ENGINEERING TOMORROW

Case story | VLT® Solutions

VLT® controlled NH_3 compressor **reduced energy consumption by 13%**

Applying a frequency converter to a NH_3 compressor reduced the energy consumption by 13% at one of the world´s leading palm oil refineries in Malaysia. This equals an energy saving of over 240,000 kWh and the return on investment was approximately 20 months.

The palm oil refinery is striving to advance environmental protection and to increase profits by reducing energy consumption. Understanding that applying frequency converters to compressors can result in significant energy savings, they wanted to retrofit a 400 kW ammonia screw compressor with a frequency converter.

The customer also wanted to integrate the frequency converter into the existing PLC and DCS systems. After evaluating several suppliers, the customer selected Danfoss because the Danfoss sales team has the expertise to support the integration of the frequency converter into their existing system.

The compressor is being used with two other compressors in an industrial refrigeration system. The frequency converter will allow the first compressor to serve as the trim compressor and will control the capacity of the system.

The first compressor and frequency converter will operate continuously. The other two compressors operate at full load when needed for additional capacity. The compressor manufacturer advised that the minimum speed of the compressor is 50%.

As a result, the VLT® drive would operate the compressor down to 50% with the slide valve completely open.

At 50% speed, the compressor speed would be maintained and further capacity reduction would be performed by the slide valve.

Technical requirements:

*** Compressor min speed:**
Check with the compressor manufacturer to verify the authorized minimum speed to maintain proper lubrication. Often this will be 50% of full speed (typically 1500 of 3000 rpm motor). Also verify the acceptable speed range.

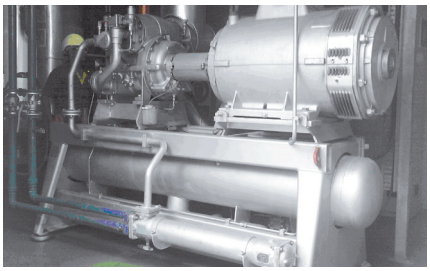
*** Compressor max speed:**
Check with the compressor manufacturer to verify the authorized maximum speed to avoid carry- over of lubrication.

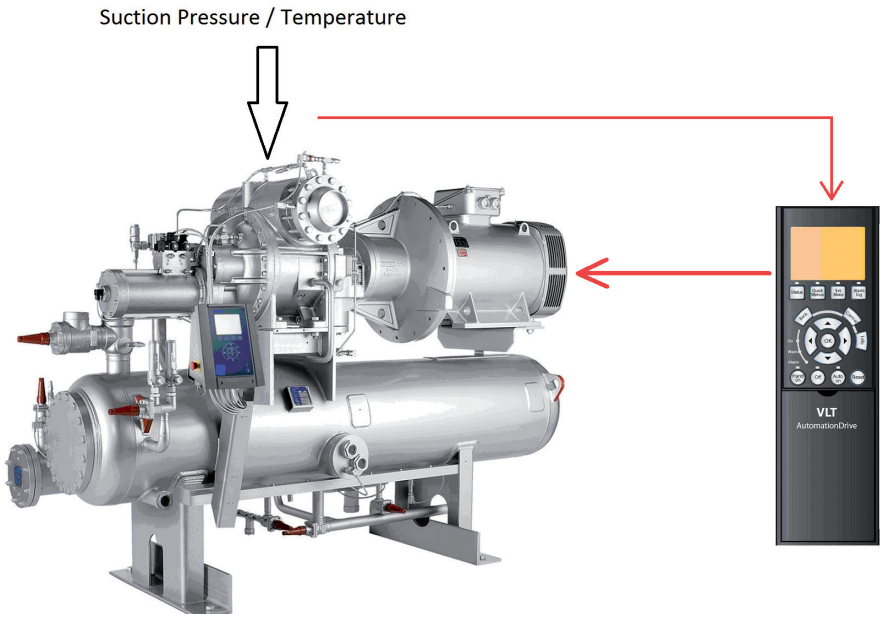
*** Motor capabilities:**
Check with the motor manufacturer to ensure that the motor can operate with a frequency converter, and thereby having suitable motor insulation.
Motor cooling can also be a limiting factor.

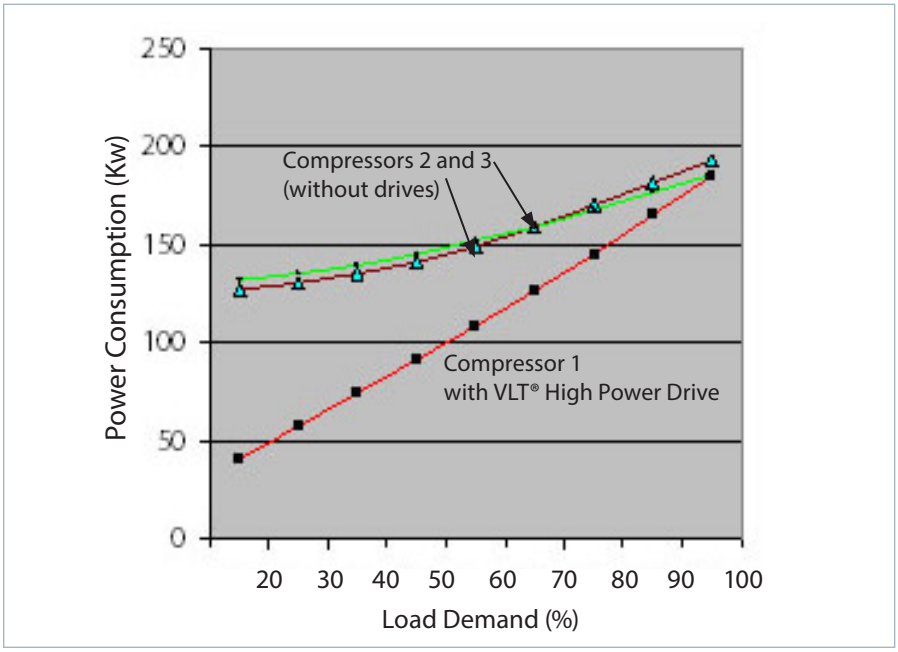
*** Torque characteristics of the frequency converter:**
Ensure that the drive is capable of providing the required torque for the application.

System Control
The control system must ensure that speed control is used exclusively down to 50% speed, with the slide valve completely open. At 50% speed, the compressor speed must be maintained and continued capacity reduction performed with the slide valve.

Results
Energy usage was measured for one month so that the savings and the payback could be determined. The chart shows the energy consumption of compressor 1 with the frequency converter compared to the energy consumption of the two compressors without frequency converters.
Applying the frequency converter to the compressor reduced the energy consumption by 13% (over 240,000 kWHrs). This resulted in a cost savings of over $66,500 per year. The return on investment was approximately 20 months.
Subsequently the customer has retrofitted many more compressors in the range of 160 kW to 400 kW, achieving further significant energy savings.







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