Ethylene Oxide: Technical Review
Status Report: Shell Technology Center – Houston, 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 Shell Technology Center in Houston, TX, to update and document work conducted since NATA was issued in August 2018. 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 the Shell Technology Center, and to assist with the update of technical assessments.

- EPA obtained updated facility emissions and control for the Shell Technology Center from the State of Texas.
- The EPA NATA estimate was based on annual routine emissions data from 2014. EPA obtained 2019 annual routine EtO emissions data for the Shell Technology Center in Houston which confirmed emissions have been consistently less than 0.5 tons per year.
- On April 14, 2021, EPA Region 6 sent a letter to the Shell Technology Center asking for updates on EtO since 2014. Shell responded to the EPA letter on May 11, 2021.
- EPA and TCEQ held a conference call with the Shell Technology Center on April 30, 2021 and discussed facility efforts to reduce reported ethylene oxide emissions and obtained additional technical information.

How EtO is handled at the facility

The Shell Technology Center primarily uses EtO in testing the performance of various catalysts.

EtO Emissions Reporting Refinements

Shell Technology Center representatives shared that their EtO emissions are from a flare and a central enclosed burner that they use as emission control devices. The enclosed burner has a removal efficiency of 99.9% while the flare control efficiency is 99%. While actual operations

involve sending EtO to both the flare and the burner, the Center has been reporting EtO emissions assuming all the EtO was sent to the flare. This has resulted in conservative, but overestimated, estimates of EtO emissions from the facility since 2014. The Center estimates that actual EtO emissions from the facility are at least a factor of ten lower that what has been conservatively over-reported in previous emissions inventories.

Preliminary 2020 Annual 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, preliminary information received from the Shell Technology Center indicates that:

From 2014-2020, through emission reductions and/or re-evaluation of actual emission levels, reported EtO annual emissions at the Shell Technology Center were reduced approximately 45 percent.

The 2020 EtO annual emissions estimate, however, is only 45% less than the previously reported facility EtO emissions in 2014 on which the EPA NATA risk estimates was based. In 2020, the more efficient emissions control device, the Clean Enclosed Burner, was not available compared to previous years due to the replacement of a blower assembly and the lack of total waste gas flow required to operate, as the facility was not fully operational due to COVID 19. 2020 was not a typical year.

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 the Shell Technology Center. 2018 data was chosen for its general availability and data quality. The revised increased cancer risk number based on 2018 emission data is 40 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 10,000) 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 the Shell Technology Center. Our results indicate *t*he estimated maximum individual cancer risk (the single highest estimated additional cancer risk for an individual in the area) decreased about 86 percent from the previous

[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.

NATA risk estimate based on 2014 emissions (from 291 in 1 million to 40 in 1 million). Preliminary 2020 annual EtO emissions are slightly lower than the 2018 EtO emissions assessed by EPA.

Future Actions Planned

More accurate numbers have revealed that EtO emissions at Shell Technology Center have been persistently lower than previously reported. The 2018 estimated cancer risk due to emissions from the Shell Technology Center is well below the EPA guideline of a 100 in 1 million (or 1 in 10,000); no further investigation or action is recommended at this time.

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-shell-technology-center-houston-tx.