



Combining Variable Speed and Inlet Throttling Blower Controls

April 1995 - ESCOR pioneered the successful implementation of Dissolved Oxygen [DO] control with variable speed multi-stage centrifugal blowers. The recently completed upgrade at the Uniontown, PA Wastewater Treatment Plant has taken this technology another step. The system combines two 350 horsepower blowers using Variable Frequency Drives (VFDs) with two 200 horsepower blowers using inlet throttling. Both sets of blowers discharge into a common header.

The original ESCOR system was installed in 1992. At that time the variable speed blowers were only used for aeration, and the constant speed blowers supplied air to a separate header for RAS air lift pumps and channel aeration.

The variable speed blowers utilized air flow transmitters for control and surge protection. This technique provides extremely accurate control, improves operating range, and yields more accurate blower protection. Conventional surge controls use motor amperage to prevent operation in surge conditions. This is not accurate when used with VFDs because the normal relationship between air flow and motor amperage is distorted at reduced speeds.

The 1995 modifications were part of a plant upgrade designed by Chester Engineers. Submerged turbine aerators were replaced with fine pore diffusers. The discharge headers were joined to permit operating the most economical combination of blowers to meet total air requirements. Separate flow controls were provided for the RAS pumping and aeration take-offs from the common header.

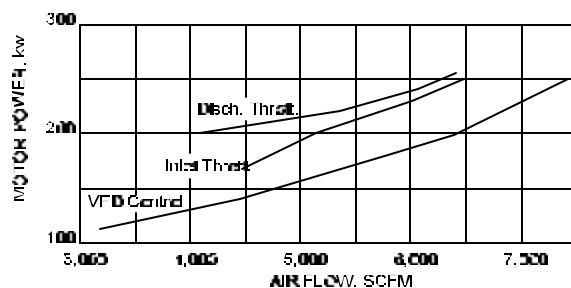
Employing ESCOR's exclusive direct flow control logic, the new system eliminated previous fluctuations in RAS flow caused by variations in blower output.

The improvements were economically implemented by using thermal dispersion air flow transmitters and insertion fittings. Eliminating 4-20 mA positioners on blower inlet and basin flow control valves further reduced cost and improved reliability.

The upgraded system automatically starts and stops blowers to achieve the most efficient combination. Depending on total air demand variable speed or a **combination of variable speed and inlet throttled blowers discharge into a common header.**

On site testing was conducted to verify energy savings. A 350 horsepower blower was modulated from maximum flow to surge by three separate methods: discharge throttling, inlet throttling, and variable speed. The test data clearly demonstrated improved performance with VFDs. The energy consumption was 15% lower across the entire flow range. The turndown improved from 36% to 57% - a significant advantage for the blowers with VFDs. ■

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Blower Performance vs. Control Method