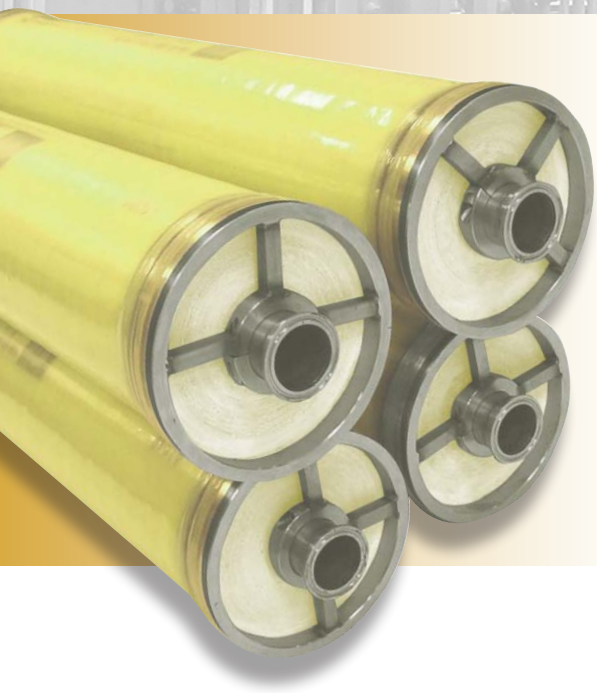


ETHYLENE OXIDE (EO) AND VINYL ACETATE MONOMER (VAM) PRODUCTION

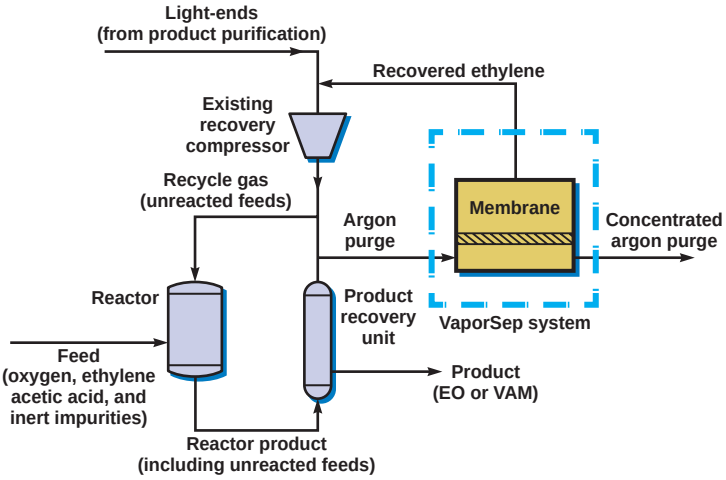
- **Recovers valuable ethylene feedstock with payback time of 1 year or less**
- **Minimizes installation cost with skid-mounted construction**
- **Simplifies installation with no additional moving parts**

"VaporSep® is a simple system with compelling economics for recovering ethylene from the argon purge."

Problem

In ethylene oxide (EO) production, oxygen and ethylene are reacted to form EO. Since the conversion per pass is not 100%, the reactor is operated in loop mode. Argon, which enters with the oxygen feed, builds up in the reactor loop and must be purged. The vinyl acetate monomer (VAM) process is very similar except acetic acid is also fed to the reactor. A portion of the ethylene feedstock is lost with the argon purge gas from the reactor loop. The value of the lost feedstock is substantial — approximately $500,000 per year for a typical EO or VAM plant.

VaporSep® Solution



Simplified EO or VAM production process showing addition of the VaporSep® membrane system

The VaporSep® unit consists of a single-stage membrane system that separates ethylene vapors from argon. The ethylene-enriched permeate is sent to an existing compressor, then returned to the reactor; the argon-enriched residue is flared.

VaporSep® systems recover more than 90% of vent ethylene that would otherwise be flared. VaporSep® units are currently used by major EO producers including Samsung, Total, PEMEX and Formosa Plastics and VAM producers including Samsung BP and Dairen.

MTR Membrane Technology & Research

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ETHYLENE OXIDE (EO) AND VINYL ACETATE MONOMER (VAM) PRODUCTION

VaporSep® system for ethylene recovery

Benefits

- Recovers valuable ethylene with payback time of 1 year or less
- Minimizes installation cost with skid-mounted construction
- Minimizes footprint and weight
- Operates at modest temperature and pressure
- Integrates into existing operations with minimal modifications
- Requires no additional rotating equipment

System Performance

- Typically 70% to 90% ethylene recovery
- Payback is 6 to 12 months

System Description

- Complete skid-mounted unit includes all necessary instrumentation and controls
- Typical size:
  15 ft (L) x 6 ft (W) x 8 ft (H); 5000 lb

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