FACTORS AFFECTING AIR PERFORMANCE

System Effect

Imagine a vane axial fan selected with great care to provide exactly the performance required in the specifications. Once installed, the air balancer reports that air performance is considerably lower than required. What went wrong?

The answer is probably system effect. The Air Movement and Control Association International Inc. (AMCA) defines system effect as "a pressure loss which recognized the effect of fan inlet restrictions, fan outlet restrictions, or other conditions influencing fan performance when installed in the system."

Fan manufacturers go to great lengths to test fans and provide reliable air performance data in their literature. These fans are tested under very specific conditions as specified on the performance pages. Statements such as, "Performance shown is for model 'xyz' with inlet and outlet ducts," indicate how the fan was tested. An installation where elbows, transitions, dampers and other disruptions to airflow are located before or after the fan can create a condition different from the manufacturer's test methods. Therefore, a performance loss or system effect is created.

System effect is very difficult to quantify and correct. Frequently, the only means to correct the resulting poor performance is to increase fan speed or increase the blade pitch. Both of these situations may increase horsepower requirements that exceed the capability of the motors. Also, the system effect may be so great that the fan is not capable of generating enough static pressure even at maximum fan speed. This could mean replacing the fan with one of greater capacity. Finally, system effect will rob an air moving device of efficiency. Higher fan speeds and greater horsepower used to overcome a design deficiency result in wasted energy.

The diagrams show some of the more common causes of system effect. Non-uniform airflow created by duct elbows, transitions, dampers or other obstacles in the airstream may dramatically reduce fan performance. Refer to AMCA Publication 201 for a quantitative discussion of system effects.