

United States  
Environmental Protection  
Agency  
Air

Office of Air Quality  
Planning and Standards  
Research Triangle Park, NC 27711

EPA 456/R-01-004  
December 2001



**EPA**

# TECHNICAL BULLETIN

## REFRIGERATED CONDENSERS FOR CONTROL OF ORGANIC AIR EMISSIONS

**A**IR

**T**ECHNOLOGY

**C**ENTER



## WHERE CAN YOU USE A REFRIGERATED CONDENSER?

A refrigerated condenser works best on emission streams containing high concentrations of volatile organic emissions. They are less effective on dilute streams (i.e., where there is much more air flow than organic vapor flow). For example, a paint spray booth requires a substantial amount of air flow through it to protect worker health and safety. As a result, most of the heat removed by a refrigerated condenser would come from air. The organic vapor content in a paint booth emission stream could be recovered by using a refrigerated condenser, but it would be very costly per ton of organic compound recovered. In addition, to reuse the organic compound, moisture condensation would probably need to be removed.

A refrigerated condenser could be a viable control option for any source of evaporative organic emissions if:

- there is minimal air flow carrying the organic emissions (i.e., the air stream is saturated with the organic compound)
- the organic vapor containment system limits air flow
- required air flow does not overload a refrigeration system with heat
- only one organic compound is emitted (or the system is designed for the compound that is the most difficult to control)

Refrigerated condensers often are used in the following applications:

- Dry Cleaning Industry - used to recycle dry cleaning fluid (perchloroethylene or petroleum-base solvent) with virtually no air flow. The vapors are usually condensed without air being used to transport them.
- Degreasers using VOC or Halogenated Solvents - some air is mixed with vapors because the solvent is uncovered (i.e., exposed to the atmosphere). Preparation (degreasing/cleaning) of parts prior to powder coating is one example of this.
- Transfer of Volatile Organic Liquid (VOL) and Petroleum Products (e.g., bulk plants, bulk terminals, and similar transfer operations).
- Vapors from Storage Vessels/Tanks

## WHAT IS REFRIGERATION?

All refrigeration units are basically "heat pumps," absorbing heat on the "cold side" of the system and releasing heat on the "hot side" of the system. All refrigeration systems have a hot side and a cold side. Some have a compressor. The difference between refrigeration systems is whether the refrigerant is actually liquefied within the apparatus and how low a temperature the "cold side" can reach.