

# equipment specs

## KRYOCLEAN™ VAPOR RECOVERY SYSTEM

### BENEFITS

- Lower operating costs
- Higher emissions control efficiencies
- Superior reliability
- Lower installed costs
- Enhanced process safety
- Automated, flexible operation
- No secondary pollution



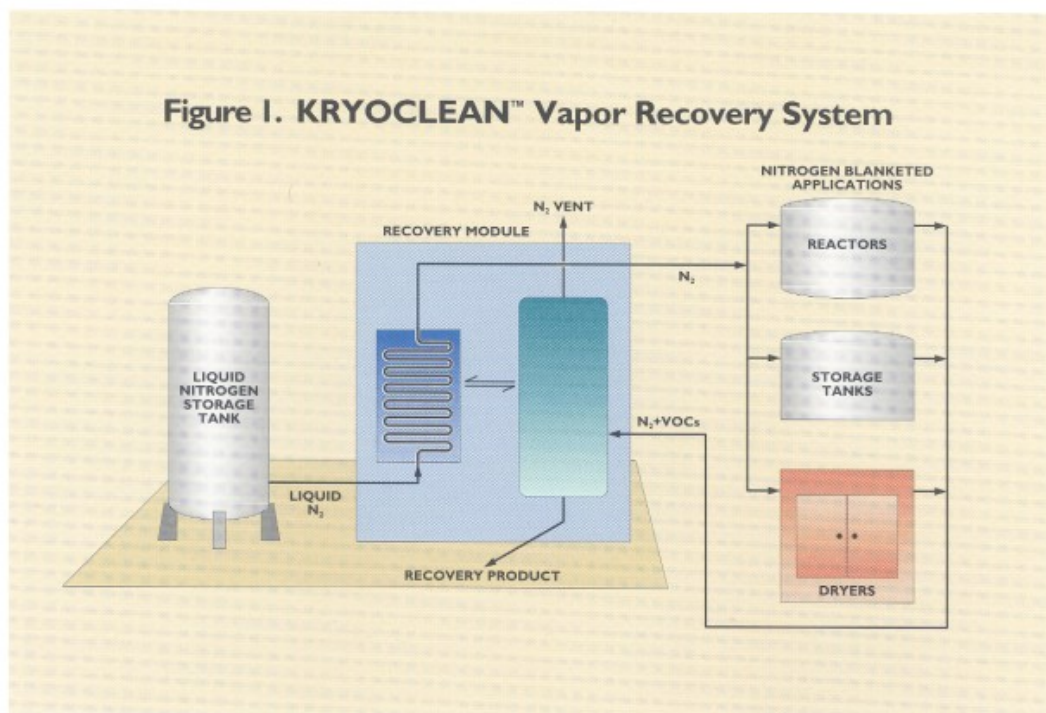
The KRYOCLEAN system enables your plant to achieve safe, reliable and effective vapor recovery — at far less cost than other pollution control technologies.

### **Stops Air Pollution ... Cold!**

In today's highly regulated chemical industry, you don't need pollution control headaches. You need abatement equipment that's economical, reliable, safe and flexible. And that's where the KRYOCLEAN system can help.

BOC Gases' KRYOCLEAN system provides versatile and effective vapor recovery at a fraction of the cost of other abatement methods. What makes the KRYOCLEAN system uniquely cost-effective is that it uses an environmentally sound utility: liquid nitrogen.

The KRYOCLEAN vapor recovery system uses liquid nitrogen as a refrigerant for condensing and recovering solvent. Vaporized nitrogen is used to purge the head space in reactors, storage tanks, dryers and other vessels.



## Liquid Nitrogen Enables Cost-Effective Pollution Control

The KRYOCLEAN vapor recovery system removes volatile organic compounds (VOCs) – at exceptionally high control efficiencies – over a wide range of varying flows and solvent loadings.

The KRYOCLEAN recovery module uses liquid nitrogen for vapor recovery. The system cools emissions, causing volatile organic compounds to condense into liquid.

If you're already using liquid nitrogen for purging, inerting, and other applications, the KRYOCLEAN system enables you to tap into your liquid nitrogen's refrigerant value ... a potential wasted in most plants.

### Principles of Operation

The KRYOCLEAN system draws organic vapors from various plant processes to the system's condensers. Liquid nitrogen is vaporized to cool the condensers via an intermediate heat transfer loop.

By lowering the process stream to the temperature

at which the volatile organic compounds condense, the KRYOCLEAN system removes these compounds from the process stream in liquid form. Liquid nitrogen's low temperature maximizes VOC removal efficiency.

The liquefied VOCs are separated and may be disposed of, recycled, or reused. Clean process gas, stripped of VOCs, is vented to the atmosphere, meeting or exceeding compliance standards for emissions control.

### The KRYOCLEAN System Keeps Your Plant in Compliance Around the Clock.

The KRYOCLEAN vapor recovery system is designed for continuous operation to minimize downtime. Dual multistage process condensers allow for uninterrupted usage by alternating freeze and thaw cycles. This enables the system to handle components in the process stream having high freezing points, such as water:

**Benefits of Using the KRYOCLEAN System for Air Pollution Control**

**Lower Operating Costs.** The annualized cost of the KRYOCLEAN system is often less than half that of other vapor recovery systems. The KRYOCLEAN system saves you money by tapping into the refrigeration value of liquid nitrogen already being used in other processes.

**Higher Emissions Control Efficiencies.** High VOC removal efficiencies enable the system to meet current and future emissions control requirements to ensure compliance. The system maintains peak control efficiencies from high turndown to full capacity.

**Superior Reliability.** The KRYOCLEAN system has fewer moving parts than mechanical refrigeration systems, resulting in less maintenance, greater reliability and minimal downtime.

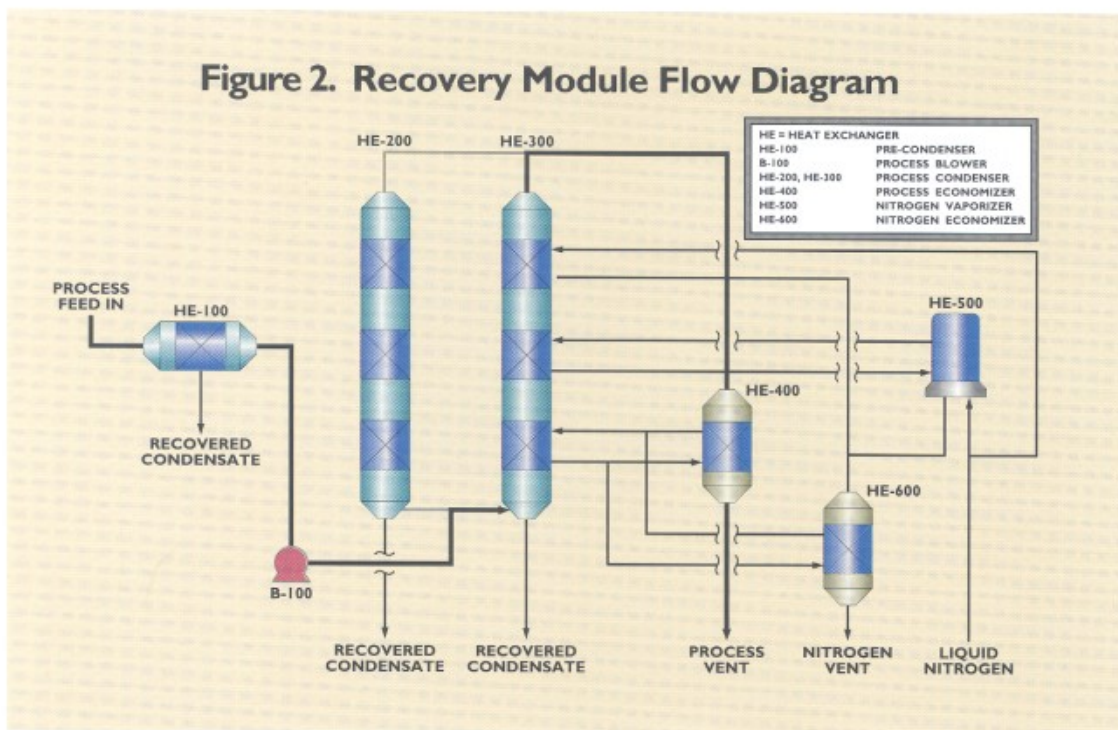
**Lower Installed Costs.** The compact KRYOCLEAN unit comes skid-mounted for fast and easy installation, minimizing labor costs.

**Enhanced Process Safety.** Use of inert nitrogen in the recovery module prevents combustible mixtures from forming.

**Automated, Flexible Operation.** A programmable logic controller with a simple-to-use operator work-station enables automated control and monitoring of the system.

**No Secondary Pollution.** The KRYOCLEAN system does not contaminate the recovery product stream with water, so no wastewater is generated. Free of NOx and incomplete combustion products typically generated by incinerators, the exhaust gas vented by the KRYOCLEAN system does not require post-treatment.

**Figure 2. Recovery Module Flow Diagram**



In the KRYOCLEAN recovery module, dual process condensers cooled by liquid nitrogen are used to condense volatile organic compounds so they can be removed as liquids.

**Nitrogen Supply**

BOC Gases offers reliable, cost-effective supply of bulk liquefied nitrogen for use with KRYOCLEAN vapor recovery systems and other process operations.

**For More Information**

Typical KRYOCLEAN system customers include producers and users of organic chemicals, pharmaceutical manufacturers, agrichemical formulators and producers, manufacturers and users of inks, dyes, adhesives, and coatings ... and others who use volatile organic compounds.

BOC Gases can evaluate your pollution control requirements and recommend the appropriate pollution control technology. We can also provide assistance with design, engineering, installation, and start up as well as ongoing technical service and support.

To find out more about the KRYOCLEAN vapor recovery system and other technologies for pollution control, contact BOC Gases' vapor recovery group, at our Murray Hill, NJ, headquarters (908) 771-1050.



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