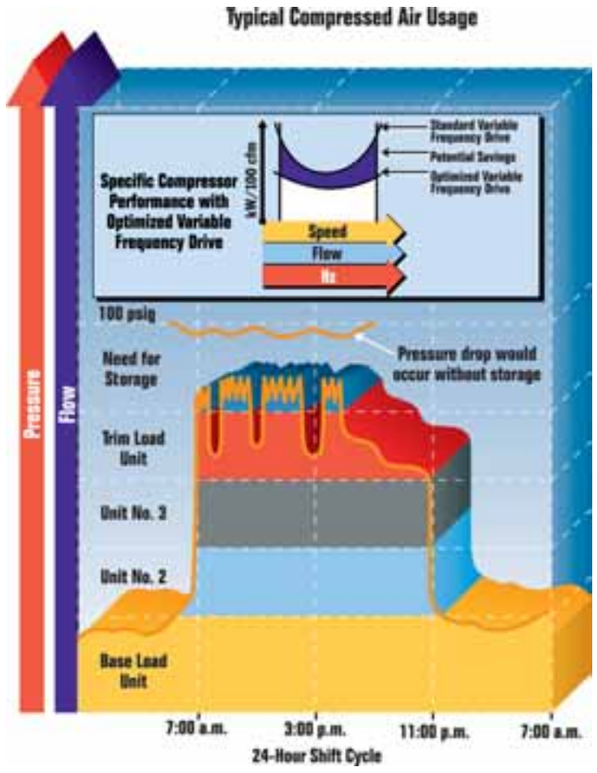
Compressed Air Solutions

When is Variable Frequency Drive Right for You?

In recent years reliable and efficient variable frequency drives have revolutionized drive systems. The advantages seem obvious, adapt output requirements to various demands while optimizing energy consumption. So why is it that not every single rotary screw compressor is now sold with variable speed drive? Because, in most applications, a variable speed drive compressor might complement a system, but would not yield the best overall solution by itself. Only a thorough air system analysis can obtain the necessary information to optimize system performance. The three most critical data points are: compressed air demand over time, actual system pressure vs. required system pressure over time and air purity requirements. Air Demand Analyzers, which are hooked up to an existing compressor system, are an efficient and accurate way to get a clear picture about an individual application. It is important to realize that each application is different and has to be treated accordingly. Even though variable frequency drive compressors can have an effective flow range of 30 to 100%, the efficiency (kW/100 cfm) is not constant over the whole speed range. As graph 1 illustrates, the best efficiency is normally between 40 and 100%. Looking further, graph 2 shows the air demand varies widely depending on the time of day or weekday and can not be handled efficiently by only one variable speed drive unit. The best overall efficiency is obtained when one variable speed compressor handles the trim, while Dual-Control (full load – idle – off) compressors run fully loaded or off, and are controlled by a system sequencer (see graphs 2 & 3). This set- up uses a smaller, less expensive variable speed unit and offers more redundancy if one unit requires service. If the air demand analysis does not show high flow fluctuations, a single or multiple Dual Control compressor system can be more efficient and less costly.

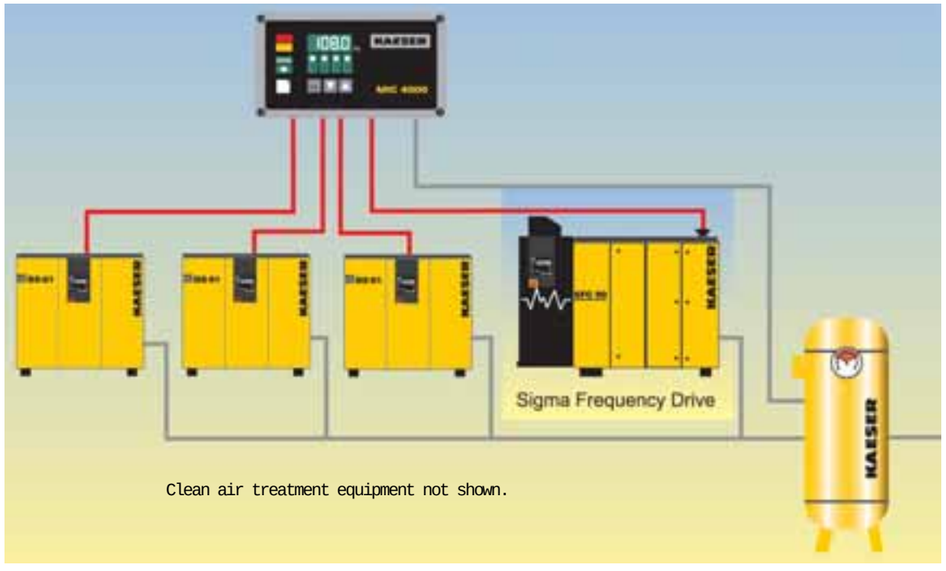


Application Hints

Selecting the correct compressor size
To maximize the effectiveness in rotary screw compressors, the variable frequency drive should rotate the airend between 40 and 100% of its speed range (check individual performance curve from manufacturer). Only a flow time diagram, obtained by an air demand analysis, can provide the correct horsepower size.

Retrofitting existing compressors
Not all compressors are suited to be retrofitted. Check with the drive motor manufacturer if cooling requirements and torque output are adequate at lower frequency (motor rpm). Check with the compressor manufacturer if the airend is designed to efficiently handle the required airend speed (tip speed) range. Also, ensure that other components like oil separation, drive train and cooling systems work efficiently throughout the speed range.

Storage receiver(s), flow controllers and sequencers
As graph 2 illustrates, sometimes the required air demand exceeds the available supply. With a proper receiver and a flow controller, additional air can be released from storage preventing pressure drop at the point of use. Sequencers can select the proper size and number of units to most efficiently supply varying air demand.



This diagram depicts a multiple unit system with a sequencer, a variable frequency drive trim compressor, storage receiver and a flow controller. This setup ensures optimum energy use.

for more info

Sigma Frequency Drive Compressor

Kaeser Compressors has paired its proprietary rotary screw profile with state-of-the-art drive technology from Siemens AG to introduce the new Sigma Frequency Control compressor. This unit provides optimized variable frequency control to ensure maximum flow range and unparalleled efficiency.

Flow Controller

The Kaeser Flow Controller (KFC) creates “real” storage within the receiver tank(s) by accumulating compressed air without delivering it downstream. The air pressure only increases upstream of the air receiver while the KFC delivers the needed flow downstream at a constant pressure.