TUTHILL CORPORATION | M-D Pneumatics Division

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TECHNICAL BULLETIN #27

Recommended Guidelines for Rotary Positive Displacement Blowers in Oxygen Service

Performance Criteria

In sizing the blowers the speed, horsepower, and pressure should be limited to 75% of maximum design. The operating temperatures should be limited to 250° F discharge with a maximum ΔT of 200° F. Any conditions which vary from these recommendations must be reviewed by M-D Engineering.

Design Criteria

Cast or ductile iron is recommended over other materials since the thermal expansion coefficients are lower. Non-sparking materials such as aluminum are not necessarily better since ignition can be caused by frictional rubbing, which is more a function of thermal expansion and high operating temperatures.

Single envelope machines are recommended with vented oil covers. Machines should have aircraft type balanced cartridge mechanical seals. Seals must be designed so no external force or device is required to keep the seals closed and tight for both static and dynamic operation. Mating rings should be 440C stainless steel lapped to a flatness of 3 helium light bands under a monochromatic light. Carbons should be superior process grade type. All O-rings should be Viton® or Kalrez®.

If double envelope machines are required, then inert gas purges or blankets are highly recommended.

Rotors should be balanced to have vibration readings not greater than 2.0 mils displacement peak-to-peak at rated speed.

The end plates should be designed for water cooling up through seven inch gear diameters to ensure the oil, bearings, gears, and seals do not see temperatures above 150° F. Larger machines must have integral lube systems with oil pump, oil filter, water cooled oil cooler, pressure regulator, oil gauge, and complete harness to direct cool oil directly on all bearings and seals.

All blowers must have vertical orientation with top suction and bottom discharge. This guarantees maximum amount of oil in the oil covers and absolutely uniform lubrication of bearings and seals in all cases.

All blowers must have internal labyrinth seals and a sealed vent chamber in conjunction with each internal mechanical seal. This allows for an area to collect any oil coming through the mechanical seal. Maintenance can then inspect for any seal leakage without removing blower from service.

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Oxygen Cleaning and Oxygen Compatible Oil

Every part must be fully oxygen cleaned and ultraviolet light checked to M-D Procedure No. S-283. Seals must be fully disassembled and cleaned, then reassembled. Bearings must not be disassembled before cleaning. After parts have been cleaned they must be bagged before blower reassembly.

All parts must be cleaned and checked in a suitable location, and must not be touched with unprotected hands.

Any oil used for assembly and test must be only Castrol Brayco oxygen compatible non-flammable oil or M-D approved equivalent. During testing the blower must be certified on the test reports that only this oil was used. Any oxygen blower should never be run or contaminated with any lubricant other than the prescribed oil.

Blower Testing

All recommended tests should be run and fully certified. The minimum testing should include the following:

1. A hydrostatic test at 100 PSIG on housings, endplates, and port fitting.
2. A helium leak test according to M-D Procedure No. S-97. Leakage rates should be less than 10^{-4}mL/sec.
3. A mechanical run test according to M-D Procedure No. S-83. The blower to be run at maximum design conditions of the blower.

Only Castrol Brayco oxygen compatible oil or customer supplied oxygen compatible oil is to be used. The mechanical run should be for a minimum of one hour. A vibration test should be conducted with the blower not exceeding 2.0 mils.

Blower Preservation and Shipping

Unit to be pressurized with 5 PSIG nitrogen with appropriate pressurizing kit. All openings are to be plugged or sealed. All port openings are to be flanged and covered with oxygen cleaned metal flange covers.

Recommended Instrumentation and Safety Devices

M-D highly recommends the following devices as a minimum to be installed by customer.

1. Amp overload on motors.
2. High discharge temperature switch or RTD.
3. Pressure and temperature indicators on suction and discharge of blower.
4. Shock pulse monitor for all bearings. (Desirable, but not absolutely necessary)

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