M&P

Air Components, Inc.

M & P Air Components, Inc. provides Components, Technologies, Guidelines, Sales and Technical Services for Industrial Air and Dry Bulk Materials Handling and Processing.

Our Goal is to provide Clients with the correct components selection and system design to achieve the best Utilization, Reliability, Safety and Economy for their plant processes.

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Technical Bulletin

Fan Balance & Vibration Control – Vibration Limits & Field Balancing **TB.60.1.04**

Fan manufactures in-house vibration limits are at filter in and fan running speed conditions, and not to exceed:

BV-3 Rigid, 0.15 in/sec, *BV-3 Flexible*, 0.20 in/sec.

BV-4 Rigid, 0.10 in/sec, *BV-4 Flexible*, 0.15 in/sec.

Field installed (in situ) vibration limits are at filter out and fan running speed conditions, and not to exceed:

BV-3 Rigid, 0.25 in/sec start up, 0.40 in/sec alarm, and 0.50 in/sec shut down.

BV-3 Flexible, 0.35 in/sec start up, 0.65 in/sec alarm, and 0.70 in/sec shut down.

BV-4 Rigid, 0.16 in/sec start up, 0.25 in/sec alarm, and 0.40 in/sec shut down.

BV-4 Flexible, 0.25 in/sec start up, 0.40 in/sec alarm, and 0.60 in/sec shut down.

As operation continues with time, it is expected that the fan vibration level will increase due to wear and accumulated effects.

As such, an increase in vibration severity is acceptable over time as long as the level does not reach alarm conditions.

Fan Rotating Accessories:

Fan rotating accessories which may effect fan vibration levels include sheaves, belts, couplings, bearings, shaft coolers and the motor or driver.

To compensate for these rotating accessories, Trim Balancing to the applicable BV category is required after all rotating accessories are installed.

Trim Balancing is normally the responsibility of the party installing the rotating accessories, and should be performed before placing the fan into service.

Sources of Fan Vibration:

Aerodynamic problems occur from operating the fan left of peak on the fan curve or from distortion of the air as it enters the fan wheel. In the case of left of peak conditions, the system pressure should be reduced until the fan is operating safely to the right of the curve peak. In the case of distorted inlet conditions, the system design must be modified.

Mechanical problems include material build up on the wheel, wheel deterioration due to abrasion or corrosion, motor or driver alignment and/or unbalance, bearings, condensates inside the wheel, bent or out of tolerance shafting, inadequate mounting structure, out of level installation, resonance frequencies, mechanical looseness, unsupported connecting ducting, and vibration transmission through connecting ducting.

An often overlooked source of fan vibration are resonance frequencies within either the mounting structure, the connecting piping, or the VFD controller (if applicable). If either has a natural frequency at or near that of the fan operating speed, it is very difficult to balance the fan to an acceptable level.

Normally, the only way to remedy this situation is to either change the fan speed or modify the mounting structure or connecting piping.

Most VFD controllers offer instructions to lock out the problem frequency range. During start up, the system should be manually operated from minimum to maximum speed (staying within the max safe speed limit of the fan) with resonance frequencies locked out.

Arrangement 2 & 10 Fans and/or adjustable speed v-belt drives are not recommended for critical process applications requiring low vibration levels.

When multiple fans are installed on a common foundation or platform, adjacent fans should have fan speeds at least 50 rpm apart.