pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MEMO

FROM	William Weaver WRW 11/6/23 Air Quality Program Manager	and	Thomas J. Hanlon *TJH 11/1/23* East Permit Section Chief

DATE June 7, 2023

RE: Dart Container Corporation of PA
Title V Significant Modification– RACT2 (36-05117)
Pitney Road Site
East Lampeter Township, Lancaster County

Procedural History

As part of the Reasonably Available Control Technology (RACT) regulations codified at 25 Pa. Code §§ 129.111—129.115 (relating to additional RACT requirements for major sources of NO_x and VOCs for the 2015 ozone NAAQS) (RACT III), the Pennsylvania Department of Environmental Protection (Department) has established a method under § 129.114(i) (relating to alternative RACT proposal and petition for alternative compliance schedule) for an applicant to demonstrate that the alternative RACT compliance requirements incorporated under § 129.99 (relating to alternative RACT proposal and petition for alternative compliance schedule) (RACT II) for a source that commenced operation on or before October 24, 2016, and which remain in force in the applicable operating permit continue to be RACT under RACT III as long as no modifications or changes were made to the source after October 24, 2016. The date of October 24, 2016, is the date specified in § 129.99(i)(1) by which written RACT proposals to address the 1997 and 2008 8-hour ozone National Ambient Air Quality Standards (NAAQS) were due to the Department or the appropriate approved local air pollution control agency from the owner or operator of an air contamination source located at a major NO_x emitting facility or a major VOC emitting facility subject to § 129.96(a) or (b) (relating to applicability).

The procedures to demonstrate that RACT II is RACT III are specified in § 129.114(i)(1)(i), 129.114(i)(1)(ii) and 129.114(i)(2), that is, subsection (i), paragraphs (1) and (2). An applicant may submit an analysis, certified by the responsible official, that the RACT II permit requirements remain RACT for RACT III by following the procedures established under subsection (i), paragraphs (1) and (2).

Paragraph (1) establishes cost effectiveness thresholds of $7,500 per ton of NO_x emissions reduced and $12,000 per ton of VOC emissions reduced as ‘‘screening level values’’ to determine the amount of analysis and due diligence that the applicant shall perform if there is no new pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis. Paragraph (1) has two subparagraphs.

Subparagraph (i) under paragraph (1) specifies that the applicant that evaluates and determines that there is no new pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis and that each technically feasible air cleaning device, air pollution control technology or technique evaluated for the alternative RACT requirement or RACT emission limitation approved by the Department (or appropriate approved local air pollution control agency) under § 129.99(e) had a cost effectiveness equal to or greater than $7,500 per ton of NO_x emissions reduced or $12,000 per ton of VOC emissions reduced shall include the following information in the analysis:

- A statement that explains how the owner or operator determined that there is no new pollutant specific air cleaning device, air pollution control technology or technique available.

- A list of the technically feasible air cleaning devices, air pollution control technologies or techniques previously evaluated under RACT II.
- A summary of the economic feasibility analysis performed for each technically feasible air cleaning device, air pollution control technology or technique in the previous bullet and the cost effectiveness of each technically feasible air cleaning device, air pollution control technology or technique as submitted previously under RACT II.
- A statement that an evaluation of each economic feasibility analysis summarized in the previous bullet demonstrates that the cost effectiveness remains equal to or greater than $7,500 per ton of NO_x emissions reduced or $12,000 per ton of VOC emissions reduced.

Subparagraph (ii) under paragraph (1) specifies that the applicant that evaluates and determines that there is no new pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis and that each technically feasible air cleaning device, air pollution control technology or technique evaluated for the alternative RACT requirement or RACT emission limitation approved by the Department (or appropriate approved local air pollution control agency) under § 129.99(e) had a cost effectiveness less than $7,500 per ton of NO_x emissions reduced or $12,000 per ton of VOC emissions reduced shall include the following information in the analysis:

- A statement that explains how the owner or operator determined that there is no new pollutant specific air cleaning device, air pollution control technology or technique available.
- A list of the technically feasible air cleaning devices, air pollution control technologies or techniques previously evaluated under RACT II.
- A summary of the economic feasibility analysis performed for each technically feasible air cleaning device, air pollution control technology or technique in the previous bullet and the cost effectiveness of each technically feasible air cleaning device, air pollution control technology or technique as submitted previously under RACT II.
- A statement that an evaluation of each economic feasibility analysis summarized in the previous bullet demonstrates that the cost effectiveness remains less than $7,500 per ton of NO_x emissions reduced or $12,000 per ton of VOC emissions reduced.
- A new economic feasibility analysis for each technically feasible air cleaning device, air pollution control technology or technique.

Paragraph (2) establishes the procedures that the applicant that evaluates and determines that there is a new or upgraded pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis shall follow.

- Perform a technical feasibility analysis and an economic feasibility analysis in accordance with § 129.92(b) (relating to RACT proposal requirements).
- Submit that analysis to the Department (or appropriate approved local air pollution control agency) for review and approval.

The applicant shall also provide additional information requested by the Department (or appropriate approved local air pollution control agency) that may be necessary for the evaluation of the analysis submitted under § 129.114(i).

<u>Introduction/Facility Description</u>

On December 30, 2022, Dart submitted a RACT 3 proposal regarding sources at their Pitney Road facility. The facility is a major source for VOC that has been in operation prior to August 3, 2018, and therefore, in accordance with 25 Pa. Code Section 129.111, the facility is subject to the Department's RACT 3 requirements cited in 25 Pa. Code Sections 129.111 thru 129.115.

The Title V permit sources at the facility include the following:

ID	Name
031	BOILER 1
032	BOILER 2
033	BOILER 3
100	EPS CONTAINER MANUFACTURING
101	CLEANUP OPERATIONS
102	UV LETTERPRESS CUP PRINTING
103	(7) PARTS WASHERS
104	BOILER ROOM GENERATOR
105	WAREHOUSE GENERATOR

The Source 100 EPS Container Manufacturing emits VOCs as pentane. These emissions are partially controlled by combustion in the boilers.

All of the sources at the facility were in operation were in operation prior to 8/3/18, and therefore are affected by the RACT 3 regulation.

<u>Emissions:</u>

Per the RACT 3 submission, the potential VOC emissions from the various source are reported by the facility as follows:

Name	Source ID	VOC PTE (TPY)	PTE basis
BOILER 1	031	0.81	AP-42; 33.5 MMBtu NG/#2 oil/#6 oil; NG factor is highest
BOILER 2	032	0.81	AP-42; 33.5 MMBtu NG/#2 oil/#6 oil; NG factor is highest
BOILER 3	033	0.81	AP-42; 33.5 MMBtu NG
EPS CONTAINER MANUFACTURING	100 (Process)	274.9	see discussion below
EPS CONTAINER MANUFACTURING	100 (Warehouse)	127.7	see discussion below
CLEANUP OPERATIONS	101	<2.7	permit limit: D 101 001
UV LETTERPRESS CUP PRINTING	102	<2.7	per E G001 004
(7) PARTS WASHERS	103	<1 TPY	7 units; minor source type
BOILER ROOM GENERATOR	104	< 1 TPY	15.4 gal/hr propane; 500 hr/yr; emergency use
WAREHOUSE GENERATOR	105	< 1 TPY	2.8 MCF/hr NG; 500 hr/yr; emergency use

The VOC PTE from the EPA container manufacturing process is corrected by DEP from the above table to 179.3 tpy, as described below:

- Per D 100 001 of the facility's Title V permit, the facility is limited to a throughput limitation of 11,500 tons of expandable polystyrene during any consecutive 12-month rolling period.
- Based on testing at another similar Dart facility, the polystyrene beads start with a pentane content of 5.5% by weight, which is gradually reduced through various processing steps and product warehousing, until the final product being shipped offsite contains approximately 1.89% pentane by weight, for a difference of 3.61% VOC lost to atmosphere at various points in the Dart East Lampeter facility. This would indicate a VOC PTE for the facility, prior to consideration of current controls, of 415.2 tpy.
- Dart's RACT 3 emission calculations, which are identical to their RACT 2 calculations, contain a calculation error, which causes their calculated facility PTE, prior to consideration of current controls, to be 402.5 tpy. This error affects certain other detail calculations as well. The error is to assign a 1% loss to the Molding area, when the actual subtraction of listed figures results in a loss of 1.11% at the Molding step.
- Per the above correction, DEP has recalculated the Source 100 process VOC PTE, prior to any control, as 287.5 tpy. The Source 100 warehousing VOC PTE is unchanged from Dart's original estimate at 127.7 tpy.
- Per the facility's RACT 2 determination, at T5 E G005 001, "*All captured VOC emissions from the blenders, holding tanks, and pre-expanders shall be vented to at least one of the boilers and reduced at a minimum destruction efficiency of 95%, as pentane, at the outlet. The capture efficiency of the control system shall be equal to or greater than 90 percent*." The pre-controlled PTE subject to this requirement is 126.5 tons. 90% captured of this is 113.85 tons, of which 95% is required to be destroyed, which leaves a final controlled VOC PTE of 5.69 tpy + uncaptured VOC PTE of 12.65 tpy, for a total VOC PTE for the controlled portions of Source 100, of 18.34 tpy. These figures are as originally calculated by Dart. This reduces the facility VOC PTE, after current controls, to 306.99 tpy. Subtracting the Warehousing PTE from this gives the PTE of the remainder of the process (both controlled and uncontrolled portions) of 179.3, of which 161 tpy VOC is from the uncontrolled portion of the process.
- Note: Per Dart's RACT 3 submission, footnote on page 1, the calculation "*Assumes existing PE control is utilized since existing Title V permit requires this level of control and increase EPS throughput of 11,500 TPY and EFs of 2.9 % and 1.9 % respectively*". This statement is an incorrect artifact from an earlier RACT 2 submission. The correct percentages are as listed above.

The facility is not a major source of NOx because the only NOx sources are two NG/oil boilers, and one natural gas-only boiler (33.5 MMBtu each) and two backup generators.

<u>RACT 3 Evaluation</u>

Exempt RACT 3 VOC Sources

The facility's three combustion boilers between 20.0 and 50.0 mmbtu/hr are exempt from the VOC RACT 3 requirements for their fuel combustion emissions, in accordance with 25 Code Section 129.111(c) – VOC sources with a PTE of less than 1.0 tpy. However, in addition to providing building heat and process steam for the cup molding operations, the facility's boilers are used to reduce the emissions of pentane from the pre-expansion of the EPS beads and the cup molding operations associated with the EPS Container Manufacturing Processes identified as Source ID #100.

The facility operates UV letterpress cup printing machines (Source ID #102) that are subject to Section 129.67b requirements, and therefore, in accordance with 25 Pa. Code Section 129.111(a) they are exempt from the VOC RACT 3 requirements. The facility also operates seven (7) parts washers that are subject to Section 129.63 requirements, and likewise, in accordance with 25 Pa. Code Section 129.111(a) are exempt from the VOC RACT 3 requirements. Dart's clean-up operations (Source ID #101) that are in support of the letterpress printing operations are subject to the Section 129.67b requirements and are exempt from the VOC RACT 3 requirements in accordance with Section 129.111(a). The Boiler Room and Warehouse Generators are exempt from the RACT2 requirements in accordance with 25 Code Section 129.111(c), because they are VOC sources with a PTE of less than 1.0 tpy.

Case-by-Case RACT 3 Evaluation

The only source at this facility that is required to be analyzed on a case-by-case basis for VOC RACT 3 is Source 100, EPS Container Manufacturing.

Dart's RACT 3 proposal describes the Source 100 manufacturing process as follows: "*The foam containers produced by Dart are made from EPS beads. EPS beads consist of high molecular weight, crystal grade polystyrene impregnated with n-pentane as a blowing agent. The EPS beads are received in 2,200-pound bulk bags. Each bag has a specially designed liner to prevent pentane from escaping during transport and storage. The gaylords or bulk bags are stored in the warehouse until needed for production.*

EPS bead bags are transferred from the warehouse to the production area where they are dumped. The liner bag is opened, and the beads are emptied into a receiver from which they are conveyed via a closed system to a blender or directly to a holding tank.

Beads from the holding tank are augured into the bottom of the pre-expander where steam is injected to control expansion. Beads exiting the pre-expander are labeled "pre-puff". The pre-puff exits the expander and falls into a hopper from which it is transferred to the screeners. At the screeners, oversized and undersized pre-puff is removed from the process. After screening, the pre-puff is placed in holding bags until needed.

The cup molding machine pulls the beads needed for each cycle from the holding bags. The beads are fed into molds which are then heated, causing the beads to expand again. Since the beads are in an enclosed space, they fuse together as they expand taking on the shape of the mold. The mold is then cooled to set the EPS in a permanent shape. The container or cup is removed from the mold for inspection then transferred, with acceptable cups going to either the packaging or printing departments. Dart uses inks that are UV-based and have insignificant emissions. This cycle is repeated continuously. After packaging, the cartons of containers or cups are sent to one of the warehouse areas for shipment to customers."

Per 25 Pa. Code Section 129.114, Alternative RACT proposal and petition for alternative compliance schedule, in Section (i), "*An owner or operator subject to subsection (a), (b) or (c) and § 129.99 that has not modified or changed a source that commenced operation on or before October 24, 2016, and has not installed and commenced operation of a new source after October 24, 2016, may, in place of the alternative RACT requirement or RACT emission limitation required under subsection (d), submit an analysis, certified by the responsible official, in writing or electronically to the Department or appropriate approved local air pollution control agency on or before December 31, 2022, that demonstrates that compliance with the alternative RACT requirement or RACT emission limitation approved by the Department or appropriate approved local air pollution Control agency under § 129.99(e) (relating to alternative RACT proposal and petition for alternative compliance schedule) assures compliance with the provisions in subsections (a)—(c) and (e)—(h), except for sources subject to § 129.112(c)(11) or (i)—(k)*."

Per the facility's RACT 3 submission, "*... since there have been no changes in our production process or raw material, we intend to show that by continuing to meet the requirements of RACT2 that we are meeting the requirements of RACT3 since the cost of control is so large and not new technologies or emission reduction options have been developed since our RACT2 analysis was completed*." This is relevant to 25 Pa. Code Section 129.114(i)(1)(i), which provides that "*The owner or operator of a subject source or facility that evaluates and determines that there is no new pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis and that each technically feasible air cleaning device, air pollution control technology or technique evaluated for the alternative RACT* *requirement or RACT emission limitation approved by the Department or appropriate approved local air pollution control agency under § 129.99(e) had a cost effectiveness: (i) equal to or greater than $7,500 per ton of NOx emissions reduced or $12,000 per ton of VOC emissions reduced shall include the following information in the analysis:"* [required information is listed as (A)-(E)]

DEP concurs that this option applies, per the following table snipped from DEP's 3/3/20 RACT 2 addendum 2 memo for the facility, which shows that add-on control cost effectiveness #s for Source 100 were all >$7,500 per ton of VOC.

Source ID	Operation	Control Option	ACA annualized cost $	$/ton VOC removed
100	Bead Area Enclosure	Regenerative Thermal Oxidizer	$977,898	$29,796
		Fixed Bed Catalytic Incinerator	$2,743,345	$83,588
		Fluidized Bed Catalytic Incinerator	$2,971,444	$90,538
		Recuperative Thermal Oxidizer	$4,201,561	$128,018
		Flare	$148,369,952	$4,520,718
100	Enclosed Cup Molding Room	Regenerative Thermal Oxidizer	$3,348,904	$27,867
		Fixed Bed Catalytic Incinerator	$8,927,343	$74,286
		Fluidized Bed Catalytic Incinerator	$9,786,748	$81,437
		Recuperative Thermal Oxidizer	$13,785,978	$114,716
		Flare	$492,584,576	$4,098,894
100	Warehouse Storage	Regenerative Thermal Oxidizer	$2,774,323	$22,869
		Fixed Bed Catalytic Incinerator	$5,082,603	$41,896
		Fluidized Bed Catalytic Incinerator	$6,166,364	$50,829
		Recuperative Thermal Oxidizer	$6,508,815	$53,652
		Flare	$209,977,120	$1,730,842

DEP's 12/19/19 RACT 2 initial review memo assessed the technical feasibility of the available control options for Source 100 as follows:

[begin quote from RACT 2 memo]

Dart evaluated control options based current practices of other EPS Manufacturers and based on the EPA RACT/BACT/LAER Clearinghouse (RBLC) database. Control options were further evaluated through EPA's report entitled "Control of VOC Emissions from PS Foam Manufacturing" from 1990 and various EPA data sheets defining optimal temperatures, air flows, and concentration levels best suited for each type of VOC control. Based on these reviews Dart determined that most of the available control technologies are not suited for control of pentane emissions for their specific operations and that the only technologies that have a proven success in pentane capture and removal are incineration and oxidation through use of combustion boilers. The control options were evaluated as follows:

Control Technology	Dart's Evaluation of Technical Feasibility	Technically Feasible?	DEP concurs?
Flare	A flare is uneconomical unless a cheap fuel source is available. It is used mainly in processes that have short-duration VOC emissions that need to be controlled and do not merit the capital expense of the other types of incineration systems.	No	Yes
Catalytic Incinerator	The RACT proposal states that, "*EPA recognizes that catalytic incinerators are not cost effective if the concentration is below 100 ppm*." It further notes that exhaust collected from warehouse or production areas at the site is expected to have less than 50 ppm VOC.	No	Yes
Recuperative Thermal Oxidizer	Possibly yes, but RTO is better option	Yes	Yes
Regenerative Thermal Oxidizer	This option is technically feasible.	Yes	Yes
Carbon Adsorption	Based on anticipated solvent loadings, Dart asserts that carbon adsorption would be technically infeasible for this application. The RACT proposal states that "*Dart does not consider Carbon Adsorption systems as a standalone control device for dilute streams such as those from the warehouse or production areas where the input concentration is already below 50 ppm*."	No	Yes
Condensation	The RACT proposal states, "*To reduce the temperature of the air stream enough to condense pentane at the low concentrations present, liquid nitrogen would be required. The amount of liquid nitrogen required to carry out this process makes this economically impractical. The concentration in the air streams that must be treated from the Dart cup manufacturing process are much lower than the 5,000 ppm minimum required for this technology, so it was not included in the economic analysis that follows. These types of systems are not commercially used as control devices in non-toxic streams*."	No	Yes
Oxidation in Boilers	The RACT proposal states, "*Dart has used this principle at several plants, including this Lancaster facility, to reduce pentane emissions from the pre-expanders, hoppers and blenders and believes that these systems meet RACT requirements."*	Yes	Yes
Gas Absorbers/Wet Scrubbers	The RACT proposal states, "*Since no compatible liquid has been found for use with pentane, this process cannot be used to capture pentane from the air stream. Therefore, this process is technically unfeasible*."	No	Yes
Biofiltration	The RACT proposal states, "*At this point biofiltration technology is unfeasible as it has not been proven and is not offered by control technology suppliers in the United States. Dart is concerned that this technology, although theoretically possible, won't be as effective with pentane due to pentane's low solubility in water. The EPA, in "Using Bioreactors to Control Air Pollution" (EPA-456/R-03-003 Sept 2003), indicated that bioreactors are not applicable for streams with temperatures above 105 °F and that this technology does not lend itself well to compliance testing. Therefore, based upon EPA's position*	No	Yes

Control Technology	Dart's Evaluation of Technical Feasibility	Technically Feasible?	DEP concurs?
	and the land usage issues associated with biofilters, Dart has determined that this technology is not suited for our application."		
Membranes	The RACT proposal states, "*Per Linde and Air Products, gas suppliers and equipment manufacturers, to date no membrane material has been developed that will allow the separation of pentane from air*."	No	Yes
Molecular Sieve	Per page 27 of Dart's RACT proposal, there are no molecular sieves "*commercially available with guarantees of 95 % reduction.*"	N/A–RTO has better efficiency	Yes
Concentration Technology	The RACT proposal states, "*Since carbon adsorption cannot meet the high reduction efficiencies desired, it is not a viable technology for high flow, dilute streams that a concentrator uses for its first step in the process. If a concentrator were to be selected for warehouse streams that have concentrations ranging from 2 – 50 ppm of pentane, removal efficiency greater than 50% could not be guaranteed. Concentrators are not viable from either a cost or a technology perspective when 90% or greater removal/destruction requirements are needed*."	No	Yes

In the review of RACT2, Dart looked at the possibility of collecting additional VOC emissions escaping from the cup making processes that are not currently being captured by the pre-expander collection system. Individual source area enclosures were determined to be either technically infeasible due to the limited space between production equipment and/or that the enclosures present health, safety, or fire hazard issues for their workers. The only viable option Dart determined to be available to them would be to use permanent total room enclosures for the bead room, the molding area, and the warehouse area. Dart calculated that they could effectively capture and control an additional 32.8 tons of VOCs from the bead room, 120.2 tons of VOCs from the molding area, and 121.3 tons of VOCs from the warehouse. The facility calculated costs in accordance with EPA's Air Compliance Advisor (ACA) and then adjusted the costs from 2003 to 2015 dollars. Using an RTO as the most cost-effective control option for the bead room and molding area, the cost evaluation came to approximately $39,327 per ton of VOCs removed for the bead room, and $36,379 per ton of VOCs removed for the molding area. Using a concentrator as the most cost-effective control option for reducing VOC emission from the warehouse area, the cost evaluation came to approximately $32,995 per ton of VOCs removed. The use of permanent total enclosures for each of these specific areas is not cost effective under the RACT2 requirements. It should be noted that the product off gassing emissions from the warehouse area are not presently addressed as a source in the Title V permit, although those emissions were addressed in DEP's BAT/LAER/ERC memo dated 12/13/10 regarding the approval of Plan Approval No. 36-05117. As part of DEP's action on the facility's RACT 2 proposal, the container manufacturing warehouse emissions will be explicitly included in the Title V permit as part of Source 100.

[end quote from RACT 2 memo]

With regard to the control options above, it should be noted that the bead room enclosure emissions figure is based on controlling the remaining 10% of emission not already routed to the boilers from the blending/holding and pre-expansion areas, while adding the currently uncontrolled areas of dumping and screening/storage (12.65 tpy + 10.4 tpy + 11.5 tpy = 34.5 tpy; 95% of that is 32.8 tpy controlled). After the molding area emission correction (noted on Page 4 of this memo), the molding area VOC PTE comes to

127.7 tpy. This is added to the “2nd bead storage” VOC PTE of 11.5 tpy to give a total PTE for the Enclosed Cup Molding Room Scenario of 139.2 tpy. 95% of that is 132.2 tpy VOC controlled.

RACT 3 129.114(i)(1)(i) ANALYSIS:

With the preceding RACT 2 case-by-case analyses as background, we now turn to the re-evaluation required under 129.114(i)(1)(i)(A)-(E). This requires the applicant to include the following information in the abbreviated RACT 3 case-by-case analysis: [requirements in **bold**; discussion following each requirement in non-bold font]

(A) a statement that explains how the owner or operator determined that there is no new pollutant specific air cleaning device, air pollution control technology or technique available.

Dart provided the following statement with their RACT 3 submittal: “*From investigation done by Dart as part of this RACT3 analysis there has been no new technologies to more cost effectively reduce emissions from the EPS steam chest molding process or more economically capture and destroy additional VOC or pentane emissions that are released since the 2016 RACT2 determination was made by PA DEP for Dart’s EPA Molding operation…*

We performed a web search of existing known control technology manufacturers to see if they were offering any new technology or advertised reduced operating cost. We could find no control device manufactures that have made improvements that significantly reduce operating cost and based on budget and public cost information it appears that the capital cost of these equipment, if you can get it in a timely manner, has significantly increased.

We also looked to determine if any emerging VOC control technologies , such as soil destruction, which had gone commercial. We were unable to find any new technologies that were proven in industry or commercial settings. For the concentrations that the capture air streams would be at it looks like thermal oxidizers continues to be the recommended control device…

A check of available literature and guidelines from the EPA showed no additional emissions or control information since the publishing of the CTG entitled "Control of VOC Emissions from Polystyrene Foam Manufacturing" in 1990 is available. Not only does this report give very little detailed information on control techniques it is also generic and outdated.

We also rereviewed EPS process regulations to see if any more strict or restrictive rules had been put in place as that would be an indication of the possibility of more effective controls. We found no new rules or regulations that had stricter emission limits or more stringent control requirements than those that were in place in 2016.

Based on our participation in industry groups we are unaware of any of our EPS foam cup competitors controlling emissions in a manner that produces less emission per ton of bead processed than we currently implement in RACT2…

Another option to obtain the same net environmental effect as an alternative to the capture and destruction or recovery method of reducing pentane emissions is to modify the process such that it emits less pentane or makes capture of the pentane emissions easier.

Dart’s Engineering Department has not come up with any new options since the RACT2 analysis that reduce emissions during the production process or that make capture of emissions easier.

Discussions with EPS bead manufacturers related to cup bead indicate that there have been no changes in specifications which leads us to believe that no other EPS container manufactures have developed ways to use this bead to make cups."

(B) a list of the technically feasible air cleaning devices, air pollution control technologies or techniques previously identified and evaluated under § 129.92(b)(1)—(3) included in the written RACT proposal submitted under § 129.99(d) and approved by the Department or appropriate approved local air pollution control agency under § 129.99(e).

Dart's RACT 3 submittal addressed the air cleaning devices, air pollution control technologies or techniques previously identified and evaluated under RACT 2.

(C) a summary of the economic feasibility analysis performed for each technically feasible air cleaning device, air pollution control technology or technique listed in clause (b) and the cost effectiveness of each technically feasible air cleaning device, air pollution control technology or technique as submitted previously under § 129.99(d) or as calculated consistent with the "EPA Air Pollution Control Cost Manual" (sixth edition), EPA/452/b-02-001, January 2002, as amended.

Dart's RACT 3 submittal included the statement that "*Dart used the method in EPA's Air Pollution Control Cost Manual to determine reduction cost but based those values using EPA's ACA cost estimate software. PA DEP determined that the software had be replaced by spreadsheets based on the Cost Control Manuals Chapters so verified our cost using those to make sure the RACT2 cost were complaint with the RACT2 requirements to meet EPA's Air Pollution Control Cost Manual*"

(D) a statement that an evaluation of each economic feasibility analysis summarized in clause (c) demonstrates that the cost effectiveness remains equal to or greater than \$7,500 per ton of NOx emissions reduced or \$12,000 per ton of VOC emissions reduced.

Dart's RACT 3 submittal included the statement that "*Dart reviewed the current RACT3 proposal as well as the technologies reviewed to determine technological and economic feasibility as part of RACT and as listed above in the list developed to meet the requirements of 129.114(i)(C) and was unable to find any indication of reduced cost of either the capital equipment, the labor, or the utilities and replacement components needed to operate and maintain it.*

The next step was to determine what today's cost would be and to do that we used the Chemical Engineering Plant Cost Index (CEPCI) since it represents the cost of equipment. In 2016 the CEPCI was 541.7 and in September 2022 it was 821.1 which indicates the capital cost would be around 50 % higher today than in 2016. Utility cost increases have seen a similar increase over the past 6 years, so we applies the CEPCI increase to the annualize cost per ton of reduction to estimate the 2022 annualized cost per ton as shown on the table below."

Source ID	Operation	Capture Air Needed (cfm)	Concentration in Capture Air (ppm)	Most Cost-Effective Control Option	129.99 (e) RACT2 Cost ($/ton)	Updated RACT2 Cost in 2022 $[1] ($/ton)
100	Bead Area Enclosure	66,300	106	RTO	29,790	45,155
100	EPS Molding Room PTE	221,000	27	RTO	27,867	42,246
100	Warehouse Storage PTE	72,000	22	RTO	22,896	32,756

(E) additional information requested by the Department or appropriate approved local air pollution control agency that may be necessary for the evaluation of the analysis.

DEP did not require any additional information regarding the case-by-case aspect of the Dart's RACT 3 analysis.

DEP ASSESSMENT:

DEP concurs that the technically feasible add-on-controls for Source 100 remain cost-ineffective for RACT 3. It should be noted that the RACT 2 cost figures for these sources were made in 2016. The Chemical Engineering Plant Cost Index (CEPCI) from 2016 – 2021 (most current year available) is 1.3199. Applying this factor to these figures to convert them to current dollars would only increase the cost-ineffectiveness of the controls. It should be noted that Dart's original EPA Air Compliance Advisor calculations showed that for all scenarios, the RTO control option was the most inexpensive. DEP believes that it is reasonable to accept that this is still true. DEP has re-calculated the RTO control option for all scenarios using the 2022 corrections to the EPA RTO cost spreadsheet. This also includes a correction of the Enclosed Cup Molding Room tons controlled to 132.19 tons (up from 120.175 tons originally) based on the change noted earlier in this memo regarding the %VOC loss at that process step being 1.11% instead of 1%. The revised cost #s are listed in the table below. Attached to this memo are the EPA oxidizer cost sheet printouts for these numbers. Items in red in the spreadsheets are customizations specific to this facility. Items in purple are generic customizations to update the calculations to the 2022 version of the spreadsheet.

Source ID	Operation	Control Option	$/ton VOC removed ACA	Tons controlled RACT 2	DEP re-run EPA SS RACT 2	Corrected Tons controlled RACT 3	$/ton VOC removed ACA (2021 $$)	DEP re-run EPA 2022 SS (2021 $$)
101	Bead Area Enclosure	Regenerative Thermal Oxidizer	$ 29,795.80	32.82	$24,101	32.82	$ 39,327.47	$ 25,400.88
		Fixed Bed Catalytic Incinerator	$ 83,587.60	32.82		32.82	$ 110,327.27	
		Fluidized Bed Catalytic Incinerator	$ 90,537.60	32.82		32.82	$ 119,500.58	
		Recuperative Thermal Oxidizer	$ 128,018.31	32.82		32.82	$ 168,971.37	
		Flare	$4,520,717.61	32.82		32.82	$5,966,895.18	
101	Enclosed Cup Molding Room	Regenerative Thermal Oxidizer	$ 27,866.89	120.175	$19,060	132.19	$ 33,438.37	$ 17,965.29
		Fixed Bed Catalytic Incinerator	$ 74,286.19	120.175		132.19	$ 89,138.36	
		Fluidized Bed Catalytic Incinerator	$ 81,437.47	120.175		132.19	$ 97,719.41	
		Recuperative Thermal Oxidizer	$ 114,715.86	120.175		132.19	$ 137,651.20	
		Flare	$4,098,893.91	120.175		132.19	$4,918,393.08	
101	Warehouse Storage	Regenerative Thermal Oxidizer	$ 22,868.75	121.315	$22,832	121.315	$ 30,184.47	$ 24,651.87
		Fixed Bed Catalytic Incinerator	$ 41,895.92	121.315		121.315	$ 55,298.42	
		Fluidized Bed Catalytic Incinerator	$ 50,829.36	121.315		121.315	$ 67,089.67	
		Recuperative Thermal Oxidizer	$ 53,652.19	121.315		121.315	$ 70,815.52	
		Flare	$1,730,842.19	121.315		121.315	$2,284,538.60	

Although none of the add-on control options listed above are cost effective for RACT 3, there remain certain process/material strategies which are potentially application to this sort of facility. Per DEP's RACT 2 11/7/17 RACT 2 review memo:

[begin quote from RACT 2 memo]:

Per Dart's 11/26/19 TD response, they have, in addition to add-on controls, evaluated a reduction in the pentane content of the beads, as well as "forced aging" in order to capture and control more of the emissions passively emitted during product warehousing. With regard to pentane content, Dart's proposal notes that, "*Dart has not been able to successfully and consistently produce premium products using EPS bead with concentrations below 5.0-5.4%.*" Also, Dart's testing with regard to the California market "*has shown that the correlation between beginning charge rate and emissions is minimal and can vary from 0-15% depending on the raw material manufacturer production technique, the amount of charge reduction, and the way each EPS molder expands and processes its bead and pre-puff.*" Furthermore, "… *a cup sized bead is not commercially available at this time with an average pentane concentration below 5.75%. Although Dart has 2 EPS bead manufacturing facilities, our cup plant EPS requirement are exceeding their production capacities so with the past year we have started to work with outside EPS raw material suppliers and have been surprised to find that their commercially available shape molding bead still has an average VOC content that is so high as Dart had reduced its charge rates from those 5.75 -5.9% VOC concentrations that were common in the 1990's to around 5.4% currently. This lack of commercially available low VOC EPS bead for shape and cup molding further supports Dart's findings that low EPS charge rate bead is not technically feasible for shape and cup molding where cell and bead size and density is critical for the application due to function and appearance.*" DEP concurs with this conclusion

With regard to forced aging, Dart notes that this method "*causes production inefficiency as well as increases fuel usage and handling labor. The main concern is that force aging increases the risk of a fire since the pentane emissions must be concentrated to capture and control them. Dart has had two significant fires at its California plant that is forced to utilize this technique*." Furthermore, this method "*only reduce[s] on-site emissions by less than 10% and much of that reduction in emissions would be realized without the extra batch processing/forced aging steps through application of… stand-alone capture systems ... If batch expansion or forced aging process was used as a stand-alone system, emissions would actually increase due to the undestructed captured emissions. Therefore, Dart believes these batch processes that force emissions out to meet product limitations are not technologically feasible if we want to continue to produce our entire product line in our Pennsylvania facilities*." DEP concurs with this assessment.

Dart ultimately concludes that the East Lampeter Township facility's current practice of capturing emissions from the blenders, holding tanks and pre-expanders, and controlling the emissions on the on-site boilers meets RACT 2. DEP concurs with this, with the added conclusion that, since a cup-sized bead is not commercially available at this time with an average pentane concentration below 5.75%, that therefore a provision should be added to the RACT 2 approval requiring that the beads used in Sources 102 and 102A have a pentane concentration not exceeding 5.75%.

In view of the RACT2 analysis conducted, and the facility's existing controls and permit conditions, the DEP has determined RACT2 to be as follows:

I. EPS Container Manufacturing (100)

(a) All captured VOC emissions from the blenders, holding tanks, and pre-expanders shall be vented to at least one of the boilers and reduced at a minimum destruction efficiency of 95%, as pentane, at the outlet. The capture efficiency of the control system shall be equal to or greater than 90 percent.

(b) The capture system shall be operational during start-up, shutdown, and normal operation of the pre-expanders, with the exception of up to three (3) hours per month for routine maintenance, which includes weekly filter and flame arrestor cleanouts/changes, weekly boiler safety testing, and monthly calibration checks, as well as, three (3) hours twice a year for fire system safety testing.

(c) The pentane concentration in the beads used in Source 100 shall not exceed 5.75% on a monthly basis.

(d) The permittee shall operate and maintain a recording device to continuously monitor and record the flow rate of the emission capture system, the pentane concentration in the air stream, and the pentane flow rate except during monthly calibration checks.

(e) The permittee shall maintain monthly records of the date, time, and duration of the time required for the weekly filter and flame arrestor cleanouts/changes, weekly boiler safety testing, monthly calibration checks, and biannual fire system safety testing.

(f) The permittee shall repeat capture efficiency testing on one of the pre-expanders, and VOC destruction efficiency testing on the boilers at least 180 days prior to each expiration of the facility's Title V operating permit unless otherwise approved in writing by the Department.

(g) The permittee shall operate and maintain a device to measure and record the pressure drop across the filter and flame arrestor.

(h) The measuring device used in paragraph (a) above, shall be calibrated in accordance with the manufacturer's specifications.

(i) The permittee shall monitor and record the following:

(1) Daily EPS throughput rate.
(2) Daily fuel usage to each of the boilers.
(3) Concentration and flow rate of the captured air ducted to the boilers
(4) Bead Pentane Concentration on a monthly basis

(j) The permittee shall calculate all VOC emissions associated with the cup manufacturing process on a monthly basis.

(k) The permittee shall maintain all monitoring records at the facility for a period of five (5) years and be made available to the Department upon request.

[end quote from RACT 2 memo]:

As an update to the above assessment, Dart's 12/30/22 RACT 3 proposal asserted that:

"From investigation done by Dart as part of this RACT3 analysis there has been no new technologies to more cost effectively reduce emissions from the EPS steam chest molding process or more economically capture and destroy additional VOC or pentane emissions that are released since the 2016 RACT2 determination was made by PA DEP for Dart's EPA Molding operation.

Therefore, the existing pre-expander emissions reduction system using boilers as destruction devices that was put in under LAER and is operating as RACT2 continues to meet RACT3 as there is no new control technologies to capture, remove or destroy pentane and no new regulations that are tougher than those evaluated when RACT2 was determined.

There are two ways to reduce VOC emissions from a process: process changes or capture and control /destruction systems. We will looked at both of these to see if there were updates in technology that could influence the cost to control determinations that were done.

Control Technology Review

We performed a web search of existing known control technology manufacturers to see if they were offering any new technology or advertised reduced operating cost. We could find no control device manufactures that have made improvements that significantly reduce operating cost and based on budget and public cost information it appears that the capital cost of these equipment, if you can get it in a timely manner, has significantly increased.

We also looked to determine if any emerging VOC control technologies , such as soil destruction, which had gone commercial. We were unable to find any new technologies that were proven in industry or commercial settings. For the concentrations that the capture air streams would be at it looks like thermal oxidizers continues to be the recommended control device.

Regulatory Requirements Review

A check of available literature and guidelines from the EPA showed no additional emissions or control information since the publishing of the CTG entitled "Control of VOC Emissions from Polystyrene Foam Manufacturing" in 1990 is available. Not only does this report give very little detailed information on control techniques it is also generic and outdated.

We also rereviewed EPS process regulations to see if any more strict or restrictive rules had been put in place as that would be an indication of the possibility of more effective controls. We found no new rules or regulations that had stricter emission limits or more stringent control requirements than those that were in place in 2016.

Based on our participation in industry groups we are unaware of any of our EPS foam cup competitors controlling emissions in a manner that produces less emission per ton of bead processed than we currently implement in RACT2.

Process Changes
Another option to obtain the same net environmental effect as an alternative to the capture and destruction or recovery method of reducing pentane emissions is to modify the process such that it emits less pentane or makes capture of the pentane emissions easier.

Dart's Engineering Department has not come up with any new options since the RACT2 analysis that reduce emissions during the production process or that make capture of emissions easier.

Discussions with EPS bead manufacturers related to cup bead indicate that there have been no changes in specifications which leads us to believe that no other EPS container manufactures have developed ways to use this bead to make cups."

The Department has reviewed the source information, control technologies or measures, and cost analysis performed by the company. The Department also performed an independent technical and cost analysis which included, the Department's continuous review of permit applications since the applicability date of RACT II, internet searches, BACT/RACT/LAER Clearinghouse search, a review of EPA and MARAMA's documents, and knowledge gained from the Department permitting staff participating in technical presentations by several vendors and manufacturers of pollution control technology. Based on review of these materials, along with training and the expertise of the reviewing staff, the Department concludes that there are no new or updated air pollution control technologies available for the sources found at this facility and determines that the case-by-case RACT 2 requirements for Source 100, as embodied in the existing Source Group 005 in Section E of the facility's Title V permit, assure compliance with requirements of RACT 3 in § 129.111 - § 129.115, for the affected equipment.

RACT 1:

The facility started up in 2002, and therefore was not subject to the RACT 1 initiative.

Recommendations:

If a source was previously subject to RACT 2 case-by-case determinations, and that source has not been modified or changed, the owner or operator may, in lieu of doing another full case-by-case proposal for RACT III, submit a limited analysis, as specified in 25 Pa. Code Section 129.114(i). Unless otherwise required, this submission does not need to be part of a plan approval or operating permit modification and no fee would be charged.

No changes are needed to the facility's Title V permit, as the case-by-case determination for RACT 3 for this facility is the same as for RACT 2.

Attachments: DEP revised cost calculations for Bead Area Enclosure, Enclosed Cup Molding Room and Warehouse Storage

cc: Onbase

Data Inputs

Select the type of oxidizer: Regenerative Thermal Oxidizer

Enter the following information for your emission source:

Composition of Inlet Gas Stream				
Pollutant Name	Concentration (ppmv)	Lower Explosive Limit (LEL) (ppmv)*	Heat of Combustion (Btu/scf)	Molecular Weight
Pentane	297	14,000	3,709	72.15

Note: The lower explosion limit (LEL), heat of combustion and molecular weight for some commonly used VOC/HAP are provided in the table below.

Enter the design data for the proposed oxidizer:

Scenario: Dart Pitney EPS Bead Area Enclosure

Percent Energy Recovery (HR) = 0 percent

Number of operating hours/year	8,760	hours/year	
Inlet volumetric flow rate(Q_{wi}) at 77°F and 1 atm.	66,300	scfm	
Inlet volumetric flow rate(Q_{wi}) (actual conditions)	66,300	acfm	
Pressure drop (ΔP)	19	inches of water	* 23 inches of water is the default pressure drop for thermal oxidizers; 19 inches of water is the default pressure drop for catalytic oxidizers. Enter actual value, if known.
Motor/Fan Efficiency (ε)	60	percent*	* 60% is a default fan efficiency. User should enter actual value, if known.
Inlet Waste Gas Temperature (T_{wi})	100	°F*	* 100°F is a default temperature. User should enter actual value, if known.
Operating Temperature (T_{fi})	1,900	°F	* Note: Default value for Tfi is 2000°F for thermal regenerative oxidizers. Use actual value if known. Tfi for regenerative oxidizers typically between 1800 and 2000°F.
Destruction and Removal Efficiency (DRE)	95	percent	
Estimated Equipment Life	20	Years*	* 20 years is the typical equipment life. User should enter actual value, if known.
Heat Loss (η)	1	percent*	* 1 percent is a default value for the heat loss. User should enter actual value, if known. Heat loss is typically between 0.2 and 1.5%.

Enter the cost data:

Desired dollar-year	2021			
CEPCI* for 2021	708	Enter the CEPCI value for 2021	536.4	2016 CEPCI
Annual Interest Rate (i)	5.5	Percent		
Electricity ($Cost_{elect}$)	0.0641	$/kWh		
Natural Gas Fuel Cost ($Cost_{fuel}$)	0.00351	$/scf		
Operator Labor Rate	$26.61	per hour		* $26.61 per hour is a default labor rate. User should enter actual value, if known.
Maintenance Labor rate	$27.40	per hour		* $27.40 per hour is a default labor rate. User should enter actual value, if known.
Contingency Factor (CF)	10.0	Percent		* 10 percent is a default value for construction contingencies. User may enter values between 5 and 15 percent.

* CEPCI is the Chemical Engineering Plant Cost Escalation/De-escalation Index. The use of CEPCI in this spreadsheet is not an endorsement of the index for purposes of cost escalation or de-escalation, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Data Sources for Default Values Used in Calculations:

Parameters for Common Compounds:

Compound	LEL (ppmv)	Heat of Combustion (Btu/scf)	Molecular Weight
Methane*	50,000	911	16.04
Ethane	30,000	1,631	30.07
Propane	21,000	2,353	44.09
Butane	19,000	3,101	58.12
Pentane	14,000	3,709	72.15
Hexane	11,000	4,404	86.17
Octane	10,000	5,796	114.23
Nonane	8,000	6,493	128.25
Decane	8,000	7,190	142.28
Ethylene**	27,000	1,499	28.05
Propylene	20,000	2,182	42.08
Cyclohexane	13,000	4,180	84.16
Benzene**	14,000	3,475	78.11
Toluene**	11,000	4,274	92.13
Methyl Chloride (Chloromethane)**	82,500	705	50.49

Footnotes
* Greenhouse gas.
** Hazardous air pollutant.

Data Element	Default Value	Sources for Default Values used in the calculation . . .	If you used your own site-specific values, please enter the value used and the reference source . . .	Recommended data sources for site-specific information
Electricity Cost ($/kWh)	0.0674	Average annual electricity cost for industrial plants is based on 2016 price data compiled by the U.S. Energy Information Administration from data reported on Form EIA-861 and 861S, (http://www.eia.gov/electricity/data.cfm#sales).		Plant's utility bill or use U.S. Energy Information Administration (EIA) data for most recent year. Available at http://www.eia.gov/electricity/data.cfm#sales.
Fuel Cost ($/MMBtu)	3.34	Annual average price paid for natural gas by industrial facilities in 2016 from the U.S. Energy Information Administration. Available at http://www.eia.gov/dnav/ng/hist/n3035us3A.htm.		Check with fuel supplier or use U.S. Energy Information Administration (EIA) data for most recent year." Available at Available at http://www.eia.gov/dnav/ng/hist/n3035us3A.htm.
Operator Labor ($/hour)	26.61	Bureau of Labor Statistics, May 2016 National Occupational Employment and Wage Estimates – United States, May 2016 (https://www.bls.gov/oes/current/oes_nat.htm). Hourly rates for operators based on data for plant and System Operators – other (51-8099).		Use plant-specific labor rate.
Maintenance Labor ($/hour)	27.40	Bureau of Labor Statistics, May 2016 National Occupational Employment and Wage Estimates – United States, May 2016 (https://www.bls.gov/oes/current/oes_nat.htm). Hourly rates for maintenance workers based on electrical and electronics commercial and industrial equipment repairers (49-2094).		Use plant-specific labor rate.

Cost Estimate

Scenario: Dart Pitney EPS Bead Area Enclosure

Direct Costs

Total Purchased equipment costs (in 2021 dollars)

Incinerator + auxiliary equipment[a] (A) =			
Equipment Costs (EC) for Regenerative Oxidizer	=[2.664 x 100,000 + (13.98 x Qtot)] x (2021 CEPI/2016 CEPCI) =	$1,577,346	in 2021 dollars
Instrumentation[b] =	0.10 × A =	$157,735	
Sales taxes =	0.03 × A =	$0	
Freight =	0.05 × A =	$78,867	
	Total Purchased equipment costs (B) =	$1,813,948	in 2021 dollars

Footnotes

a - Auxiliary equipment includes equipment (e.g., duct work) normally not included with unit furnished by incinerator vendor.

b - Includes the instrumentation and controls furnished by the incinerator vendor.

Direct Installation Costs (in 2021 dollars)

Foundations and Supports =	0.08 × B =	$145,116	
Handlong and Errection =	0.14 × B =	$253,953	
Electrical =	0.04 × B =	$72,558	
Piping =	0.02 × B =	$36,279	
Insulation for Ductwork =	0.01 × B =	$18,139	
Painting =	0.01 × B =	$18,139	
Site Preparation (SP) =		$0	
Buildings (Bldg) =		$235,500	capture bldg mods and ductwork
	Total Direct Installaton Costs =	$779,684	
Total Direct Costs (DC) =	Total Purchase Equipment Costs (B) + Total Direct Installation Costs =	$2,593,632	in 2021 dollars

Total Indirect Installation Costs (in 2021 dollars)

Engineering =	0.10 × B =	$181,395	
Construction and field expenses =	0.05 × B =	$90,697	
Contractor fees =	0.10 × B =	$181,395	
Start-up =	0.02 × B =	$36,279	
Performance test =	0.01 × B =	$18,139	
	Total Indirect Costs (IC) =	$507,905	
Continency Cost (C) =	CF(IC+DC)=	$310,154	
Total Capital Investment =	**DC + IC +C =**	**$3,411,692**	**in 2021 dollars**

Direct Annual Costs

Annual Electricity Cost	= Fan Power Consumption × Operating Hours/year × Electricity Price =	$137,932	
Annual Fuel Costs for Natural Gas	= $Cost_{fuel}$ × Fuel Usage Rate × 60 min/hr × Operating hours/year	$233,075	
Operating Labor	Operator = 0.5hours/shift × Labor Rate × (Operating hours/8 hours/shift)	$14,569	
	Supervisor = 15% of Operator	$2,185	
Maintenance Costs	Labor = 0.5 hours/shift × Labor Rate × (Operating Hours/8 hours/shift)	$15,002	
	Materials = 100% of maintenance labor	$15,002	
Direct Annual Costs (DC) =		**$417,764**	**in 2021 dollars**

Indirect Annual Costs

Overhead	= 60% of sum of operating, supervisor, maintenance labor and maintenance materials	$28,054	
Administrative Charges	= 2% of TCI	$68,234	
Property Taxes	= 1% of TCI	$0	
Insurance	= 1% of TCI	$34,117	
Capital Recovery	= CRF[TCI-1.08(cat. Cost)]	$285,488	
Indirect Annual Costs (IC) =		**$415,893**	**in 2021 dollars**
Total Annual Cost =	**DC + IC =**	**$833,657**	**in 2021 dollars**

Cost Effectiveness

Cost Effectiveness = (Total Annual Cost)/(Annual Quantity of VOC/HAP Pollutants Destroyed)

Total Annual Cost (TAC) =	$833,657	per year in 2021 dollars
VOC/HAP Pollutants Destroyed =	32.8	tons/year
Cost Effectiveness =	$25,401	per ton of pollutants removed in 2021 dollars

Data Inputs

Select the type of oxidizer: Regenerative Thermal Oxidizer

Enter the following information for your emission source:

Composition of Inlet Gas Stream				
Pollutant Name	**Concentration (ppmv)**	**Lower Explosive Limit (LEL) (ppmv)***	**Heat of Combustion (Btu/scf)**	**Molecular Weight**
Pentane	100	14,000	3,709	72.15

Note: The lower explosion limit (LEL), heat of combustion and molecular weight for some commonly used VOC/HAP are provided in the table below.

Enter the design data for the proposed oxidizer:

Scenario: Dart Pitney EPS Enclosed Cup Molding Room

Number of operating hours/year	8,760	hours/year	
Inlet volumetric flow rate(Q_{wi}) at 77°F and 1 atm.	221,000	scfm	
Inlet volumetric flow rate(Q_{wi}) (actual conditions)	221,000	acfm	
Pressure drop (ΔP)	19	inches of water	* 23 inches of water is the default pressure drop for thermal oxidizers; 19 inches of water is the default pressure drop for catalytic oxidizers. Enter actual value, if known.
Motor/Fan Efficiency (ε)	60	percent*	* 60% is a default fan efficiency. User should enter actual value, if known.
Inlet Waste Gas Temperature (T_{wi})	100	°F*	* 100°F is a default temperature. User should enter actual value, if known.
Operating Temperature (T_{fi})	1,900	°F	* Note: Default value for Tfi is 2000°F for thermal regenerative oxidizers. Use actual value if known. Tfi for regenerative oxidizers typically between 1800 and 2000°F.
Destruction and Removal Efficiency (DRE)	95	percent	
Estimated Equipment Life	20	Years*	* 20 years is the typical equipment life. User should enter actual value, if known.
Heat Loss (η)	1	percent*	* 1 percent is a default value for the heat loss. User should enter actual value, if known. Heat loss is typically between 0.2 and 1.5%.

Percent Energy Recovery (HR) = 0 percent

Enter the cost data:

Desired dollar-year	2021		
CEPCI* for 2021	708	Enter the CEPCI value for 2021	536.4 2016 CEPCI
Annual Interest Rate (i)	5.5	Percent	
Electricity ($Cost_{elect}$)	0.0641	$/kWh	
Natural Gas Fuel Cost ($Cost_{fuel}$)	0.00351	$/scf	
Operator Labor Rate	$26.61	per hour	* $26.61 per hour is a default labor rate. User should enter actual value, if known.
Maintenance Labor rate	$27.40	per hour	* $27.40 per hour is a default labor rate. User should enter actual value, if known.
Contingency Factor (CF)	10.0	Percent	* 10 percent is a default value for construction contingencies. User may enter values between 5 and 15 percent.

* CEPCI is the Chemical Engineering Plant Cost Escalation/De-escalation Index. The use of CEPCI in this spreadsheet is not an endorsement of the index for purposes of cost escalation or de-escalation, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Data Sources for Default Values Used in Calculations:

Parameters for Common Compounds:

Compound	LEL (ppmv)	Heat of Combustion (Btu/scf)	Molecular Weight
Methane*	50,000	911	16.04
Ethane	30,000	1,631	30.07
Propane	21,000	2,353	44.09
Butane	19,000	3,101	58.12
Pentane	14,000	3,709	72.15
Hexane	11,000	4,404	86.17
Octane	10,000	5,796	114.23
Nonane	8,000	6,493	128.25
Decane	8,000	7,190	142.28
Ethylene**	27,000	1,499	28.05
Propylene	20,000	2,182	42.08
Cyclohexane	13,000	4,180	84.16
Benzene**	14,000	3,475	78.11
Toluene**	11,000	4,274	92.13
Methyl Chloride (Chloromethane)**	82,500	705	50.49

Footnotes

* Greenhouse gas.

** Hazardous air pollutant.

Data Element	Default Value	Sources for Default Values used in the calculation . . .	If you used your own site-specific values, please enter the value used and the reference source . . .	Recommended data sources for site-specific information
Electricity Cost ($/kWh)	0.0674	Average annual electricity cost for industrial plants is based on 2016 price data compiled by the U.S. Energy Information Administration from data reported on Form EIA-861 and 861S, (http://www.eia.gov/electricity/data.cfm#sales).		Plant's utility bill or use U.S. Energy Information Administration (EIA) data for most recent year. Available at http://www.eia.gov/electricity/data.cfm#sales.
Fuel Cost ($/MMBtu)	3.34	Annual average price paid for natural gas by industrial facilities in 2016 from the U.S. Energy Information Administration. Available at http://www.eia.gov/dnav/ng/hist/n3035us3A.htm.		Check with fuel supplier or use U.S. Energy Information Administration (EIA) data for most recent year." Available at Available at http://www.eia.gov/dnav/ng/hist/n3035us3A.htm.
Operator Labor ($/hour)	26.61	Bureau of Labor Statistics, May 2016 National Occupational Employment and Wage Estimates – United States, May 2016 (https://www.bls.gov/oes/current/oes_nat.htm). Hourly rates for operators based on data for plant and System Operators – other (51-8099).		Use plant-specific labor rate.
Maintenance Labor ($/hour)	27.40	Bureau of Labor Statistics, May 2016 National Occupational Employment and Wage Estimates – United States, May 2016 (https://www.bls.gov/oes/current/oes_nat.htm). Hourly rates for maintenance workers based on electrical and electronics commercial and industrial equipment repairers (49-2094).		Use plant-specific labor rate.

Cost Estimate

Scenario: Dart Pitney EPS Enclosed Cup Molding Room

Direct Costs

Total Purchased equipment costs (in 2021 dollars)

Incinerator + auxiliary equipment[a] (A) =			
Equipment Costs (EC) for Regenerative Oxidizer	=[2.664 x 100,000 + (13.98 x Qtot)] x (2021 CEPI/2016 CEPCI) =	$4,437,371	in 2021 dollars
Equipment Costs (EC) for Recuperative Thermal Oxidizer			in 2021 dollars
Equipment Costs (EC) for a Fixed Bed/Monolith Catalytic Oxidizer			in 2021 dollars
Equipment Costs (EC) for Fluid Bed Catalytic Oxidizer			in 2021 dollars
Instrumentation[b] =	0.10 × A =	$443,737	
Sales taxes =	0.03 × A =	$0	
Freight =	0.05 × A =	$221,869	
	Total Purchased equipment costs (B) =	$5,102,976	in 2021 dollars

Footnotes

a - Auxiliary equipment includes equipment (e.g., duct work) normally not included with unit furnished by incinerator vendor.

b - Includes the instrumentation and controls furnished by the incinerator vendor.

Direct Installation Costs (in 2021 dollars)

Foundations and Supports =	0.08 × B =	$408,238	
Handlong and Errection =	0.14 × B =	$714,417	
Electrical =	0.04 × B =	$204,119	
Piping =	0.02 × B =	$102,060	
Insulation for Ductwork =	0.01 × B =	$51,030	
Painting =	0.01 × B =	$51,030	
Site Preparation (SP) =		$0	
Buildings (Bldg) =		$437,000	capture bldg mods and ductwork
	Total Direct Installaton Costs =	$1,967,893	
Total Direct Costs (DC) =	Total Purchase Equipment Costs (B) + Total Direct Installation Costs =	$7,070,869	in 2021 dollars

Total Indirect Installation Costs (in 2021 dollars)

Engineering =	0.10 × B =	$510,298	
Construction and field expenses =	0.05 × B =	$255,149	
Contractor fees =	0.10 × B =	$510,298	
Start-up =	0.02 × B =	$102,060	
Performance test =	0.01 × B =	$51,030	
	Total Indirect Costs (IC) =	$1,428,833	
Continency Cost (C) =	CF(IC+DC)=	$849,970	
Total Capital Investment =	**DC + IC +C =**	**$9,349,672**	**in 2021 dollars**

Direct Annual Costs

Annual Electricity Cost	= Fan Power Consumption × Operating Hours/year × Electricity Price =	$459,772	
Annual Fuel Costs for Natural Gas	= $Cost_{fuel}$ × Fuel Usage Rate × 60 min/hr × Operating hours/year	$777,563	
Operating Labor	Operator = 0.5hours/shift × Labor Rate × (Operating hours/8 hours/shift)	$14,569	
	Supervisor = 15% of Operator	$2,185	
Maintenance Costs	Labor = 0.5 hours/shift × Labor Rate × (Operating Hours/8 hours/shift)	$15,002	
	Materials = 100% of maintenance labor	$15,002	
Direct Annual Costs (DC) =		**$1,284,092**	**in 2021 dollars**

Indirect Annual Costs

Overhead	= 60% of sum of operating, supervisor, maintenance labor and maintenance materials	$28,054	
Administrative Charges	= 2% of TCI	$186,993	
Property Taxes	= 1% of TCI	$0	
Insurance	= 1% of TCI	$93,497	
Capital Recovery	= CRF[TCI-1.08(cat. Cost)]	$782,374	
Indirect Annual Costs (IC) =		**$1,090,919**	**in 2021 dollars**
Total Annual Cost =	**DC + IC =**	**$2,375,011**	**in 2021 dollars**

Cost Effectiveness

Cost Effectiveness = (Total Annual Cost)/(Annual Quantity of VOC/HAP Pollutants Destroyed)

Total Annual Cost (TAC) =	$2,375,011	per year in 2021 dollars
VOC/HAP Pollutants Destroyed =	132.2	tons/year
Cost Effectiveness =	$17,965	per ton of pollutants removed in 2021 dollars

Data Inputs

Select the type of oxidizer: Regenerative Thermal Oxidizer

Enter the following information for your emission source:

Composition of Inlet Gas Stream				
Pollutant Name	Concentration (ppmv)	Lower Explosive Limit (LEL) (ppmv)*	Heat of Combustion (Btu/scf)	Molecular Weight
Pentane	100	14,000	3,709	72.15

Note: The lower explosion limit (LEL), heat of combustion and molecular weight for some commonly used VOC/HAP are provided in the table below.

Enter the design data for the proposed oxidizer:

Scenario: Dart Pitney EPA Warehouse

Percent Energy Recovery (HR) = 0 percent

Number of operating hours/year	8,760	hours/year	
Inlet volumetric flow rate(Q_{wi}) at 77°F and 1 atm.	270,000	scfm	
Inlet volumetric flow rate(Q_{wi}) (actual conditions)	270,000	acfm	
Pressure drop (ΔP)	19	inches of water	* 23 inches of water is the default pressure drop for thermal oxidizers; 19 inches of water is the default pressure drop for catalytic oxidizers. Enter actual value, if known.
Motor/Fan Efficiency (ε)	60	percent*	* 60% is a default fan efficiency. User should enter actual value, if known.
Inlet Waste Gas Temperature (T_{wi})	100	°F*	* 100°F is a default temperature. User should enter actual value, if known.
Operating Temperature (T_{fi})	1,900	°F	* Note: Default value for Tfi is 2000°F for thermal regenerative oxidizers. Use actual value if known. Tfi for regenerative oxidizers typically between 1800 and 2000°F.
Destruction and Removal Efficiency (DRE)	95	percent	
Estimated Equipment Life	20	Years*	* 20 years is the typical equipment life. User should enter actual value, if known.
Heat Loss (η)	1	percent*	* 1 percent is a default value for the heat loss. User should enter actual value, if known. Heat loss is typically between 0.2 and 1.5%.

Enter the cost data:

Desired dollar-year	2021				
CEPCI* for 2021	780	Enter the CEPCI value for 2021	536.4	2021 CEPCI	
Annual Interest Rate (i)	5.5	Percent			
Electricity ($Cost_{elect}$)	0.0641	$/kWh			
Natural Gas Fuel Cost ($Cost_{fuel}$)	0.00351	$/scf			
Operator Labor Rate	$26.61	per hour			* $26.61 per hour is a default labor rate. User should enter actual value, if known.
Maintenance Labor rate	$27.40	per hour			* $27.40 per hour is a default labor rate. User should enter actual value, if known.
Contingency Factor (CF)	10.0	Percent			* 10 percent is a default value for construction contingencies. User may enter values between 5 and 15 percent.

* CEPCI is the Chemical Engineering Plant Cost Escalation/De-escalation Index. The use of CEPCI in this spreadsheet is not an endorsement of the index for purposes of cost escalation or de-escalation, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Data Sources for Default Values Used in Calculations:

Parameters for Common Compounds:

Compound	LEL (ppmv)	Heat of Combustion (Btu/scf)	Molecular Weight
Methane*	50,000	911	16.04
Ethane	30,000	1,631	30.07
Propane	21,000	2,353	44.09
Butane	19,000	3,101	58.12
Pentane	14,000	3,709	72.15
Hexane	11,000	4,404	86.17
Octane	10,000	5,796	114.23
Nonane	8,000	6,493	128.25
Decane	8,000	7,190	142.28
Ethylene**	27,000	1,499	28.05
Propylene	20,000	2,182	42.08
Cyclohexane	13,000	4,180	84.16
Benzene**	14,000	3,475	78.11
Toluene**	11,000	4,274	92.13
Methyl Chloride (Chloromethane)**	82,500	705	50.49

Footnotes
* Greenhouse gas.
** Hazardous air pollutant.

Data Element	Default Value	Sources for Default Values used in the calculation . . .	If you used your own site-specific values, please enter the value used and the reference source . . .	Recommended data sources for site-specific information
Electricity Cost ($/kWh)	0.0674	Average annual electricity cost for industrial plants is based on 2016 price data compiled by the U.S. Energy Information Administration from data reported on Form EIA-861 and 861S, (http://www.eia.gov/electricity/data.cfm#sales).		Plant's utility bill or use U.S. Energy Information Administration (EIA) data for most recent year. Available at http://www.eia.gov/electricity/data.cfm#sales.
Fuel Cost ($/MMBtu)	3.34	Annual average price paid for natural gas by industrial facilities in 2016 from the U.S. Energy Information Administration. Available at http://www.eia.gov/dnav/ng/hist/n3035us3A.htm.		Check with fuel supplier or use U.S. Energy Information Administration (EIA) data for most recent year." Available at Available at http://www.eia.gov/dnav/ng/hist/n3035us3A.htm.
Operator Labor ($/hour)	26.61	Bureau of Labor Statistics, May 2016 National Occupational Employment and Wage Estimates – United States, May 2016 (https://www.bls.gov/oes/current/oes_nat.htm). Hourly rates for operators based on data for plant and System Operators – other (51-8099).		Use plant-specific labor rate.
Maintenance Labor ($/hour)	27.40	Bureau of Labor Statistics, May 2016 National Occupational Employment and Wage Estimates – United States, May 2016 (https://www.bls.gov/oes/current/oes_nat.htm). Hourly rates for maintenance workers based on electrical and electronics commercial and industrial equipment repairers (49-2094).		Use plant-specific labor rate.

Cost Estimate

Scenario: Dart Pitney EPA Warehouse

Direct Costs

Total Purchased equipment costs (in 2021 dollars)

Incinerator + auxiliary equipment[a] (A) =			
Equipment Costs (EC) for Regenerative Oxidizer	=[2.664 x 100,000 + (13.98 x Qtot)] x (2021 CEPI/2016 CEPCI) =	$5,886,642	in 2021 dollars
Instrumentation[b] =	0.10 × A =	$588,664	
Sales taxes =	0.03 × A =	$0	
Freight =	0.05 × A =	$294,332	
	Total Purchased equipment costs (B) =	$6,769,639	in 2021 dollars

Footnotes
a - Auxiliary equipment includes equipment (e.g., duct work) normally not included with unit furnished by incinerator vendor.
b - Includes the instrumentation and controls furnished by the incinerator vendor.

Direct Installation Costs (in 2021 dollars)

Foundations and Supports =	0.08 × B =	$541,571	
Handlong and Errection =	0.14 × B =	$947,749	
Electrical =	0.04 × B =	$270,786	
Piping =	0.02 × B =	$135,393	
Insulation for Ductwork =	0.01 × B =	$67,696	
Painting =	0.01 × B =	$67,696	
Site Preparation (SP) =		$0	
Buildings (Bldg) =		$530,000	capture bldg mods and ductwork
	Total Direct Installaton Costs =	$2,560,892	
Total Direct Costs (DC) =	Total Purchase Equipment Costs (B) + Total Direct Installation Costs =	$9,330,530	in 2021 dollars

Total Indirect Installation Costs (in 2021 dollars)

Engineering =	0.10 × B =	$676,964	
Construction and field expenses =	0.05 × B =	$338,482	
Contractor fees =	0.10 × B =	$676,964	
Start-up =	0.02 × B =	$135,393	
Performance test =	0.01 × B =	$67,696	
	Total Indirect Costs (IC) =	$1,895,499	
Continency Cost (C) =	CF(IC+DC)=	$1,122,603	
Total Capital Investment =	**DC + IC +C =**	**$12,348,632**	**in 2021 dollars**

Direct Annual Costs

Annual Electricity Cost	= Fan Power Consumption × Operating Hours/year × Electricity Price =	$561,713	
Annual Fuel Costs for Natural Gas	= $Cost_{fuel}$ × Fuel Usage Rate × 60 min/hr × Operating hours/year	$949,964	
Operating Labor	Operator = 0.5hours/shift × Labor Rate × (Operating hours/8 hours/shift)	$14,569	
	Supervisor = 15% of Operator	$2,185	
Maintenance Costs	Labor = 0.5 hours/shift × Labor Rate × (Operating Hours/8 hours/shift)	$15,002	
	Materials = 100% of maintenance labor	$15,002	
Direct Annual Costs (DC) =		**$1,558,433**	**in 2021 dollars**

Indirect Annual Costs

Overhead	= 60% of sum of operating, supervisor, maintenance labor and maintenance materials	$28,054	
Administrative Charges	= 2% of TCI	$246,973	
Property Taxes	= 1% of TCI	$0	
Insurance	= 1% of TCI	$123,486	
Capital Recovery	= CRF[TCI-1.08(cat. Cost)]	$1,033,325	
Indirect Annual Costs (IC) =		**$1,431,839**	**in 2021 dollars**
Total Annual Cost =	**DC + IC =**	**$2,990,272**	**in 2021 dollars**

Cost Effectiveness

Cost Effectiveness = (Total Annual Cost)/(Annual Quantity of VOC/HAP Pollutants Destroyed)

Total Annual Cost (TAC) =	$2,990,272	per year in 2021 dollars
VOC/HAP Pollutants Destroyed =	121.3	tons/year
Cost Effectiveness =	$24,652	per ton of pollutants removed in 2021 dollars

Weaver, William (DEP)

From:	Pam Dolbee <pam.dolbee@dart.biz>
Sent:	Tuesday, April 18, 2023 11:47 AM
To:	Weaver, William (DEP)
Cc:	Hanlon, Thomas; Ariadna Clark
Subject:	RE: [External] RE: Dart Pitney RACT 3 question
Attachments:	image003.emz; image008.emz; image010.emz; image015.emz

Yes I think your summary is correct and describes the rounding error and then provides the correct #.

Thanks for helping figure this out and correct this.

As I mentioned on the call I hope to have the max. # of batches that can be run to make EPS bead from the bead plant personnel later today and will then recalc the PTE based on the % of max we are currently operating at as I'm not certain how Beston came up with the value he had.

From: Weaver, William (DEP) <wiweaver@pa.gov>
Sent: Tuesday, April 11, 2023 9:32 AM
To: Pam Dolbee <pam.dolbee@dart.biz>
Cc: Hanlon, Thomas <thanlon@pa.gov>; Ariadna Clark <ariadna.clark@dart.biz>
Subject: RE: [External] RE: Dart Pitney RACT 3 question

Pam,

Just checking in. Do you concur with the Dart Pitney emission discussion in yellow below?

From: Weaver, William (DEP)
Sent: Tuesday, March 28, 2023 7:47 AM
To: Pam Dolbee <pam.dolbee@dart.biz>
Cc: Hanlon, Thomas <thanlon@pa.gov>; Ariadna Clark <ariadna.clark@dart.biz>
Subject: RE: [External] RE: Dart Pitney RACT 3 question

No need to resubmit. I just needed to know how to explain it in our review memo. Here is the present draft of how our review memo will explain the sitewide emission PTE for Pitney. Does this look correct to you?

- Per D 100 001 of the facility's Title V permit, the facility is limited to a throughput limitation of 11,500 tons of expandable polystyrene during any consecutive 12-month rolling period.
- Based on testing at another similar Dart facility, the polystyrene beads start with a pentane content of 5.5% by weight, which is gradually reduced through various processing steps and product warehousing, until the final product being shipped offsite contains approximately 1.89% pentane by weight, for a difference of 3.61% VOC lost to atmosphere at various points in the Dart East Lampeter facility. This would indicate a VOC PTE for the facility of 415.2 tpy.
- Dart's RACT 3 emission calculations, which are identical to their RACT 2 calculations, contain a calculation error, which causes their calculated facility PTE to be 402.5 tpy. This error affects certain other detail calculations as well. The error is to assign a 1% loss to the Molding area, when the actual subtraction of listed figures results in a loss of 1.11% at the Molding step.
- Per the above correction, DEP has recalculated the Source 100 process VOC PTE, prior to any control, as 287.5 tpy. The Source 100 warehousing VOC PTE is unchanged from Dart's original estimate at 127.7 tpy.

- Per the facility's RACT 2 determination, at T5 E G005 001, "*All captured VOC emissions from the blenders, holding tanks, and pre-expanders shall be vented to at least one of the boilers and reduced at a minimum destruction efficiency of 95%, as pentane, at the outlet. The capture efficiency of the control system shall be equal to or greater than 90 percent*." The pre-controlled PTE subject to this requirement is 126.5 tons. 90% captured of this is 113.85 tons, of which 95% is required to be destroyed, which leaves a final controlled VOC PTE of 5.69 tpy + uncaptured VOC PTE of 12.65 tpy, for a total VOC PTE for the controlled portions of Source 100, of 18.34 tpy. These figures are as originally calculated by Dart. This reduces the facility VOC PTE, after current controls, to 306.99 tpy.
- Note: Per Dart's RACT 3 submission, footnote on page 1, the calculation "*Assumes existing PE control is utilized since existing Title V permit requires this level of control and increase EPS throughput of 11,500 TPY and EFs of 2.9 % and 1.9 % respectively*". This statement is an incorrect artifact from an earlier RACT 2 submission. The correct percentages are as listed above.

William Weaver | Air Quality Program Manager
Department of Environmental Protection
Southcentral Regional Office
909 Elmerton Avenue | Harrisburg, PA 17110
Phone: 717.705.4868
wiweaver@pa.gov

From: Pam Dolbee <pam.dolbee@dart.biz>
Sent: Monday, March 27, 2023 9:32 PM
To: Weaver, William (DEP) <wiweaver@pa.gov>
Cc: Hanlon, Thomas <thanlon@pa.gov>; Ariadna Clark <ariadna.clark@dart.biz>
Subject: RE: [External] RE: Dart Pitney RACT 3 question

Yes, I think the statement in question uses the incorrect emission factors as the emission calcs use the 3.5 % site wide emissions shown in D19 of the spreadsheet and you are correct the warehouse emission makes up 1.11 % of the overall 3.5 % sitewide loss.

I believe that the calcs and amounts are ok, but we just used the wrong valves in that statement and then I misinterpreted your question on Friday.

That statement should be.

Assumes existing PE control is utilized since existing Title V permit requires this level of control and increase EPS throughput of 11,500 TPY and EFs of 2.4 % (D18) and 1.1 % (see D15) respectively.

The 2.9 and 1.9 are complete errors and were not used in calcs for emissions or cost with the Oct 21, 2019 update as these use the 3.5 % site wide emission factor and the 2.39/2.4 % process loss and 1.1 % warehouse lose emission factor.

Do we need to correct and resubmit the RACT II page that has this statement in it or what are the next steps?

Thanks, and sorry.

From: Weaver, William (DEP) <wiweaver@pa.gov>
Sent: Monday, March 27, 2023 1:02 PM
To: Pam Dolbee <pam.dolbee@dart.biz>
Cc: Ariadna Clark <ariadna.clark@dart.biz>; Hanlon, Thomas <thanlon@pa.gov>
Subject: RE: [External] RE: Dart Pitney RACT 3 question

Oh, now here I may have discovered the answer to my question posed a few minutes ago below. The attached 10/31/19 email that I have just located states: "*As we indicated during this meeting while we were looking into your question we discovered that we had erroneously used the old Leola emission factors in/for Lancaster's RACT II submittal. We inappropriately used the EPS container molding process emission factor of 2.9 % release rate instead of the 2.4 % we used in the original 2001 application for this plant and should have used in our 2016 RACT II submittal for the Lancaster /Pitney Rd plant. We also mistakenly used a higher warehouse emission factor in the 2016 RACT II submittal instead of the 1.1 % factor we used in the original application and we should have used in RACT II.*"

So is it therefore the case that the percentages in the following statement in your RACT 3 submission, are just completely wrong, and should be disregarded?

Assumes existing PE control is utilized since existing Title V permit requires this level of control and increase EPS throughput of 11,500 TPY and EFs of 2.9 % and 1.9 % respectively."

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Southcentral Regional Office
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wiweaver@pa.gov

Quote of the Day: Haste Makes Waste

From: Weaver, William (DEP)
Sent: Monday, March 27, 2023 12:53 PM
To: 'Pam Dolbee' <pam.dolbee@dart.biz>
Cc: Ariadna Clark <ariadna.clark@dart.biz>; Hanlon, Thomas <thanlon@pa.gov>
Subject: RE: [External] RE: Dart Pitney RACT 3 question

Got, it, thanks! Now I need to write narrative explaining step-by-step how the EPS Container Manufacturing Process VOC emissions were calculated. First I need to explain the statement that the calculation "*Assumes existing PE control is utilized since existing Title V permit requires this level of control and increase EPS throughput of 11,500 TPY and EFs of 2.9 % and 1.9 % respectively."*

As best I can tell, the 1.9% in that statement corresponds to the 1.89% pentane "ship" in the spreadsheet, (= % pentane left in the product when it is shipped off site). Is that right?

That brings us to the 2.9% factor noted above. I don't see anything close to 2.9% in the spreadsheet, but I do see the following:
- 2.39% EPS molding process loss PTE no control
- 3.5% EPS PTE including warehouse and no control
- 2.56% site with control

So where does the 2.9% fit into all of that?

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From: Pam Dolbee <pam.dolbee@dart.biz>
Sent: Friday, March 24, 2023 4:35 PM
To: Weaver, William (DEP) <wiweaver@pa.gov>
Cc: Ariadna Clark <ariadna.clark@dart.biz>; Hanlon, Thomas <thanlon@pa.gov>
Subject: [External] RE: Dart Pitney RACT 3 question

As allowed on by 29.114(d) we solely relied on the 2019 RACT II analysis and cost info as the basis for our Lancaster facility RACT III proposal since there have been no changes in the process, equipment or raw materials we use and no additional control requirement implemented by EPA or other regulatory agencies and no new destruction devices that would be more effective or cost efficient since the RACT II control requirements were determined.

I've attached the spreadsheet from the appendix which is a direct copy of the 2019 RACT II process (see page 97 of the 10/21/19 update). The % VOC in bead information is from another facility where we did process step emission factor testing. This data was then used only to show the breakdown of emissions within the source so that we could perform the cost analysis since no site-specific process step emissions breakdown was done at Pitney.

I could not find a copy of the reference 11/11 RACT II document so have used the 10/21/19 version I had so I hope the page numbers I reference below in our explanation match up.

If you need additional information or explanation, please email or call. If a call is needed, I am in an airplane Monday morning and in a conference all day Tuesday and Wednesday so would need to set a call up for lunch time those days. I am not sure of my availability on Thursday or Friday next week as I'm going to take some vacation time to celebrate that reporting season is done. I should be able to respond by emails in the evenings next week.

Have a great weekend.

From: Weaver, William (DEP) <wiweaver@pa.gov>
Sent: Tuesday, March 21, 2023 4:10 PM
To: Pam Dolbee <pam.dolbee@dart.biz>
Cc: Ariadna Clark <ariadna.clark@dart.biz>; Hanlon, Thomas <thanlon@pa.gov>
Subject: Dart Pitney RACT 3 question

Pam,

Would you be able to answer the following RACT 3 questions for Dart Pitney?

1.) Could you send an excel version of the following table from your RACT 3 submission?

EPS Process Emissions and Process Step Emissions

		Lancaster EPS Container Molding Emission Breakdown							
					max EPS (TPY)	11,500.0	permit limit EPS		
			PTE			Site PTE			
	equip #	% C5 in bead	# pentane/100 # EPS	% loss process	% loss site	tons pentane/yr	% total		
dumping	5	5.5	0.09	3.77	2.57	10.4	2.57		
blending/holding	6	5.41	0.1	4.18	2.86	11.5	2.86		
pre-expansion	20	5.31	1	41.84	28.57	115.0	28.57		
screening/storage	10	4.31	0.1	4.18	2.86	11.5	2.86		
2nd bead storage	30	4.21	0.1	4.18	2.86	11.5	2.86		
molding	120	4.11	1	41.84	28.57	115.0	28.57		
Warehousing of final product	1	3	1.11		31.71	127.7	31.71		
ship		1.89				**402.6**			
EPS molding process loss PTE no control			2.39			274.9			
EPS PTE including warehouse and no control			3.50			402.5			
EPS molding with capture of 1 % in PE			1.45			159.9			
site with control			2.56			294.3			
								emissions	
						Total Emissions	% total	reduction	% process
					Enclosed bead handling	148.4	36.86	140.9325	53.97
		destroyed	captured at 90 %		enclosed cup area	126.5	31.43	120.175	46.03
		108.1575	113.85		PE system (blenders, HT, & PE)	126.5	31.43	108.1575	46.03
					warehouse	127.7	31.71	121.27	
					Process	**402.50**			
					EPS Molding Process	**274.8**			
			difference between bead room enclosure and existing PE system			21.9		32.8	

Please find attached the spreadsheet from 2019.

2.) How does the above table fit in with the statement elsewhere in your submission that, "*1 Assumes existing PE control is utilized since existing Title V permit requires this level of control and increase EPS throughput of 11,500 TPY and EFs of 2.9 % and 1.9 % respectively*"?

The statement above is to tell you that for the PTE calcs in the table on page 1 we used the original emission factors and throughput from the permit application.

As stated above the screenshot above is used to try to estimate the emissions split by process step. As you can see, we used the other sites emission information in column % C5 in bead to determine the % lost at each step as shows in the % loss column and then applied it to the PTE for Pitney Rd in the site PTE column.

This is demonstrated by the fact that the PTE total of 402.6 TPY on the spreadsheet matches the PTE on page one when the EPS contaminate manufacturing PTE of 274.9 is added to the EPS container warehousing PTE of 127.7.

Call or email if we need to discuss further or you have additional questions/concerns.

3.) Where/how in the above table does Dart account for the existing control of some of the sources in the existing boilers?

The table shows the potential at each process step. Back in 2019 we then went through each of these potential capture areas and determined a cost per ton to prove that the existing control was consistent with RACT. Please reference pages 14-21 of the Oct 21, 2019 revised RACT II doc where we discussed the different capture options. In this section we describe the current capture system as an option. It is represented by the with an emissions PTE of 126.5 which is 11.5 TPY from blender/holding tanks combined with the estimated pre-expander emissions as described on the tables on page 23 and 24.

We did not rework these values per 29.114(d) since a review of control requirements required by EPA and other states indicated additional capture and control was not being required and when combined with a review of new technology that showed there was no new control devices that were more effective or efficient . for control since the rules allowed the use of RACT II numbers.-

4.) How does the above table fit in with the controlled emissions that DEP used for the RACT 2 cost analyses, as follows, which were based on the (attached) 11/11/19 RACT submission from Dart:

Source ID	Operation	Control Option	annualized cost $	$/ton VOC removed	Tons controlled	Dart Detail	DEP re-run
101	Bead Area Enclosure	Regenerative Thermal Oxidizer	$977,898	$29,796	32.82	$39,327	$24,101
		Fixed Bed Catalytic Incinerator	$2,743,345	$83,588	32.82		
		Fluidized Bed Catalytic Incinerator	$2,971,444	$90,538	32.82		
		Recuperative Thermal Oxidizer	$4,201,561	$128,018	32.82		
		Flare	$148,369,952	$4,520,718	32.82		
101	Enclosed Cup Molding Room	Regenerative Thermal Oxidizer	$3,348,904	$27,867	120.175	$36,379	$19,060
		Fixed Bed Catalytic Incinerator	$8,927,343	$74,286	120.175		
		Fluidized Bed Catalytic Incinerator	$9,786,748	$81,437	120.175		
		Recuperative Thermal Oxidizer	$13,785,978	$114,716	120.175		
		Flare	$492,584,576	$4,098,894	120.175		
101	Warehouse Storage	Regenerative Thermal Oxidizer	$2,774,323	$22,869	121.315	$32,995	$22,829
		Fixed Bed Catalytic Incinerator	$5,082,603	$41,896	121.315		
		Fluidized Bed Catalytic Incinerator	$6,166,364	$50,829	121.315		
		Recuperative Thermal Oxidizer	$6,508,815	$53,652	121.315		
		Flare	$209,977,120	$1,730,842	121.315		

That table was included in RACT II.

The values shown represent the additional emission reduction over the already installed collection system assuming 95 % destruction/control.

Again, reference the table on page 24 of the 10/21/19 RACT II proposal document. I'm going to start from the bottom and move up as the connection of the warehouse and enclosed molding room are straight forward as the number circled above is 95 % of the PTE shown in the spreadsheet as the PTE. The value circled in red represents the controlled emissions used to determine the cost effectiveness where the spreadsheet and the table below show the PTE of that process step.

The warehouse valve of 121.315 TPY in this table assumes 100 % capture of the 127.7 PTE shown in the warehouse PTE column above and in the emissions table below.

The 120.175 TPY emission reduction or controlled emissions shown on the "enclosed cup molding room" section corresponds to the PTE of 126.5 TPY shown above in the spreadsheet and in the table below.

The bead areas enclosure is a little tricker as it represents the additional emissions that would be captured and destroyed above the amount already being controlled by the existing pre-expander system. The sum of the dumper, blender/HT , pre-expander, and screening /storage bag PTE is 148.4 TPY. If we assume 100 % capture and 95 % control as indicated in the table on page 33 of the 10/21/19 RACT II chart the reduction in emissions would be 140.9 TPY (actually 140.98 so there is a rounding error). As indicated on this same table in footnote 2 we only expect to capture 90 % of the 126.5 TPY of emissions from the pre-expander/HT/Blender emissions, our existing control system, and then would destroy them at 95 % so the reduction in emissions would be 108.2 TPY. Since we are already doing this, it is appropriate to look at the reduction from the total bead area enclosure from an incremental perspective as the existing system is already capturing and controlling the majority of these emissions. Therefore, the reduction by applying the total room enclosure over the existing and installed pre-expander control system is only 32.82 TPY so this is the value used to determine the cost to reduce those additional 32.8 tons.

Once again please free to email or call to discuss this as I may not have explained it adequately or effectively.

5.) How does the RACT 2 table in item 4 above fit in with the following table from Dart's RACT 3 submission?

Source ID	Operation	Emission	129.99 (e) RACT2 Cost ($/ton)
100	Bead Area Enclosure	148.5	29,790
100	EPS Molding	126.5	27,867
100	Warehouse Storage	127.7	22,896

The emissions above match the PTE's listed in the spreadsheet at the top. The values in the middle spreadsheets are the controlled emissions or in most cases 95 % of the PTE. See the answer to the previous question for additional details/info.

William Weaver | Air Quality Program Manager
Department of Environmental Protection
Southcentral Regional Office
909 Elmerton Avenue | Harrisburg, PA 17110
Phone: 717.705.4868
wiweaver@pa.gov

Weaver, William (DEP)

From: Pam Dolbee <pam.dolbee@dart.biz>
Sent: Friday, December 30, 2022 4:08 PM
To: Weaver, William (DEP); Millard, Rick; Hanlon, Thomas
Cc: Ariadna Clark; Emily Merola; Matt Forbes
Subject: [External] Dart Lancaster Pitney (36-05117) Final RACT III Proposal Packet
Attachments: Dart Lancaster RACT III Notification 12-23-22 update.pdf; Certified RACT III Proposal for Dart Container Lancaster -Lampeter (36-05117).pdf

ATTENTION: *This email message is from an external sender. Do not open links or attachments from unknown senders. To report suspicious email, use the [Report Phishing button in Outlook.]*

Please find attached Dart Container Corporation RACT 3 Proposal and the RACT III Notification for the Lancaster/Lampeter facility as required to comply with the notification requirements in 25 PA Code 129.111 and 129.115.

We believe the attached notification and accompany proposal addresses the compliance obligations contained in 25 PA Code 129.111-114

Please acknowledge receipt of this notification and accompanying RACT III proposal for our records.

Feel free to reach out to us if you need additional information during the review process or to discuss our RACT III proposal which relies mostly on the RACT II analysis and recommends the same requirements as RACT III since there have been no additions or modifications to the process and a review of new commercially available control technology and possible process modifications indicated that there are no new or alternate approaches that have been introduced that would lower emissions or lower emission reduction costs since the RACT II review was done.

Please let us know If we need to submit a hard copy /wet certification so we can get that in the mail next week.

Pam Dolbee
EHS Regional EHS Manager
Dart Container – Mason, MI
Office: (517) 244-2515
Cell: (517) 240-5762

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHAPTER 129. STANDARDS FOR SOURCES ADDITIONAL RACT REQUIREMENTS FOR MAJOR SOURCES OF NOx AND VOCs FOR THE 2015 OZONE NAAQS

Written notification, 25 Pa. Code §§129.111 and 129.115(a)

25 Pa. Code Sections 129.111 and129.115(a) require that the owner and operator of an air contamination source subject to the final-form RACT III regulations submit a notification describing how you intend to comply with the final-form RACT III requirements, and other information spelled out in subsection 129.115(a). The owner or operator may use this template to notify DEP. Notification must be submitted in writing or electronically to the appropriate Regional Manager located at the appropriate DEP regional office. In addition to the notification required by §§ 129.111 and 129.115(a), you also need to submit an applicable analysis or RACT determination as per § 129.114(a) or (i).

Is the facility major for NOx?	**Yes** ☐ **No** ☒
Is the facility major for VOC?	**Yes** ☒ **No** ☐

FACILITY INFORMATION							
Facility Name	Dart Container Corporation of PA						
Permit Number	36-05117	**PF ID if known**					
Address Line1	110 Pitney Rd						
Address Line2							
City	**Lancaster**	**State**	**PA**	**Zip**	**17602**		
Municipality	East Lampeter Township	**County**	Lancaster				
OWNER INFORMATION							
Owner	Dart Container Corporation of PA						
Address Line1	60 East Main Street						
Address Line2							
City	**Leola**	**State**	**PA**	**Zip**	17540		
Email	Ariadna.clark@dart.biz	Phone					
CONTACT INFORMATION							
Permit Contact Name	Pam Dolbee						
Permit Contact Title	Regional EHS Manager						
Address Line	432 Hogsback						
City	**Mason**	**State**	**MI**	**Zip**	49277		
Email	**Pam.dolbee@dart.biz**	Phone	517 240-5762				

Complete Table 1, including all air contamination sources that commenced operation on or before August 3rd, 2018. Air contamination sources determined to be exempt from permitting requirements also must be included. You may find this information in section A and H of your operating permit.

Table 1 - Source Information

Source ID	Source Name	Make	Model	Physical location of a source (i.e, building#, plant#, etc.)	Was this source subject to RACT II?
031	Boiler 1	Cleaver Brooks	CB-800	Boiler Room	No- minor NOX source and VOC PTE < 1 TPY
032	Boiler 2	Cleaver Brooks	CB-800	Boiler Room	No- minor NOX source and VOC PTE < 1 TPY
033	Boiler 3	Cleaver Brook	CB-800	Boiler Room	No- minor NOX source and VOC PTE < 1 TPY
100	EPS Container Manufacturing	Misc. – Dart	NA	Cup Room	Yes- case by case
101	Cleanup Operations	NA	NA	Cup Room	No- rule 129.97 applies so exempt from RACT II (PTE < 2.7 TPY) per 129.96(a)
102	UV LetterPress Cup Printer	Dart	P-250 and Misc	Cup Room	No- rule 129.97 applies so exempt from RACT II (PTE < 2.7 TPY) per 129.96(a)
103	Parts Washers	Misc.	NA	Cup Room /Fork Truck Shop	No- rule 129.93 applies so exempt from RACT II (PTE < 2.7 TPY) per 129.96(a)
104	Boiler Room Generator	Onan	35GGFD-1790	Boiler Room	No- minor NOX source and VOC PTE < 1 TPY
105	Warehouse Generator	Cummins Power Generation	GGHE-5003801	Warehouse	No- minor NOX source and VOC PTE < 1 TPY

Complete Table 2 or 3 if the facility is a major NOx or VOC emitting facility. For the column with the title "How do you intend to comply", compliance options are:

- Presumptive RACT requirement under §129.112 (**PRES**),
- Facility-wide averaging (**FAC**) §129.113,
- System-wide averaging (**SYS**) §129.113, or
- Case by case determination §129.114 (**CbC**).
- Please provide the applicable subsection if source will comply with the presumptive requirement under §129.112.

Table 2 – Method of RACT III Compliance, NOx

Source ID	Source Name	NOx PTE TPY	Exempt from RACT III (yes or no)	How do you intend to comply? (PRES, CbC, FAC or SYS)	Specific citation of rule if presumptive option is chosen
031	Boiler 1	15.6	Yes- per 129.111(a) Not at a major NOX source		
032	Boiler 2	15.6	Yes- per 129.111(a) Not at a major NOX source		
033	Boiler 3	15.6	Yes- per 129.111(a) Not at a major NOX source		
100	EPS Container Manufacturing	0.0	Yes- per 129.111(a) Not at a major NOX source		
101	Cleanup Operations	0.0	Yes- per 129.111(a) Not at a major NOX source		
102	UV LetterPress Cup Printer	0.0	Yes- per 129.111(a) Not at a major NOX source		
103	Parts Washers	0.0	Yes- per 129.111(a) Not at a major NOX source		
104	Boiler Room Generator	<1.0	Yes- per 129.111(a) Not at a major NOX source		
105	Warehouse Generator	< 1.0	Yes- per 129.111(a) Not at a major NOX source		

Please complete Table 3 if the facility is a major VOC emitting facility. Please provide the applicable section if a source is complying with any RACT regulation listed in 25 Pa Code §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71—129.73, 129.75 129.71—129.75, 129.77 and 129.101—129.107.

Table 3 – Method of RACT III Compliance, VOC

Source ID	Source Name	VOC PTE TPY	Exempt from RACT III (yes or no)	How do you intend to comply?	Specify citation of rule or subject to 25 Pa Code RACT regulation, (list the applicable sections)
031	Boiler 1	< .81 TPY	Yes		129.111(c) since PTE < 1.0 TPY
032	Boiler 2	< .81 TPY	Yes		129.111(c) since PTE < 1.0 TPY
033	Boiler 3	< .81 TPY	Yes		129.111(c) since PTE < 1.0 TPY
100	EPS Container Manufacturing	313.97 TPY	No	CbC	129.114(c)/(d) for Case by Case RACT
101	Cleanup Operations	< 2.7 TPY	No	PRES	129.112 (c)
102	UV LetterPress Cup Printer	< 2.7 TPY	Yes		127.67b applies so exempt per 129.111(a)
103	Parts Washers	< 1 TPY	Yes		127.63 applies so exempt per 129.111(a)
104	Boiler Room Generator	.32 TPY	Yes		129.111(c) since PTE< 1.0 TPY
105	Warehouse Generator	.01 TPY	Yes		129.111(c) since PTE < 1.0 TPY

DART CONTAINER RACT III PROPSAL FOR DART'S EPS MOLDING PROCESS

December 23, 2022 update

This document provides information related to Dart's Lancaster sites Case by Case RACT III proposal required under 25 PA 129.111- 115.

Dart Container Corporation of Pennsylvania

Table of Contents

Site Information and RACT III Sources

Dart Container Corporation of Pennsylvania's Lancaster site is a major VOC source and, therefore, must comply with the RACT III requirements recently passed by Pennsylvania and found in 25 Pa 129.111 -115 regulations.

The site's Title V permit, # 36-05117, contains the VOC and NOx emitting processes/sources listed in the table listed below but since the site is a minor NOx source RACT III only applies to the VOC emission sources.

The table below lists all the VOC emission sources and shows which ones RACT III applies to. This is a summary of the PA DEP notification table.

Process	Source ID	VOC PTE (TPY)	RACT III Applies
Boiler 1- 33.5 MMBTU/hr[2]	031	0.81	No; Exempt since PTE < 1.0 so exempt per 129.111(c)
Boiler 2- 33.5 MMBTU/hr[2]	032	0.81	No; Exempt since PTE < 1.0 so exempt per 129.111(c)
Boiler 2- 33.5 MMBTU/hr[2]	.033	.81	No; Exempt since PTE < 1.0 so exempt per 129.111(c)
EPS container manufacturing[1]	100	274.9	YES, 129.114(c)/(d) for Case-by-Case RACT
EPS container warehousing[1]	100	127.7	Yes, 129.114(c)/(d) for Case-by-Case RACT
Clean-up Operations	101	2.7	Yes, Presumptive RACT 129.112 (c)
UV Letterpress Cup Printing	102	2.7	No, 127.67b applies so exempt per 129.111(a)
Parts Washers (7)	103	<1 TPY	No, 127.63 applies so exempt per 129.111(a)
Boiler Room Emergency[3] Generator	104	< 1 TPY	No, 129.111(c) since PTE< 1.0 TPY
Warehouse Emergency[3] Generator	105	< 1.0 TPY	No, 129.111(c) since PTE < 1.0 TPY

[1] Assumes existing PE control is utilized since existing Title V permit requires this level of control and increase EPS throughput of 11,500 TPY and EFs of 2.9 % and 1.9 % respectively
[2] Uses PTE for VOC from combustion in boilers using AP-42 emission factor
[3] PTE uses 500 hrs. /yr. since an Emergency Generator that is only used during power outages for emergency operations

The site went through RACT II review, and the permit was issued in March 2020 and requires the following.

According to 25 PA Code 129.114(c) below we use the requirements in 29.114(d) to determine and demonstrate based on the RACT II cost and verifications of no additional relevant controls that no additional controls are needed.

Dart proposes that RACT III for the EPS Molding Process be the same as the RACT II requirements that were determined by the case-by case review under 129.00 and as specified in our current permit conditions for G005 which is found in Appendix C.

EPS Container Manufacturing Source RACT III Proposal
EPS Process Description

Dart makes foam cups and containers using the steam chest molding process.

The foam containers produced by Dart are made from EPS beads. EPS beads consist of high molecular weight, crystal grade polystyrene impregnated with n-pentane as a blowing agent. The EPS beads are received in 2,200-pound bulk bags. Each bag has a specially designed liner to prevent pentane from escaping during transport and storage. The gaylords or bulk bags are stored in the warehouse until needed for production.

EPS bead bags are transferred from the warehouse to the production area where they are dumped. The liner bag is opened, and the beads are emptied into a receiver from which they are conveyed via a closed system to a blender or directly to a holding tank.

Beads from the holding tank are augured into the bottom of the pre-expander where steam is injected to control expansion. Beads exiting the pre-expander are labeled "pre-puff". The pre-puff exits the expander and falls into a hopper from which it is transferred to the screeners. At the screeners, oversized and undersized pre-puff is removed from the process. After screening, the pre-puff is placed in holding bags until needed.

The cup molding machine pulls the beads needed for each cycle from the holding bags. The beads are fed into molds which are then heated, causing the beads to expand again. Since the beads are in an enclosed space, they fuse together as they expand taking on the shape of the mold. The mold is then cooled to set the EPS in a permanent shape. The container or cup is removed from the mold for inspection then transferred, with acceptable cups going to either the packaging or printing departments. Dart uses inks that are UV-based and have insignificant emissions. This cycle is repeated continuously. After packaging, the cartons of containers or cups are sent to one of the warehouse areas for shipment to customers.

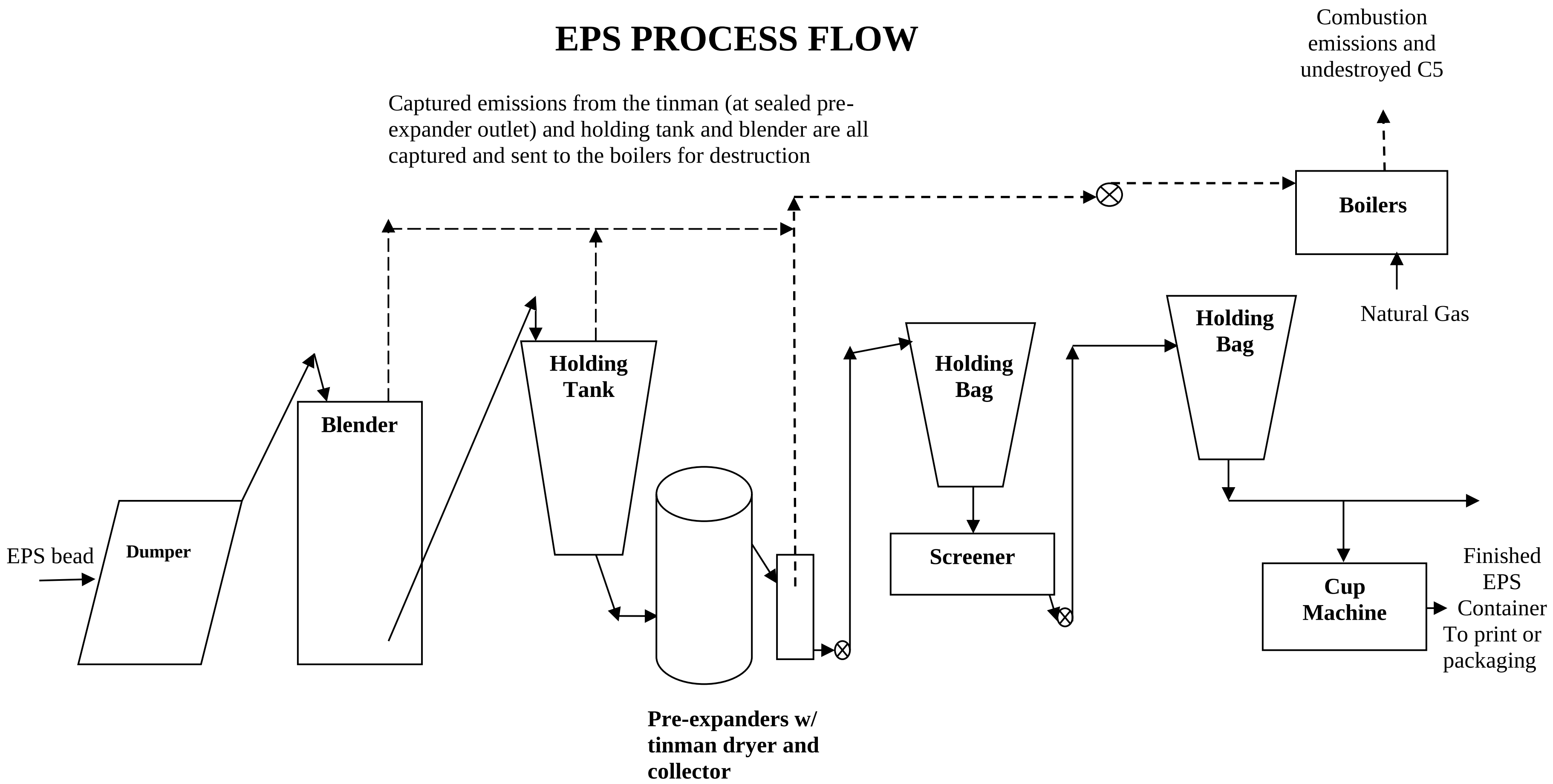
The boilers, which use natural gas as their main fuel, are used to produce the steam required for cup production and building heat.

Although the cup production process is a continuous operation, it is composed of individual process steps that are needed to prep the raw material as well as mold the finished container. Air transfer systems are the main method of moving the pre-expanded EPS bead from one piece of equipment to the next.

During each process step and during transfers, various amounts of n-pentane are released from the EPS. In addition to these steps there are also emissions released from the off gassing that occurs during finished good storage. All of these emission generating steps were addressed in the RACT2 determination.

The process flow diagram below shows the major processing steps associated with the EPS container manufacturing process.

EPS PROCESS FLOW



Current RACT2 Requirements

It should be worth noting that when this facility was started up in 2002, the existing pre-expander control system was determined to meet LAER for EPS molding operations and this was determined to satisfy RACT2 as documented in the Group 005 VOC Case Specific RACT 2 Requirement section of our Title V permit.

> *RACT2 requires capture of 90 % of the emissions from the blenders, holding tanks, and pre-expanders. These emissions are sent to the boilers where they are destroyed (at a rate of 95 % or more). The capture and destruction system must be on at all times these sources are in operation except for up to 3 hours per month for maintenance activities.*
>
> *Records shall be maintained to demonstrate compliance with the above as well as the EPS bead usage and the pressure drop across the filter and flame arrestor as well as calibration.*
>
> *Capture and destruction testing is required at least 180 days prior to the expiration of the permit.*
>
> *The monthly average pentane concentration of the expandable polystyrene beads used in the operation must be below 5.75 % Records shall be kept demonstrating compliance.*

RACT2 Control Cost and Analysis per 129.92(a)

The table below shows the RACT2 control cost that were determined and used to determine RACT2 requirements.

Source ID	**Operation**	**Emission**	**129.99 (e) RACT2 Cost ($/ton)**
100	**Bead Area Enclosure**	148.5	29,790
100	**EPS Molding**	126.5	27,867
100	**Warehouse Storage**	127.7	22,896

RACT3 Analysis and Demonstration per § 129.114(i)(1)(i) to show that compliance with RACT2 analysis assures compliance with the provisions of 129.112(c)/RACT3

Per 25 PA Code 129.114(h)(i) since there have been no changes in our production process or raw material, we intend to show that by continuing to meet the requirements of RACT2 that we are meeting the requirements of RACT3 since the cost of control is so large and not new technologies or emission reduction options have been developed since our RACT2 analysis was completed.

129.114(i)(1)(A) Evaluation of new control technologies

From investigation done by Dart as part of this RACT3 analysis there has been no new technologies to more cost effectively reduce emissions from the EPS steam chest molding process or more economically capture and destroy additional VOC or pentane emissions that are released since the 2016 RACT2 determination was made by PA DEP for Dart's EPA Molding operation.

Therefore, the existing pre-expander emissions reduction system using boilers as destruction devices that was put in under LAER and is operating as RACT2 continues to meet RACT3 as there is no new control technologies to capture, remove or destroy pentane and no new regulations that are tougher than those evaluated when RACT2 was determined.

There are two ways to reduce VOC emissions from a process: process changes or capture and control /destruction systems. We will looked at both of these to see if there were updates in technology that could influence the cost to control determinations that were done.

Control Technology Review

We performed a web search of existing known control technology manufacturers to see if they were offering any new technology or advertised reduced operating cost. We could find no control device manufactures that have made improvements that significantly reduce operating cost and based on budget and public cost information it appears that the capital cost of these equipment, if you can get it in a timely manner, has significantly increased.

We also looked to determine if any emerging VOC control technologies , such as soil destruction, which had gone commercial. We were unable to find any new technologies that were proven in industry or commercial settings. For the concentrations that the capture air streams would be at it looks like thermal oxidizers continues to be the recommended control device.

Regulatory Requirements Review

A check of available literature and guidelines from the EPA showed no additional emissions or control information since the publishing of the CTG entitled "Control of VOC Emissions from Polystyrene Foam Manufacturing" in 1990 is available. Not only does this report give very little detailed information on control techniques it is also generic and outdated.

We also rereviewed EPS process regulations to see if any more strict or restrictive rules had been put in place as that would be an indication of the possibility of more effective controls. We found no new rules or regulations that had stricter emission limits or more stringent control requirements than those that were in place in 2016.

Based on our participation in industry groups we are unaware of any of our EPS foam cup competitors controlling emissions in a manner that produces less emission per ton of bead processed than we currently implement in RACT2.

Process Changes

Another option to obtain the same net environmental effect as an alternative to the capture and destruction or recovery method of reducing pentane emissions is to modify the process such that it emits less pentane or makes capture of the pentane emissions easier.

Dart's Engineering Department has not come up with any new options since the RACT2 analysis that reduce emissions during the production process or that make capture of emissions easier.

Discussions with EPS bead manufacturers related to cup bead indicate that there have been no changes in specifications which leads us to believe that no other EPS container manufactures have developed ways to use this bead to make cups.

129.114(i)(1)(B) List of Technology Feasible Air Cleaning Devised, Air Pollution Control Technology, and/or Techniques Evaluated in RACT2 as part of 129.92(b)(1)-(3)

There were various capture combination options that were evaluated as RACT2, but the following 3 capture options were found to be the most effective and were used in the economic analysis for RACT2.

- Bead Area Enclosure
- Enclosed Cup Molding Room
- Enclosed Warehouse

For each of these capture options the following destruction technologies were evaluated using the methods in EPA's Air Pollution Control Manual and EPA's Control Cost Manual/Spreadsheets.

- Regenerative Thermal Oxidizer (RTO)
- Fix Bed Catalytic Incinerator
- Fluidized Bed Catalytic Incinerator
- Recuperative Thermal Oxidizer
- Flare

129.114(i)(1)(C) Statement that an evaluation of each economic feasibility analysis meets EPA's Air Pollution Control Cost Manual" (6th Ed. – 2002)

Dart used the method in EPA's Air Pollution Control Cost Manual to determine reduction cost but based those values using EPA's ACA cost estimate software. PA DEP determined that the software had be replaced by spreadsheets based on the Cost Control Manuals Chapters so verified our cost using those to make sure the RACT2 cost were complaint with the RACT2 requirements to meet EPA's Air Pollution Control Cost Manual.

129.114(i)(1)(D) Evaluation of Cost Feasibility Changes
Dart reviewed the current RACT3 proposal as well as the technologies reviewed to determine technological and economic feasibility as part of RACT and as listed above in the list developed to meet the requirements of 129.114(i)(C) and was unable to find any indication of reduced cost of either the capital equipment, the labor, or the utilities and replacement components needed to operate and maintain it.

The next step was to determine what today's cost would be and to do that we used the Chemical Engineering Plant Cost Index (CEPCI) since it represents the cost of equipment. In 2016 the CEPCI was 541.7 and in September 2022 it was 821.1 which indicates the capital cost would be around 50 % higher today than in 2016. Utility cost increases have seen a similar increase over the past 6 years, so we applies the CEPCI increase to the annualize cost per ton of reduction to estimate the 2022 annualized cost per ton as shown on the table below.

Source ID	Operation	Capture Air Needed (cfm)	Concentration in Capture Air (ppm)	Most Cost-Effective Control Option	129.99 (e) RACT2 Cost ($/ton)	Updated RACT2 Cost in 2022 $[1] ($/ton)
100	**Bead Area Enclosure**	66,300	106	RTO	29,790	45,155
100	**EPS Molding Room PTE**	221,000	27	RTO	27,867	42,246
100	**Warehouse Storage PTE**	72,000	22	RTO	22,896	32,756

[1] RACT2 cost which were in 2016 dollars updated to 2022(Sept.) dollars using the CEPCI (541.7/821.1= 1.5158)

This data supports that cost of the control devices and the cost to operate it have significantly rose over the past 6 years and the updated estimated cost indicated that it is not economically feasible to justify additional capture as the cost per ton indicated that the cost per ton for additional emission reduction are not cost effective. Dart proposes that RACT III be the same as RACT II for the EPS Container Process.

Pentane Emission Reduction Options through Alternate Processes/Equipment

RACT3 Schedule
The site is already implementing the RACT2 requirements which is what is proposed as the RACT3 requirements per the attached certification, so the site proposes to be in compliance with the RACT3 requirements upon approval of the proposal by DEP or Jan 1, 2023.

25 PA Code 129.114(h)(i) Certification

I, Ariadna Clark, the RO for Dart Container Corporation of PA , certify based on reasonable inquiries and knowledge that above RACT III analysis and information used and present is true and accurate to the best of my knowledge and that it demonstrates that no new control technologies are available to reduce emissions beyond what was analyzed as part of Dart's RACT II analysis.

Ariadna Clark (Dec 27, 2022 22:37 AST) 12/27/2022

Ariadna Clark, Plant Manager Date

Appendix A
Emission Calculations for EPS Process
Used in RACT2

EPS Process Emissions and Process Step Emissions

		Lancaster EPS Container Molding Emission Breakdown							
					max EPS (TPY)	11,500.0	permit limit EPS		
			PTE			**Site PTE**			
	equip #	**% C5 in bead**	**# pentane/100 # EPS**	**% loss process**	**% loss site**	**tons pentane/yr**	**% total**		
dumping	5	5.5	0.09	3.77	2.57	10.4	2.57		
blending/holding	6	5.41	0.1	4.18	2.86	11.5	2.86		
pre-expansion	20	5.31	1	41.84	28.57	115.0	28.57		
screening/storage	10	4.31	0.1	4.18	2.86	11.5	2.86		
2nd bead storage	30	4.21	0.1	4.18	2.86	11.5	2.86		
molding	120	4.11	1	41.84	28.57	115.0	28.57		
Warehousing of final product	1	3	1.11		31.71	127.7	31.71		
ship		1.89				**402.5**			
EPS molding process loss PTE no contorl			2.39			274.9			
EPS PTE including warehouse and no control			3.50			402.5			
EPS molding with capture of 1 % in PE			1.45			159.9			
site with contorl			2.56			294.3			
								emissions	
						Total Emissions	% total	reduction	% process
					Enclosed bead handling	148.4	36.86	140.9325	53.97
		destroyed	captured at 90 %		enclosed cup area	126.5	31.43	120.175	46.03
		108.1575	113.85		PE system (blenders, HT, & PE)	126.5	31.43	108.1575	46.03
					warehouse	127.7	31.71	121.27	
					Process	**402.50**			
					EPS Molding Process	**274.9**			
			difference between bead room enclosure and existing PE system			21.9		32.8	

Appendix B
Listing of RACT II Analysis Information that was submitted

Contents

Dart Container Corporation of Pennsylvania Lancaster Facility RACT Determination
October 22, 2019 update

Appendix C
Proposed RACT III Requirements as Container in Permit Emission Group 005

SECTION E. Source Group Restrictions.

Group Name: GROUP 005

Group Description: VOC Case Specific RACT2 Requirements

Sources included in this group

ID	Name
100	EPS CONTAINER MANUFACTURING

I. RESTRICTIONS.

No additional requirements exist except as provided in other sections of this permit including Section B (Title V General Requirements).

II. TESTING REQUIREMENTS.

No additional testing requirements exist except as provided in other sections of this permit including Section B (Title V General Requirements).

III. MONITORING REQUIREMENTS.

No additional monitoring requirements exist except as provided in other sections of this permit including Section B (Title V General Requirements).

IV. RECORDKEEPING REQUIREMENTS.

No additional record keeping requirements exist except as provided in other sections of this permit including Section B (Title V General Requirements).

V. REPORTING REQUIREMENTS.

No additional reporting requirements exist except as provided in other sections of this permit including Section B (Title V General Requirements).

VI. WORK PRACTICE REQUIREMENTS.

No additional work practice requirements exist except as provided in other sections of this permit including Section B (Title V General Requirements).

VII. ADDITIONAL REQUIREMENTS.

 # 001 [25 Pa. Code §129.99]

Alternative RACT proposal and petition for alternative compliance schedule.

The following is a case-by-case RACT 2 determination and requirements for the following sources, pursuant to 25 Pa. Code Section 129.99:

I. EPS Container Manufacturing (100)

(a) All captured VOC emissions from the blenders, holding tanks, and pre-expanders shall be vented to at least one of the boilers and reduced at a minimum destruction efficiency of 95%, as pentane, at the outlet. The capture efficiency of the control system shall be equal to or greater than 90 percent.

(b) The capture system shall be operational during start-up, shutdown, and normal operation of the pre-expanders, with the exception of up to three (3) hours per month for routine maintenance, which includes weekly filter and flame arrestor cleanouts/changes, weekly boiler safety testing, and monthly calibration checks, as well as, three (3) hours twice a year for fire system safety testing.

(c) The pentane concentration in the beads used in Source 100 shall not exceed 5.75% based on a monthly average.

(d) The permittee shall operate and maintain a recording device to continuously monitor and record the flow rate of the emission capture system, the pentane concentration in the air stream, and the pentane flow rate except during monthly calibration checks.

SECTION E. Source Group Restrictions.

(e) The permittee shall maintain monthly records of the date, time, and duration of the time required for the weekly filter and flame arrestor cleanouts/changes, weekly boiler safety testing, monthly calibration checks, and biannual fire system safety testing.

(f) The permittee shall repeat capture efficiency testing on one of the pre-expanders, and VOC destruction efficiency testing on the boilers at least 180 days prior to each expiration of the facility's Title V operating permit unless otherwise approved in writing by the Department.

(g) The permittee shall operate and maintain a device to measure and record the pressure drop across the filter and flame arrestor.

(h) The measuring device used in paragraph (a) above, shall be calibrated in accordance with the manufacturer's specifications.

(i) The permittee shall monitor and record the following:

(1) Daily EPS throughput rate.
(2) Daily fuel usage to each of the boilers.
(3) Concentration and flow rate of the captured air ducted to the boilers
(4) Bead Pentane Concentration on a monthly basis

(j) The permittee shall calculate all VOC emissions associated with the cup manufacturing process on a monthly basis.

(k) The permittee shall maintain all monitoring records at the facility for a period of five (5) years and be made available to the Department upon request.

*** **Permit Shield in Effect.** ***