KAESER COMPRESSORS

APPLYING VARIABLE SPEED COMPRESSORS IN MULTIPLE COMPRESSOR APPLICATIONS –

APPLICATION SUCCESS & IMPROVEMENT STORIES

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ABSTRACT

Variable speed control for all types of industrial equipment is now readily available on the market with competitive pricing to non-variable speed controlled alternatives, including in the air compressor industry. With the advent of prescriptive rebate programs for variable speed compressors and other equipment, the demand for these types of controls has increased. General wisdom would recommend a variable speed compressor for all applications, or multiple variable speed compressors within each system. There are significant benefits for systems where the demand changes rapidly to be served by variable speed compressors; by varying the frequency of the input electricity to the motor, a variable speed compressor can speed up and slow down to match supply output to the customer's demand while maintaining a stable operating pressure within the system. However, many factors should be considered when selecting new air compressors – especially for multiple compressor systems. This paper will provide guidance on the design of variable speed compressors, how they can operate most efficiently with existing compressors, explain the tools necessary to consider when applying variable speed compressors to multiple compressor stations (or any compressors within a system), and provide examples of systems which required improvement as well as systems which were well optimized.

HOW VARIABLE SPEED COMPRESSORS FIT WITHIN THE OVERALL SYSTEM

Variable Speed Compressors

Variable speed control for air compressors is not the panacea for compressed air system efficiency. It can be an important component of an optimized system, provided that it is properly applied. Many factors must be considered before choosing to add even a properly sized variable speed compressor to a system. To understand the part a variable speed compressor would play in creating an efficient system, it is important to take all of the system factors into consideration.

With regard to the variable speed compressor itself, factors to consider include the losses associated with the drive, the increased losses in the motor caused by harmonics in the power supply and the efficient operating range of speeds of the compressor. Drive losses can reduce efficiency 3-5% when compared to a fixed speed compressor. A variable speed drive improves the total energy efficiency only if such additional losses are exceeded by the benefits resulting from the capability to regulate the speed at less than full load conditions. An application where the compressor runs at any steady speed for prolonged periods of time could be made more efficient by using a properly-sized and controlled fixed speed compressor (or compressors) that does not have the losses mentioned above.