



## ECOfreeze Vacuum System

An Improved Way to Eliminate  
Process Vapors



**GRAHAM**  
ENGINEERING ANSWERS

# ECOfreeze

## Energy Efficient and Environmentally Friendly

ECOfreeze is a unique condenser technology designed to remove vapors or steam from a process stream before they can enter the vacuum system or downstream components. Your system will run clean, with lower energy and maintenance costs. And because ECOfreeze also reduces the production of contaminated wastewater, there is lower waste-treatment cost and lower environmental impact.

The ECOfreeze technology provides an improved way to process edible oils, plastic, polyester or resin intermediates, and other process derivatives. And it's exclusively from Graham, the experts in vacuum system technology. Because it's not just about engineering products, it's about engineering answers.

### The ECOfreeze Advantage

ECOfreeze offers considerable advantages over traditional vacuum systems.

- Reduces overall energy costs
- Assures total product recovery
- Minimizes environmental impact
- Enhances operational flexibility
- Simplifies cleaning and maintenance
- Reduces vacuum system size



*Our freeze condensers trap and solidify product on heat transfer surfaces to improve reclamation and reduce carry-over into the downstream vacuum system.*

With today's high energy costs and strict environmental regulations, installing an ECOfreeze system makes good sense for a new process or when evaluating options to revamp an existing system.

### How ECOfreeze Works

ECOfreeze uses a cold heat transfer surface to solidify process vapors or steam through condensation followed by freezing, or directly by means of deposition. Deposition occurs when vapors pass directly to ice without passing through the liquid phase. By freezing process vapors before they enter the vacuum system, the energy-demanding compression process is accomplished more efficiently and economically. In many cases, the vacuum system downstream of a freeze condenser handles air only because all process vapors are trapped by the freeze condenser.

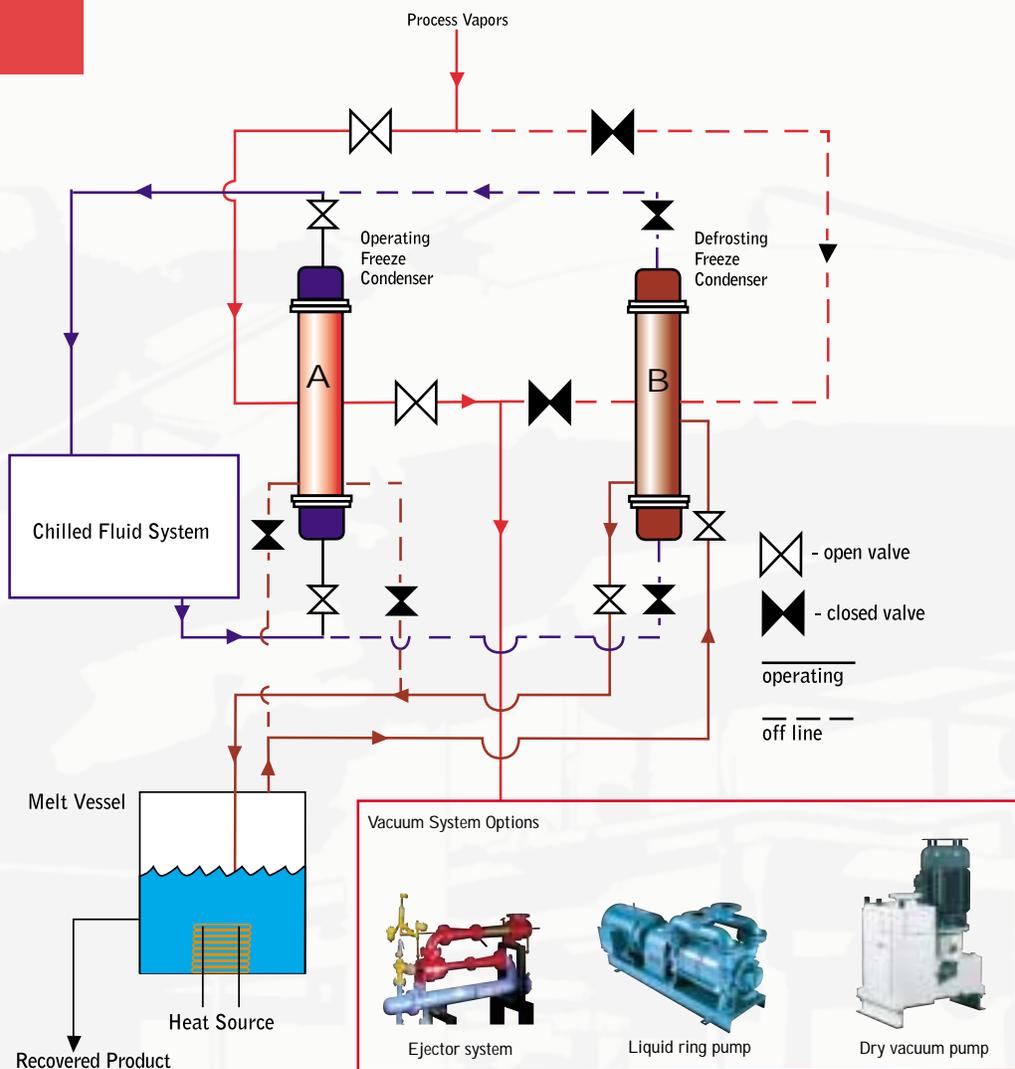
### ECOfreeze Diagram (see illustration opposite page)

ECOfreeze uses two condensers for a typical application. While Condenser A is in the freezing or ice-building mode, Condenser B is defrosting and preparing to go on line. As process vapors pass through the shellside of the freeze condenser, the vapors turn into ice as they contact the cold heat transfer surface and this ice continually increases in thickness, causing operating pressure to increase. The standby unit is brought on line and an operating freeze condenser is transferred to defrost mode once an undesirable operating pressure is reached. A secondary heat source or warm vapors from the melt vessel are used to defrost an idled condenser. A variety of cooling fluids may be used; however, the actual fluid selected is dependent on the freeze point of the process vapors handled.

### Your Single Source for Equipment and Support

To achieve optimal results, an ECOfreeze system requires a properly matched freeze condenser and supporting vacuum system. Graham designs and builds the critical components in the ECOfreeze system regardless of whether the design requires an ejector system, a liquid ring pump, or dry pump.

At Graham, we also provide the after-sale support services to ensure your system operates to design specifications. From on-site installation and start-up assistance to training your personnel in maintenance and operation procedures, Graham Technical Support Services are with you every step of the way.



## Comparison of ECOfreeze Condensation versus Conventional Ejector System

### Application

75,000 lb/hr edible oil deodorizer operating at 1.5 torr

### Load from the Fatty Acid Scrubber

1,000 lb/hr stripping steam  
 20 lb/hr air  
 7 lb/hr FFA  
 1.25 torr at 160°F to vacuum system

### ECOfreeze Condenser Vacuum System

#### Utilities

Motive steam (200 psig D&S)	1,100 lb/hr
Water (87°F)	125 gpm
Cooling fluid (liquid ammonia)	2,200 lb/hr
Waste steam for defrost mode (25 psig or greater)	2,600 lb/hr

### Conventional Ejector System

#### Utilities

Motive steam (200 psig D&S)	10,000 lb/hr
Water (87°F)	2,000 gpm
Caustic flush solution	15 gpm

### ECOfreeze Advantages

- Substantially lower consumption of high pressure motive steam, 1,100 pph versus 10,000 pph.
- The caustic flush system used in a conventional ejector system is eliminated. 15 gpm NaOH solution is eliminated and so is the chemical treatment with H<sub>2</sub>SO<sub>4</sub>.
- Cooling water is dramatically reduced, 125 gpm versus 2,000 gpm.

Graham engineers analyze  
your specific vacuum and  
heat transfer requirements to  
maximize the efficiency and  
performance of your process.

Because it's not just about  
engineering products, it's about

**engineering answers**

Graham Corporation  
20 Florence Avenue  
Batavia, New York 14020  
Phone: 585-343-2216 Fax: 585-343-1097  
web site: [www.graham-mfg.com](http://www.graham-mfg.com)  
e-mail: [equipment@graham-mfg.com](mailto:equipment@graham-mfg.com)

