



REGION 1

BOSTON, MA 02109

Clean Air Act Inspection Report

Report Date: December 19, 2024

I. Background

Inspection Date: December 4, 2024

Inspection Type: Partial Compliance Evaluation

EPA Inspector: Jack Melcher, Senior Enforcement Coordinator, Air Compliance Section

JOHN MELCHER

Digitally signed by JOHN MELCHER

Date: 2024.12.19 08:55:35 -05'00'

EPA Reviewer: Darren Fortescue, Manager, Air Compliance Section

DARREN FORTESCUE

Digitally signed by DARREN FORTESCUE

Date: 2024.12.19 09:24:21 -05'00'

Facility Name: Edwards Vacuum

ICIS Air ID#: MA0000002512100877

Facility Location: 20 Creek Brook Drive; Haverhill, MA 01832

Mailing Address: Same

Disclaimer:

Unless otherwise noted, this report describes conditions at the facility/property as observed by EPA inspector(s), and/or through records provided to and/or information reported to EPA inspector(s) by facility representatives and as understood by the inspector(s). This report may not capture all operations or activities ongoing at the time of the inspection. This report does not make final determinations on potential areas of concern. Nothing in this report affects EPA's authorities under federal statutes and regulations to pursue further investigation or action.

Inspection Attendees:

Name	Title	Organization
Jack Melcher	Senior Enforcement Coordinator	US EPA, Region 1, Enforcement and Compliance Assurance Division, Air Compliance Section
Dana Donovan	Life Scientist	US EPA, Region 1, Enforcement and Compliance Assurance Division, Air Compliance Section
Chris Mahoney	Safety, Health, Environment (SHE) & Facilities Manager	Edwards Vacuum, Haverhill facility, Semiconductor Chamber Solutions
Ian Armstrong	Senior SHE Specialist	Edwards Vacuum
Liam King	Material Compliance Engineer	Edwards Vacuum, Haverhill facility

Facility/Process Description:

According to its 2024 annual report filed with the Massachusetts Secretary of State, Edwards Vacuum “is a leading developer and manufacturer of sophisticated vacuum products, abatement solutions and related value-added services.”

According to Edward Vacuum’s website, the Haverhill facility (“the Facility”) is “Edwards’ new facility for cryopump manufacturing and R&D [Research and Development].”¹

EPA’s Enforcement & Compliance History Online website provides facility and environmental compliance information regarding the facility: <https://echo.epa.gov/detailed-facility-report?fid=110071267976>.

Potentially Applicable Federal Air Regulations:

The following federal air regulations may be applicable to the Facility:

- 40 CFR Part 60 - Standards of Performance for New Stationary Sources
 - Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
- 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories
 - Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

¹ Available at: <https://www.edwardsvacuum.com/en-us/news-and-events/new-edwards-facilities-to-support-north-america-semiconductor-growth>

- 40 CFR Part 82 - Protection of Stratospheric Ozone
- 40 CFR Part 84 - Phasedown of Hydrofluorocarbons
- 40 CFR Part 98 - Mandatory Greenhouse Gas Reporting:
 - Subpart OO - Suppliers of Industrial Greenhouse Gases
 - Subpart QQ - Importers and Exporters of Fluorinated Greenhouse Gases Contained in Pre-Charged Equipment or Closed-Cell Foams

State Air Permit:

In an email dated October 18, 2024, the Massachusetts Department of Environmental Protection (“MassDEP”) stated that, as of the date of MassDEP’s June 14, 2023, inspection, the facility was not subject to air quality permitting.

Previous Enforcement Actions:

On August 30, 2023, MassDEP issued a Notice of Noncompliance regarding hazardous waste, air quality, and industrial wastewater issues. The air quality component was regarding certification of emergency engines pursuant to 310 CMR 7.26(42)(e)1 and maintenance records for emergency engines pursuant to 310 CMR 7.26(42)(f). According to a letter from MassDEP dated March 25, 2024, the facility had addressed the issues identified in the Notice of Noncompliance as of a February 29, 2024 MassDEP inspection.

II. Inspection

Inspection was not announced in advance.

Mr. Melcher and Ms. Donovan (“the inspectors”) arrived at approximately 9:30 a.m. The weather was clear and the temperature approximately 33 degrees Fahrenheit.

Through a telephone number posted on the door, the inspectors notified the Facility of their arrival. Shortly thereafter, the inspectors were greeted by Chris Mahoney, SHE & Facilities Manager. The inspectors and Mr. Mahoney entered a conference room and conducted an opening conference.

A. Opening Conference:

Mr. Melcher presented his inspector credentials and explained that EPA was performing a Clean Air Act compliance inspection. Mr. Melcher said that the Facility had the right to claim certain information as Confidential Business Information.

Mr. Mahoney said that Edwards Vacuum is a Limited Liability Company within the Atlas Copco corporation, based in Sweden. Edwards Vacuum has several locations in the United States, with a United States parent company based in New Jersey.

Mr. Melcher said that the Facility was targeted for inspection because Edwards Vacuum had ceased submitting Greenhouse Gas (“GHG”) reports to EPA for its Chelmsford, Massachusetts facility. Mr. Melcher said that the regulations require some continued reported even after emissions go below the applicability threshold and for subject facilities to notify EPA when they cease operations. Mr. Melcher

said that EPA had not received GHG reports for the Haverhill facility. Mr. Melcher said that, during the inspection, EPA would also collect information regarding the Facility's engines.

Mr. Melcher also said that the Facility may also be subject to the American Innovation and Manufacturing Act of 2020 regulating the importation and exportation of hydrofluorocarbons ("HFCs"), but this was not a planned topic of discussion for the inspection.

1. Greenhouse Gas Reporting

Mr. Mahoney said that Edwards Vacuum had moved from the previous facility location in Chelmsford to the current facility location in Haverhill in January 2023. Mr. Mahoney said that he started with Edwards Vacuum in June 2023.

Mr. Mahoney said that he had been corresponding with EPA regarding Ozone Depleting Substances, but that he was not familiar with the GHG reporting program.

Mr. Melcher said that, due to the potential for Confidential Business Information in the reports, he did not have copies of the reports, but that GHG reports had been submitted for the Chelmsford facility as recently as 2022 for the 2021 reporting period. Mr. Melcher said that EPA records reflect that Mark Crepeau was the Reporting Designated Representative for the Chelmsford facility and Debbora Ahlgren was the Reporting Agent. Mr. Melcher said that EPA had repeatedly tried to contact these company representatives but had not received a response. Mr. Mahoney said that Mr. Crepeau and Ms. Ahlgren no longer worked for Edwards Vacuum.

Mr. Melcher said that, for the 2021 reporting period, the Chelmsford facility had reported approximately 70,000 metric tons of carbon dioxide-equivalent, well in excess of the 25,000 metric tons of carbon dioxide-equivalent applicability threshold in Part 98.

Mr. Mahoney projected his laptop screen to a large monitor in the conference room. Mr. Mahoney navigated to EPA's electronic Greenhouse Gas Reporting Tool ("e-GGRT") website and found that he did not have a login. Mr. Melcher provided the Chelmsford facility's GHG Reporting Program identification number, 1014026, to Mr. Mahoney. Mr. Mahoney set up a login in e-GGRT but was not able to access the Chelmsford facility. Mr. Mahoney sent an email to ghgreporting@epa.gov for help in regaining Edwards Vacuum's access to e-GGRT for the Chelmsford facility.

Mr. Mahoney said that Edwards Vacuum had moved from the Chelmsford facility to the Haverhill facility due to the lease expiring at the Chelmsford facility. Mr. Mahoney said that the Haverhill facility was constructed to have the same production capacity as the Chelmsford facility, but, due to a downturn in the semiconductor industry, the Haverhill facility was only operating at about 25% of capacity. Later in the inspection, Mr. Mahoney said that the Facility is in production from 6:00 a.m. to 2:30 p.m., Monday through Friday.

Mr. Mahoney showed the inspectors an example of the Facility's product, a cryopump. Selected photographs taken by the inspections are included as Appendix A of this report. See Photo 1. Mr. Mahoney explained the following:

- The cryopump is used by semiconductor manufacturers to add clean, cold air to the wafer etching process.

- A motor at the bottom of the cryopump “actuates” lead metal “shot” inside the cylinder, cooling refrigerant gases.
- Intake air is cleaned using a charcoal filter array, cooled, and introduced into the semiconductor manufacturing process.

Mr. Mahoney stated that cryopumps are shipped to customers charged with helium gas and do not contain fluorinated GHGs (“F gases”).

Mr. Mahoney said the manufacturing of the cryopumps at the Facility is primarily an assembly of parts produced elsewhere; other than some welding, the Facility does not perform metal working.

Mr. Mahoney said that, in addition to manufacturing cryopumps, the Facility performs research and development, service to customers’ cryopumps, and repackaging and supply of refrigerant gases.

Mr. Mahoney said that one area of research and development was regarding Edwards Vacuum’s “Polycold” or “PCC” refrigerant gas. Mr. Mahoney said that Polycold is a mixture of methane, ethane, and propane.

Mr. Mahoney said that, while the Facility does perform some service to customers’ cryopumps, the majority of this work is now being performed at Edwards Vacuum’s facility in Arizona.

Mr. Mahoney said that the Facility supplies refrigerant gases, including F gases, to customers all over the world. Ian Armstrong, Senior SHE Specialist, joined the meeting virtually. Liam King, Material Compliance Engineer, joined the meeting in-person. Mr. Mahoney showed an email on the conference room screening showing an accounting of refrigerant gases that included R-125, R-14, R-23, R-236FA, and R-245FA.

2. Engines

Mr. Mahoney said that the Facility has two Atlas Copco gensets, each of which contain two Volvo Penta engines, and one Caterpillar (“CAT”) genset, which includes a CAT engine.

Mr. Melcher said that he had corresponded with MassDEP and had obtained copies of the engine certifications provided to MassDEP. The certifications for the Atlas Copco gensets are dated February 8, 2023, and the certification for the Caterpillar genset is dated September 1, 2022.

Mr. Mahoney said that, on October 23, 2023, due to mechanical problems in the existing engines, the Facility replaced its Atlas Copco gensets with identical units.

Mr. Mahoney said that the gensets are only used for emergency power and the Facility does not have an agreement to sell power. Mr. Mahoney said that the facility had not lost power in 2024, and the engines had only been operated for maintenance purposes.

B. Facility Tour

At approximately 11:15 a.m., Mr. Mahoney and the inspectors began a facility tour.

The group toured the assembly area, which included the following sub-areas:

- Cylinder second stage,
- Refrigerator assemble,
- Ultrasonic cleaning,
- Refrigerator Test, and
- Cryofinal assembly.

At the ultrasonic cleaning sub-area, Mr. Mahoney said that water, soaps, and anti-foaming agents are used in the bath. The inspectors observed a drum labeled “corrosive” and “AquaVantage 815 QR-NF detergent degreaser.”

The group briefly exited the building on the northeast side to view the outdoor gas storage tanks and air chilling equipment. Mr. Mahoney said that the large storage tank held nitrogen, and the smaller storage tank held argon.

The group re-entered the building and visited the compressed gas storage room. Tanks with the following labels were observed:

- Oxygen,
- Empty,
- Helium,
- Nitrogen,
- Polycold,
- Nitrogen and helium,
- Hydrogen,
- HFC-125,
- Freon 236fa, and
- Tetrafluoromethane.

The group visited the “PCC Room.” The inspectors observed tanks labeled “Polycold,” as well a tank labeled tetrafluoromethane. Mr. Mahoney said that, despite the name of the room, all service blends are packaged in the room.

The group exited the building and visited the QAC 1500 Atlas Copco gensets. The gensets were not on wheels, as had been observed by MassDEP inspectors during their June 14, 2023 inspection. Mr. Mahoney opened the cabinet doors for the genset located to the southwest and a photograph was taken of the visible engine labels. See Photo 2. The label states that the engine family is PVPXL16.1CDD with a date of manufacture of February 2023 and that the engine complies with U.S. EPA / California regulations for 2023 nonroad / off-road diesel engines. Mr. Mahoney said that the engines likely have a diesel particulate filter.

Mr. Mahoney said that the Facility’s intent is to automatically operate the engines once per week for 30 minutes, but there have been problems with getting the system to operate; if there are any alarms in the system (e.g., precipitation has collected in the pan below the engine), the engines will not run. Mr. Mahoney said that the Facility’s intent is to automatically generate a report on engine operation, but this was not functioning correctly; however, Mr. Mahony can access the run time information in an online portal.

A label on the control panel of the genset states that, “This equipment has an engine that meets U.S. EPA emission standards under 40 CFR 1039.625,” and “manufactured in 2020.”

The group visited the CAT genset. Mr. Mahoney said that the CAT genset provides back-up power for lighting and life safety systems at the Facility. The inspectors could not see a label on the CAT engine.

Mr. Mahoney said that CAT engine operation data is not stored in an online portal but is stored in the Programmable Logic Controller on the genset. Mr. Mahoney said that the CAT engine operates 10 minutes per week on Tuesday mornings. Mr. Mahoney scrolled through approximately the last five run records for the engine to verify that this procedure is followed.

The group re-entered the building and walked through the Polycold Development room. Mr. Mahoney said that Edwards Vacuum was researching expanding the use of its Polycold product. The inspectors observed several tanks attached to piping affixed to the wall. Mr. Mahoney said that tanks received from customers are evacuated into a central tank and then hauled off-site for disposal.

The group walked through the Polycold Servicing Area. Mr. Mahoney said that this was the one service that was still performed at the Facility, but this function would likely be transferred elsewhere soon.

C. Records Review

At approximately 12:00 p.m., the group returned to the conference room and Mr. Mahoney looked for records for the engines. Mr. Mahoney opened the portal for the Atlas Copco engines and attempted to pull a run-time report. The report status did not move beyond “Pending” during the inspection.

Mr. Mahoney found a manufacture date of the Atlas Copco gensets of March 31, 2022, as well as serial numbers for the two gensets, but not information specific to the Volve Penta engines.

D. Closing Conference

At approximately 12:30 p.m., the group held a closing conference.

Mr. Melcher first addressed Greenhouse Gas reporting. For the Chelmsford facility Edwards Vacuum did not appear to have submitted its reporting year 2022 data and did not submit the required notification that the facility was closing. For the Haverhill facility, Mr. Melcher recommended that the Facility determine its applicable greenhouse gas emissions and, if necessary, create a GHG Reporting Program identification number and report emissions for the 2023 reporting year. Mr. Melcher said that he believed that reports were due in March following the reporting year.

For engines, Mr. Melcher that Mr. Mahoney provide the following information via email:

- Run times for the Volvo Penta engines for calendar year 2024,
- Model and year of manufacture for the Volvo Penta engines, and
- If available, photographs of nameplate labels for all of the engines.

Mr. Melcher said that the Facility may already be subject to the import requirements of the American Innovation and Manufacturing Act and that additional requirements for exports are becoming effective in January 2025.

Mr. Melcher said that he would prepare an inspection report describing the inspection and provide it to Mr. Mahoney.

The inspectors departed at approximately 12:40 p.m.

III. Post-Inspection Correspondence

On December 4, 2024, Mr. Mahoney emailed Mr. Melcher to provide run times since October 2023 for the four Volvo Penta engines. The maximum run time recorded was 67 hours.

On December 12, 2024, Mr. Mahoney emailed Mr. Melcher to provide the following serial numbers and manufacture dates for the four Volvo Penta engines:

Serial Number	Manufacture Date
2016145182	6/1/2021
2016145190	6/1/2021
2016145199	6/1/2021
2016145229	6/2/2021

Appendix A: Inspection Report Photographs

Facility:	Edwards Vacuum
Address:	20 Creek Brook Drive; Haverhill, MA 01832
Programmatic ID:	MA0000002512100877
Inspection Date:	12/4/2024
Photographer:	Dana Donovan
Camera Model:	iPad Pro 11-inch (M4)

Photo Number	File Name	Time Taken	Description
1	20241204_152537803_iOS.jpg	10:25	model cryopump in lobby of building



Blower

Cylinder

Gas inlet and
outlet pipes

Motor

Photo Number	File Name	Time Taken	Description
2	20241204_164528332_iOS.jpg	11:45	plates with information about two Volvo Penta engines in Atlas Copco genset

