

Fan Generated Vacuum Systems Require Careful Troubleshooting

When used as the vacuum source for fourdrinier foil units, “fans” should be analyzed and properly adjusted for maximum performance

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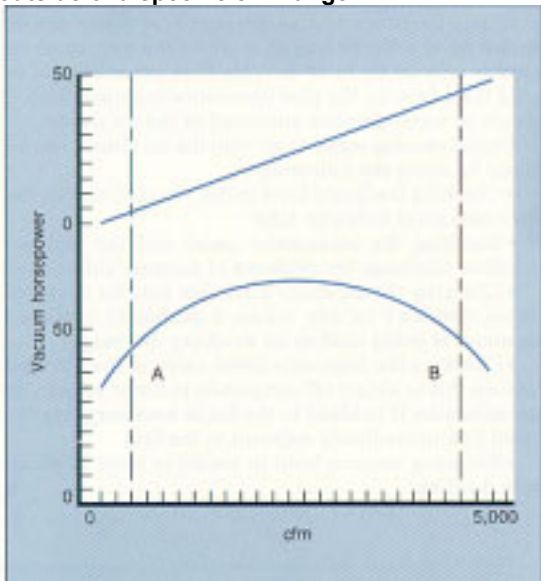
Fans, or centrifugal blowers used as centrifugal exhausters, are sometimes used as the vacuum source for fourdrinier foil units because overall power consumption can be relatively low. But differences between these units and liquid-ring vacuum pumps must be well understood to ensure continued trouble-free operation.

Fans are designed to operate in a defined cfm range. Problems can quickly occur if they are operated outside of this range (Figure 1).

This article discusses methods for troubleshooting those problems as well as the setup and general operation of fan generated vacuum systems, specifically as used with Huyck vacufoils up to 50 inches of vacuum WG (3.5 in. Hg).

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FIGURE 1: Problems can occur when fans operate outside of a specific cfm range.



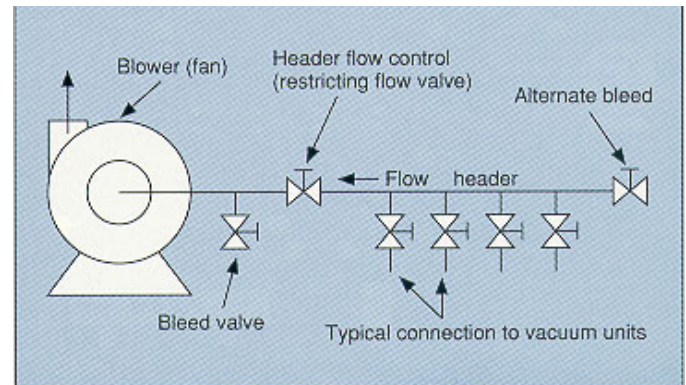
PROBLEM 1 – NOT ENOUGH AIR. Range “A” is where the fan is starved for air. This causes a pulsation in the header and the fan casing, which flexes the fan casing. This may eventually cause fatigue failure or result in the impeller hitting the casings, producing vibration and, finally, disintegration of the casing and impellers. The following determine if the system is in this state:

- In-bleed air to the system and the vibration/pulsation should stop. Note also that vacuum at the vacufoil will increase with air in-bleed. Be aware that vibration can also be caused by water entering the fan and/or a buildup of material on the impeller or casing.
- Have an electrician check the motor amps and compare this with the rated amps of the fan motor to see on which side of the curve the unit is operating.

Insufficient air intake is best prevented by having a bleed valve located as close as possible to the fan inlet (Figure 2). Note that in-bleeding at this location is preferred over excessive air bleeding on the front side of the vacufoils. In-bleeding through the units increases the velocity through the separators and can further cause water to be carried through the fan – a very undesirable condition.

TOO MUCH AIR. In Range “B” of Figure 1, the fan motor will trip-out the breaker because of an overload

FIGURE 2: Locating a bleed valve as close as possible to the fan inlet can prevent insufficient air intake.



condition, requiring an electrician to reset the breaker in the electrical control room. This condition can take place when stock is taken off the wire and there is no restriction to air intake.

To prevent this phenomenon from occurring, the amount of air to the fan must be reduced so that it is operating below the maximum trip-out limit of the breaker. A restriction valve (butterfly or gate) should be placed in the line directly before the fan and should be preset during initial tuning so that the motor amps are less than the rated maximum with stock off the wire (Figure 3).

Purposely over sizing the fan motor by 30% to 40% has been tried in order to overcome this problem. The alternative would be to provide an automatic control valve with a feedback control from, perhaps, the couch vacuum. When stock goes off the wire, the couch vacuum decreases, triggering the control valve to go to the setting to prevent motor overload.

The cost of this control system is more expensive than the extra cost of motor over sizing. Note that the oversized motor will not operate with extra power consumption; it will simply run in a lower position in its amp curve.

INITIAL SETUP, TROUBLESHOOTING. With stock off the wire, close valve “B” (Figure 3) to 60% to 70% open and have the mill electrician check running amps at the breaker.

FIGURE 3: A restriction valve should be located in the line directly before the fan.

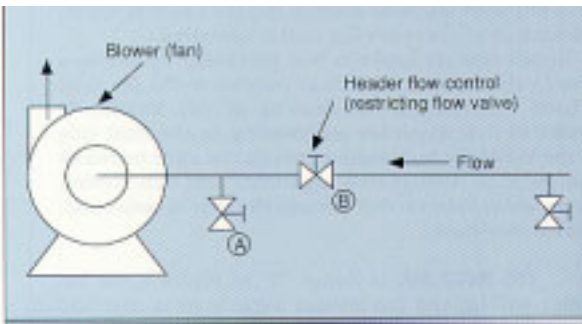
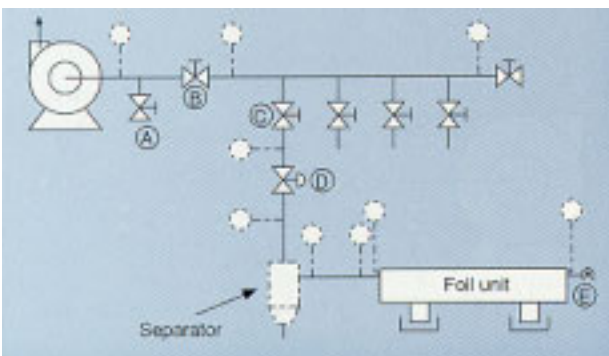


FIGURE 4: Checkpoints are needed to troubleshoot the fourdrinier fan vacuum system.



Amps should be less than 85% to 90% of rated maximums with stock off the wire. Check visually or by finger touch for pulsation in the fan casing or the header. If pulsations are occurring, open bleed valve “A” 10% to 15% or until pulsations stop. The electrician should check amps at the breaker or motor. If the motor is running less than 30% to 35% of maximum rated amps, the unit could be near a starvation (pulsation) condition, and the bleed valve should be opened more.

It is almost impossible to troubleshoot without adequate tapping points at which to measure vacuum. To do this, mills should install 1/4” NT.P nipples for vacuum gauge insertion during spot checks with a portable manometer. Some ideal locations of vacuum checkpoints are shown by the dotted symbols in Figure 4.

If insufficient vacuum is being produced at the units, measure vacuum successively at all vacuum points back to the fan inlet (with the same manometer or gauge) and determine where the pressure drop is occurring. Note that there should be a manual valve “C” in the individual vacuum line to each foil unit. This should be adjusted so that the control valve “D” operates at approximately the 50% open position.

Valve “E” should be cracked only slightly to equalize vacuum across the unit. Excessive in-bleed at this point can cause excessive velocity in the separator and carryover of entrained water to the fan.

Water exiting the blower exhaust is caused by several factors.

- Unit(s) operated with vacuum above theoretical maximum hydraulic head.
- Unit(s) flooded with water because of insufficient discharge capacity.
- Air flow through separator being too high to allow entrained water to separate out of the air stream.

It may be difficult to understand how water can be pulled up to a fan 30 ft. to 40 ft. above the unit when its head is only 30 in. to 40 in. This does occur but not in solid fluid flow up the pipe (theoretically impossible). It occurs in water droplets entrained in the air stream.

Unit(s) causing water to get into the air stream can be found by doing the following:

- Checking the liquid level in the vacufoil unit by the front side level indicator tube.
- Watching the manometer panel and the seal pot overflow discharge for evidence of surging/pulsations
- Checking the separator discharge pots for overflow (there shouldn't be any unless a purposely oversized separator is being used as an auxiliary discharge).
- Checking the front side bleed valve of the vacufoil (reduce this or shut it off completely to lower velocity in the separator; if in-bleed to the fan is necessary, use the bleed line immediately adjacent to the fan).
- Reducing vacuum level in unit(s) in order to eliminate flooding.