# Vacuum Ice Maker (VIM) for Deep Mine Cooling

## Product Data Sheet

October 2010

## 1. Features

Vacuum Ice Maker (VIM) is capable of producing up to 1,000 tonR (3,500kW) of cooling capacity. The VIM is the most efficient ice maker on the market with very low power consumption - 0.4 kW per tonR for the ice maker unit alone. The system' total power consumption including supporting chiller is less than 1 kW per tonR.

The VIM is designed to work with any type of feed water including brackish water typically available in mines and has desalination ability as a by-product.

Vacuum Ice Maker (VIM) is based on IDE's proven technology, which has been operating worldwide for more than 20 years.

## 2. Process Description

Inside the VIM freezer, water is exposed to a deep vacuum. The vacuum forces a small part of the water to evaporate while the remaining water freezes forming water-ice mixture.

The mixture is pumped out from the freezer to an ice concentrator that separates the water from the ice crystals and delivers the ice to the mine ice distribution system.

In order to maintain the deep vacuum in the freezer, the water vapor is continuously evacuated from the freezer, compressed and fed into the condenser by IDE's unique centrifugal compressor. Condensing of the vapor requires cooling water at 5ºC (41ºF), which is supplied from a standard water chiller.

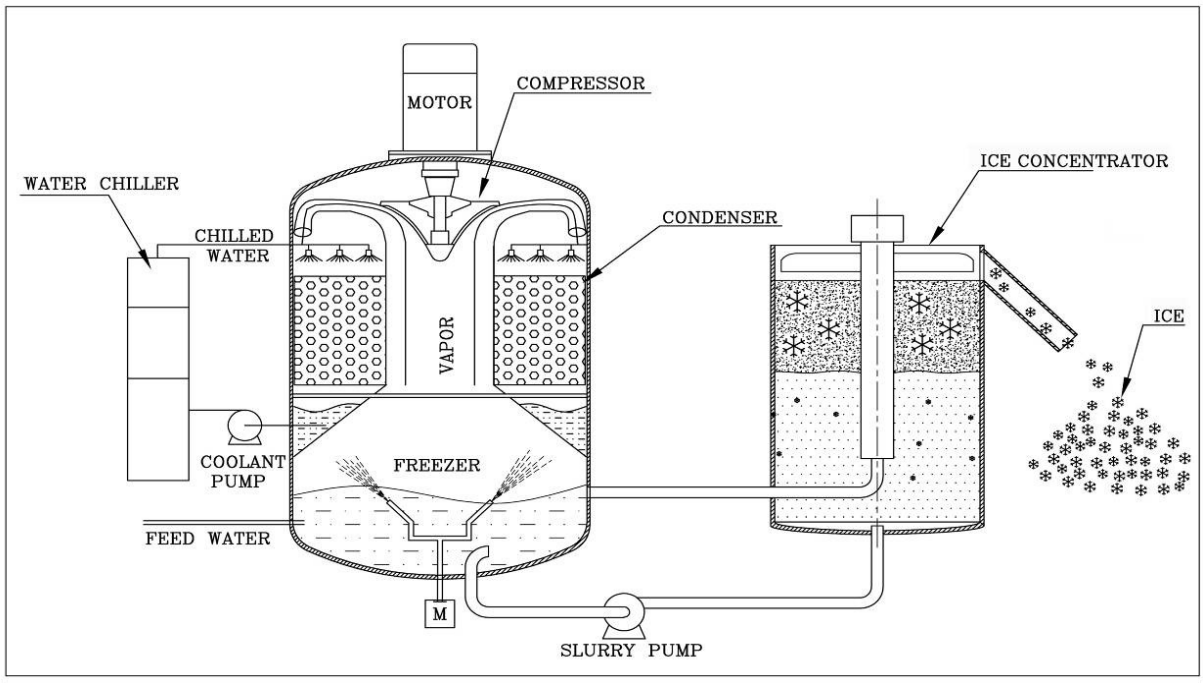


*Figure 1: Flow Diagram*

# 3. Technical Specifications

| Specifications | VIM400 (Ice) | VIM850 (Ice) |
|---|---|---|
| Designed Cooling Capacity | 1,750 kW (500 tonR) | 3,500 kW (1000 tonR) |
| Ice Making Mass Capacity[1] (at 4.5°C/40°F feed water temperature) | 560 ton ice/day | 1,120 ton ice/day |
| Electrical supply | 400V / 50Hz / 3 Phase or 480V / 60Hz / 3 Phase | |
| Designed Power Consumption[2] | 235 kW | 397 kW |
| Specific Power per tonR | 0.47 kW/tonR | 0.40 kW/tonR |
| Ice Grain Size | 0.5 – 1.0 mm<br>0.02-0.04 inch | |
| Typical Ice Mass Fraction (IMF) | 75% | |
| Freezer Type | Direct Contact Evaporator Chamber | |
| Refrigerant Type | Water | |
| Nominal Feed Water Flow Rate | 23.3 m³/hr<br>103 US gal/min | 46.6 m³/hr<br>205 US gal/min |
| Recommended Feed Water Temperature range[3] | 2°C - 6°C<br>35.6°F - 42.8°F | |
| Compressor | High speed centrifugal compressor<br>with aluminum rotor and composite material blades | |
| Condenser Type | Direct contact | |
| Cooling Water Temperature | 5°C (41°F) | |
| Cooling Water Flow Rate | 480 m³/hr<br>2,113 US gal/min | 670 m³/hr<br>2,950 US gal/min |
| Dimensions: | | |
| VIM Dimensions DxH | 3.8m x 11.4m<br>12.5ft x 37.4ft | 5m x 12.6m<br>16.4ft x 41.3ft |
| Ice Concentrator Dimensions DxH | 3.3m x 11.4m<br>10.8ft x 37.4ft | 4m x 12.6m<br>13.1ft x 41.3ft |
| VIM Weight | 32 tons | 48 tons |
| Concentrator Weight | 11 tons | 15 tons |

[1] Considering IMF of 75%.

[2] The above power consumption refers to the VIM unit only and does not include the supporting cooling system (Chiller, Cooling Tower and Cooling Tower circulation pump)

[3] The VIM can be operated with any given feed water temperature.
Each 1°C (1.8°F) increase in the temperature of the feed water reduces the ice mass production by 1.5%.
The refrigeration capacity is not affected by the feed water temperature.

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