

**MARYLAND DEPARTMENT OF THE ENVIRONMENT**

**AIR AND RADIATION ADMINISTRATION  
APPLICATION FOR A PERMIT TO CONSTRUCT**

**DOCKET #16-23**

COMPANY: WR Grace & Company

LOCATION: 7500 Grace Drive, Columbia, MD 21044

APPLICATION: Installation of a new research-scale pilot plant including small, R&D-scale reactors, chillers, separators, feeders, and samplers with an exhaust gas stream, cleaned by an electric, flameless thermal oxidizer.

<u>ITEM</u>	<u>DESCRIPTION</u>
1	Notice of Application and Opportunity to Request an Informational Meeting
2	Environmental Justice (EJ) Information - EJ Fact Sheet and MDE Score and Screening Report
3	Permit to Construct Application Forms – Forms 5, 5EP, 5T, 6, simplified process flow diagram, list of key equipment, site plan, emissions calculations, TAP compliance demonstration, safety data sheet, and vendor information.
4	Zoning

**DEPARTMENT OF THE ENVIRONMENT  
AIR AND RADIATION ADMINISTRATION**

**NOTICE OF APPLICATION AND  
OPPORTUNITY TO REQUEST AN INFORMATIONAL MEETING**

The Maryland Department of the Environment, Air and Radiation Administration (ARA) received a permit-to-construct application from W. R. Grace & Company on September 21, 2023 for the installation of a new research-scale pilot plant including small, R&D-scale reactors, chillers, separators, feeders, and samplers with an exhaust gas stream, cleaned by an electric, flameless thermal oxidizer. The proposed pilot plant line will be located at 7500 Grace Drive, Columbia, MD 21044.

In accordance with HB 1200/Ch. 588 of 2022, the applicant provided an environmental justice (EJ) Score for the census tract in which the project is located using the MDE EJ Screening Tool. The EJ Score, expressed as a statewide percentile, was shown to be 29% which the Department has verified. This score considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities. Multiple environmental health indicators are used to identify overburdened communities.

Copies of the application, the MDE EJ Screening Tool Report (which includes the score), and other supporting documents are available for public inspection on the Department's website at <https://mde.maryland.gov/programs/Permits/AirManagementPermits/Pages/index.aspx> (click on Docket Number 16-23). Any applicant-provided information regarding a description of the environmental and socioeconomic indicators contributing to that EJ score can also be found at the listed website. Such information has not yet been reviewed by the Department. A review of the submitted information will be conducted when the Department undertakes its technical review of all documents included in the application.

Pursuant to the Environment Article, Section 1-603, Annotated Code of Maryland, the Department will hold an informational meeting to discuss the application and the permit review process if the Department receives a written request for a meeting within 10 working days from the date of the second publication of this notice. A requested informational meeting will be held virtually using teleconference or internet-based conferencing technology unless a specific request for an in-person informational meeting is received. All requests for an informational meeting should be directed to the attention of Ms. Shannon Heafey, Air Quality Permits Program by email to [shannon.heafey@maryland.gov](mailto:shannon.heafey@maryland.gov) or by mail to the Air and Radiation Administration, 1800 Washington Boulevard, Baltimore, Maryland 21230.

Further information may be obtained by calling Ms. Shannon Heafey at 410-537-4433.

Christopher R. Hoagland, Director  
Air and Radiation Administration



# The Applicant's Guide to Environmental Justice and Permitting

## What You Need to Know

This fact sheet is designed to provide guidance to applicants on incorporating environmental justice screening requirements pursuant to House Bill 1200, effective October 1, 2022.

### What is Environmental Justice?

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The concept behind the term environmental justice (EJ) is that regardless of race, color, national origin, or income, all Maryland residents and communities should have an equal opportunity to enjoy an enhanced quality of life. How to assess whether equal protection is being applied is the challenge.

Communities surrounded by a disproportionate number of polluting facilities puts residents at a higher risk for health problems from environmental exposures. It is important that residents who may be adversely affected by a proposed source be aware of the current environmental issues in their community in order to have meaningful involvement in the permitting process. Resources may be available from government and private entities to ensure that community health is not negatively impacted by a new source located in the community.

Extensive research has documented that health disparities exist between demographic groups in the United States, such as differences in mortality and morbidity associated with factors that include race/ethnicity, income, and educational attainment. House Bill 1200 adds to MDE's work incorporating diversity, equity and inclusion into our mission to help overburdened and underserved communities with environmental issues.

### What is House Bill 1200 and what does it require?

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Effective October 1, 2022, House Bill 1200 requires a person applying for a permit from the Department under §1-601 of the Environment Article of the Annotated Code of Maryland or any permit requiring public notice and participation to include in the application an EJ Score for the census tract where the applicant is seeking the permit; requiring the Department, on receiving a certain permit application to review the EJ Score; and requiring notices to include information related to EJ Scores and generally relating to environmental permits and environmental justice screenings.

### What is a "Maryland EJ Tool"?

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The term "Maryland EJ Tool" means a publicly available state mapping tool that allows users to: (1) explore layers of environmental justice concern; (2) determine an overall EJ score for census tracts in the state; and (3) view additional context layers relevant to an area. The MDE EJ Screening Tool is considered a Maryland EJ Tool.

### What is an "EJ Score"?

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The term "EJ Score" means an overall evaluation of an area's environment and environmental justice indicators, as defined by MDE in regulation, including: (1) pollution burden exposure; (2) pollution burden environmental effects; (3) sensitive populations; and (4) socioeconomic factors.

The MDE EJ Screening Tool considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities, and multiple environmental health indicators to identify overburdened communities. The tool uses these indicators to calculate a



# The Applicant's Guide to Environmental Justice and Permitting

## What You Need to Know

Final EJ Score Percentile, statewide. It is that score, linked to the census tract where the project is to be located, that needs to be reported to MDE as part of your permit application.

### What does the application require?

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The link for the MDE EJ Screening Tool is located on the Department's website, [www.mde.maryland.gov](http://www.mde.maryland.gov). Click on the Environmental Justice header at the top of the Department's home page, then select EJ Screening Tool from the menu on the left. Click on Launch the EJ Screening Tool. After you open the tool, click okay on the opening screen. At the top right, please click the first button for the MDE Screening Report. Input the address of the proposed installation in the address bar. Click on the Report button. Once the report has been generated select the print icon and save it in a .pdf format.

The applicant needs to include the MDE Screening Report with the EJ Score from the MDE EJ Screening Tool as part of the permit application upon submission. An application will not be considered complete without the report.

The applicant is encouraged to provide the Department with a discussion about the environmental exposures in the community. This will provide pertinent information about how the applicant should proceed with engaging with the community. Residents of a community with a high indicator score and a high degree of environmental exposure should be afforded broader opportunities to participate in the permit process and understand the impacts a project seeking permit approval may have on them.

### Questions

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For air quality permits, please call 410-537-3230.

For water permits, please call 410-537-4145.

For land permits pertaining to Solid Waste, please call 410-537-3098. For land permits pertaining to Oil Control, please call 410-537-3483.

For land permits pertaining to Animal Feeding Operations, please call 410-537-4423.

For land permits pertaining to Biosolids, please call 410-537-3403.

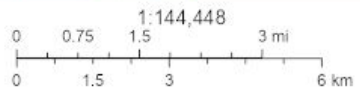
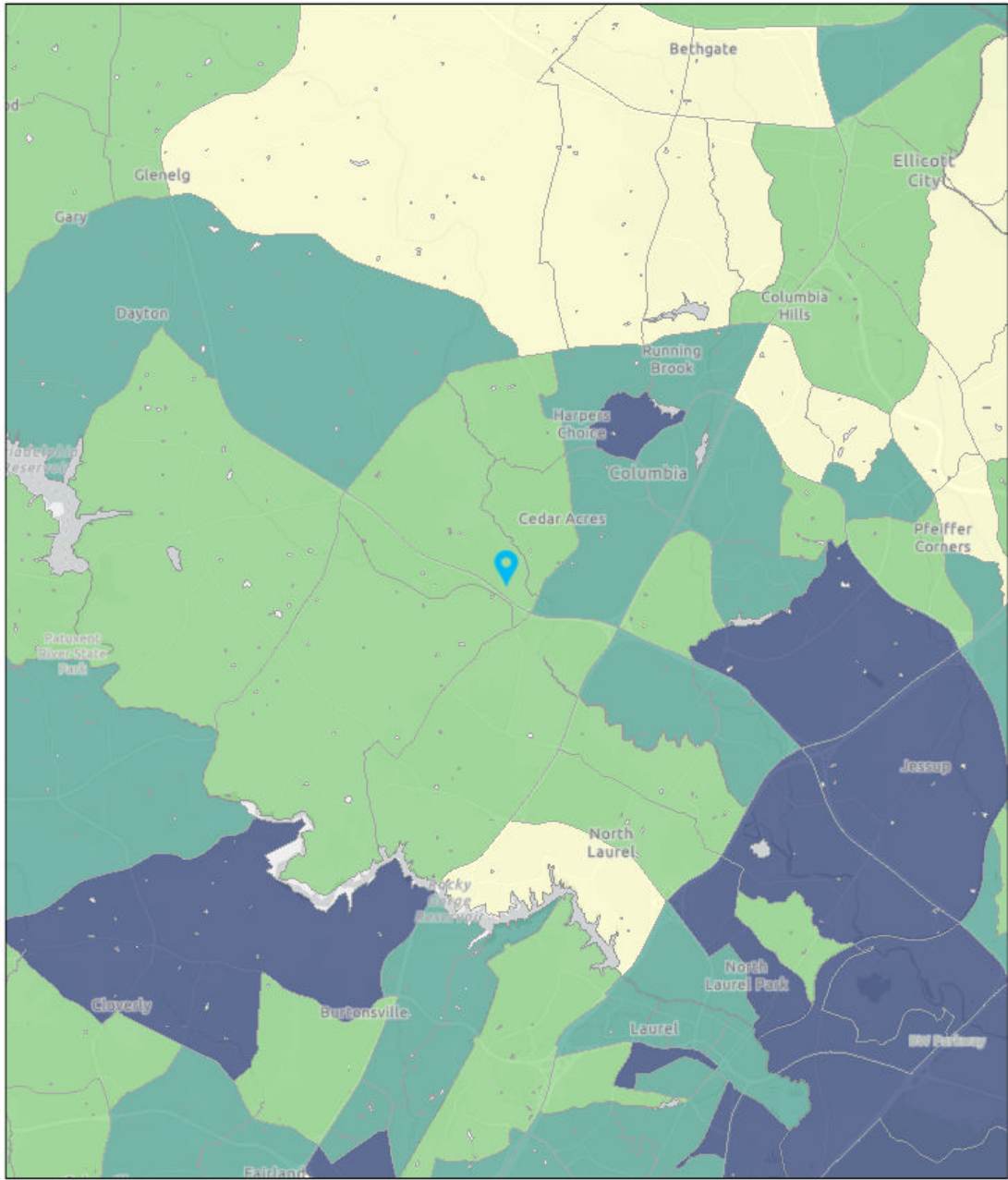


# MDE Screening Report

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## Area of Interest (AOI) Information

Aug 29 2023 15:28:48 Eastern Daylight Time



MDE Final EJ Score (%ile score)

- 0% - 24.9th %ile
- 25% - 49.9th %ile
- 50% - 74.9th %ile
- 75% - 100th %ile

MDE, OS, OIMT. Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Summary

Name	Count	Area(mi <sup>2</sup> )	Length(mi)
MDE Final EJ Score (%ile score)	1	N/A	N/A
Overburdened Communities Combined Score	1	N/A	N/A
Overburdened Pollution Environmental Score (%ile score)	1	N/A	N/A
Overburdened Exposure Score (%ile score)	1	N/A	N/A
Overburdened Sensitive Population (%ile score)	1	N/A	N/A
Socioeconomic/Demographic Score 2020 (Percentile score) (Underserved Community)	1	N/A	N/A
Air Emissions Facilities	0	N/A	N/A
Sulfur Dioxide (2010)	0	N/A	N/A
Ozone (2015)	1	N/A	N/A
Fine Particles (2012)	1	N/A	N/A
Biosolids FY 2020 and Current Permit Details	0	N/A	N/A
Biosolids FY2010 - 2014 Permit Details	0	N/A	N/A
Biosolids FY2009 Expired Permit Details	0	N/A	N/A
Biosolids FY 2020 and Current Permits Distribution By Acreage	1	N/A	N/A
Biosolids FY2015 - 2019 Permits Distribution By Acreage	1	N/A	N/A
Biosolids FY2010 - 2014 Permits Distribution By Acreage	1	N/A	N/A
Biosolids FY2009 Permits Expired Distribution By Acreage	1	N/A	N/A
Biosolids FY 2020 and Current Permit Distribution By Percent Coverage	1	N/A	N/A
Biosolids FY2015 - 2019 Permit Distribution By Percent Coverage	1	N/A	N/A
Biosolids FY2010 - 2014 Permit Distribution By Percent Coverage	1	N/A	N/A
Biosolids FY2009 Expired Permit Distribution By Percent Coverage	1	N/A	N/A
Concentrated Animal Feeding Operations (CAFOs)	0	N/A	N/A
Composting Facilities	0	N/A	N/A
Food Scrap Acceptors	0	N/A	N/A
Landfills	0	N/A	N/A



Correctional Facilities	0	N/A	N/A
Industrial Food Suppliers	0	N/A	N/A
Residential Colleges	0	N/A	N/A
Non-Residential Colleges	0	N/A	N/A
Hospitals	0	N/A	N/A
High Schools	0	N/A	N/A
Grocery Stores	0	N/A	N/A
10 Miles from Landfill	6	N/A	N/A
10 Miles from Composting Facility	4	N/A	N/A
General Composting Facilities Tier 2 (MD)	0	N/A	N/A
Commercial Anaerobic Digester (MD)	0	N/A	N/A
Out of State Facilities	0	N/A	N/A
30 mile buffer (Maryland)	3	N/A	N/A
30 Mile Buffer (Out of State)	0	N/A	N/A
Land Restoration Facilities	0	N/A	N/A
Determinations (points)	0	N/A	N/A
Determinations (areas)	0	N/A	N/A
Entities	0	N/A	N/A
Active Coal Mine Sites	0	N/A	N/A
Historic Mine Facilities	0	N/A	N/A
All Permitted Solid Waste Acceptance Facilities	0	N/A	N/A
Municipal Solid Waste Acceptance Facilities	0	N/A	N/A
Maryland Dam Locations	0	N/A	N/A
Maryland Pond Locations	0	N/A	N/A
Surface Water Intakes	0	N/A	N/A
Wastewater Discharge Facilities	0	N/A	N/A
Drinking Water	0	N/A	N/A
Clean Water	0	N/A	N/A

### MDE Final EJ Score (%ile score)

#	Census tract identifier	Geographic Area Name	Total Population	Final EJ Score Percent (for this tract)	Final EJ Score Percentile (Distribution across Maryland)	Area(mi <sup>2</sup> )
1	24027605505	Census Tract 6055.05, Howard County, Maryland	6529	26.24	28.98	N/A

### Overburdened Communities Combined Score

#	GEOID20	Geographic_Area_Name	TotalPop	Overburd_Exposure_Percent	Overburd_Exposure_Percentile
1	24027605505	Census Tract 6055.05, Howard County, Maryland	6,529	46.79	54.68

#	Overburd_Poll_Enviro_Percent	Overburd_Poll_Enviro_Percentile	Sensitive_Population_Percent	Sensitive_Population_Percentile	OverburdenedAIIPercent	OverburdenedAIIPercentile	Area(mi²)
1	0.97	1.64	60.19	50.38	28.23	47.16	N/A

#### Overburdened Pollution Environmental Score (%ile score)

#	GEOID20	Geographic_Area_Name	RentalsOccupiedPre79Percent	Percentile	PercentRMP
1	24027605505	Census Tract 6055.05, Howard County, Maryland	0.67	5.88	1.61

#	PercentRMPEJ	PercentHazWaste	PercentHazWasteEJ	PercentSuperFundNPL	PercentSuperFundNPLEJ
1	7.15	2.86	17.58	3.59	16.00

#	PercentHazWW	PercentHazWWEJ	BrownFPercent	Percentile_1	PercentPowerPlants
1	0.00	0.00	0.00	0.00	0.00

#	Percentile_12	PercentCAFOS	Percentile_12_13	PercentActiveMines	Percentile_12_13_14
1	0.00	0.00	0.00	0.00	0.00

#	PollutionEnvironmentalPercent	PolInEnvironmentalPercentile	Area(mi²)
1	0.97	1.64	N/A

#### Overburdened Exposure Score (%ile score)

#	GEOID20	Geographic_Area_Name	Total_Pop	PercentNATA_Cancer	Percentile_NATA_Cancer
1	24027605505	Census Tract 6055.05, Howard County, Maryland	6,529.00	60.00	28.74

#	PercentNATA_Resp_HI	Percentile_NATA_Resp_HI	PercentNATA_Diesel	Percentile_NATA_Diesel	PercentNATA_PM25
1	80.00	32.05	26.26	20.53	97.81

#	PercentileNATA_PM25	PercentOzone	PercentileOzone	PercentTraffic	PercentileTraffic
1	28.91	96.36	29.19	3.34	19.36

#	PercentTRI	PercentileTRI	PercentHazWasteLF	Percentile_HazWasteLF	PollutionExposurePercent	PollutionExposurePercentile	Area(mi²)
1	10.53	91.73	0.00	0.00	46.79	54.68	N/A

#### Overburdened Sensitive Population (%ile score)

#	GEOID20	Geographic_Area_Name	PerAstma	PercentileAst	PerMyo
1	24027605505	Census Tract 6055.05, Howard County, Maryland	54.90	81.68	59.20

#	PercentileMyo	PerLow	PercentileLow	PercentBroad	PercentileBroad
1	82.78	28.40	51.81	1.75	10.66

#	PercentSens	PercentileSens	Area(mi <sup>2</sup> )
1	36.06	56.73	N/A

### Socioeconomic/Demographic Score 2020 (Percentile score) (Underserved Community)

#	Census tract identifier	Geographic Area Name	Total Population	Percent Poverty	Percent Minority
1	24027605505	Census Tract 6055.05, Howard County, Maryland	6,529	3.86	54.33

#	Percent Limited English Proficiency	Demographic Score (Percent for this tract)	Demographic Score (Percentile Distribution across Maryland)	Area(mi <sup>2</sup> )
1	5.20	21.13	46.47	N/A

### Ozone (2015)

#	STATEFP10	COUNTYFP10	COUNTYNS10	GEOID10	NAME10
1	24	027	01709077	24027	Howard

#	Ozone NAA Area	8-Hr Ozone (2015) Designation	8-HR Ozone (2015) Classification	8-Hr Ozone (2015) Status	Area(mi <sup>2</sup> )
1	Baltimore, MD	Nonattainment	Moderate	No Data	N/A

### Fine Particles (2012)

#	STATEFP10	COUNTYFP10	COUNTYNS10	GEOID10	NAME10	PM2.5 (2012) Status	Area(mi <sup>2</sup> )
1	24	027	01709077	24027	Howard	Attainment/Uncl assifiable	N/A

### Biosolids FY 2020 and Current Permits Distribution By Acreage

#	County Name	FY2020andAfter	Area(mi <sup>2</sup> )
1	Howard	471.00	N/A

### Biosolids FY2015 - 2019 Permits Distribution By Acreage

#	County Name	FY2015to2019	Area(mi <sup>2</sup> )
1	Howard	214.60	N/A

### Biosolids FY2010 - 2014 Permits Distribution By Acreage

#	County Name	FY2010to2014	Area(mi <sup>2</sup> )
1	Howard	No Data	N/A

## Biosolids FY2009 Permits Expired Distribution By Acreage

#	County Name	FY2009	Area(mi <sup>2</sup> )
1	Howard	<i>No Data</i>	N/A

## Biosolids FY 2020 and Current Permit Distribution By Percent Coverage

#	County Name	FY2020andAfter	Area(mi <sup>2</sup> )
1	Howard	471.00	N/A

## Biosolids FY2015 - 2019 Permit Distribution By Percent Coverage

#	County Name	FY2015to2019	Area(mi <sup>2</sup> )
1	Howard	214.60	N/A

## Biosolids FY2010 - 2014 Permit Distribution By Percent Coverage

#	County Name	FY2010to2014	Area(mi <sup>2</sup> )
1	Howard	<i>No Data</i>	N/A

## Biosolids FY2009 Expired Permit Distribution By Percent Coverage

#	County Name	FY2009	Area(mi <sup>2</sup> )
1	Howard	<i>No Data</i>	N/A

## 10 Miles from Landfill

#	County	Type	Facility_N	ADDRESS	FILL
1	ANNEARUNDEL	WPT	Annapolis Junction PF & TS	8077 Brock Bridge Road, Jessup MD 20794.	-
2	FREDERICK	WMF	Fort Detrick Municipal Landfill	7184 Troy Hill Drive Elkridge MD 21075.	61
3	HOWARD	WMF	Alpha Ridge Municipal Landfill	2350 Marriottsville Road, Marriottsville MD 21104.	195
4	HOWARD	WPT	Alpha Ridge PF & TS	2350 Marriottsville Road, Marriottsville MD 21104.	195
5	HOWARD	WPT	Ameriwaste PF & TS	7150 Kit Kat Road, Elkridge MD 21075.	-
6	HOWARD	WTS	Workplace Essentials TS	7184 Troy Hill Drive Elkridge MD 21075.	-

#	SITE__ACRE	AI_No_	Owner_Type	MD_GRID__E	PERMITNUMB	EXPIRATION	Area(mi <sup>2</sup> )
1	17.00	15,228.00	PRI	860 /470	2011-WPT-0158	3/23/2016, 8:00 PM	N/A
2	297.00	1,790.00	FED	672 /583	2015-WMF-0327	8/25/2020, 8:00 PM	N/A
3	590.00	1,357.00	CTY	823 /539	2010-WMF-0110	4/3/2016, 8:00 PM	N/A
4	590.00	1,357.00	CTY	823 /539	2012-WPT-0578	3/18/2018, 8:00 PM	N/A
5	12.89	36,535.00	PRI	865 /489	2011-WPT-0572	11/2/2016, 8:00 PM	N/A
6	1.00	36,696.00	PRI	885 /550	2015-WTS-0594	6/3/2020, 8:00 PM	N/A

### 10 Miles from Composting Facility

#	County	Facility	Address	Accepts_Fo	Location_o	Area(mi <sup>2</sup> )
1	<i>No Data</i>	ACME Biomass Reduction Inc.	21601 Newhampshire Ave, Brookeville, MD 20833	No	21601 New Hampshire Ave, Brookeville, MD 20833	N/A
2	<i>No Data</i>	Aspen Nursery	1570 New hampshire Ave, Silver Spring, MD 20905	No	New Hampshire Ave, Silver Spring, MD 20905	N/A
3	<i>No Data</i>	Composting Facility at Alpha Ridge Landfill	2350 Marriottsville Rd, Marriottsville, MD 21104	Yes	2350 Marriottsville Rd, Marriottsville, MD 21104	N/A
4	<i>No Data</i>	County Nursery Inc.	3330 Spencerville Road, Burtonsville, MD	No	3330 Spencerville Rd, Burtonsville, MD 20866	N/A

### 30 mile buffer (Maryland)

#	Facility_Name_1	Facility_Contact_1	Contact_Phone	Contact_Email_1	Contact_2
1	Bioenergy DEVCO - Maryland Organics Recycling Facility	Vinnie Bevivino	(202) 360-1805	Vbevivino@bioenergydevco.com	Mike Manna
2	Composting Facility at Alpha Ridge Landfill	Bureau of Environmental Services	(410) 313-6444	<i>No Data</i>	<i>No Data</i>
3	Prince George's County Organics Composting Facility	Angie Webb, Recycling Coordinator	(240) 904-4630	awebb@menv.com	<i>No Data</i>

#	Contact_2_Phone	Contact_2_Email	URL	Area(mi <sup>2</sup> )
1	(609) 744-2819	mmanna@bioenergydevco.com	<a href="https://www.bioenergydevco.com/maryland-organics-recycling-facility/">https://www.bioenergydevco.com/maryland-organics-recycling-facility/</a>	N/A
2	<i>No Data</i>	<i>No Data</i>	<a href="https://www.howardcountymd.gov/public-works/composting-facility">https://www.howardcountymd.gov/public-works/composting-facility</a>	N/A
3	<i>No Data</i>	<i>No Data</i>	<a href="https://www.princegeorgescoutymd.gov/583/Organics-Composting-Facility">https://www.princegeorgescoutymd.gov/583/Organics-Composting-Facility</a>	N/A

August 3, 2023

Suna Yi Sariscak, Manager  
Air Quality Permits Program  
Maryland Department of the Environment  
Air and Radiation Management Administration  
1800 Washington Boulevard, Suite 720  
Baltimore, Maryland 21230-1720  
MDE.Submit-AirPermits@maryland.gov

Re: Permit to Construct (PTC) Application to Install Research Pilot Scale Test Catalytic Chemical Conversion of Plastics Process

Dear Ms. Sariscak:

W.R. Grace & Company – Conn. (Grace) is submitting this PTC application to construct a research pilot scale test catalytic chemical conversion of plastics process at the Columbia, Maryland facility. This test process will use Grace's innovative catalyst technology to convert commercially available plastic pellets into potentially usable energy-containing liquids and gas. This test process will evaluate the desired new technologies including catalyst and process conditions as well as resultant liquid/gas properties for research and development purposes only. As presented in the PTC application the reactor gases will be controlled by a very high efficiency electric, flameless thermal oxidizer prior to exhausting to the atmosphere. Atmospheric emissions from this test process will be low.

Enclosed are the completed MDE Forms 5, 5EP, 5T and 6, supporting flow diagram, plot plans and emissions calculations, and a TAP compliance demonstration.

Your prompt attention to our application would be appreciated. Grace would like to request a meeting/call with you in the next few weeks to discuss our planned process and to answer any initial questions you may have on our application. If you need anything additional or have any questions, do not hesitate to contact me at 410-531-4570 or at [daniel.resca@grace.com](mailto:daniel.resca@grace.com).

Sincerely,



Recoverable Signature

X *Daniel Resca*

Daniel Resca  
Project Manager  
Signed by: Daniel Resca

Enclosures

Cc:

W. R. Grace & Co.-Conn. Columbia, MD Facility  
Application to Install a Research Pilot Scale Test Catalytic  
Chemical Conversion of Plastics Process

Introduction

W. R. Grace & Co.-Conn.'s (Grace's) research facility located in Columbia, Maryland performs research and development (R&D) activities involving proprietary processes and materials. Grace proposes to install, in Building 30, a pilot-scale test catalytic chemical conversion process (the Project), using Grace's innovative catalyst technology, to convert commercially available plastics pellets into potentially usable energy-containing liquids and gas. This proposed pilot plant will be used to evaluate the desired new technologies including catalyst and process conditions as well as resultant liquid/gas properties for research and development only.

The following comprises the application for a permit-to-construct (PTC) the proposed Project, and includes a project description as well as several attachments, namely:

Attachment 1 Simplified Process Flow Diagram

Attachment 2 List of Key Project Equipment

Attachment 3 Site Plan

Attachment 4 MDE PTC Application Checklist and Forms 5, 5T, 5EP (two) and 6

Attachment 5 Emissions – Calculations, Engineering Estimates and Assumptions

Attachment 6 TAP Compliance Demonstration

Attachment 7 Safety Data Sheet of Example Plastic Feedstock

Attachment 8 Vendor Information for Electric Flameless Thermal Oxidizer

Project Description

The proposed Project will involve four key systems: 1) reaction; 2) product recovery; 3) catalyst circulation/regeneration; and 4) steam generation. Attachment 1 is a simplified process flow diagram of the proposed Project.

The proposed Project is designed to process 1 kg/hr of commercially available plastic pellet feedstock (the benchmark feedstock can be 100% homogeneous polypropylene (PP). However, a typical mixed plastic also can include low density polyethylene (LDPE), high density polyethylene (HDPE), polyethylene terephthalate (PET), polystyrene (PS), polyvinyl chloride (PVC), and others). The plastic feedstock will be manually transferred to a feed system that

meters the feedstock into the reaction system. The catalytic chemical conversion reaction occurs at high temperature, in an oxygen-free environment. A catalyst circulation/regeneration system will be used to supply fresh and regenerated catalyst to the reaction system as well as supply heat required for the reaction. The catalytic chemical conversion reaction produces a product vapor comprised of non-condensable gas and condensable liquid. Residual catalyst in the product vapor will be recovered by a process cyclone and returned to the reactors. Then, the product vapor will go through a product recovery system involving vapor condensation and gas/liquid separation. The separated non-condensable gas will go through an electric flameless thermal oxidizer prior to venting to the atmosphere. The separated condensed liquid will be collected in two, 3-gal tanks. The collected liquid will be transferred, daily, to 55-gal drums in the warehouse, and ultimately shipped to a 3<sup>rd</sup> party waste treatment facility.

Spent catalyst from the reaction system will go through a steam stripper, then transferred with N<sub>2</sub> gas to the top of the catalyst regenerator. Combustion air will be introduced to the regenerator to burn off the spent catalyst coke. The regenerator is designed to provide excess air sufficient for complete combustion. Hot, regenerated catalyst is withdrawn from the regenerator and transferred, through risers, back to the reaction system with steam and N<sub>2</sub> gas. As mentioned above, the hot regenerated catalyst provides the heat for the reaction. Electric heating at the regenerator, the transfer lines to the risers, and the risers will heat the catalyst transferred from the regenerator to the reaction system and will be the prime source of heat during process startup. Regenerator hot combustion flue gas will be treated prior to venting to the atmosphere. The flue gas will go through a knock-out filter pot (to remove residual catalyst) and a gas/liquid separator (to remove water and cool the gas).

Steam used in the proposed process will be produced by electric steam generating units.

Being a pilot scale test installation for research and development there will be handling of samples of gas and liquid products, feedstock and catalyst for testing/analysis all at bench scale.

Attachment 2 lists the key process equipment proposed for the Project.

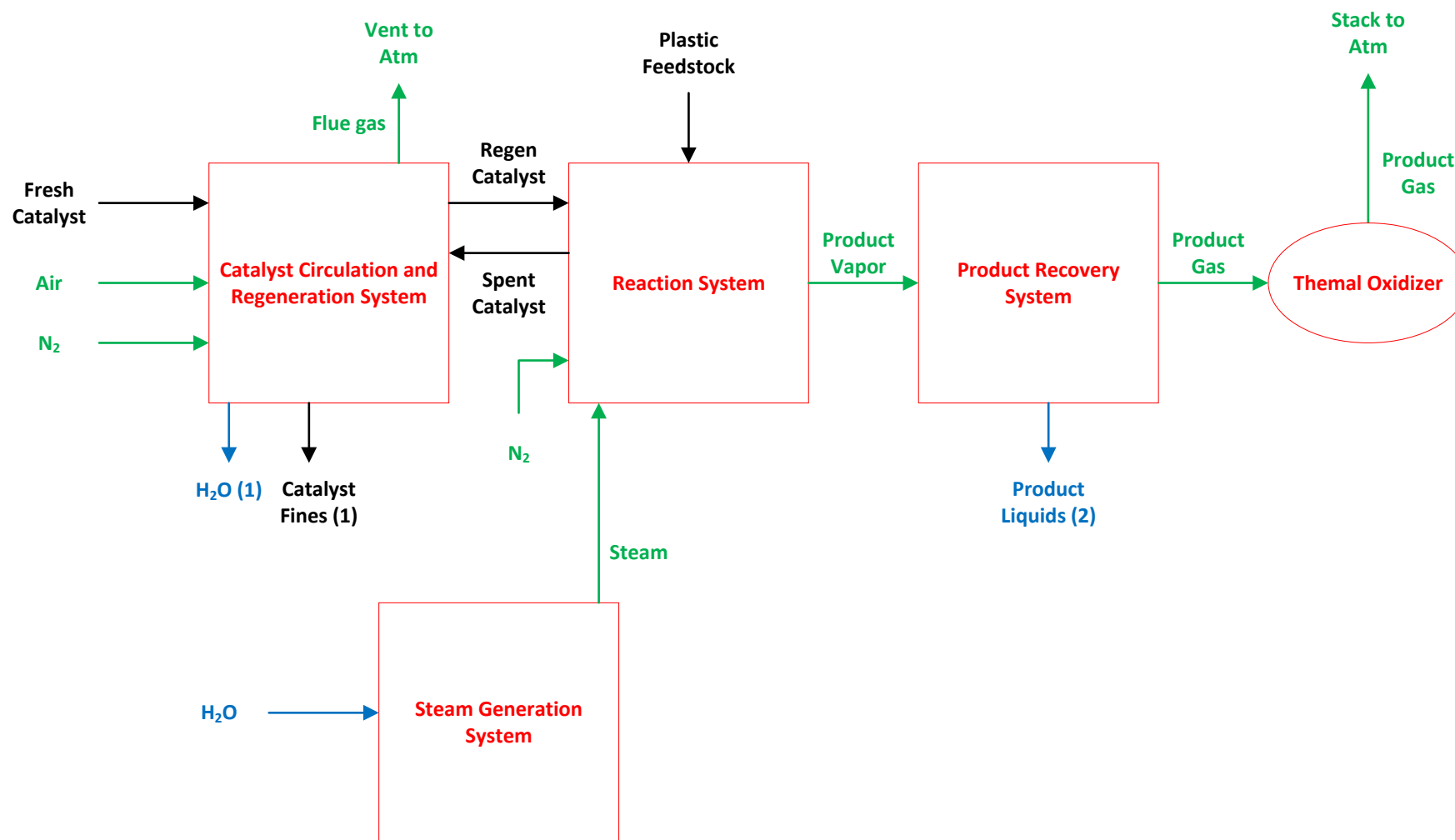
The proposed installation is scheduled to operate over two shifts on a given workday, with start-up activities, continuous reactor operation, shut-down activities and regular maintenance all occurring over 16 hours. Yearly operation is expected to be less than or equal to 4000 hr/yr.



## ATTACHMENT 1

### Simplified Process Flow Diagram

# Simplified Process Flow Diagram for Proposed Research Pilot Scale Test Catalytic Chemical Conversion Process



## Notes:

- (1) Non-hazardous waste disposal
- (2) Transfer to 3<sup>rd</sup> party treatment facility

## ATTACHMENT 2

### List of Key Project Equipment

## List of Key Equipment for Planned Project

- Reactors and risers
- Reactor gas cyclone
- Reactor gas stabilization column
- Electric flameless thermal oxidizer
- Spent catalyst stripper
- Spent catalyst regenerator
- Steam generators
- Associated hoppers, vessels/tanks, heat exchangers, coolers, electric heating units, conveyance systems, piping, analyzers and instrumentation

## ATTACHMENT 3

Site Plan



5/2023  
1985 2023

987 ft

1985

Google Earth

Imagery Date: 5/11/2023 lat: 39.190709° lon: -76.902127° elev: 0 ft eye alt: 4498 ft

Thermal Oxidizer Stack



Regen Exhaust Vent



**BLDG 30**

Image © 2023 Airbus

Google Earth

Imagery Date: 5/11/2023 lat 39.192026° lon -76.902814° elev 0 ft eye alt 477 ft

1985

## ATTACHMENT 4

MDE PTC Application Checklist and Forms 5, 5T, 5EP (two) and 6





## AIR QUALITY PERMIT TO CONSTRUCT APPLICATION CHECKLIST

OWNER OF EQUIPMENT/PROCESS	
COMPANY NAME:	W.R. Grace & Co. - Conn
COMPANY ADDRESS:	7500 Grace Drive, Columbia, MD 21044
LOCATION OF EQUIPMENT/PROCESS	
PREMISES NAME:	W.R. Grace Corporate Headquarters
PREMISES ADDRESS:	7500 Grace Drive, Columbia, MD 21044
CONTACT INFORMATION FOR THIS PERMIT APPLICATION	
CONTACT NAME:	Dan Resca
JOB TITLE:	Project Manager, Columbia
PHONE NUMBER:	410-531-4570
EMAIL ADDRESS:	daniel.resca@grace.com
DESCRIPTION OF EQUIPMENT OR PROCESS	
Catalytic Chemical Conversion of Plastics R&D Process	

Application is hereby made to the Department of the Environment for a Permit to Construct for the following equipment or process as required by the State of Maryland Air Quality Regulation, COMAR 26.11.02.09.

Check each item that you have submitted as part of your application package.

- Application package cover letter describing the proposed project
- Complete application forms (Note the number of forms included or NA if not applicable.)
 

No. <u>  1  </u> Form 5	No. <u>      </u> Form 11
No. <u>  1  </u> Form 5T	No. <u>      </u> Form 41
No. <u>  2  </u> Form 5EP	No. <u>      </u> Form 42
No. <u>  1  </u> Form 6	No. <u>      </u> Form 44
No. <u>      </u> Form 10	
- Vendor/manufacturer specifications/guarantees
- Evidence of Workman's Compensation Insurance
- Process flow diagrams with emission points
- Site plan including the location of the proposed source and property boundary
- Material balance data and all emissions calculations
- Material Safety Data Sheets (MSDS) or equivalent information for materials processed and manufactured.
- Certificate of Public Convenience and Necessity (CPCN) waiver documentation from the Public Service Commission <sup>(1)</sup>
- Documentation that the proposed installation complies with local zoning and land use requirements <sup>(2)</sup>

<sup>(1)</sup> Required for emergency and non-emergency generators installed on or after October 1, 2001 and rated at 2001 kW or more.

<sup>(2)</sup> Required for applications subject to Expanded Public Participation Requirements.

**APPLICATION FOR FUEL BURNING EQUIPMENT**

**Information Regarding Public Outreach**

For Air Quality Permit to Construct applications subject to public review, applicants should consider the following information in the initial stages of preparing a permit application.

If you are not sure at the time you are applying for a permit whether public review of your application is required or for information on steps you can take to engage the surrounding community where your planned project will be located, please contact the Air Quality Permits Program at 410-537-3225 and seek their advice.

Communicating and engaging the local community as early as possible in your planning and development process is an important aspect of your project and should be considered a priority. Environmental Justice or "EJ" is a movement to inform, involve, and engage communities impacted by potential and planned environmental projects by affording citizens opportunities to learn about projects and discuss any concerns regarding impacts.

Although some permit applications are subject to a formal public review process prescribed by statute, the Department strongly encourages you to engage neighboring communities separate from and well ahead of the formal permitting process. Sharing your plans by way of community meetings, informational outreach at local gatherings or through local faith-based organizations can initiate a rewarding and productive dialogue that will reduce anxiety and establish a permanent link with your neighbors in the community.

All parties benefit when there is good communication. The Department can assist applicants in developing an outreach plan that fits the needs of both the company and the public.

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**Air and Radiation Management Administration ▪ Air Quality Permits Program**

**APPLICATION FOR PROCESSING/MANUFACTURING EQUIPMENT**

Permit to Construct

Registration Update

Initial Registration

**1A. Owner of Equipment/Company Name**

W.R. Grace & Company - Conn.

**Mailing Address**

7500 Grace Drive

**Street Address**

Columbia Maryland 21044

City State Zip

**Telephone Number**

( 410 ) 531-8300

**Signature**



Matt Meixell, Facilities Site Manager

Print Name and Title

8/4/2023

Date

**1B. Equipment Location and Telephone Number (if different from above)**

Same as above

Street Number and Street Name

City/Town

State

Zip

( )

Telephone Number

Premises Name (if different from above)

**3. Status (A= New, B= Modification to Existing Equipment, C= Existing Equipment)**

Status	New Construction Begun (MM/YY)	New Construction Completed (MM/YY)	Existing Initial Operation (MM/YY)
A 15	0 1 2 4 16-19	0 8 2 4 20-23	 20-23

**4. Describe this Equipment: Make, Model, Features, Manufacturer (include Maximum Hourly Input Rate, etc.)**

Research-scale catalytic chemical conversion of plastics process for Research & Development

**5. Workmen's Compensation Coverage** 792878903

Binder/Policy Number

11/15/2023

Expiration Date

Company Zurich American Insurance Company

NOTE: Before a Permit to Construct may be issued by the Department, the applicant must provide the Department with proof of worker's compensation coverage as required under Section 1-202 of the Worker's Compensation Act.

**6A. Number of Pieces of Identical Equipment Units to be Registered/Permitted at this Time** See Attach 2

**6B. Number of Stack/Emission Points Associated with this Equipment** 2

**DO NOT WRITE IN THIS BLOCK**

**2. REGISTRATION NUMBER**

County No.

Premises No.

--	--

--	--	--	--

1-2

3-6

Registration Class

Equipment No.

--

--	--	--	--

7

8-11

Data Year

--	--

12-13

Application Date



**7. Person Installing this Equipment (if different from Number 1 on Page 1)**

Name \_\_\_\_\_ Title \_\_\_\_\_  
 Company \_\_\_\_\_  
 Mailing Address/Street \_\_\_\_\_  
 City/Town \_\_\_\_\_ State \_\_\_\_\_ Telephone (\_\_\_\_) \_\_\_\_\_

**8. Major Activity, Product or Service of Company at this Location**

Research & Development

**9. Control Devices Associated with this Equipment**

None  
  
 24-0

Simple/Multiple Cyclone <input type="checkbox"/> 24-1	Spray/Adsorb Tower <input type="checkbox"/> 24-2	Venturi Scrubber <input type="checkbox"/> 24-3	Carbon Adsorber <input type="checkbox"/> 24-4	Electrostatic Precipitator <input type="checkbox"/> 24-5	Baghouse <input type="checkbox"/> 24-6	Thermal/Catalytic Afterburner <input type="checkbox"/> 24-7	Dry Scrubber <input type="checkbox"/> 24-8
--	---	---	--	---	--	--	---

Other

Describe Electric flameless thermal oxidizer  
 24-9

**10. Annual Fuel Consumption for this Equipment**

OIL-1000 GALLONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 26-31	SULFUR % <input type="text"/> <input type="text"/> 32-33	GRADE <input type="text"/> 34	NATURAL GAS-1000 FT <sup>3</sup> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 35-41	LP GAS-100 GALLONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 42-45	GRADE <input type="text"/> 42-45
COAL- TONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 46-52	SULFUR % <input type="text"/> <input type="text"/> 53-55	ASH% <input type="text"/> <input type="text"/> 56-58	WOOD-TONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 59-63	MOISTURE % <input type="text"/> <input type="text"/> 64-65	

OTHER FUELS  ANNUAL AMOUNT CONSUMED OTHER FUEL  ANNUAL AMOUNT CONSUMED  
 (Specify Type) 66-1 (Specify Units of Measure) (Specify Type) 66-2 (Specify Units of Measure)  
 1= Coke 2= COG 3=BFG 4=Other

**11. Operating Schedule (for this Equipment)**

Continuous Operation <input type="checkbox"/> 67-1	Batch Process <input checked="" type="checkbox"/> 67-2	Hours per Batch <input type="text"/> <input type="text"/> 68-69	Batch per Week <input type="text"/> 68-69	Hours per Day <input type="text"/> <input type="text"/> 70-71	Days Per Week <input type="text"/> 72	Days per Year <input type="text"/> <input type="text"/> <input type="text"/> 73-75
Seasonal Variation in Operation:						
No Variation <input checked="" type="checkbox"/> 76	Winter Percent <input type="text"/> <input type="text"/> 77-78	Spring Percent <input type="text"/> <input type="text"/> 79-80	Summer Percent <input type="text"/> <input type="text"/> 81-82	Fall Percent <input type="text"/> <input type="text"/> 83-84	(Total Seasons= 100%)	

**12. Equivalent Stack Information- is Exhaust through Doors, Windows, etc. Only? (Y/N)**

See Form 5EP

**N**  
85

If not, then

Height Above Ground (FT)

Inside Diameter at Top

Exit Temperature (°F)

Exit Velocity (FT/SEC)

--	--	--

86-88

--	--	--

89-91

--	--	--	--

92-95

--	--	--

96-98

**NOTE: See Attach 1 and Attach 3**

**Attach a block diagram of process/process line, indicating new equipment as reported on this form and all existing equipment, including control devices and emission points.**

**13. Input Materials (for this equipment only)**

Is any of this data to be considered confidential? **N** (Y or N)

	NAME	CAS NO. (IF APPLICABLE)	PER HOUR	INPUT RATE		UNITS
				UNITS	PER YEAR	
1.	Commercial plastic pellet feedstock		1000	g	4000	kg
2.	Catalyst					
3.						
4.						
5.						
6.						
7.						
8.						
9.						

**TOTAL**

**14. Output Materials (for this equipment)**

Process/Product Stream

	NAME	CAS NO. (IF APPLICABLE)	PER HOUR	OUTPUT RATE		UNITS
				UNITS	PER YEAR	
1.	Gas stream (H2, CO2, C4 hydrocarbons)		647	g	2588	kg
2.	Liquid stream (C5+ organic, H2O, HCl)		320	g	1280	kg
3.	Char		33	g	132	kg
4.						
5.						
6.						
7.						
8.						
9.						

**TOTAL**

**15. Waste Streams- Solid and Liquid**

	NAME	CAS NO. (IF APPLICABLE)	PER HOUR	OUTPUT RATE		UNITS
				UNITS	PER YEAR	
1.	Liquid stream (C5+ organic, H2O, HCl)		320	g	1280	kg
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						

**TOTAL**

**16. Total Stack Emissions (for this equipment only) in Pounds Per Operating Day**

Particulate Matter

99-104

Oxides of Sulfur

105-110

Oxides of Nitrogen

111-116

Carbon Monoxide

177-122

Volatile Organic Compounds

123-128

PM-10

129-134

**17. Total Fugitive Emissions (for this equipment only) in Pounds Per Operating Day**

Particulate Matter

135-139

Oxides of Sulfur

140-144

Oxides of Nitrogen

145-149

Carbon Monoxide

150-154

Volatile Organic Compounds

155-159

PM-10

160-164

**Method Used to Determine Emissions (1= Estimate 2= Emission Factor 3= Stack Test 4= Other)**

TSP

165

SOX

166

NOX

167

CO

168

VOC

169

PM10

170

**AIR AND RADIATION MANAGEMENT ADMINISTRATION USE ONLY**

**18. Date Rec'd. Local**

**Date Rec'd. State**

**Return to Local Jurisdiction**

Date \_\_\_\_\_ By \_\_\_\_\_

**Reviewed by Local Jurisdiction**

Date \_\_\_\_\_ By \_\_\_\_\_

**Reviewed by State**

Date \_\_\_\_\_ By \_\_\_\_\_

**19. Inventory Date**

**Month/Year**

171-174

**Equipment Code**

175-177

**SCC Code**

178-185

**20. Annual**

**Operating Rate**

186-192

**Maximum Design**

**Hourly Rate**

193-199

**Permit to Operate**

**Month**

200-201

**Transaction Date**

**(MM/DD/YR)**

202-207

**Staff Code**

208-210

**VOC Code**

211 212

**SIP Code**

213 214

**Regulation Code**

215-218

**Confidentiality**

219

**Point Description**

220-238

**Action**

A: Add  
C: Change

239

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**FORM 5EP: Emission Point Data**

**Complete one (1) Form 5EP for EACH emission point** (stack or fugitive emissions) related to the proposed installation.

Applicant Name: W.R. Grace & Company - Conn.

**1. Emission Point Identification Name/Number**

List the applicant assigned name/number for this emission point and use this value on the attached required plot plan:  
TO Stack

**2. Emission Point Description**

Describe the emission point including all associated equipment and control devices:  
Reactor output gas stream controlled by thermal oxidizer

**3. Emissions Schedule for the Emission Point**

Continuous or Intermittent (C/I)?	I	<b>Seasonal Variation</b> Check box if none: <input checked="" type="checkbox"/> Otherwise estimate seasonal variation:	
Minutes per hour:	60	Winter Percent	
Hours per day:	16	Spring Percent	
Days per week:	5	Summer Percent	
Weeks per year:	50	Fall Percent	

**4. Emission Point Information**

Height above ground (ft):	59'-1"	Length and width dimensions at top of rectangular stack (ft):	Length:	Width:	
Height above structures (ft):	30'-5"				
Exit temperature (°F):	1600	Inside diameter at top of round stack (ft):	0.833		
Exit velocity (ft/min):	200.4	Distance from emission point to nearest property line (ft):	280		
Exhaust gas volumetric flow rate (acfm):	109.3	Building dimensions if emission point is located on building (ft)	Height 28'-8"	Length 163'	Width 144'

**5. Control Devices Associated with the Emission Point**

Identify each control device associated with the emission point and indicate the number of devices. **A Form 6 is also required for each control device.** If none check none:

- |   |           |  |  |
|---|-----------|--|--|
| <input type="checkbox"/> None                     |           | <input type="checkbox"/> Thermal Oxidizer          | No. _____                              |
| <input type="checkbox"/> Baghouse                 | No. _____ | <input type="checkbox"/> Regenerative              |  |
| <input type="checkbox"/> Cyclone                  | No. _____ | <input type="checkbox"/> Catalytic Oxidizer        | No. _____                              |
| <input type="checkbox"/> Elec. Precipitator (ESP) | No. _____ | <input type="checkbox"/> Nitrogen Oxides Reduction | No. _____                              |
| <input type="checkbox"/> Dust Suppression System  | No. _____ | <input type="checkbox"/> Selective                 | <input type="checkbox"/> Non-Selective |
| <input type="checkbox"/> Venturi Scrubber         | No. _____ | <input type="checkbox"/> Catalytic                 | <input type="checkbox"/> Non-Catalytic |
| <input type="checkbox"/> Spray Tower/Packed Bed   | No. _____ | <input checked="" type="checkbox"/> Other          | No. _____                              |
| <input type="checkbox"/> Carbon Adsorber          | No. _____ | Specify: Electric Flameless Thermal Oxidizer       |  |
| <input type="checkbox"/> Cartridge/Canister       |           |  |  |
| <input type="checkbox"/> Regenerative             |           |  |  |

## FORM 5EP: Emission Point Data

### 6. Estimated Emissions from the Emission Point

Criteria Pollutants	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Particulate Matter (filterable as PM10)		0.000	0.000	0.000
Particulate Matter (filterable as PM2.5)		0.000	0.000	0.000
Particulate Matter (condensables)				
Volatile Organic Compounds (VOC)		0.014	0.218	0.027
Oxides of Sulfur (SOx)				
Oxides of Nitrogen (NOx)				
Carbon Monoxide (CO)				
Lead (Pb)				
Greenhouse Gases (GHG)	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Carbon Dioxide (CO <sub>2</sub> )		4.31	68.90	136.61
Methane (CH <sub>4</sub> )		0.000	0.001	0.000
Nitrous Oxide (N <sub>2</sub> O)				
Hydrofluorocarbons (HFCs)				
Perfluorocarbons (PFCs)				
Sulfur Hexafluoride (SF <sub>6</sub> )				
Total GHG (as CO <sub>2</sub> e)		4.31	68.93	136.61
List individual federal Hazardous Air Pollutants (HAP) below:	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
1,3-Butadiene		0.000	0.001	0.000

(Attach additional sheets as necessary.)



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**FORM 5EP: Emission Point Data**

**Complete one (1) Form 5EP for EACH emission point** (stack or fugitive emissions) related to the proposed installation.

Applicant Name: W.R. Grace & Company - Conn.

**1. Emission Point Identification Name/Number**

List the applicant assigned name/number for this emission point and use this value on the attached required plot plan:  
Regen Exhaust Vent

**2. Emission Point Description**

Describe the emission point including all associated equipment and control devices:  
Regenerator flue gas stream

**3. Emissions Schedule for the Emission Point**

Continuous or Intermittent (C/I)?	I	<b>Seasonal Variation</b> Check box if none: <input checked="" type="checkbox"/> Otherwise estimate seasonal variation:	
Minutes per hour:	60	Winter Percent	
Hours per day:	16	Spring Percent	
Days per week:	5	Summer Percent	
Weeks per year:	50	Fall Percent	

**4. Emission Point Information**

Height above ground (ft):	39.0	Length and width dimensions at top of rectangular stack (ft):	Length:	Width:	
Height above structures (ft):	10.3				
Exit temperature (°F):	80	Inside diameter at top of round stack (ft):	0.833		
Exit velocity (ft/min):	1835	Distance from emission point to nearest property line (ft):	280		
Exhaust gas volumetric flow rate (acfm):	1000	Building dimensions if emission point is located on building (ft)	Height 28'-8"	Length 163'	Width 144'

**5. Control Devices Associated with the Emission Point**

Identify each control device associated with the emission point and indicate the number of devices. **A Form 6 is also required for each control device.** If none check none:

- |   |           |  |  |
|---|-----------|--|--|
| <input checked="" type="checkbox"/> None          |           | <input type="checkbox"/> Thermal Oxidizer          | No. _____                              |
| <input type="checkbox"/> Baghouse                 | No. _____ | <input type="checkbox"/> Regenerative              |  |
| <input type="checkbox"/> Cyclone                  | No. _____ | <input type="checkbox"/> Catalytic Oxidizer        | No. _____                              |
| <input type="checkbox"/> Elec. Precipitator (ESP) | No. _____ | <input type="checkbox"/> Nitrogen Oxides Reduction | No. _____                              |
| <input type="checkbox"/> Dust Suppression System  | No. _____ | <input type="checkbox"/> Selective                 | <input type="checkbox"/> Non-Selective |
| <input type="checkbox"/> Venturi Scrubber         | No. _____ | <input type="checkbox"/> Catalytic                 | <input type="checkbox"/> Non-Catalytic |
| <input type="checkbox"/> Spray Tower/Packed Bed   | No. _____ | <input type="checkbox"/> Other                     | No. _____                              |
| <input type="checkbox"/> Carbon Adsorber          | No. _____ | Specify:   |  |
| <input type="checkbox"/> Cartridge/Canister       |           |  |  |
| <input type="checkbox"/> Regenerative             |           |  |  |

**FORM 5EP: Emission Point Data**

**6. Estimated Emissions from the Emission Point**

Criteria Pollutants	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Particulate Matter (filterable as PM10)		0.000	0.000	0.000
Particulate Matter (filterable as PM2.5)		0.000	0.000	0.000
Particulate Matter (condensables)				
Volatile Organic Compounds (VOC)				
Oxides of Sulfur (SOx)				
Oxides of Nitrogen (NOx)		0.001	0.011	0.001
Carbon Monoxide (CO)		0.000	0.002	0.000
Lead (Pb)				
Greenhouse Gases (GHG)	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Carbon Dioxide (CO <sub>2</sub> )		0.251	4.019	0.502
Methane (CH <sub>4</sub> )				
Nitrous Oxide (N <sub>2</sub> O)				
Hydrofluorocarbons (HFCs)				
Perfluorocarbons (PFCs)				
Sulfur Hexafluoride (SF <sub>6</sub> )				
Total GHG (as CO <sub>2</sub> e)		0.251	4.019	0.502
List individual federal Hazardous Air Pollutants (HAP) below:	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)

(Attach additional sheets as necessary.)

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**FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration**

Applicant Name: W.R. Grace & Co. - Conn.

**Step 1: Quantify premises-wide emissions of Toxic Air Pollutants (TAP) from new and existing installations in accordance with COMAR 26.11.15.04. Attach supporting documentation as necessary.**

Toxic Air Pollutant (TAP)	CAS Number	Class I or Class II?	Screening Levels ( $\mu\text{g}/\text{m}^3$ )			Estimated Premises Wide Emissions of TAP			
						Actual Total Existing TAP Emissions	Projected TAP Emissions from Proposed Installation	Premises Wide Total TAP Emissions	
			1-hour	8-hour	Annual	(lb/hr)	(lb/hr)	(lb/hr)	(lb/yr)
<i>ex. ethanol</i>	64175	II	18843	3769	N/A	0.60	0.15	0.75	1500
<i>ex. benzene</i>	71432	I	80	16	0.13	0.5	0.75	1.00	400
See Attach 5 and Attach 6									

(attach additional sheets as necessary.)

**Note: Screening levels can be obtained from the Department's website (<http://www.mde.maryland.gov>) or by calling the Department.**

**Step 2: Determine which TAPs are exempt from further review. A TAP that meets either of the following Class I or Class II small quantity emitter exemptions is exempt from further TAP compliance demonstration requirements under Step 3 and Step 4.**

Class II TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(a))

A Class II TAP is exempt from Step 3 and Step 4 if the Class II TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour, and any applicable 1-hour or 8-hour screening level for the TAP must be greater than  $200 \mu\text{g}/\text{m}^3$ .

Class I TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(b))

A Class I TAP is exempt from Step 3 and Step 4 if the Class I TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour and 350 pounds per year, any applicable 1-hour or 8-hour screening level for the TAP must be greater than  $200 \mu\text{g}/\text{m}^3$ , and any applicable annual screening level for the TAP must be greater than  $1 \mu\text{g}/\text{m}^3$ .

**If a TAP meets either the Class I or Class II TAP Small Quantity Emitter Exemption Requirements, no further review under Step 3 and Step 4 are required for that specific TAP.**

## FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration

### Step 3: Best Available Control Technology for Toxics Requirement (T-BACT, COMAR 26.11.15.05)

In the following table, list all TAP emission reduction options considered when determining T-BACT for the proposed installation. The options should be listed in order beginning with the most effective control strategy to the least effective strategy. Attach supporting documentation as necessary.

Target Pollutants	Emission Control Option	% Emission Reduction	Costs		T-BACT Option Selected? (yes/no)
			Capital	Annual Operating	
<i>ex. ethanol and benzene</i>	<i>Thermal Oxidizer</i>	99	\$50,000	\$100,000	<i>no</i>
<i>ex. ethanol and benzene</i>	<i>Low VOC materials</i>	80	0	\$100,000	<i>yes</i>
VOC	Electric Flameless TO	99.99			Yes

(attach additional sheets as necessary)

### Step 4: Demonstrating Compliance with the Ambient Impact Requirement (COMAR 26.11.15.06)

Each TAP not exempt in Step 2 must be individually evaluated to determine that the emissions of the TAP will not adversely impact public health. The evaluation consists of a series of increasingly non-conservative (and increasingly rigorous) tests. Once a TAP passes a test in the evaluation, no further analysis is required for that TAP. "Demonstrating Compliance with the Ambient Impact Requirement under the Toxic Air Pollutant (TAP) Regulations (COMAR 26.11.15.06)" provides guidance on conducting the evaluation. Summarize your results in the following table. Attach supporting documentation as necessary.

Toxic Air Pollutant (TAP)	CAS Number	Screening Levels (µg/m <sup>3</sup> )			Premises Wide Total TAP Emissions		Allowable Emissions Rate (AER) per COMAR 26.11.16.02A		Off-site Concentrations per Screening Analysis (µg/m <sup>3</sup> )			Compliance Method Used?
		1-hour	8-hour	Annual	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	1-hour	8-hour	Annual	AER or Screen
<i>ex. ethanol</i>	64175	18843	3769	N/A	0.75	1500	0.89	N/A	N/A	N/A	N/A	AER
<i>ex. benzene</i>	71432	80	16	0.13	1.00	400	0.04	36.52	1.5	1.05	0.12	Screen
See Attach 6												

(attach additional sheets as necessary)

**If compliance with the ambient impact requirement cannot be met using the allowable emissions rate method or the screening analysis method, refined dispersion modeling techniques may be required. Please consult with the Department's Air Quality Permit Program prior to conducting dispersion modeling methods to demonstrate compliance.**

**MARYLAND DEPARTMENT OF THE ENVIRONMENT**

1800 Washington Blvd ▪ Baltimore, Maryland 21230  
(410) 537-3230 ▪ 1-800-633-6101 ▪ www.mde.state.md.us

**Air and Radiation Management Administration ▪ Air Quality Permits Program**

**APPLICATION FOR PERMIT TO CONSTRUCT  
GAS CLEANING OR EMISSION CONTROL EQUIPMENT**

<b>1. Owner of Installation</b> W.R. Grace & Co. - Conn.	<b>Telephone No.</b> (410) 531-4570	<b>Date of Application</b> 8/3/23	
<b>2. Mailing Address</b> 7500 Grace Drive	<b>City</b> Columbia	<b>Zip Code</b> 21044	<b>County</b> Howard
<b>3. Equipment Location</b> 7500 Grace Drive	<b>City/Town or P.O.</b> Columbia, MD	<b>County</b> Howard	
<b>4. Signature of Owner or Operator</b>	<b>Title</b>	<b>Print or Type Name</b>	
<b>5. Application Type:</b>	Alteration <input type="checkbox"/>	New Construction <input checked="" type="checkbox"/>	
<b>6. Date Construction is to Start:</b> 1/24	<b>Completion Date (Estimate):</b> 8/24		
<b>7. Type of Gas Cleaning or Emission Control Equipment:</b>			
Simple Cyclone <input type="checkbox"/>	Multiple Cyclone <input type="checkbox"/>	Afterburner <input type="checkbox"/>	Electrostatic Precipitator <input type="checkbox"/>
Scrubber <input type="checkbox"/>	_____ (type)	Other <input checked="" type="checkbox"/>	Electric Flameless TO _____ (type)
<b>8. Gas Cleaning Equipment Manufacturer</b> PCC	<b>Model No.</b> EFTO25	<b>Collection Efficiency (Design Criteria)</b> > 99.99%	
<b>9. Type of Equipment which Control Equipment is to Service:</b> Catalyst Chemical Conversion Reactor System			
<b>10. Stack Test to be Conducted:</b>			
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	_____ (Stack Test to be Conducted By)	_____ (Date)
<b>11. Cost of Equipment</b> _____			
<b>Estimated Erection Cost</b> _____			

**12. The Following Shall Be Design Criteria:**

	<u><b>INLET</b></u>	<u><b>OUTLET</b></u>
Gas Flow Rate	_____ ACFM*	109.3 _____ ACFM*
Gas Temperature	_____ °F	1600 _____ °F
Gas Pressure	_____ INCHES W.G.	_____ INCHES W.G.
	PRESSURE DROP _____	
Dust Loading	_____ GRAINS/ACFD**	_____ GRAINS/ACFD**
Moisture Content	_____ %	_____ %
OR		
Wet Bulb Temperature	_____ °F	_____ °F
Liquid Flow Rate (Wet Scrubber)	_____ GALLONS/MINUTE	
	(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)	
	* = ACTUAL CUBIC FEET PER MINUTE	** = ACTUAL CUBIC FEET DRY

**WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.**

**13. Particle Size Analysis**

<u>Size of Dust Particles Entering Cleaning Unit</u>	<u>% of Total Dust</u>	<u>% to be Collected</u>
0 to 10 Microns	_____	_____
10 to 44 Microns	_____	_____
Larger than 44 Microns	_____	_____

**14. For Afterburner Construction Only:**

Volume of Contaminated Air \_\_\_\_\_ CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature \_\_\_\_\_ °F

Capacity of Afterburner \_\_\_\_\_ BTU/HR

Diameter (or area) of Afterburner Throat \_\_\_\_\_

Combustion Chamber \_\_\_\_\_ (diameter) \_\_\_\_\_ (length) Operating Temperature at Afterburner \_\_\_\_\_ °F

Retention Time of Gases \_\_\_\_\_

**15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.**

See Attach 1

Date Received: Local \_\_\_\_\_ State \_\_\_\_\_

Acknowledgement Date: \_\_\_\_\_

By \_\_\_\_\_

Reviewed By:

Local \_\_\_\_\_

State \_\_\_\_\_

Returned to Local:

Date \_\_\_\_\_

By \_\_\_\_\_

Application Returned to Applicant:

Date \_\_\_\_\_

By \_\_\_\_\_

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT:

--	--	--	--	--

PREMISES NUMBER:

--	--	--	--	--	--

Emission Calculations Revised By \_\_\_\_\_ Date \_\_\_\_\_



## ATTACHMENT 5

Emissions – Calculations, Engineering Estimates and Assumptions

**Table 1. Reactor Product Gas Emissions**

Operation 16 hr/dy 4000 hr/yr

Pollutant	CAS	C	VOC?	HAP?	From Reactor (1)		Control Efficiency (%)	Emissions (3)			
					Other C4 Speciation (% Other C4) (4)	Mass (g/hr)		(lb/hr)	(lb/dy)	(lb/yr)	(tpy)
CO <sub>2</sub>						18	0	0.040	0.635	158.733	0.079
PM (5)						0.375	99	0.000	0.000	0.033	0.000
Methane	74-82-8	C1	No	No		3	99	0.000	0.001	0.265	0.000
Ethane	74-84-0	C2	No	No		8	99	0.000	0.003	0.705	0.000
Ethylene	74-85-1	C2	Yes	No		79	99	0.002	0.028	6.967	0.003
Propane	74-98-6	C3	Yes	No		66	99	0.001	0.023	5.820	0.003
Propylene	115-07-1	C3	Yes	No		246	99	0.005	0.087	21.694	0.011
Butane	106-97-8	C4	Yes	No		60	99	0.001	0.021	5.291	0.003
Other C4		C4				167					
Isobutene	115-11-7	C4	Yes	No	36	60.12	99	0.001	0.021	5.302	0.003
1-Butene	106-98-9	C4	Yes	No	20	33.4	99	0.001	0.012	2.945	0.001
t-2-Butene	624-64-6	C4	Yes	No	23	38.41	99	0.001	0.014	3.387	0.002
c-2-Butene	590-18-1	C4	Yes	No	20	33.4	99	0.001	0.012	2.945	0.001
1,3-Butadiene	106-99-0	C4	Yes	Yes	1	1.67	99	0.000	0.001	0.147	0.000
Total VOC			Yes				99	0.014	0.218	54.498	0.027

(1) Based on engineering estimates

(2) For VOC, the proposed electric flameless thermal oxidizer is designed for a VOC control efficiency of greater than 99.99% (i.e., meets requirements of COMAR 26.11.19.30 of at least 90% control overall). For PM, assume 99% particulate control for process cyclone

(3) Assumed 16 hr/dy and 4000 hr/yr operation

(4) Based on typical distribution for catalytic cracking

(5) Based on regenerator outlet particulate fines equal to 0.3% /dy of catalyst inventory. The catalyst inventory for the regenerator is about 2000 g, and daily operation is 16 hr/dy

Reactor Outlet PM g/hr = 0.3 g PM/dy/100 g catalyst inventory X 2000 g catalyst / 16 hr/dy

**Table 2. Additional Thermal Oxidizer CO<sub>2</sub> Emissions From Controlling Hydrocarbons**

Operation 16 hr/dy 4000 hr/yr  
 TO CE 99 %  
 CO<sub>2</sub> MW 44.01 g/mol

Pollutant	CAS	# of C	MW (g/mol)	TO Inlet Mass Rate (g/hr)	Mass Rate Controlled by TO (g/hr)	Mol Rate Controlled by TO (mol/hr)	Equiv Mol C Rate (mol/hr)	Mass Rate CO <sub>2</sub> (g/hr)	
Methane	74-82-8	1	16.04	3	2.97	0.1851621	0.185162	8.148984	
Ethane	74-84-0	2	30.07	8	7.92	0.2633854	0.526771	23.18319	
Ethylene	74-85-1	2	28.05	79	78.21	2.7882353	5.576471	245.4205	
Propane	74-98-6	3	44.097	66	65.34	1.4817335	4.4452	195.6333	
Propylene	115-07-1	3	42.08	246	243.54	5.7875475	17.36264	764.1299	
Butane	106-97-8	4	58.12	60	59.4	1.0220234	4.088094	179.917	
Isobutene	115-11-7	4	56.11	60.12	59.5188	1.0607521	4.243008	186.7348	
1-Butene	106-98-9	4	56.11	33.4	33.066	0.5893067	2.357227	103.7416	
t-2-Butene	624-64-6	4	56.11	38.41	38.0259	0.6777027	2.710811	119.3028	
c-2-Butene	590-18-1	4	56.11	33.4	33.066	0.5893067	2.357227	103.7416	
1,3-Butadiene	106-99-0	4	54.09	1.67	1.6533	0.0305657	0.122263	5.38079	
				629				1935.334	
								4.266685	lb/hr
								68.26696	lb/dy
								273067.9	lb/yr
								136.5339	tpy

**Table 3. Regenerator Flue Gas Emissions**

Operation 16 hr/dy 4000 hr/yr

Pollutant	Control Efficiency (1)	Emissions (2)		
	(%)	(lb/hr)	(lb/dy)	(tpy)
CO <sub>2</sub> (3)	99	0.251	4.019	0.502
CO (4)		0.0001	0.0017	0.0002
NO (5) (6)		0.0007	0.0107	0.0013
PM (7)		0.0000	0.0001	0.0000

(1) Assume 99% particulate control for process knockout pot  
 (2) Assume 16 hr/dy and 4000 hr/yr operation  
 (3) Assume engineering estimate of CO<sub>2</sub> flow rate equal to 33 NL/hr  

$$\text{CO}_2 \text{ g/hr} = 44 \text{ g CO}_2/\text{mol CO}_2 \times 58 \text{ NL CO}_2/\text{hr} / 22.4 \text{ NL/mol}$$
  
 (4) Assume lean burn (excess oxygen) conditions resulting in 0.01 vol% CO in flue gas (detection limit of CO analyzer) and flue gas flow rate of 377 NL/hr  

$$\text{CO g/hr} = 28 \text{ g CO/mol CO} \times 0.01 \text{ NL CO}/100 \text{ NL flue gas} \times 377 \text{ NL flue gas/hr} / 22.4 \text{ NL/mol}$$
  
 (5) Assume the mass of nitrogen in the composite plastic feedstock is equal to the mass of nitrogen in the fraction of the feedstock that is Nylon, the constituent with the highest nitrogen content. Nylon has a nitrogen content of 12.3 wt% and the fraction of Nylon in the composite feedstock is less than 2 wt%  

$$\text{N content of feed wt\%} = (12.3 \text{ g N} / 100 \text{ g Nylon} \times 2 \text{ g Nylon} / 100 \text{ g feed}) \times 100 = 0.246$$
  
 (6) Based on 600 ppmv (dry basis) NO in flue gas from Xinjin Zhao et. al., 1997, Nitrogen Chemistry and NOx Control in a Fluid Catalytic Cracking Regenerator (Ind. Eng. Chem. Res., 1997, 36, 11, 4535-4542) for a similar N content feed and lean combustion, and a flue gas flow rate of 377 NL/hr  

$$\text{NO g/hr} = 30 \text{ g NO/mol NO} \times 600 \text{ NL NO}/1000000 \text{ NL flue gas} \times 377 \text{ NL flue gas/hr} / 22.4 \text{ NL/mol}$$
  
 (7) Based on engineering estimate of regenerator outlet particulate fines equal to 0.3% /dy of catalyst inventory. The catalyst inventory for the regenerator is about 1500 g, and daily operation is 16 hr/dy  

$$\text{Regenerator Outlet PM g/hr} = 0.3 \text{ g PM}/100 \text{ g catalyst inventory/dy} \times 1500 \text{ g catalyst} / 16 \text{ hr/dy}$$

## ATTACHMENT 6

TAP Compliance Demonstration

# TAP Compliance Demonstration

## MARYLAND TAP REQUIREMENTS

The proposed Project has the potential to discharge to the atmosphere several non-criteria substances which include Toxic Air Pollutants (TAPs) and, pursuant to COMAR 26.11.15.03 A (1), is subject to the Maryland TAP requirements (under COMAR 26.11.15 and 26.11.16) because the proposed installation is required to obtain a permit to construct (PTC) under COMAR 26.11.02.09.

COMAR 26.11.15.06 requires a demonstration that TAP emissions will not unreasonably endanger human health. Grace is demonstrating compliance with this ambient impact requirement using a screening analysis as specified under COMAR 26.11.15.07. According to COMAR 26.11.16.02 A, such a demonstration is made by showing that TAP emissions from the premises will not cause increases in ambient levels that exceed the applicable risk-based screening level for a Class I TAP and the applicable TLV-/threshold-based screening level for a Class II TAP (MDE Screening Levels).

The proposed Project will be a new installation/source as defined under COMAR 26.11.15.01 B (10). For new installations, COMAR 26.11.15.06 A (1) requires that the total emissions from the premises of each TAP discharged by the new installation be used in demonstrating compliance with the TAP impact requirements. COMAR 26.11.15.06 A (2) does not require the accounting of other premise-wide emissions from existing installations/sources on the existing premises (as defined under COMAR 26.11.15.01 B (7)) for a TAP that is not listed in COMAR 26.11.16.07. Except for 1,3-Butadiene, all TAPs expected to be discharged from the proposed Project (see Table 1 (Attachment 5)) are not listed in COMAR 26.11.16.07. However, several of the registered installations/sources at the existing premises are considered new installations (not existing installations).

## EMISSIONS

### Proposed Project TAP Emissions

Several non-criteria pollutants are expected to be discharged into the ambient air from the proposed Project's new thermal oxidizer stack (see Table 1 (Attachment 5)). Methane (CAS 74-82-8), ethane (CAS 74-84-0), ethylene (CAS 74-85-1), propane (CAS 74-98-6), and propylene (CAS 115-07-1) are listed as simple asphyxiants under COMAR 26.11.16.08 and are excluded from the definition of Toxic Air Pollutants (TAPs), as defined under COMAR 26.11.15.01 B (20). 1,3-butadiene (CAS 106-99-0) is a Class I TAP while the remaining non-criteria pollutants in Table 1 (Attachment 5) are Class II TAPs.

### Other Premise-Wide TAP Emissions

Other new installations on the existing premises discharge a TAP that is expected to be discharged from the proposed Project; namely, butene (CAS 106-98-9).

The Test Polymerization Process (controlled by the existing thermal oxidizer) constructed in 2014 (ARA Registration Number 027-0013-7-0084) and the Test Gas-Phase Polymerization Process constructed in 2017 (ARA Registration Number 027-0013-7-0086) are permitted to emit butene. The maximum combined hourly butene emissions from these two installations is 0.03 lb/hr. For the Test Polymerization Process the maximum hourly butene emissions is expected to be 0.01 lb/hr (based on the supplement to the permit to Construct application (dated November 21, 2014), if butene is used as an additive). For the Test Gas-Phase Polymerization Process the maximum hourly butene emissions is expected to be 0.02 lb/hr (assuming butene from one linear low density polyethylene (LLDPE) batch run is released in one hour].

## **EXEMPTION FROM TAP REGULATIONS**

The anticipated emissions of butane, isobutene (CAS 115-11-7), 1-butene, t-2-butene (CAS 624-64-6), and c-2-butene (CAS 590-18-1) from the premises are exempt from the Maryland TAP regulations (specifically COMAR 26.11.15.05 and COMAR 26.11.15.06) because of the small quantity of discharge from this proposed Project and other permitted installations.

Under COMAR 26.11.15.03 B (3) (a):

“The emissions of a Class II TAP from a premises are exempt from the requirements of Regulations .05 and .06 of this chapter, if:

- (i) The total allowable emissions of the TAP from the premises are 0.5 pound per hour (0.23 kilogram per hour) or less; and
- (ii) All applicable TLV-based, threshold-based, or special screening levels for the TAP are greater than 200 micrograms/cubic meter.”

After construction of the proposed Project, the maximum hourly emissions of butane from the premises will be about 0.001 lb/hr. This premises value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for butane is 23770.96  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of isobutene from the premises will be about 0.001 lb/hr. This value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for isobutene is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of 1-butene (butene) from the premises will be about 0.03 lb/hr (0.001 lb/hr + 0.03 lb/hr). This premises value includes the anticipated emissions due to the proposed Project and the possible emissions due to the Test Polymerization Process and the Test Gas-Phase Polymerization Process (see Other Premise-Wide TAP Emissions above). These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for butane is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of t-2-butene from the premises will be about 0.001 lb/hr. This value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for isobutene is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of c-2-butene from the premises will be about 0.001 lb/hr. This value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for isobutene is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

Because the total allowable butane, isobutene, butene, t-2-butene and c-2-butene (Class II TAPs) emissions from the premises are each below 0.5 lb/hr, and the applicable screening levels are well above 200  $\mu\text{g}/\text{m}^3$ , these emissions qualify for the small-emitter exemption from TAP compliance demonstration requirements.

Under COMAR 26.11.15.03 B (3) (b):

“The emissions of a Class I TAP from a premises are exempt from the requirements of Regulations .05 and .06 of this chapter, if:

- (i) The total allowable emissions of the TAP from the premises are 0.5 pound per hour (0.23 kilogram per hour) or less;
- (ii) The total allowable emissions of the TAP from the premises are 350 pounds per year (159 kilograms per year) or less;
- (iii) All applicable TLV-based, threshold-based, or special screening levels for the TAP are greater than 200 micrograms/cubic meter; and
- (iv) The applicable risk-based screening level is greater than 1 microgram/cubic meter.”

Because the risk-based screening level for 1,3-butadiene (i.e., 0.03  $\mu\text{g}/\text{m}^3$ ) is not greater than 1  $\mu\text{g}/\text{m}^3$ , the 1,3-butadiene emissions do not qualify for the small-emitter exemption from TAP compliance demonstration requirements.

## **SCREENING ANALYSIS**

For the screening analysis, estimates of TAP emissions are compared to the conservative Allowable Emission Rates (AERs) consistent with the Table provided under COMAR 26.11.16.02 A (4) (MDE AER). Compliance with the TAP impact requirements is demonstrated if the TAP emissions are less than the respective AERs.

### **MDE-Based AER**

The AERs given in the Table under COMAR 26.11.16.02 (4), for non-stack or downwash sources, can be generalized as follows:



Short-term (1-hr/8-hr)            AER (lb/hr) = SL/279

Long-term (annual)                AER (lb/yr) = SL/0.00274

where SL is the applicable MDE Screening Level ( $\mu\text{g}/\text{m}^3$ ).

This is based on discussions in “An Example of Demonstrating Compliance with Ambient Impact Requirement. (COMAR 26.11.15.06) – Fact Sheet” on MDE’s website.

### **Screening Compliance Demonstration**

Since many of the expected non-criteria pollutants from the proposed Project are not TAPs and of the TAPs 1,3-butadiene (CAS 106-99-0, a Class I TAP) is the only TAP not exempt from the TAP requirements under COMAR 26.11.15.05 and 26.11.05.06, a TAP screening analysis was performed for 1,3-butadiene. The screening analysis presented in Table 4 demonstrates TAP compliance for 1,3-butadiene.

**Table 4. TAP Demonstration Screening Analysis**

Substance	Substance Alternate Name	CAS Number	MDE TAP (1)	MDE Screening Level (2)			TAP Emissions						Small Quantity Exemption (5)	MDE AER (6)			Compliance																			
				1-hr	8-hr	Annual	Project TAP Hourly (3)	Project TAP Annual (3)	Other TAP Hourly (4)	Other TAP Annual	Sitewide TAP Hourly	Sitewide TAP Annual		1-hr	8-hr	Annual	1-hr	8-hr	Annual																	
				(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)		(lb/hr)	(lb/hr)	(lb/hr)	(lb/yr)	(lb/hr)	(lb/hr)	(lb/yr)																
Methane		74-82-8	No				0.000066	0.264555																												
Ethane		74-84-0	No				0.0001764	0.70548																												
Ethylene		74-85-1	No				0.0017417	6.966613																												
Propane		74-98-6	No				0.0014551	5.820208																												
Propylene		115-07-1	No				0.0054234	21.6935																												
Butane		106-97-8	Class II		23770.9611		0.0013228	5.291099										0	85.20057742		0													Yes		
Isobutene	Isobutylene	115-11-7	Class II		5737.2188		0.0013254	5.301681										0	20.56350824		0														Yes	
1-Butene	Butene, isomers	106-98-9	Class II		5737.2188		0.0007363	2.945378		0.03								0	20.56350824		0														Yes	
t-2-Butene	Butene, isomers	624-64-6	Class II		5737.2188		0.0008468	3.387185											0	20.56350824		0													Yes	
c-2-Butene	Butene, isomers	590-18-1	Class II		5737.2188		0.0007363	2.945378											0	20.56350824		0													Yes	
1,3-Butadiene		106-99-0	Class I		44.2454	3.00E-02	0.000037	0.147269											0	0.158585663		0	10.94890511											Yes	Yes	

(1) COMAR 26.11.15.01 and COMAR 26.11.16.08  
(2) MDE's Toxic Air Pollutant Regulations Assistance web page; Screening Levels  
(3) See Table 1 (Attachment 5)  
(4) Other sitewide emissions: Butene emissions based on PTC application for Gas Phase Polymerization Process submitted on May 26, 2016 (accounting for GPP emissions and RSPP controlled emissions)  
(5) COMAR 26.11.15.03 B (3) (a) and (b)  
(6) Based on "An Example of Demonstrating Compliance with Ambient Impact Requirement. (COMAR 26.11.15.06 - Fact Sheet" on MDE's website

## ATTACHMENT 7

Safety Data Sheet for Example Plastic Feedstock

**1 Identification**

- **Product identifier**
- **Trade name: polypropylene**
- **Application of the substance / the preparation:**  
Product for industrial research and applicability tests.
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**  
GRACE  
W. R. Grace & Co.-Conn  
7500 Grace Drive  
Columbia MD 21044  
U. S. A.
- **Information department:**  
Health and Safety (9 AM to 5 PM-EST) 1-410-531-4000  
MSDS.Davison@grace.com
- **Emergency telephone number:**  
Chemtrec North America: +1-800-424-9300  
Chemtrec International: +1-703-527-3887  
Other Emergencies (24hr): +1-410-531-4000

**2 Hazard(s) identification**

- **Classification of the substance or mixture**  
The substance is not classified, according to the Globally Harmonized System (GHS).
- **Label elements**
- **GHS label elements** None
- **Hazard pictograms** None
- **Signal word** None
- **Hazard statements** None
- **Classification system:**
- **NFPA ratings (scale 0 - 4)**



Health = 0  
Fire = 1  
Reactivity = 0

- **HMIS-ratings (scale 0 - 4)**



Health = 0  
Fire = 1  
Reactivity = 0

- **Hazard not otherwise classified**  
WARNING: Product dust together with air may develop ignitable and explosive mixtures

**3 Composition/information on ingredients**

- **Chemical characterization: Substances**
- **Additional information:**

- **CAS No. and description:**

9003-07-0	polypropylene	100%
-----------	---------------	------

**Trade name: polypropylene**

(Contd. of page 1)

#### 4 First-aid measures

- **Description of first aid measures**

- **After inhalation:** Supply fresh air; consult doctor in case of complaints.

- **After skin contact:**

Generally the product does not irritate the skin.

Wash with water.

After contact with the molten product, cool rapidly with cold water.

Do not pull solidified product away from the skin.

Seek medical treatment.

- **After eye contact:**

Flush opened eye with large quantities of running water for at least 30 minutes. If symptoms occur, consult a doctor.

- **After swallowing:** Seek medical attention. Do not induce vomiting.

- **Information for doctor:**

- **Most important symptoms and effects, both acute and delayed**

No further relevant information available.

- **Indication of any immediate medical attention and special treatment needed**

No further relevant information available.

#### 5 Fire-fighting measures

- **Extinguishing media**

- **Suitable extinguishing agents:**

CO<sub>2</sub>, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

- **Hazardous combustion products**

In case of fire, the following can be released:

Carbon monoxide and carbon dioxide

- **Advice for firefighters**

- **Protective equipment:**

Do not inhale explosion gases or combustion gases.

Wear personal protective equipment.

Wear respiratory protective device.

- **Additional information**

Collect contaminated fire fighting water separately. It must not enter the sewage system.

Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.

WARNING: Product dust together with air may develop ignitable and explosive mixtures

Prevent formation of dust.

#### 6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures**

Remove persons from danger area.

Wear protective clothing.

WARNING: Product dust together with air may develop ignitable and explosive mixtures

Keep away from ignition sources

- **Environmental precautions:**

Do not allow to enter sewers, surface or ground water.

Prevent from spreading (e.g. by damming-in or oil barriers).

- **Methods and material for containment and cleaning up:**

Vacuuming or wet sweeping may be used to avoid dust dispersal.

Vacuuming or wet sweeping may be used to avoid dust dispersal.

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Trade name: **polypropylene**

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- **Reference to other sections**

See Section 7 for information on safe handling.  
See Section 8 for information on personal protection equipment.  
See Section 13 for disposal information.

- **Protective Action Criteria for Chemicals**

- **PAC-1:**

5.2 mg/m<sup>3</sup>

- **PAC-2:**

58 mg/m<sup>3</sup>

- **PAC-3:**

350 mg/m<sup>3</sup>

## 7 Handling and storage

- **Handling:**

- **Precautions for safe handling**

Keep away from heat and direct sunlight.  
Prevent formation of dust.  
Provide suction extractors if dust is formed.  
Use appropriate industrial vacuum cleaners or central vacuum systems for dust removal.  
Take precautionary measures against static discharges.

- **Information about protection against explosions and fires:**

Dust can combine with air to form an explosive mixture.  
When transferring this material into flammable solvents, use proper grounding to avoid static electric sparks.  
WARNING: Product dust together with air may develop ignitable and explosive mixtures  
When transferring this material, use proper grounding to avoid static electric sparks.

- **Conditions for safe storage, including any incompatibilities**

- **Storage:**

- **Requirements to be met by storerooms and receptacles:** No special requirements.

- **Information about storage in one common storage facility:** Store away from foodstuffs.

- **Further information about storage conditions:** None.

## 8 Exposure controls/personal protection

- **Additional information about design of technical systems:**

Dust control and material handling systems should contain explosion relief vents, an explosion suppression system or other explosion suppression or prevention controls. Ensure that dust-handling systems are designed in a manner to prevent the escape of dust into the work area. Use only appropriately classified electrical equipment and powered industrial trucks.

- **Control parameters**

- **Components with limit values that require monitoring at the workplace:** Not required.

- **Additional information:** Valid lists at time of creation were used as basis.

- **Exposure controls**

- **Personal protective equipment:**

- **General protective and hygienic measures:**

The usual precautionary measures for handling chemicals should be followed.

- **Breathing equipment:**

As appropriate for the employee exposure, use a NIOSH approved respirator and cartridge.

(Contd. on page 4)

USA

Trade name: **polypropylene**

(Contd. of page 3)

· **Protection of hands:**

Protective gloves

Check protective gloves prior to each use for their proper condition.

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

· **Material of gloves**

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

Nitrile rubber, NBR

Butyl rubber, BR

Strong fabric gloves

Leather gloves

Recommended thickness of the material:  $\geq 0.35$  mm

· **For the permanent contact gloves made of the following materials are suitable:**

Butyl rubber, BR

Nitrile rubber, NBR

· **Eye protection:**

Safety glasses

· **Body protection:** Protective work clothing**9 Physical and chemical properties**· **Information on basic physical and chemical properties**· **General Information**· **Appearance:**

<b>Form:</b>	Granulate
<b>Color:</b>	Transparent

· <b>Odor:</b>	Odorless
· <b>Odor threshold:</b>	Not applicable.

· <b>pH-value at 20 °C (68 °F):</b>	7
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· **Change in condition**

<b>Melting point/Melting range:</b>	120-170 °C (248-338 °F)
-------------------------------------	-------------------------

<b>Boiling point/Boiling range:</b>	Not determined.
-------------------------------------	-----------------

· <b>Flash point:</b>	Not determined.
-----------------------	-----------------

· <b>Flammability (solid, gaseous):</b>	Not determined.
---	-----------------

· <b>Ignition temperature:</b>	410 °C (770 °F)
--------------------------------	-----------------

· <b>Decomposition temperature:</b>	~250 °C (~482 °F)
-------------------------------------	-------------------

· <b>Auto igniting:</b>	Product is not self-igniting.
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(Contd. on page 5)

USA

**Trade name: polypropylene**

(Contd. of page 4)

· <b>Danger of explosion:</b>	Danger of dust explosion.
· <b>Explosion limits:</b>	
<b>Lower:</b>	Not applicable.
<b>Upper:</b>	Not applicable.
· <b>Vapor pressure:</b>	Not applicable.
· <b>Density at 20 °C (68 °F):</b>	0.90 - 0.92 g/cm <sup>3</sup> (7.5105 - 7.6774 lbs/gal)
· <b>Bulk density at 20 °C (68 °F):</b>	0.5 kg/m <sup>3</sup>
· <b>Vapor density</b>	Not applicable.
· <b>Evaporation rate</b>	Not applicable.
· <b>Solubility in / Miscibility with</b>	
<b>Water:</b>	Insoluble.
· <b>Coefficient of water/oil distribution:</b>	Not available.
· <b>Viscosity:</b>	
<b>Dynamic:</b>	Not applicable.
<b>Kinematic:</b>	Not applicable.
· <b>Other information</b>	No further relevant information available.

**10 Stability and reactivity**

- **Reactivity** No further relevant information available.
- **Chemical stability** No decomposition if used and stored according to specifications.
- **Possibility of hazardous reactions**  
WARNING: Product dust together with air may develop ignitable and explosive mixtures  
As the product is supplied it is not capable of dust explosion; however enrichment with fine dust causes risk of dust explosion.
- **Conditions to avoid**  
In case of thermal decomposition caused by smouldering and incomplete combustion toxic fumes may be developed.
- **Incompatible materials:** Protect from contamination.
- **Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Aldehyde  
At temperatures above 250°C, depolymerization and the release of starting monomers can arise.

**11 Toxicological information**

- **Information on toxicological effects**
- **Acute toxicity:**
- **Primary irritant effect:**
- **on the skin:** No irritant effect.
- **on the eye:** Irritating effect.
- **Respiratory sensitization** No further relevant information available.
- **Skin sensitization** No further relevant information available.
- **Additional toxicological information:**
- **Carcinogenic categories**

· <b>IARC (International Agency for Research on Cancer)</b>	3
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(Contd. on page 6)



**Trade name: polypropylene**

(Contd. of page 5)

· **NTP (National Toxicology Program)**

Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**

Substance is not listed.

· **CMR effects (carcinogenity, mutagenicity and toxicity for reproduction)**

- **Carcinogenicity** No further relevant information available.
- **Mutagenicity** No further relevant information available.
- **Reproductive toxicity** No further relevant information available.
- **Specific target organ toxicity (single exposure)** No further relevant information available.
- **Specific target organ toxicity (repeated exposure)** No further relevant information available.

**12 Ecological information**

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.
- **Behavior in environmental systems:**
- **Bioaccumulative potential** No further relevant information available.
- **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:** Do not allow product to reach ground water, water course or sewage system.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No further relevant information available.

**13 Disposal considerations**

- **Precautions for disposal:**
- **Recommendation:**  
Disposal must be made according to official regulations.  
Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State/provincial and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state/provincial and local requirements.

**14 Transport information**

- |                                     |      |
|-------------------------------------|------|
| · <b>UN-Number</b>                  |      |
| · <b>DOT, ADR, ADN, IMDG, IATA</b>  | None |
| · <b>UN proper shipping name</b>    |      |
| · <b>DOT, ADR, ADN, IMDG, IATA</b>  | None |
| · <b>Transport hazard class(es)</b> |      |
| · <b>DOT, ADR, ADN, IMDG, IATA</b>  |      |
| · <b>Class</b>                      | None |

(Contd. on page 7)

**Trade name: polypropylene**

(Contd. of page 6)

· <b>Packing group</b>	
· <b>DOT, ADR, IMDG, IATA</b>	None
· <b>Environmental hazards:</b>	Not applicable.
· <b>Special precautions for user</b>	Not applicable.
· <b>Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code</b>	Not applicable.
· <b>Transport/Additional information:</b>	Not dangerous according to the above specifications. GRACE recommendation for air transport: Cargo aircraft only.

## 15 Regulatory information

- **Safety, health and environmental regulations/legislation specific for the substance or mixture**
- **SARA**

· **SARA 302/304**

Substance is not listed.

· **SARA 313**

Substance is not listed.

· **SARA 311/312** Combustible Dust.

· **TSCA (Toxic Substances Control Act):**

ACTIVE

· **Hazardous Air Pollutants**

Substance is not listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**

Substance is not listed.

· **Chemicals known to cause developmental toxicity:**

Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**

Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is not listed.

· **Canadian DSL**

9003-07-0 | polypropylene

· **Canadian NDSL**

Substance is not listed.

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**Trade name: polypropylene**

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- **European EINECS**

The corresponding monomers are listed in EINECS.

Substance is not listed.

- **Philippines Inventory of Chemicals and Chemical Substances PICCS**

Substance is listed.

- **Inventory of the Existing Chemical Substances manufactured or imported in China IECSC**

9003-07-0 polypropylene

- **Australian Inventory of Chemical Substances AICS**

Substance is listed.

- **Existing and New Chemical Substance List ENCS**

6-402

- **Korean Existing Chemical Inventory KECI**

KE-29389

- **TCSCA (Taiwan)**

Substance is not listed.

- **New Zealand Inventory of Chemicals (NZIoC)**

Substance is listed.

- **Existing Chemical Directory of Thailand (DIW)**

Substance is listed.

- **TCSI - Taiwan Chemical Substance Inventory**

Substance is listed.

- **GHS label elements** None
- **Hazard pictograms** None
- **Signal word** None
- **Hazard statements** None

## 16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Department issuing SDS:** GRACE Safety & Health Department

- **Other information:**

Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling

- **Contact:**

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Tel: +49 6241 40300

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Grace Products (Singapore) Pte Ltd

230 Orchard Road

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USA

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Version: 3.2

Reviewed on 01/08/2021

**Trade name: polypropylene**

(Contd. of page 8)

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Kohken New River Bldg 3F  
2-21-18, Shinkawa  
Chuo-ku, Tokyo 104-0033  
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Tel: +81 3.3537.6006  
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**Other information:**

- **Date of preparation / last revision** 01/08/2021 / 3.1
- **The first date of preparation** 06/06/2006
- **Number of revision times and the latest revision date** 3.2 / 01/08/2021

**Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)  
IMDG: International Maritime Code for Dangerous Goods  
DOT: US Department of Transportation  
IATA: International Air Transport Association  
ACGIH: American Conference of Governmental Industrial Hygienists  
NFPA: National Fire Protection Association (USA)  
HMIS: Hazardous Materials Identification System (USA)  
PBT: Persistent, Bioaccumulative and Toxic  
vPvB: very Persistent and very Bioaccumulative  
NIOSH: National Institute for Occupational Safety  
OSHA: Occupational Safety & Health  
TLV: Threshold Limit Value  
PEL: Permissible Exposure Limit  
REL: Recommended Exposure Limit

- **Others** No further relevant information available.

- \* **Data compared to the previous version altered.**

USA

**1 Identification**

- **Product identifier**
- **Trade name: Polyethylene**
- **Application of the substance / the preparation:** Raw material
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**  
GRACE  
W. R. Grace & Co.-Conn  
7500 Grace Drive  
Columbia MD 21044  
U. S. A.
- **Information department:**  
Health and Safety (9 AM to 5 PM-EST) 1-410-531-4000  
MSDS.Davison@grace.com
- **Emergency telephone number:**  
Chemtrec North America: +1-800-424-9300  
Chemtrec International: +1-703-527-3887  
Other Emergencies (24hr): +1-410-531-4000

**2 Hazard(s) identification**

- **Classification of the substance or mixture**  
The substance is not classified, according to the Globally Harmonized System (GHS).
- **Label elements**
- **GHS label elements** None
- **Hazard pictograms** None
- **Signal word** None
- **Hazard statements** None
- **Hazard not otherwise classified** The product is combustible.

**3 Composition/information on ingredients**

- **Chemical characterization: Substances**
- **Additional information:**

· **CAS No. and description:**

9002-88-4	Polyethylene	100%
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**4 First-aid measures**

- **Description of first aid measures**
- **General information:**  
Immediately remove contaminated clothing if necessary to prevent direct skin contact.
- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:**  
Immediately wash with water at least for 30 minutes and rinse thoroughly.  
Seek medical treatment.
- **After eye contact:**  
Flush opened eye with large quantities of running water for at least 30 minutes. If symptoms occur, consult a doctor.
- **After swallowing:** Seek medical attention. Do not induce vomiting.

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USA

**Trade name: Polyethylene**

(Contd. of page 1)

- **Information for doctor:**
- **Most important symptoms and effects, both acute and delayed**  
No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed**  
No further relevant information available.

**5 Fire-fighting measures**

- **Extinguishing media**
- **Suitable extinguishing agents:**  
CO2, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **For safety reasons unsuitable extinguishing agents:** Water with full jet
- **Hazardous combustion products**  
Carbon monoxide and carbon dioxide  
Can form explosive gas-air mixtures.
- **Advice for firefighters**
- **Protective equipment:**  
Wear personal protective equipment.  
Wear respiratory protective device.
- **Additional information**  
Cool receptacles with water spray.  
Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.  
Heating of container(s) will cause the pressure to rise with risk of bursting.

**6 Accidental release measures**

- **Personal precautions, protective equipment and emergency procedures**  
Ensure adequate ventilation  
Keep away from ignition sources  
Wear protective clothing.  
Wear respiratory protective device.
- **Environmental precautions:**  
Damp down dust with water spray.  
Do not allow to enter sewers, surface or ground water.
- **Methods and material for containment and cleaning up:**  
Dispose of the collected material according to regulations.
- **Reference to other sections**  
See Section 7 for information on safe handling.  
See Section 8 for information on personal protection equipment.  
See Section 13 for disposal information.
- **Protective Action Criteria for Chemicals**

· <b>PAC-1:</b>	16 mg/m <sup>3</sup>
· <b>PAC-2:</b>	170 mg/m <sup>3</sup>
· <b>PAC-3:</b>	1,000 mg/m <sup>3</sup>

USA

(Contd. on page 3)

**Trade name: Polyethylene**

(Contd. of page 2)

## 7 Handling and storage

- **Handling:**
- **Precautions for safe handling**  
Keep away from heat and direct sunlight.  
Any deposit of dust which cannot be avoided must be regularly removed.  
Take precautionary measures against static discharges.  
No special measures required.
- **Information about protection against explosions and fires:**  
WARNING: Product dust together with air may develop ignitable and explosive mixtures  
Keep ignition sources away. Do not smoke.  
Protect against electrostatic charges.  
The product is flammable.
- **Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by storerooms and receptacles:**  
Use only receptacles specifically permitted for this substance/product.
- **Information about storage in one common storage facility:** Store away from foodstuffs.
- **Further information about storage conditions:** Store in dry conditions.

## 8 Exposure controls/personal protection

- **Additional information about design of technical systems:** No further data; see item 7.
- **Control parameters**
- **Components with limit values that require monitoring at the workplace:** Not required.
- **Additional information:** Valid lists at time of creation were used as basis.
- **Exposure controls**
- **Personal protective equipment:**
- **General protective and hygienic measures:**  
The usual precautionary measures for handling chemicals should be followed.  
Keep away from foodstuffs, beverages and feed.  
Immediately remove all soiled and contaminated clothing.  
Wash hands before breaks and at the end of work.  
Do not inhale dust / smoke / mist.  
Prevent contact with the eyes and skin.
- **Protection of hands:**  
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.  
Due to lack of information no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.



Protective gloves

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

- **Material of gloves**  
Recommended thickness of the material:  $\geq 0.35$  mm  
Leather gloves
- **For the permanent contact in work areas without heightened risk of injury (e.g. Laboratory) gloves made of the following material are suitable:**  
Leather gloves

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Printing date 03/11/2022

Version: 3.3

Reviewed on 03/10/2022

Trade name: **Polyethylene**

(Contd. of page 3)

- **For the permanent contact gloves made of the following materials are suitable:**  
Leather gloves
- **For the permanent contact of a maximum of 15 minutes gloves made of the following materials are suitable:**  
Leather gloves
- **Not suitable are gloves made of the following materials:** Strong fabric gloves
- **Eye protection:**



Safety glasses

- **Body protection:** Protective work clothing

## 9 Physical and chemical properties

- Information on basic physical and chemical properties

- General Information

- Appearance:

Form:	Solid
Color:	White

- Odor: Odorless
- Odor threshold: Not applicable.

- pH-value (50 g/l) at 20 °C (68 °F): 7

- Change in condition

Melting point/Melting range:	120-135 °C (248-275 °F)
------------------------------	-------------------------

Boiling point/Boiling range:	Not determined.
------------------------------	-----------------

Drip point:	50-150 °C (122-302 °F) (DIN 51801 & ASTM D 3954-9)
-------------	--

- Flash point: >220 °C (>428 °F) (DIN 51758)

- Flammability (solid, gaseous): Flammable.
- Ignition temperature: >350 °C (>662 °F)
- Decomposition temperature: Not applicable.

- Auto ignition temperature: Product is not self-igniting.

- Danger of explosion: Product is not explosive. However, formation of explosive air/vapor mixtures are possible.

- Explosion limits:

Lower:	Not applicable.
Upper:	Not applicable.

- Vapor pressure: Not applicable.

- Density at 20 °C (68 °F): ~0.93 g/cm<sup>3</sup> (~7.76085 lbs/gal)

- Vapor density: Not determined.

- Evaporation rate: Not determined.

- Solubility in / Miscibility with

Water:	Insoluble.
--------	------------

- Coefficient of water/oil distribution: >6 log POW (calculated)

(Contd. on page 5)

USA



**Trade name: Polyethylene**

(Contd. of page 4)

- **Viscosity:**  

<b>Dynamic at 120 °C (248 °F):</b>	<400 mPas (DIN 53019)
<b>Kinematic:</b>	Not applicable.
- **Other information**  

<b>Particle characteristics</b>	Not determined.
---------------------------------	-----------------

**10 Stability and reactivity**

- **Reactivity** No further relevant information available.
- **Chemical stability** No decomposition if used and stored according to specifications.
- **Possibility of hazardous reactions**  
 As the product is supplied it is not capable of dust explosion; however enrichment with fine dust causes risk of dust explosion.
- **Conditions to avoid**  
 In case of thermal decomposition caused by smouldering and incomplete combustion toxic fumes may be developed.
- **Incompatible materials:** Protect from contamination.
- **Hazardous decomposition products:**  
 Carbon monoxide and carbon dioxide  
 Flammable gases/vapors  
 Hydrocarbons

**11 Toxicological information**

- **Information on toxicological effects**
- **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**

<b>9002-88-4 Polyethylene</b>		
Oral	LD50	7,950 mg/kg (rat)

· **Primary irritant effect:**

· **on the skin:**

<b>9002-88-4 Polyethylene</b>		
Irritation of skin	IS	0 (-)

· **on the eye:**

<b>9002-88-4 Polyethylene</b>		
Irritation of eyes	IS	0 (-)

- **Sensitization:** No sensitizing effects known.
- **Skin sensitization** No further relevant information available.

· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**

3

· **NTP (National Toxicology Program)**

Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**

Substance is not listed.

(Contd. on page 6)

Trade name: **Polyethylene**

(Contd. of page 5)

- **CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction)**
- **Carcinogenicity** No further relevant information available.
- **Mutagenicity** No further relevant information available.
- **Reproductive toxicity** No further relevant information available.
- **Specific target organ toxicity (single exposure)** No further relevant information available.
- **Specific target organ toxicity (repeated exposure)** No further relevant information available.

## 12 Ecological information

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.
- **Other information:**  
Do not allow product to reach sewage system, groundwater and any water course.  
By the insolubility in water there is a separation at every filtration and sedimentation process.
- **Behavior in environmental systems:**
- **Bioaccumulative potential**  
Due to the distribution coefficient n-octanol/water an accumulation in organisms is possible.
- **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:**  
Do not allow product to reach ground water, water course or sewage system.  
Not hazardous for water.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No further relevant information available.

## 13 Disposal considerations

- **Precautions for disposal:**
- **Recommendation:**  
Disposal must be made according to official regulations.  
Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State/provincial and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state/provincial and local requirements.

## 14 Transport information

- |                                     |                 |
|-------------------------------------|-----------------|
| · <b>UN-Number</b>                  |                 |
| · <b>DOT, ADR, ADN, IMDG, IATA</b>  | Not applicable. |
| · <b>UN proper shipping name</b>    |                 |
| · <b>DOT, ADR, ADN, IMDG, IATA</b>  | Not applicable. |
| · <b>Transport hazard class(es)</b> |                 |
| · <b>DOT, ADR, ADN, IMDG, IATA</b>  |                 |
| · <b>Class</b>                      | Not applicable. |

(Contd. on page 7)

**Trade name: Polyethylene**

(Contd. of page 6)

· <b>Packing group</b>	
· <b>DOT, ADR, IMDG, IATA</b>	Not applicable.
· <b>Environmental hazards:</b>	Not applicable.
· <b>Special precautions for user</b>	Not applicable.
· <b>Segregation groups</b>	-
· <b>Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code</b>	Not applicable.
· <b>Transport/Additional information:</b>	Not dangerous according to the above specifications. GRACE recommendation for air transport: Cargo aircraft only.

**15 Regulatory information**

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **SARA**

· **SARA 302/304**

Substance is not listed.

· **SARA 313**

Substance is not listed.

· **SARA 311/312** Not applicable.

· **TSCA (Toxic Substances Control Act):**

ACTIVE

· **Hazardous Air Pollutants**

Substance is not listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**

Substance is not listed.

· **Chemicals known to cause developmental toxicity:**

Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

Substance is not listed.

· **TLV (Threshold Limit Value)**

Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is not listed.

· **Canadian DSL**

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· **Canadian NDSL**

Substance is not listed.

· **European EINECS**

Substance is not listed.

· **Philippines Inventory of Chemicals and Chemical Substances PICCS**

Substance is listed.

· **Inventory of the Existing Chemical Substances manufactured or imported in China IECSC**

9002-88-4 | Polyethylene

· **Australian Inventory of Industrial Chemicals (AIIC)**

Substance is listed.

· **Existing and New Chemical Substance List ENCS**

6-1

· **Korean Existing Chemical Inventory KECI**

KE-28877

· **TCSCA (Taiwan)**

EPEP4A01714252

· **Russian Register of Potentially Hazardous Chemical and Biological Substances (RPOHV)**

№ BT-000548 от 14.07.1995 г.

· **New Zealand Inventory of Chemicals (NZIoC)**

Substance is listed.

· **Existing Chemical Directory of Thailand (DIW)**

Substance is listed.

· **TCSI - Taiwan Chemical Substance Inventory**

Substance is listed.

· **Mexican National Inventory of Chemical Substances (INSQ)**

Substance is listed.

· **GHS label elements** None· **Hazard pictograms** None· **Signal word** None· **Hazard statements** None· **Classification system:**· **NFPA ratings (scale 0 - 4)**Health = 1  
Fire = 1  
Reactivity = 0· **HMIS-ratings (scale 0 - 4)**Health = 1  
Fire = 1  
Reactivity = 0**16 Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing SDS:** GRACE Safety & Health Department

(Contd. on page 9)

USA

Printing date 03/11/2022

Version: 3.3

Reviewed on 03/10/2022

**Trade name: Polyethylene**

(Contd. of page 8)

**Contact:**

SALES OFFICES

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Columbia, MD 21044

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## W. R. Grace Japan K.K

Kohken New River Bldg 3F

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JAPAN

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Fax: +81 3.3537.6007

**Other information:****Date of preparation / last revision** 03/11/2022 / 3.2**The first date of preparation** 05/07/2003**Number of revision times and the latest revision date** 3.3 / 03/10/2022**Abbreviations and acronyms:**

ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

PBT: Persistent, Bioaccumulative and Toxic

vPvB: very Persistent and very Bioaccumulative

NIOSH: National Institute for Occupational Safety

OSHA: Occupational Safety &amp; Health

TLV: Threshold Limit Value

PEL: Permissible Exposure Limit

REL: Recommended Exposure Limit

**Others** No further relevant information available.**\* Data compared to the previous version altered.**

## ATTACHMENT 8

Electric Flameless Thermal Oxidizer Vendor Information

# ELECTRIC FTO

## FLAMELESS THERMAL OXIDIZER



**High  
Destruction  
Efficiency,  
Low NOx,  
Electrically  
Heated**

The *PCC Electric FTO (EFTO)* consistently treats Volatile Organic Compounds (VOCs) in waste gas streams yielding removal efficiencies of 99.9999%. The thermal oxidation is accomplished at 1800°F to avoid production of thermal NOx and to minimize operating costs. Thermal NOx levels are <1 ppmv.

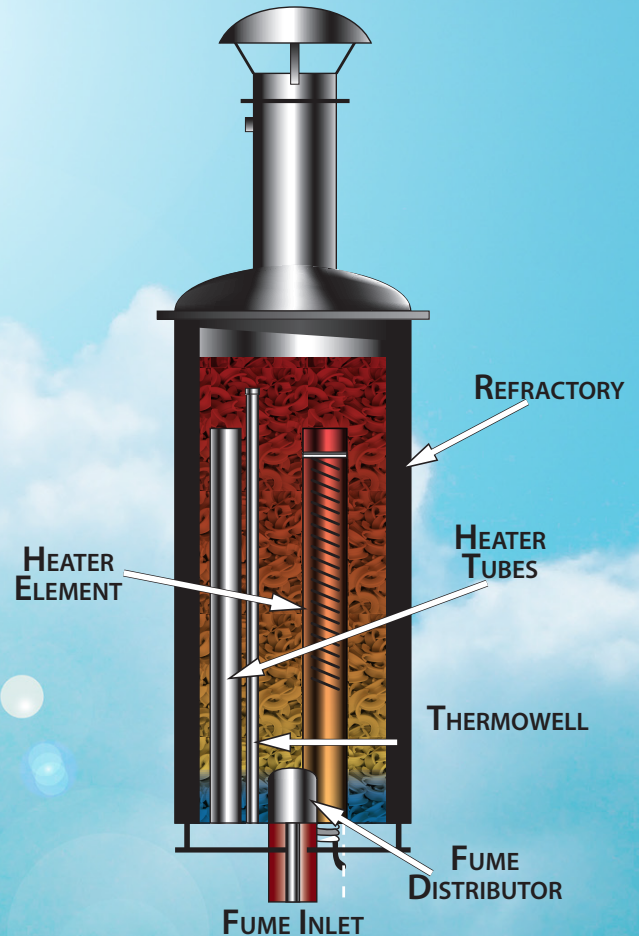
The *PCC Electric FTO* consists of a carbon steel, refractory-lined oxidation vessel. The vessel contains three spiral-wound electric resistance heater elements in 310SS protection tubes surrounded by a bed of randomly packed inert ceramic saddles. The *PCC Electric FTO* is fully automatic and there are no moving parts in the oxidizer. Alternate materials of construction are available as required based on the waste gas composition. A typical system requires 480V 3phase 100 amp, 120V 1 phase 20 amp, and 5 scfm of instrument air at 80 psig.

**How the PCC  
Electric FTO  
Works**

The *PCC EFTO* consists of a vertical, refractory-lined vessel filled with ceramic media. The ceramic media is pre-heated to a calculated temperature through the use of an electric resistance heater. Electrical energy is only required as a supplement to the heat content of the fume and to preheat the ceramic bed during start-up.

The waste gas and air are pre-mixed at the bottom of the vessel and introduced into the unit. The organic compounds found in the waste gas are oxidized and discharged into the atmosphere via a stack extension on the top of the unit.

The *PCC Electric FTO* operates well below the Lower Flammable Limit (LFL), eliminating the possibility of a flame within the system. The fume oxidizes as it passes through the oxidation zone releasing heat, which is transferred into the surrounding ceramic matrix thus maintaining the operating temperature of the bed without the need for supplemental heat via the electric heaters.



**Simplicity of  
Design**

The *PCC EFTO's* simplicity of design and portability make it a multi-purpose piece of equipment for multiple low volume gas treatment applications. The *PCC EFTO's* standardized design requires minimal customization. The modular configuration makes it simple to install.

**PROCESS COMBUSTION CORPORATION**

300 Weyman Road, Suite 400 · Pittsburgh, PA 15236 · (412) 655-0955 · pcc@pcc-group.com · www.pcc-group.com

**Call now for a competitive proposal!**



# HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING

3430 Court House Drive ■ Ellicott City, Maryland 21043 ■ 410-313-2350

Lynda D. Eisenberg, AICP, Director

FAX 410-313-3467

September 21, 2023

Daniel Resca  
Project Manager  
W.R. Grace  
7500 Grace Drive  
Columbia, MD 21044

Susan Nash  
Regulatory and Compliance Engineer Sr.  
Air and Radiation Administration  
Air Quality Permits Program  
Maryland Department of the Environment  
Suite 720  
1800 Washington Boulevard  
Baltimore, MD 21230

RE: MDE Air Permit to Construct, and Zoning Compliance Certificate for, Research-scale Pilot Plant in an existing building and lab, Building 30 Lab 120 at 7500 Grace Drive in Columbia, Maryland, Tax Map 35, Grid 22, Parcel 145, Lot PAR A (the "Property")

To Whom It May Concern:

The Property referenced above is located in a PEC (Planned Employment Center) zoning district, per the Howard County Zoning Regulations ("HCZR").

This office understands that the Property's owner will be installing a new research-scale pilot plant in an existing lab within an existing building (Building 30, Lab 120) at the Property. The purpose of this facility is to develop the process and catalysts associated with Grace's new technology for the chemical recycling of plastics. This new pilot plant will be used for Research and Development purposes only and will not be used as a commercial production plant. The proposed Installation will be part of an existing previously approved research lab facility and will not require any additional zoning review or approval. We have determined that the proposed installation will not necessitate the submission and approval of a new Conditional Use application. Further, a review of our records confirms that there are no zoning violations at the Property.

The Howard County Zoning Regulations are viewable at [https://library.municode.com/md/howard\\_county/codes/zoning](https://library.municode.com/md/howard_county/codes/zoning).

If you have any questions, please contact me at 410-313-4415 or [srolls@howardcountymd.gov](mailto:srolls@howardcountymd.gov).

Sincerely,

*Steve Rolls*

Steve Rolls, Planning Support Technician II  
Division of Public Service  
and Zoning Administration

(PUL-23-064)



**MARYLAND DEPARTMENT OF THE ENVIRONMENT**

**AIR AND RADIATION ADMINISTRATION  
APPLICATION FOR A PERMIT TO CONSTRUCT**

**SUPPLEMENT TO  
DOCKET #16-23**

COMPANY: WR Grace & Company

LOCATION: 7500 Grace Drive, Columbia, MD 21044

APPLICATION: Installation of a new research-scale pilot plant including small, R&D-scale reactors, chillers, separators, feeders, and samplers with an exhaust gas stream, cleaned by an electric, flameless thermal oxidizer.

<u>ITEM</u>	<u>DESCRIPTION</u>
1	Notice of Tentative Determination, Opportunity to Request a Public Hearing, and Opportunity to Submit Written Comments
2	Fact Sheet and Tentative Determination
3	Draft Permit to Construct and Conditions
4	Supplemental Information Revised Application Explanation of Emission Factors dated January 9, 2024
5	Privilege Log

**MARYLAND DEPARTMENT OF THE ENVIRONMENT  
AIR AND RADIATION ADMINISTRATION**

**NOTICE OF TENTATIVE DETERMINATION, OPPORTUNITY TO REQUEST  
A PUBLIC HEARING, AND OPPORTUNITY TO SUBMIT WRITTEN COMMENTS**

**FIRST NOTICE**

The Department of the Environment, Air and Radiation Administration (ARA) has completed its review of an application for a Permit to Construct submitted by W.R. Grace & Company on September 21, 2023 for one (1) pilot plant line. The proposed installation will be located at 7500 Grace Drive, Columbia, MD 21044.

Pursuant to Section 1-604, of the Environment Article, Annotated Code of Maryland, the Department has made a tentative determination that the Permit to Construct can be issued and is now ready to receive public comment on the application. Copies of the Department's tentative determination, the application, the draft permit to construct with conditions, and other supporting documents are available for public inspection on the Department's website. Look for Docket #16-23 at the following link:

<https://mde.maryland.gov/programs/Permits/AirManagementPermits/Pages/index.aspx>

In accordance with HB 1200/Ch. 588 of 2022, the applicant provided an environmental justice (EJ) Score for the census tract in which the project is located using the Maryland EJ Screening Tool. The EJ Score, expressed as a statewide percentile, was shown to be 29, which the Department has verified. This score considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities. Multiple environmental health indicators are used to identify overburdened communities. The Department's review of the environmental and socioeconomic indicators contributing to that EJ score is included in the tentative determination that is available for public inspection.

Interested persons may request a public hearing and/or submit written comments on the tentative determination. Requests for a public hearing must be submitted in writing and must be received by the Department no later than 20 days from the date of this notice. A requested public hearing will be held virtually using teleconference or internet-based conferencing technology unless a specific request for an in-person public hearing is received. Written comments must be received by the Department no later than 30 days from the date of this notice.

Interested persons may request an extension to the public comment period. The extension request must be submitted in writing and must be received by the Department no later than 30 days from the date of this notice or within 5 days after the hearing (if a hearing is requested), whichever is later. The public comment period may only be extended one time for a 60-day period.

All requests for a public hearing, requests for an extension to the public comment period, and all written comments should be directed to the attention of Ms. Shannon Heafey, Air Quality Permits Program by email to [shannon.heafey@maryland.gov](mailto:shannon.heafey@maryland.gov) or by mail to the Air and Radiation Administration, 1800 Washington Boulevard, Baltimore, Maryland 21230.

Further information may be obtained by calling Ms. Shannon Heafey at 410-537-4433.

Christopher R. Hoagland, Director  
Air and Radiation Administration

**MARYLAND DEPARTMENT OF ENVIRONMENT  
AIR AND RADIATION ADMINISTRATION**

**FACT SHEET AND TENTATIVE DETERMINATION  
W.R. GRACE & CO. - CONN**

**PROPOSED INSTALLATION OF ONE (1) NEW PILOT PLANT LINT**

**I. INTRODUCTION**

The Maryland Department of the Environment (the "Department") received an application from W. R. Grace & Co. - CONN on September 21, 2023 for a Permit to Construct for the installation of one (1) new pilot plant line. The proposed installation will be located at 7500 Grace Drive, Columbia, MD 21044.

A notice was placed in the Howard County Times on December 2, 2023 and December 14, 2023 announcing an opportunity to request an informational meeting to discuss the application for a Permit to Construct. An informational meeting was not requested.

As required by law, all public notices were also provided to elected officials in all State, county, and municipality legislative districts located within a one-mile radius of the facility's property boundary.

The Department has reviewed the application and has made a tentative determination that the proposed installation is expected to comply with all applicable air quality regulations. A notice will be published to provide the public with opportunities to request a public hearing and to comment on the application, the Department's tentative determination, the draft permit conditions, and other supporting documents. The Department will not schedule a public hearing unless a legitimate request is received.

If the Department does not receive any comments that are adverse to the tentative determination, the tentative determination will automatically become a final determination. If adverse comments are received, the Department will review the comments, and will then make a final determination with regard to issuance or denial of the permit. A notice of final determination will be published in a newspaper of general circulation in the affected area. The final determination may be subject to judicial review pursuant to Section 1-601 of the Environment Article, Annotated Code of Maryland.

**II. CURRENT STATUS AND PROPOSED INSTALLATION**

**A. Current Status**

W. R. Grace & Co. – Conn. (Grace) operates a research and development facility in Columbia, Maryland. The facility includes boilers, spray dryers, and pilot scale research

processes. The facility is a State Permit to Operate source per COMAR 26.11.02.13A(13). The current State Permit to Operate was issued on January 1, 2020 and will expire on December 31, 2024.

**B. Proposed Installation**

Grace proposes to install one (1) new pilot plant line to process 1 kg per hour of commercially available plastic feedstock.

Plastic feedstock and catalyst will be fed to a Reaction System. The reactor will vent product vapor to a Product Recovery System, where condensable vapor will be removed and sent to storage as the liquid product. Liquid product will be stored temporarily in drum before sending to a 3rd party environmental facility for treatment. Non-condensable vapor from the product recovery system will go to an electric flameless thermal oxidizer. The thermal oxidizer has a stack that vents to the atmosphere.

Spent catalyst [catalyst with coke on it] will be transferred with catalyst circulation to the Regeneration System, where excess hot air [1350 degrees Fahrenheit] will completely oxidize the coke. Regenerated catalyst will be circulated back into the Reaction System. The Regeneration System has a stack that vents to atmosphere.

The Steam Generation System supplying steam to the Reaction System is powered by electricity.

**III. APPLICABLE REGULATIONS**

The proposed installation is subject to all applicable Federal and State air quality control regulations, including, but not limited to the following:

- (a) COMAR 26.11.01.07C, which requires that the Permittee report to the Department occurrences of excess emissions.
- (b) COMAR 26.11.02.19C & D, which require that the Permittee submit to the Department annual certifications of emissions, and that the Permittee maintain sufficient records to support the emissions information presented in the submittals.
- (c) COMAR 26.11.06.02C(2), which prohibits visible emissions other than uncombined water.
- (d) COMAR 26.11.06.03B(2), which limits the concentration of particulate matter in any exhaust gases to not more than 0.03 grains per standard cubic foot of dry exhaust gas.

- (e) COMAR 26.11.06.08 and 26.11.06.09, which generally prohibit the discharge of emissions beyond the property line in such a manner that a nuisance or air pollution is created.
- (f) COMAR 26.11.15.05, which requires that the Permittee implement “Best Available Control Technology for Toxics” (T – BACT) to control emissions of toxic air pollutants.
- (g) COMAR 26.11.15.06, which prohibits the discharge of toxic air pollutants to the extent that such emissions will unreasonably endanger human health.
- (h) COMAR 26.11.19.02I, which requires that the Permittee establish in writing and implement facility-wide “good operating practices” designed to minimize emissions of VOC.
- (i) COMAR 26.11.19.16, which requires that the Permittee implement a VOC leak detection and repair program designed to minimize unintended emissions of VOC from process equipment and components, e.g., in-process vessels, storage tanks, pumps, compressors, valves, flanges and other pipeline fittings, pressure relief valves, process drains, and open-ended pipes.
- (j) COMAR 26.11.19.30, which establishes requirements for control of VOC emissions from chemical production installations at a premises that, on any day has actual uncontrolled emissions of 20 pounds or more per day.

#### **IV. GENERAL AIR QUALITY**

The U.S. Environmental Protection Agency (EPA) has established primary and secondary National Ambient Air Quality Standards (NAAQS) for six (6) criteria pollutants, i.e., sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, ozone, and lead. The primary standards were established to protect public health, and the secondary standards were developed to protect against non-health effects such as damage to property and vegetation.

The Department utilizes a statewide air monitoring network, operated in accordance with EPA guidelines, to measure the concentrations of criteria pollutants in Maryland’s ambient air. The measurements are used to project statewide ambient air quality, and currently indicate that Howard County complies with the NAAQS for sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide and lead.

Ground level ozone continues to present a problem for the entire Baltimore metropolitan area, which is classified as a non-attainment area for ozone. The primary contributors to the formation of ozone are emissions of oxides of nitrogen, primarily from combustion equipment, and

emissions of Volatile Organic Compounds (VOC) such as paint solvents and gasoline vapors. Howard County is included in the non-attainment area for ozone.

With regard to toxic air pollutants (TAPs), screening levels (i.e., acceptable ambient concentrations for toxic air pollutants) are generally established at 1/100 of allowed worker exposure levels (TLVs)<sup>1</sup>. The Department has also developed additional screening levels for carcinogenic compounds. The additional screening levels are established such that continuous exposure to the subject TAP at the screening level for a period of 70 years is expected to cause an increase in lifetime cancer risk of no more than 1 in 100,000.

## **V. ENVIRONMENTAL JUSTICE ANALYSIS**

The concept behind the term environmental justice (EJ) is that regardless of race, color, national origin, or income, all Maryland residents and communities should have an equal opportunity to enjoy an enhanced quality of life. How to assess whether equal protection is being applied is the challenge.

Communities surrounded by a disproportionate number of polluting facilities puts residents at a higher risk for health problems from environmental exposures. It is important that residents who may be adversely affected by a proposed source be aware of the current environmental issues in their community in order to have meaningful involvement in the permitting process. Resources may be available from government and private entities to ensure that community health is not negatively impacted by a new source located in the community.

Extensive research has documented that health disparities exist between demographic groups in the United States, such as differences in mortality and morbidity associated with factors that include race/ethnicity, income, and educational attainment.

The Maryland General Assembly passed HB 1200, effective October 1, 2022, that adds to MDE's work incorporating diversity, equity and inclusion into our mission to help overburdened and underserved communities with environmental issues. In accordance with HB 1200/Ch, 588 of 2022, the applicant provided an environmental justice (EJ) Score for the census tract in which the proposed source is located using the Maryland EJ Screening Tool. The EJ Score, expressed as a statewide percentile, was shown to be 29, which the Department has verified. This score considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities. Multiple environmental health indicators are used to identify overburdened communities.

To account for other sources of pollution surrounding the proposed source, the Department

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<sup>1</sup> TLVs are threshold limit values (exposure limits) established for toxic materials by the American Conference of Governmental Industrial Hygienists (ACGIH). Some TLVs are established for short-term exposure (TLV – STEL), and some are established for longer-term exposure (TLV – TWA), where TWA is an acronym for time-weight average.

conducted an additional EJ Score analysis to evaluate the impact of other sources located within 1 mile of the proposed source. The highest EJ Score in a census tract located within 1 mile of the proposed source, expressed as a statewide percentile, was shown to be 50.

An EJ Score of 50 indicates that the proposed installation is located in an area that is not disproportionately impacted by sources of pollution or at a higher risk of health problems from environmental exposures than other areas in Maryland. The Department has reviewed the air quality impacts from this proposed installation and has determined that the proposed installation will meet all applicable air quality standards.

## **VI. COMPLIANCE DEMONSTRATION AND ANALYSIS**

The proposed installation must comply with all State imposed emissions limitations and screening levels, as well as the NAAQS. The Department has conducted an engineering and air quality review of the application. The emissions were projected based on lab data, production data, technical papers, and engineering estimates. The conservative U.S. EPA's SCREEN3 model was used to project the maximum ground level concentrations from the proposed facility, which were then compared to the screening levels and the NAAQS.

- A. Estimated Emissions** - The maximum emissions of air pollutants of concern from the proposed installation are listed in Table I.
- B. Compliance with National Ambient Air Quality Standards** - The maximum ground level concentrations for nitrogen oxides and carbon monoxide based on the emissions from the proposed installation are listed in column 2 of Table II. The combined impact of the projected contribution from the proposed installation and the ambient background concentration for each pollutant shown in column 3 of Table II is less than the NAAQS for each pollutant shown in column 4.
- C. Compliance with Air Toxics Regulations** – The toxic air pollutant of concern that would be emitted from this installation is listed in column 1 of Table III. The predicted maximum off-site ambient concentrations of this toxic air pollutant is shown in column 4 of Table III, and the maximum concentration is less than the corresponding screening level for the toxic air pollutant shown in column 2.

## **VII. TENTATIVE DETERMINATION**

Based on the above information, the Department has concluded that the proposed installation will comply with all applicable Federal and State air quality control requirements. In accordance with the Administrative Procedure Act, the Department has made a tentative determination to issue the Permit to Construct.

Enclosed with the tentative determination is a copy of the draft Permit to Construct.

**TABLE I  
PROJECTED MAXIMUM EMISSIONS FROM THE PROPOSED INSTALLATION**

POLLUTANT	PROJECTED MAXIMUM EMISSIONS FROM PROPOSED INSTALLATION	
	(lbs/day)	(tons/year)
Nitrogen Dioxide (NO <sub>2</sub> )	0.011	0.001
Carbon Monoxide (CO)	0.002	0.0003
Volatile Organic Compounds (VOC)	0.218	0.027

**TABLE II  
PROJECTED IMPACT OF EMISSIONS OF CRITERIA POLLUTANTS FROM THE PROPOSED INSTALLATION ON AMBIENT AIR QUALITY**

POLLUTANTS	MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS CAUSED BY EMISSIONS FROM PROPOSED PROCESS (µg/m <sup>3</sup> )	BACKGROUND AMBIENT AIR CONCENTRATIONS (µg/m <sup>3</sup> )*	NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) (µg/m <sup>3</sup> )
Nitrogen Dioxide (NO <sub>2</sub> )	annual avg. → 0.003	annual avg. → 29	annual avg. → 100
Carbon Monoxide (CO)	8-hour max → 0.004 1-hour max → 0.006	8-hr max. → 1495 1-hr max. → 2185	8-hr max. → 10,000 1-hr max. → 40,000

\*Background concentrations were obtained from Maryland air monitoring stations as follows:

NO<sub>2</sub> → Interstate 95 South Welcome Center in Howard County  
CO → 600 Dorsey Ave in Essex [worst case]



**TABLE III  
 PREDICTED MAXIMUM OFF-SITE AMBIENT CONCENTRATIONS FOR  
 TOXIC AIR POLLUTANTS EMITTED FROM THE PROPOSED INSTALLATION**

<b>TOXIC AIR POLLUTANTS</b>	<b>SCREENING LEVELS (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>PROJECTED WORST-CASE FACILITY-WIDE EMISSIONS (lbs/hr)</b>	<b>PREDICTED MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS (<math>\mu\text{g}/\text{m}^3</math>)</b>
1,3 - Butadiene	1-hour→ None 8-hour→ 44.25 Annual→ 0.03	0.000037	1-hour→ N/A 8-hour→ 0.0009 Annual→ 0.0001

The values represent maximum facility-wide emissions of toxic air pollutants during any 1-hour period of facility operation.

The values are based on worst-case emissions from the proposed facility and were predicted by EPA's SCREEN3 model, which provides conservative estimations concerning the impact of pollutants on ambient air quality.

**DRAFT PERMIT**

Wes Moore  
Governor

Serena McIlwain  
Secretary

**Air and Radiation Administration**

1800 Washington Boulevard, Suite 720  
Baltimore, MD 21230

Construction Permit

Operating Permit

PERMIT NO.:  
027-0013-7-0088

DATE ISSUED:  
TBD

PERMIT FEE:  
\$1500.00

EXPIRATION DATE:  
In accordance with COMAR 26.11.02.04B

**LEGAL OWNER & ADDRESS**

W.R. Grace & Co.-CONN  
7500 Grace Drive  
Columbia, MD 21044  
Attention: Mr. Matt Meixell, Facilities Site  
Manager

**SITE**

W.R. Grace & Co.-CONN  
7500 Grace Drive  
Columbia, MD 21044  
AI # 3432

**SOURCE DESCRIPTION**

This permit authorizes the installation of one (1) pilot plant line to process 1 kg/hr of plastic feedstock.

This permit to construct also serves as a temporary permit to operate for a period of up to 180 days after initiating operation of the plant authorized by this permit

This source is subject to the conditions described on the attached pages.

**W.R. GRACE & CO. - CONN**  
**7500 GRACE DRIVE**  
**COLUMBIA, MD 21044**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 027-0013-7-0088**

**INDEX**

- Part A – General Provisions
- Part B – Applicable Regulations
- Part C – Construction Conditions
- Part D – Operating Conditions
- Part E – Notifications and Monitoring
- Part F – Record Keeping and Reporting
- Part G – Temporary Permit-To-Operate Conditions

**Part A – General Provisions**

- (1) The following Air and Radiation Administration (ARA) permit-to-construct applications and supplemental information are incorporated into this permit by reference:
  - (a) Application for Processing or Manufacturing Equipment (Form 5) received September 21, 2023.
  - (b) Application for Gas Cleaning or Emission Control Equipment (Form 6) received September 21, 2023.
  - (c) Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration (Form 5T) received September 21, 2023.
  - (d) Two (2) Emission Point Data (Form 5EPs) received September 21, 2023; a corrected form 5EP was received on January 11, 2024.
  - (e) Supplemental Information including a block flow diagram, a list of key equipment, a site plan, emissions estimates, an example SDS sheet for plastic feedstock, and vendor information for the flameless thermal oxidizer received September 21, 2023.

If there are any conflicts between representations in this permit and representations in the applications, the representations in the permit shall govern. Estimates of dimensions, volumes, emissions rates, operating rates, feed rates and hours of operation included in the applications do not constitute enforceable numeric limits beyond the extent necessary for compliance with applicable requirements.

**W.R. GRACE & CO. - CONN**  
**7500 GRACE DRIVE**  
**COLUMBIA, MD 21044**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 027-0013-7-0088**

- (2) Upon presentation of credentials, representatives of the Maryland Department of the Environment (“MDE” or the “Department”) and the Howard County Health Department shall at any reasonable time be granted, without delay and without prior notification, access to the Permittee’s property and permitted to:
  - (a) inspect any construction authorized by this permit;
  - (b) sample, as necessary to determine compliance with requirements of this permit, any materials stored or processed on-site, any waste materials, and any discharge into the environment;
  - (c) inspect any monitoring equipment required by this permit;
  - (d) review and copy any records, including all documents required to be maintained by this permit, relevant to a determination of compliance with requirements of this permit; and
  - (e) obtain any photographic documentation or evidence necessary to determine compliance with the requirements of this permit.
- (3) The Permittee shall notify the Department prior to increasing quantities and/or changing the types of any materials referenced in the application or limited by this permit. If the Department determines that such increases or changes constitute a modification, the Permittee shall obtain a permit-to-construct prior to implementing the modification.
- (4) Nothing in this permit authorizes the violation of any rule or regulation or the creation of a nuisance or air pollution.
- (5) If any provision of this permit is declared by proper authority to be invalid, the remaining provisions of the permit shall remain in effect.
- (6) Subsequent to issuance of this permit, the Department may impose additional and modified requirements that are incorporated into a State permit-to-operate issued pursuant to COMAR 26.11.02.13.

**Part B – Applicable Regulations**

- (1) This source is subject to all applicable federal air pollution control requirements.

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- (2) This source is subject to all applicable federally enforceable State air pollution control requirements including, but not limited to, the following regulations:
- (a) COMAR 26.11.01.07C, which requires that the Permittee report to the Department occurrences of excess emissions.
  - (b) COMAR 26.11.02.04B, which states that a permit to construct or an approval expires if, as determined by the Department:
    - (i) Substantial construction or modification is not commenced within 18 months after the date of issuance of the permit or approval, unless the Department specifies a longer period in the permit or approval;
    - (ii) Construction or modification is substantially discontinued for a period of 18 months after the construction or modification has commenced; or
    - (iii) The source for which the permit or approval was issued is not completed within a reasonable period after the date of issuance of the permit or approval.
  - (c) COMAR 26.11.02.09A, which requires that the Permittee obtain a permit-to-construct if an installation is to be modified in a manner that would cause changes in the quantity, nature, or characteristics of emissions from the installation as referenced in this permit.
  - (d) COMAR 26.11.06.02C(2), which prohibits visible emissions other than uncombined water..
  - (e) COMAR 26.11.06.03B(2), which limits the concentration of particulate matter in any exhaust gases to not more than 0.03 grains per standard cubic foot of dry exhaust gas.
  - (f) COMAR 26.11.19.02I, which requires that the Permittee establish in writing and implement facility-wide “good operating practices” designed to minimize emissions of VOC.
  - (g) COMAR 26.11.19.16, which requires that the Permittee implement a VOC leak detection and repair program designed to minimize unintended emissions of VOC from process equipment and components, e.g., in-process vessels, storage tanks, pumps,

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compressors, valves, flanges and other pipeline fittings, pressure relief valves, process drains, and open-ended pipes.

- (h) COMAR 26.11.19.30, which establishes requirements for control of VOC emissions from chemical production installations at a premises that, on any day has actual uncontrolled emissions of 20 pounds or more per day.
- (3) This source is subject to all applicable State-only enforceable air pollution control requirements including, but not limited to, the following regulations:
- (a) COMAR 26.11.02.13A(13), which requires that the Permittee obtain from the Department, and maintain and renew as required, a valid State permit-to-operate.
  - (b) COMAR 26.11.02.14D, which requires that the Permittee submit to the Department not later than 60 days prior to initiating operation of the installation for which this permit is issued a completed application for a State permit-to-operate.
  - (c) COMAR 26.11.02.19C & D, which require that the Permittee submit to the Department annual certifications of emissions, and that the Permittee maintain sufficient records to support the emissions information presented in such submittals.
  - (d) COMAR 26.11.06.08 and 26.11.06.09, which generally prohibit the discharge of emissions beyond the property line in such a manner that a nuisance or air pollution is created.
  - (e) COMAR 26.11.15.05, which requires that the Permittee implement “Best Available Control Technology for Toxics” (T – BACT) to control emissions of toxic air pollutants.
  - (f) COMAR 26.11.15.06, which prohibits the discharge of toxic air pollutants to the extent that such emissions would unreasonably endanger human health.

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**Part C – Construction Conditions**

- (1) Except as otherwise provided in this part, the one (1) new pilot plant line shall be constructed in accordance with specifications included in the incorporated applications.
- (2) The new pilot plant capacity shall be constructed with a nominal throughput of 1 kg/hr of plastic feedstock.
- (3) The new pilot plant capacity shall be constructed with a maximum of 4000 kg/year plastic feedstock throughput.
- (4) All equipment installed as part of the pilot plant line shall be constructed with electricity as the only power source, unless the Permittee receives approval from the Department to use another energy source.
- (5) The Product Recovery System shall be constructed to vent through an electric flameless thermal oxidizer before discharging to atmosphere.
- (6) The electric flameless thermal oxidizer shall be equipped with instrumentation to continuously monitor the combustion zone temperature.

**Part D – Operating Conditions**

- (1) Except as otherwise provided in this part, the one (1) new pilot plant line shall be operated in accordance with specifications included in the application and any operating procedures recommended by equipment vendors unless the Permittee obtains from the Department written authorization for alternative operating procedures.
- (2) The Permittee shall maintain and operate all installations and associated air pollution control equipment so as to assure full and continuous compliance with all applicable air pollution control regulations and permit conditions.
- (3) The Permittee shall properly maintain, calibrate, and operate all control panel instrumentation and all devices employed to monitor performance of the facility's air pollution control devices.
- (4) The new pilot plant capacity shall be limited to an average throughput of 1 kg/hr of plastic feedstock on a daily run basis.

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- (5) The new pilot plant capacity shall be limited to 4000 kg/year of plastic feedstock throughput.
- (6) All equipment installed as part of the new pilot plant line shall be powered by electricity, unless the Permittee receives approval from the Department to use another energy source
- (7) The Product Recovery System Shall vent through an electric flameless thermal oxidizer before discharging to atmosphere.
- (8) The combustion zone of the electric flameless thermal oxidizer shall be maintained at a minimum temperature of 1,400 °F when the pilot plant is operating.
- (9) Per COMAR 26.11.19.30D(4), the pilot plant shall not operate unless the electric flameless thermal oxidizer is operating properly. If the thermal oxidizer has an unavoidable outage or malfunction, the pilot plant shall commence shutdown per plant procedures.
- (10) In accordance with COMAR 26.11.19.02I, the Permittee shall implement “good operating practices” designed to minimize emissions of VOC to the atmosphere.
  - (a) Where applicable, “good operating practices” shall include, at a minimum:
    - (i) Provisions for training operators with regard to practices, procedures, and maintenance requirements that are consistent with equipment manufacturers’ recommendations, and with requirements dictated by the Permittee’s experiences with operation of equipment. The training shall include material concerning proper maintenance procedures for air pollution control equipment;
    - (ii) Maintenance of covers on containers and other vessels that are not in use and that contain VOC or VOC-containing materials;
    - (iii) Minimize spills of VOC-containing cleaning materials;
    - (iv) Convey VOC-containing cleaning materials from one location to another in closed containers or pipelines;



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- (v) Minimize VOC emissions from cleaning of storage, mixing, and conveying equipment;
  - (vi) Scheduling operations as much as practical to minimize color changes and other material changes when applying VOC-containing materials by spray application;
  - (vii) Where practical, using high-volume-low-pressure (HVLP) spray applicators or other high efficiency application methods for spray application of VOC-containing materials; and
  - (viii) Mixing and blending VOC-containing materials, as much as practical, in closed containers, and implementing preventive measures designed to minimize emissions from products that contain VOC.
- (b) “Good operating practices” shall be established in writing, shall be made available to the Department upon request, and shall be either included as part of an operator training program or posted where clearly visible to operators.
- (c) The Permittee shall take all reasonable precautions to prevent or minimize the discharge of VOC into the atmosphere when cleaning process equipment and coating application equipment, including containers, vessels, tanks, lines, spray application devices, and pumps. Reasonable precautions for equipment cleanup shall include, at a minimum:
- (i) Storing all waste materials, including VOC-contaminated cloth and paper, in closed containers;
  - (ii) For frequently cleaned equipment, preparing written standard operating procedures that include, where practical, provisions for using non-VOC or low-VOC cleaning agents, and procedures designed to minimize the quantities of VOC-containing cleaning materials used;
  - (iii) Where practical, using enclosed spray-applicator cleaning methods, VOC-recycling systems and other

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spray-applicator cleaning methods designed to reduce or eliminate VOC emissions; and

- (iv) Where practical, using detergents, high-pressure water, or other non-VOC cleaning options to clean coating lines, containers, and process equipment.
- (d) With regard to storage and transfer of VOC, the Permittee shall, at a minimum:
- (i) Install conservation vents, or other vapor control measures designed to minimize standing losses, on all storage tanks with a capacity of 2000 gallons or more in VOC service; and
  - (ii) For stationary storage tanks with capacities greater than 10,000 gallons and less than 40,000 gallons that store VOC or VOC-containing materials, excluding gasoline, with vapor pressures greater than 1.5 psia, use vapor balance, vapor control lines, or other vapor control measures, whenever VOC are transferred from tank trucks into such tanks.
- (11) In accordance with COMAR 26.11.19.16, the Permittee shall visually inspect all equipment and components in VOC service for leaks at least once per calendar month. If leaks are detected, the Permittee shall:
- (a) Tag any leak immediately so that the tag is clearly visible. The tag shall be made of a material that will withstand any weather or corrosive conditions to which it may be normally exposed. The tag shall bear an identification number, the date that the leak was discovered, and the identity of the person who discovered the leak. The tag shall remain in place until the leak has been repaired.
  - (b) Initiate immediate action to repair all observed VOC leaks that can be repaired within 48 hours.
  - (c) Repair all other leaking components within fifteen (15) days of discovery. If a replacement part is needed, the part shall be ordered within three (3) days of discovery of the leak, and the leak shall be repaired within 48 hours of receipt of the part.

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- (d) Maintain a supply of components and component parts, such as seals, gaskets, packing and pipe fittings, that are known to wear or corrode, or that otherwise need to be routinely replaced.
- (12) In accordance with COMAR 26.11.19.16D, leaking components that cannot be repaired as required because they are inaccessible, or that cannot be repaired during operation of an installation, shall be identified in a log and included in the facility's maintenance schedule for repair during the next outage of the installation.

**Part E – Notification & Monitoring**

- (1) The Permittee shall provide electronic notification to the Department, within 10 days of initially introducing feed to the new pilot plant line, that startup has commenced.
- (2) The Permittee shall continuously monitor and record the combustion zone temperature of the thermal oxidizer whenever the pilot plant line is in operation.
- (3) The Permittee shall continuously monitor and record the feed rate of the plastic feedstock.

**Part F – Record Keeping and Reporting**

- (1) The Permittee shall maintain for at least five (5) years, and shall make available to the Department upon request, records of the following information:
  - (a) Records of the date and time that each pilot plant run begins and ends;
  - (b) Records of the composition of the plastic feedstock used in each pilot plant run;
  - (c) Continuous records of the feed rate of the plastic feedstock during each pilot plant run;
  - (d) Continuous records of the thermal oxidizer combustion zone temperature during each pilot plant run;
  - (e) Monthly records of the mass of plastic feedstock usage;

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- (f) Daily records of the mass of catalyst introduced to the pilot plant at the beginning of a run and daily records of the mass of catalyst extracted from the pilot plant at the end of a run;
  - (g) Monthly records of the mass of catalyst losses based on the daily catalyst records;
  - (h) Manufacturer information for the thermal oxidizer, including the design specifications;
  - (i) Maintenance records for the thermal oxidizer;
  - (j) All written descriptions of "good operating practices" designed to minimize emissions of VOC; and
  - (k) VOC leak detection and repair logs that include identification of the persons who conducted the leak detection inspections, the dates on which the inspections were conducted, the findings during the inspections, a listing by tag identification number and a description of all leaks discovered, and the date and nature of all leak repairs effected.
- (2) The Permittee shall maintain at the facility for at least five (5) years, and shall make available to the Department upon request, records necessary to support annual certifications of emissions and demonstrations of compliance for toxic air pollutants. Such records shall include, if applicable, the following:
- (a) mass emissions rates for each regulated pollutant, and the total mass emissions rate for all regulated pollutants for each registered source of emissions;
  - (b) accounts of the methods and assumptions used to quantify emissions;
  - (c) all operating data, including operating schedules and production data, that were used in determinations of emissions;
  - (d) amounts, types, and analyses of all fuels used;

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- (e) any records, the maintenance of which is required by this permit or by State or federal regulations, that pertain to the operation and maintenance of continuous emissions monitors, including:
    - (i) all emissions data generated by such monitors;
    - (ii) all monitor calibration data;
    - (iii) information regarding the percentage of time each monitor was available for service; and
    - (iv) information concerning any equipment malfunctions.
  - (f) information concerning operation, maintenance, and performance of air pollution control equipment and compliance monitoring equipment, including:
    - (i) identifications and descriptions of all such equipment;
    - (ii) operating schedules for each item of such equipment;
    - (iii) accounts of any significant maintenance performed;
    - (iv) accounts of all malfunctions and outages; and
    - (v) accounts of any episodes of reduced efficiency.
  - (g) limitations on source operation or any work practice standards that significantly affect emissions; and
  - (h) other relevant information as required by the Department.
- (3) The Permittee shall submit to the Department by April 1 of each year a certification of emissions for the previous calendar year. The certifications shall be prepared in accordance with requirements, as applicable, adopted under COMAR 26.11.01.05 – 1 and COMAR 26.11.02.19D.
- (a) Certifications of emissions shall be submitted on forms obtained from the Department.
  - (b) A certification of emissions shall include mass emissions rates for each regulated pollutant, and the total mass emissions rate for all

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regulated pollutants for each of the facility's registered sources of emissions.

- (c) The person responsible for a certification of emissions shall certify the submittal to the Department in the following manner:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

- (4) The Permittee shall submit to the Department by April 1 of each year a written certification of the results of an analysis of emissions of toxic air pollutants from the Permittee's facility during the previous calendar year. Such analysis shall include either:
- (a) a statement that previously submitted compliance demonstrations for emissions of toxic air pollutants remain valid; or
  - (b) a revised compliance demonstration, developed in accordance with requirements included under COMAR 26.11.15 & 16, that accounts for changes in operations, analytical methods, emissions determinations, or other factors that have invalidated previous demonstrations.
- (5) The Permittee shall report, in accordance with requirements under COMAR 26.11.01.07, occurrences of excess emissions to the Compliance Program of the Air and Radiation Administration.

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**Part G – Temporary Permit-to-Operate Conditions**

- (1) This permit-to-construct shall also serve as a temporary permit-to-operate that confers upon the Permittee authorization to operate the new pilot plant line for a period of up to 180 days after initiating operation of the pilot plant line.
- (2) The Permittee shall provide the Department with written or electronic notification of the date on which operation of the new pilot plant line is initiated. Such notification shall be provided within 10 business days of the date to be reported.
- (3) During the effective period of the temporary permit-to-operate the Permittee shall operate the new installation as required by the applicable terms and conditions of this permit-to-construct, and in accordance with operating procedures and recommendations provided by equipment vendors.
- (4) The Permittee shall submit to the Department an application for a State permit-to-operate no later than 60 days prior to expiration of the effective period of the temporary permit-to-operate.

# MARYLAND DEPARTMENT OF THE ENVIRONMENT

## AIR AND RADIATION ADMINISTRATION

### SUPPLEMENTAL INFORMATION REFERENCES

The Code of Maryland Regulations (COMAR) is searchable by COMAR citation at the following Division of State Documents website:

<http://www.dsd.state.md.us/COMAR/ComarHome.html>

The Code of Federal Regulations (CFR), including New Source Performance Standards (NSPS) at 40 CFR, Part 60 and National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40 CFR, Parts 61 and 63, is searchable by CFR citation at the following U.S. Government Publishing Office website:

<http://www.ecfr.gov>

Information on National Ambient Air Quality Standards (NAAQS) is located at the following U.S. Environmental Protection Agency (EPA) website:

<https://www.epa.gov/criteria-air-pollutants/naaqs-table>

Information on Maryland's Ambient Air Monitoring Program is located at the following Maryland Department of the Environment website:

<http://mde.maryland.gov/programs/Air/AirQualityMonitoring/Pages/index.aspx>

Information on the U.S. EPA's Screen3 computer model and other EPA-approved air dispersion models is located at the following U.S. EPA website:

[http://www.epa.gov/scram001/dispersion\\_screening.htm](http://www.epa.gov/scram001/dispersion_screening.htm)

Information on the U.S. EPA TANKS Emission Estimation Software is located at the following U.S. EPA website:

<http://www.epa.gov/ttn/chief/software/tanks/index.html>

Information on the U.S. EPA Emission Factors and AP-42 is located at the following U.S. EPA website:

<https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors>



August 3, 2023

Suna Yi Sariscak, Manager  
Air Quality Permits Program  
Maryland Department of the Environment  
Air and Radiation Management Administration  
1800 Washington Boulevard, Suite 720  
Baltimore, Maryland 21230-1720  
MDE.Submit-AirPermits@maryland.gov

Re: Permit to Construct (PTC) Application to Install Research Pilot Scale Test Catalytic Chemical Conversion of Plastics Process

Dear Ms. Sariscak:

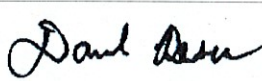
W.R. Grace & Company – Conn. (Grace) is submitting this PTC application to construct a research pilot scale test catalytic chemical conversion of plastics process at the Columbia, Maryland facility. This test process will use Grace's innovative catalyst technology to convert commercially available plastic pellets into potentially usable energy-containing liquids and gas. This test process will evaluate the desired new technologies including catalyst and process conditions as well as resultant liquid/gas properties for research and development purposes only. As presented in the PTC application the reactor gases will be controlled by a very high efficiency electric, flameless thermal oxidizer prior to exhausting to the atmosphere. Atmospheric emissions from this test process will be low.

Enclosed are the completed MDE Forms 5, 5EP, 5T and 6, supporting flow diagram, plot plans and emissions calculations, and a TAP compliance demonstration.

Your prompt attention to our application would be appreciated. Grace would like to request a meeting/call with you in the next few weeks to discuss our planned process and to answer any initial questions you may have on our application. If you need anything additional or have any questions, do not hesitate to contact me at 410-531-4570 or at [daniel.resca@grace.com](mailto:daniel.resca@grace.com).

Sincerely,

 Recoverable Signature

X 

Daniel Resca  
Project Manager  
Signed by: Daniel Resca

Enclosures

Cc:

## W. R. Grace & Co.-Conn. Columbia, MD Facility

### Application to Install a Research Pilot Scale Test Catalytic Chemical Conversion of Plastics Process

#### Introduction

W. R. Grace & Co.-Conn.'s (Grace's) research facility located in Columbia, Maryland performs research and development (R&D) activities involving proprietary processes and materials. Grace proposes to install, in Building 30, a pilot-scale test catalytic chemical conversion process (the Project), using Grace's innovative catalyst technology, to convert commercially available plastics pellets into potentially usable energy-containing liquids and gas. This proposed pilot plant will be used to evaluate the desired new technologies including catalyst and process conditions as well as resultant liquid/gas properties for research and development only.

The following comprises the application for a permit-to-construct (PTC) the proposed Project, and includes a project description as well as several attachments, namely:

Attachment 1 Simplified Process Flow Diagram

Attachment 2 List of Key Project Equipment

Attachment 3 Site Plan

Attachment 4 MDE PTC Application Checklist and Forms 5, 5T, 5EP (two) and 6

Attachment 5 Emissions – Calculations, Engineering Estimates and Assumptions

Attachment 6 TAP Compliance Demonstration

Attachment 7 Safety Data Sheet of Example Plastic Feedstock

Attachment 8 Vendor Information for Electric Flameless Thermal Oxidizer

#### Project Description

The proposed Project will involve four key systems: 1) reaction; 2) product recovery; 3) catalyst circulation/regeneration; and 4) steam generation. Attachment 1 is a simplified process flow diagram of the proposed Project.

The proposed Project is designed to process 1 kg/hr of commercially available plastic pellet feedstock (the benchmark feedstock can be 100% homogeneous polypropylene (PP). However, a typical mixed plastic also can include low density polyethylene (LDPE), high density polyethylene (HDPE), polyethylene terephthalate (PET), polystyrene (PS), polyvinyl chloride (PVC), and others). The plastic feedstock will be manually transferred to a feed system that

meters the feedstock into the reaction system. The catalytic chemical conversion reaction occurs at high temperature, in an oxygen-free environment. A catalyst circulation/regeneration system will be used to supply fresh and regenerated catalyst to the reaction system as well as supply heat required for the reaction. The catalytic chemical conversion reaction produces a product vapor comprised of non-condensable gas and condensable liquid. Residual catalyst in the product vapor will be recovered by a process cyclone and returned to the reactors. Then, the product vapor will go through a product recovery system involving vapor condensation and gas/liquid separation. The separated non-condensable gas will go through an electric flameless thermal oxidizer prior to venting to the atmosphere. The separated condensed liquid will be collected in two, 3-gal tanks. The collected liquid will be transferred, daily, to 55-gal drums in the warehouse, and ultimately shipped to a 3<sup>rd</sup> party waste treatment facility.

Spent catalyst from the reaction system will go through a steam stripper, then transferred with N<sub>2</sub> gas to the top of the catalyst regenerator. Combustion air will be introduced to the regenerator to burn off the spent catalyst coke. The regenerator is designed to provide excess air sufficient for complete combustion. Hot, regenerated catalyst is withdrawn from the regenerator and transferred, through risers, back to the reaction system with steam and N<sub>2</sub> gas. As mentioned above, the hot regenerated catalyst provides the heat for the reaction. Electric heating at the regenerator, the transfer lines to the risers, and the risers will heat the catalyst transferred from the regenerator to the reaction system and will be the prime source of heat during process startup. Regenerator hot combustion flue gas will be treated prior to venting to the atmosphere. The flue gas will go through a knock-out filter pot (to remove residual catalyst) and a gas/liquid separator (to remove water and cool the gas).

Steam used in the proposed process will be produced by electric steam generating units.

Being a pilot scale test installation for research and development there will be handling of samples of gas and liquid products, feedstock and catalyst for testing/analysis all at bench scale.

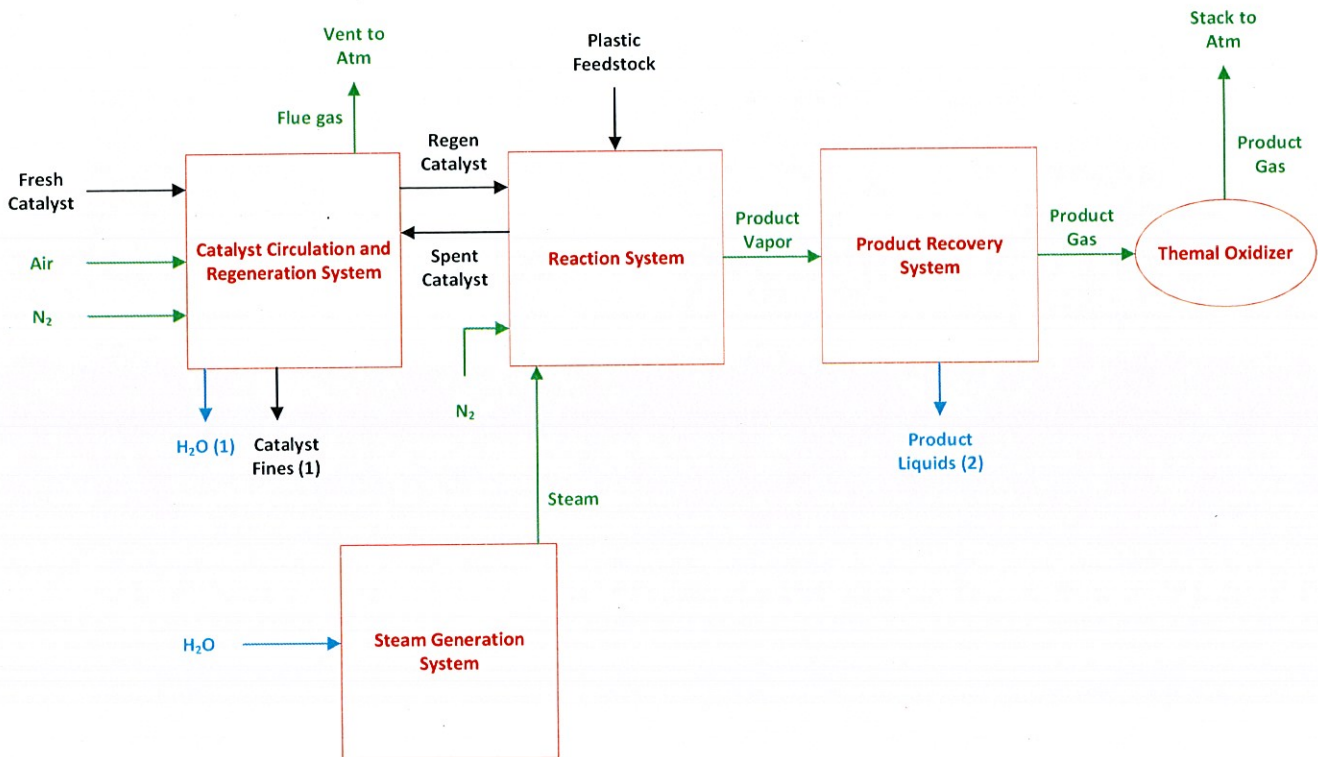
Attachment 2 lists the key process equipment proposed for the Project.

The proposed installation is scheduled to operate over two shifts on a given workday, with start-up activities, continuous reactor operation, shut-down activities and regular maintenance all occurring over 16 hours. Yearly operation is expected to be less than or equal to 4000 hr/yr.

## ATTACHMENT 1

### Simplified Process Flow Diagram

## Simplified Process Flow Diagram for Proposed Research Pilot Scale Test Catalytic Chemical Conversion Process



### Notes:

- (1) Non-hazardous waste disposal
- (2) Transfer to 3<sup>rd</sup> party treatment facility

## ATTACHMENT 2

### List of Key Project Equipment

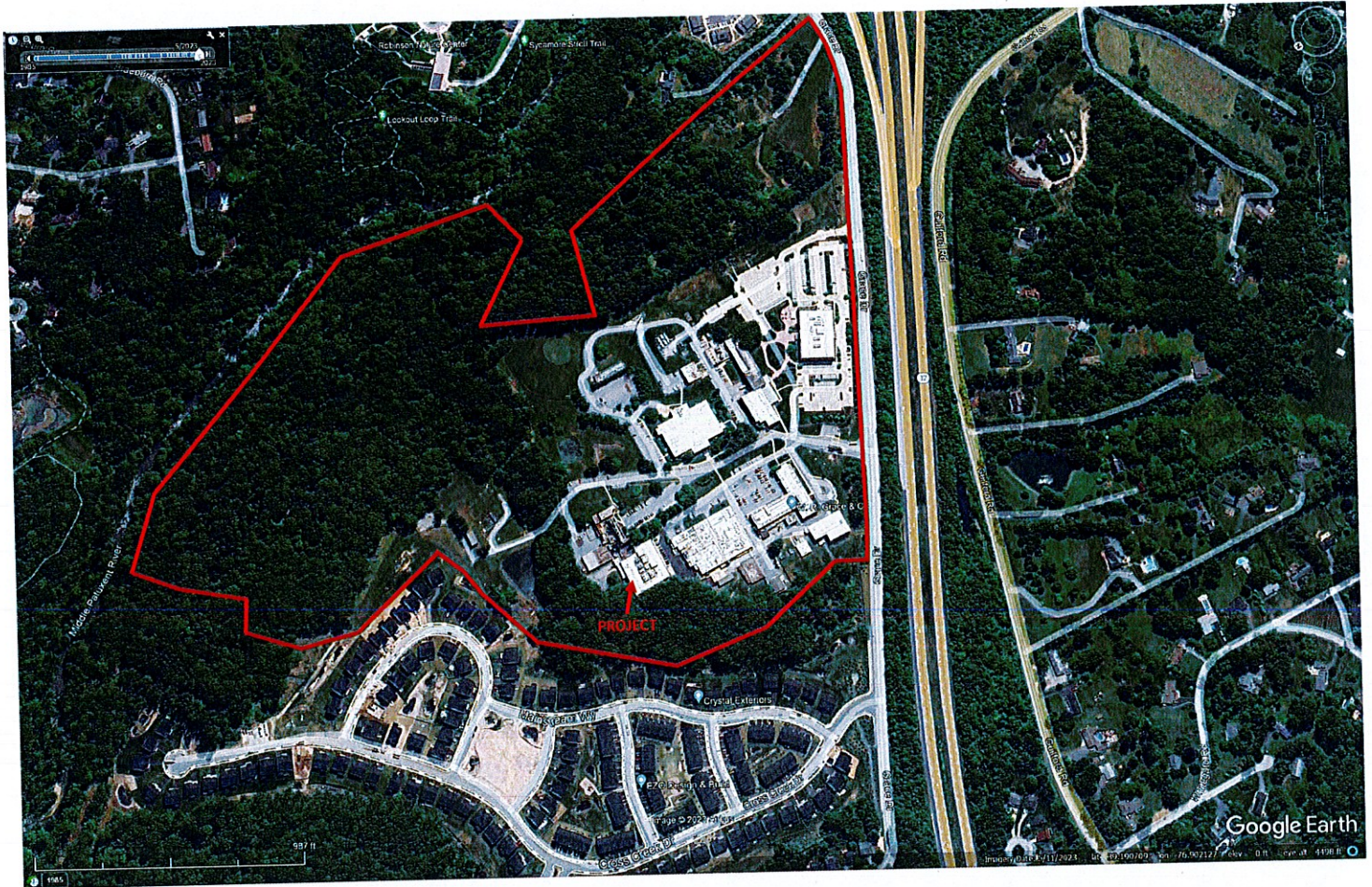
## List of Key Equipment for Planned Project

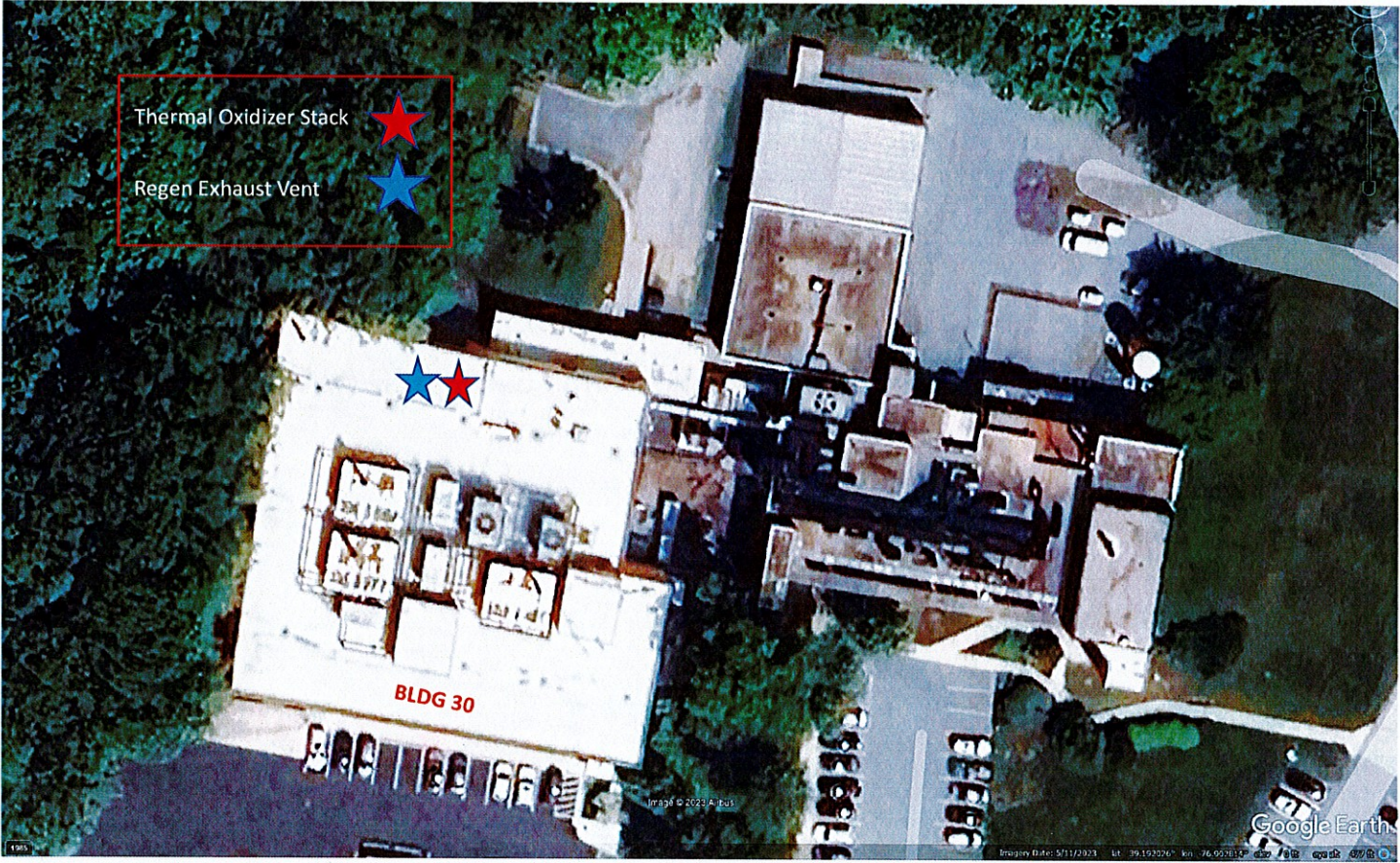
- Reactors and risers
- Reactor gas cyclone
- Reactor gas stabilization column
- Electric flameless thermal oxidizer
- Spent catalyst stripper
- Spent catalyst regenerator
- Steam generators
- Associated hoppers, vessels/tanks, heat exchangers, coolers, electric heating units, conveyance systems, piping, analyzers and instrumentation



**ATTACHMENT 3**

**Site Plan**







Thermal Oxidizer Stack   
Regen Exhaust Vent 

**BLDG 30**

Google Earth

Image Date: 5/11/2023 Lat: 39.153026° Lon: -76.957015°

## ATTACHMENT 4

MDE PTC Application Checklist and Forms 5, 5T, 5EP (two) and 6



## AIR QUALITY PERMIT TO CONSTRUCT APPLICATION CHECKLIST

OWNER OF EQUIPMENT/PROCESS	
COMPANY NAME:	W R. Grace & Co - Conn
COMPANY ADDRESS:	7500 Grace Drive, Columbia, MD 21044
LOCATION OF EQUIPMENT/PROCESS	
PREMISES NAME:	W.R. Grace Corporate Headquarters
PREMISES ADDRESS:	7500 Grace Drive, Columbia, MD 21044
CONTACT INFORMATION FOR THIS PERMIT APPLICATION	
CONTACT NAME:	Dan Resca
JOB TITLE:	Project Manager, Columbia
PHONE NUMBER:	410-531-4570
EMAIL ADDRESS:	daniel.resca@grace.com
DESCRIPTION OF EQUIPMENT OR PROCESS	
Catalytic Chemical Conversion of Plastics R&D Process	

Application is hereby made to the Department of the Environment for a Permit to Construct for the following equipment or process as required by the State of Maryland Air Quality Regulation, COMAR 26.11.02.09.

Check each item that you have submitted as part of your application package.

- Application package cover letter describing the proposed project
- Complete application forms (Note the number of forms included or NA if not applicable.)
 

No. <u>  1  </u> Form 5	No. <u>      </u> Form 11
No. <u>  1  </u> Form 5T	No. <u>      </u> Form 41
No. <u>  2  </u> Form 5EP	No. <u>      </u> Form 42
No. <u>  1  </u> Form 6	No. <u>      </u> Form 44
No. <u>      </u> Form 10	
- Vendor/manufacturer specifications/guarantees
- Evidence of Workman's Compensation Insurance
- Process flow diagrams with emission points
- Site plan including the location of the proposed source and property boundary
- Material balance data and all emissions calculations
- Material Safety Data Sheets (MSDS) or equivalent information for materials processed and manufactured.
- Certificate of Public Convenience and Necessity (CPCN) waiver documentation from the Public Service Commission <sup>(1)</sup>
- Documentation that the proposed installation complies with local zoning and land use requirements <sup>(2)</sup>

<sup>(1)</sup> Required for emergency and non-emergency generators installed on or after October 1, 2001 and rated at 2001 kW or more.

<sup>(2)</sup> Required for applications subject to Expanded Public Participation Requirements.

**APPLICATION FOR FUEL BURNING EQUIPMENT**

**Information Regarding Public Outreach**

For Air Quality Permit to Construct applications subject to public review, applicants should consider the following information in the initial stages of preparing a permit application.

If you are not sure at the time you are applying for a permit whether public review of your application is required or for information on steps you can take to engage the surrounding community where your planned project will be located, please contact the Air Quality Permits Program at 410-537-3225 and seek their advice.

Communicating and engaging the local community as early as possible in your planning and development process is an important aspect of your project and should be considered a priority. Environmental Justice or "EJ" is a movement to inform, involve, and engage communities impacted by potential and planned environmental projects by affording citizens opportunities to learn about projects and discuss any concerns regarding impacts.

Although some permit applications are subject to a formal public review process prescribed by statute, the Department strongly encourages you to engage neighboring communities separate from and well ahead of the formal permitting process. Sharing your plans by way of community meetings, informational outreach at local gatherings or through local faith-based organizations can initiate a rewarding and productive dialogue that will reduce anxiety and establish a permanent link with your neighbors in the community.

All parties benefit when there is good communication. The Department can assist applicants in developing an outreach plan that fits the needs of both the company and the public.

**MARYLAND DEPARTMENT OF THE ENVIRONMENT**

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Air and Radiation Management Administration • Air Quality Permits Program

**APPLICATION FOR PROCESSING/MANUFACTURING EQUIPMENT**

Permit to Construct

Registration Update

Initial Registration

**1A. Owner of Equipment/Company Name**

W.R. Grace & Company - Conn.

**Mailing Address**

7500 Grace Drive

**Street Address**

Columbia

Maryland

21044

**City**

State

Zip

**Telephone Number**

( 410 ) 531-8300

**Signature**



Matt Meixell, Facilities Site Manager

Print Name and Title

**DO NOT WRITE IN THIS BLOCK**

**2. REGISTRATION NUMBER**

**County No.**

1	2
---	---

1-2

**Premises No.**

3	4	5	6
---	---	---	---

3-6

**Registration Class**

7
---

7

**Equipment No.**

8	9	10	11
---	---	----	----

8-11

**Data Year**

12	13
----	----

12-13

**Application Date**

8/4/2023

Date

**1B. Equipment Location and Telephone Number (if different from above)**

Same as above

Street Number and Street Name

City/Town

State

Zip

Telephone Number

Premises Name (if different from above)

**3. Status (A= New, B= Modification to Existing Equipment, C= Existing Equipment)**

**Status**

A
---

15

**New Construction  
Begun (MM/YY)**

0	1	2	4
---	---	---	---

16-19

**New Construction  
Completed (MM/YY)**

0	8	2	4
---	---	---	---

20-23

**Existing Initial  
Operation (MM/YY)**

--	--	--	--

20-23

**4. Describe this Equipment: Make, Model, Features, Manufacturer (include Maximum Hourly Input Rate, etc.)**

Research-scale catalytic chemical conversion of plastics process for Research & Development

**5. Workmen's Compensation Coverage** 792878903

Binder/Policy Number

11/15/2023

Expiration Date

Company Zurich American Insurance Company

NOTE: Before a Permit to Construct may be issued by the Department, the applicant must provide the Department with proof of worker's compensation coverage as required under Section 1-202 of the Worker's Compensation Act.

**6A. Number of Pieces of Identical Equipment Units to be Registered/Permitted at this Time** See Attach 2

**6B. Number of Stack/Emission Points Associated with this Equipment** 2



**7. Person Installing this Equipment (if different from Number 1 on Page 1)**

Name \_\_\_\_\_ Title \_\_\_\_\_  
 Company \_\_\_\_\_  
 Mailing Address/Street \_\_\_\_\_  
 City/Town \_\_\_\_\_ State \_\_\_\_\_ Telephone (\_\_\_\_) \_\_\_\_\_

**8. Major Activity, Product or Service of Company at this Location**

Research & Development

**9. Control Devices Associated with this Equipment**

None  
 24-0

Simple/Multiple Cyclone <input type="checkbox"/> 24-1	Spray/Adsorb Tower <input type="checkbox"/> 24-2	Venturi Scrubber <input type="checkbox"/> 24-3	Carbon Adsorber <input type="checkbox"/> 24-4	Electrostatic Precipitator <input type="checkbox"/> 24-5	Baghouse <input type="checkbox"/> 24-6	Thermal/Catalytic Afterburner <input type="checkbox"/> 24-7	Dry Scrubber <input type="checkbox"/> 24-8
--	---	---	--	---	--	--	---

Other

Describe Electric flameless thermal oxidizer  
 24-9

**10. Annual Fuel Consumption for this Equipment**

OIL-1000 GALLONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 26-31	SULFUR % <input type="text"/> <input type="text"/> 32-33	GRADE <input type="text"/> 34	NATURAL GAS-1000 FT <sup>3</sup> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 35-41	LP GAS-100 GALLONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 42-45	GRADE <input type="text"/> 46-52
COAL- TONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 46-52	SULFUR % <input type="text"/> <input type="text"/> 53-55	ASH% <input type="text"/> <input type="text"/> 56-58	WOOD-TONS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 59-63	MOISTURE % <input type="text"/> <input type="text"/> 64-65	

OTHER FUELS  ANNUAL AMOUNT CONSUMED  OTHER FUEL  ANNUAL AMOUNT CONSUMED  
 (Specify Type) 66-1 (Specify Units of Measure) (Specify Type) 66-2 (Specify Units of Measure)

1=Coke 2= COG 3=BFG 4=Other

**11. Operating Schedule (for this Equipment)**

Continuous Operation <input type="checkbox"/> 67-1	Batch Process <input checked="" type="checkbox"/> 67-2	Hours per Batch <input type="text"/> <input type="text"/> 68-69	Batch per Week <input type="text"/> 70-71	Hours per Day <input type="text"/> <input type="text"/> 72	Days Per Week <input type="text"/> 73-75	Days per Year <input type="text"/> <input type="text"/> <input type="text"/> 76-78
--	--	---	---	--	--	--

Seasonal Variation in Operation:  
 No Variation  Winter Percent  Spring Percent  Summer Percent  Fall Percent   
 76 77-78 79-80 81-82 83-84 (Total Seasons= 100%)

**12. Equivalent Stack Information- is Exhaust through Doors, Windows, etc. Only? (Y/N)**

See Form 5EP

**N**  
85

If not, then

Height Above Ground (FT)

Inside Diameter at Top

Exit Temperature (°F)

Exit Velocity (FT/SEC)

--	--	--

86-88

--	--	--

89-91

--	--	--	--

92-95

--	--	--

96-98

**NOTE: See Attach 1 and Attach 3**

**Attach a block diagram of process/process line, indicating new equipment as reported on this form and all existing equipment, including control devices and emission points.**

**13. Input Materials (for this equipment only)**

Is any of this data to be considered confidential? **N** (Y or N)

	NAME	CAS NO. (IF APPLICABLE)	INPUT RATE		
			PER HOUR	UNITS	PER YEAR
1.	Commercial plastic pellet feedstock		1000	g	4000
2.	Catalyst				
3.					
4.					
5.					
6.					
7.					
8.					
9.					

**TOTAL**

**14. Output Materials (for this equipment)**

Process/Product Stream

	NAME	CAS NO. (IF APPLICABLE)	OUTPUT RATE		
			PER HOUR	UNITS	PER YEAR
1.	Gas stream (H2, CO2, C4 hydrocarbons)		647	g	2588
2.	Liquid stream (C5+ organic, H2O, HCl)		320	g	1280
3.	Char		33	g	132
4.					
5.					
6.					
7.					
8.					
9.					

**TOTAL**

**15. Waste Streams - Solid and Liquid**

	NAME	CAS NO. (IF APPLICABLE)	OUTPUT RATE		
			PER HOUR	UNITS	PER YEAR
1.	Liquid stream (C5+ organic, H2O, HC)		320	g	1280
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

**TOTAL**





**16. Total Stack Emissions (for this equipment only) in Pounds Per Operating Day**

Particulate Matter

99-104

Oxides of Sulfur

105-110

Oxides of Nitrogen

111-116

Carbon Monoxide

177-122

Volatile Organic Compounds

123-128

PM-10

129-134

**17. Total Fugitive Emissions (for this equipment only) in Pounds Per Operating Day**

Particulate Matter

135-139

Oxides of Sulfur

140-144

Oxides of Nitrogen

145-149

Carbon Monoxide

150-154

Volatile Organic Compounds

155-159

PM-10

160-164

**Method Used to Determine Emissions (1= Estimate 2= Emission Factor 3= Stack Test 4= Other)**

TSP

165

SOX

166

NOX

167

CO

168

VOC

169

PM10

170

**AIR AND RADIATION MANAGEMENT ADMINISTRATION USE ONLY**

18. Date Rec'd. Local \_\_\_\_\_

Date Rec'd. State \_\_\_\_\_

Return to Local Jurisdiction

Date \_\_\_\_\_ By \_\_\_\_\_

Reviewed by Local Jurisdiction

Date \_\_\_\_\_ By \_\_\_\_\_

Reviewed by State

Date \_\_\_\_\_ By \_\_\_\_\_

19. Inventory Date

Month/Year

171-174

Equipment Code

175-177

SCC Code

178-185

20. Annual

Operating Rate

186-192

Maximum Design

Hourly Rate

193-199

Permit to Operate

Month

200-201

Transaction Date

(MM/DD/YR)

202-207

Staff Code

208-210

VOC Code

211 212

SIP Code

213 214

Regulation Code

215-218

Confidentiality

219

Point Description

220-238

Action

239

A: Add  
C: Change



**FORM 5EP: Emission Point Data**

**Complete one (1) Form 5EP for EACH emission point** (stack or fugitive emissions) related to the proposed installation.

Applicant Name: W.R. Grace & Company - Conn.

**1. Emission Point Identification Name/Number**

List the applicant assigned name/number for this emission point and use this value on the attached required plot plan:

TO Stack

**2. Emission Point Description**

Describe the emission point including all associated equipment and control devices:

Reactor output gas stream controlled by thermal oxidizer

**3. Emissions Schedule for the Emission Point**

Continuous or Intermittent (C/I)?	I	<b>Seasonal Variation</b> Check box if none: <input checked="" type="checkbox"/> Otherwise estimate seasonal variation:	
Minutes per hour:	60	Winter Percent	
Hours per day:	16	Spring Percent	
Days per week:	5	Summer Percent	
Weeks per year:	50	Fall Percent	

**4. Emission Point Information**

Height above ground (ft):	59'-1"	Length and width dimensions at top of rectangular stack (ft):	Length:	Width:	
Height above structures (ft):	30'-5"				
Exit temperature (°F):	1600	Inside diameter at top of round stack (ft):		0.833	
Exit velocity (ft/min):	200.4	Distance from emission point to nearest property line (ft):		280	
Exhaust gas volumetric flow rate (acfm):	109.3	Building dimensions if emission point is located on building (ft)	Height 28'-8"	Length 163'	Width 144'

**5. Control Devices Associated with the Emission Point**

Identify each control device associated with the emission point and indicate the number of devices. **A Form 6 is also required for each control device.** If none check none:

- |   |           |   |  |
|---|-----------|---|--|
| <input type="checkbox"/> None                     |           | <input type="checkbox"/> Thermal Oxidizer           | No. _____                              |
| <input type="checkbox"/> Baghouse                 | No. _____ | <input type="checkbox"/> Regenerative               |  |
| <input type="checkbox"/> Cyclone                  | No. _____ | <input type="checkbox"/> Catalytic Oxidizer         | No. _____                              |
| <input type="checkbox"/> Elec. Precipitator (ESP) | No. _____ | <input type="checkbox"/> Nitrogen Oxides Reduction  | No. _____                              |
| <input type="checkbox"/> Dust Suppression System  | No. _____ | <input type="checkbox"/> Selective                  | <input type="checkbox"/> Non-Selective |
| <input type="checkbox"/> Venturi Scrubber         | No. _____ | <input type="checkbox"/> Catalytic                  | <input type="checkbox"/> Non-Catalytic |
| <input type="checkbox"/> Spray Tower/Packed Bed   | No. _____ | <input checked="" type="checkbox"/> Other           | No. _____                              |
| <input type="checkbox"/> Carbon Adsorber          | No. _____ | Specify: <u>Electric Flameless Thermal Oxidizer</u> |  |
| <input type="checkbox"/> Cartridge/Canister       |           |   |  |
| <input type="checkbox"/> Regenerative             |           |   |  |

**FORM 5EP: Emission Point Data**

**6. Estimated Emissions from the Emission Point**

Criteria Pollutants	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Particulate Matter (filterable as PM10)		0.000	0.000	0.000
Particulate Matter (filterable as PM2.5)		0.000	0.000	0.000
Particulate Matter (condensables)				
Volatile Organic Compounds (VOC)		0.014	0.218	0.027
Oxides of Sulfur (SOx)				
Oxides of Nitrogen (NOx)				
Carbon Monoxide (CO)				
Lead (Pb)				
Greenhouse Gases (GHG)	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Carbon Dioxide (CO <sub>2</sub> )		4.31	68.90	8.61
Methane (CH <sub>4</sub> )		0.000	0.001	0.000
Nitrous Oxide (N <sub>2</sub> O)				
Hydrofluorocarbons (HFCs)				
Perfluorocarbons (PFCs)				
Sulfur Hexafluoride (SF <sub>6</sub> )				
Total GHG (as CO <sub>2</sub> e)		4.31	68.93	8.62
List individual federal Hazardous Air Pollutants (HAP) below:	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
1,3-Butadiene		0.000	0.001	0.000

(Attach additional sheets as necessary.)

**FORM 5EP: Emission Point Data**

**Complete one (1) Form 5EP for EACH emission point** (stack or fugitive emissions) related to the proposed installation.

Applicant Name: W.R. Grace & Company - Conn.

**1. Emission Point Identification Name/Number**

List the applicant assigned name/number for this emission point and use this value on the attached required plot plan:  
TO Stack

**2. Emission Point Description**

Describe the emission point including all associated equipment and control devices:  
Reactor output gas stream controlled by thermal oxidizer

**3. Emissions Schedule for the Emission Point**

Continuous or Intermittent (C/I)?	I	<b>Seasonal Variation</b> Check box if none: <input checked="" type="checkbox"/> Otherwise estimate seasonal variation:	
Minutes per hour:	60	Winter Percent	
Hours per day:	16	Spring Percent	
Days per week:	5	Summer Percent	
Weeks per year:	50	Fall Percent	

**4. Emission Point Information**

Height above ground (ft):	59'-1"	Length and width dimensions at top of rectangular stack (ft):	Length:	Width:	
Height above structures (ft):	30'-5"				
Exit temperature (°F):	1600	Inside diameter at top of round stack (ft):	0.833		
Exit velocity (ft/min):	200.4	Distance from emission point to nearest property line (ft):	280		
Exhaust gas volumetric flow rate (acfm):	109.3	Building dimensions if emission point is located on building (ft)	Height 28'-8"	Length 163'	Width 144'

**5. Control Devices Associated with the Emission Point**

Identify each control device associated with the emission point and indicate the number of devices. **A Form 6 is also required for each control device.** If none check none:

- |   |   |   |  |
|---|---|---|--|
| <input type="checkbox"/> None                     | <input type="checkbox"/> Thermal Oxidizer | No. _____   |  |
| <input type="checkbox"/> Baghouse                 | No. _____                                 | <input type="checkbox"/> Regenerative               |  |
| <input type="checkbox"/> Cyclone                  | No. _____                                 | <input type="checkbox"/> Catalytic Oxidizer         | No. _____                              |
| <input type="checkbox"/> Elec. Precipitator (ESP) | No. _____                                 | <input type="checkbox"/> Nitrogen Oxides Reduction  | No. _____                              |
| <input type="checkbox"/> Dust Suppression System  | No. _____                                 | <input type="checkbox"/> Selective                  | <input type="checkbox"/> Non-Selective |
| <input type="checkbox"/> Venturi Scrubber         | No. _____                                 | <input type="checkbox"/> Catalytic                  | <input type="checkbox"/> Non-Catalytic |
| <input type="checkbox"/> Spray Tower/Packed Bed   | No. _____                                 | <input checked="" type="checkbox"/> Other           | No. _____                              |
| <input type="checkbox"/> Carbon Adsorber          | No. _____                                 | Specify: <u>Electric Flameless Thermal Oxidizer</u> |  |
| <input type="checkbox"/> Cartridge/Canister       |   |   |  |
| <input type="checkbox"/> Regenerative             |   |   |  |

*11/12/24  
 Replaced PRV  
 Jan 11, 2024  
 Email from  
 D. Resca to  
 S. Nash  
 BEN*

**FORM 5EP: Emission Point Data**

**6. Estimated Emissions from the Emission Point**

Criteria Pollutants	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Particulate Matter (filterable as PM10)		0.000	0.000	0.000
Particulate Matter (filterable as PM2.5)		0.000	0.000	0.000
Particulate Matter (condensables)				
Volatile Organic Compounds (VOC)		0.014	0.218	0.027
Oxides of Sulfur (SOx)				
Oxides of Nitrogen (NOx)				
Carbon Monoxide (CO)				
Lead (Pb)				
Greenhouse Gases (GHG)	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Carbon Dioxide (CO <sub>2</sub> )		4.31	68.90	136.61
Methane (CH <sub>4</sub> )		0.000	0.001	0.000
Nitrous Oxide (N <sub>2</sub> O)				
Hydrofluorocarbons (HFCs)				
Perfluorocarbons (PFCs)				
Sulfur Hexafluoride (SF <sub>6</sub> )				
Total GHG (as CO <sub>2</sub> e)		4.31	68.93	136.61
List individual federal Hazardous Air Pollutants (HAP) below:	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
1,3-Butadiene		0.000	0.001	0.000

(Attach additional sheets as necessary.)

*11/12/24  
Replaced per Jan 11, 2024  
email from D. Rosca  
to S. Nash /SK*

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**FORM 5EP: Emission Point Data**

**Complete one (1) Form 5EP for EACH emission point** (stack or fugitive emissions) related to the proposed installation.

Applicant Name: W.R. Grace & Company - Conn.

**1. Emission Point Identification Name/Number**

List the applicant assigned name/number for this emission point and use this value on the attached required plot plan:  
Regen Exhaust Vent

**2. Emission Point Description**

Describe the emission point including all associated equipment and control devices:  
Regenerator flue gas stream

**3. Emissions Schedule for the Emission Point**

Continuous or Intermittent (C/I)?	I	Seasonal Variation	
		Check box if none: <input checked="" type="checkbox"/> Otherwise estimate seasonal variation:	
Minutes per hour:	60	Winter Percent	
Hours per day:	16	Spring Percent	
Days per week:	5	Summer Percent	
Weeks per year:	50	Fall Percent	

**4. Emission Point Information**

Height above ground (ft):	39.0	Length and width dimensions at top of rectangular stack (ft):	Length:	Width:	
Height above structures (ft):	10.3				
Exit temperature (°F):	80	Inside diameter at top of round stack (ft):	0.833		
Exit velocity (ft/min):	1835	Distance from emission point to nearest property line (ft):	280		
Exhaust gas volumetric flow rate (acfm):	1000	Building dimensions if emission point is located on building (ft)	Height 28'-8"	Length 163'	Width 144'

**5. Control Devices Associated with the Emission Point**

Identify each control device associated with the emission point and indicate the number of devices. **A Form 6 is also required for each control device.** If none check none:

- |   |           |  |  |
|---|-----------|--|--|
| <input checked="" type="checkbox"/> None          |           | <input type="checkbox"/> Thermal Oxidizer          | No. _____                              |
| <input type="checkbox"/> Baghouse                 | No. _____ | <input type="checkbox"/> Regenerative              |  |
| <input type="checkbox"/> Cyclone                  | No. _____ | <input type="checkbox"/> Catalytic Oxidizer        | No. _____                              |
| <input type="checkbox"/> Elec. Precipitator (ESP) | No. _____ | <input type="checkbox"/> Nitrogen Oxides Reduction | No. _____                              |
| <input type="checkbox"/> Dust Suppression System  | No. _____ | <input type="checkbox"/> Selective                 | <input type="checkbox"/> Non-Selective |
| <input type="checkbox"/> Venturi Scrubber         | No. _____ | <input type="checkbox"/> Catalytic                 | <input type="checkbox"/> Non-Catalytic |
| <input type="checkbox"/> Spray Tower/Packed Bed   | No. _____ | <input type="checkbox"/> Other                     | No. _____                              |
| <input type="checkbox"/> Carbon Adsorber          | No. _____ | Specify:   |  |
| <input type="checkbox"/> Cartridge/Canister       |           |  |  |
| <input type="checkbox"/> Regenerative             |           |  |  |

**FORM 5EP: Emission Point Data**

**6. Estimated Emissions from the Emission Point**

Criteria Pollutants	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Particulate Matter (filterable as PM10)		0.000	0.000	0.000
Particulate Matter (filterable as PM2.5)		0.000	0.000	0.000
Particulate Matter (condensables)				
Volatile Organic Compounds (VOC)				
Oxides of Sulfur (SOx)				
Oxides of Nitrogen (NOx)		0.001	0.011	0.001
Carbon Monoxide (CO)		0.000	0.002	0.000
Lead (Pb)				
Greenhouse Gases (GHG)	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Carbon Dioxide (CO <sub>2</sub> )		.....	4.019	0.502
Methane (CH <sub>4</sub> )				
Nitrous Oxide (N <sub>2</sub> O)				
Hydrofluorocarbons (HFCs)				
Perfluorocarbons (PFCs)				
Sulfur Hexafluoride (SF <sub>6</sub> )				
Total GHG (as CO <sub>2</sub> e)		0.251	4.019	0.502
List individual federal Hazardous Air Pollutants (HAP) below:	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)

(Attach additional sheets as necessary.)

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**FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration**

Applicant Name: W.R. Grace & Co. - Conn.

**Step 1: Quantify premises-wide emissions of Toxic Air Pollutants (TAP) from new and existing installations in accordance with COMAR 26.11.15.04. Attach supporting documentation as necessary.**

Toxic Air Pollutant (TAP)	CAS Number	Class I or Class II?	Screening Levels ( $\mu\text{g}/\text{m}^3$ )			Estimated Premises Wide Emissions of TAP			
						Actual Total Existing TAP Emissions	Projected TAP Emissions from Proposed Installation	Premises Wide Total TAP Emissions	
			1-hour	8-hour	Annual	(lb/hr)	(lb/hr)	(lb/hr)	(lb/yr)
<i>ex. ethanol</i>	64175	<i>II</i>	18843	3769	N/A	0.60	0.15	0.75	1500
<i>ex. benzene</i>	71432	<i>I</i>	80	16	0.13	0.5	0.75	1.00	400
See Attach 5 and Attach 6									

(attach additional sheets as necessary.)

**Note:** Screening levels can be obtained from the Department's website (<http://www.mde.maryland.gov>) or by calling the Department.

**Step 2:** Determine which TAPs are exempt from further review. A TAP that meets either of the following Class I or Class II small quantity emitter exemptions is exempt from further TAP compliance demonstration requirements under Step 3 and Step 4.

Class II TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(a))

A Class II TAP is exempt from Step 3 and Step 4 if the Class II TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour, and any applicable 1-hour or 8-hour screening level for the TAP must be greater than  $200 \mu\text{g}/\text{m}^3$ .

Class I TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(b))

A Class I TAP is exempt from Step 3 and Step 4 if the Class I TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour and 350 pounds per year, any applicable 1-hour or 8-hour screening level for the TAP must be greater than  $200 \mu\text{g}/\text{m}^3$ , and any applicable annual screening level for the TAP must be greater than  $1 \mu\text{g}/\text{m}^3$ .

**If a TAP meets either the Class I or Class II TAP Small Quantity Emitter Exemption Requirements, no further review under Step 3 and Step 4 are required for that specific TAP.**



**FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration**

**Step 3: Best Available Control Technology for Toxics Requirement (T-BACT, COMAR 26.11.15.05)**

In the following table, list all TAP emission reduction options considered when determining T-BACT for the proposed installation. The options should be listed in order beginning with the most effective control strategy to the least effective strategy. Attach supporting documentation as necessary.

Target Pollutants	Emission Control Option	% Emission Reduction	Costs		T-BACT Option Selected? (yes/no)
			Capital	Annual Operating	
<i>ex. ethanol and benzene</i>	<i>Thermal Oxidizer</i>	99	\$50,000	\$100,000	no
<i>ex. ethanol and benzene</i>	<i>Low VOC materials</i>	80	0	\$100,000	yes
VOC	Electric Flameless TO	99.99			Yes

(attach additional sheets as necessary)

**Step 4: Demonstrating Compliance with the Ambient Impact Requirement (COMAR 26.11.15.06)**

Each TAP not exempt in Step 2 must be individually evaluated to determine that the emissions of the TAP will not adversely impact public health. The evaluation consists of a series of increasingly non-conservative (and increasingly rigorous) tests. Once a TAP passes a test in the evaluation, no further analysis is required for that TAP. "Demonstrating Compliance with the Ambient Impact Requirement under the Toxic Air Pollutant (TAP) Regulations (COMAR 26.11.15.06)" provides guidance on conducting the evaluation. Summarize your results in the following table. Attach supporting documentation as necessary.

Toxic Air Pollutant (TAP)	CAS Number	Screening Levels (µg/m <sup>3</sup> )			Premises Wide Total TAP Emissions		Allowable Emissions Rate (AER) per COMAR 26.11.16.02A		Off-site Concentrations per Screening Analysis (µg/m <sup>3</sup> )			Compliance Method Used? AER or Screen
		1-hour	8-hour	Annual	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	1-hour	8-hour	Annual	
<i>ex. ethanol</i>	64175	18843	3769	N/A	0.75	1500	0.89	N/A	N/A	N/A	N/A	AER
<i>ex. benzene</i>	71432	80	16	0.13	1.00	400	0.04	36.52	1.5	1.05	0.12	Screen
See Attach 6												

(attach additional sheets as necessary)

If compliance with the ambient impact requirement cannot be met using the allowable emissions rate method or the screening analysis method, refined dispersion modeling techniques may be required. Please consult with the Department's Air Quality Permit Program prior to conducting dispersion modeling methods to demonstrate compliance.

# MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Blvd ▪ Baltimore, Maryland 21230  
(410) 537-3230 ▪ 1-800-633-6101 ▪ www.mde.state.md.us

## Air and Radiation Management Administration ▪ Air Quality Permits Program

### APPLICATION FOR PERMIT TO CONSTRUCT GAS CLEANING OR EMISSION CONTROL EQUIPMENT

<b>1. Owner of Installation</b> W.R. Grace & Co. - Conn.	<b>Telephone No.</b> (410) 531-4570	<b>Date of Application</b> 8/3/23
<b>2. Mailing Address</b> 7500 Grace Drive	<b>City</b> Columbia	<b>Zip Code</b> 21044
	<b>County</b> Howard	
<b>3. Equipment Location</b> 7500 Grace Drive	<b>City/Town or P.O.</b> Columbia, MD	<b>County</b> Howard
<b>4. Signature of Owner or Operator</b>	<b>Title</b>	<b>Print or Type Name</b>
<b>5. Application Type:</b> Alteration <input type="checkbox"/> New Construction <input checked="" type="checkbox"/>		
<b>6. Date Construction is to Start:</b> 1/24		<b>Completion Date (Estimate):</b> 8/24
<b>7. Type of Gas Cleaning or Emission Control Equipment:</b>		
Simple Cyclone <input type="checkbox"/>	Multiple Cyclone <input type="checkbox"/>	Afterburner <input type="checkbox"/>
Scrubber <input type="checkbox"/>	Other <input checked="" type="checkbox"/>	Electric Flameless TO <input type="checkbox"/>
_____ (type)		_____ (type)
<b>8. Gas Cleaning Equipment Manufacturer</b> PCC	<b>Model No.</b> EFTO25	<b>Collection Efficiency (Design Criteria)</b> > 99.99%
<b>9. Type of Equipment which Control Equipment is to Service:</b> Catalyst Chemical Conversion Reactor System		
<b>10. Stack Test to be Conducted:</b>		
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> _____ (Date)		
(Stack Test to be Conducted By)		
<b>11. Cost of Equipment</b> _____		
<b>Estimated Erection Cost</b> _____		

**12. The Following Shall Be Design Criteria:**

	<u>INLET</u>		<u>OUTLET</u>
Gas Flow Rate	_____ ACFM*		109.3 _____ ACFM*
Gas Temperature	_____ °F		1600 _____ °F
Gas Pressure	_____ INCHES W.G.		_____ INCHES W.G.
PRESSURE DROP _____			
Dust Loading	_____ GRAINS/ACFD**		_____ GRAINS/ACFD**
Moisture Content	_____ %		_____ %
OR			
Wet Bulb Temperature	_____ °F		_____ °F
Liquid Flow Rate (Wet Scrubber)	_____ GALLONS/MINUTE		
(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)			
* = ACTUAL CUBIC FEET PER MINUTE		** = ACTUAL CUBIC FEET DRY	

**WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.**

**13. Particle Size Analysis**

<u>Size of Dust Particles Entering Cleaning Unit</u>	<u>% of Total Dust</u>	<u>% to be Collected</u>
0 to 10 Microns	_____	_____
10 to 44 Microns	_____	_____
Larger than 44 Microns	_____	_____

**14. For Afterburner Construction Only:**

Volume of Contaminated Air \_\_\_\_\_ CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature \_\_\_\_\_ °F

Capacity of Afterburner \_\_\_\_\_ BTU/HR

Diameter (or area) of Afterburner Throat \_\_\_\_\_

Combustion Chamber \_\_\_\_\_ (diameter) \_\_\_\_\_ (length) Operating Temperature at Afterburner \_\_\_\_\_ °F

Retention Time of Gases \_\_\_\_\_

**15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.**

See Attach 1

Date Received: Local \_\_\_\_\_ State \_\_\_\_\_

Acknowledgement Date: \_\_\_\_\_

By \_\_\_\_\_

Reviewed By:

Local \_\_\_\_\_

State \_\_\_\_\_

Returned to Local:

Date \_\_\_\_\_

By \_\_\_\_\_

Application Returned to Applicant:

Date \_\_\_\_\_

By \_\_\_\_\_

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT:

--	--	--	--	--	--

PREMISES NUMBER:

--	--	--	--	--	--

Emission Calculations Revised By \_\_\_\_\_ Date \_\_\_\_\_

## ATTACHMENT 5

Emissions – Calculations, Engineering Estimates and Assumptions

**Table 1. Reactor Product Gas Emissions**

Operation 16 hr/dy 4000 hr/yr

Pollutant	CAS	C	VOC?	HAP?	From Reactor (1)		Control Efficiency (%)	Emissions (3)			
					Other C4 Speciation (% Other C4) (4)	Mass (g/hr)		(lb/hr)	(lb/dy)	(lb/yr)	(tpy)
CO <sub>2</sub>						18	0	0.040	0.635	158.733	0.079
PM (5)						0.375	99	0.000	0.000	0.033	0.000
Methane	74-82-8	C1	No	No		3	99	0.000	0.001	0.265	0.000
Ethane	74-84-0	C2	No	No		8	99	0.000	0.003	0.705	0.000
Ethylene	74-85-1	C2	Yes	No		79	99	0.002	0.028	6.967	0.003
Propane	74-98-6	C3	Yes	No		66	99	0.001	0.023	5.820	0.003
Propylene	115-07-1	C3	Yes	No		246	99	0.005	0.087	21.694	0.011
Butane	106-97-8	C4	Yes	No		60	99	0.001	0.021	5.291	0.003
Other C4		C4				167					
Isobutene	115-11-7	C4	Yes	No	36	60.12	99	0.001	0.021	5.302	0.003
1-Butene	106-98-9	C4	Yes	No	20	33.4	99	0.001	0.012	2.945	0.001
t-2-Butene	624-64-6	C4	Yes	No	23	38.41	99	0.001	0.014	3.387	0.002
c-2-Butene	590-18-1	C4	Yes	No	20	33.4	99	0.001	0.012	2.945	0.001
1,3-Butadiene	106-99-0	C4	Yes	Yes	1	1.67	99	0.000	0.001	0.147	0.000
Total VOC			Yes				99	0.014	0.218	54.498	0.027

- (1) Based on engineering estimates
- (2) For VOC, the proposed electric flameless thermal oxidizer is designed for a VOC control efficiency of greater than 99.99% (i.e., meets requirements of COMAR 26.11.19.30 of at least 90% control overall). For PM, assume 99% particulate control for process cyclone
- (3) Assumed 16 hr/dy and 4000 hr/yr operation
- (4) Based on typical distribution for catalytic cracking
- (5) Based on regenerator outlet particulate fines equal to 0.3%/dy of catalyst inventory. The catalyst inventory for the regenerator is about 2000 g, and daily operation is 16 hr/dy

Reactor Outlet PM g/hr = 0.3 g PM/dy/100 g catalyst inventory X 2000 g catalyst / 16 hr/dy

Table 2. Additional Thermal Oxidizer CO<sub>2</sub> Emissions From Controlling Hydrocarbons

Operation 16 hr/dy 4000 hr/yr  
 TO CE 99 %  
 CO<sub>2</sub> MW 44.01 g/mol

Pollutant	CAS	# of C	MW (g/mol)	TO Inlet Mass Rate (g/hr)	Mass Rate Controlled by TO (g/hr)	Mol Rate Controlled by TO (mol/hr)	Equiv Mol C Rate (mol/hr)	Mass Rate CO <sub>2</sub> (g/hr)	
Methane	74-82-8	1	16.04	3	2.97	0.1851621	0.185162	8.148984	
Ethane	74-84-0	2	30.07	8	7.92	0.2633854	0.526771	23.18319	
Ethylene	74-85-1	2	28.05	79	78.21	2.7882353	5.576471	245.4205	
Propane	74-98-6	3	44.097	66	65.34	1.4817335	4.4452	195.6333	
Propylene	115-07-1	3	42.08	246	243.54	5.7875475	17.36264	764.1299	
Butane	106-97-8	4	58.12	60	59.4	1.0220234	4.088094	179.917	
Isobutene	115-11-7	4	56.11	60.12	59.5188	1.0607521	4.243008	186.7348	
1-Butene	106-98-9	4	56.11	33.4	33.066	0.5893067	2.357227	103.7416	
t-2-Butene	624-64-6	4	56.11	38.41	38.0259	0.6777027	2.710811	119.3028	
c-2-Butene	590-18-1	4	56.11	33.4	33.066	0.5893067	2.357227	103.7416	
1,3-Butadiene	106-99-0	4	54.09	1.67	1.6533	0.0305657	0.122263	5.38079	
				629				1935.334	
								4.266685	lb/hr
								68.26696	lb/dy
								17066.74	lb/yr
								8.53337	tpy



**Table 2. Additional Thermal Oxidizer CO<sub>2</sub> Emissions From Controlling Hydrocarbons**

Operation 16 hr/dy 4000 hr/yr  
 TO CE 99 %  
 CO<sub>2</sub> MW 44.01 g/mol

Pollutant	CAS	# of C	MW (g/mol)	TO Inlet Mass Rate (g/hr)	Mass Rate Controlled by TO (g/hr)	Mol Rate Controlled by TO (mol/hr)	Equiv Mol C Rate (mol/hr)	Mass Rate CO <sub>2</sub> (g/hr)		
Methane	74-82-8	1	16.04	3	2.97	0.1851621	0.185162	8.148984		
Ethane	74-84-0	2	30.07	8	7.92	0.2633854	0.526771	23.18319		
Ethylene	74-85-1	2	28.05	79	78.21	2.7882353	5.576471	245.4205		
Propane	74-98-6	3	44.097	66	65.34	1.4817335	4.4452	195.6333		
Propylene	115-07-1	3	42.08	246	243.54	5.7875475	17.36264	764.1299		
Butane	106-97-8	4	58.12	60	59.4	1.0220234	4.088094	179.917		
Isobutene	115-11-7	4	56.11	60.12	59.5188	1.0607521	4.243008	186.7348		
1-Butene	106-98-9	4	56.11	33.4	33.066	0.5893067	2.357227	103.7416		
t-2-Butene	624-64-6	4	56.11	38.41	38.0259	0.6777027	2.710811	119.3028		
c-2-Butene	590-18-1	4	56.11	33.4	33.066	0.5893067	2.357227	103.7416		
1,3-Butadiene	106-99-0	4	54.09	1.67	1.6533	0.0305657	0.122263	5.38079		
								629	1935.334	
									4.266685	lb/hr
									68.26696	lb/dy
									273067.9	lb/yr
									136.5339	tpy

*11/12/24  
 Replanned per Jan 11/2024  
 email from D. Rosin to  
 S. Nash /EN*

**Table 3. Regenerator Flue Gas Emissions**

Operation                      16 hr/dy                      4000 hr/yr

Pollutant	Control Efficiency (1)	Emissions (2)		
	(%)	(lb/hr)	(lb/dy)	(tpy)
CO <sub>2</sub> (3)	99	0.251	4.019	0.502
CO (4)		0.0001	0.0017	0.0002
NO (5) (6)		0.0007	0.0107	0.0013
PM (7)		0.0000	0.0001	0.0000

(1) Assume 99% particulate control for process knockout pot  
(2) Assume 16 hr/dy and 4000 hr/yr operation  
(3) Assume engineering estimate of CO<sub>2</sub> flow rate equal to 33 NL/hr  
 $CO_2 \text{ g/hr} = 44 \text{ g } CO_2/\text{mol } CO_2 \times 58 \text{ NL } CO_2/\text{hr} / 22.4 \text{ NL/mol}$   
(4) Assume lean burn (excess oxygen) conditions resulting in 0.01 vol% CO in flue gas (detection limit of CO analyzer) and flue gas flow rate of 377 NL/hr  
 $CO \text{ g/hr} = 28 \text{ g } CO/\text{mol } CO \times 0.01 \text{ NL } CO/100 \text{ NL flue gas} \times 377 \text{ NL flue gas/hr} / 22.4 \text{ NL/mol}$   
(5) Assume the mass of nitrogen in the composite plastic feedstock is equal to the mass of nitrogen in the fraction of the feedstock that is Nylon, the constituent with the highest nitrogen content. Nylon has a nitrogen content of 12.3 wt% and the fraction of Nylon in the composite feedstock is less than 2 wt%  
 $N \text{ content of feed wt\%} = (12.3 \text{ g N} / 100 \text{ g Nylon} \times 2 \text{ g Nylon} / 100 \text{ g feed}) \times 100 = 0.246$   
(6) Based on 600 ppmv (dry basis) NO in flue gas from Xinjin Zhao et. al., 1997, Nitrogen Chemistry and NO<sub>x</sub> Control in a Fluid Catalytic Cracking Regenerator (Ind. Eng. Chem. Res., 1997, 36, 11, 4535-4542) for a similar N content feed and lean combustion, and a flue gas flow rate of 377 NL/hr  
 $NO \text{ g/hr} = 30 \text{ g } NO/\text{mol } NO \times 600 \text{ NL } NO/1000000 \text{ NL flue gas} \times 377 \text{ NL flue gas/hr} / 22.4 \text{ NL/mol}$   
(7) Based on engineering estimate of regenerator outlet particulate fines equal to 0.3% /dy of catalyst inventory. The catalyst inventory for the regenerator is about 1500 g, and daily operation is 16 hr/dy  
 $Regenerator \text{ Outlet PM g/hr} = 0.3 \text{ g PM}/100 \text{ g catalyst inventory/dy} \times 1500 \text{ g catalyst} / 16 \text{ hr/dy}$

## ATTACHMENT 6

TAP Compliance Demonstration

# TAP Compliance Demonstration

## MARYLAND TAP REQUIREMENTS

The proposed Project has the potential to discharge to the atmosphere several non-criteria substances which include Toxic Air Pollutants (TAPs) and, pursuant to COMAR 26.11.15.03 A (1), is subject to the Maryland TAP requirements (under COMAR 26.11.15 and 26.11.16) because the proposed installation is required to obtain a permit to construct (PTC) under COMAR 26.11.02.09.

COMAR 26.11.15.06 requires a demonstration that TAP emissions will not unreasonably endanger human health. Grace is demonstrating compliance with this ambient impact requirement using a screening analysis as specified under COMAR 26.11.15.07. According to COMAR 26.11.16.02 A, such a demonstration is made by showing that TAP emissions from the premises will not cause increases in ambient levels that exceed the applicable risk-based screening level for a Class I TAP and the applicable TLV-/threshold-based screening level for a Class II TAP (MDE Screening Levels).

The proposed Project will be a new installation/source as defined under COMAR 26.11.15.01 B (10). For new installations, COMAR 26.11.15.06 A (1) requires that the total emissions from the premises of each TAP discharged by the new installation be used in demonstrating compliance with the TAP impact requirements. COMAR 26.11.15.06 A (2) does not require the accounting of other premise-wide emissions from existing installations/sources on the existing premises (as defined under COMAR 26.11.15.01 B (7)) for a TAP that is not listed in COMAR 26.11.16.07. Except for 1,3-Butadiene, all TAPs expected to be discharged from the proposed Project (see Table 1 (Attachment 5)) are not listed in COMAR 26.11.16.07. However, several of the registered installations/sources at the existing premises are considered new installations (not existing installations).

## EMISSIONS

### Proposed Project TAP Emissions

Several non-criteria pollutants are expected to be discharged into the ambient air from the proposed Project's new thermal oxidizer stack (see Table 1 (Attachment 5)). Methane (CAS 74-82-8), ethane (CAS 74-84-0), ethylene (CAS 74-85-1), propane (CAS 74-98-6), and propylene (CAS 115-07-1) are listed as simple asphyxiants under COMAR 26.11.16.08 and are excluded from the definition of Toxic Air Pollutants (TAPs), as defined under COMAR 26.11.15.01 B (20). 1,3-butadiene (CAS 106-99-0) is a Class I TAP while the remaining non-criteria pollutants in Table 1 (Attachment 5) are Class II TAPs.

### Other Premise-Wide TAP Emissions

Other new installations on the existing premises discharge a TAP that is expected to be discharged from the proposed Project; namely, butene (CAS 106-98-9).

The Test Polymerization Process (controlled by the existing thermal oxidizer) constructed in 2014 (ARA Registration Number 027-0013-7-0084) and the Test Gas-Phase Polymerization Process constructed in 2017 (ARA Registration Number 027-0013-7-0086) are permitted to emit butene. The maximum combined hourly butene emissions from these two installations is 0.03 lb/hr. For the Test Polymerization Process the maximum hourly butene emissions is expected to be 0.01 lb/hr (based on the supplement to the permit to Construct application (dated November 21, 2014), if butene is used as an additive). For the Test Gas-Phase Polymerization Process the maximum hourly butene emissions is expected to be 0.02 lb/hr (assuming butene from one linear low density polyethylene (LLDPE) batch run is released in one hour].

## **EXEMPTION FROM TAP REGULATIONS**

The anticipated emissions of butane, isobutene (CAS 115-11-7), 1-butene, t-2-butene (CAS 624-64-6), and c-2-butene (CAS 590-18-1) from the premises are exempt from the Maryland TAP regulations (specifically COMAR 26.11.15.05 and COMAR 26.11.15.06) because of the small quantity of discharge from this proposed Project and other permitted installations.

Under COMAR 26.11.15.03 B (3) (a):

"The emissions of a Class II TAP from a premises are exempt from the requirements of Regulations .05 and .06 of this chapter, if:

- (i) The total allowable emissions of the TAP from the premises are 0.5 pound per hour (0.23 kilogram per hour) or less; and
- (ii) All applicable TLV-based, threshold-based, or special screening levels for the TAP are greater than 200 micrograms/cubic meter."

After construction of the proposed Project, the maximum hourly emissions of butane from the premises will be about 0.001 lb/hr. This premises value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for butane is 23770.96  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of isobutene from the premises will be about 0.001 lb/hr. This value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for isobutene is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of 1-butene (butene) from the premises will be about 0.03 lb/hr (0.001 lb/hr + 0.03 lb/hr). This premises value includes the anticipated emissions due to the proposed Project and the possible emissions due to the Test Polymerization Process and the Test Gas-Phase Polymerization Process (see Other Premise-Wide TAP Emissions above). These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for butane is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of t-2-butene from the premises will be about 0.001 lb/hr. This value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for isobutene is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

After construction of the proposed Project, the maximum hourly emissions of c-2-butene from the premises will be about 0.001 lb/hr. This value includes the anticipated emissions due to the proposed Project. These emissions are well below the 0.5 lb/hr level for Class II TAPs in section (i) above. In addition, the screening level for isobutene is 5737.22  $\mu\text{g}/\text{m}^3$  (8-hour). This screening level is well above the minimum set forth in (ii) above.

Because the total allowable butane, isobutene, butene, t-2-butene and c-2-butene (Class II TAPs) emissions from the premises are each below 0.5 lb/hr, and the applicable screening levels are well above 200  $\mu\text{g}/\text{m}^3$ , these emissions qualify for the small-emitter exemption from TAP compliance demonstration requirements.

Under COMAR 26.11.15.03 B (3) (b):

“The emissions of a Class I TAP from a premises are exempt from the requirements of Regulations .05 and .06 of this chapter, if:

- (i) The total allowable emissions of the TAP from the premises are 0.5 pound per hour (0.23 kilogram per hour) or less;
- (ii) The total allowable emissions of the TAP from the premises are 350 pounds per year (159 kilograms per year) or less;
- (iii) All applicable TLV-based, threshold-based, or special screening levels for the TAP are greater than 200 micrograms/cubic meter; and
- (iv) The applicable risk-based screening level is greater than 1 microgram/cubic meter.”

Because the risk-based screening level for 1,3-butadiene (i.e., 0.03  $\mu\text{g}/\text{m}^3$ ) is not greater than 1  $\mu\text{g}/\text{m}^3$ , the 1,3-butadiene emissions do not qualify for the small-emitter exemption from TAP compliance demonstration requirements.

## **SCREENING ANALYSIS**

For the screening analysis, estimates of TAP emissions are compared to the conservative Allowable Emission Rates (AERs) consistent with the Table provided under COMAR 26.11.16.02 A (4) (MDE AER). Compliance with the TAP impact requirements is demonstrated if the TAP emissions are less than the respective AERs.

### **MDE-Based AER**

The AERs given in the Table under COMAR 26.11.16.02 (4), for non-stack or downwash sources, can be generalized as follows:

Short-term (1-hr/8-hr)      AER (lb/hr) = SL/279

Long-term (annual)          AER (lb/yr) = SL/0.00274

where SL is the applicable MDE Screening Level ( $\mu\text{g}/\text{m}^3$ ).

This is based on discussions in "An Example of Demonstrating Compliance with Ambient Impact Requirement. (COMAR 26.11.15.06) – Fact Sheet" on MDE's website.

### **Screening Compliance Demonstration**

Since many of the expected non-criteria pollutants from the proposed Project are not TAPs and of the TAPs 1,3-butadiene (CAS 106-99-0, a Class I TAP) is the only TAP not exempt from the TAP requirements under COMAR 26.11.15.05 and 26.11.05.06, a TAP screening analysis was performed for 1,3-butadiene. The screening analysis presented in Table 4 demonstrates TAP compliance for 1,3-butadiene.

Table 4. TAP Demonstration Screening Analysis

Substance	Substance Alternate Name	CAS Number	MDE TAP (1)	MDE Screening Level (2)			TAP Emissions						Small Quantity Exemption (5)	MDE AER (6)			Compliance							
				1-hr	8-hr	Annual	Project TAP Hourly (3)	Project TAP Annual (3)	Other TAP Hourly (4)	Other TAP Annual	Site-wide TAP Hourly	Site-wide TAP Annual		1-hr	8-hr	Annual	1-hr	8-hr	Annual					
				(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)		(lb/hr)	(lb/hr)	(lb/hr)	(lb/yr)							
Methane		74-82-8	No				0.000066	0.264555					0.000066	0.26455493										
Ethane		74-84-0	No				0.0001764	0.70548					0.00017637	0.705479814										
Ethylene		74-85-1	No				0.0017417	6.966613					0.001741653	6.966613168										
Propane		74-98-6	No				0.0014551	5.820208					0.001455052	5.820208469										
Propylene		115-07-1	No				0.0054234	21.6935					0.005423376	21.69350429										
Butane		106-97-8	Class II		23770.9611		0.0013228	5.291099					0.001322775	5.291098608	Yes	0	85.20057742	0			Yes			
Isobutene	Isobutylene	115-11-7	Class II		5737.2188		0.0013254	5.301681					0.00132542	5.301680806	Yes	0	20.56350824	0			Yes			
1-Butene	Butene, isomers	106-98-9	Class II		5737.2188		0.0007363	2.945378	0.03				0.000736345	2.945378225	Yes	0	20.56350824	0			Yes			
t-2-Butene	Butene, isomers	624-64-6	Class II		5737.2188		0.0008468	3.387185					0.000846796	3.387184959	Yes	0	20.56350824	0			Yes			
c-2-Butene	Butene, isomers	590-18-1	Class II		5737.2188		0.0007363	2.945378					0.000736345	2.945378225	Yes	0	20.56350824	0			Yes			
1,3-Butadiene		106-99-0	Class I		44.2454	3.00E-02	0.000037	0.147269					0.000037	0.147268911	No	0	0.158585663	10.94890511			Yes	Yes		

(1) COMAR 26.11.15.01 and COMAR 26.11.16.08

(2) MDE's Toxic Air Pollutant Regulations Assistance web page; Screening Levels

(3) See Table 1 (Attachment 5)

(4) Other site-wide emissions: Butene emissions based on PTC application for Gas Phase Polymerization Process submitted on May 26, 2016 (accounting for GPP emissions and RSPD controlled emissions)

(5) COMAR 26.11.15.03 B (3) (a) and (b)

(6) Based on "An Example of Demonstrating Compliance with Ambient Impact Requirement. (COMAR 26.11.15.06 - Fact Sheet" on MDE's website



## ATTACHMENT 7

Safety Data Sheet for Example Plastic Feedstock

**1 Identification**

- **Product identifier**
- **Trade name: polypropylene**
- **Application of the substance / the preparation:**  
Product for industrial research and applicability tests.
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**  
GRACE  
W. R. Grace & Co.-Conn  
7500 Grace Drive  
Columbia MD 21044  
U. S. A.
- **Information department:**  
Health and Safety (9 AM to 5 PM-EST) 1-410-531-4000  
MSDS.Davison@grace.com
- **Emergency telephone number:**  
Chemtrec North America: +1-800-424-9300  
Chemtrec International: +1-703-527-3887  
Other Emergencies (24hr): +1-410-531-4000

**2 Hazard(s) identification**

- **Classification of the substance or mixture**  
The substance is not classified, according to the Globally Harmonized System (GHS).
- **Label elements**
- **GHS label elements** None
- **Hazard pictograms** None
- **Signal word** None
- **Hazard statements** None
- **Classification system:**
- **NFPA ratings (scale 0 - 4)**



Health = 0  
Fire = 1  
Reactivity = 0

- **HMIS-ratings (scale 0 - 4)**



Health = 0  
Fire = 1  
Reactivity = 0

- **Hazard not otherwise classified**
- **WARNING:** Product dust together with air may develop ignitable and explosive mixtures

**3 Composition/information on ingredients**

- **Chemical characterization: Substances**
- **Additional information:**

- **CAS No. and description:**

9003-07-0	polypropylene	100%
-----------	---------------	------

100%

USA

(Contd. on page 2)

**Trade name: polypropylene**

(Contd. of page 1)

#### 4 First-aid measures

- **Description of first aid measures**
- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:**  
Generally the product does not irritate the skin.  
Wash with water.  
After contact with the molten product, cool rapidly with cold water.  
Do not pull solidified product away from the skin.  
Seek medical treatment.
- **After eye contact:**  
Flush opened eye with large quantities of running water for at least 30 minutes. If symptoms occur, consult a doctor.
- **After swallowing:** Seek medical attention. Do not induce vomiting.
- **Information for doctor:**
- **Most important symptoms and effects, both acute and delayed**  
No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed**  
No further relevant information available.

#### 5 Fire-fighting measures

- **Extinguishing media**
- **Suitable extinguishing agents:**  
CO<sub>2</sub>, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **Hazardous combustion products**  
In case of fire, the following can be released:  
Carbon monoxide and carbon dioxide
- **Advice for firefighters**
- **Protective equipment:**  
Do not inhale explosion gases or combustion gases.  
Wear personal protective equipment.  
Wear respiratory protective device.
- **Additional information**  
Collect contaminated fire fighting water separately. It must not enter the sewage system.  
Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.  
WARNING: Product dust together with air may develop ignitable and explosive mixtures  
Prevent formation of dust.

#### 6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures**  
Remove persons from danger area.  
Wear protective clothing.  
WARNING: Product dust together with air may develop ignitable and explosive mixtures  
Keep away from ignition sources
- **Environmental precautions:**  
Do not allow to enter sewers, surface or ground water.  
Prevent from spreading (e.g. by damming-in or oil barriers).
- **Methods and material for containment and cleaning up:**  
Vacuuming or wet sweeping may be used to avoid dust dispersal.  
Vacuuming or wet sweeping may be used to avoid dust dispersal.

(Contd. on page 3)

USA

Trade name: **polypropylene**

(Contd. of page 2)

· **Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

· **Protective Action Criteria for Chemicals**· **PAC-1:**5.2 mg/m<sup>3</sup>· **PAC-2:**58 mg/m<sup>3</sup>· **PAC-3:**350 mg/m<sup>3</sup>**7 Handling and storage**· **Handling:**· **Precautions for safe handling**

Keep away from heat and direct sunlight.

Prevent formation of dust.

Provide suction extractors if dust is formed.

Use appropriate industrial vacuum cleaners or central vacuum systems for dust removal.

Take precautionary measures against static discharges.

· **Information about protection against explosions and fires:**

Dust can combine with air to form an explosive mixture.

When transferring this material into flammable solvents, use proper grounding to avoid static electric sparks.

WARNING: Product dust together with air may develop ignitable and explosive mixtures

When transferring this material, use proper grounding to avoid static electric sparks.

· **Conditions for safe storage, including any incompatibilities**· **Storage:**· **Requirements to be met by storerooms and receptacles:** No special requirements.· **Information about storage in one common storage facility:** Store away from foodstuffs.· **Further information about storage conditions:** None.**8 Exposure controls/personal protection**· **Additional information about design of technical systems:**

Dust control and material handling systems should contain explosion relief vents, an explosion suppression system or other explosion suppression or prevention controls. Ensure that dust-handling systems are designed in a manner to prevent the escape of dust into the work area. Use only appropriately classified electrical equipment and powered industrial trucks.

· **Control parameters**· **Components with limit values that require monitoring at the workplace:** Not required.· **Additional information:** Valid lists at time of creation were used as basis.· **Exposure controls**· **Personal protective equipment:**· **General protective and hygienic measures:**

The usual precautionary measures for handling chemicals should be followed.

· **Breathing equipment:**

As appropriate for the employee exposure, use a NIOSH approved respirator and cartridge.

(Contd. on page 4)

USA

Trade name: polypropylene

(Contd. of page 3)

· **Protection of hands:**

Protective gloves

Check protective gloves prior to each use for their proper condition.

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

· **Material of gloves**

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

Nitrile rubber, NBR

Butyl rubber, BR

Strong fabric gloves

Leather gloves

Recommended thickness of the material:  $\geq 0.35$  mm

· **For the permanent contact gloves made of the following materials are suitable:**

Butyl rubber, BR

Nitrile rubber, NBR

· **Eye protection:**

Safety glasses

· **Body protection:** Protective work clothing**9 Physical and chemical properties**· **Information on basic physical and chemical properties**· **General Information**· **Appearance:**

Form: Granulate  
Color: Transparent

· **Odor:** Odorless  
· **Odor threshold:** Not applicable.

· **pH-value at 20 °C (68 °F):** 7

· **Change in condition**

**Melting point/Melting range:** 120-170 °C (248-338 °F)

**Boiling point/Boiling range:** Not determined.

· **Flash point:** Not determined.

· **Flammability (solid, gaseous):** Not determined.

· **Ignition temperature:** 410 °C (770 °F)

· **Decomposition temperature:** ~250 °C (~482 °F)

· **Auto igniting:** Product is not self-igniting.

(Contd. on page 5)

USA

Trade name: **polypropylene**

(Contd. of page 4)

· <b>Danger of explosion:</b>	Danger of dust explosion.
· <b>Explosion limits:</b>	
<b>Lower:</b>	Not applicable.
<b>Upper:</b>	Not applicable.
· <b>Vapor pressure:</b>	Not applicable.
· <b>Density at 20 °C (68 °F):</b>	0.90 - 0.92 g/cm <sup>3</sup> (7.5105 - 7.6774 lbs/gal)
· <b>Bulk density at 20 °C (68 °F):</b>	0.5 kg/m <sup>3</sup>
· <b>Vapor density</b>	Not applicable.
· <b>Evaporation rate</b>	Not applicable.
· <b>Solubility in / Miscibility with</b>	
<b>Water:</b>	Insoluble.
· <b>Coefficient of water/oil distribution:</b>	Not available.
· <b>Viscosity:</b>	
<b>Dynamic:</b>	Not applicable.
<b>Kinematic:</b>	Not applicable.
· <b>Other information</b>	No further relevant information available.

**10 Stability and reactivity**

- **Reactivity** No further relevant information available.
- **Chemical stability** No decomposition if used and stored according to specifications.
- **Possibility of hazardous reactions**  
WARNING: Product dust together with air may develop ignitable and explosive mixtures  
As the product is supplied it is not capable of dust explosion; however enrichment with fine dust causes risk of dust explosion.
- **Conditions to avoid**  
In case of thermal decomposition caused by smouldering and incomplete combustion toxic fumes may be developed.
- **Incompatible materials:** Protect from contamination.
- **Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Aldehyde  
At temperatures above 250°C, depolymerization and the release of starting monomers can arise.

**11 Toxicological information**

- **Information on toxicological effects**
- **Acute toxicity:**
- **Primary irritant effect:**
- **on the skin:** No irritant effect.
- **on the eye:** Irritating effect.
- **Respiratory sensitization** No further relevant information available.
- **Skin sensitization** No further relevant information available.
- **Additional toxicological information:**
- **Carcinogenic categories**
- **IARC (International Agency for Research on Cancer)**

3

(Contd. on page 6)

USA

Trade name: **polypropylene**

(Contd. of page 5)

- **NTP (National Toxicology Program)**  
Substance is not listed.
- **OSHA-Ca (Occupational Safety & Health Administration)**  
Substance is not listed.
- **CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction)**
- **Carcinogenicity** No further relevant information available.
- **Mutagenicity** No further relevant information available.
- **Reproductive toxicity** No further relevant information available.
- **Specific target organ toxicity (single exposure)** No further relevant information available.
- **Specific target organ toxicity (repeated exposure)** No further relevant information available.

## 12 Ecological information

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.
- **Behavior in environmental systems:**
- **Bioaccumulative potential** No further relevant information available.
- **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:** Do not allow product to reach ground water, water course or sewage system.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No further relevant information available.

## 13 Disposal considerations

- **Precautions for disposal:**
- **Recommendation:**  
Disposal must be made according to official regulations.  
Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State/provincial and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state/provincial and local requirements.

## 14 Transport information

· <b>UN-Number</b>	
· <b>DOT, ADR, ADN, IMDG, IATA</b>	None
· <b>UN proper shipping name</b>	
· <b>DOT, ADR, ADN, IMDG, IATA</b>	None
· <b>Transport hazard class(es)</b>	
· <b>DOT, ADR, ADN, IMDG, IATA</b>	
· <b>Class</b>	None

(Contd. on page 7)

Trade name: **polypropylene**

(Contd. of page 6)

· <b>Packing group</b>	
· <b>DOT, ADR, IMDG, IATA</b>	None
· <b>Environmental hazards:</b>	Not applicable.
· <b>Special precautions for user</b>	Not applicable.
· <b>Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code</b>	Not applicable.
· <b>Transport/Additional information:</b>	Not dangerous according to the above specifications. GRACE recommendation for air transport: Cargo aircraft only.

**15 Regulatory information**

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **SARA**

· **SARA 302/304**

Substance is not listed.

· **SARA 313**

Substance is not listed.

· **SARA 311/312 Combustible Dust.**

· **TSCA (Toxic Substances Control Act):**

ACTIVE

· **Hazardous Air Pollutants**

Substance is not listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**

Substance is not listed.

· **Chemicals known to cause developmental toxicity:**

Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**

Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is not listed.

· **Canadian DSL**

9003-07-0 | polypropylene

· **Canadian NDSL**

Substance is not listed.

(Contd. on page 8)



Trade name: polypropylene

(Contd. of page 7)

· **European EINECS**

The corresponding monomers are listed in EINECS.

Substance is not listed.

· **Philippines Inventory of Chemicals and Chemical Substances PICCS**

Substance is listed.

· **Inventory of the Existing Chemical Substances manufactured or imported in China IECSC**

9003-07-0 | polypropylene

· **Australian Inventory of Chemical Substances AICS**

Substance is listed.

· **Existing and New Chemical Substance List ENCS**

6-402

· **Korean Existing Chemical Inventory KECI**

KE-29389

· **TCSCA (Taiwan)**

Substance is not listed.

· **New Zealand Inventory of Chemicals (NZIoC)**

Substance is listed.

· **Existing Chemical Directory of Thailand (DIW)**

Substance is listed.

· **TCSI - Taiwan Chemical Substance Inventory**

Substance is listed.

· **GHS label elements** None· **Hazard pictograms** None· **Signal word** None· **Hazard statements** None**16 Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing SDS:** GRACE Safety & Health Department· **Other information:**

Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling

· **Contact:**

SALES OFFICES

## USA:

GRACE

W. R. Grace &amp; Co.-Conn

7500 Grace DR

Columbia, MD 21044

Tel: +1 410-531 4000

## Europe:

Grace GmbH

In der Hollerhecke 1

D-67545 Worms, Germany

Tel: +49 6241 40300

## Asia Pacific:

Grace Products (Singapore) Pte Ltd

230 Orchard Road

(Contd. on page 9)

USA

**Trade name: polypropylene**

(Contd. of page 8)

09-232, Faber House  
Singapore 238854  
Tel: +65 6737 3033  
Fax: +65 6737 5826

Grace Trading (Shanghai) Ltd  
19th Floor K.Wah Center  
1010 Huai Hai Zhong Road  
Shanghai, 200031 China  
T (电话): +86 21 3325 8288  
F (传真): +86 21 5405 1500

W. R. Grace Japan K.K  
Kohken New River Bldg 3F  
2-21-18, Shinkawa  
Chuo-ku, Tokyo 104-0033  
JAPAN  
Tel: +81 3.3537.6006  
Fax: +81 3.3537.6007

**Other information:**

- **Date of preparation / last revision** 01/08/2021 / 3.1
- **The first date of preparation** 06/06/2006
- **Number of revision times and the latest revision date** 3.2 / 01/08/2021

**Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)  
IMDG: International Maritime Code for Dangerous Goods  
DOT: US Department of Transportation  
IATA: International Air Transport Association  
ACGIH: American Conference of Governmental Industrial Hygienists  
NFPA: National Fire Protection Association (USA)  
HMIS: Hazardous Materials Identification System (USA)  
PBT: Persistent, Bioaccumulative and Toxic  
vPvB: very Persistent and very Bioaccumulative  
NIOSH: National Institute for Occupational Safety  
OSHA: Occupational Safety & Health  
TLV: Threshold Limit Value  
PEL: Permissible Exposure Limit  
REL: Recommended Exposure Limit

- **Others** No further relevant information available.
- **\* Data compared to the previous version altered.**

**1 Identification**

- **Product identifier**
- **Trade name:** Polyethylene
- **Application of the substance / the preparation:** Raw material
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**  
GRACE  
W. R. Grace & Co.-Conn  
7500 Grace Drive  
Columbia MD 21044  
U. S. A.
- **Information department:**  
Health and Safety (9 AM to 5 PM-EST) 1-410-531-4000  
MSDS.Davison@grace.com
- **Emergency telephone number:**  
Chemtrec North America: +1-800-424-9300  
Chemtrec International: +1-703-527-3887  
Other Emergencies (24hr): +1-410-531-4000

**2 Hazard(s) identification**

- **Classification of the substance or mixture**  
The substance is not classified, according to the Globally Harmonized System (GHS).
- **Label elements**
- **GHS label elements** None
- **Hazard pictograms** None
- **Signal word** None
- **Hazard statements** None
- **Hazard not otherwise classified** The product is combustible.

**3 Composition/information on ingredients**

- **Chemical characterization:** Substances
- **Additional information:**

· **CAS No. and description:**

9002-88-4 | Polyethylene

100%

**4 First-aid measures**

- **Description of first aid measures**
- **General information:**  
Immediately remove contaminated clothing if necessary to prevent direct skin contact.
- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:**  
Immediately wash with water at least for 30 minutes and rinse thoroughly.  
Seek medical treatment.
- **After eye contact:**  
Flush opened eye with large quantities of running water for at least 30 minutes. If symptoms occur, consult a doctor.
- **After swallowing:** Seek medical attention. Do not induce vomiting.

(Contd. on page 2)

USA

Trade name: Polyethylene

(Contd. of page 1)

- **Information for doctor:**
- **Most important symptoms and effects, both acute and delayed**  
No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed**  
No further relevant information available.

**5 Fire-fighting measures**

- **Extinguishing media**
- **Suitable extinguishing agents:**  
CO<sub>2</sub>, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **For safety reasons unsuitable extinguishing agents:** Water with full jet
- **Hazardous combustion products**  
Carbon monoxide and carbon dioxide  
Can form explosive gas-air mixtures.
- **Advice for firefighters**
- **Protective equipment:**  
Wear personal protective equipment.  
Wear respiratory protective device.
- **Additional information**  
Cool receptacles with water spray.  
Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.  
Heating of container(s) will cause the pressure to rise with risk of bursting.

**6 Accidental release measures**

- **Personal precautions, protective equipment and emergency procedures**  
Ensure adequate ventilation  
Keep away from ignition sources  
Wear protective clothing.  
Wear respiratory protective device.
- **Environmental precautions:**  
Damp down dust with water spray.  
Do not allow to enter sewers, surface or ground water.
- **Methods and material for containment and cleaning up:**  
Dispose of the collected material according to regulations.
- **Reference to other sections**  
See Section 7 for information on safe handling.  
See Section 8 for information on personal protection equipment.  
See Section 13 for disposal information.
- **Protective Action Criteria for Chemicals**

· PAC-1:	16 mg/m <sup>3</sup>
· PAC-2:	170 mg/m <sup>3</sup>
· PAC-3:	1,000 mg/m <sup>3</sup>

USA

(Contd. on page 3)

Trade name: Polyethylene

(Contd. of page 2)

## 7 Handling and storage

- **Handling:**
- **Precautions for safe handling**  
Keep away from heat and direct sunlight.  
Any deposit of dust which cannot be avoided must be regularly removed.  
Take precautionary measures against static discharges.  
No special measures required.
- **Information about protection against explosions and fires:**  
WARNING: Product dust together with air may develop ignitable and explosive mixtures  
Keep ignition sources away. Do not smoke.  
Protect against electrostatic charges.  
The product is flammable.
- **Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by storerooms and receptacles:**  
Use only receptacles specifically permitted for this substance/product.
- **Information about storage in one common storage facility:** Store away from foodstuffs.
- **Further information about storage conditions:** Store in dry conditions.

## 8 Exposure controls/personal protection

- **Additional information about design of technical systems:** No further data; see item 7.
- **Control parameters**
- **Components with limit values that require monitoring at the workplace:** Not required.
- **Additional information:** Valid lists at time of creation were used as basis.
- **Exposure controls**
- **Personal protective equipment:**
- **General protective and hygienic measures:**  
The usual precautionary measures for handling chemicals should be followed.  
Keep away from foodstuffs, beverages and feed.  
Immediately remove all soiled and contaminated clothing.  
Wash hands before breaks and at the end of work.  
Do not inhale dust / smoke / mist.  
Prevent contact with the eyes and skin.
- **Protection of hands:**  
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.  
Due to lack of information no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.



Protective gloves

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

- **Material of gloves**  
Recommended thickness of the material:  $\geq 0.35$  mm  
Leather gloves
- **For the permanent contact in work areas without heightened risk of injury (e.g. Laboratory) gloves made of the following material are suitable:**  
Leather gloves

(Contd. on page 4)

USA

Trade name: Polyethylene

(Contd. of page 3)

- For the permanent contact gloves made of the following materials are suitable:  
Leather gloves
- For the permanent contact of a maximum of 15 minutes gloves made of the following materials are suitable:  
Leather gloves
- Not suitable are gloves made of the following materials: Strong fabric gloves
- Eye protection:



Safety glasses

- Body protection: Protective work clothing

## 9 Physical and chemical properties

### · Information on basic physical and chemical properties

#### · General Information

#### · Appearance:

Form: Solid  
Color: White

· Odor: Odorless  
· Odor threshold: Not applicable.

· pH-value (50 g/l) at 20 °C (68 °F): 7

#### · Change in condition

Melting point/Melting range: 120-135 °C (248-275 °F)

Boiling point/Boiling range: Not determined.

Drip point: 50-150 °C (122-302 °F) (DIN 51801 & ASTM D 3954-9)

· Flash point: >220 °C (>428 °F) (DIN 51758)

· Flammability (solid, gaseous): Flammable.  
· Ignition temperature: >350 °C (>662 °F)  
· Decomposition temperature: Not applicable.

· Auto ignition temperature: Product is not self-igniting.

· Danger of explosion: Product is not explosive. However, formation of explosive air/vapor mixtures are possible.

· Explosion limits:  
Lower: Not applicable.  
Upper: Not applicable.

· Vapor pressure: Not applicable.

· Density at 20 °C (68 °F): ~0.93 g/cm<sup>3</sup> (~7.76085 lbs/gal)  
· Vapor density: Not determined.

· Evaporation rate: Not determined.

#### · Solubility in / Miscibility with

Water: Insoluble.  
· Coefficient of water/oil distribution: >6 log POW (calculated)

(Contd. on page 5)

USA

Trade name: **Polyethylene**

(Contd. of page 4)

· <b>Viscosity:</b>	
Dynamic at 120 °C (248 °F):	<400 mPas (DIN 53019)
Kinematic:	Not applicable.
· <b>Other information</b>	
Particle characteristics	Not determined.

**10 Stability and reactivity**

- **Reactivity** No further relevant information available.
- **Chemical stability** No decomposition if used and stored according to specifications.
- **Possibility of hazardous reactions**  
As the product is supplied it is not capable of dust explosion; however enrichment with fine dust causes risk of dust explosion.
- **Conditions to avoid**  
In case of thermal decomposition caused by smouldering and incomplete combustion toxic fumes may be developed.
- **Incompatible materials:** Protect from contamination.
- **Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Flammable gases/vapors  
Hydrocarbons

**11 Toxicological information**

· **Information on toxicological effects**

· **Acute toxicity:**

· <b>LD/LC50 values that are relevant for classification:</b>	
<b>9002-88-4 Polyethylene</b>	
Oral	LD50 7,950 mg/kg (rat)

· **Primary irritant effect:**

· <b>on the skin:</b>	
<b>9002-88-4 Polyethylene</b>	
Irritation of skin	IS 0 (-)

· <b>on the eye:</b>	
<b>9002-88-4 Polyethylene</b>	
Irritation of eyes	IS 0 (-)

- **Sensitization:** No sensitizing effects known.
- **Skin sensitization** No further relevant information available.

· **Additional toxicological information:**

· **Carcinogenic categories**

· <b>IARC (International Agency for Research on Cancer)</b>	
	3

· <b>NTP (National Toxicology Program)</b>	
Substance is not listed.	

· <b>OSHA-Ca (Occupational Safety &amp; Health Administration)</b>	
Substance is not listed.	

(Contd. on page 6)

**Trade name: Polyethylene**

(Contd. of page 5)

- **CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction)**
- **Carcinogenicity** No further relevant information available.
- **Mutagenicity** No further relevant information available.
- **Reproductive toxicity** No further relevant information available.
- **Specific target organ toxicity (single exposure)** No further relevant information available.
- **Specific target organ toxicity (repeated exposure)** No further relevant information available.

**12 Ecological information**

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.
- **Other information:**  
Do not allow product to reach sewage system, groundwater and any water course.  
By the insolubility in water there is a separation at every filtration and sedimentation process.
- **Behavior in environmental systems:**
- **Bioaccumulative potential**  
Due to the distribution coefficient n-octanol/water an accumulation in organisms is possible.
- **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:**  
Do not allow product to reach ground water, water course or sewage system.  
Not hazardous for water.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No further relevant information available.

**13 Disposal considerations**

- **Precautions for disposal:**
- **Recommendation:**  
Disposal must be made according to official regulations.  
Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State/provincial and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state/provincial and local requirements.

**14 Transport information**

· <b>UN-Number</b>	Not applicable.
· <b>DOT, ADR, ADN, IMDG, IATA</b>	Not applicable.
· <b>UN proper shipping name</b>	Not applicable.
· <b>DOT, ADR, ADN, IMDG, IATA</b>	Not applicable.
· <b>Transport hazard class(es)</b>	
· <b>DOT, ADR, ADN, IMDG, IATA</b>	
· <b>Class</b>	Not applicable.

(Contd. on page 7)



Trade name: **Polyethylene**

(Contd. of page 6)

· <b>Packing group</b>	
· <b>DOT, ADR, IMDG, IATA</b>	Not applicable.
· <b>Environmental hazards:</b>	Not applicable.
· <b>Special precautions for user</b>	Not applicable.
· <b>Segregation groups</b>	-
· <b>Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code</b>	Not applicable.
· <b>Transport/Additional information:</b>	Not dangerous according to the above specifications. GRACE recommendation for air transport: Cargo aircraft only.

15 Regulatory information	
· <b>Safety, health and environmental regulations/legislation specific for the substance or mixture</b>	
· <b>SARA</b>	
· <b>SARA 302/304</b>	Substance is not listed.
· <b>SARA 313</b>	Substance is not listed.
· <b>SARA 311/312</b>	Not applicable.
· <b>TSCA (Toxic Substances Control Act):</b>	ACTIVE
· <b>Hazardous Air Pollutants</b>	Substance is not listed.
· <b>Proposition 65</b>	
· <b>Chemicals known to cause cancer:</b>	Substance is not listed.
· <b>Chemicals known to cause reproductive toxicity for females:</b>	Substance is not listed.
· <b>Chemicals known to cause reproductive toxicity for males:</b>	Substance is not listed.
· <b>Chemicals known to cause developmental toxicity:</b>	Substance is not listed.
· <b>Carcinogenic categories</b>	
· <b>EPA (Environmental Protection Agency)</b>	Substance is not listed.
· <b>TLV (Threshold Limit Value)</b>	Substance is not listed.
· <b>NIOSH-Ca (National Institute for Occupational Safety and Health)</b>	Substance is not listed.
· <b>Canadian DSL</b>	9002-88-4   Polyethylene

(Contd. on page 8)

Trade name: **Polyethylene**

(Contd. of page 7)

· **Canadian NDSL**

Substance is not listed.

· **European EINECS**

Substance is not listed.

· **Philippines Inventory of Chemicals and Chemical Substances PICCS**

Substance is listed.

· **Inventory of the Existing Chemical Substances manufactured or imported in China IECSC**

9002-88-4 | Polyethylene

· **Australian Inventory of Industrial Chemicals (AIIC)**

Substance is listed.

· **Existing and New Chemical Substance List ENCS**

6-1

· **Korean Existing Chemical Inventory KECI**

KE-28877

· **TCSCA (Taiwan)**

EPEP4A01714252

· **Russian Register of Potentially Hazardous Chemical and Biological Substances (RPOHV)**

№ BT-000548 от 14.07.1995 г.

· **New Zealand Inventory of Chemicals (NZIoC)**

Substance is listed.

· **Existing Chemical Directory of Thailand (DIW)**

Substance is listed.

· **TCSI - Taiwan Chemical Substance Inventory**

Substance is listed.

· **Mexican National Inventory of Chemical Substances (INSQ)**

Substance is listed.

· **GHS label elements** None· **Hazard pictograms** None· **Signal word** None· **Hazard statements** None· **Classification system:**· **NFPA ratings (scale 0 - 4)**Health = 1  
Fire = 1  
Reactivity = 0· **HMSI-ratings (scale 0 - 4)**Health = 1  
Fire = 1  
Reactivity = 0**16 Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing SDS:** GRACE Safety & Health Department

(Contd. on page 9)

USA

**Trade name: Polyethylene**

(Contd. of page 8)

**Contact:**  
SALES OFFICES

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**Other information:**

- **Date of preparation / last revision** 03/11/2022 / 3.2
- **The first date of preparation** 05/07/2003
- **Number of revision times and the latest revision date** 3.3 / 03/10/2022

**Abbreviations and acronyms:**

ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)  
IMDG: International Maritime Code for Dangerous Goods  
DOT: US Department of Transportation  
IATA: International Air Transport Association  
LC50: Lethal concentration, 50 percent  
LD50: Lethal dose, 50 percent  
PBT: Persistent, Bioaccumulative and Toxic  
vPvB: very Persistent and very Bioaccumulative  
NIOSH: National Institute for Occupational Safety  
OSHA: Occupational Safety & Health  
TLV: Threshold Limit Value  
PEL: Permissible Exposure Limit  
REL: Recommended Exposure Limit

- **Others** No further relevant information available.

- **\* Data compared to the previous version altered.**

## ATTACHMENT 8

Electric Flameless Thermal Oxidizer Vendor Information

# ELECTRIC FTO

## FLAMELESS THERMAL OXIDIZER



**High  
Destruction  
Efficiency,  
Low NOx,  
Electrically  
Heated**

The *PCC Electric FTO (EFTO)* consistently treats Volatile Organic Compounds (VOCs) in waste gas streams yielding removal efficiencies of 99.9999%. The thermal oxidation is accomplished at 1800°F to avoid production of thermal NOx and to minimize operating costs. Thermal NOx levels are <1 ppmv.

The *PCC Electric FTO* consists of a carbon steel, refractory-lined oxidation vessel. The vessel contains three spiral-wound electric resistance heater elements in 310SS protection tubes surrounded by a bed of randomly packed inert ceramic saddles. The *PCC Electric FTO* is fully automatic and there are no moving parts in the oxidizer. Alternate materials of construction are available as required based on the waste gas composition. A typical system requires 480V 3phase 100 amp, 120V 1 phase 20 amp, and 5 scfm of instrument air at 80 psig.

**How the PCC  
Electric FTO  
Works**

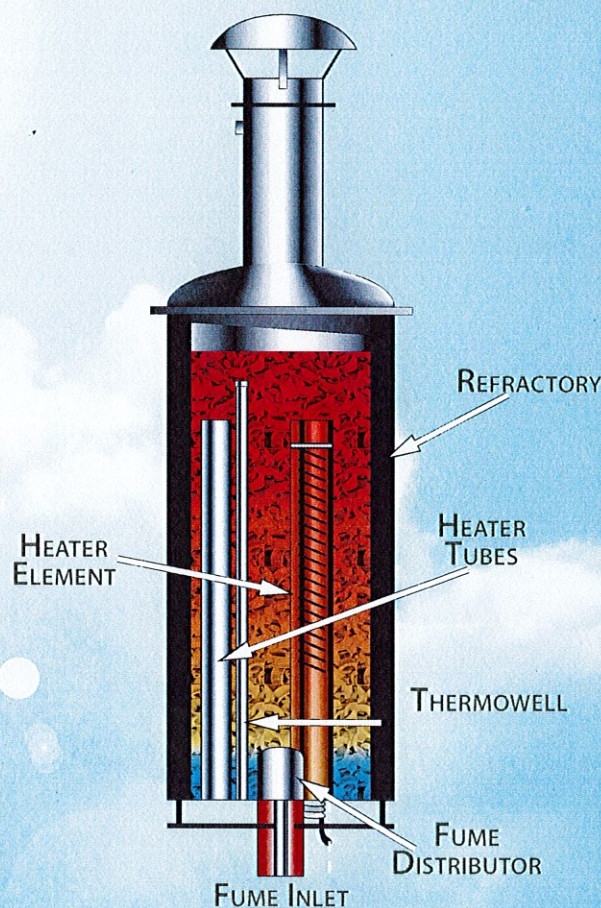
The *PCC EFTO* consists of a vertical, refractory-lined vessel filled with ceramic media. The ceramic media is pre-heated to a calculated temperature through the use of an electric resistance heater. Electrical energy is only required as a supplement to the heat content of the fume and to preheat the ceramic bed during start-up.

The waste gas and air are pre-mixed at the bottom of the vessel and introduced into the unit. The organic compounds found in the waste gas are oxidized and discharged into the atmosphere via a stack extension on the top of the unit.

The *PCC Electric FTO* operates well below the Lower Flammable Limit (LFL), eliminating the possibility of a flame within the system. The fume oxidizes as it passes through the oxidation zone releasing heat, which is transferred into the surrounding ceramic matrix thus maintaining the operating temperature of the bed without the need for supplemental heat via the electric heaters.

**Simplicity of  
Design**

The *PCC EFTO's* simplicity of design and portability make it a multi-purpose piece of equipment for multiple low volume gas treatment applications. The *PCC EFTO's* standardized design requires minimal customization. The modular configuration makes it simple to install.



### PROCESS COMBUSTION CORPORATION

300 Weyman Road, Suite 400 · Pittsburgh, PA 15236 · (412) 655-0955 · pcc@pcc-group.com · www.pcc-group.com

*Call now for a competitive proposal!*

January 9, 2024

Susan Nash, Regulatory and Compliance Engineer Sr.  
Air and Radiation Administration  
Air Quality Permits Program  
Maryland Department of the Environment  
1800 Washington Boulevard  
Baltimore, Maryland 21230  
[susan.nash@maryland.gov](mailto:susan.nash@maryland.gov)

W. R. Grace & Co.- Conn. Columbia, MD facility's application for a planned pilot-scale test catalytic chemical conversion process was submitted to MDE on August 7, 2023.

The following is a response to your question, received on January 5, 2024, regarding emissions estimates in our application; namely, "How were the emissions estimates done for both stacks and for all types of pollutants [criteria, GHG, TAPs, etc.]".

Estimated emissions (along with relevant information in footnotes and assumed control efficiencies) for the Thermal Oxidizer (TO) Stack and the Regenerator Exhaust Vent are presented in Tables 1 and 2, for the TO Stack and Table 3, for the Regenerator Exhaust Vent, in Attachment 5 of the application. A summary of the bases and assumptions for the emissions estimates are given below.

For the TO Stack:

- Criteria pollutants
  - VOC based on gaseous hydrocarbon yield (i.e., mass hydrocarbon per mass raw material) and typical distribution of hydrocarbons from catalytic cracking estimated from
    - Bench scale lab testing results
    - Published technical papers of similar reactions
    - Understanding of cracking chemistry of the raw material
    - Mass balance of the system
  - PM estimated from
    - Assumed percentage of outlet particulate fines based on system catalyst inventory
- GHG pollutants
  - CO<sub>2</sub> estimated from
    - Bench scale lab testing results
    - Published technical papers of similar reactions
    - Understanding of cracking chemistry of the raw material
    - Mass balance of the system
    - As a result of the destruction of hydrocarbons in the TO, assumed moles of hydrocarbon carbon input to TO are converted to mass of CO<sub>2</sub> (one mole of carbon to one mole of CO<sub>2</sub>)

- Methane based on gaseous hydrocarbon yield (i.e., mass hydrocarbon per mass raw material) and typical distribution of hydrocarbons from catalytic cracking estimated from
  - Bench scale lab testing results
  - Published technical papers of similar reactions
  - Understanding of cracking chemistry of the raw material
  - Mass balance of the system
- TAPs
  - Six of the speciated VOC pollutants are Class II TAPs. See Criteria Pollutants bullet above for VOC.

For the Regenerator Exhaust Vent:

- All pollutants
  - Based on 20 years of experience on operating regenerators from other similar pilot plants (eg., Davison Circulating Riser (DCR))
- Criteria pollutants
  - CO estimated from
    - Assumed lean burn (excess oxygen) resulting in trace CO at detection limit
  - NO estimated from
    - Published technical paper of similar process (and similar N content of raw feed and lean combustion)
  - PM estimated from
    - Assumed percentage of outlet particulate fines based on system catalyst inventory
- GHG pollutants
  - CO<sub>2</sub> estimated from
    - Carbon balance of coke deposited on spent catalyst

Please contact me with any questions.

Sincerely,

Daniel Resca  
Project Manager  
W.R. Grace & Co.-Conn  
[Daniel.resca@grace.com](mailto:Daniel.resca@grace.com)  
410-531-4570

**MARYLAND DEPARTMENT OF THE ENVIRONMENT**

**AIR AND RADIATION ADMINISTRATION**

**PRIVILEGE LOG**

The following items are considered confidential business information and are not included in the permit to construct docket (Docket #16-23) for public review:

Detailed emissions calculations.



**MARYLAND DEPARTMENT OF THE ENVIRONMENT**

**AIR AND RADIATION ADMINISTRATION  
APPLICATION FOR A PERMIT TO CONSTRUCT**

**SUPPLEMENT 2 TO  
DOCKET #16-23**

COMPANY: WR Grace & Company

LOCATION: 7500 Grace Drive, Columbia, MD 21044

APPLICATION: Installation of a new research-scale pilot plant including small, R&D-scale reactors, chillers, separators, feeders, and samplers with an exhaust gas stream, cleaned by an electric, flameless thermal oxidizer.

<u>ITEM</u>	<u>DESCRIPTION</u>
1	Notice of Tentative Determination, Public Hearing, and Opportunity to Submit Written Comments
2	Updated Fact Sheet and Tentative Determination

**MARYLAND DEPARTMENT OF THE ENVIRONMENT  
AIR AND RADIATION ADMINISTRATION**

**NOTICE OF TENTATIVE DETERMINATION, PUBLIC HEARING, AND  
OPPORTUNITY TO SUBMIT WRITTEN COMMENTS**

**FIRST NOTICE**

The Department of the Environment, Air and Radiation Administration (ARA) has completed its review of an application for a Permit to Construct submitted by W.R. Grace & Company on September 21, 2023 for one (1) pilot plant line. The proposed installation will be located at 7500 Grace Drive, Columbia, MD 21044.

The issuance of the Permit-to-Construct for this facility will be the subject of a Virtual Public Hearing to be held on April 29, 2024 at 6:00 p.m.

To attend the hearing, please register using the following link no later than April 26, 2024:

<https://forms.gle/rp2FbG77LWTBtz7F9>

Registered attendees will receive instructions on how to join the virtual hearing using a computer and internet connection or telephone on the day of the hearing.

Pursuant to Section 1-604, of the Environment Article, Annotated Code of Maryland, the Department has made a tentative determination that the Permit to Construct can be issued and is now ready to receive public comment on the application. Copies of the Department's tentative determination, the application, the draft permit to construct with conditions, and other supporting documents are available for public inspection on the Department's website. Look for Docket #16-23 at the following link:

<https://mde.maryland.gov/programs/Permits/AirManagementPermits/Pages/index.aspx>

In accordance with HB 1200/Ch. 588 of 2022, the applicant provided an environmental justice (EJ) Score for the census tract in which the project is located using the Maryland EJ Screening Tool. The EJ Score, expressed as a statewide percentile, was shown to be 29, which the Department has verified. This score considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities. Multiple environmental health indicators are used to identify overburdened communities. The Department's review of the environmental and socioeconomic indicators contributing to that EJ score is included in the tentative determination that is available for public inspection.

Persons who wish to make a statement concerning this application at the hearing are requested to provide the Department with a copy of their statement. A public request for a 60-day extension to the 30-day comment period has been granted. In lieu of oral statements at the hearing, written comments may be submitted at the time of the hearing or to the Department no later than 90 days from the date of this notice.

All written comments should be directed to the attention of Ms. Shannon Heafey by email to [shannon.heafey@maryland.gov](mailto:shannon.heafey@maryland.gov) or by mail to the Air Quality Permits Program, Air and Radiation Administration, 1800 Washington Boulevard, Baltimore, Maryland 21230.

The Department will provide an interpreter for deaf and hearing-impaired persons provided that a request is made for such service at least ten (10) days prior to the hearing. Further information may be obtained by calling Ms. Shannon Heafey at 410-537-4433.

Christopher R. Hoagland, Director  
Air and Radiation Administration

**MARYLAND DEPARTMENT OF ENVIRONMENT  
AIR AND RADIATION ADMINISTRATION**

**FACT SHEET AND TENTATIVE DETERMINATION  
W.R. GRACE & COMPANY**

**PROPOSED INSTALLATION OF ONE (1) NEW PILOT PLANT LINT**

**I. INTRODUCTION**

The Maryland Department of the Environment (the "Department") received an application from W. R. Grace & Company on September 21, 2023 for a Permit to Construct for the installation of one (1) new pilot plant line. The proposed installation will be located at 7500 Grace Drive, Columbia, MD 21044.

A notice was placed in the Howard County Times on December 2, 2023 and December 14, 2023 announcing an opportunity to request an informational meeting to discuss the application for a Permit to Construct. An informational meeting was not requested.

The Department has reviewed the application and has made a tentative determination that the proposed installation is expected to comply with all applicable air quality regulations. A notice will be published to provide the public with opportunities to request a public hearing and to comment on the application, the Department's tentative determination, the draft permit conditions, and other supporting documents. The Department will not schedule a public hearing unless a legitimate request is received.

The issuance of the Permit-to-Construct for this facility will be the subject of a Virtual Public Hearing to be held on April 29, 2024 at 6:00 p.m. to provide interested parties an opportunity to comment on the Department's tentative determination and draft permit conditions, and/or to present other pertinent concerns about the proposed facility. Notices concerning the date and time of the virtual public hearing will be published in the legal section of a newspaper with circulation in general area of the proposed facility. Interested parties may also submit written comments.

As required by law, all public notices were also provided to elected officials in all State, county, and municipality legislative districts located within a one-mile radius of the facility's property boundary.

If the Department does not receive any comments that are adverse to the tentative determination, the tentative determination will automatically become a final determination. If adverse comments are received, the Department will review the comments, and will then make a final determination with regard to issuance or denial of the permit. A notice of final determination will be published in a newspaper of general circulation in the affected area. The final determination may be subject to judicial review pursuant to Section 1-601 of the Environment Article, Annotated Code of Maryland.

## **II. CURRENT STATUS AND PROPOSED INSTALLATION**

### **A. Current Status**

W. R. Grace & Company. (Grace) operates a research and development facility in Columbia, Maryland. The facility includes boilers, spray dryers, and pilot scale research processes. The facility is a State Permit to Operate source per COMAR 26.11.02.13A(13). The current State Permit to Operate was issued on January 1, 2020 and will expire on December 31, 2024.

### **B. Proposed Installation**

Grace proposes to install one (1) new pilot plant line to process 1 kg per hour of commercially available plastic feedstock.

Plastic feedstock and catalyst will be fed to a Reaction System. The reactor will vent product vapor to a Product Recovery System, where condensable vapor will be removed and sent to storage as the liquid product. Liquid product will be stored temporarily in drum before sending to a 3rd party environmental facility for treatment. Non-condensable vapor from the product recovery system will go to an electric flameless thermal oxidizer. The thermal oxidizer has a stack that vents to the atmosphere.

Spent catalyst [catalyst with coke on it] will be transferred with catalyst circulation to the Regeneration System, where excess hot air [1350 degrees Fahrenheit] will completely oxidize the coke. Regenerated catalyst will be circulated back into the Reaction System. The Regeneration System has a stack that vents to atmosphere.

The Steam Generation System supplying steam to the Reaction System is powered by electricity.

## **III. APPLICABLE REGULATIONS**

The proposed installation is subject to all applicable Federal and State air quality control regulations, including, but not limited to the following:

- (a) COMAR 26.11.01.07C, which requires that the Permittee report to the Department occurrences of excess emissions.
- (b) COMAR 26.11.02.19C & D, which require that the Permittee submit to the Department annual certifications of emissions, and that the Permittee maintain sufficient records to support the emissions information presented in the submittals.
- (c) COMAR 26.11.06.02C(2), which prohibits visible emissions other than uncombined water.

- (d) COMAR 26.11.06.03B(2), which limits the concentration of particulate matter in any exhaust gases to not more than 0.03 grains per standard cubic foot of dry exhaust gas.
- (e) COMAR 26.11.06.08 and 26.11.06.09, which generally prohibit the discharge of emissions beyond the property line in such a manner that a nuisance or air pollution is created.
- (f) COMAR 26.11.15.05, which requires that the Permittee implement “Best Available Control Technology for Toxics” (T – BACT) to control emissions of toxic air pollutants.
- (g) COMAR 26.11.15.06, which prohibits the discharge of toxic air pollutants to the extent that such emissions will unreasonably endanger human health.
- (h) COMAR 26.11.19.02I, which requires that the Permittee establish in writing and implement facility-wide “good operating practices” designed to minimize emissions of VOC.
- (i) COMAR 26.11.19.16, which requires that the Permittee implement a VOC leak detection and repair program designed to minimize unintended emissions of VOC from process equipment and components, e.g., in-process vessels, storage tanks, pumps, compressors, valves, flanges and other pipeline fittings, pressure relief valves, process drains, and open-ended pipes.
- (j) COMAR 26.11.19.30, which establishes requirements for control of VOC emissions from chemical production installations at a premises that, on any day has actual uncontrolled emissions of 20 pounds or more per day.

#### **IV. GENERAL AIR QUALITY**

The U.S. Environmental Protection Agency (EPA) has established primary and secondary National Ambient Air Quality Standards (NAAQS) for six (6) criteria pollutants, i.e., sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, ozone, and lead. The primary standards were established to protect public health, and the secondary standards were developed to protect against non-health effects such as damage to property and vegetation.

The Department utilizes a statewide air monitoring network, operated in accordance with EPA guidelines, to measure the concentrations of criteria pollutants in Maryland’s ambient air. The measurements are used to project statewide ambient air quality, and currently indicate that Howard County complies with the NAAQS for sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide and lead.

Ground level ozone continues to present a problem for the entire Baltimore metropolitan area, which is classified as a non-attainment area for ozone. The primary contributors to the formation of ozone are emissions of oxides of nitrogen, primarily from combustion equipment, and emissions of Volatile Organic Compounds (VOC) such as paint solvents and gasoline vapors. Howard County is included in the non-attainment area for ozone.

With regard to toxic air pollutants (TAPs), screening levels (i.e., acceptable ambient concentrations for toxic air pollutants) are generally established at 1/100 of allowed worker exposure levels (TLVs)<sup>1</sup>. The Department has also developed additional screening levels for carcinogenic compounds. The additional screening levels are established such that continuous exposure to the subject TAP at the screening level for a period of 70 years is expected to cause an increase in lifetime cancer risk of no more than 1 in 100,000.

## **V. ENVIRONMENTAL JUSTICE ANALYSIS**

The concept behind the term environmental justice (EJ) is that regardless of race, color, national origin, or income, all Maryland residents and communities should have an equal opportunity to enjoy an enhanced quality of life. How to assess whether equal protection is being applied is the challenge.

Communities surrounded by a disproportionate number of polluting facilities puts residents at a higher risk for health problems from environmental exposures. It is important that residents who may be adversely affected by a proposed source be aware of the current environmental issues in their community in order to have meaningful involvement in the permitting process. Resources may be available from government and private entities to ensure that community health is not negatively impacted by a new source located in the community.

Extensive research has documented that health disparities exist between demographic groups in the United States, such as differences in mortality and morbidity associated with factors that include race/ethnicity, income, and educational attainment.

The Maryland General Assembly passed HB 1200, effective October 1, 2022, that adds to MDE's work incorporating diversity, equity and inclusion into our mission to help overburdened and underserved communities with environmental issues. In accordance with HB 1200/Ch, 588 of 2022, the applicant provided an environmental justice (EJ) Score for the census tract in which the proposed source is located using the Maryland EJ Screening Tool. The EJ Score, expressed as a statewide percentile, was shown to be 29, which the Department has verified. This score considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities. Multiple environmental health indicators are used to identify overburdened communities.

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<sup>1</sup> TLVs are threshold limit values (exposure limits) established for toxic materials by the American Conference of Governmental Industrial Hygienists (ACGIH). Some TLVs are established for short-term exposure (TLV – STEL), and some are established for longer-term exposure (TLV – TWA), where TWA is an acronym for time-weight average.

To account for other sources of pollution surrounding the proposed source, the Department conducted an additional EJ Score analysis to evaluate the impact of other sources located within 1 mile of the proposed source. The highest EJ Score in a census tract located within 1 mile of the proposed source, expressed as a statewide percentile, was shown to be 50.

An EJ Score of 50 indicates that the proposed installation is located in an area that is not disproportionately impacted by sources of pollution or at a higher risk of health problems from environmental exposures than other areas in Maryland. The Department has reviewed the air quality impacts from this proposed installation and has determined that the proposed installation will meet all applicable air quality standards.

## **VI. COMPLIANCE DEMONSTRATION AND ANALYSIS**

The proposed installation must comply with all State imposed emissions limitations and screening levels, as well as the NAAQS. The Department has conducted an engineering and air quality review of the application. The emissions were projected based on lab data, production data, technical papers, and engineering estimates. The conservative U.S. EPA's SCREEN3 model was used to project the maximum ground level concentrations from the proposed facility, which were then compared to the screening levels and the NAAQS.

- A. Estimated Emissions** - The maximum emissions of air pollutants of concern from the proposed installation are listed in Table I.
- B. Compliance with National Ambient Air Quality Standards** - The maximum ground level concentrations for nitrogen oxides and carbon monoxide based on the emissions from the proposed installation are listed in column 2 of Table II. The combined impact of the projected contribution from the proposed installation and the ambient background concentration for each pollutant shown in column 3 of Table II is less than the NAAQS for each pollutant shown in column 4.
- C. Compliance with Air Toxics Regulations** – The toxic air pollutant of concern that would be emitted from this installation is listed in column 1 of Table III. The predicted maximum off-site ambient concentrations of this toxic air pollutant is shown in column 4 of Table III, and the maximum concentration is less than the corresponding screening level for the toxic air pollutant shown in column 2.

## **VII. TENTATIVE DETERMINATION**

Based on the above information, the Department has concluded that the proposed installation will comply with all applicable Federal and State air quality control requirements. In accordance with the Administrative Procedure Act, the Department has made a tentative determination to issue the Permit to Construct.

Enclosed with the tentative determination is a copy of the draft Permit to Construct.

**TABLE I  
PROJECTED MAXIMUM EMISSIONS FROM THE PROPOSED INSTALLATION**

POLLUTANT	PROJECTED MAXIMUM EMISSIONS FROM PROPOSED INSTALLATION	
	(lbs/day)	(tons/year)
Nitrogen Dioxide (NO <sub>2</sub> )	0.011	0.001
Carbon Monoxide (CO)	0.002	0.0003
Volatile Organic Compounds (VOC)	0.218	0.027

**TABLE II  
PROJECTED IMPACT OF EMISSIONS OF CRITERIA POLLUTANTS FROM THE PROPOSED INSTALLATION ON AMBIENT AIR QUALITY**

POLLUTANTS	MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS CAUSED BY EMISSIONS FROM PROPOSED PROCESS (µg/m <sup>3</sup> )	BACKGROUND AMBIENT AIR CONCENTRATIONS (µg/m <sup>3</sup> )*	NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) (µg/m <sup>3</sup> )
Nitrogen Dioxide (NO <sub>2</sub> )	annual avg. → 0.003	annual avg. → 29	annual avg. → 100
Carbon Monoxide (CO)	8-hour max → 0.004 1-hour max → 0.006	8-hr max. → 1495 1-hr max. → 2185	8-hr max. → 10,000 1-hr max. → 40,000

\*Background concentrations were obtained from Maryland air monitoring stations as follows:

NO<sub>2</sub> → Interstate 95 South Welcome Center in Howard County  
CO → 600 Dorsey Ave in Essex [worst case]



**TABLE III  
 PREDICTED MAXIMUM OFF-SITE AMBIENT CONCENTRATIONS FOR  
 TOXIC AIR POLLUTANTS EMITTED FROM THE PROPOSED INSTALLATION**

<b>TOXIC AIR POLLUTANTS</b>	<b>SCREENING LEVELS (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>PROJECTED WORST-CASE FACILITY-WIDE EMISSIONS (lbs/hr)</b>	<b>PREDICTED MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS (<math>\mu\text{g}/\text{m}^3</math>)</b>
1,3 - Butadiene	1-hour→ None 8-hour→ 44.25 Annual→ 0.03	0.000037	1-hour→ N/A 8-hour→ 0.0009 Annual→ 0.0001

The values represent maximum facility-wide emissions of toxic air pollutants during any 1-hour period of facility operation.

The values are based on worst-case emissions from the proposed facility and were predicted by EPA's SCREEN3 model, which provides conservative estimations concerning the impact of pollutants on ambient air quality.