AIR-COOLED, OIL-FREE AIR COMPRESSOR

Frame A00 20-50 HP

1. SPECIFICATION SCOPE

1.1 This specification covers the requirement for supply of a packaged oil-free, NFPA99 approved rotary screw air compressor, Kobelco KNW Series model _____.

1.2 Any and all exceptions to the specification shall be clearly identified in the proposal under a section entitled, "Exceptions to Specifications."

1.3 Healthcare Facility Packages in compliance with NFPA 99 code requirements for healthcare facilities include the following options:

a. Automatic Lead/Lag control,

b. Non-fused disconnect switch,

c. Inlet air adapter

d. Auto restart after power failure.

e. “Lag in use” alarm

2. GENERAL REQUIREMENTS

2.1 The manufacturer shall supply a positive displacement, two-stage rotary screw air compressor capable of delivering 100% oil-free air. There shall be no lubricants in the compression chamber. The assembly shall be fully packaged, including air compressor, main drive motor, oil cooler, intercooler and aftercooler, separate motor driven lubrication system, regulation and control systems, all mounted on a common base frame and fully enclosed by a steel sound dampening enclosure.

2.2 The compressor shall be the manufacturer's oil-free, two-stage rotary screw air compressor package in compliance with NFPA 99 code requirements for healthcare facilities. The compressor shall consist of two compressor stages connected to an integral speed increaser. Each stage is to be driven from a common bull gear to ensure optimum speed and high efficiency. There shall be an air-cooled intercooler between the first and second compression stages and an air-cooled aftercooler installed after the final stage.

2.3 The capacity shall be expressed in terms of free-air delivery in actual cubic feet per minute (ACFM) measured at the discharge pressure and related back to inlet conditions. The capacity and shaft power shall be guaranteed per modified ASME PTC9. The ACFM and shaft power quoted shall be within the following tolerances:

Air Delivery ..... ± 4%

Power Consumption ..... ± 5%

The compressor shall be rated at _____ ACFM at _____ PSIG discharge pressure and be suitable for use on ___ volts, ___ phase, ___ Hz.

3. COMPRESSOR UNIT

3.1 Casing

The compressor air-end shall be a class 35 cast iron housing with precision manufactured, helical screw type rotors. The housing shall be air-cooled.

3.2 Rotors

Rotors and shafts shall be one-piece SUS420 stainless steel construction. Internal rotor cooling shall not be required. Rotors shall have an asymmetric profile to ensure high efficiency. Rotors shall be coated with M_0S_2 for sealing clearances. Rotors shall be dynamically balanced to guarantee vibration-free operation. Rotary lobe type compressors shall not be acceptable.

3.3 Timing Gears

Precision timing gears shall be manufactured of chromium molybdenum steel and be fitted to the rotor shafts and shall maintain precise rotor-to-rotor clearance. Gears shall be designed to assist in thrust canceling and absorb no more than 10% of input power under full load.

3.4 Bearings

Anti-friction bearings shall be incorporated on each rotor. Radial loads shall be carried by straight roller bearings. Axial loads shall be carried by two sets of angular contact ball bearings.

3.5 Speed Increaser

A speed increaser shall be an integral part of the compressor unit and include the main drive shaft bull gear. The gear train shall be so designed to be thrust canceling.

3.6 Seals

The seals shall be restrictive ring type, self-adjusting and centering and constructed of stainless steel. The oil and air seal chambers shall be vented to atmosphere to prevent any possible contamination of the compressed air stream. Carbon seals shall not be acceptable.

3.7 Gaskets

All gaskets shall be asbestos free.

3.8 Coolers

The compressor cooling system shall be comprised of a separate motor driven fan and incorporate the following coolers:

3.8.1 Air-cooled oil cooler.

3.8.2 Air-cooled intercooler complete with moisture separator and automatic drain.

3.8.3 Air-cooled aftercooler complete with moisture separator and automatic drain.

3.8.4 The cooling fan shall be driven by a separate motor, starting and stopping with the oil pump for maximum cooling during start-up and shutdown.

3.8.5 All coolers shall be cross-flow aluminum construction to achieve maximum cooling efficiency and shall be rated for 150 PSIG at 500 degrees F. operating conditions.

3.9 Drive Motors

The main drive motor shall be horizontal ball bearing, NEMA design B with class B temperature rise and class F insulation and energy efficient TEFC.

3.9.1 The oil pump motor shall be (TEFC) C flange connected through a non-lubricated coupling for permanent shaft alignment.

3.9.2 The cooling fan motor shall be totally enclosed fan-cooled (TEFC) for maximum service life.

3.10 Lubricating System

3.10.1 Lubrication oil for the compressor shall be contained in an integral sump.

3.10.2 A separate direct driven gear type oil pump shall be provided to ensure positive lubrication at start-up when gear and bearing loads are at their peak.

3.10.3 The drive gear, all bearings and timing gears in each stage shall be spray lubricated.

3.10.4 All bearings and timing gears shall be pre-lubricated prior to start-up and continue to be lubricated during shutdown. This time period for lubrication shall be monitored and controlled by the unit's internal control system.

3.11 Pressure Regulating System

The regulating system shall be a full load/no load type for maximum efficiency.

3.12 Control System

3.12.1 The control system shall be integral with the compressor package and shall consist of an electro-pneumatic regulator, designed to provide manual and automatic running. The capacity control valve shall be a disc type for trouble-free operation.

The control system voltage shall be maximum of 115 volts, 60 Hz. The control system shall provide automatic shutdown of the compressor during periods of excessive idling.

3.12.2 The control system shall be controlled and monitored by an Allen Bradley Programmable Logic Controller (PLC). This controller will initiate and sequence the events during start-up, operation, and shutdown. The PLC will monitor system functions, safety devices, and instrumentation. The PLC will incorporate an Erasable Re-programmable Read Only Memory (EPROM) for permanent program storage. This device shall enable control sequences to be changed on site or in the manufacturer's factory to meet future plant needs. The control system shall provide for the following:

a. Start oil pump to ensure positive lubrication prior to start-up of the main drive motor.

b. Start cooling fan when oil pressure is established.

c. The compressor shall start unloaded and shall shut down unloaded, ensuring maximum component life.

d. The oil pump shall continue to run until the compressor stops.

e. Stop cooling fan motors 20 seconds after compressor is stopped to exhaust latent heat.

f. Dry contacts are provided for remote indication of power failure or fault conditions and run indication.

g. The control system shall provide automatic shut-off of the compressor if it remains unloaded for 10 minutes (to conserve energy) and shall automatically restart compressor on demand.

h. Service indication shall be provided when it is time to perform routine maintenance.

i. Shutdown indication shall occur with "first out" (first failure) feature when abnormal operating parameters are reached.

Pre alarms shall be required for all temperature shutdowns.

j. Shall be adaptable to accept optional automatic or manual lead/lag control, sequencer control, automatic restart following power failure, remote start/stop control, or other controls as may be required for future plant needs.

k. Shall be expandable to automatically start dryers, pumps, cooling tower, or other remote devices.

l. Shall be capable of recording time and day of last 100 alarms/events.

3.12.3 The control system shall include automatic lead/lag control. Each compressor HMI device shall be connected via Cat V cable utilizing the Ethernet communication process.

3.12.4 The control system shall include automatic restarting of the lead compressor after a power failure.

3.13 Monitoring Equipment / Operator Interface

3.13.1 Operator interface shall be touch screen type with graphics, sunlight readable, and color to read compressor data easily. Three configurable graphs for historical trending shall be standard.

3.13.2 Minimum required devices:

a. First-stage discharge air pressure display.

b. Second-stage discharge air pressure display.

c. Oil pressure display.

d. Air inlet filter service indicator.

e. Digital first-stage discharge air temperature display.

f. Digital second-stage air inlet temperature display.

g. Digital second-stage discharge temperature display.

h. Digital aftercooler outlet air temperature display.

i. Digital oil temperature display.

j. Low oil pressure indicator.

k. Running time display.

l. Loaded time display.

m. Standby light.

n. Power-on light.

o. Motor overload indication.

p. Compressor run light.

q. Oil pump run light.

r. Fan run light.

s. Load light.

t. Manual unload button.

u. Oil level gauge.

v. Oil filter condition indicator.

w. Alarm buzzer.

x. Lamp test switch.

y. Buzzer cancel switch.

z. “Lag in Use” alarm .

3.14 Safety Devices

Compressor shall have automatic shut-off devices for the following conditions:

3.14.1 Low oil pressure.

3.14.2 High outlet air pressure.

3.14.3 High first-stage discharge air temperature.

3.14.4 High second-stage inlet air temperature.

3.14.5 High second-stage discharge air temperature.

3.14.6 High outlet air temperature.

3.14.7 High oil temperature.

3.14.8 Compressor motor overload.

3.14.9 Lube oil pump motor overload.

3.14.10 Cooling fan motor overload.

3.14.11 High cabinet temperature.

3.14.12 Main starter failure.

3.14.13 Non-fused disconnect switch.

The unit shall automatically stop, annunciate by alarm bell, and indicate the appropriate failure by alarm and text display. Alarm bell must remain on until manually reset.

3.15 Filter System

3.15.1 Air intake filters are to be enclosed in package and easily accessible for service. Air entering the compressor shall be drawn from outside the package.

3.15.2 Filters shall be paper cartridge type.

5 micron - 99% or greater efficiency.

3.16 Compressor Enclosure

3.16.1 The compressor unit, including motor, shall be enclosed in a steel sound insulating canopy with doors to provide ready access for normal maintenance.

3.16.2 The doors shall be removable. Enclosure and base frame to be painted for long life and durable finish.

3.16.3 Sound insulating material shall be nominal 2 pounds per cubic foot polyether foam with UL94HP-1 flame resistance. Sound insulating material shall be 1 inch thick.

3.16.4 Enclosure shall be ventilated using a separate motor driven fan starting when oil pressure is established and stopping 20 seconds after the compressor stops.

3.17 Noise Levels

The compressor noise level shall not exceed 85 dBA at three (3) feet.

3.18 Installation Requirements

The compressor shall be designed so that the installation is simplified. No special foundations are required other than those necessary to support the weight of the unit. The unit shall be delivered with all internal compressed air and oil piping, and wiring complete. There shall be a 2-source hook-up for utilities, one for air discharge and one for incoming electrical service. All automatic drain lines shall be brought out of the cabinet for ease in connecting to floor drain.

4.0 OPTIONAL EQUIPMENT

The following optional equipment could be included in the assembly provided. Check options required.

4.1 Sequencer for multi-machine operation. (Specify quantity: 3, 4, 5, or 6 machines.)

4.2 Compressor hold down brackets.

END OF SECTION