Ethylene Oxide: Technical Review
Status Report: Indorama Ventures, Port Neches, TX

As EPA pursues its mission to protect public health and the environment, addressing ethylene oxide (EtO) remains a major priority for the Agency. EPA's National Air Toxics Assessment (NATA), released in August 2018, identified a number of areas across the nation with potentially elevated risk from continuous exposure to EtO in the outdoor air. NATA estimated these risks based on EtO emissions from 2014, which were the most recently available at the time, and are now seven years old.

NATA is a screening-level analysis that is intended to identify pollutants or areas for closer examination. EPA and the State air agencies are working together to better understand emissions in areas that NATA identified as potentially having elevated risk. State air agency partners are in discussions with individual facilities to identify opportunities for reducing EtO emissions from those facilities. EPA is reviewing its national regulations for industrial facilities that emit EtO. Actual risks today may be lower or higher than NATA estimated due to several factors, including updated or more refined facility emissions information or recent facility changes including the installation of pollution controls.

The information below describes the technical analyses conducted for Indorama Ventures in Port Neches, TX to update and document work conducted since NATA was issued in August 2018 (Note: The Huntsman Port Neches facility is now owned by Indorama Ventures). EPA is providing this information to address, in part, the EPA Office of Inspector General's Management Alert (dated March 31, 2020).

Initial Actions Conducted

On October 15, 2020, EPA Region 6 requested assistance from the State of Texas in gathering the most current information on ethylene oxide emitting facilities, including Indorama, and to assist with the update of technical assessments.

- EPA obtained updated facility emissions and control information on EtO from the State of Texas.
- The EPA NATA estimate was based on annual routine emissions data from 2014. EPA obtained 2019 annual routine and upset EtO emissions for Indorama which showed continued significant EtO event emissions and changes in EtO emission totals from previous years. Fifty-four percent of the reported sitewide EtO emissions from 2014 to 2019 are reported as emissions events.
- On April 14, 2021, EPA Region 6 sent a letter to Indorama asking for updates on EtO since 2014. On May 3, 2021, Indorama provided a response to the EPA letter.
- EPA and TCEQ held a conference call with Indorama on May 3, 2021 and discussed facility efforts to reduce reported ethylene oxide emissions and obtained additional technical information.
- On May 5, 2021 EPA Region 6 sent an email to Indorama with follow-up questions on the information they provided. Indorama replied via email on May 19, 2021.

The Facility and EtO Processes

The Indorama Port Neches facility has multiple manufacturing units and processes. which includes EtO production, as well as the production of other chemicals and products using EtO. Products from this facility are used in various industries, including electronics, beauty and personal care, solvents, resin intermediates, stabilizers, energy and construction.

Preliminary 2020 Annual Routine Emissions Data Update

The 2020 emissions inventory data updates from facilities were due for submissions to TCEQ on April 1, 2021.While a TCEQ quality assurance/quality control review of this new 2020 emissions data continues, the preliminary review of this data, along with information received from Indorama indicate that:

- From 2014-2020, through emission reductions and/or re-evaluation of actual emission levels, reported EtO routine annual emissions at the Indorama facility decreased approximately 44 percent.

Air Emissions Event (Process Upsets) Update

Facility air emission events added significant EtO emissions to the total annual EtO emissions since 2014. Fifty-four percent of the reported sitewide EtO emissions from 2014 to 2019 are reported as emissions events. Indorama has undertaken multiple efforts to reduce air emission events or" upsets" at the facility.

Annual upsets at the facility involving EtO hit an all-time low in 2020, with one reported upset that year releasing a very small amount of EtO. In 2021, the facility has reported a number of upsets involving EtO; EPA remains concerned that the historic problems with upsets at the site may not be completely resolved.

Annual Routine Reported Emissions Updates

2016: Indorama discovered emissions of another compound were incorrectly added to the EtO number and revised the emissions inventory to correct the error.

2017: Review of EtO emissions inventory numbers discovered an over-reporting of EtO emissions and revised the emissions inventory.

2019: There were two updates made to the emissions inventory: one increase and one decrease. Indorama increased its emissions inventory for this year when an error was identified during a facility/state review of previously reported EtO emission numbers. During an Indorama review, Indorama reduced its emissions inventory when it discovered an incorrectly low destruction and removal efficiency was being used in a calculation, which resulted in higher than actual reported EtO annual emissions.

Facility Improvements and Planned EtO Reduction Efforts

The facility made improvements to its Leak Detection and Repair (LDAR) program to reduce EtO emissions. Numerous LDAR program improvements at the site have been taken, are in progress and are planned:

- 1,300 lb reduction in calculated EO emissions in 2020

- Utilized actual monitoring data in lieu of emission factors
- Improved torqueing methods and the quality of washers installed on EO reactors and other large equipment
- Altered maintenance prioritization to escalate timing to address Delay of Repair
- Continued focus on LDAR program to seek further emission reductions and better EtO estimates

Indorama has additional EtO emission reduction efforts planned at the facility as summarized below:

- Several phases of Advanced Process Controls work to be done in the next 3-5 years which are expected to improve reliability of units and reduce unit upsets, which reduces unplanned emission events
- Continued utilization of Risk Based Mechanical Integrity program which is expected to reduce unplanned events due to mechanical integrity failures
- Continued improvements to electrical and steam infrastructure and electrical relays
- Continued focus on LDAR program to seek further emission reductions and better EtO estimates

Updated EPA Risk Assessment

Based on 2018 emission inventory data, EPA is updating the estimated inhalation public health risk from ethylene oxide in the community near Indorama. 2018 data was chosen for its general availability and data quality. The revised increased cancer risk number based on 2018 emission data is 2,000 in 1 million[1].

EPA modeling of estimated risks is very conservative. It provides a threshold recommendation to warrant a closer look at facility operations and emissions and is not a "bright-line" regulatory action limit for required action. EPA uses a general 100 in 1 million (1 in 10,00) increased risk of cancer as a guideline for further investigation. It assumes a continuous, 24 hours per day inhalation exposure to hazardous pollutants, including EtO, for a lifetime of 70 years

Based on 2018 data, EPA reassessed and updated the estimated inhalation public health risk from hazardous air pollutants, including EtO, in the community near Indorama. Our results indicate the estimated maximum individual cancer risk (the single highest estimated additional cancer risk for an individual in the area) increased about 37 percent from the previous NATA risk estimate based on 2014 emissions (from 1,456 in 1 million to 2,000 in 1 million).

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[1] In a letter dated June 17, 2021, pursuant to CAA section 307(d)(7)(B), the Agency will grant reconsideration on the following aspects of the final Miscellaneous Organic NESHAP (MON) rule to provide an additional opportunity for public comment: (1) the use of EPA's Integrated Risk Information System (IRIS) value for ethylene oxide in assessing cancer risk for the source category; and (2) the use of the TCEQ risk value for ethylene oxide as an alternative risk value to EPA's IRIS value. Reconsideration is being granted on this topic on the basis that the TCEQ risk value for ethylene oxide was finalized after the comment period closed and because the risk posed by ethylene oxide is of central relevance to EPA's determination that risks from sources in the Miscellaneous Organic Chemical Manufacturing source category are unacceptable and that more stringent standards are required.

Preliminary 2020 annual EtO emissions are about 72 percent less than the 2018 EtO emissions assessed by EPA. However, there were virtually no facility upsets involving EtO in 2020; several EtO emission upsets have occurred already in 2021. EPA is concerned that problems with upsets at the site may not be resolved.

Observations

The revised estimated 2018 maximum individual cancer risk is well above 1 in 10,000. Adding upset emissions to the risk assessment dramatically increased the updated risk estimate. 2020 only had one small emissions event. 2021 has had multiple emissions events, some due to the TX freeze. EPA remains concerned that problems with upsets at the facility may not be completely resolved.

Future Actions Planned

EPA plans to continue to monitor the facility upsets involving EtO, evaluate if historical problems with upsets have been resolved, and continue to monitor their progress with reduction of emissions inventory.

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Additional information will be provided at a community outreach event currently being planned by EPA in coordination with TCEQ, and at the following website after the outreach event is conducted: https://www.epa.gov/hazardous-air-pollutants-ethylene-oxide/status-report-indorama-formerly-huntsman-port-neches-tx.