

# Vapor injection technology enables superior refrigeration performance



## Background

The demand for reliable and cost-effective cold storage facilities across India continues to grow. A multi commodity facility was planned for construction in the city of Nashik to meet the need of its expanding economy. This new cold storage facility would store perishables for export.



## Solution

Distributed system design (3 independent refrigeration systems per room)

Product movement per day:

Room number	Room 1	Room 2	Room 3	Room 4
Target room temperature	-20 °C			
Products to be stored	Frozen fruits & vegetables			
Product initial temp	-10 °C			
Product target temp	-18 °C			
Pull down time	24 hours			
Product load per day	10 MT		15 MT	
Required refrigeration capacity	30 kW		40 kW	
Installed Copeland condensing unit	KHZ536LVL-TFD-103 (6 units @ 10kW)		KHZ550LVL-TFD-103 (6 units @ 13.5kW)	

## Challenge



Limited installation space, minimize noise



Reliability issues



Delivery timelines



High electrical connected load related CAPEX



Minimize operating expenses (Electricity and maintenance costs)

## Approach

01

Identify customer needs and pain points

02

Heat load calculation and equipment selection

03

Customer site visit

04

System design and optimization

05

Customer support during and after installation

## Results



- Lower noise vibration harmonics  
– Compact design feature of scroll compressors



- Smaller electricity feeder enables CAPEX savings  
– 35% reduction in connected load



- Up to 22% energy cost savings vs semi hermetic compressor systems



- Space saving, smaller footprint and weight reduction  
– Up to 50% lighter, 30% less volume, 30% less floor space needed vs semi hermetic systems



- Built in redundancy of distributed system design minimizes the risk of facility downtimes, improving reliability

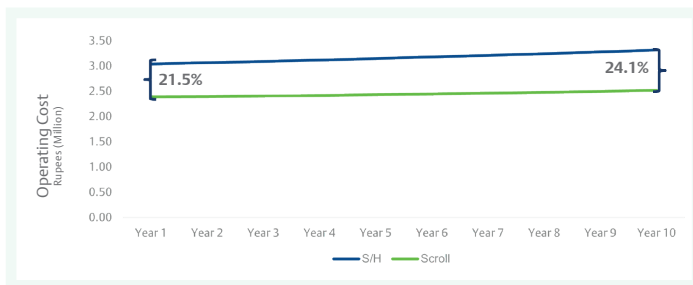


- Rapid CAPEX recovery leading to reduction in total cost of ownership



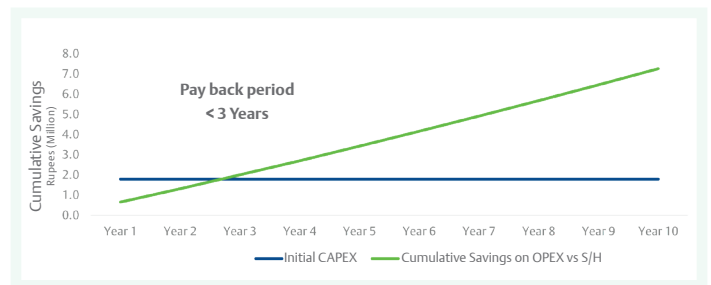
- Faster delivery  
– High quality India made CDUs delivered in 4 weeks

### Operating Cost Comparison Semi Hermetic vs Scroll



\* Simulated Data For 10HP Condensing Unit

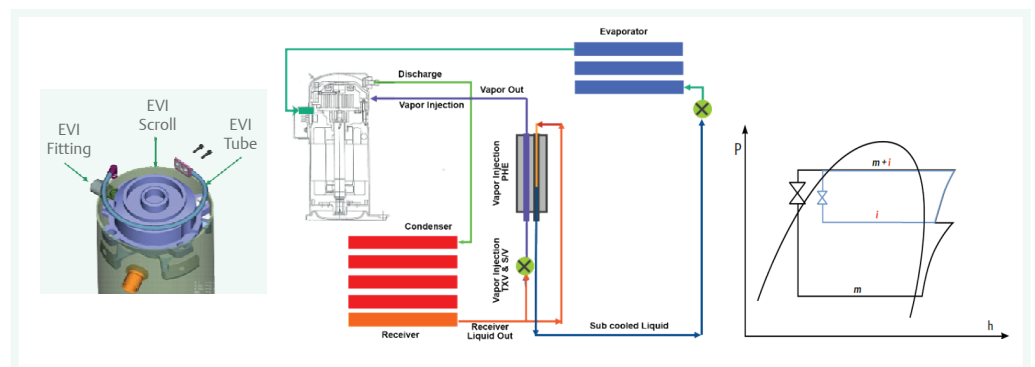
### Pay Back Period on Initial CAPEX For Scroll Condensing Units



\* Simulated Data For 10HP Condensing Unit

### Vapor Injection Technology for Refrigeration Scroll Compressors

- Injects into the middle of compression process
- Economizer cycle benefits:  
– 20% increased efficiency  
– 40% increased capacity
- Improved reliability at low temperature applications
- Axial and Radial Compliance significantly reduces starting current
- Wide operating envelope at +20C RGT without additional cooling



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