



STATE OF DELAWARE
**DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL**

OFFICE OF THE
SECRETARY

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Secretary's Order No. 2017-A-0024

Re: Hercules, LLC's Application for an Air Pollution Control Permit to Operate Spray Drying Equipment at 500 Hercules Road, Wilmington, New Castle County

Date of Issuance: September 21, 2017
Effective Date: September 21, 2017

BACKGROUND

This Order of the Secretary of the Department of Natural Resources and Environmental Control ("Department") considers Hercules, LLC's ("Applicant") May 17, 2016 application ("Application") for an air pollution control permit to operate spray drying process equipment¹ ("Equipment") at the Hercules/Ashland complex of buildings at 500 Hercules Road, Wilmington, New Castle County ("Facility").

The Equipment would produce small batches of various pharmaceutical samples for research and development purposes. The Department regulates the air emissions from the solvents used in the spray drying process, which sprays one of the following seven solvents on pharmaceutical powder: ethanol, isopropyl alcohol, ethyl acetate, tetrahydrofuran, methanol, methylene chloride, and acetone. The Department regulates the emissions from: 1) the Volatile Organic Compounds ("VOCs") ethanol, isopropyl

¹ The Equipment consists of two model PSD-1 dryers (identified as R&D and GMP), a model SD Micro dryer, and a model MP-1 fluid bed dryer. The Department approved the operation of the PSD-1 GMP spray dryer.

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alcohol, ethyl alcohol, tetrahydrofuran and methanol; 2) the Hazardous Air pollutants ("HAPs") methanol and methylene chloride, and 3) acetone. The Applicant proposes to install as pollution control equipment for the Equipment's air emissions two 2,000 lb. canister carbon bed adsorption units operating in series, with the primary bed capturing 90% of the pollutants, and the secondary bed increasing the total effectiveness to at least 95%.

The Department's Division of Air Quality ("DAQ") prepared a Draft Permit, which would allow the Equipment to operate subject to restricted emission limits and monitoring and reporting requirements. The Draft Permit requires that the Applicant test weekly the effectiveness of the carbon bed pollution control equipment, and to replace the primary bed with the secondary bed when the primary bed reaches 85% of its capacity, as measured by the amount of solvents used.

The Draft Permit represents the Department's tentative decision prior to receiving public comments. The Draft Permit, if approved, would supersede the Equipment's prior construction and operating permits for the Equipment. On September 4, 2016, the Department provided public notice of the Draft Permit. The Department received comments and requests for a public hearing.

The DAQ held a public workshop on September 26, 2016 in order to explain the Draft Permit to the public. The Department also held a December 8, 2016, public hearing before the Department's presiding hearing officer, Robert P. Haynes, Esquire.

At the public hearing, ten persons provided public comments that opposed the Draft Permit. The public comments sought: 1) to reduce the Equipment's operating hours (even to zero) because of the possible harm to persons in nearby residences, daycare

centers, churches, and schools; 2) denial of any permit because the Equipment's operation would violate the local zoning ordinances; and 3) a permit condition that would monitor actual emissions. Mr. Haynes granted an unopposed motion to extend the public comment period to January 9, 2017, and the Department received public comments during this period that raised the same issues as raised at the public hearing.

Mr. Haynes requested technical assistance from the DAQ, which provided a Technical Response Memorandum ("TRM"). The DAQ recommended that the Department issue the Applicant a permit that reflected revisions to the Draft Permit ("Revised Draft Permit"). The DAQ recommended permit revisions that relied upon the Applicant's January 27, 2017 agreement to reduce the Equipment's annual operating hours from 2,920 to 2,190 and to allow only 1.2 tons of annual air emissions versus only separate limits on each solvent. The total annual limit should reduce air emissions of HAPs, for example, from the 3.1 tons per year in the Draft Permit to 1.2 tons per year in the Revised Draft Permit. Set forth below is a table that compares and summarizes the DAQ recommended Revised Draft Permit limits with the Draft Permit's limits:

Permit Condition	Pollutant	Type of pollutant	Draft Permit (Ton/Year)	DAQ Recommended Revised Draft Permit (Ton/Year)
2.1.1	Ethanol	VOC	1.1	0.5
2.1.2	Isopropyl Alcohol	VOC	1.1	0.4
2.1.3	Ethyl Acetate	VOC	1.6	0.6
2.1.4	Tetrahydrofuran	VOC	2.2	0.9
2.1.5	Methanol	VOC & HAP	1.1	0.4
2.1.6	Methylene Chloride	HAP	3.1	1.2
2.1.7	Acetone	Non-VOC/HAP	2.9	1.1
2.1.8	Total VOCs		2.5	1.0
2.1.9	Total HAPs		3.1	1.2
2.3	Total emissions	all	NA	1.2
3.5	Operating hours	NA	2,920	2,190

The DAQ TRM recommended that the Department not change the Revised Draft Permit to reflect the changes advocated in the public comments. The DAQ TRM reaffirmed that the Equipment's emissions would meet the air quality standards for protecting the environment and human health.

Mr. Haynes prepared the attached Hearing Officer's Report ("Report"), which sets forth the complete procedural history, summarizes and establishes the Record², proposes findings of fact, and provides reasons and conclusions. The Report recommends that the Department adopt the DAQ recommended Revised Draft Permit and addresses the public comments and provides reasons for not adopting the changes advocated in the public comments.

FINDINGS OF FACT

The Department finds that the Record, as established and summarized in the Report, supports a final decision to approve the Revised Draft Permit.³ The DAQ supports the Revised Draft Permit with a technical memorandum attached to its TRM, which explains in detail the reasons for the limits, as summarized above in the table of emissions.

The Revised Draft Permit's emission limits reflect a significant reduction to the limits in the Draft Permit. The public comments included comments that sought to reduce the Equipment's operating hours. In response, the Applicant agreed to reduce the Equipment's operating hours to 2,190 hours annually. Consequently, the DAQ reflected the reduced operating hours in its recommended Revised Draft Permit. The Report

² The Record contains the information that the Department relies upon in this decision.

³ Under the Department's regulations, the Department sends the Environmental Protection Agency ("EPA") the permit approved by this Order as a "proposed permit" for EPA's review and approval. *7 DE Admin. Code 1102 Section 12.4.7.*

considered the public comments and concluded that they did not raise any issue that warranted denial of the Application. The operating permit approved by this Order will supersede the Department's previously issued construction for all the Equipment and operating permits issued for one of the dryers. The Department adopts the Report and the TRM attached to it as further support for this Order.

The Department finds that the Revised Draft Permit will allow the Applicant to perform its research and development activities using the spray dryers to recover the pharmaceutical powder suspended by the solvents. The Applicant has conducted research and development at the Facility for many years consistent with New Castle County's 'Office Regional' zoning of the Facility's property that allows research and development manufacturing. Nevertheless, the public comments contend that the Facility should not operate the Equipment because of its proximity to residential neighborhoods, churches, schools, and daycare facilities. The Department has no jurisdiction to change New Castle County's zoning. Instead, the Department accepts the zoning and applies its expertise to evaluate the health risk of air emissions on nearby residents.

The Department's experts used computer modeling, applied public health risk studies, and determined that the Equipment's air emissions posed no risk to nearby residents. This Order approves the Revised Draft Permit because the Department determines that meets all the Department's requirements to control air emissions from the Equipment in order to protect the public health and the environment. The Department's experts determined that the emissions would be within recognized limits established to protect human health. The DAQ used Potential to Emit ("PTE") calculations to determine emission limits based upon a worst-case scenario of the Equipment's maximum

possible emissions; i.e., the solvent used, the Equipment's design capacities, the operation of all four dryers at once, and operating the Equipment for 2,920 hours annually. Even under the PTE conditions, the Equipment's emissions will not cause harm to human health based upon the recognized standards that are protective of human health. Moreover, the DAQ recommended permit reflects the Applicant's voluntary agreement to reduce the Equipment's operating hours in response to the public comments, which would significantly reduce the allowed emissions. The Department agrees with the DAQ recommended Revised Draft Permit and approves it based upon the reduced operating hours and lower emissions.

The DAQ and the Report considered the public comments that requested continuous emission monitoring, but the DAQ and the Report recommended no change to the proposed emissions monitoring. The method included in the Revised Draft Permit will measure emissions from the solvents based upon the amount of solvents used, which is the mass balance method of monitoring air emissions. This method is a reasonable, accurate, and widely accepted method for measuring solvent emissions. The Department finds that the total proposed emissions do not justify any continuous air monitoring equipment at this time, but the Department may re-consider this decision should the Equipment's operating history show problems with the emissions that require a continuous monitoring method.

REASONS AND CONCLUSIONS

The Department issues this Order that will approve the issuance of the Revised Draft Permit, subject to any further required federal review. The permit authorized by

this Order will allow the Applicant to operate the Equipment consistent with the permit conditions designed to protect public health and the environment.

In sum, as more fully described in the Findings of Fact above and in the Report, the Department adopts the following as a final order of the Department:

1. The Department has jurisdiction under its statutory authority to make a determination in this proceeding;
2. The Department provided adequate public notice of the proceeding and the public hearing in a manner required by the law and regulations;
3. The Department held a public hearing in a manner required by the law and regulations;
4. The Department considered all timely and relevant public comments in making its determination;
5. The Department shall submit the Revised Draft Permit as a proposed permit for the EPA's review and approval. The Revised Draft Permit includes reasonable conditions supported by the experts in the DAQ and consistent with the Department's Regulations. The Department shall issue the Applicant a permit upon the EPA's review and approval; and
7. The Department shall publish this Order on its web page and provide public notice of this Order in the same manner of the public notice of the public hearing consistent with the applicable laws and the Department regulations and otherwise as the Department determines appropriate.



Shawn M. Garvin
Secretary

HEARING OFFICER'S REPORT

TO: The Honorable Shawn M. Garvin
Secretary, Department of Natural Resources and Environmental Control

FROM: Robert P. Haynes, Esquire
Senior Hearing Officer, Office of the Secretary
Department of Natural Resources and Environmental Control

RE: Hercules, LLC's Application For An Air Pollution Control Permit to Operate Spray
Drying Equipment at 500 Hercules Road, Wilmington, New Castle County.

DATE: June 5, 2017

I. PROCEDURAL HISTORY

This Report makes recommendations to the Secretary of the Department of Natural Resources and Environmental Control ("Department") on Hercules, LLC's¹ ("Applicant") May 16, 2016 application ("Application"), which seeks an air pollution control permit to operate spray drying process equipment² ("Equipment") at 500 Hercules Road, Wilmington, New Castle County ("Facility").

The Application reflects a revision to a September 28, 2012 application. On April 16, 2014, the Department's Division of Air Quality ("DAQ") issued the Applicant a construction permit APC 2013/0083-Construction (VOC ACT)(MACT)(FE)(Amendment 1) for the Equipment. The DAQ conducted an inspection of the Equipment's construction, and thereafter on October 29, 2015 issued the Applicant an operating permit APC-2016/0037-Operation (VOC RACT)(Amendment 1) for only one of the spray dryers, identified as model PSD-1 GMP.

On May 2, 2016, the Applicant met with the DAQ to review the Equipment's potential to emit ("PTE") calculations, which the DAQ was reviewing as part of the Applicant's September

¹ The Applicant is a wholly owned subsidiary of Ashland, Inc. and the Facility is a complex of buildings on a 50-acre site that includes the Ashland Inc. corporate headquarters. The Equipment is located in a building used for research and development.

² The Equipment includes two identical model PSD-1 spray dryers (separately identified as R&D and GMP), two smaller spray dryers, model and a pollution control system. A full description of the Equipment is in the Findings of Fact, *infra*.

28, 2012 application to obtain the Department approval of re-classifying the Facility from its current major source status to a minor source status based upon the total air emissions from the Facility's eighteen air emission sources, including the Equipment, for purposes of the Department's regulation under the Department state administered *Title V Operating Permit Program, 7 DE Admin. Code 1130* ("Regulation 1130"). The result of this meeting was the Applicant's agreement to submit the Application that reflected revised PTE calculations. The Department has not approved this change to the Title V permit³ regulation pending a decision on the Application.

Pursuant to Regulation 1130's procedures, the DAQ reviewed the Application and determined that it was complete. The DAQ prepared a Draft Permit, APC-2017/0044-Operation (VOC RACT)(SM), which would supersede the Equipment's construction and operating permits. The DAQ also prepared a supporting technical memorandum, dated September 6, 2016, that explained the regulatory and scientific support for the Draft Permit's conditions.

On September 4, 2016, the DAQ published public notice of the Draft Permit in *The News Journal* and *The Delaware State News*, with public comments due by October 4, 2016. The DAQ also sent the Draft Permit to the Applicant, and the United States Environmental Protection Agency ("EPA").

The DAQ held an informal public workshop on September 26, 2016 at 6 p.m. at the Mill Creek Fire Company's Memorial Hall, which is near the Facility. The purpose of the public workshop was to explain the Draft Permit and answer the public's questions in an informal setting.

³ The Department regulates all of the Facility's 17 other sources of air emissions in a Title V permit AQM-003/00017-Renewal 1(Rev 2) ("Title V permit").

The DAQ received public comments, including requests for a public hearing. The Department assigned me to preside over the public hearing. On November 8, 2016, the DAQ published legal notices in *The Delaware State News* and *The News Journal* of a December 8, 2016 public hearing at the same location as the public workshop.

Approximately thirty members of the public attended the public hearing along with representatives from the DAQ and the Applicant. The DAQ and the Applicant made presentations and thereafter ten members of the public presented comments. I granted an unopposed request for an extension of the public comment period until January 9, 2017.

Following the public hearing, The Department received one written comment during the extended public comment period. On January 27, 2017, the Applicant submitted an email that indicated its agreement to reduce the Equipment's operating hours from 2,920 to 2,190.

I requested technical assistance from the DAQ, which prepared the attached Technical Response Memorandum (“TRM”), which recommended that the Department issue the Applicant the revised draft permit APC-2017/0044 (VOC RACT) (SM) attached to the TRM along with a revised memorandum. The DAQ TRM also addressed the public comments.

II. SUMMARY OF THE RECORD⁴

The record contains the following: 1) the verbatim transcript of the public hearing; 2) the documents introduced as exhibits at the public hearing, as identified below; and 3) this Report, the DAQ TRM and the documents referenced therein. The following summarizes the information in the record.

⁴ This summary does not establish any facts and the summary of comments at the public hearing paraphrases the verbatim transcript.

A. The Public Hearing Record

The DAQ representatives who introduced themselves at the public hearing were Paul Foster, P.E., Program Manager, Angela Marconi, P.E., BCCE, Managing Engineer, and Lindsay Rennie, Environmental Engineer. The Applicant's representatives who introduced themselves were Richmond Williams, Esquire, and Tom Baker, the Facility's Environmental Health and Safety Manager.

Ms. Marconi provided opening comments on the draft permit and presented a slide presentation, which is DAQ Ex. 1. She provided the public hearing's agenda and an overview of the Department's decision-making process. She said that the Department issued an air permit for the Facility in 1979, and that in 1999 the Department began regulating the Facility's air emission sources pursuant to the Title V air permit program. Ms. Marconi explained that in 2012 the Applicant requested that the Department regulate the Facility's air emissions based upon a "synthetic minor" permit classification, as opposed to its current "major source" classification. She indicated that in December 2015 the Department and the Applicant began the process of re-classifying the Facility from a Title V regulated facility to a synthetic minor regulated facility.

Ms. Marconi's presentation indicated that in 2013 the Applicant applied for a permit to construct four spray dryers. The Department provided public notice of this application and draft permit in 2014, and issued the construction permit in 2014. She stated that in October 2015 the DAQ issued a permit to operate one of the spray dryers.

She described the Facility as part of the corporate administrative buildings and R&D labs, which she said are within New Castle County zoning classification that allows light industry for R&D. She indicated that the spray drying process recovers pharmaceutical powder that is suspended in solvents. The recovery process emits air pollutants from the four dryers. She said that two dryers, identified as GMP and R&D, were identical model equipment and that the two

other dryers, a SD Micro dryer and fluid bed dryer, were smaller. She explained that the dryers use a carbon adsorption pollution control system. She described that the two larger dryers use nitrogen to move the pharmaceutical powder through a cyclone, a bag filter, a HEPA filter and a condenser.

She indicated that the draft permit proposes conditions that are protective of human health and the environment by requiring minimal visible emissions, records maintenance, employee training, and equipment maintenance. The draft permit also requires the Applicant to disclose any deviations from the permit.

She elaborated on the tracking of the spray dryers' operations by the amount of solvent used. She explained that the carbon adsorption bed is 90% efficient in removing air emissions. She stated that the Applicant will change a carbon bed when it reaches 85% of capacity based upon a weekly inspection and usage logs. She described other weekly inspections that would use soapy water solution to check for leaks and a breakthrough test using a draeger tube between the two carbon beds.

She addressed the public questions received after the public notice. She indicated that the emissions were from seven solvents used during the drying process that emit pollutants categorized as VOCs, HAPs and Acetone. She said that the process would only use one solvent at a time. She indicated that if the Applicant used the solvent methanol, then the emissions would be for VOC and HAP. She said the permit limits were conservative based upon assumptions that all four dryers would operate at the same time and at their maximum capacities.

She stated that the draft permit would establish annual limits of 2.9 tons for Acetone, 2.5 tons for VOCs, and 3.1 tons for HAPs. She indicated that these limits were based upon the potential to emit ("PTE") calculations. She described using the Environmental Protection Agency's ("EPA") SCREEN 3 computer model, which she described as a pretty simplistic and

very conservative model. This model compares the proposed emissions to the threshold limit value ("TLV"), as established by the American Conference of Government Industrial Hygienists. She said that the Department requires that the exposure levels be one hundred times lower than the TLV. She explained that the modeling showed that some solvents had high numbers, such as methylene chloride.

She described how the DAQ proposed to amend the draft permit to include conditions that would require operating the condenser temperature at certain maximum set points, with 5 degrees Celsius for all solvents except for methylene chloride, which would be set at minus 10 degrees Celsius. She indicated that the permit would require only operating one dryer with methylene chloride at the same time. She described how the permit prohibited the equipment from operating without the condensers and carbon beds pollution control equipment.

The Applicant's Richmond Williams, Esquire, began the presentation with a slide presentation. He stated that the record contains the Application, which he said was complete and complied with all the regulatory requirements. He provided a fact sheet that the Applicant prepared for the September meeting. He showed slides of the R&D building's location, which he said was 'fairly distant' from property's fence line. He indicated that the R&D lab makes samples for customers. He described the drying process, and its use of the carbon adsorption system, which described as two carbon bed canisters that are in series with the first canister removing 90% of the pollutants. He said the one canister satisfies the regulatory requirements and that the second bed provides additional protection.

Tom Baker, the Facility's Environmental Health and Safety Manager, spoke next and described the equipment. The first dryer he described were the two PSD 1 dryers, which he described as about 10' high and operated with a closed loop system in which the solvents circulates back through the system to reduce emissions. He said that this equipment simulates the

manufacturing process that Applicant's customers would use, but on a smaller scale. He described photographs on the slides that showed the equipment. He said the equipment would produce batches of samples for analysis by the R&D operations. He said the batch run time would be about 4 hours and would use around 2.25 gallons of solvent to collect 4 pounds of powder.

He described the micro spray dryer as a similar dryer except that it did not have a condenser. He said this dryer produces a batch after about 30 minute run time using less than a pint of solvent to collect 20 grams of material.

He described the fluid bed dryer as spraying solvent from the top. He said this equipment runs approximately 2 hours and uses half a gallon of solvent to produce half a pound of samples.

He described the two-bed carbon adsorption system as each having 7' high canister weighing 2,000 lb. and containing activated carbon. He said the carbon reacts with the solvent and prevents its discharge. He described the solvents as substances that also found in beer, wine and alcohol, fuel additives, varnishes, perfumes, and household materials. He mentioned that methylene chloride is in paint strippers and degreasers.

He explained that the process uses nitrogen as a safety feature to control the flammable solvents. He mentioned the process operates with an interlock system and a computerized system that controls and monitors temperatures, pressures, and flows to ensure that the process operates within its desired parameters. The two larger dryers will not operate without the condensers. He described the safety feature of oxygen sensors to detect any leaks and shutdown the system. He described the response to any spills.

He described the carbon beds, the baghouse, and HEPA filter for particle collection. He described the maintenance procedure in which the Applicant cleans the equipment after each batch. He described the carbon bed replacement when the first bed is at 85% capacity and

moving the second bed to become the first bed and adding a new bed as the second bed. He described the leak detection testing protocol. He described the waste disposal because of the questions asked at the September public meeting.

The following documents were marked as exhibits for the Record:

DNREC Ex. 1. May 17, 2016 Application,
DNREC Ex.2 September 4, 2016 public notice,
DNREC Ex. 3 draft permit,
DNREC Ex. 4 Applicant fact sheet,
DNREC Ex. 5 M. Nester comment,
DNREC Ex. 6. D. Nester comment,
DNREC Ex. 7 Westminster Association comment,
DNREC, Ex. 8 Stremple comment,
DNREC Ex. 9 DeDonato comment,
DNREC Ex. 10 Milltown Limestone Civic Association comment, and
DNREC Ex. 11 public notice of the public hearing.

The following is a summary of the public comments presented at the public hearing:

1. David Wallan spoke as a representative of the Parish Council of St. Catherine's Catholic Church. He objected to the permit as grossly excessive and overstated based upon the emissions of HAP and VOC in a neighborhood with homes, schools, daycare facilities, and churches. He noted that there was no monitoring requirement and that a malfunction could go undetected for days, weeks or months. He described the permit as based upon potential to emit levels of emissions or worst-case scenario and very conservative pollution control factors, while the application showed lower emissions. He stated that the PTE for the PSD-1 units was based upon the equipment operating 292 days, 10 hours a day and at 100% capacity. He compared this to the expected emission calculation that assumed 182 days and 8 hours a day at 50% capacity, which he said would justify a reduction in the permit's emissions. He said that the permit would allow emissions 32 times higher than required for the equipment's expected operation. He claimed that the permit limits provide no incentive to minimize emissions and carefully manage and monitor their output. He stated that he understood that the PTE calculations were consistent

with conventional regulatory practices, but he stated that the Facility's location in a residential area was unlike other industrial sites where there may be a buffer area between the emissions and children, elderly and others. He requested a permit that reflected the planned operating parameters and the full capabilities of the pollution control equipment. He also requested that the Department require monitoring. His prepared written statement was marked as Wallan Ex. 1.

2. Pat Carlozzi spoke as a nearby resident, a high school teacher, a Certified Management Accountant, and former employee of Agilent Technologies who worked across the road from the Facility. She objected to the permit because she questioned whether the process was R&D. She claimed that the Applicant's R&D may entail more than R&D and that it should be located in an area zoned industrial. She cited Ashland's \$5 billion annual revenues to support a move to another location. Her written statement was marked as Carlozzi Ex. 1.

3. Bill Harris spoke as a nearby resident. He objected to the permit based upon the application relying on assumed 1,820 hours of operating time in a year, but that the permit assumed 2,920 hours. He did not see any reason for the Department to be so generous in the permit.

4. Coralie Pryde indicated she was a former professional chemist and materials scientist. She said that the permit's methylene chloride limit was equal to the level that would evaporate without any controls, which she said seemed high. She said methylene chloride has serious toxicological, general environmental and air pollution effects. She recommended establishing a limit ten times less than in the draft permit. She recommended testing the emissions and not relying on the amount of solvents used in the drying process. She said the permit should have temperature requirements as a vital control for the condensers to make sure they are cold enough and that the temperature sensors should have alarms to alert when the temperature is above the allowed limits. She said that there are other ways to check for emissions using infrared or

volume spectroscopy of any GC analysis and that these are relatively inexpensive ways to analyze air emissions and can run continuously. She expressed her concern for problems with a release in a populated area without such continuous testing of the air emissions.

5. Carol Crowe spoke as a nearby resident with a background in analytical chemistry. She expressed concern with methylene chloride and tetrahydrofuran, or THF. She commented on how the presentation glossed over these chemicals and instead talked mostly about ethanol, which she claimed was the 'least problem solvent'. She said that methylene chloride and THF are known carcinogens. She mentioned the use of the SCREEN 3 model and asked if the model air emissions compared to the actual operation of the equipment. She claimed that the pilot spray dryers have been operating. She asked if there was an alert issued to the community for any unauthorized air releases. She concluded her comments by stating that she researched the Applicant's Federal Drug Administration's enforcement history and found that in 2016 that the Applicant had enforcement problems in Virginia.

6. Victor Singer provided comments on the permit being for an industrial process that is intended to be profitable. He asked about requiring insurance coverage for the public risk from abnormal operation of the equipment. He requested that the permit include a confessed judgment feature similar to such a condition in past permits.

7. Elizabeth Crowe spoke as a nearby resident and asked if the permit was a done deal. I explained that the Department's permitting procedure followed regulations that required that the Department prepare a draft permit as its tentative decision, which then is the subject of public comments.

8. William Dunn spoke as the President of the Milltown-Limestone Civic Alliance that represents nearby communities. He requested that the Department reduce the draft permit's allowed emissions, which he claimed were set too high under the circumstances. He objected to

the proposed operations near residential housing. He said the permit had limits that were ten times too high for the expected output. He criticized the Department's acceptance of a materials balance analysis as the sole determining factor for the chemicals' emissions and that any analysis would occur after potential problems exited the stacks and affected the surrounding community. He recommended that the Department require continuous air monitoring and that if the monitoring detects any exceedance of limits then the process would be shutdown. He referred to the hearing presentation on the equipment's interlock mechanism, which he said would not shutdown the air release downstream of the filters. He also stated that the condensers should operate at temperatures low enough to remove the methylene chloride. He mentioned that they would operate at 5 degrees Celsius when the equipment should operate at 10 degrees below Celsius. He mentioned going on-line and finding a dozen spectrometers, handheld and in process units, ranging in cost from a few hundred dollars for hand held units to a few thousand for in process units. He recommended adding a spectrometer to the stack that exhausts the emissions in order to protect the surrounding communities. He ended his comments by requesting that the public comment period remain open for thirty days. There was no opposition to the request, and I granted the extension.

9. Christine Whitehead identified herself as a member of the Delaware Coalition for Open Government and she complained about time and location for the public hearing, which she stated was one of the worst in her twenty-five years of watching government because it was held during rush hour traffic. She commented that Ms. Pryde took an hour to get here from Brandywine Hundred because of rush hour traffic and Christmas shopping. She said that when Hercules sold the surrounding property for residential housing they had a moral obligation to the area.

10. Beth Cucciardi spoke as a resident of Westminster. She commented on the disposal of waste materials and recommended that the Applicant follow 'green chemistry principles' that would reduce and reuse whenever possible.

I closed the hearing and indicated that the Applicant had fifteen days from the January 9, 2017 close of the public comment period to submit a response to the public comments.

The Department received comments from Mr. Dunn, marked as Dunn Ex. 1.

The Applicant in a January 27, 2017 email indicated its agreement to a permit condition that would limit the Equipment's annual operating hours to 2,190.

B. Post-hearing Record

The post-hearing record includes the DAQ TRM, which included as attachment recommended revisions to the Draft Permit and a revised technical memorandum. The DAQ TRM addressed the public comments, which DAQ categorized into four areas of concern, namely, 1) whether the Equipment's operation will be inconsistent with local zoning regulation; 2) whether the Equipment's emissions will adversely impact nearby residents and visitors to daycare facilities, churches, and schools; 3) whether the draft permit's limits are too high; and 4) whether the air emissions should be monitored at the stack.

The DAQ TRM responded to the first public concern by stating that New Castle County's zoning ordinance has the Facility located within an "Office Regional" zoning classification, which "allows light manufacturing including research and development facilities, where the facility generally resembles an industrial or manufacturing facility or where such facility manufactures a finished product." The DAQ TRM indicated that the Applicant had satisfied its regulatory burden to show that the Equipment would be consistent with the local zoning regulation.

The DAQ TRM addressed the public comments' second concern, which was the possible risk to nearby persons, by indicating that the permit's limits were based upon air emission modeling designed to protect the public from any adverse health risks. This modeling showed that maximum downwind concentration ("MDC") would be no more than 1% of the allowed threshold limit value ("TLV"), as established by the American Conference of Governmental Industrial Hygienists. The DAQ TRM indicated that human exposure at the TLV would not cause adverse health effects to nearly all workers in daily working conditions and over a lifetime of work. The SCREEN3 modeling used the following conservative assumptions for the Equipment's emissions: 1) that all the dryers would operate at the same time, 2) that all dryers operating would operate at their maximum rated capacities, and 3) that the carbon adsorption system would remove 95% of the pollutants. The Department's experts concluded that any exposure would be below 1 % of the TLV.

The DAQ TRM addressed the third public concern, which was that the permit's limits were too high. The DAQ TRM explained how the Application was based upon expected operations, which was different from the PTE emissions that the Department's regulations required for calculating the possible environmental impact. The DAQ TRM described negotiations with the Applicant over the permit limits that resulted in flexibility in the long-term and required the Applicant to use the condenser and carbon adsorption system. The DAQ TRM indicated that the Applicant agreed to reduce its operating hours in the permit in order to reduce its PTE, which allowed the Department to reduce the Draft Permit's limits for the individual solvents and a 1.2 tons total limit.

The DAQ TRM addressed the fourth public concern, which sought a different method of monitoring the emissions. The DAQ TRM indicated that its recommended permit would impose an 8.8 lb./hr. limit for any solvent used, which equates to 1.35 gallons per hour. The DAQ TRM

stated that this amount would mean that a total release would be no more than 1.35 gallons based upon the amount of solvent already in the Equipment. The DAQ TRM concluded that this amount was too low to require installing a continuous emissions monitoring system. The DAQ TRM explained that it recommended monitoring emissions by measuring the amount of solvents used by the dryers and by requiring weekly inspections of the carbon adsorption system. The DAQ recommended permit would require the Applicant to conduct weekly leak detection inspections and to measure the performance of the primary bed to determine if the carbon needs replacement. The DAQ TRM stated that the permit required replacing a carbon bed when it reached 85% of its adsorption capacity. The DAQ also revised the draft permit to incorporate numerical limits on the exhaust from the first carbon bed.

The DAQ TRM also stated that the Applicant agreed to reduce its annual operating hours from 2,920 to 2,190, which the DAQ reflected in the permit. In addition, the Department used a 95% efficiency for the carbon bed adsorption system, which reflects a 90% reduction from the first bed and a conservative estimate of a 50% reduction from the second bed. Consequently, the DAQ recommended the Department issue a permit with revised limits. The following lists the limits in the original Draft Permit and the DAQ's recommended permit:

Permit Section	Pollutant	Type	Draft 12 Month Rolling (Ton/Yr.)	Recommended 12 Month Rolling (Ton/Yr.)
2.1.1	Ethanol	VOC	1.1	
2.1.2	Isopropyl Alcohol	VOC	1.1	0.4
2.1.3	Ethyl Acetate	VOC	1.6	0.6
2.1.4	Tetrahydrofuran	VOC	2.2	0.9
2.1.5	Methanol	VOC & HAP	1.1	0.4
2.1.6	Methylene Chloride	HAP	1.2	1.2
2.1.7	Acetone	Non-VOC/HAP	2.9	1.1
2.1.8	Total VOCs		2.5	1.0
2.1.9	Total HAPs		3.1	1.2
2.3	Total emissions	all	NA	1.2
3.5	Operating hours	NA	2,920	2,190

The DAQ TRM also attached its technical memorandum, which supplements the prior technical memorandum prepared for the September Draft Permit. This memorandum provided a detailed explanation of the Equipment and the technical support for the DAQ recommended permit conditions. The most notable change was restricting the Equipment's operating hours and clarifying the pollution control system testing.

III. FINDINGS OF FACT

I find that the Record, as established above, supports that the Department approve the permit that the DAQ provided with its TRM.

The Application provided the necessary information on the Equipment, which identified the four spray dryers and their pollution control system as follows: 1) two Niro. Inc./GEA Process Engineering Division ("Niro") model PSD-1 co-current atomizer spray dryers, identified as R&D and GMP, 2) one Niro model SD Micro bench scale atomizer spray dryer, 3) one Aeromatic model MP1 fluid bed dryer, and 4) two Envirotrol model BPM-2000 carbon absorbers operating in series.

The two larger spray dryers, the PSD-1 models identified as R&D and GMP, would use one of the seven solvents the following solvents: ethanol, methanol, acetone, isopropanol, ethyl acetate, methylene chloride, and tetrahydrofuran. The Equipment sprays a selected solvent to suspend pharmaceutical powder, and then the sprayed powder is dried. The two PSD-1 spray dryers use a closed loop system with integrated condensers.

The Equipment will be operated as part of the Applicant's research and development operations located in building No. 8162 . The Applicant will use the Equipment for small batch production of pharmaceutical samples for R&D purposes. The small batch production means that the Equipment would not operate continuously. Instead, the Applicant will use a dryer to produce a batch, with the production time between 30 minutes to four hours depending on the

dryer used and the sample produced. After producing a batch, the Applicant would clean a spray dryer before its reuse. The spray dryers will have the following operational limits the spray rate of the solvent: Model PSD-1 8.8 lbs./hr., Model SD Micro 3.3 lbs./hr., and Model MP-1 2.2 lbs/hr.

The PDS 1 spray dryers have integrated condensers that reduce particle matter emissions and the Draft Permit includes a condition to control the temperature of the condensers to ensure their proper operation.

The four dryers' air emissions would be transported to the pollution control system, which uses two canisters carbon adsorbers in series. Each canister holds a 2,000 pound activated carbon bed, and the first canister should capture 90 % of the emissions. The second canister also should capture 90% of the emissions, and together they should capture 99% of the spray dryers' emissions. The DAQ used 95% efficiency factor in its revised Draft Permit in order to be conservative. The emissions from the pollution control system would vent through a single stack 10' above grade and 341' from the nearest property line.

The Equipment's emissions will be monitored using a mass balance or material balance method. This method relies on the amount of solvent used in the process. This measurement is used to determine when the carbon beds should be replaced. This method is a widely accepted and used method for measuring emissions, particularly from solvents. The DAQ revised Draft Permit also requires weekly testing of the pollution control system's operation.

The revised Draft Permit will allow the Equipment to operate up to 2,190 hours annually. This operating restriction will be enforced by a condition and restricts the air emissions. Under the DAQ recommended Draft Permit, the emissions of any of the solvents' pollutants will be no more than 1.2 tons over a twelve-month rolling average.

All the public comments opposed the Draft Permit. Several of the public comments claimed that the Equipment's operation would endanger public health because of the emissions near residential areas, churches, schools, and day care centers. Other public comments questioned whether the proposed use of the Equipment was compatible with local zoning requirements. Finally, the public comments opposed the emissions monitoring that did not measure the actual air emissions.

The DAQ TRM provided a response that indicated that the Equipment's emissions would meet the standards for protecting public health and the environment. I agree that the record supports finding that the Equipment's emissions would not adversely affect residents and visitors to nearby properties based upon the scientific support for the impact on human health. The Department's experts, using approved computer modeling, determined that the Equipment's air emissions would meet the air quality requirements at the Facility's boundaries. The emissions would be 1% of the TLV determined to be safe for humans. The EPA SCREEN 3 computer modeling software used assumptions that had emissions from all dryers operating at once and at maximum design capacity. This assumption inflates the emissions above the expected actual levels, which allows the Department to regulate emissions based upon a worst-case scenario.

The DAQ TRM also addressed the issue of the zoning. The DAQ TRM indicated that the proposed use was compatible with New Castle County's zoning regulation as "Regional Office." I find that the record supports that the Applicant supported its Application by providing that the Equipment's proposed use complies with New Castle County's zoning regulation. I further find that the Applicant's information meets the Department's filing requirements for disclosure of the local zoning compliance. The Department does not have any legal authority to determine whether the Equipment will in fact comply with New Castle County's zoning.

The DAQ TRM addressed the public concern with the emission monitoring by determining that the maximum possible emission did not justify the installation of monitoring equipment. I agree and find that the mass balance method is a widely accepted method for measuring and monitoring solvent emissions. The Equipment will not operate continuously and there is no need for monitoring equipment of the actual emissions when the monitoring may be accomplished accurately by the measurement of the solvents used and the proper maintenance and inspection of the pollution control system.

The DAQ revised the draft permit to address some of the public concerns. The revised draft permit reflects lower operating hours. In addition, the total emissions from all the solvents combined will be no more than 1.2 tons annually, which means that the use of multiple solvents will reduce the 1.2 limits for total from any of the seven solvents. The draft permit also reflects temperature limits on the PSD-1 condensers.

IV. CONCLUSIONS AND REASONS

I find and conclude that the record supports approval of the DAQ permit attached to the TRM. The approval of the revised draft permit will be the proposed permit that the Department will send to EPA for its review as required by Regulation 1130's procedures and if EPA approves the Department will issue the final permit. The permit recommended for approval will supersede the construction permit for all the Equipment and the operating permit for the PSD-1 GMP dryer.

The revised draft permit reflects changes made in response to the public comments, and includes a lower operating hour assumption used to calculate the PTE. In addition, the revised permit conditions impose a combined emissions limit, which will effectively lower the total emissions of any one solvent if the Applicant uses multiple solvents. The Applicant intends to

use multiple solvents, which means that the combined total limit will apply to lower the emissions of any one solvent.

The public comments that claim that the Equipment's operation would violate land use regulation do not support any denial of the permit application absent New Castle County's determination that the Equipment's operation would violate local land use ordinances.

The DAQ experts prepared memorandum on the Application and the draft permit, as revised, that explains the draft permit's conditions and that the air emissions will not pose an undue risk to the environment and public health.

I recommend that the Department enter an Order with the following ordering paragraphs:

1. The Department issues this Order pursuant to *7 Del. C. Section 6006* following a public hearing on the Application and draft permit to operate the Equipment at the Facility;
2. The Department is authorized under *7 Del. C. Section 6003(b)(1)* to issue permits for the construction, installation, replacement, modification or use of any equipment which may cause or contribute to the discharge of an air contaminant;
3. The Department provided adequate public notice of the Application, the draft permit, and the public hearing as required by *7 Del. C. Section 6004*, and held the public hearing in a manner required by *7 Del. C. Section 6006* and the *Air Quality Regulations* at *7 DE Admin. Code 1100 et seq.*;
4. The Department considered all timely and relevant public comments in making this determination, and this Order and attached Report establishes the Record to support a final decision on the Application;
5. The DAQ shall issue a proposed permit for EPA's review consistent with the draft permit approved by this Order and shall issue a permit to the Applicant following EPA's review and approval;

5. Pursuant to 7 Del. C. 6001, the conditions and terms in the permit amendments approved by this Order will protect the public health, safety and welfare from any undue harm from the Equipment's operation; and

6. The Department shall publish this Order on its web site and provide such public notice of it in a manner required by the law and the Department's regulations.



Robert P. Haynes, Esquire
Senior Hearing Officer

MEMORANDUM



TO: Robert Haynes
Hearing Officer

THROUGH: Ali Mirzakhali, P.E.
Division Director

Angela D. Marconi, P.E., BCEE
Acting Program Manager

FROM: Lindsay Rennie
Environmental Engineer

SUBJECT: **Report on the Public Hearing for Hercules LLC's proposal to operate Four (4) Spray Dryers, located at 500 Hercules Road, Wilmington.**
Draft Permit: APC-2017/0044-OPERATION (VOC RACT)(SM)

DATE: March 17, 2017

Background

Given below are the Division of Air Quality's responses to the comments made at the public hearing held on December 8, 2016 regarding Hercules LLC's, request to operate four (4) spray dryers at 500 Hercules Road, Wilmington.

Hercules LLC is a wholly owned subsidiary of Ashland Inc. The Hercules Research Center is a facility that conducts Research and Development for pharmaceutical products. This facility is classified as a Title V source operating under Permit: **AQM-003/00017-Renewal 1 (Rev 2)**. On January 27, 2012 the facility submitted an application to be reclassified as a Synthetic Minor Source. This request was subsequently withdrawn and reissued as a request to be classified as a Natural Minor Source on January 14, 2015. After reviewing the facility's emission units the Department notified the facility of their ineligibility for a Natural Minor status on November 16, 2015.

The facility applied for a construction permit for an R&D Spray Drying Process consisting of four (4) spray dryers and associated equipment on September 6, 2013. A construction permit was issued on April 16, 2014. The Process consists of one R&D Spray Dryer, one GMP Spray Dryer, one SD Micro Spray Dryer, one MP-1 Fluid Bed Dryer and a carbon adsorption system. The operation permits for the four spray dryers were to be issued as individual permits. This began with the issuance of the GMP spray dryer permit on October 29, 2015. However, as part of the reclassification process from Title V to Synthetic Minor, the operation permits for the GMP spray dryer and the remaining three (3) spray dryers will be issued as one synthetic minor permit.

Review of Application and Public Hearing

The Division of Air Quality (DAQ) issued a public notice that it had developed a Draft Synthetic Minor Permit: **APC-2017/0044-OPERATION (VOC RACT)(SM)** for the Hercules spray drying process. The legal notice was published in the Sunday News Journal and the Delaware State News on September 4, 2016. A public meeting was held Monday, September 26, 2016. A public hearing was requested and held on December 8, 2016 at the Mill Creek Fire Company, located at 3900 Kirkwood Highway, Marshalltown, Delaware to receive comments on DAQ's draft permit. The public notice period closed on January 9, 2017 in response to a request made at the public hearing for an extended public comment period.

On behalf of DNREC Hearing Officer, Mr. Robert Haynes, conducted the public hearing. Prior to the public comments, the Division of Air Quality (DAQ) Managing Engineer, Mrs. Angela D. Marconi, P.E., BCEE presented the background information on air permitting actions that included the permit application, draft permit and legal notice for the Spray Drying Process.

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The applicant representatives, Mr. Tom Baker, EH&S Manager, and Mr. Richmond Williams, Esquire spoke on behalf of Hercules LLC. They presented technical information on the spray drying process and specifics of the draft permit related to the equipment, emissions, and controls.

A public hearing comments report, with comments received during the public hearing, was prepared by Wilcox & Fetzer, Ltd and was submitted to the Department on December 14, 2016.

Enforcement History

A Notice of Violation was issued in 2010 due to late submittal of an application for Permit: AQM-003/00017-Renewal 2 during 2010. A NOV Penalty due to noncompliance has been served and a NOV settlement has been satisfied.

Comments and DAQ Response

The main concerns brought up at the Public Hearing were in reference to zoning, proximity of the Facility to residential communities, the quantity of emissions allowed by the permit, and the level of monitoring required by the permit. Each concern is addressed below and is referenced in the table of General Public comments. More individual concerns are addressed in the table alongside the comment.

1. The Spray Drying Process is not allowed based on Zoning Restrictions.
While the area surrounding Hercules is indeed residential, the property on which Hercules sits is zoned "Office Regional". This zoning designation according to the New Castle County Unified Development Code is designed to accommodate light industry including "research and development facilities, where the facility generally resembles an industrial or manufacturing facility or where such facility manufactures a finished product." Hercules meets this description and as such is zoned appropriately to operate a small scale spray drying process.
2. The Facility and associated emissions are in too close a proximity to residential communities.
The Department conducts conservative emissions modeling prior to the issuance of each permit. The passing criteria requires the maximum downwind concentration (MDC) to be no more than 1% of the allowable threshold limit value (TLV) as established by the American Conference of Governmental Industrial Hygienists. The TLV represents conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects. Based on SCREEN3 modeling, the maximum downwind concentration occurs within the property boundary line. Any exposure experienced by neighboring communities will fall below this concentration. The emission rate used for this modeling was reevaluated based on an adsorption efficiency of 95% from the carbon beds. All of the solvents meet this conservative criterion when all units are operating simultaneously under maximum operating conditions.
3. The quantity of emissions allowed by the permit is too high.
The permit application requested emission limits based on the Facility's expected operation. After discussions with the facility over the course of several months it was determined that a flexible permit limit would be more sensible long term. The permit limits set in the draft permit allows flexibility over the ratio of solvents used in a year while requiring the use of the capture and control devices i.e. condensers and carbon adsorbers.

The facility has decided to reduce their permitted hours of operation, thereby reducing their maximum potential emissions. This federally enforceable hourly limit will allow for no more than a total of 1.2 tons of pollutant to be emitted in any twelve month period. This emission limit reduction also reflects the control efficiency of the second carbon bed, an increase from 90% to 95% control efficiency.

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4. The permit does not require adequate monitoring of emissions.

The facility operates small R&D processes. The permit limits the processing rate to 8.8 lbs/hr for the larger units. This equates to about 1.35 gallons per hour. In the event of a failure the total release would be no more than the 1.35 gallons already introduced to system. These quantities are too low to require continuous emissions monitoring. Instead, the facility is required to monitor the throughput to the system as a method of long term emissions monitoring. Additionally, weekly checks of the carbon adsorbers are conducted to ensure the equipment is controlling effectively. These include a leak check of the fittings and connections and a draeger tube test to verify satisfactory adsorption from the carbon beds and that breakthrough between the carbon beds has not occurred. The facility will use mass balance as the primary indicator to determine breakthrough; changing the beds at 85% capacity rather than waiting for the draeger test to indicate saturation of the first carbon bed.

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The comments in the table below have been edited for clarity and brevity. Verbatim statements can be found in the Air Quality Hearing Transcript prepared by Wilcox & Fetzer, Ltd.

General Public Comment Summary	DAQ Responses
<p>DAVID WALLAN REPRESENTATIVE OF THE PARISH COUNCIL OF ST. CATHERINE OF SIENA CATHOLIC CHURCH:</p> <p>The emission limits requested in this permit are based on what are called potential to emit calculations. It would give the Applicant free reign to legally emit far more pollutants than are required to operate the facility. Inflated permit limits also provide no incentive for the Applicant to minimize emissions and carefully manage and monitor their output since they are permitted pollutants at the ultimate limits of their capability.</p> <p>The permit application also contains much more modest and realistic expected emission calculations. We would like to see a permit application that accurately reflects the planned activity of this new facility with reasonable factors for variation and output. Such an application would include assumptions that reflect the planned operating parameters, the rates, and the operating schedule of the facility to take into account the full capabilities of the installed air pollution controlled system, i.e., the two carbon absorption beds and use the expected solvent mixtures.</p> <p>There is no requirement to regularly monitor or measure the amount or types of materials being released into the air. An equipment malfunction or mishap might go undetected for days, weeks or months. We would like to see a permit application [that] would include...provisions for regular and systematic monitoring and measuring the pollutants emitted would also be included so that we have some assurance that our community is not being jeopardized.</p> <p>We submit that this permit is not conventional. It requests to emit tons of HAPs from a site located in a dense residential community. Unlike many other industry sites, there is little to no buffer zone between it and the surrounding neighborhoods.</p> <p>Children, the elderly and others at high-risk for air pollutants are close by.</p>	<p>See response 3.</p> <p>See response 3.</p> <p>See response 4.</p> <p>See response 2.</p>
<p>MS. PAT CARLOZZI:</p> <p>Before a process like this would have begun, Ashland must have determined where small scale and large scale chemical manufacturing would take place. It sounds like your large scale manufacturing is going to take place at these large pharmaceutical companies. But certainly, you could be doing the small scale testing work at their locations. Certainly, someone would have raised the point that zoning laws, as they exist,</p>	<p>See response 1.</p>

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<p>would not permit you to do this in a residential neighborhood, and there would have been a Plan B that you would have financially modeled. Why not just go with a Plan B? Secondly, why not move to [an industrial] location, or the final location which you identified that you're going to do your scale of?</p> <p>MR. BILL HARRIS: The initial application projected or requested 1,820 hours of operating time. But the permit itself is based upon 2,920 hours that has been pointed out. That is a significant effect on the PTE from the permit. And it's not really clear to me why this extended amount of run time was given. I don't see any reason why DNREC should be generous and give more operating time than what the permittee originally applied for. Secondly, just listening a few moments ago, Ashland noted that all of the solvents are processed -- the process itself is, approximately, four hours per batch where solvents are being used, and I'm assuming some, that means some solvent would be going through the dryers and into the carbon beds and thus being emitted into the atmosphere. Again, the emission calculations in the permit memorandum are based upon ten hours of solvent flow per batch. Again, that is grossly inflating the amount of solvent potential to emit. Is it four hours? Is it ten hours? If it is four hours, we need to reduce the potential to emit to that quantity.</p> <p>As part of the permit application, the permittee is limited to no more than disposing of 11 pounds per day of Volatile Organic Compounds. And that is a standard throughout the whole state. One of the substances, Methylene chloride, after running through the carbon filter, will be emitting about 1.5 pounds per day. Ten times 1.5 is 15 pounds per day. And it is being emitted to the atmosphere. That, to me, sounds like a definition of disposal of Volatile Organic Compound. So, if it is ten hours per batch of operation, why are they being allowed to exceed other permit conditions?</p> <p>We talked about operating hour limits, but I think that needs to be included as one of the operating limits of the permit. Nowhere does it say exactly how many hours per day can they run. Preferably, the permit should specify the amount of hours of spraying and condensing is permitted on a rolling 12-month basis. This is just numbers that are backed up where the potential permit numbers from the permit come from. They should just make it more clear exactly what we are expecting Ashland to do. Likewise, their emission calculations are based upon -- we talked about earlier -- only one solvent per batch. We should put that in the permit to make it clearer. Something might come down the pike and they may decide a combination of solvents might be something they want to try to experiment with. The permit as written right now would allow them to do that, although the emission calculations are based upon one solvent at a time. We also, again, on the operating limit one batch per day. That is what Ashland is asking for. Let's put it in concrete. Let's put it in the permit.</p>	<p>See response 3.</p> <p>The referenced condition does not allow disposal of VOCs in a manner that would allow evaporation into the ambient air. Emissions are not considered disposal. The solvent collected in the condensers are to be stored and disposed of in an acceptable manner.</p> <p>This would be unnecessarily stringent with no improvement in air quality control. The facility has requested an annual hourly limit to lower the maximum PTE.</p>

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<p>At one point the permit talked about replacing the carbon bed filters at breakthrough, but breakthrough is never specifically defined. It mentions earlier in this permit that efficiency would be 90 percent or better. I'm assuming that is what they are referring to as breakthrough, but it is not clear. That needs to be defined in the permit. And likewise, if the emissions are based upon a 90 percent efficiency operation, the carbon bed filters, and they would say breakthrough occurred at 90 percent, it would seem to me the safe thing to do is set a higher efficiency to be defined as breakthrough, 92, 93 percent. What it is, I'm not sure because we don't have enough information. We don't really know exactly with the information given how fast is the break-through. We got some information from the manufacturer, but, as we know, every process is different. Certain conditions, certain circumstances it might happen after so many hours, "X" number of hours. But other circumstances, it might happen under "Y." We're just going by some generic off-the-shelf manufacturer's information. I'm requesting that Ashland provide harder data, preferably through testing, to help us define when the breakthrough would occur so we can start to change the beds out before that breakthrough occurs. Along those lines, right now the permit requires weekly testing of the VOC, HAP emissions. It doesn't really define which technique is to be used. We need that defined. And until we get the breakthrough defined, I would request that the testing be done more frequently, preferably daily, during operations so we can have data. After a period when we are comfortable when the breakthrough occurs under different circumstances, perhaps then we can go back and loosen up how frequently the testing needs to be done. Likewise, we talked about the carbon bed has to be changed at the breakthrough. There is nothing in the permit requiring testing of the VOCs after that change out. What's to say there might not be some problem with the bed itself or the process that was done? We could run, according to the permit right now, a week much less than 90 percent efficiency and we wouldn't know about it until the next time we test. So, I would request that part of the permit require testing for VOCs and HAPs immediately after any carbon bed change out.</p>	<p>See response 4.</p>
<p>The permit also has generic language in there giving DNREC the opportunity or permission to request stack testing when requested. It is a new process. We think we know what it's going to do. It seems to me to be judicious to do a stack test on the whole process once we get it up and running to make sure it's doing what it's supposed to be doing. We'll all agree it is good engineering practice in the first place, let's put it down. And maybe then, based upon what we see and assumed efficiencies, put them on a separate schedule for a stack testing.</p> <p>On another topic, Methylene chloride is one of the VOC chemicals that will be used. In fact, it looks like one of the more common chemicals used. I note that just recently the EPA says as part of the Toxic Substance Control Act, they will be reexamining Methylene chloride for its toxicity and danger to the</p>	<p>See response 4.</p> <p>In the event of an EPA ruling, DAQ permits will be addressed as necessary.</p>

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<p>human health. What happens, and this is nothing that I guess can be addressed right now, but I think the public needs some understanding from DNREC, but what happens if the EPA decides to reclassify Methylene chloride as an extremely hazardous compound. What happens if they change the limits? I know our screen testing assumes the published acceptable exposure limits for Methylene chloride, what is to say if that changes down the road, what processes do we have to go back and revise the permit for the use of Methylene chloride?</p>	
<p>MS. CORALIE PRYDE: Looking at the amount of methylene chloride that is permitted, it seems to be equal to the amount of methylene chloride that would evaporate normally in an uncontrolled situation without filters and other things. It seems to me that the amount of methylene chloride that is allowed should be very close for what was listed for the control situation. And that's ten times less that it has been permitted for.</p> <p>I did not quite understand in this permit is exactly what controls are there to make sure that the process is working properly at all times. I hear about tests that should be done on occasion. And on test...is a mass balance. That is not a very accurate way to do things, and it does not give you on-the-spot results.</p> <p>With modern technology there are a lot of ways to check for the various solvents that are being used, whether it is infrared or volume spectroscopy or any GC analysis. I think there are a lot of, at this point, relatively inexpensive analysis that you can run continually. Again, because of the constant readout of what's happening that is there, and also with some kind of a device to either send out an alarm, or to trigger an automatic shutdown when the amount of affluent gets up to more than would be expected.</p> <p>A vital part of this situation is making sure that your condensers are cold enough. And it seems like it would be quite simple and straightforward to put some kind of temperature measurement in for the water or water mixture that is being used in the condenser and to measure that at all times. And to ensure it's always several degrees below the maximum point that's allowed, and that there would be some kind of alarm when it approaches anywhere near that maximum and either have a worker prepared to shut down the machinery as it reaches that point or even have an automatic shutoff.</p>	<p>See response 3.</p> <p>See response 4.</p> <p>See response 4.</p> <p>The condenser temperature is monitored continuously. The permit requires the Facility to stay below temperatures necessary for adequate condensing for applicable units.</p> <p>See response 4.</p>
<p>MS. CAROL CROWE: I just wanted to reiterate some of the problems with some of the solvents in particular, the methylene chloride and the tetrahydrofuran. I guess they were talking about the 90 percent efficiency of the carbon beds. So, that means that ten percent could be escaping...into the nearby community.</p>	<p>See response 2 and 3.</p>

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<p>You have been running like the pilot spray dryers for a while. Have they compared like what the modeling drift studies and whatnot, how they compare to actual emissions from the pilot dryers?</p> <p>If there is an emission, if something happens, is there any way that you can alert the nearby communities, the people that live right across the street? So, if you do have an emission excursion, there is nothing in there to alert the nearby communities for potential problems.</p> <p>I looked up Ashland and Hercules, and I saw that they were having, most recently, some problems with the FDA down in one of their Virginia sites for toxic waste problems down there.</p>	<p>This information is not pertinent to the issuance of the air permit.</p> <p>See response 2. The permit contains a reporting provision. The community is welcome to sign up for the Delaware Environmental Release Notification System.</p> <p>DAQ has no comment.</p>
<p>MR. VICTOR SINGER:</p> <p>I would like to be assured that insurance coverage exists to cover the potential for public risk. That potential for public risk is not as much during normal operation of the system as during abnormal operation of the system. There is existing law the DNREC is responsible for enforcing that deals with abnormal risk. There out to be sufficient insurance coverage to assure that whatever damage potential, if there is, is going to be paid for promptly.</p> <p>If somebody contends to have been damaged by emissions of some sort from this operation, the question that arises is who has the burden of proving the connection. The permit issued by DNREC many years ago when there was a confessed judgment feature. Anything that could have been related to the process was permitted, the Applicant could confess to being responsible for any bad outcome. That sort of feature ought to be built into the permit.</p>	<p>This is not a standard condition.</p> <p>DAQ has no comment.</p>
<p>MR. WILLIAM DUNN, PRESIDENT OF MILLTOWN-LIMESTONE CIVIC ALLIANCE:</p> <p>Many would like to insist that the proposed approval of emission limits be lowered as they are far too high under the circumstances. [DNREC] allows outputs that could exceed their proposed operation by as much as ten times in some chemical situations. Hercules LLC's expected output [is far too high considering] the proximity of their operation to residential housing.</p>	<p>See response 3.</p>

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<p>The Company's proposal to rely on material balance analysis as the sole determining factor as to what the process's output may be inadequate for two reasons. Firstly, the frequently acceptable material balance analysis is still referred to as the theoretical method in determining the consumption or use of chemicals in the process. Secondly, it only evaluates any problems that may develop after the potential problem has exited the stacks and impacted the surrounding community. We think it is both reasonable and rational... to insist that a continuous air monitoring be employed, and that monitoring be tied back to the process equipment to trigger a shutdown when emissions begin to approach or exceed unsafe levels.</p> <p>The instrument condensers will not operate at a temperature low enough to fully remove the methylene chloride because I think they referred to it operating around 5C where you have to get to -10C to capture the methylene chloride in the process.</p> <p>Spectrometer manufactures have off-the-shelf pieces of equipment ...that run from a few hundred dollars...to a few thousand dollars. When tied back into the process control loop ...one of these units added to each exhaust stack benefit the surrounding homeowner's safety, [and] reflect a true community and environmental stewardship on behalf of Ashland and Hercules, LLC.</p>	<p>See response 2. See response 4.</p> <p>The draft permit has always required the condenser temperature to be below -10°C for methylene chloride.</p> <p>See response 4.</p>
<p>MS. CHRISTINE WHITEHEAD, DELAWARE COALITION FOR OPEN GOVERNEMENT MEMBER: Hercules has a high moral responsibility because they sold this property for residential use. They are now surrounded close by a number houses and families.</p>	<p>See response 2.</p>
<p>MS. BETH GUCCIARDI: I was struck by the fact that you guys were sending off your waste solvent for incineration, rather than reclaiming it. It would be wonderful to see Hercules Ashland commit to the principles of green chemistry...specifically looking for alternatives to using methylene chloride as a solvent in that system. There are other solvents that are much less harmful.</p>	<p>DAQ has no comment.</p>

MEMORANDUM

Hercules LLC

DAQ's Response Document for the Public Hearing on December 8, 2016

Draft Permit: APC-2017/0044-OPERATION (VOC RACT)(SM)

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COMMENTS

In response to the Public Hearing comments, the Facility has offered the following reductions in emission limits to the "Proposed" permit. The revised emission limits represent a 730 hour reduction in operating hours from 2,920 hours per year to 2,190 hours per year. Additionally, the emission limits are adjusted to show the usage of the second carbon bed, raising the control efficiency from 90% to 95%.

- 2.1 Air contaminant emission shall not exceed those specified in 7 DE Admin. Code 1100 and the following:
 - 2.1.1 Ethanol: 0.5 TPY (from 1.1 TPY)
 - 2.1.2 Isopropyl Alcohol: 0.4 TPY (from 1.1 TPY)
 - 2.1.3 Ethyl Acetate: 0.6 TPY (from 1.6 TPY)
 - 2.1.4 Tetrahydrofuran: 0.9 TPY (from 2.2 TPY)
 - 2.1.5 Methanol: 0.4 TPY (from 1.1 TPY)
 - 2.1.6 Methylene Chloride: 1.2 TPY (from 3.1 TPY)
 - 2.1.7 Acetone: 1.1 TPY (from 2.9 TPY)
 - 2.1.8 VOCs: 1.0 TPY (from 2.5 TPY)
 - 2.1.9 HAPs: 1.2 TPY (from 3.1 TPY)
- 2.2 Total emissions in a twelve month rolling period shall not exceed 1.2 tons.
- 3.1 Hours of operation of the spray drying process are not to exceed 2,190 hours in any twelve month rolling period.

The Department has clarified the testing and monitoring requirements of the permit.

- 4.2 The Facility shall conduct draeger tube tests as a secondary measure to determine breakthrough in accordance with Condition 3.5.3 and Appendix C, where Appendix C is subject to verification.
 - 4.2.1 A weekly test sample shall be taken after the primary carbon bed. Before breakthrough is determined as defined in Appendix C of this permit, the facility shall discontinue use of the carbon train until the primary carbon bed has been replaced with one that has not reached saturation.

APPENDIX C

Primary Carbon Bed Gas Stream Concentration

Solvent	PPM by Vol at 90% Efficiency
Ethanol	2,308
Isopropyl Alcohol	2,796
Ethyl Acetate	4,545
Tetrahydrofuran	8,582
Methanol	5,514
Methylene Chloride	7,315
Acetone	10,693

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RECOMMENDATIONS

DAQ has prepared the revised "Proposed" Permit: APC-2017/0044-OPERATION (VOC RACT)(SM) for the Department's review of comments, findings, and suggestions. DAQ recommends submitting the attached permit and revised technical reference memorandum as part of the hearing record.

I hope this information will assist you in reviewing the issues and making your recommendations to the Secretary of the Department of Natural Resources and Environmental Control. If you have any questions, please contact the Division at (302) 323-4542.

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pc: Dover File

MEMORANDUM

TO: Angela D. Marconi, P.E., BCEE *AM*

FROM: Lindsay T. Rennie *LR*

**SUBJECT: Hercules, LLC.
Hercules Research Center
"Proposed" Permit: APC-2017/0044-OPERATION (VOC RACT)(SM)
R&D Spray Drying Process**

DATE: March 17, 2017

BACKGROUND INFORMATION

Hercules LLC is a wholly owned subsidiary of Ashland Inc. The Hercules Research Center conducts Research and Development for pharmaceutical products. This facility is classified as a Title V source operating under **Permit: AQM-003/00017-Renewal 1 (Rev 2)**. On January 27, 2012 the facility submitted an application to be reclassified as a Synthetic Minor Source. This request was subsequently withdrawn and reissued as a request to be classified as a Natural Minor Source on January 14, 2015. After reviewing the facility's emission units the Department notified the facility of their ineligibility for a Natural Minor status in November 16, 2015.

The facility applied for a construction permit for an R&D Spray Drying Process consisting of four (4) spray dryers and associated equipment on September 6, 2013. A construction permit was issued on April 16, 2014. The Process consists of one R&D Spray Dryer, one GMP Spray Dryer, one SD Micro Spray Dryer, one MP-1 Fluid Bed Dryer and a carbon adsorption system. The operation permits for the four spray dryers were to be issued as individual permits. This began with the issuance of the GMP spray dryer permit on October 29, 2015. However, as part of the reclassification process from Title V to Synthetic Minor, the operation permits for the GMP spray dryer and the remaining three (3) spray dryers will be issued as one synthetic minor permit. Below is the process, technical information and SCREEN3 analysis for each spray dryer and the full process.

PROCESS DESCRIPTION

The PSD-1 GMP spray dryer and PSD-1 R&D spray dryer are identical units manufactured by Niro/GEA. The PSD-1 spray dryer is a small co-current atomized nozzle spray dryer for pharmaceutical research. It includes a feed pump to add solution to the atomizer and an inlet gas heater to heat the process gas. In the drying chamber the heated gas dries the atomized droplets from the feed pump. The droplets then move through a cyclone, a bag filter and a HEPA filter to collect the product. Most of the solvent that passes through the filtering stages or evaporated in the drying chamber is recovered in the condenser. The final controlled emissions from the drying process are vented through two carbon adsorber beds in series.

The SD Mirco spray dryer manufactured by Niro/GEA is a small bench scale dryer for pharmaceutical research. It includes a feed pump to add solution to the atomizer and an inlet gas heater to heat the process gas. In the drying chamber the heated gas dries the atomized droplets from the feed pump. The droplets then move through a cyclone, a bag filter and a HEPA filter to collect the product. The final emissions from the drying process are vented through two carbon adsorber beds in series. The SD Micro spray dryer does not have a condenser for solvent recovery.

The MP-1 Fluid Bed is manufactured by Aeromatic. This unit is a small fluid bed processor for spray drying, granulating and coating for pharmaceuticals research.

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The R&D and GMP spray dryers each have a condenser that is welded in line for solvent removal. The SD Micro and MP-1 spray dryers do not have condensers. All of the dryers vent through the activated carbon adsorption system.

TECHNICAL INFORMATION

Emissions from the spray dryer units will consist of acetone, volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). Estimated emission calculations follow.

During a batch, solvent is added to the process up to a maximum spray rate. A typical batch contains solvent and solids, for conservative calculations the batch makeup is considered entirely solvent. In between batches the time for disassembly, cleaning, drying and reassembly of the equipment requires fourteen (14) hours. This allows for ten (10) hours per day to run each batch. Following the drying process, the spray dried material is characterized for particle size, particle size distribution, density, solvent content and morphology. This accounts for approximately 20% of the processing time throughout the year; 73 days per year of processing time leaving 292 days to run batches. The maximum operating hours of the spray dryer result in 2,920 hours per year (10 hours/batch X 292 batches/year).

Two Envirotrol BPM-2000 carbon adsorbers in series will be used to control the emissions from each of the spray dryers. At 2000 pounds of activated carbon per adsorber and a density of 0.47 g/mL (29.313 lb/ft³), the carbon will have a volume of 68.2 ft³. The pressure drop at 50 cfm, according to the Pressure Drop Chart in Attachment II of original application, is <1.0 inches of water. A single carbon bed has an adsorption efficiency of 90%.

Pre-Condenser Emissions

In the case of the R&D and GMP spray dryers; most of the solvent that enters the spray drying process is recovered through the condenser and disposed of as waste. Without the condenser the solvent would be vented into the atmosphere. The use of the condenser is considered integral to the system and as such is not considered a control device. The PTE is the amount of solvent that is vented to the carbon beds.

Pre-Carbon Bed Emissions

The emissions for the R&D and GMP spray dryers after the condenser and before reaching the carbon bed can be found in Table 1. The quantity per year exhausted for each solvent is calculated as a percentage of the total gas vented based on the total nitrogen vented, the solvent usage quantity and the solvent factor.

The solvent usage quantity is the typical liquid solvent amounts used throughout the year expressed as a percentage of total solvent use. Each of the solvents typically range in usage from 1% to 35% over the course of a year. Isopropyl Alcohol, Ethyl Acetate and Tetrahydrofuran each account for 1% of the expected yearly solvent volume, while Methanol and Acetone each account for 35%. To provide the most flexibility in solvent usage and to determine conservative emission rates; the single most volatile solvents for VOCs and HAPs each are assumed to be used exclusively for all batches. This provides the worst case solvents to determine the VOC and HAP limitations.

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The solvent factor is a mass ratio of solvent gas and nitrogen gas in the vent stream at ambient pressure. The ratio is calculated based upon the molecular weight and vapor pressure of each solvent at their maximum condenser temperatures. The total nitrogen vented is a maximum of 26.4 lbs/hr (12kg/hr) based on equipment design of the PSD-1 spray dryers (GMP and R&D). The amount exhausted for each solvent is:

$$\text{Total Nitrogen Vented(lb/yr)} \times \text{Yearly Solvent Usage(\%)} \times \text{Solvent Factor(lb/lb)} \\ = \text{Solvent Emissions (lb/yr)}$$

In the case of the SD Micro spray dryer and the MP-1 Fluid bed; none of the solvent that enters the spray drying process is recovered but is vented through the carbon adsorbers. The waste that can occur before the carbon beds is the PTE for the spray drying process. Maximum emissions in TPY for each solvent are listed in Table 2 and 3 below.

Post Carbon Bed Emissions

A single carbon bed has a carbon adsorption efficiency of 90%. The two in series will an efficiency of 99%, though conservative calculations assume a combined 95% efficiency. The carbon adsorber units are monitored for solvent loading using the following procedures to ensure that the air pollution control system is operating properly to control emissions.

The carbon beds are monitored via a Carbon Bed Usage Log totaling the amount of solvent sent to the carbon beds. When the CBUL reaches 550 pounds; 85% of the loading capacity, the carbon bed is considered saturated and sent offsite for regeneration. A secondary method of determining saturation is a weekly draeger tube test. When the test shows that the primary carbon bed is no longer controlling at 90% efficiency, the unit is replaced. The secondary carbon bed is moved into position to replace the primary unit and will be monitored as a new primary carbon bed unit. A new carbon bed, with fresh activated carbon, is used to replace the secondary unit in the train. Additionally the carbon bed is checked weekly for leaks. The facility has five carbon beds on site. Four are part of the two trains of carbon beds and the fifth serves as a replacement. The testing procedures are incorporated into the "Use of Carbon Bed Adsorbers" Standard Operating Procedures.

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POTENTIAL TO EMIT (PTE)

The PSD-1 Spray Dryers operate at a maximum spray rate of 8.8 lbs/hr for 2920 hours per year. This results in a maximum of 25,698 lbs of solvent spray dried each year or 12.85 TPY. The solvents can be made up of completely VOCs, completely HAPs, some mixture of the two, or of acetone. The PTE is 8.51 TPY of VOCs and 12.85 of HAPs. The PTE however, totals no more than 12.85 TPY. Hourly and annual emissions for each part of the PSD-1 spray drying process are below. The controlled emissions reflect 95% removal of the carbon adsorbers.

Table 1: PSD-1 Spray Dryer Emissions Summary

Solvents	Type	Uncontrolled Emission Rate (lbs/hr)	Uncontrolled Emissions (TPY)	Controlled Emission Rate (lbs/hr)	Controlled Emissions (TPY)
Ethanol	VOC	0.995	1.452	0.050	0.073
Isopropyl Alcohol	VOC	0.832	1.215	0.042	0.061
Ethyl Acetate	VOC	3.771	5.505	0.189	0.275
Tetrahydrofuran	VOC	5.827	8.507	0.291	0.425
Methanol	VOC-HAP	1.676	2.447	0.084	0.122
Methylene Chloride	HAP	8.800	12.848	0.440	0.642
Acetone	Non-VOC Non-HAP	7.266	10.608	0.363	0.530
Maximum	VOC	5.83	8.51	0.291	0.425
Maximum	HAP	8.80	12.85	0.440	0.642

Notes:

1. The table shows the data for one PSD-1 Spray Dryer. There are two identical units at the facility (R&D and GMP).
2. The maximum uncontrolled hourly emissions are based on an operating scenario of a maximum spray rate of 8.8 lbs/hr, 88 lbs/batch, a maximum N₂ rate of 26.4 lb/hr and each compound running 100% of the time.
3. The maximum controlled and uncontrolled emissions are based upon the dryer operating one batch per day, 10 hrs/batch and 292 days/year.
4. The maximum hourly VOC and HAP emissions and the maximum annual VOC and HAP emissions show the data for the worst case scenario VOC solvent (tetrahydrofuran) and HAP solvent (methylene chloride).

In response to public comments, the facility has offered to reduce their allowable operating hours resulting in a reduction of their permitted emission limits. The permit would decrease operating hours by 730 hours (25%) over a course of a year from 2920 hours/year to 2190 hours/year. The resulting maximum allowable emissions from a PSD-1 spray dryer are below. The total quantity of pollutants from a single PSD-1 spray dryer unit that would be permitted is 0.49 TPY.

Acetone: 0.40 TPY

VOCs: 0.32 TPY

HAPS: 0.49 TPY

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The SD Micro Spray Dryer operates at a maximum spray rate of 3.3 lbs/hr for 2,920 hours per year. This results in a maximum of 9,636 lbs of solvent spray dried each year or 4.82 TPY. The solvents can be made up of entirely VOCs, entirely HAPs, some mixture of the two, or of acetone. The PTE is 4.82 TPY of VOCs and 4.82 TPY of HAPs. The PTE however, will total no more than 4.82 TPY. Hourly and annual emissions for the SD Micro spray drying process are below. The controlled emissions reflect 95% removal of the carbon adsorbers.

Table 2: SD Micro Spray Dryer Emission Summary

Solvents	Type	Uncontrolled Emission Rate (lbs/hr)	Uncontrolled Emissions (TPY)	Controlled Emission Rate (lbs/hr)	Controlled Emissions (TPY)
Ethanol	VOC	3.300	4.818	0.165	0.241
Isopropyl Alcohol	VOC	3.300	4.818	0.165	0.241
Ethyl Acetate	VOC	3.300	4.818	0.165	0.241
Tetrahydrofuran	VOC	3.300	4.818	0.165	0.241
Methanol	VOC-HAP	3.300	4.818	0.165	0.241
Methylene Chloride	HAP	3.300	4.818	0.165	0.241
Acetone	Non-VOC Non-HAP	3.300	4.818	0.165	0.241
Maximum	VOC	3.30	4.818	0.165	0.241
Maximum	HAP	3.30	4.818	0.165	0.241

NOTES:

1. The maximum uncontrolled hourly emissions are based on an operating scenario of a maximum spray rate of 3.3 lb/hr, 33 lbs/batch, and each compound running 100% of the time.
2. The maximum controlled and uncontrolled emission are based upon the dryer operating one batch per day, 10 hrs/batch and 292 days/year.
3. The maximum hourly VOC and HAP and emissions the maximum annual VOC and HAP emissions show the data for the worst case scenario VOC solvent (tetrahydrofuran) and HAP solvent (methylene chloride).

In response to public comments, the facility has offered to reduce their allowable operating hours resulting in a reduction of their permitted emission limits. The permit would decrease operating hours by 730 hours (25%) over a course of a year from 2,920 hours/year to 2,190 hours/year. The resulting maximum allowable emissions from the SD Micro spray dryer below. The total quantity of pollutants that would be permitted annually is 0.19 TPY.

Acetone: 0.19 TPY

VOCs: 0.19 TPY

HAPS: 0.19 TPY

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The MP-1 Fluid Bed operates at a maximum spray rate of 2.2 lbs/hr for 2,555 hours per year when allowing for particle characterization 30% of the time. This results in a maximum of 5,621 lbs/yr of solvent spray dried each year or 2.81 TPY. The solvents can be made up of entirely VOCs, acetone or some mixture of the two. This unit does not use HAP containing solvents. The PTE is 2.81 TPY of VOCs. The controlled emissions reflect 95% removal of the carbon adsorbers.

Table 3: MP-1 Fluid Bed

Solvents	Type	Uncontrolled Emission Rate (lbs/hr)	Uncontrolled Emissions (TPY)	Controlled Emission Rate (lbs/hr)	Controlled Emissions (TPY)
Ethanol	VOC	2.20	2.811	0.110	0.141
Isopropyl Alcohol	VOC	2.20	2.811	0.110	0.141
Acetone	Non-VOC Non-HAP	2.20	2.811	0.110	0.141
Maximum	VOC	2.20	2.811	0.110	0.141

NOTES:

1. The maximum uncontrolled hourly emissions are based on an operating scenario of a maximum spray rate of 2.2 lb/hr, 22 lbs/batch, and each compound running 100% of the time.
2. The maximum uncontrolled emissions are based upon the dryer operating one batch per day, 10 hrs/batch and 256 days/year.
3. The maximum hourly VOC and HAP and emissions the maximum annual VOC and HAP emissions show the data for any one VOC solvent.

In response to public comments, the facility has offered to reduce their allowable operating hours resulting in a reduction of their permitted emission limits. The permit would decrease operating hours by 365 hours (15%) over a course of a year from 2,555 hours/year to 2,190 hours/year. The resulting maximum emissions from the MP-1 Fluid Bed dryer are below. The total quantity of pollutants that would be permitted annually is 0.12 TPY.

Acetone: 0.12 TPY

VOCs: 0.12 TPY

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The solvent emissions for the full spray drying process are below. Table 4 shows the total hourly emissions for each solvent in each spray dryer assuming simultaneous usage. The Hourly Emission Rates column becomes the pollutant permit limits for Conditions 2.1.1 through 2.1.7.

Table 4: Spray Drying Process Hourly Emission Rates

Solvents	Type	PSD-1 GMP	PSD-1 R&D	SD Micro	MP-1 Fluid Bed	Hourly Emission Rates (lbs/hr)
Ethanol	VOC	0.050	0.050	0.165	0.110	0.37
Isopropyl Alcohol	VOC	0.042	0.042	0.165	0.110	0.36
Ethyl Acetate	VOC	0.189	0.189	0.165	0.0	0.54
Tetrahydrofuran	VOC	0.291	0.291	0.165	0.0	0.75
Methanol	VOC-HAP	0.085	0.085	0.165	0.0	0.33
Methylene Chloride	HAP	0.440	0.440	0.165	0.0	1.05
Acetone	Non-VOC Non-HAP	0.363	0.363	0.165	0.110	1.00

Table 5: Spray Drying Process Controlled Emissions (TPY)

Solvents	Type	PSD-1 GMP	PSD-1 R&D	SD Micro	MP-1 Fluid Bed	Controlled Emissions	Revised Controlled Emissions
Ethanol	VOC	0.073	0.073	0.241	0.141	0.53	0.41
Isopropyl Alcohol	VOC	0.061	0.061	0.241	0.141	0.50	0.39
Ethyl Acetate	VOC	0.275	0.275	0.241	0.0	0.79	0.59
Tetrahydrofuran	VOC	0.425	0.425	0.241	0.0	1.09	0.82
Methanol	VOC-HAP	0.122	0.122	0.241	0.0	0.49	0.36
Methylene Chloride	HAP	0.642	0.642	0.241	0.0	1.53	1.14
Acetone	Non-VOC Non-HAP	0.530	0.530	0.241	0.141	1.44	1.10

The maximum VOC emissions occur when Tetrahydrofuran is used in the GMP spray dryer, the R&D spray dryer and the SD Micro spray dryer and when Ethanol or Isopropyl Alcohol is used in the MP-1 Fluid Bed resulting in 1.23 TPY. The maximum HAP emissions occur when Methylene Chloride is used in the GMP spray dryer, the R&D spray dryer and the SD Micro spray dryer resulting in 1.53 TPY.

In response to public comments, the facility has offered to reduce their allowable operating hours resulting in a reduction of their permitted emission limits. The permit would decrease operating hours to 2,190 hours/year. The resulting maximum emissions from the spray drying process are shown in the final column of Table 5. The total allowable VOCs and HAPS become 0.97 TPY and 1.14 TPY respectively. These are reflected in Conditions 2.1.8 and 2.1.9.

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Table 6: Spray Dryer Emissions

Emission Units	Uncontrolled Emission Rate (lbs/hr)		Uncontrolled Emissions (TPY)		Controlled Emission Rate (lbs/hr)		Controlled Emissions (TPY)	
	VOC	HAP	VOC	HAP	VOC	HAP	VOC	HAP
PSD-1 GMP Spray Dryer	5.8	8.8	8.5	12.8	0.29	0.44	0.32	0.49
PSD-1 R&D Spray Dryer	5.8	8.8	8.5	12.8	0.29	0.44	0.32	0.49
SD Micro Spray Dryer	3.3	3.3	4.8	4.8	0.17	0.17	0.19	0.19
MP-1 Fluid Bed	2.2	-	2.8	-	0.11	-	0.12	-
Total	17.1	20.9	24.6	30.4	0.9	1.1	1.0	1.2

The controlled emission rates and expected annual emission for each unit reflect use of the condensers where applicable and both carbon bed adsorbers with a combined adsorption efficiency of 95%. A total emission limit has been added to the permit. The controlled emissions do not reflect the reduction in operation hours. No more than 1.2 tons of all pollutants combined from all units will be allowed to be emitted from the combined spray drying process with the inclusion of the reduced operating hours.

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SCREEN ANALYSIS

A SCREEN3 model was performed using the hourly emission rates when all four units are operating simultaneously at maximum capacity. All emissions rates used were after treatment of only the primary carbon bed. The stack parameters are of the carbon bed stack. The nearest property line is at 341 feet from the stack. Below are the parameters used in the SCREEN3 program and the results of that modeling.

Table 7: Stack Parameters

Stack Height (ft)	10
Stack Diameter (ft)	0.333
Gas Exit Temp (°F)	68
Ambient Temp (°F)	68
Exhaust Velocity (ft/s)	0

Table 8: Screen3 Carbon Bed Modeling Results

Solvent	Pollutant		Emission Rate ² (lb/hr)	TLV _{8-hr} (mg/m ³)	MDC _{8-hr} (mg/m ³)	TLV : MDC
Ethanol ¹	VOC		0.37	1884	0.682	3135
Isopropyl Alcohol	VOC		0.36	492	0.655	842
Ethyl Acetate	VOC		0.54	1441	0.982	1643
Tetrahydrofuran	VOC		0.75	147	1.364	121
Methanol	VOC	HAP	0.33	262	0.609	489
Methylene Chloride		HAP	1.05	173	1.7052	101
Acetone	-	-	1.00	1187	1.819	731

¹ For ethanol the STEL value of 1,000 ppm was used and compared to the one hour MDC.

² The emission rates shown are of the use of all four spray dryers after the pollutants have passed through both of the carbon beds.

The Department requires the ratio of an emission's threshold limit value (TLV) and the maximum down-wind concentration (MDC) to be greater than 100; TLV:MDC>100. At this ratio, the emission is presumed to not have an adverse effect on the public. At an emission rate of 1 lb/hr, the maximum down-wind concentration (MDC) occurs at a distance of approximately 131 feet (40 m) for all pollutants, this is within the boundary lines of the facility.

The initial Screen3 modeling used hourly emission rates assuming a carbon adsorption efficiency of 90%. At this emission rate, methylene chloride did not pass the modeling in the unlikely event that more than one unit was used simultaneously at their maximum capacities. The revised values above, takes into account the second carbon bed for a combined adsorption efficiency of 95%, and all pollutants meet the Department's requirement of having TLV:MDC >100 under all conditions.

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Following are the facility wide emissions for the Hercules Research Center. The facility has eighteen (18) active emission units including the four spray dryers. Inclusion of the four spray dryers surpasses the major source threshold for VOCs and HAPs. The facility is a major source of VOCs, methylene chloride and HAPs in the aggregate. To avoid major source status, the facility has taken limits requiring the use of the carbon adsorbers to lower their emissions below 25 tons as shown in Table 9 and Table 10.

Table 9: Spray Dryer VOC and HAP Permit Limits (TPY)

Source	VOC PTE	VOC Permit Limit	Methylene Chloride PTE	Methanol PTE	HAP Permit Limit
PSD-1 GMP Spray Dryer	8.51	0.32	12.85	2.45	0.48
PSD-1 R&D Spray Dryer	8.51	0.32	12.85	2.45	0.48
SD-1 Micro Spray Dryer	4.82	0.18	4.82	4.82	0.18
MP-1 Fluid Bed	2.81	0.12	0.0	0.0	0.0
Total	24.65	1.0	30.52	9.72	1.2

Table 10: Facility Wide PTE with Permit Limits (TPY)

Source	PM	CO	NOx	SOx	VOC	HAP
B001 – Boiler	0.54	4.09	4.12	0.22	0.35	
B002 – Boiler	0.54	4.09	4.12	0.22	0.35	
R&D Cellulose Cutter	0.01					
Aquarius Power Blending & Dust Collector	1.30					
R&D Activities – (2) Lab Hood Exhaust Systems					6.57	3.45
R&D Activities – (3) Lab Hood Exhaust Systems					5.41	
Cold Solvent Degreaser					2.37	
(4) Dust Collector Registrations	4.3					
Gasoline Dispensing					0.44	0.02
Mini Glatt Spray Dryer Registration					0.56	0.56
Buchi Spray Dryer Registration					1.70	3.14
PSD-1 GMP Spray Dryer					0.32	0.48
PSD-1 R&D Spray Dryer					0.32	0.48
SD-1 Micro Spray Dryer					0.18	0.18
MP-1 Fluid Bed					0.12	
Total	6.69	8.18	8.24	0.44	18.69	8.31

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REGULATORY REVIEW

- 7 DE Admin. Code 1102: Permits**

An air emission permit is required since the equipment has the potential to emit more than pounds per day of pollutant.

- 7 DE Admin Code. 1103: Ambient Air Quality Standards**

Screen 3 was performed on this equipment and public health and welfare will not be affected by the installation and operation of this equipment.

- 7 DE Admin. Code 1105: Particulate Emissions from Industrial Process Operations**

The R&D spray drying process may emit particulate matter. As such, emissions of particulate matter into the atmosphere shall not exceed 0.2 grains per standard cubic foot. This requirement is addressed in Condition 2.4 of this permit.

- 7 DE Admin Code 1114: Visible Emissions**

No person shall cause or allow the emission of visible air contaminants and /or smoke from a stationary or mobile source, the shade or appearance of which is greater than 20% opacity for an aggregate of more than three minutes in any one hour or more than fifteen (15) minutes in any 24 hour period. The requirement is covered by Condition 2.5 of this permit. Compliance with these requirements can be demonstrated by inspection and record review.

- 7 DE Admin. Code 1119: Control of Odorous Air Contaminants**

Odors from this source shall not be detectable beyond the plant property line in sufficient quantities such as to cause a condition of air pollution. This requirement is covered by emission limitation 2.6. Compliance with the requirement can be demonstrated by inspection and Department notifications of neighbor complaints.

- 7 DE Admin. Code 1124: Control of Volatile Organic Compound Emissions**

This facility is exempt from Regulation 1124 based on Conditions 1.2 and 3.3.

Condition 1.2 – This regulation is applicable to the sources of VOCs as set-forth herein, except: Sources, other than solvent metal-cleaning sources, whose emissions of VOCs are not more than 15 pounds per day, unless other limits are specified herein, provided the emission rates are determined and certified in a manner acceptable to the Department.

Actual VOC emissions from this process are expected to be less than 10 pounds per day.

Hourly emissions limits are include in Conditions 2.1.1 through 2.1.9.

Condition 3.3 – This regulation does not apply to any equipment at a facility used exclusively for chemical or physical analysis or determination of product quality and commercial acceptance provided the operation of the equipment is not an integral part of the production process and the total actual emission from all such equipment at the facility do not exceed 450 pounds in any calendar month. Any facility claiming exemption from the provisions 3.3 of this regulation shall comply with the provisions of 3.5 of this regulation.

Actual VOC emissions from this process are expected to be less than 230 pounds per month.

This requirement is included in Condition 2.3.

Condition 3.5 – Any facility that claims exemption from the provisions of this regulation by reason of meeting the conditions in 3.3 of this regulation shall maintain the following annual records in a readily

MEMORANDUM

"Proposed" Permit: APC-2017/0044-OPERATION (VOC RACT)(SM)

Hercules, LLC – Hercules Research Center

Spray Drying Process

March 17, 2017

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accessible location for at least 5 years and shall make those records available to the Department upon verbal or written request:

3.5.1 Records to document the purpose of the equipment for which the exemption is claimed.

3.5.2 Records to document the amount of each VOC containing material used in the equipment each calendar month and the VOC content of each material such that emissions can be determined for each calendar month.

These recordkeeping requirements are incorporated into Conditions 5.2, 5.5 and 5.8.

The Work Practice Standards of Section 8.4 of this regulation are included in the Operating Limitations of this permit.

- 7 DE Admin Code 1125:** Requirements for Preconstruction Review
The facility is undergoing reclassification from a major source to a synthetic minor source. The facility is taking limits to reduce emission of VOCs and HAPs below 25 TPY. The inclusion of the condenser and carbon bed reduces the emissions of each spray dryer below 5 tons per year therefore, MNSR is not applicable.
- 7 DE Admin. Code 1130:** Title V State Operating Permit Program
Ashland Inc. is currently a Title V source permitted under **Permit: AQM-003/00017 – Renewal (01)(Revision 02)**. The facility will be reclassified as a Synthetic Minor source with the issuance of this permit.
- 7 DE Admin. Code 1138:** Emission Standards for Hazardous Air Pollutants for Source Categories.
The process is not identified under the source categories listed in the regulation.

MACT Review: The facility is not subject to the Chemical Manufacturing Area Source (CMAS) rule (40 CFR Part 63, Subpart VVVVV). Section 63.11494(c)(3) provides exemptions for facilities that qualify as Research and Development facilities per CAA 112(c)(7).

RECOMMENDATIONS

The "Draft/Proposed" permit was advertised on Sunday, September 4, 2016 for thirty days and sent to the EPA for concurrent review. The EPA did not submit any comments though a Public hearing was requested and held on December 8, 2016. The public comment period closed on January 9, 2017. The permit has been revised to reflect the comments of the public and the facility. I recommend that this "Proposed" permit and technical reference memorandum be submitted as part of the hearing record.

JLF:ADM:LTR

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pc: Dover File



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR QUALITY
STATE STREET COMMONS
100 W. Water Street, Suite 6A
DOVER, DELAWARE 19904

Telephone: (302) 739 - 9402
Fax No.: (302) 739 - 3106

March XX, 2017

"Proposed" Permit: APC-2017/0044-OPERATION (VOC RACT)(SM)

Hercules, LLC
R&D Spray Drying Process
Hercules Research Center
500 Hercules Road
Wilmington, DE 19808

ATTENTION: Thomas P. Baker
EHS Manager

Dear Mr. Baker:

Pursuant to 7 **DE Admin. Code** 1102, Section 2, approval of the Department of Natural Resources and Environmental Control (the Department) is hereby granted for the operation of the following equipment located at the Hercules Research Center in Wilmington, Delaware.

- 1) Two PSD-1 Spray Dryers with condensers (R&D and GMP) ,
- 2) One SD Micro Spray Dryer,
- 3) One MP-1 Fluid Bed Dryer, and
- 4) Two carbon adsorption systems made up of two, 2000 pound carbon canister beds in series.

In addition to the above, the Company may separately register other emission units in accordance with Section 2.1 of 7 **DE Admin. Code** 1102, provided that the emissions associated with these activities do not, when combined with the allowable emissions of this permit, allow emissions of any pollutant to exceed the major source threshold for that pollutant.

This permit is issued in accordance with the following documents where more recent documents may supersede older documents:

- 1) Application submitted on Form Nos. AQM-1, AQM-2, AQM-3.1, AQM-4.2, and AQM-5 dated May 17, 2016 signed by Michael Hassman, Director,
- 2) Supplemental information received October 23, 2015, November 29, 2015, December 22, 2015, May 25, 2016, August 5, 2016 and January 27, 2017.

This permit is issued subject to the following conditions all of which are federally enforceable except Condition 2.6:

Delaware's good nature depends on you!

1. General Provisions

- 1.1 Hercules, LCC agrees that all limits, restrictions and requirements in this permit are necessary to limit their potential to emit below major source thresholds. Violation of any limit, restriction or requirement contained herein may be grounds for suspension or revocation of the permit or other enforcement action for noncompliance with the permit, the failure to apply for a Title V permit, or the failure to obtain a Title V permit.
- 1.2 Representatives of the Department may, at any reasonable time, inspect this facility.
- 1.3 This permit may not be transferred to another location or to another piece of equipment or process.
- 1.4 This permit may not be transferred to another person, owner, or operator unless the transfer has been approved in advance by the Department. Approval (or disapproval) of the permit transfer will be provided by the Department in writing. A request for a permit transfer shall be received by the Department at least thirty (30) days before the date of the requested permit transfer. This request shall include:
 - 1.4.1 Signed letters from each person stating the permit transfer is agreeable to each person; and
 - 1.4.2 An Applicant Background Information Questionnaire pursuant to 7 Del.C, Chapter 79 if the person receiving the permit has not been issued any permits by the Department in the previous five (5) years.
- 1.5 The owner or operator shall not initiate construction, install, or alter any equipment or facility or air contaminant control device which will emit or prevent the emission of an air contaminant prior to submitting an application to the Department pursuant to 7 DE Admin. Code 1102, and, when applicable 7 DE Admin. Code 1125, and receiving approval of such application from the Department; except as exempted in 7 DE Admin. Code 1102 Section 2.2.

2. Emission Limitations

- 2.1 Air contaminant emission levels shall not exceed those specified in 7 DE Admin. Code 1100 and the following:

Allowable Emissions From R&D Spray Drying Processes				
Condition	Pollutant	Type	Emission Rate (lbs/hr)	Annual Emissions 12 Month Rolling (TPY)
2.1.1	Ethanol	VOC	0.37	0.5
2.1.2	Isopropyl Alcohol	VOC	0.36	0.4
2.1.3	Ethyl Acetate	VOC	0.54	0.6
2.1.4	Tetrahydrofuran	VOC	0.75	0.9
2.1.5	Methanol	VOC - HAP	0.33	0.4
2.1.6	Methylene Chloride	HAP	1.05	1.2

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2.1.7	Acetone	Non-VOC Non-HAP	1.00	1.1
2.1.8	VOCs		0.9	1.0
2.1.9	HAPs		1.1	1.2

- 2.2 Total emissions from this process shall not exceed 1.2 tons for any twelve month rolling period.
- 2.3 Total VOC emissions from this process shall not exceed 450 pounds in any calendar month in accordance with 7 **DE Admin. Code** 1124 Section 3.3.
- 2.4 Particulate emissions from the spray drying process shall not exceed 0.2 grains/scf.
- 2.5 No person shall cause or allow the emission of visible air contaminants and/or smoke from a stationary or mobile source, the shade or appearance of which is greater than twenty (20) percent opacity for an aggregate of more than three (3) minutes in any one (1) hour or more than fifteen (15) minutes in any twenty-four (24) hour period.
- 2.6 Odors from this source shall not be detectable beyond the plant property line in sufficient quantities such as to cause a condition of air pollution.
- 2.7 Emissions from this facility, including emissions from all sources registered in accordance with 7 **DE Admin. Code** 1102 shall not exceed the major source threshold for any pollutant as established by the definition of a "major source" in 7 **DE Admin. Code** 1130.

3. Operational Limitations

- 3.1 Hours of operation of the spray drying process shall not exceed 2,190 hours in any twelve month rolling period.
- 3.2 For the PSD-1 Spray Dryer Units (R&D and GMP), the Facility shall comply with the following operational limits:
- 3.2.1 **Spray Dryers**
- 3.2.1.1 The solvent spray rate shall not exceed 8.8 lbs/hr (4 kg/hr).
- 3.2.1.2 The dryers shall only be operated when both the condenser system and carbon adsorption system are operating and functioning properly.
- 3.2.2 **Condenser System**
- 3.2.2.1 Temperatures must remain below the maximum threshold of each solvent as provided by in the Company's technical data submitted October 23, 2015 and shown in Appendix B.
- 3.3 For the SD Micro Spray Dryer, the Facility shall comply with the operational limits below:
- 3.3.1 The solvent spray rate shall not exceed 3.3 lbs/hr (1.5 kg/hr).

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- 3.3.2 The dryer shall only be operated when the carbon adsorption system is operating and functioning properly.
- 3.4 For the MP-1 Fluid Bed, the Facility shall comply with the following operational limits:
 - 3.4.1 The solvent spray rate shall not exceed 2.2 lbs/hr (1 kg/hr).
 - 3.4.2 The dryer shall only be operated when the carbon adsorption system is operating and functioning properly.
- 3.5 For the Carbon Adsorption Systems, the Facility shall comply with the following operational limits:
 - 3.5.1 The VOC/HAP removal efficiency of the primary carbon bed shall be maintained at or higher than 90%. The removal efficiency of the secondary carbon bed shall be maintained at or higher than 50% for a total removal efficiency of at least 95%. This removal efficiency shall be demonstrated by following the Standard Operating Procedures for the use of Carbon Adsorption Systems including the following practices:
 - 3.5.2 For each spray dryer venting through the Carbon Adsorption Systems, the Facility shall maintain a Carbon Bed Usage Log (CBUL) to track the amount of solvent entering the Carbon Adsorption Systems for each batch and the total amount since the date of the last carbon bed replacement.
 - 3.5.3 The carbon beds shall be replaced when the total solvent gas entering the carbon beds as determined by the CBUL reaches 550 lbs (250 kg), the equivalent of 85% capacity of the carbon beds, or before breakthrough is detected during a weekly draeger tube test with a reading approaching 90% efficiency as found in Appendix C, where Appendix C is subject to verification and revision.
 - 3.5.4 The Facility shall maintain the Carbon Adsorption System according to the manufacturer's recommendations.
- 3.6 The Facility may only use the solvents and aqueous solutions of the solvents listed in Condition 2.1 for processing in the spray dryers, with the exception below.
 - 3.6.1 The MP-1 Fluid Bed Dryer is limited to the following solvents and aqueous solutions of these solvents:
 - 3.6.1 Ethanol
 - 3.6.2 Isopropyl Alcohol
 - 3.6.3 Acetone
- 3.7 The owner or operator shall not cause, allow, or permit the disposal of more than eleven pounds of any VOC or of any materials containing more than eleven pounds of VOCs in any one day in a manner that would permit the evaporation of VOCs into the ambient air.
- 3.8 The owner or operator shall not use open containers for the storage or disposal of cloth or paper impregnated with VOCs that are used for surface preparation, cleanup, or

coating removal. Containers for the storage or disposal of cloth or paper impregnated with VOCs shall be kept closed, except when adding or removing material.

- 3.9 The owner or operator shall not store in open containers spent or fresh VOCs to be used for surface preparation, cleanup, or coating removal. Containers for the storage of spent or fresh VOCs shall be kept closed, except when adding or removing material.
- 3.10 The owner or operator shall not use VOCs for the cleanup of spray equipment unless equipment is used to collect the cleaning compounds and to minimize their evaporation into the atmosphere.
- 3.11 The owner or operator shall:
 - 3.11.1 Convey VOC containing cleaning materials from one location to another in closed containers or pipes;
 - 3.11.2 Handle and transfer all fresh and spent cleaning solvent and other VOC containing material to or from any container, tank, vat, vessel, mixing vessel, or piping system, etc. in such a manner that minimizes spills and other losses; and
 - 3.11.3 Clean up spills of fresh and spent cleaning solvent and other VOC containing material immediately.
- 3.12 The owner or operator shall minimize air circulation around cleaning operations and shall implement equipment practices that minimize emissions including keeping parts cleaners covered when not in use and maintaining cleaning equipment to repair solvent leaks.
- 3.13 At all times, including periods of startup, shutdown, and malfunction, the owner or operator shall, to the extent practicable, maintain and operate the facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating procedures are being used will be based on information available to the Department which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.
- 3.14 All structural and mechanical components of the equipment or process covered by this Permit shall be maintained in proper operating condition.

4. Testing and Monitoring Requirements

- 4.1 The Facility shall measure and record the quantity of solvent recovered by the condenser after each PSD-1 spray dryer batch.
- 4.2 The Facility shall conduct draeger tube tests as a secondary measure to determine breakthrough in accordance with Condition 3.5.3 and Appendix C, where Appendix C is subject to verification and revision.
 - 4.2.1 A weekly test sample shall be taken after the primary carbon bed. Before breakthrough is determined as defined in Appendix C of this permit, the facility

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shall discontinue use of the carbon train until the primary carbon bed has been replaced with one that has not reached saturation.

- 4.2.2 A test sample shall be taken during the first operation with a new primary carbon bed to demonstrate that the new configuration is controlling effectively as defined in Appendix C of this permit.
- 4.3 The Facility shall conduct weekly leak checks in accordance with the Standard Operating Procedures approved by the Department.
- 4.4 The Department reserves the right to require that the owner or operator perform emission tests using methods approved in advance by the Department.
- 4.4.1 One (1) original and one (1) copy test protocol shall be submitted a minimum of forty-five (45) days in advance of the tentative test date to the addresses in Condition 4.1.3. The tests shall be conducted in accordance with the State of Delaware and Federal requirements.
- 4.4.2 The test protocol shall be approved by the Department prior to initiating any testing. Upon approval of the test protocol the Company shall schedule the compliance demonstration with the Source Testing Engineer. The Department must observe the test for the results to be considered in acceptance.
- 4.4.3 The final results of the testing shall be submitted to the Department within sixty (60) days of the test completion. One (1) original and one (1) copy of the test report shall be submitted to the addresses below:
- | | |
|-----------------------------------|-----------------------------------|
| <u>Original to:</u> | <u>One (1) Copy to:</u> |
| Engineering and Compliance Branch | Engineering and Compliance Branch |
| Attn: Permitting Engineer | Attn: Source Testing |
| Division of Air Quality | Division of Air Quality |
| State Street Commons | 715 Grantham Lane |
| 100 W. Water Street, Suite 6A | New Castle, DE 19720 |
| Dover, DE 19904 | |
- 4.4.4 The final report of the results must meet the following requirements to be considered valid:
- 4.4.4.1 The full report shall include the emission test report (including raw data from the test) as well as a summary of the results and statement of compliance or non-compliance with permit conditions;
- 4.4.4.2 Summary of Results and Statement of Compliance or Non-Compliance
The owner or operator shall supplement the report from the emissions testing firm with a summary of results that includes the following information:
- 4.4.4.2.1 A statement that the owner or operator has reviewed the report from the emissions testing firm and agrees with the findings.

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4.4.4.2.2 Permit number(s) and condition(s) which are the basis for the compliance evaluation.

4.4.4.2.3 Summary of results with respect to each permit condition.

4.4.4.2.4 Statement of compliance or non-compliance with each permit condition.

4.4.5 The results must demonstrate to the Department's satisfaction that the emission unit is operating in compliance with the applicable regulations and conditions of this permit; if the final report of the test results shows non-compliance the owner or operator shall propose corrective action(s). Failure to demonstrate compliance through the test may result in enforcement action.

4.5 The owner or operator shall monitor work practice standards for the handling, storage, and disposal of VOCs and employee training records on an annual basis and update records as needed.

5. Record Keeping Requirements

5.1 The Facility shall maintain all records necessary for determining compliance with this permit in a readily accessible location for five (5) years and shall make these records available to the Department upon written or verbal request.

5.2 The Facility shall maintain records for each batch of product processed in each dryer including the following information:

5.2.1 VOC and HAP content;

5.2.2 The spray rate;

5.2.3 The amount of solvent recovered in the condensers, pursuant to Condition 4.1.

5.2.4 The hourly emission rate per batch; and

5.2.5 The hours of operation per rolling twelve month period.

5.3 The Facility shall maintain records for the Carbon Adsorption System including the following:

5.3.1 Carbon Bed Usage Log (CBUL);

5.3.2 Records of carbon bed replacement;

5.3.3 Records of the weekly leak test; and

5.3.4 Records and results of the weekly draeger tube test.

5.4 Records of all maintenance performed on these units shall be maintained and made available to the Department upon request.

5.5 The facility shall maintain a Department approved set of Standard Operating Procedures on file.

5.6 Material Safety Data Sheets or other product documentation shall be kept on file for Department review.

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Hercules, LLC - Wilmington

Hercules Research Center

R&D Spray Drying Process

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- 5.7 The Facility shall maintain a record of all postings and employee training related to these work practice standards and the storage, use, and disposal of VOCs.
- 5.8 The rolling twelve (12) month total emissions shall be calculated and recorded each month in a log for each of the following pollutants.
 - 5.8.1 Ethanol
 - 5.8.2 Isopropyl Alcohol
 - 5.8.3 Ethyl Acetate
 - 5.8.4 Tetrahydrofuran
 - 5.8.5 Methanol
 - 5.8.6 Methylene Chloride
 - 5.8.7 Acetone
 - 5.8.8 Total Volatile Organic Compounds
 - 5.8.9 Total Hazardous Air Pollutants
 - 5.8.10 Sum of all VOCs, HAPs, and Acetone emitted.

6. Reporting Requirements

- 6.1 Emissions in excess of any permit condition or emissions which create a condition of air pollution shall be reported to the Department immediately upon discovery by calling the Environmental Emergency Notification and Complaint number, (800) 662-8802.
- 6.2 In addition to complying with condition 6.1 of this permit, any reporting required by 7 **DE Admin. Code** 1203 "**Reporting of a Discharge of a Pollutant or an Air Contaminant**", and any other reporting requirements mandated by the State of Delaware, the owner or operator shall for each occurrence of excess emissions, within thirty (30) calendar days of becoming aware of such occurrence, supply the Department in writing with the following information:
 - 6.2.1 The name and location of the facility;
 - 6.2.2 The subject source(s) that caused the excess emissions;
 - 6.2.3 The time and date of the first observation of the excess emissions;
 - 6.2.4 The cause and expected duration of the excess emissions;
 - 6.2.5 For sources subject to numerical emission limitations, the estimated rate of emissions (expressed in the units of the applicable emission limitation) and the operating data and calculations used in determining the magnitude of the excess emissions; and
 - 6.2.6 The proposed corrective actions and schedule to correct the conditions causing the excess emissions.

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Hercules Research Center

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- 6.3 One (1) original and one (1) copy of all required reports shall be sent to the address below:

Division of Air Quality
State Street Commons
100 W. Water Street, Suite 6A
Dover, DE 19901

7. Administrative Conditions

- 7.1 This permit supersedes **Permit: APC-2012/0097-OPERATION, Permit: APC-2013/0083-CONSTRUCTION (VOC RACT)(MACT)(FE)(Amendment 1) and Permit: APC-2016/0037-OPERATION (VOC RACT)(Amendment 1).**
- 7.2 This permit shall be made available on the premises.
- 7.3 Failure to comply with the provisions of this permit may be grounds for suspension or revocation.

Sincerely,

Angela D. Marconi, P.E., BCEE
Acting Program Manager
Engineering & Compliance Branch

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pc: Dover File

APPENDIX A

Emission Unit Control Devices

Spray Dryer	Condenser	Carbon Beds
PSD-1 GMP	YES	YES
PSD-1 R&D	YES	YES
SD Micro	NO	YES
MP-1 Fluid Bed	NO	YES

APPENDIX B

Maximum Condenser Temperatures of Solvent

Solvent	Maximum Condenser Temperature (°C)
Ethanol	5
Isopropyl Alcohol	5
Ethyl Acetate	5
Tetrahydrofuran	5
Methanol	5
Methylene Chloride	-10
Acetone	5

APPENDIX C

Primary Carbon Bed Gas Stream Concentration

Solvent	PPM by Vol at 90% Efficiency
Ethanol	2,308
Isopropyl Alcohol	2,796
Ethyl Acetate	4,545
Tetrahydrofuran	8,582
Methanol	5,514
Methylene Chloride	7,315
Acetone	10,693

MEMORANDUM

TO: Robert Haynes
Hearing Officer

THROUGH: Ali Mirzakhali, P.E. *AM*
Division Director

Angela D. Marconi, P.E., BCEE *ADM*
Acting Program Manager

FROM: Lindsay Rennie *LR*
Environmental Engineer

SUBJECT: **Supplemental Report on the Public Hearing for Hercules LLC's proposal to operate Four (4) Spray Dryers, located at 500 Hercules Road, Wilmington.
Draft Permit: APC-2017/0044-OPERATION (VOC RACT)(SM)**

DATE: May 31, 2017

Background

Following discussion of the information contained in the Hearing Officer's report and as requested, I have conducted a review of the Hearing Officer's report, public comments and the original memorandum report (technical response memo, TRM) regarding the hearing for Hercules LLC's proposal to operate Four (4) Spray Dryers, located at 500 Hercules Road, Wilmington. As a result of that review, the Division of Air Quality has prepared this supplemental report to ensure all comments have been adequately addressed.

Review of Hearing Transcript and Public Comments

The hearing transcript was reviewed and all comments from the hearing record were adequately addressed in the previous TRM.

Several comments contained in a letter by Mr. William Dunn were not clearly addressed in the TRM. These comments are therefore addressed herein.

Comments and DAQ Response

The comments in the table below were submitted in a letter to Mr. Haynes following the public hearing.

MEMORANDUM

Hercules LLC

DAQ's Supplemental Response Document for the Public Hearing on December 8, 2016

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May 31, 2017

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General Public Comment Summary	DAQ Responses
<p>MR. WILLIAM DUNN – LETTER SUBMISSION</p> <p>The Permit far exceeds the Permit Request; DNREC admits that in a review meeting with Hercules LLC regarding the specifics of the application that in a discussion about the hours of Operation, Hercules stated that it is possible their hours may need to be longer than was requested in the Permit. DNREC decided to increase the permissible limits based NOT on an increased operating number formally amended in the application, but based on an estimated calculated value determined by DNREC employees which would allow process operations close to 24-hours a day, 7 days a week, 365 days a year. Also note that Hercules estimates that each batch will only emit volatile organics for from 2 to 4 hours per batch and not 24-hours per day as each batch has an approximate cycle of about 20 hours.</p>	<p>The permit application contained two sets of data. Emissions based on expected operation and emissions based on maximum operation. The expected operation emissions were based on expected quantities used per solvent. This narrow way of evaluating emissions could result in permit violations even if there was a reduction in actual emissions. After discussions with the facility over the course of several months it was determined that a permit limit based on maximum operation would be more sensible long term and better reflect the needs of the facility. The permit limits set in the draft permit allows flexibility over the ratio of solvents used in a year while requiring the use of the capture and control devices i.e. condensers and carbon adsorbers.</p> <p>The facility has decided to reduce their permitted hours of operation, thereby reducing their maximum potential emissions. This federally enforceable hourly limit will allow for no more than a total of 1.2 tons of pollutant to be emitted in any twelve month period. This emission limit reduction also reflects a portion of the control efficiency of the second carbon bed, an increase from 90% to 95% overall control efficiency.</p> <p>The operation under the “Draft” permit emission limits represented operation of 2,920 hours per year. This is reflective of “full” operation, taking into account inherent restrictions.</p> <p>The draft permit uses standard permit conditions that apply to all permits and also adds specific conditions based upon the equipment that will be operated.</p>
<p>Based on the community’s evaluation of the proposed Permit and our evaluation of existing Permits, the proposed Permit reflects a “Boiler plate” evaluation and approach in DNREC’s preparation of this Permit in many other regards other than what is noted above.</p>	

MEMORANDUM

Hercules LLC

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General Public Comment Summary	DAQ Responses
<p>DNREC argues that there are a number of Air Permitted exhaust stacks that are near Residential housing. The community believes that many of these situations reflect residential housing growth following the Department's granting of those permits. In the case of Greenville Overlook 1, there are over a dozen residential parcels, between 300 and 600 feet from the purposed stacks. These residential parcels are already approved and many are already built or under construction.</p> <p>DNREC internal policy requires that the TLV (Threshold Limit Value) to adjusted MDC (Maximum Downwind Concentration) ratio of chemicals in the exhaust stream to be at least 100 to 1. According to DNREC's technical analysis of the permit application, the TLV:adjusted MDC ratio for exhausted methylene chloride is less than 100:1 if more than one process line is operating although the minimum ration can be achieved if only one process line is in operation. The proposed permit, however, does not restrict the operation of the process lines in order to maintain a minimum TLV:adjusted MDC ratio of 100:1.</p> <p>The proposed permit refers to changing carbon filter beds before breakthrough without either defining breakthrough or requiring carbon filter change out before breakthrough, which is standard good engineering practice. As actual operating conditions can cause breakthrough much earlier than published estimates of breakthrough, the community is requesting that either (a) Hercules, LLC conduct testing of the installed processes to identify the minimum number of hours of operation before breakthrough and the permit include an operational limit to replace the</p>	<p>The Department conducts conservative emissions modeling prior to the issuance of each permit. The passing criteria requires the maximum downwind concentration (MDC) to be no more than 1% of the allowable threshold limit value (TLV) as established by the American Conference of Governmental Industrial Hygienists. The TLV represents conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects. Based on SCREEN3 modeling, the maximum downwind concentration occurs within the property boundary line. Any exposure experienced by neighboring communities will fall below this concentration. The emission rate used for this modeling was reevaluated based on an adsorption efficiency of 95% from the carbon beds. All of the solvents meet this conservative criterion when all units are operating simultaneously under maximum operating conditions.</p> <p>See response above.</p> <p>The Draft permit did not take into account the removal efficiency of the second carbon adsorber though its use was required. The Proposed permit sets revised emission rates based on the combined efficiency of the two carbon adsorbers. Under these parameters, the Department criterion is met.</p> <p>The scale of this project does not trigger any regulatory requirement for the installation of continuous monitoring. The operating of the spray dryers can be adequately monitored using a material balance approach. Additionally, weekly checks of the carbon adsorbers are conducted to ensure the equipment is controlling effectively. Numerical limits have been added to the permit.</p>

MEMORANDUM

Hercules LLC

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General Public Comment Summary	DAQ Responses
<p>carbon bed filters at 95% of the minimum operating time or (b) Hercules, LLC install continuous monitoring on the exhaust and the permit include an operating limit to replace the carbon bed filters when the monitoring system detects emissions within 95% of the emission limit.</p> <p>Finally, what has been the position of the community and the MLCA from the beginning, we are NOT opposed to the operation in general and could support their application IF, there is an automated, real-time exhaust monitoring system in place and that system is tied back to the process Control System which would provide the community interlocks and, if necessary, executes an automatic shutdown in the case of a problem with their condensers and filters. This is NOT a unique requirement by DNREC and is required at other Industrial sites in this State.</p>	<p>See response above. There are interlocks that will shut down the process if the equipment is malfunctioning.</p>

MEMORANDUM

Hercules LLC

DAQ's Supplemental Response Document for the Public Hearing on December 8, 2016

Draft Permit: APC-2017/0044-OPERATION (VOC RACT)(SM)

May 31, 2017

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RECOMMENDATIONS

DAQ recommends that this supplemental technical response memorandum be included as part of the hearing record.

I hope this information will assist you in reviewing the issues and making your recommendations to the Secretary of the Department of Natural Resources and Environmental Control. If you have any questions, please contact the Division at (302) 323-4542.

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pc: Dover File

