

Emission Control and Recovery of Solvents from Pharmaceutical Manufacturing



MEGTEC Systems, Inc. Solvent Recovery Division specializes in the design and supply of process equipment used to remove and recover volatile organic compounds (VOCs) from air and water utilizing adsorption, evaporation and distillation technologies.

Our systems are widely used in the pharmaceutical industry primarily for the following applications:

- a) Remove VOCs (solvents) and Hazardous Air Pollutants (HAPs) from air and other gaseous emissions
- b) Remove organic solvents from wastewater prior to discharge
- c) Separate and recover organic solvents from waste solvent mixtures

Many of the systems we supplied have been installed to meet the pharmaceutical MACT regulations for HAPs.

Our solvent recovery and/or distillation systems are installed in a number of different countries including, the U.S and Puerto Rico, Ireland and several EU countries.

The bottom line is process knowledge

Remove and Recycle VOCs (Solvents) from Air and Liquid Emissions

Typical Emission Sources

Air

- Fluid bed dryers (pill coating)
- Vent condensers
- Miscellaneous reactor, tank vents

Liquid

- Wastewater from reactor, storage tank cleaning
- Waste organic solvent mixtures

MEGTEC Products

- Activated carbon adsorption
- Wastewater steam stripping
- Multi-component distillation
- Thermal, catalytic and regenerative oxidizers
- Biological treatment

MEGTEC Services

- Design and supply of process equipment
- Turnkey installation
- HAZOP review
- Process validation studies
- Preventive maintenance, spare parts and system upgrades
- Activated carbon screening and replacement services



Distillation system at a wastewater treatment facility

Wastewater Treatment

Located in Southeastern United States, this generic drug manufacturing plant owned by a major pharmaceutical company was generating a wastewater stream rich in solvents like acetone and isopropanol (IPA).

The high solvent concentration in the wastewater (in excess of 1000 ppm) prevented the company from discharging this stream to the municipal water treatment plant. Instead, they had to have an outside firm haul it away as hazardous waste at a cost exceeding \$1 million per year.

MEGTEC designed and supplied this skid-mounted distillation system to treat up to 50 gpm wastewater to remove acetone and IPA.

Installed in 2006, the system is reducing the solvent level in the wastewater to less than 15 ppm so it can be discharged to the municipal sewer while also producing an enriched acetone/IPA mixture.



Carbon adsorption system for VOC abatement

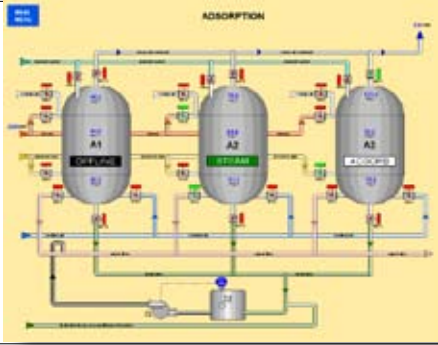
HAP/VOC Emission Control

Installed and in operation since 1995 at a multinational pharmaceutical company in Cork County, Ireland, this carbon adsorption system is removing miscellaneous VOCs from the various point source air emissions to meet T.A. Luft standards for air quality.

The system is designed to treat 10,000 cubic meters per hour (or 6340 cubic feet per minute) of air containing VOCs such as acetone, acetonitrile, toluene and methylene chloride. The VOCs are removed in the system and recovered as chlorinated and non-chlorinated solvents.

The system consists of a skid-mounted two-bed adsorption system, condenser, decanter with all associated piping, valves, instruments and controls. The system is designed for continuous and fully automatic operations. The carbon adsorbers are constructed of corrosion resistant material Alloy 254.

Ensure Pharmaceutical MACT Compliance



Carbon adsorption flow diagram



Carbon adsorption and distillation system



Skid-mounted system

Instrumentation and Controls

MEGTEC's instrumentation and controls team prides itself in staying up to date with the latest in programmable logic controller (PLC) technology. MEGTEC's standard controls package integrates an HMI that is easily accessible via a web browser and offers data logging in CSV formatted files for use in spreadsheets or database programs.

More complex systems, along with an increased need for automated reporting and data analysis, calls for SCADA software packages that are customized and tailored to meet our customers' needs. Remote monitoring of PLC, HMI and SCADA systems allows our process engineers to troubleshoot and implement solutions right away.

We also have customers with distributed control systems (DCS) equipment and strict control standard requirements. From special communication gateways to incorporating special I/O equipment, we can meet our customers' needs.

MEGTEC's Controls team consists of seasoned professionals with years of experience in project startup, training and other customer services.

VOC Abatement and Distillation

Shown above, this unique solvent recovery system was installed and commissioned in the 1991-1992 period for a major multi-national company to control facility wide emissions at their Beerse, Belgium facility.

This facility manufactured multiple products in many batch reactors located in multiple buildings. The total air flow was relatively large (80,000 cubic meters per hour) with VOCs (solvents) in the air stream including both chlorinated and non-chlorinated solvents and both water immiscible and miscible solvents.

With the combination of substantial air volumes and the inherently variable nature of the solvent loading, the solvent mix presented many technical challenges in the design and selection of a VOC abatement system. Recuperative and regenerative thermal oxidizers were considered and ultimately rejected for two reasons. The presence of chlorinated solvents would have required an additional scrubber to remove HCl formed due to the oxidation of chlorinated solvents and the possibility of formation of secondary pollutants (dioxins) and the desire in EU countries among environmental engineers and regulators to seek non-burning alternatives.

MEGTEC's design included a combination of activated carbon adsorption and distillation technologies to remove VOCs from the air, collect the solvent mixtures and separate as chlorinated, water immiscible and water miscible fractions.

MEGTEC can design and supply individual components as well as complete skid-mounted systems based on customer requirements

- Project management
- Process design (flow diagrams, equipment specifications, P&IDs)
- Mechanical designs (detailed piping, structural and component fabrication drawings)
- Instrumentation and controls system design
- Turnkey installation services
- System or component fabrication
- System startup, operator and maintenance training

For over thirty years, the Solvent Recovery Division has been a leader in supplying systems to separate, purify and recover organic solvents for recycle and reuse. Our systems are installed and in operation around the globe in many industries including:

- Chemical manufacturing
- Pharmaceutical manufacturing
- Semiconductor and electronics
- Gravure printing
- Paper, film and foil coating

