METHODS FOR MODULATING AIR FLOW

Although fans must be selected to meet airflow requirements under maximum conditions, they may be
operated at reduced flow a large part of the time. Reducing airflow as conditions permit should return a bonus in terms of reduced power use and lower noise level.

Three methods for reducing air flow:

Increase pressure, using louvers to block air flow

Reduce blade angle, using automatic fans and single speed motors

Reduce RPM, using variable-speed motors

All three, when provided with suitable sensing and control devices, can provide a fine degree of control as ambient conditions change. They vary substantially, however, in the savings bonus they return.

Using louvers to choke off air flow can *increase* the horsepower and noise level due to higher pressure and air turbulence. No bonus here!

Automatic fan hubs will provide full horsepower savings resulting from the lower CFM and Total Pressure. Since tip speed remains constant with this method, only a modest reduction in noise level is realized.

Reducing the RPM will provide the same power savings as automatic fans. In addition, it will provide the full noise level reduction that results from lower tip speed.

Automatic fans are more commonly used than variable-speed motors. They are considerably less expensive and require simpler controls. They are more efficient at or near full load and blade angles may be set to provide reverse flow to overcome convection currents.

Variable Speed units operate more efficiently at low load. Their cost may be justified in applications where noise level is a major consideration, particularly where night-time noise reduction is important. The need to avoid critical speeds can be eliminated with blades designed like those of a helicopter, attached to the hub by a pivot, making V-S motors more attractive. (See Tech Note #5)

Substantial savings can be realized. One cooler manufacturer has estimated as follows: Assuming an air-cooler rejecting 2Mw of heat in a single-phase system, power savings of 10 kw and a noise reduction of 7dB would be realized with a variable-speed motor based on an ambient temperature reduction of 20° C (36° F). For a 10°C (18°F) reduction, 4dB would be realized.

Moore has prepared an Engineering Paper, TMC-655, entitled “Modulating Air Flow Savings” suggesting a method for estimating savings. See “Engineering Papers” for a list of Papers available from Moore.

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