



TECHNICAL BULLETIN #22

Recommendations and Guidelines for Water/Liquid Injected Blowers

SPECIAL NOTE: While applications such as carpet cleaning, dairy milking, and wet vacuum cleaning do include small, but measurable amounts of liquid entrained in the process stream, in a properly designed system, the amount of liquid in the process stream is infinitesimally small by the time it approaches the blower and will generally pass through the blower or is evaporated by the heat of compression generated by the blower.

Water/Liquid Injection Advantages

- Removes heat of compression
- Seals clearances in many situations which reduces slip and improves efficiency
- In vacuum and some pressure units it allows much greater performance over dry, single stage blowers.
- In some cases, injection provides flushing of the blower.

Water/Liquid Injection Disadvantages

- Can cause accelerated corrosion or erosion on standard iron materials
- Winterization or special draining may be required if unit is shut down and unprotected during freezing weather.
- May not be acceptable if any liquid travels downstream and contaminates the product.
- Other liquids such as oil, alcohol, or other process fluids may not absorb as much heat as water and may require special materials of construction.

Recommendations

- Vertical flow designs with top suction and injection provide self-drainage through blower.
- Keep liquid injection to 3 GPM per 1000 CFM (6.7 L/min per 1000 m³/h) or less for best performance.
- Use rotors with either hypocycloidal, segment waist or our new DOMINATOR™ profiles to avoid any problems with internal compression, which can occur with some involute rotor profiles and possibly cause damage to rotor shafts and bearings.
- Keep the speed of the blower around midrange instead of high speed to reduce erosion effects.
- Mount a recommended water injection kit with a water shutoff/metering valve and a solenoid valve.
- Use a flow switch on critical applications.
- Injection nozzle should be used and mounted in suction pipe about six to eight pipe diameters upstream. This provides a more even liquid spray distribution.
- On long rotor housings, liquid injection ports sometimes need to be placed along the suction side of the housing to provide even spray over the full length of the rotors.
- Special materials such as stainless steel or protective coatings can be used to extend blower life versus standard materials.
- All rotors should be either solid, have self-draining cores, or be O-ring plugged to prevent captured liquid from causing rotor unbalance.
- Blower should be properly instrumented to be able to monitor suction and discharge pressures and temperatures. The injection fluid should also have pressure, flow, and temperature indication.
- If possible, blower should be located inside in a heated building with adequate space for proper maintenance.
- Water injection line or kit should be slightly oversized with an adjustable valve to vary the flow.



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Recommendations (cont.)

- In cases where injection fluid or process fluid can collect as liquid in the vent chambers to add drain tubing to the discharge port in vertical flow machines. This keeps liquid away from the mechanical seals, reducing chemical attack, elimination of seal face lubricant and liquid migration across the seal faces.
- In cases where the blower is susceptible to the entrance of large slugs of liquid, a liquid separator or knockout pot should be located upstream of the blower.

Injection Rate Guidelines

- The anticipated full heat load per minute can be calculated by multiplying gas HP by 42.44 BTU/min.
- If water is used which contains dissolved solids or minerals it should be over injected. This reduces mineral buildup in the blower, a common cause of failure. A conservative guideline is to use 0.5 GPM (1.9 L/min) for every 25 Gas HP (18.5 Gas kW). Do not exceed 0.1% of the total displacement of the blower by the injection liquid volume.
- Procedures should be developed for each individual blower application for shutdown (i.e.: the water may be shut off for a few minutes allowing the blower to dry without overheating). Water should be properly drained if unit is to be exposed to freezing weather or shipped back to the factory or service center.
- On vacuum boosters, the vapor pressure of the injection liquid must be lower than the maximum vacuum. Water should not be used below 20 Torr (26.5 mbar a) unless checked by a qualified application engineer.
- On all applications utilizing liquids that do not evaporate, the heat load absorbed should only be calculated as sensible heat.
- The sight gauge and all materials coming in contact with injection fluid must be compatible.
- Water used for injection on steam blowers should be pure and come from a condenser in the system.