SAMPLE BID REQUEST SPECIFICATION FOR A QSI 245

1. Scope of supply.

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 245 CFM (total package rated performance measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 110 PSIG. This compressor shall be capable of full load operation at 110 PSIG and have a maximum pressure capability of 125 PSIG.

2. Airend.

2.1 The airend shall have a 4-6 lobe combination with both male and female rotors being identical in diameter.

2.2 The discharge end of the rotors shall be supported by a triplex bearing arrangement on the male rotor and a duplex bearing arrangement on the female rotor. The suction end of the rotors shall be supported by a single row of cylindrical roller bearings.

2.3 The airend shall have an axial flow inlet housing to allow incoming air to enter the compression area over the entire face of the rotors. Radial inlet arrangements will not be accepted. This inlet housing shall bolt directly to a "C"-faced drive motor to maintain permanent rotor shaft to motor shaft alignment.

2.4 The discharge bearings must be housed in the main rotor housing to maintain permanent rotor alignment within the rotor housing. Separate, bolt-on castings for discharge bearings will not be accepted.

2.5 The area around the bearings shall be free of any obstruction to the free flow of fluid. Pockets or reservoirs where fluid might collect in the bearing area shall have a magnetic drain plug to trap metallic contamination. This drain plug shall be of sufficient size and conveniently located to allow the regular cleaning of pockets or reservoirs in the bearing area.

2.6 Male rotor RPM shall be identical to the actual speed of the main drive motor. The tip speed of the driven rotor shall not exceed 19 meters per second.

2.7 The motor and airend shall be directly coupled through a flexible drop-out type coupling. No belts or gears shall be included in the drive arrangement.

2.8 The drive rotor shall have a redundant shaft sealing arrangement. Should the primary shaft seal fail, a secondary seal shall be capable of preventing fluid from leaking out of the

airend. A method of detecting a primary shaft seal failure while the machine is in operation shall be provided.

3. Drive motor.

3.1 The main drive motor shall be 50 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

3.2 The main drive motor shall have an ODP enclosure.

3.3 The main drive motor shall be of a "C"-faced design so that it can be rigidly bolted to the airend assembly.

4. Cooling system.

4.1 The compressor shall be air-cooled.

4.2 The cooling system shall be capable of maintaining proper compressor temperatures in ambient conditions up to 110°F.

4.3 Coolers shall be vertical draft.

4.4 Fluid circulation shall be by positive displacement pump.

5. Aftercooler.

5.1 An air-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to have an approach temperature of not more than 5°F at standard conditions.

5.2 A 99.9% efficient moisture separator and trap shall be included.

6. Compressor Fluid.

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use.

6.2 The fluid shall contain no chemical substances that would require it to be treated as hazardous according to the appropriate laws in effect at the time of sale. Used fluid shall be suitable for recycling along with other waste petroleum oil.

6.3 Fluid carryover into the downstream air system shall not exceed 3 PPM by weight with new elements.

6.4 A fluid filter shall be provided with a 10 micron absolute rating. The filter media must be microfiberglass. Paper media will not be accepted.

7. Compressor controls.

7.1 The compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a user adjustable percent of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically reload/restart if the system pressure falls below the set point. A selector switch on the control panel shall be provided to allow the user to bypass the automatic shutdown feature and elect a continuous run mode should the system demand dictate.

7.2 Gauges or indicators shall also be provided to indicate:

A) Compressor discharge temperature
B) Discharge air pressure
C) Percent capacity
D) Operating mode
E) Power on
F) Running hours

7.3 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown (Probes must be provided at the compressor discharge and the air/fluid separator reservoir to monitor high temperature conditions)
B) Motor overload (This should alert a motor overload for all motors on the compressor package)
C) Change inlet filter
D) Change fluid filter
E) Change Separator Element

This shutdown and maintenance annunciator panel shall be constructed in such a way that connections for remote annunciation can easily be made.

8. Electrical controls.

8.1 All electrical controls shall be designed and constructed in accordance with National Electrical Code (NEC) guidelines.

8.2 The main starter control box shall be NEMA 1 design and contain starters for the main drive motor and fan motor along with other electrical controls.

8.3 All components within the main starter control box shall be UL and/or CSA approved or listed.

8.4 The main starter control box shall be UL and/or CSA approved or listed.

8.5 Remote mounted starter control panel boxes will not be accepted.

9. Safety system.

9.1 Pressure vessels shall be ASME coded.

9.2 A pressure relief safety valve shall be provided. This valve shall be sized to handle the full capacity of the compressor. It shall have a single, directed outlet. Multidirectional valves will not be accepted.

9.3 A high air/fluid temperature shutdown system shall be provided. This system shall operate with a minimum of two temperature sensors. One sensor must be located directly in the discharge air stream of the airend. One sensor must be located on the dry side of the air/fluid separator element. This system must be designed to prevent the compressor from running with a failed sensor.

10. Sound levels.

10.1 Sound levels shall not exceed 82 dB(A) when measured in free field conditions, 1 meter away from the compressor.

OPTIONS

Replace section in main bid spec with appropriate section below for desired option.

****** AUTO DEMAND CONTROL**

7.1 In the "LOCAL" control mode, the compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a predetermined percentage of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically restart if the system pressure falls below the set point. In

the "REMOTE" control mode, control of the compressor shall be transferred to a remote controller that shall operate the compressor in conjunction with one or more other compressors. The actual operation of the compressor will be identical to the "LOCAL" mode except the remote controller will determine pressure set points.

******** **200 VOLT**

3.1 The main drive motor shall be 50 nameplate horsepower rated for 200 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **230 VOLT**

3.1 The main drive motor shall be 50 nameplate horsepower rated for 230 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **575 VOLT**

3.1 The main drive motor shall be 50 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **NEMA 4**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **NEMA 12 (use NEMA 4)**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **FOOD GRADE FLUID**

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use. It shall meet FDA CFR 178.3570 spec for food grade lubricants.

******** **FULL CANOPY**

1.2 The compressor shall have a full metal enclosure with quick release panels for easy access to service and maintenance items.

(WITHOUT SHROUDS)

10.1 Sound levels shall not exceed 77 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WITH LOW SOUND SHROUDS)

10.1 Sound levels shall not exceed 73 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WATER-COOLED)

10.1 Sound levels shall not exceed 73 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **WATER-COOLED**

4.1 The compressor shall be water-cooled.

4.3 Coolers shall be shell and tube type water-cooled coolers. The coolers shall be sized to maintain normal operating temperatures with inlet water temperatures as high as 100°F. Water pressure drop through the cooling system shall be no more than 3 PSIG.

5.1 A water-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to cool the discharge air temperature to within 15°F of the inlet water temperature.

10.1 Sound levels shall not exceed 80 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **SOLID STATE REDUCED VOLTAGE STARTERS**

8.2 The main starter control box shall be NEMA 1 and shall contain provisions to connect a remotely mounted solid state reduced voltage starter for the main drive motor. Motor protection shall include:

a) Shorted SCR detection
b) Phase loss
c) Overload
d) Current flow sensing
e) Short circuit protection

f) Anti-oscillation circuit

Torque, ramp time and current limit shall be adjustable. An LED display shall indicate the following:

a) Power On
b) Start
c) Current Flow
d) Run
e) At Speed
f) Over Temperature
g) Overload
h) Phase Loss
i) Shorted SCR
j) Short Circuit
k) Shunt Trip

Output relays shall be provided to indicate the following:

a) Run
b) Shunt Trip
c) Programmable Status Relay - Will energize on any one of the following conditions (jumper selectable): At Speed, Phase Loss, Over Temperature, Overload, Shorted SCR and Over Current

8.5 Remote mounted control panel boxes will be accepted.

****

125 PSIG FULL LOAD OPERATION

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 243 CFM (measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 125 PSIG. This compressor shall be capable of full load operation at 125 PSIG and have a maximum pressure capability of 140 PSIG.

3.1 The main drive motor shall be 60 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

**** **200 VOLT**

3.1 The main drive motor shall be 60 nameplate horsepower rated for 200 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

**** **230 VOLT**

3.1 The main drive motor shall be 60 nameplate horsepower rated for 230 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **575 VOLT**

3.1 The main drive motor shall be 60 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **Power$ync®**

2.9 The airend shall have a method of controlling displacement at operating speed that does not introduce areas of unswept volume or clearance pockets into the rotor bores. Lift valves that extend into the rotor bore prior to final machining and are machined to the exact tolerance of the rotor bore as the rotor bore is being machined are the preferred method of capacity control. Lift valves must be double acting to use air pressure to both open and close.

7.1 The compressor controls shall be microprocessor-based. There shall be three user-selectable control methods.

A) Constant Run Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand.

B) Auto Dual Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand. After a user-defined period of unloaded operation, the compressor will automatically shutdown and assume a standby mode. Should system demand return, the compressor will automatically restart.

C) Network Mode -- In place of the pressure deadband, the Network Mode shall use a target pressure and a variable response rate. The control shall maintain the system pressure to within two or three pounds of the target pressure. In the upper 50% of the capacity range, the control shall match system demand without restricting the inlet air flow. In the lower 50% of the capacity range, the control shall select either a load/no load or modulating control method, based on user-defined parameters.

7.2 A complete, redundant electro-mechanical control system shall be included that will safely operate the compressor in the event of a microprocessor failure. This system shall be user selectable from a switch mounted in the main electrical control enclosure.

7.3 LED displays shall be provided that will constantly indicate discharge temperature and system pressure.

7.4 A four-line by forty-character LCD display shall be provided that will allow access to the following information:

Power-Up Warning Displays:

A) Sump Pressure Sensor Failure

B) Line Pressure Sensor Failure
C) Discharge Temperature Sensor Failure
D) Sump Temperature Sensor Failure
E) Tripped Motor Overload
F) Relay Board Communication Failure
G) Diagnostic Failure
H) Setup Memory Failure
I) Control Relay Not Disengaged
J) Main Motor Contactor Not Disengaged
K) Wye Contactor Not Disengaged (on Wye-Delta starters)
L) Deadband Data Error
M) Setup Memory Error
N) Setup Data Not Initialized
O) Air Filter Vacuum Switch Faulty
P) Fluid Filter Delta-P Switch Faulty
Q) An Element Needs Servicing
R) Minor Diagnostic Failure
S) Machine ID Error

Operational Displays:

A) Sump Pressure Too High For Restart
B) Compressor Is Starting
C) **Warning** Possible Reverse Rotation
D) Compressor Is Running In Auto-Dual Mode
E) Compressor Is Unloaded
F) Time Left To Shutdown
G) Compressor Has Timed Out And Shut Down **Warning** Will Automatically Restart
H) Running In Continuous Run Mode
I) Running In Network Mode Position __ Of __
J) Programmed Shutdown
K) **Warning** An Element Needs Servicing
L) Emergency Stop Button Has Been Pressed
M) ** Warning** Setup Memory Failure
N) ** Warning** Sequence Data Error
O) ** Warning** Schedule Data Error
P) ** Warning** Compressor ID Already In Use
Q) ** Warning** High Discharge Temperature
R) ** Warning** High Sump Temperature
S) ** Warning** High Sump Pressure
T) ** Warning** Motor Overload
U) ** Warning** Contactor Is Not Engaging
V) ** Warning** Contactor is Not Disengaging
W) Discharge RTD Faulty Or Disconnected

X) Sump RTD Faulty Or Disconnected
Y) Line Pressure Sensor Faulty
Z) Sump Pressure Sensor Faulty
AA) ** Warning** Communication Failure
BB) ** Warning** Firmware Failure
CC) Compressor Not In Scheduled Sequence

Adjustable Operating Parameters:

A) Compressor Unloaded Pressure
B) Compressor Loaded Pressure
C) Timed Stop Delay In Minutes
D) Cycle Count
E) Short Cycle Time In Seconds
F) Target Pressure
G) Network Unloaded Pressure
H) Network Loaded Pressure
I) Modulation Turn Off Delay In Minutes
J) Machine ID
K) Sequence Number To Change
L) Day To Change
M) Clear Sequence
N) Clear Sequence And Schedule
O) Set Delayed Unload Mode
P) Set Immediate Unload Mode

Maintenance Displays:

A) Loaded Hours
B) Unloaded Hours
C) Hours Since Last Fluid Change
D) Control Line Filter Hours
E) Intake Filter Hours
F) Fluid Filter Hours
G) Separator Element Hours
H) View Current Time And Date
I) Set Time And Date
J) Compressor Control Test
K) Serial Number
L) Software Version Number
M) Compressor Model
N) Drive Motor Horsepower
O) Voltage
P) Starter Type
Q) Cooling Type
R) Airend Type
S) High Air Temperature Shutdown Setting

T) High Sump Pressure Shutdown Setting
U) Maximum Unloaded Pressure Setting
V) Minimum Loaded Pressure Setting
W) Current Loaded Pressure Setting
X) Current Unloaded Pressure Setting
Y) Current Target Pressure Setting
Z) Machine ID
AA) Auto Dual Shutdown Timer Setting
BB) Wye Delta Transition Time Setting
CC) Modulation Cycle Count Setting
DD) Modulation Time Setting
EE) Sump Temperature
FF) Pressure Transducer Calibration Date
GG) Temperature Sensor Calibration Date
HH) Unit Configuration Date
II) Current Time And Date
JJ) Modem Baud Rate
KK) Shutdown Log
LL) Network Diagnostics

7.5 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown
B) Motor overload
C) High Sump Pressure Shutdown
D) Change inlet filter
E) Change lubricant filter
F) Change Separator Element

7.6 The control shall have the built-in capability to network up to 16 similar compressors of various sizes. In this network configuration, the sequence in which the compressors operate as base load and trim shall be user selectable. The control shall be able to store no fewer than nine different sequences. An internal clock and calendar shall be included that will allow different sequences to be scheduled no fewer than nine times per day. The controller shall have the ability to schedule each day of the week differently.

7.7 The controller shall include a shutdown log that will allow the operator to view service and shutdown alarms in the reverse order of occurrence. The log shall give plain English messages that will identify the source of the alarm.

SAMPLE BID REQUEST SPECIFICATION FOR A QSI 370

1. Scope of supply.

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 370 CFM (total package rated performance measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 110 PSIG. This compressor shall be capable of full load operation at 110 PSIG and have a maximum pressure capability of 125 PSIG.

2. Airend.

2.1 The airend shall have a 4-6 lobe combination with both male and female rotors being identical in diameter.

2.2 The discharge end of the rotors shall be supported by a triplex bearing arrangement on the male rotor and a duplex bearing arrangement on the female rotor. The suction end of the rotors shall be supported by a single row of cylindrical roller bearings.

2.3 The airend shall have an axial flow inlet housing to allow incoming air to enter the compression area over the entire face of the rotors. Radial inlet arrangements will not be accepted. This inlet housing shall bolt directly to a "C"-faced drive motor to maintain permanent rotor shaft to motor shaft alignment.

2.4 The discharge bearings must be housed in the main rotor housing to maintain permanent rotor alignment within the rotor housing. Separate, bolt-on castings for discharge bearings will not be accepted.

2.5 The area around the bearings shall be free of any obstruction to the free flow of fluid. Pockets or reservoirs where fluid might collect in the bearing area shall have a magnetic drain plug to trap metallic contamination. This drain plug shall be of sufficient size and conveniently located to allow the regular cleaning of pockets or reservoirs in the bearing area.

2.6 Male rotor RPM shall be identical to the actual speed of the main drive motor. The tip speed of the driven rotor shall not exceed 19 meters per second.

2.7 The motor and airend shall be directly coupled through a flexible drop-out type coupling. No belts or gears shall be included in the drive arrangement.

2.8 The drive rotor shall have a redundant shaft sealing arrangement. Should the primary shaft seal fail, a secondary seal shall be capable of preventing fluid from leaking out of the

airend. A method of detecting a primary shaft seal failure while the machine is in operation shall be provided.

3. Drive motor.

3.1 The main drive motor shall be 75 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

3.2 The main drive motor shall have an ODP enclosure.

3.3 The main drive motor shall be of a "C"-faced design so that it can be rigidly bolted to the airend assembly.

4. Cooling system.

4.1 The compressor shall be air-cooled.

4.2 The cooling system shall be capable of maintaining proper compressor temperatures in ambient conditions up to 110°F.

4.3 Coolers shall be vertical draft.

4.4 Fluid circulation shall be by positive displacement pump.

5. Aftercooler.

5.1 An air-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to have an approach temperature of not more than 5°F at standard conditions.

5.2 A 99.9% efficient moisture separator and trap shall be included.

6. Compressor Fluid.

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use.

6.2 The fluid shall contain no chemical substances that would require it to be treated as hazardous according to the appropriate laws in effect at the time of sale. Used fluid shall be suitable for recycling along with other waste petroleum oil.

6.3 Fluid carryover into the downstream air system shall not exceed 3 PPM by weight with new elements.

6.4 A fluid filter shall be provided with a 10 micron absolute rating. The filter media must be microfiberglass. Paper media will not be accepted.

7. Compressor controls.

7.1 The compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a user adjustable percent of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically reload/restart if the system pressure falls below the set point. A selector switch on the control panel shall be provided to allow the user to bypass the automatic shutdown feature and elect a continuous run mode should the system demand dictate.

7.2 Gauges or indicators shall also be provided to indicate:

A) Compressor discharge temperature
B) Discharge air pressure
C) Percent capacity
D) Operating mode
E) Power on
F) Running hours

7.3 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown (Probes must be provided at the compressor discharge and the air/fluid separator reservoir to monitor high temperature conditions)
B) Motor overload (This should alert a motor overload for all motors on the compressor package)
C) Change inlet filter
D) Change fluid filter
E) Change Separator Element

This shutdown and maintenance annunciator panel shall be constructed in such a way that connections for remote annunciation can easily be made.

8. Electrical controls.

8.1 All electrical controls shall be designed and constructed in accordance with National Electrical Code (NEC) guidelines.

8.2 The main starter control box shall be NEMA 1 design and contain starters for the main drive motor and fan motor along with other electrical controls.

8.3 All components within the main starter control box shall be UL and/or CSA approved or listed.

8.4 The main starter control box shall be UL and/or CSA approved or listed.

8.5 Remote mounted starter control panel boxes will not be accepted.

9. Safety system.

9.1 Pressure vessels shall be ASME coded.

9.2 A pressure relief safety valve shall be provided. This valve shall be sized to handle the full capacity of the compressor. It shall have a single, directed outlet. Multidirectional valves will not be accepted.

9.3 A high air/fluid temperature shutdown system shall be provided. This system shall operate with a minimum of two temperature sensors. One sensor must be located directly in the discharge air stream of the airend. One sensor must be located on the dry side of the air/fluid separator element. This system must be designed to prevent the compressor from running with a failed sensor.

10. Sound levels.

10.1 Sound levels shall not exceed 85 dB(A) when measured in free field conditions, 1 meter away from the compressor.

OPTIONS

Replace section in main bid spec with appropriate section below for desired option.

****** AUTO DEMAND CONTROL**

7.1 In the "LOCAL" control mode, the compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a predetermined percentage of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically restart if the system pressure falls below the set point. In

the "REMOTE" control mode, control of the compressor shall be transferred to a remote controller that shall operate the compressor in conjunction with one or more other compressors. The actual operation of the compressor will be identical to the "LOCAL" mode except the remote controller will determine pressure set points.

******** **200 VOLT**

3.1 The main drive motor shall be 75 nameplate horsepower rated for 200 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **230 VOLT**

3.1 The main drive motor shall be 75 nameplate horsepower rated for 230 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **575 VOLT**

3.1 The main drive motor shall be 75 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **NEMA 4**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **NEMA 12 (use NEMA 4)**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **FOOD GRADE FLUID**

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use. It shall meet FDA CFR 178.3570 spec for food grade lubricants.

******** **FULL CANOPY**

1.2 The compressor shall have a full metal enclosure with quick release panels for easy access to service and maintenance items.

(WITHOUT SHROUDS)

10.1 Sound levels shall not exceed 83 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WITH LOW SOUND SHROUDS)

10.1 Sound levels shall not exceed 77 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WATER-COOLED)

10.1 Sound levels shall not exceed 79 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **WATER-COOLED**

4.1 The compressor shall be water-cooled.

4.3 Coolers shall be shell and tube type water-cooled coolers. The coolers shall be sized to maintain normal operating temperatures with inlet water temperatures as high as 100°F. Water pressure drop through the cooling system shall be no more than 3 PSIG.

5.1 A water-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to cool the discharge air temperature to within 15°F of the inlet water temperature.

10.1 Sound levels shall not exceed 85 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **SOLID STATE REDUCED VOLTAGE STARTERS**

8.2 The main starter control box shall be NEMA 1 and shall contain provisions to connect a remotely mounted solid state reduced voltage starter for the main drive motor. Motor protection shall include:

a) Shorted SCR detection
b) Phase loss
c) Overload
d) Current flow sensing
e) Short circuit protection

f) Anti-oscillation circuit

Torque, ramp time and current limit shall be adjustable. An LED display shall indicate the following:

a) Power On
b) Start
c) Current Flow
d) Run
e) At Speed
f) Over Temperature
g) Overload
h) Phase Loss
i) Shorted SCR
j) Short Circuit
k) Shunt Trip

Output relays shall be provided to indicate the following:

a) Run
b) Shunt Trip
c) Programmable Status Relay - Will energize on any one of the following conditions (jumper selectable): At Speed, Phase Loss, Over Temperature, Overload, Shorted SCR and Over Current

8.5 Remote mounted control panel boxes will be accepted.

****

125 PSIG FULL LOAD OPERATION

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 368 CFM (measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 125 PSIG. This compressor shall be capable of full load operation at 125 PSIG and have a maximum pressure capability of 140 PSIG.

3.1 The main drive motor shall be 100 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

**** **200 VOLT**

3.1 The main drive motor shall be 100 nameplate horsepower rated for 200 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

**** **230 VOLT**

3.1 The main drive motor shall be 100 nameplate horsepower rated for 230 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **575 VOLT**

3.1 The main drive motor shall be 100 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **Power$ync®**

2.9 The airend shall have a method of controlling displacement at operating speed that does not introduce areas of unswept volume or clearance pockets into the rotor bores. Lift valves that extend into the rotor bore prior to final machining and are machined to the exact tolerance of the rotor bore as the rotor bore is being machined are the preferred method of capacity control. Lift valves must be double acting to use air pressure to both open and close.

7.1 The compressor controls shall be microprocessor-based. There shall be three user-selectable control methods.

A) Constant Run Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand.

B) Auto Dual Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand. After a user-defined period of unloaded operation, the compressor will automatically shutdown and assume a standby mode. Should system demand return, the compressor will automatically restart.

C) Network Mode -- In place of the pressure deadband, the Network Mode shall use a target pressure and a variable response rate. The control shall maintain the system pressure to within two or three pounds of the target pressure. In the upper 50% of the capacity range, the control shall match system demand without restricting the inlet air flow. In the lower 50% of the capacity range, the control shall select either a load/no load or modulating control method, based on user-defined parameters.

7.2 A complete, redundant electro-mechanical control system shall be included that will safely operate the compressor in the event of a microprocessor failure. This system shall be user selectable from a switch mounted in the main electrical control enclosure.

7.3 LED displays shall be provided that will constantly indicate discharge temperature and system pressure.

7.4 A four-line by forty-character LCD display shall be provided that will allow access to the following information:

Power-Up Warning Displays:

A) Sump Pressure Sensor Failure
B) Line Pressure Sensor Failure
C) Discharge Temperature Sensor Failure
D) Sump Temperature Sensor Failure
E) Tripped Motor Overload
F) Relay Board Communication Failure
G) Diagnostic Failure
H) Setup Memory Failure
I) Control Relay Not Disengaged
J) Main Motor Contactor Not Disengaged
K) Wye Contactor Not Disengaged (on Wye-Delta starters)
L) Deadband Data Error
M) Setup Memory Error
N) Setup Data Not Initialized
O) Air Filter Vacuum Switch Faulty
P) Fluid Filter Delta-P Switch Faulty
Q) An Element Needs Servicing
R) Minor Diagnostic Failure
S) Machine ID Error

Operational Displays:

A) Sump Pressure Too High For Restart
B) Compressor Is Starting
C) **Warning** Possible Reverse Rotation
D) Compressor Is Running In Auto-Dual Mode
E) Compressor Is Unloaded
F) Time Left To Shutdown
G) Compressor Has Timed Out And Shut Down **Warning** Will Automatically Restart
H) Running In Continuous Run Mode
I) Running In Network Mode Position __ Of __
J) Programmed Shutdown
K) **Warning** An Element Needs Servicing
L) Emergency Stop Button Has Been Pressed
M) ** Warning** Setup Memory Failure
N) ** Warning** Sequence Data Error
O) ** Warning** Schedule Data Error
P) ** Warning** Compressor ID Already In Use
Q) ** Warning** High Discharge Temperature
R) ** Warning** High Sump Temperature
S) ** Warning** High Sump Pressure
T) ** Warning** Motor Overload

U) ** Warning** Contactor Is Not Engaging
V) ** Warning** Contactor is Not Disengaging
W) Discharge RTD Faulty Or Disconnected
X) Sump RTD Faulty Or Disconnected
Y) Line Pressure Sensor Faulty
Z) Sump Pressure Sensor Faulty
AA) ** Warning** Communication Failure
BB) ** Warning** Firmware Failure
CC) Compressor Not In Scheduled Sequence

Adjustable Operating Parameters:

A) Compressor Unloaded Pressure
B) Compressor Loaded Pressure
C) Timed Stop Delay In Minutes
D) Cycle Count
E) Short Cycle Time In Seconds
F) Target Pressure
G) Network Unloaded Pressure
H) Network Loaded Pressure
I) Modulation Turn Off Delay In Minutes
J) Machine ID
K) Sequence Number To Change
L) Day To Change
M) Clear Sequence
N) Clear Sequence And Schedule
O) Set Delayed Unload Mode
P) Set Immediate Unload Mode

Maintenance Displays:

A) Loaded Hours
B) Unloaded Hours
C) Hours Since Last Fluid Change
D) Control Line Filter Hours
E) Intake Filter Hours
F) Fluid Filter Hours
G) Separator Element Hours
H) View Current Time And Date
I) Set Time And Date
J) Compressor Control Test
K) Serial Number
L) Software Version Number
M) Compressor Model
N) Drive Motor Horsepower
O) Voltage
P) Starter Type

Q) Cooling Type
R) Airend Type
S) High Air Temperature Shutdown Setting
T) High Sump Pressure Shutdown Setting
U) Maximum Unloaded Pressure Setting
V) Minimum Loaded Pressure Setting
W) Current Loaded Pressure Setting
X) Current Unloaded Pressure Setting
Y) Current Target Pressure Setting
Z) Machine ID
AA) Auto Dual Shutdown Timer Setting
BB) Wye Delta Transition Time Setting
CC) Modulation Cycle Count Setting
DD) Modulation Time Setting
EE) Sump Temperature
FF) Pressure Transducer Calibration Date
GG) Temperature Sensor Calibration Date
HH) Unit Configuration Date
II) Current Time And Date
JJ) Modem Baud Rate
KK) Shutdown Log
LL) Network Diagnostics

7.5 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown
B) Motor overload
C) High Sump Pressure Shutdown
D) Change inlet filter
E) Change lubricant filter
F) Change Separator Element

7.6 The control shall have the built-in capability to network up to 16 similar compressors of various sizes. In this network configuration, the sequence in which the compressors operate as base load and trim shall be user selectable. The control shall be able to store no fewer than nine different sequences. An internal clock and calendar shall be included that will allow different sequences to be scheduled no fewer than nine times per day. The controller shall have the ability to schedule each day of the week differently.

7.7 The controller shall include a shutdown log that will allow the operator to view service and shutdown alarms in the reverse order of occurrence. The log shall give plain English messages that will identify the source of the alarm.

SAMPLE BID REQUEST SPECIFICATION FOR A QSI 500

1. Scope of supply.

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 500 CFM (total package rated performance measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 110 PSIG. This compressor shall be capable of full load operation at 110 PSIG and have a maximum pressure capability of 125 PSIG.

2. Airend.

2.1 The airend shall have a 4-6 lobe combination with both male and female rotors being identical in diameter.

2.2 The discharge end of the rotors shall be supported by a triplex bearing arrangement on the male rotor and a duplex bearing arrangement on the female rotor. The suction end of the rotors shall be supported by a single row of cylindrical roller bearings.

2.3 The airend shall have an axial flow inlet housing to allow incoming air to enter the compression area over the entire face of the rotors. Radial inlet arrangements will not be accepted. This inlet housing shall bolt directly to a "C"-faced drive motor to maintain permanent rotor shaft to motor shaft alignment.

2.4 The discharge bearings must be housed in the main rotor housing to maintain permanent rotor alignment within the rotor housing. Separate, bolt-on castings for discharge bearings will not be accepted.

2.5 The area around the bearings shall be free of any obstruction to the free flow of fluid. Pockets or reservoirs where fluid might collect in the bearing area shall have a magnetic drain plug to trap metallic contamination. This drain plug shall be of sufficient size and conveniently located to allow the regular cleaning of pockets or reservoirs in the bearing area.

2.6 Male rotor RPM shall be identical to the actual speed of the main drive motor. The tip speed of the driven rotor shall not exceed 24 meters per second.

2.7 The motor and airend shall be directly coupled through a flexible drop-out type coupling. No belts or gears shall be included in the drive arrangement.

2.8 The drive rotor shall have a redundant shaft sealing arrangement. Should the primary shaft seal fail, a secondary seal shall be capable of preventing fluid from leaking out of the

airend. A method of detecting a primary shaft seal failure while the machine is in operation shall be provided.

3. Drive motor.

3.1 The main drive motor shall be 100 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

3.2 The main drive motor shall have an ODP enclosure.

3.3 The main drive motor shall be of a "C"-faced design so that it can be rigidly bolted to the airend assembly.

4. Cooling system.

4.1 The compressor shall be air-cooled.

4.2 The cooling system shall be capable of maintaining proper compressor temperatures in ambient conditions up to 110°F.

4.3 Coolers shall be vertical draft.

4.4 Fluid circulation shall be by positive displacement pump.

5. Aftercooler.

5.1 An air-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to have an approach temperature of not more than 5°F at standard conditions.

5.2 A 99.9% efficient moisture separator and trap shall be included.

6. Compressor Fluid.

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use.

6.2 The fluid shall contain no chemical substances that would require it to be treated as hazardous according to the appropriate laws in effect at the time of sale. Used fluid shall be suitable for recycling along with other waste petroleum oil.

6.3 Fluid carryover into the downstream air system shall not exceed 3 PPM by weight with new elements.

6.4 A fluid filter shall be provided with a 10 micron absolute rating. The filter media must be microfiberglass. Paper media will not be accepted.

7. Compressor controls.

7.1 The compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a user adjustable percent of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically reload/restart if the system pressure falls below the set point. A selector switch on the control panel shall be provided to allow the user to bypass the automatic shutdown feature and elect a continuous run mode should the system demand dictate.

7.2 Gauges or indicators shall also be provided to indicate:

A) Compressor discharge temperature
B) Discharge air pressure
C) Percent capacity
D) Operating mode
E) Power on
F) Running hours

7.3 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown (Probes must be provided at the compressor discharge and the air/fluid separator reservoir to monitor high temperature conditions)
B) Motor overload (This should alert a motor overload for all motors on the compressor package)
C) Change inlet filter
D) Change fluid filter
E) Change Separator Element

This shutdown and maintenance annunciator panel shall be constructed in such a way that connections for remote annunciation can easily be made.

8. Electrical controls.

8.1 All electrical controls shall be designed and constructed in accordance with National Electrical Code (NEC) guidelines.

8.2 The main starter control box shall be NEMA 1 design and contain starters for the main drive motor and fan motor along with other electrical controls.

8.3 All components within the main starter control box shall be UL and/or CSA approved or listed.

8.4 The main starter control box shall be UL and/or CSA approved or listed.

8.5 Remote mounted starter control panel boxes will not be accepted.

9. Safety system.

9.1 Pressure vessels shall be ASME coded.

9.2 A pressure relief safety valve shall be provided. This valve shall be sized to handle the full capacity of the compressor. It shall have a single, directed outlet. Multidirectional valves will not be accepted.

9.3 A high air/fluid temperature shutdown system shall be provided. This system shall operate with a minimum of two temperature sensors. One sensor must be located directly in the discharge air stream of the airend. One sensor must be located on the dry side of the air/fluid separator element. This system must be designed to prevent the compressor from running with a failed sensor.

10. Sound levels.

10.1 Sound levels shall not exceed 87 dB(A) when measured in free field conditions, 1 meter away from the compressor.

OPTIONS

Replace section in main bid spec with appropriate section below for desired option.

****** AUTO DEMAND CONTROL**

7.1 In the "LOCAL" control mode, the compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a predetermined percentage of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically restart if the system pressure falls below the set point. In

the "REMOTE" control mode, control of the compressor shall be transferred to a remote controller that shall operate the compressor in conjunction with one or more other compressors. The actual operation of the compressor will be identical to the "LOCAL" mode except the remote controller will determine pressure set points.

******** **200 VOLT**

3.1 The main drive motor shall be 100 nameplate horsepower rated for 200 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

8.2 The main electrical control box shall be NEMA 1 design and contain starters for the fan motor (air-cooled main cooling fan or water-cooled canopy vent fan) along with other electrical controls.

******** **230 VOLT**

3.1 The main drive motor shall be 100 nameplate horsepower rated for 230 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **575 VOLT**

3.1 The main drive motor shall be 100 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **NEMA 4**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **NEMA 12 (use NEMA 4)**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **FOOD GRADE FLUID**

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use. It shall meet FDA CFR 178.3570 spec for food grade lubricants.

******** **FULL CANOPY**

1.2 The compressor shall have a full metal enclosure with quick release panels for easy access to service and maintenance items.

(WITHOUT SHROUDS)

10.1 Sound levels shall not exceed 83 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WITH LOW SOUND SHROUDS)

10.1 Sound levels shall not exceed 80 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WATER-COOLED)

10.1 Sound levels shall not exceed 80 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **WATER-COOLED**

4.1 The compressor shall be water-cooled.

4.3 Coolers shall be shell and tube type water-cooled coolers. The coolers shall be sized to maintain normal operating temperatures with inlet water temperatures as high as 100°F. Water pressure drop through the cooling system shall be no more than 6 PSIG.

5.1 A water-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to cool the discharge air temperature to within 15°F of the inlet water temperature.

10.1 Sound levels shall not exceed 86 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **SOLID STATE REDUCED VOLTAGE STARTERS**

8.2 The main starter control box shall be NEMA 1 and shall contain provisions to connect a remotely mounted solid state reduced voltage starter for the main drive motor. Motor protection shall include:

a) Shorted SCR detection
b) Phase loss
c) Overload

d) Current flow sensing
e) Short circuit protection
f) Anti-oscillation circuit

Torque, ramp time and current limit shall be adjustable. An LED display shall indicate the following:

a) Power On
b) Start
c) Current Flow
d) Run
e) At Speed
f) Over Temperature
g) Overload
h) Phase Loss
i) Shorted SCR
j) Short Circuit
k) Shunt Trip

Output relays shall be provided to indicate the following:

a) Run
b) Shunt Trip
c) Programmable Status Relay - Will energize on any one of the following conditions (jumper selectable): At Speed, Phase Loss, Over Temperature, Overload, Shorted SCR and Over Current

8.5 Remote mounted control panel boxes will be accepted.

****

125 PSIG FULL LOAD OPERATION

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 496 CFM (measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 125 PSIG. This compressor shall be capable of full load operation at 125 PSIG and have a maximum pressure capability of 140 PSIG.

3.1 The main drive motor shall be 125 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

****

200 VOLT

3.1 The main drive motor shall be 125 nameplate horsepower rated for 200 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

8.2 The main electrical control box shall be NEMA 1 design and contain starters for the fan motor (air-cooled main cooling fan or water-cooled canopy vent fan) along with other electrical controls.

******** **230 VOLT**

3.1 The main drive motor shall be 125 nameplate horsepower rated for 230 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

8.2 The main electrical control box shall be NEMA 1 design and contain starters for the fan motor (air-cooled main cooling fan or water-cooled canopy vent fan) along with other electrical controls.

******** **575 VOLT**

3.1 The main drive motor shall be 125 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

**** **Power$ync®**

2.9 The airend shall have a method of controlling displacement at operating speed that does not introduce areas of unswept volume or clearance pockets into the rotor bores. Lift valves that extend into the rotor bore prior to final machining and are machined to the exact tolerance of the rotor bore as the rotor bore is being machined are the preferred method of capacity control. Lift valves must be double acting to use air pressure to both open and close.

7.1 The compressor controls shall be microprocessor-based. There shall be three user-selectable control methods.

A) Constant Run Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand.

B) Auto Dual Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand. After a user-defined period of unloaded operation, the compressor will automatically shutdown and assume a standby mode. Should system demand return, the compressor will automatically restart.

C) Network Mode -- In place of the pressure deadband, the Network Mode shall use a target pressure and a variable response rate. The control shall maintain the system pressure to within two or three pounds of the target pressure. In the upper 50% of the capacity range, the control shall match system demand without restricting the inlet air flow. In the lower 50% of the capacity range, the control shall select either a load/no load or modulating control method, based on user-defined parameters.

7.2 A complete, redundant electro-mechanical control system shall be included that will safely operate the compressor in the event of a microprocessor failure. This system shall be user selectable from a switch mounted in the main electrical control enclosure.

7.3 LED displays shall be provided that will constantly indicate discharge temperature and system pressure.

7.4 A four-line by forty-character LCD display shall be provided that will allow access to the following information:

Power-Up Warning Displays:

A) Sump Pressure Sensor Failure
B) Line Pressure Sensor Failure
C) Discharge Temperature Sensor Failure
D) Sump Temperature Sensor Failure
E) Tripped Motor Overload
F) Relay Board Communication Failure
G) Diagnostic Failure
H) Setup Memory Failure
I) Control Relay Not Disengaged
J) Main Motor Contactor Not Disengaged
K) Wye Contactor Not Disengaged (on Wye-Delta starters)
L) Deadband Data Error
M) Setup Memory Error
N) Setup Data Not Initialized
O) Air Filter Vacuum Switch Faulty
P) Fluid Filter Delta-P Switch Faulty
Q) An Element Needs Servicing
R) Minor Diagnostic Failure
S) Machine ID Error

Operational Displays:

A) Sump Pressure Too High For Restart
B) Compressor Is Starting
C) **Warning** Possible Reverse Rotation
D) Compressor Is Running In Auto-Dual Mode
E) Compressor Is Unloaded
F) Time Left To Shutdown
G) Compressor Has Timed Out And Shut Down **Warning** Will Automatically Restart
H) Running In Continuous Run Mode
I) Running In Network Mode Position __ Of __
J) Programmed Shutdown
K) **Warning** An Element Needs Servicing
L) Emergency Stop Button Has Been Pressed
M) ** Warning** Setup Memory Failure

N) ** Warning** Sequence Data Error
O) ** Warning** Schedule Data Error
P) ** Warning** Compressor ID Already In Use
Q) ** Warning** High Discharge Temperature
R) ** Warning** High Sump Temperature
S) ** Warning** High Sump Pressure
T) ** Warning** Motor Overload
U) ** Warning** Contactor Is Not Engaging
V) ** Warning** Contactor is Not Disengaging
W) Discharge RTD Faulty Or Disconnected
X) Sump RTD Faulty Or Disconnected
Y) Line Pressure Sensor Faulty
Z) Sump Pressure Sensor Faulty
AA) ** Warning** Communication Failure
BB) ** Warning** Firmware Failure
CC) Compressor Not In Scheduled Sequence

Adjustable Operating Parameters:

A) Compressor Unloaded Pressure
B) Compressor Loaded Pressure
C) Timed Stop Delay In Minutes
D) Cycle Count
E) Short Cycle Time In Seconds
F) Target Pressure
G) Network Unloaded Pressure
H) Network Loaded Pressure
I) Modulation Turn Off Delay In Minutes
J) Machine ID
K) Sequence Number To Change
L) Day To Change
M) Clear Sequence
N) Clear Sequence And Schedule
O) Set Delayed Unload Mode
P) Set Immediate Unload Mode

Maintenance Displays:

A) Loaded Hours
B) Unloaded Hours
C) Hours Since Last Fluid Change
D) Control Line Filter Hours
E) Intake Filter Hours
F) Fluid Filter Hours
G) Separator Element Hours
H) View Current Time And Date
I) Set Time And Date

J) Compressor Control Test
K) Serial Number
L) Software Version Number
M) Compressor Model
N) Drive Motor Horsepower
O) Voltage
P) Starter Type
Q) Cooling Type
R) Airend Type
S) High Air Temperature Shutdown Setting
T) High Sump Pressure Shutdown Setting
U) Maximum Unloaded Pressure Setting
V) Minimum Loaded Pressure Setting
W) Current Loaded Pressure Setting
X) Current Unloaded Pressure Setting
Y) Current Target Pressure Setting
Z) Machine ID
AA) Auto Dual Shutdown Timer Setting
BB) Wye Delta Transition Time Setting
CC) Modulation Cycle Count Setting
DD) Modulation Time Setting
EE) Sump Temperature
FF) Pressure Transducer Calibration Date
GG) Temperature Sensor Calibration Date
HH) Unit Configuration Date
II) Current Time And Date
JJ) Modem Baud Rate
KK) Shutdown Log
LL) Network Diagnostics

7.5 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown
B) Motor overload
C) High Sump Pressure Shutdown
D) Change inlet filter
E) Change lubricant filter
F) Change Separator Element

7.6 The control shall have the built-in capability to network up to 16 similar compressors of various sizes. In this network configuration, the sequence in which the compressors operate as base load and trim shall be user selectable. The control shall be able to store no fewer than nine different sequences. An internal clock and calendar shall be included that will allow different sequences to be scheduled no fewer than nine times per day. The controller shall have the ability to schedule each day of the week differently.

7.7 The controller shall include a shutdown log that will allow the operator to view service and shutdown alarms in the reverse order of occurrence. The log shall give plain English messages that will identify the source of the alarm.

SAMPLE BID REQUEST SPECIFICATION FOR A QSI-750

1. Scope of supply.

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 757 CFM (total package rated performance measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 110 PSIG. This compressor shall be capable of full load operation at 110 PSIG and have a maximum pressure capability of 125 PSIG.

2. Airend.

2.1 The airend shall have a 4-6 lobe combination with both male and female rotors being identical in diameter.

2.2 The discharge end of the rotors shall be supported by a triplex bearing arrangement on the male rotor and a duplex bearing arrangement on the female rotor. The suction end of the rotors shall be supported by a single row of cylindrical roller bearings.

2.3 The airend shall have an axial flow inlet housing to allow incoming air to enter the compression area over the entire face of the rotors. Radial inlet arrangements will not be accepted. This inlet housing shall bolt directly to a "C"-faced drive motor to maintain permanent rotor shaft to motor shaft alignment.

2.4 The discharge bearings must be housed in the main rotor housing to maintain permanent rotor alignment within the rotor housing. Separate, bolt-on castings for discharge bearings will not be accepted.

2.5 The area around the bearings shall be free of any obstruction to the free flow of fluid. Pockets or reservoirs where fluid might collect in the bearing area shall have a magnetic drain plug to trap metallic contamination. This drain plug shall be of sufficient size and conveniently located to allow the regular cleaning of pockets or reservoirs in the bearing area.

2.6 Male rotor RPM shall be identical to the actual speed of the main drive motor. The tip speed of the driven rotor shall not exceed 24 meters per second.

2.7 The motor and airend shall be directly coupled through a flexible drop-out type coupling. No belts or gears shall be included in the drive arrangement.

2.8 The drive rotor shall have a redundant shaft sealing arrangement. Should the primary shaft seal fail, a secondary seal shall be capable of preventing fluid from leaking out of the airend. A method of detecting a primary shaft seal failure while the machine is in operation shall be provided.

3. Drive motor.

3.1 The main drive motor shall be 150 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

3.2 The main drive motor shall have an ODP enclosure.

3.3 The main drive motor shall be of a "C"-faced design so that it can be rigidly bolted to the airend assembly.

4. Cooling system.

4.1 The compressor shall be air-cooled.

4.2 The cooling system shall be capable of maintaining proper compressor temperatures in ambient conditions up to 110°F.

4.3 Coolers shall be horizontal draft.

4.4 Fluid circulation shall be by positive displacement pump.

5. Aftercooler.

5.1 An air-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to have an approach temperature of not more than 5°F at standard conditions.

5.2 A 99.9% efficient moisture separator and trap shall be included.

6. Compressor Fluid.

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use.

6.2 The fluid shall contain no chemical substances that would require it to be treated as hazardous according to the appropriate laws in effect at the time of sale. Used fluid shall be suitable for recycling along with other waste petroleum oil.

6.3 Fluid carryover into the downstream air system shall not exceed 3 PPM by weight with new elements.

6.4 A fluid filter shall be provided with a 10 micron absolute rating. The media must be microfiberglass. Paper media filters will not be accepted.

7. Compressor controls.

7.1 The compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a user adjustable percent of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically reload/restart if the system pressure falls below the set point. A selector switch on the control panel shall be provided to allow the user to bypass the automatic shutdown feature and elect a continuous run mode should the system demand dictate.

7.2 Gauges or indicators shall also be provided to indicate:

A) Compressor discharge temperature
B) Discharge air pressure
C) Percent capacity
D) Operating mode
E) Power on
F) Running hours

7.3 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown (Probes must be provided at the compressor discharge and the air/fluid separator reservoir to monitor high temperature conditions)
B) Motor overload (This should alert a motor overload for all motors on the compressor package)
C) Change inlet filter
D) Change fluid filter
E) Change Separator Element

This shutdown and maintenance annunciator panel shall be constructed in such a way that connections for remote annunciation can easily be made.

8. Electrical controls.

8.1 All electrical controls shall be designed and constructed in accordance with National Electrical Code (NEC) guidelines.

8.2 The main starter control box shall be NEMA 1 design and contain starters for the main drive motor and fan motor along with other electrical controls.

8.3 All components within the main starter control box shall be UL and/or CSA approved or listed.

8.4 The main starter control box shall be UL and/or CSA approved or listed.

8.5 Remote mounted starter control panel boxes will not be accepted.

9. Safety system.

9.1 Pressure vessels shall be ASME coded.

9.2 A pressure relief safety valve shall be provided. This valve shall be sized to handle the full capacity of the compressor. It shall have a single, directed outlet. Multidirectional valves will not be accepted.

9.3 A high air/fluid temperature shutdown system shall be provided. This system shall operate with a minimum of two temperature sensors. One sensor must be located directly in the discharge air stream of the airend. One sensor must be located on the dry side of the air/fluid separator element. This system must be designed to prevent the compressor from running with a failed sensor.

10. Sound levels.

10.1 Sound levels shall not exceed 89 dB(A) when measured in free field conditions, 1 meter away from the compressor.

OPTIONS

Replace section in main bid spec with appropriate section below for desired option.

****** AUTO DEMAND CONTROL**

7.1 In the "LOCAL" control mode, the compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a predetermined percentage of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically restart if the system pressure falls below the set point. In the "REMOTE" control mode, control of the compressor shall be transferred to a remote controller that shall operate the compressor in conjunction with one or more other

compressors. The actual operation of the compressor will be identical to the "LOCAL" mode except the remote controller will determine pressure set points.

******** **200 VOLT**

3.1 The main drive motor shall be 150 nameplate horsepower rated for 200 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

8.2 The main electrical control box shall be NEMA 1 design and contain starters for the fan motor (air-cooled main cooling fan or water-cooled canopy vent fan) along with other electrical controls.

******** **230 VOLT**

3.1 The main drive motor shall be 150 nameplate horsepower rated for 230 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

8.2 The main electrical control box shall be NEMA 1 design and contain starters for the fan motor (air-cooled main cooling fan or water-cooled canopy vent fan) along with other electrical controls.

******** **575 VOLT**

3.1 The main drive motor shall be 150 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **NEMA 4**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **NEMA 12 (use NEMA 4)**

8.2 The main control box shall be NEMA 4 design and contain starters for the main drive motor and fan motor along with other electrical controls.

******** **FOOD GRADE FLUID**

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use. It shall meet FDA CFR 178.3570 spec for food grade lubricants.

******** **FULL CANOPY**

1.2 The compressor shall have a full metal enclosure with quick release panels for easy access to service and maintenance items.

(WITHOUT SHROUDS)

10.1 Sound levels shall not exceed 87 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WITH LOW SOUND SHROUDS)

10.1 Sound levels shall not exceed 80 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WATER-COOLED)

10.1 Sound levels shall not exceed 80 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **WATER-COOLED**

4.1 The compressor shall be water-cooled.

4.3 Coolers shall be shell and tube type water-cooled coolers. The coolers shall be sized to maintain normal operating temperatures with inlet water temperatures as high as 100ºF. Water pressure drop through the cooling system shall be no more than 8 PSIG.

5.1 A water-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to cool the discharge air temperature to within 15oF of the inlet water temperature.

10.1 Sound levels shall not exceed 87 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **SOLID STATE REDUCED VOLTAGE STARTERS**

8.2 The main starter control box shall be NEMA 1 and shall contain provisions to connect a remotely mounted solid state reduced voltage starter for the main drive motor. Motor protection shall include:

a) Shorted SCR detection
b) Phase loss
c) Overload
d) Current flow sensing
e) Short circuit protection
f) Anti-oscillation circuit

Torque, ramp time and current limit shall be adjustable. An LED display shall indicate the following:

a) Power On
b) Start
c) Current Flow
d) Run
e) At Speed
f) Over Temperature
g) Overload
h) Phase Loss
i) Shorted SCR
j) Short Circuit
k) Shunt Trip

Output relays shall be provided to indicate the following:

a) Run
b) Shunt Trip
c) Programmable Status Relay - Will energize on any one of the following conditions (jumper selectable): At Speed, Phase Loss, Over Temperature, Overload, Shorted SCR and Over Current

8.5 Remote mounted control panel boxes will be accepted.

**** 125 PSIG FULL LOAD OPERATION

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 751 CFM (measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 125 PSIG. This compressor shall be capable of full load operation at 125 PSIG and have a maximum pressure capability of 140 PSIG.

3.1 The main drive motor shall be 200 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

8.2 The main electrical control box shall be NEMA 1 design and contain starters for the fan motor (air-cooled main cooling fan or water-cooled canopy vent fan) along with other electrical controls.

******** **575 VOLT**

3.1 The main drive motor shall be 200 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **Power$ync®**

2.9 The airend shall have a method of controlling displacement at operating speed that does not introduce areas of unswept volume or clearance pockets into the rotor bores. Lift valves that extend into the rotor bore prior to final machining and are machined to the exact tolerance of the rotor bore as the rotor bore is being machined are the preferred method of capacity control. Lift valves must be double acting to use air pressure to both open and close.

7.1 The compressor controls shall be microprocessor-based. There shall be three user-selectable control methods.

A) Constant Run Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand.

B) Auto Dual Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand. After a user-defined period of unloaded operation, the compressor will automatically shutdown and assume a standby mode. Should system demand return, the compressor will automatically restart.

C) Network Mode -- In place of the pressure deadband, the Network Mode shall use a target pressure and a variable response rate. The control shall maintain the system pressure to within two or three pounds of the target pressure. In the upper 50% of the capacity range, the control shall match system demand without restricting the inlet air flow. In the lower 50% of the capacity range, the control shall select either a load/no load or modulating control method, based on user-defined parameters.

7.2 A complete, redundant electro-mechanical control system shall be included that will safely operate the compressor in the event of a microprocessor failure. This system shall be user selectable from a switch mounted in the main electrical control enclosure.

7.3 LED displays shall be provided that will constantly indicate discharge temperature and system pressure.

7.4 A four-line by forty-character LCD display shall be provided that will allow access to the following information:

Power-Up Warning Displays:

A) Sump Pressure Sensor Failure

B) Line Pressure Sensor Failure
C) Discharge Temperature Sensor Failure
D) Sump Temperature Sensor Failure
E) Tripped Motor Overload
F) Relay Board Communication Failure
G) Diagnostic Failure
H) Setup Memory Failure
I) Control Relay Not Disengaged
J) Main Motor Contactor Not Disengaged
K) Wye Contactor Not Disengaged (on Wye-Delta starters)
L) Deadband Data Error
M) Setup Memory Error
N) Setup Data Not Initialized
O) Air Filter Vacuum Switch Faulty
P) Fluid Filter Delta-P Switch Faulty
Q) An Element Needs Servicing
R) Minor Diagnostic Failure
S) Machine ID Error

Operational Displays:

A) Sump Pressure Too High For Restart
B) Compressor Is Starting
C) **Warning** Possible Reverse Rotation
D) Compressor Is Running In Auto-Dual Mode
E) Compressor Is Unloaded
F) Time Left To Shutdown
G) Compressor Has Timed Out And Shut Down **Warning** Will Automatically Restart
H) Running In Continuous Run Mode
I) Running In Network Mode Position __ Of __
J) Programmed Shutdown
K) **Warning** An Element Needs Servicing
L) Emergency Stop Button Has Been Pressed
M) ** Warning** Setup Memory Failure
N) ** Warning** Sequence Data Error
O) ** Warning** Schedule Data Error
P) ** Warning** Compressor ID Already In Use
Q) ** Warning** High Discharge Temperature
R) ** Warning** High Sump Temperature
S) ** Warning** High Sump Pressure
T) ** Warning** Motor Overload
U) ** Warning** Contactor Is Not Engaging
V) ** Warning** Contactor is Not Disengaging
W) Discharge RTD Faulty Or Disconnected
X) Sump RTD Faulty Or Disconnected

Y) Line Pressure Sensor Faulty
Z) Sump Pressure Sensor Faulty
AA) ** Warning** Communication Failure
BB) ** Warning** Firmware Failure
CC) Compressor Not In Scheduled Sequence

Adjustable Operating Parameters:

A) Compressor Unloaded Pressure
B) Compressor Loaded Pressure
C) Timed Stop Delay In Minutes
D) Cycle Count
E) Short Cycle Time In Seconds
F) Target Pressure
G) Network Unloaded Pressure
H) Network Loaded Pressure
I) Modulation Turn Off Delay In Minutes
J) Machine ID
K) Sequence Number To Change
L) Day To Change
M) Clear Sequence
N) Clear Sequence And Schedule
O) Set Delayed Unload Mode
P) Set Immediate Unload Mode

Maintenance Displays:

A) Loaded Hours
B) Unloaded Hours
C) Hours Since Last Fluid Change
D) Control Line Filter Hours
E) Intake Filter Hours
F) Fluid Filter Hours
G) Separator Element Hours
H) View Current Time And Date
I) Set Time And Date
J) Compressor Control Test
K) Serial Number
L) Software Version Number
M) Compressor Model
N) Drive Motor Horsepower
O) Voltage
P) Starter Type
Q) Cooling Type
R) Airend Type
S) High Air Temperature Shutdown Setting
T) High Sump Pressure Shutdown Setting

U) Maximum Unloaded Pressure Setting
V) Minimum Loaded Pressure Setting
W) Current Loaded Pressure Setting
X) Current Unloaded Pressure Setting
Y) Current Target Pressure Setting
Z) Machine ID
AA) Auto Dual Shutdown Timer Setting
BB) Wye Delta Transition Time Setting
CC) Modulation Cycle Count Setting
DD) Modulation Time Setting
EE) Sump Temperature
FF) Pressure Transducer Calibration Date
GG) Temperature Sensor Calibration Date
HH) Unit Configuration Date
II) Current Time And Date
JJ) Modem Baud Rate
KK) Shutdown Log
LL) Network Diagnostics

7.5 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown
B) Motor overload
C) High Sump Pressure Shutdown
D) Change inlet filter
E) Change lubricant filter
F) Change Separator Element

7.6 The control shall have the built-in capability to network up to 16 similar compressors of various sizes. In this network configuration, the sequence in which the compressors operate as base load and trim shall be user selectable. The control shall be able to store no fewer than nine different sequences. An internal clock and calendar shall be included that will allow different sequences to be scheduled no fewer than nine times per day. The controller shall have the ability to schedule each day of the week differently.

7.7 The controller shall include a shutdown log that will allow the operator to view service and shutdown alarms in the reverse order of occurrence. The log shall give plain English messages that will identify the source of the alarm.

SAMPLE BID REQUEST SPECIFICATION FOR A QSI-1000

1. Scope of supply.

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 1010 CFM (total package rated performance measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 110 PSIG. This compressor shall be capable of full load operation at 110 PSIG and have a maximum pressure capability of 125 PSIG.

2. Airend.

2.1 The airend shall have a 4-6 lobe combination with both male and female rotors being identical in diameter.

2.2 The discharge end of the rotors shall be supported by triplex bearings on the male rotor and duplex tapered roller bearings on the female rotor. The suction end of the rotors shall be supported by a single row of cylindrical roller bearings.

2.3 The airend shall have an axial flow inlet housing to allow incoming air to enter the compression area over the entire face of the rotors. Radial inlet arrangements will not be accepted.

2.4 The discharge bearings must be housed in the main rotor housing to maintain permanent rotor alignment within the rotor housing. Separate, bolt-on castings for discharge bearings will not be accepted.

2.5 The area around the bearings shall be free of any obstruction to the free flow of fluid. Pockets or reservoirs where fluid might collect in the bearing area shall have a magnetic drain plug to trap metallic contamination. This drain plug shall be of sufficient size and conveniently located to allow the regular cleaning of pockets or reservoirs in the bearing area.

2.6 Male rotor RPM shall be identical to the actual speed of the main drive motor. The tip speed of the driven rotor shall not exceed 31 meters per second.

2.7 The motor and airend shall be directly coupled through a flexible drop-out type coupling. No belts or gears shall be included in the drive arrangement.

2.8 The drive rotor shall have a redundant shaft sealing arrangement. Should the primary shaft seal fail, a secondary seal shall be capable of preventing fluid from leaking out of the airend. A method of detecting a primary shaft seal failure while the machine is in operation shall be provided.

3. Drive motor.

3.1 The main drive motor shall be 200 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

3.2 The main drive motor shall have an ODP enclosure.

4. Cooling system.

4.1 The compressor shall be air-cooled.

4.2 The cooling system shall be capable of maintaining proper compressor temperatures in ambient conditions up to 110°F.

4.3 Coolers shall be horizontal draft.

4.4 Fluid circulation shall be by positive displacement pump.

5. Aftercooler.

5.1 An air-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to have an approach temperature of not more than 5°F at standard conditions.

5.2 A 99.9% efficient moisture separator and trap shall be included.

6. Compressor Fluid.

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use.

6.2 The fluid shall contain no chemical substances that would require it to be treated as hazardous according to the appropriate laws in effect at the time of sale. Used fluid shall be suitable for recycling along with other waste petroleum oil.

6.3 Fluid carryover into the downstream air system shall not exceed 5 PPM by weight with new elements.

6.4 A fluid filter shall be provided with a 10 micron absolute rating. The filter media must be microfiberglass. Paper media will not be accepted.

7. Compressor controls.

7.1 The compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a user adjustable percent of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically reload/restart if the system pressure falls below the set point. A selector switch on the control panel shall be provided to allow the user to bypass the automatic shutdown feature and elect a continuous run mode should the system demand dictate.

7.2 Gauges or indicators shall also be provided to indicate:

A) Compressor discharge temperature
B) Discharge air pressure
C) Percent capacity
D) Operating mode
E) Power on
F) Running hours

7.3 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown (Probes must be provided at the compressor discharge and the air/fluid separator reservoir to monitor high temperature conditions)
B) Motor overload (This should alert a motor overload for all motors on the compressor package)
C) Change inlet filter
D) Change fluid filter
E) Change Separator Element

This shutdown and maintenance annunciator panel shall be constructed in such a way that connections for remote annunciation can easily be made.

8. Electrical controls.

8.1 All electrical controls shall be designed and constructed in accordance with National Electrical Code (NEC) guidelines.

8.2 The main starter control box shall be NEMA 1 design and contain the starter for the fan motor along with other electrical controls.

8.3 All components within the main starter control box shall be UL and/or CSA approved or listed.

8.4 The main starter control box shall be UL and/or CSA approved or listed.

8.5 Remote mounted control panel boxes will not be accepted.

9. Safety system.

9.1 Pressure vessels shall be ASME coded.

9.2 A pressure relief safety valve shall be provided. This valve shall be sized to handle the full capacity of the compressor. It shall have a single, directed outlet. Multidirectional valves will not be accepted.

9.3 A high air/fluid temperature shutdown system shall be provided. This system shall operate with a minimum of two temperature sensors. One sensor must be located directly in the discharge air stream of the airend. One sensor must be located on the dry side of the air/fluid separator element. This system must be designed to prevent the compressor from running with a failed sensor.

10. Sound levels.

10.1 Sound level shall average 89 dB(A) when measured in free field conditions, 1 meter away from the compressor.

OPTIONS

Replace section in main bid spec with appropriate section below for desired option.

****** AUTO DEMAND CONTROL**

7.1 In the "LOCAL" control mode, the compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a predetermined percentage of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically restart if the system pressure falls below the set point. In the "REMOTE" control mode, control of the compressor shall be transferred to a remote controller that shall operate the compressor in conjunction with one or more other compressors. The actual operation of the compressor will be identical to the "LOCAL" mode except the remote controller will determine pressure set points.

****** 575 VOLT**

3.1 The main drive motor shall be 200 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **NEMA 4**

8.2 The main control box shall be NEMA 4 design and contain the starters for the fan motor along with other electrical controls.

******** **NEMA 12 (use NEMA 4)**

8.2 The main control box shall be NEMA 4 design and contain the starter for the fan motor along with other electrical controls.

******** **FOOD GRADE FLUID**

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use. It shall meet FDA CFR 178.3570 spec for food grade lubricants.

******** **FULL CANOPY**

1.2 The compressor shall have a full metal enclosure with quick release panels for easy access to service and maintenance items.

(WITHOUT SHROUDS)

10.1 Sound level shall average 85 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WITH LOW SOUND SHROUDS)

10.1 Sound level shall average 82 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WATER-COOLED)

10.1 Sound level shall average 79 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **WATER-COOLED**

4.1 The compressor shall be water-cooled.

4.3 Coolers shall be shell and tube type water-cooled coolers. The coolers shall be sized to maintain normal operating temperatures with inlet water temperatures as high as 100°F. Water pressure drop through the cooling system shall be no more than 10 PSIG.

5.1 A water-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to cool the discharge air temperature to within 15°F of the inlet water temperature.

10.1 Sound level shall average 86 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **SOLID STATE REDUCED VOLTAGE STARTERS**

8.2 The main starter control box shall be NEMA 1 and shall contain provisions to connect a remotely mounted solid state reduced voltage starter for the main drive motor. Motor protection shall include:

a) Shorted SCR detection
b) Phase loss
c) Overload
d) Current flow sensing
e) Short circuit protection
f) Anti-oscillation circuit

Torque, ramp time and current limit shall be adjustable. An LED display shall indicate the following:

a) Power On
b) Start
c) Current Flow
d) Run
e) At Speed
f) Over Temperature
g) Overload
h) Phase Loss
i) Shorted SCR
j) Short Circuit
k) Shunt Trip

Output relays shall be provided to indicate the following:

a) Run
b) Shunt Trip
c) Programmable Status Relay - Will energize on any one of the following conditions (jumper selectable): At Speed, Phase Loss, Over Temperature, Overload, Shorted SCR and Over Current

8.5 Remote mounted control panel boxes will be accepted.

****

125 PSIG FULL LOAD OPERATION

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 1003 CFM (measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 125 PSIG. This compressor shall be capable of full load operation at 125 PSIG and have a maximum pressure capability of 140 PSIG.

3.1 The main drive motor shall be 250 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

****

575 VOLT

3.1 The main drive motor shall be 250 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

****

Power$ync®

2.9 The airend shall have a method of controlling displacement at operating speed that does not introduce areas of unswept volume or clearance pockets into the rotor bores. Lift valves that extend into the rotor bore prior to final machining and are machined to the exact tolerance of the rotor bore as the rotor bore is being machined are the preferred method of capacity control. Lift valves must be double acting to use air pressure to both open and close.

7.1 The compressor controls shall be microprocessor-based. There shall be three user-selectable control methods.

A) Constant Run Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand.

B) Auto Dual Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand. After a user-defined period of unloaded operation, the compressor will automatically shutdown and assume a standby mode. Should system demand return, the compressor will automatically restart.

C) Network Mode -- In place of the pressure deadband, the Network Mode shall use a target pressure and a variable response rate. The control shall maintain the system pressure to within two or three pounds of the target pressure. In the upper 50% of the capacity range, the control shall match system demand without

restricting the inlet air flow. In the lower 50% of the capacity range, the control shall select either a load/no load or modulating control method, based on user-defined parameters.

7.2 A complete, redundant electro-mechanical control system shall be included that will safely operate the compressor in the event of a microprocessor failure. This system shall be user selectable from a switch mounted in the main electrical control enclosure.

7.3 LED displays shall be provided that will constantly indicate discharge temperature and system pressure.

7.4 A four-line by forty-character LCD display shall be provided that will allow access to the following information:

Power-Up Warning Displays:

A) Sump Pressure Sensor Failure
B) Line Pressure Sensor Failure
C) Discharge Temperature Sensor Failure
D) Sump Temperature Sensor Failure
E) Tripped Motor Overload
F) Relay Board Communication Failure
G) Diagnostic Failure
H) Setup Memory Failure
I) Control Relay Not Disengaged
J) Main Motor Contactor Not Disengaged
K) Wye Contactor Not Disengaged (on Wye-Delta starters)
L) Deadband Data Error
M) Setup Memory Error
N) Setup Data Not Initialized
O) Air Filter Vacuum Switch Faulty
P) Fluid Filter Delta-P Switch Faulty
Q) An Element Needs Servicing
R) Minor Diagnostic Failure
S) Machine ID Error

Operational Displays:

A) Sump Pressure Too High For Restart
B) Compressor Is Starting
C) **Warning** Possible Reverse Rotation
D) Compressor Is Running In Auto-Dual Mode
E) Compressor Is Unloaded
F) Time Left To Shutdown
G) Compressor Has Timed Out And Shut Down **Warning** Will Automatically Restart
H) Running In Continuous Run Mode
I) Running In Network Mode Position __ Of __

J) Programmed Shutdown
K) **Warning** An Element Needs Servicing
L) Emergency Stop Button Has Been Pressed
M) ** Warning** Setup Memory Failure
N) ** Warning** Sequence Data Error
O) ** Warning** Schedule Data Error
P) ** Warning** Compressor ID Already In Use
Q) ** Warning** High Discharge Temperature
R) ** Warning** High Sump Temperature
S) ** Warning** High Sump Pressure
T) ** Warning** Motor Overload
U) ** Warning** Contactor Is Not Engaging
V) ** Warning** Contactor is Not Disengaging
W) Discharge RTD Faulty Or Disconnected
X) Sump RTD Faulty Or Disconnected
Y) Line Pressure Sensor Faulty
Z) Sump Pressure Sensor Faulty
AA) ** Warning** Communication Failure
BB) ** Warning** Firmware Failure
CC) Compressor Not In Scheduled Sequence

Adjustable Operating Parameters:

A) Compressor Unloaded Pressure
B) Compressor Loaded Pressure
C) Timed Stop Delay In Minutes
D) Cycle Count
E) Short Cycle Time In Seconds
F) Target Pressure
G) Network Unloaded Pressure
H) Network Loaded Pressure
I) Modulation Turn Off Delay In Minutes
J) Machine ID
K) Sequence Number To Change
L) Day To Change
M) Clear Sequence
N) Clear Sequence And Schedule
O) Set Delayed Unload Mode
P) Set Immediate Unload Mode

Maintenance Displays:

A) Loaded Hours
B) Unloaded Hours
C) Hours Since Last Fluid Change
D) Control Line Filter Hours
E) Intake Filter Hours

F) Fluid Filter Hours
G) Separator Element Hours
H) View Current Time And Date
I) Set Time And Date
J) Compressor Control Test
K) Serial Number
L) Software Version Number
M) Compressor Model
N) Drive Motor Horsepower
O) Voltage
P) Starter Type
Q) Cooling Type
R) Airend Type
S) High Air Temperature Shutdown Setting
T) High Sump Pressure Shutdown Setting
U) Maximum Unloaded Pressure Setting
V) Minimum Loaded Pressure Setting
W) Current Loaded Pressure Setting
X) Current Unloaded Pressure Setting
Y) Current Target Pressure Setting
Z) Machine ID
AA) Auto Dual Shutdown Timer Setting
BB) Wye Delta Transition Time Setting
CC) Modulation Cycle Count Setting
DD) Modulation Time Setting
EE) Sump Temperature
FF) Pressure Transducer Calibration Date
GG) Temperature Sensor Calibration Date
HH) Unit Configuration Date
II) Current Time And Date
JJ) Modem Baud Rate
KK) Shutdown Log
LL) Network Diagnostics

7.5 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown
B) Motor overload
C) High Sump Pressure Shutdown
D) Change inlet filter
E) Change lubricant filter
F) Change Separator Element

7.6 The control shall have the built-in capability to network up to 16 similar compressors of various sizes. In this network configuration, the sequence in which the compressors

operate as base load and trim shall be user selectable. The control shall be able to store no fewer than nine different sequences. An internal clock and calendar shall be included that will allow different sequences to be scheduled no fewer than nine times per day. The controller shall have the ability to schedule each day of the week differently.

7.7 The controller shall include a shutdown log that will allow the operator to view service and shutdown alarms in the reverse order of occurrence. The log shall give plain English messages that will identify the source of the alarm.

SAMPLE BID REQUEST SPECIFICATION FOR A QSI-1250

1. Scope of supply.

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 1264 CFM (total package rated performance measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 110 PSIG. This compressor shall be capable of full load operation at 110 PSIG and have a maximum pressure capability of 125 PSIG.

2. Airend.

2.1 The airend shall have a 4-6 lobe combination with both male and female rotors being identical in diameter.

2.2 The discharge end of the rotors shall be supported by triplex bearings on the male rotor and duplex tapered roller bearings on the female rotor. The suction end of the rotors shall be supported by a single row of cylindrical roller bearings.

2.3 The airend shall have an axial flow inlet housing to allow incoming air to enter the compression area over the entire face of the rotors. Radial inlet arrangements will not be accepted.

2.4 The discharge bearings must be housed in the main rotor housing to maintain permanent rotor alignment within the rotor housing. Separate, bolt-on castings for discharge bearings will not be accepted.

2.5 The area around the bearings shall be free of any obstruction to the free flow of fluid. Pockets or reservoirs where fluid might collect in the bearing area shall have a magnetic drain plug to trap metallic contamination. This drain plug shall be of sufficient size and conveniently located to allow the regular cleaning of pockets or reservoirs in the bearing area.

2.6 Male rotor RPM shall be identical to the actual speed of the main drive motor. The tip speed of the driven rotor shall not exceed 31 meters per second.

2.7 The motor and airend shall be directly coupled through a flexible drop-out type coupling. No belts or gears shall be included in the drive arrangement.

2.8 The drive rotor shall have a redundant shaft sealing arrangement. Should the primary shaft seal fail, a secondary seal shall be capable of preventing fluid from leaking out of the airend. A method of detecting a primary shaft seal failure while the machine is in operation shall be provided.

3. Drive motor.

3.1 The main drive motor shall be 250 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

3.2 The main drive motor shall have an ODP enclosure.

4. Cooling system.

4.1 The compressor shall be air-cooled.

4.2 The cooling system shall be capable of maintaining proper compressor temperatures in ambient conditions up to 110°F.

4.3 Coolers shall be horizontal draft.

4.4 Fluid circulation shall be by positive displacement pump.

5. Aftercooler.

5.1 An air-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to have an approach temperature of not more than 5°F at standard conditions.

5.2 A 99.9% efficient moisture separator and trap shall be included.

6. Compressor Fluid.

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use.

6.2 The fluid shall contain no chemical substances that would require it to be treated as hazardous according to the appropriate laws in effect at the time of sale. Used fluid shall be suitable for recycling along with other waste petroleum oil.

6.3 Fluid carryover into the downstream air system shall not exceed 5 PPM by weight with new elements.

6.4 A fluid filter shall be provided with a 10 micron absolute rating. The filter media must be microfiberglass. Paper media will not be accepted.

7. Compressor controls.

7.1 The compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a user adjustable percent of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically reload/restart if the system pressure falls below the set point. A selector switch on the control panel shall be provided to allow the user to bypass the automatic shutdown feature and elect a continuous run mode should the system demand dictate.

7.2 Gauges or indicators shall also be provided to indicate:

A) Compressor discharge temperature
B) Discharge air pressure
C) Percent capacity
D) Operating mode
E) Power on
F) Running hours

7.3 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown (Probes must be provided at the compressor discharge and the air/fluid separator reservoir to monitor high temperature conditions)
B) Motor overload (This should alert a motor overload for all motors on the compressor package)
C) Change inlet filter
D) Change fluid filter
E) Change Separator Element

This shutdown and maintenance annunciator panel shall be constructed in such a way that connections for remote annunciation can easily be made.

8. Electrical controls.

8.1 All electrical controls shall be designed and constructed in accordance with National Electrical Code (NEC) guidelines.

8.2 The main starter control box shall be NEMA 1 design and contain the starter for the fan motor along with other electrical controls.

8.3 All components within the main starter control box shall be UL and/or CSA approved or listed.

8.4 The main starter control box shall be UL and/or CSA approved or listed.

8.5 Remote mounted control panel boxes will not be accepted.

9. Safety system.

9.1 Pressure vessels shall be ASME coded.

9.2 A pressure relief safety valve shall be provided. This valve shall be sized to handle the full capacity of the compressor. It shall have a single, directed outlet. Multidirectional valves will not be accepted.

9.3 A high air/fluid temperature shutdown system shall be provided. This system shall operate with a minimum of two temperature sensors. One sensor must be located directly in the discharge air stream of the airend. One sensor must be located on the dry side of the air/fluid separator element. This system must be designed to prevent the compressor from running with a failed sensor.

10. Sound levels.

10.1 Sound level shall average 95 dB(A) when measured in free field conditions, 1 meter away from the compressor.

OPTIONS

Replace section in main bid spec with appropriate section below for desired option.

****** AUTO DEMAND CONTROL**

7.1 In the "LOCAL" control mode, the compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a predetermined percentage of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically restart if the system pressure falls below the set point. In the "REMOTE" control mode, control of the compressor shall be transferred to a remote controller that shall operate the compressor in conjunction with one or more other compressors. The actual operation of the compressor will be identical to the "LOCAL" mode except the remote controller will determine pressure set points.

****** 575 VOLT**

3.1 The main drive motor shall be 250 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **NEMA 4**

8.2 The main control box shall be NEMA 4 design and contain the starters for the fan motor along with other electrical controls.

******** **NEMA 12 (use NEMA 4)**

8.2 The main control box shall be NEMA 4 design and contain the starter for the fan motor along with other electrical controls.

******** **FOOD GRADE FLUID**

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use. It shall meet FDA CFR 178.3570 spec for food grade lubricants.

******** **FULL CANOPY**

1.2 The compressor shall have a full metal enclosure with quick release panels for easy access to service and maintenance items.

(WITHOUT SHROUDS)

10.1 Sound level shall average 91 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WITH LOW SOUND SHROUDS)

10.1 Sound level shall average 85 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WATER-COOLED)

10.1 Sound level shall average 84 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **WATER-COOLED**

4.1 The compressor shall be water-cooled.

4.3 Coolers shall be shell and tube type water-cooled coolers. The coolers shall be sized to maintain normal operating temperatures with inlet water temperatures as high as 100°F. Water pressure drop through the cooling system shall be no more than 13 PSIG.

5.1 A water-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to cool the discharge air temperature to within 15°F of the inlet water temperature.

10.1 Sound level shall average 92 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **SOLID STATE REDUCED VOLTAGE STARTERS**

8.2 The main starter control box shall be NEMA 1 and shall contain provisions to connect a remotely mounted solid state reduced voltage starter for the main drive motor. Motor protection shall include:

a) Shorted SCR detection
b) Phase loss
c) Overload
d) Current flow sensing
e) Short circuit protection
f) Anti-oscillation circuit

Torque, ramp time and current limit shall be adjustable. An LED display shall indicate the following:

a) Power On
b) Start
c) Current Flow
d) Run
e) At Speed
f) Over Temperature
g) Overload
h) Phase Loss
i) Shorted SCR
j) Short Circuit
k) Shunt Trip

Output relays shall be provided to indicate the following:

a) Run
b) Shunt Trip
c) Programmable Status Relay - Will energize on any one of the following conditions (jumper selectable): At Speed, Phase Loss, Over Temperature, Overload, Shorted SCR and Over Current

8.5 Remote mounted control panel boxes will be accepted.

****

125 PSIG FULL LOAD OPERATION

1.1 This specification is for an oil-flooded rotary screw compressor with a minimum capacity of 1255 CFM (measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 125 PSIG. This compressor shall be capable of full load operation at 125 PSIG and have a maximum pressure capability of 140 PSIG.

3.1 The main drive motor shall be 300 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

****

575 VOLT

3.1 The main drive motor shall be 300 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

****

Power$ync®

2.9 The airend shall have a method of controlling displacement at operating speed that does not introduce areas of unswept volume or clearance pockets into the rotor bores. Lift valves that extend into the rotor bore prior to final machining and are machined to the exact tolerance of the rotor bore as the rotor bore is being machined are the preferred method of capacity control. Lift valves must be double acting to use air pressure to both open and close.

7.1 The compressor controls shall be microprocessor-based. There shall be three user-selectable control methods.

A) Constant Run Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand.

B) Auto Dual Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand. After a user-defined period of unloaded operation, the compressor will automatically shutdown and assume a standby mode. Should system demand return, the compressor will automatically restart.

C) Network Mode -- In place of the pressure deadband, the Network Mode shall use a target pressure and a variable response rate. The control shall maintain the system pressure to within two or three pounds of the target pressure. In the upper 50% of the capacity range, the control shall match system demand without

restricting the inlet air flow. In the lower 50% of the capacity range, the control shall select either a load/no load or modulating control method, based on user-defined parameters.

7.2 A complete, redundant electro-mechanical control system shall be included that will safely operate the compressor in the event of a microprocessor failure. This system shall be user selectable from a switch mounted in the main electrical control enclosure.

7.3 LED displays shall be provided that will constantly indicate discharge temperature and system pressure.

7.4 A four-line by forty-character LCD display shall be provided that will allow access to the following information:

Power-Up Warning Displays:

A) Sump Pressure Sensor Failure
B) Line Pressure Sensor Failure
C) Discharge Temperature Sensor Failure
D) Sump Temperature Sensor Failure
E) Tripped Motor Overload
F) Relay Board Communication Failure
G) Diagnostic Failure
H) Setup Memory Failure
I) Control Relay Not Disengaged
J) Main Motor Contactor Not Disengaged
K) Wye Contactor Not Disengaged (on Wye-Delta starters)
L) Deadband Data Error
M) Setup Memory Error
N) Setup Data Not Initialized
O) Air Filter Vacuum Switch Faulty
P) Fluid Filter Delta-P Switch Faulty
Q) An Element Needs Servicing
R) Minor Diagnostic Failure
S) Machine ID Error

Operational Displays:

A) Sump Pressure Too High For Restart
B) Compressor Is Starting
C) **Warning** Possible Reverse Rotation
D) Compressor Is Running In Auto-Dual Mode
E) Compressor Is Unloaded
F) Time Left To Shutdown
G) Compressor Has Timed Out And Shut Down **Warning** Will Automatically Restart
H) Running In Continuous Run Mode
I) Running In Network Mode Position __ Of __

J) Programmed Shutdown
K) **Warning** An Element Needs Servicing
L) Emergency Stop Button Has Been Pressed
M) ** Warning** Setup Memory Failure
N) ** Warning** Sequence Data Error
O) ** Warning** Schedule Data Error
P) ** Warning** Compressor ID Already In Use
Q) ** Warning** High Discharge Temperature
R) ** Warning** High Sump Temperature
S) ** Warning** High Sump Pressure
T) ** Warning** Motor Overload
U) ** Warning** Contactor Is Not Engaging
V) ** Warning** Contactor is Not Disengaging
W) Discharge RTD Faulty Or Disconnected
X) Sump RTD Faulty Or Disconnected
Y) Line Pressure Sensor Faulty
Z) Sump Pressure Sensor Faulty
AA) ** Warning** Communication Failure
BB) ** Warning** Firmware Failure
CC) Compressor Not In Scheduled Sequence

Adjustable Operating Parameters:

A) Compressor Unloaded Pressure
B) Compressor Loaded Pressure
C) Timed Stop Delay In Minutes
D) Cycle Count
E) Short Cycle Time In Seconds
F) Target Pressure
G) Network Unloaded Pressure
H) Network Loaded Pressure
I) Modulation Turn Off Delay In Minutes
J) Machine ID
K) Sequence Number To Change
L) Day To Change
M) Clear Sequence
N) Clear Sequence And Schedule
O) Set Delayed Unload Mode
P) Set Immediate Unload Mode

Maintenance Displays:

A) Loaded Hours
B) Unloaded Hours
C) Hours Since Last Fluid Change
D) Control Line Filter Hours
E) Intake Filter Hours

F) Fluid Filter Hours
G) Separator Element Hours
H) View Current Time And Date
I) Set Time And Date
J) Compressor Control Test
K) Serial Number
L) Software Version Number
M) Compressor Model
N) Drive Motor Horsepower
O) Voltage
P) Starter Type
Q) Cooling Type
R) Airend Type
S) High Air Temperature Shutdown Setting
T) High Sump Pressure Shutdown Setting
U) Maximum Unloaded Pressure Setting
V) Minimum Loaded Pressure Setting
W) Current Loaded Pressure Setting
X) Current Unloaded Pressure Setting
Y) Current Target Pressure Setting
Z) Machine ID
AA) Auto Dual Shutdown Timer Setting
BB) Wye Delta Transition Time Setting
CC) Modulation Cycle Count Setting
DD) Modulation Time Setting
EE) Sump Temperature
FF) Pressure Transducer Calibration Date
GG) Temperature Sensor Calibration Date
HH) Unit Configuration Date
II) Current Time And Date
JJ) Modem Baud Rate
KK) Shutdown Log
LL) Network Diagnostics

7.5 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown
B) Motor overload
C) High Sump Pressure Shutdown
D) Change inlet filter
E) Change lubricant filter
F) Change Separator Element

7.6 The control shall have the built-in capability to network up to 16 similar compressors of various sizes. In this network configuration, the sequence in which the compressors

operate as base load and trim shall be user selectable. The control shall be able to store no fewer than nine different sequences. An internal clock and calendar shall be included that will allow different sequences to be scheduled no fewer than nine times per day. The controller shall have the ability to schedule each day of the week differently.

7.7 The controller shall include a shutdown log that will allow the operator to view service and shutdown alarms in the reverse order of occurrence. The log shall give plain English messages that will identify the source of the alarm.

SAMPLE BID REQUEST SPECIFICATION FOR A QSI-1500

1. Scope of supply.

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 1515 CFM (total package rated performance measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 110 PSIG. This compressor shall be capable of full load operation at 110 PSIG and have a maximum pressure capability of 125 PSIG.

2. Airend.

2.1 The airend shall have a 4-6 lobe combination with both male and female rotors being identical in diameter.

2.2 The discharge end of the rotors shall be supported by triplex bearings on the male rotor and duplex tapered roller bearings on the female rotor. The suction end of the rotors shall be supported by a single row of cylindrical roller bearings.

2.3 The airend shall have an axial flow inlet housing to allow incoming air to enter the compression area over the entire face of the rotors. Radial inlet arrangements will not be accepted.

2.4 The discharge bearings must be housed in the main rotor housing to maintain permanent rotor alignment within the rotor housing. Separate, bolt-on castings for discharge bearings will not be accepted.

2.5 The area around the bearings shall be free of any obstruction to the free flow of fluid. Pockets or reservoirs where fluid might collect in the bearing area shall have a magnetic drain plug to trap metallic contamination. This drain plug shall be of sufficient size and conveniently located to allow the regular cleaning of pockets or reservoirs in the bearing area.

2.6 Male rotor RPM shall be identical to the actual speed of the main drive motor. The tip speed of the driven rotor shall not exceed 31 meters per second.

2.7 The motor and airend shall be directly coupled through a flexible drop-out type coupling. No belts or gears shall be included in the drive arrangement.

2.8 The drive rotor shall have a redundant shaft sealing arrangement. Should the primary shaft seal fail, a secondary seal shall be capable of preventing fluid from leaking out of the airend. A method of detecting a primary shaft seal failure while the machine is in operation shall be provided.

3. Drive motor.

3.1 The main drive motor shall be 300 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

3.2 The main drive motor shall have an ODP enclosure.

4. Cooling system.

4.1 The compressor shall be air-cooled.

4.2 The cooling system shall be capable of maintaining proper compressor temperatures in ambient conditions up to 110°F.

4.3 Coolers shall be horizontal draft.

4.4 Fluid circulation shall be by positive displacement pump.

5. Aftercooler.

5.1 An air-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to have an approach temperature of not more than 5°F at standard conditions.

5.2 A 99.9% efficient moisture separator and trap shall be included.

6. Compressor Fluid.

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use.

6.2 The fluid shall contain no chemical substances that would require it to be treated as hazardous according to the appropriate laws in effect at the time of sale. Used fluid shall be suitable for recycling along with other waste petroleum oil.

6.3 Fluid carryover into the downstream air system shall not exceed 5 PPM by weight with new elements.

6.4 A fluid filter shall be provided with a 10 micron absolute rating. The filter media must be microfiberglass. Paper media will not be accepted.

7. Compressor controls.

7.1 The compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a user adjustable percent of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically reload/restart if the system pressure falls below the set point. A selector switch on the control panel shall be provided to allow the user to bypass the automatic shutdown feature and elect a continuous run mode should the system demand dictate.

7.2 Gauges or indicators shall also be provided to indicate:

A) Compressor discharge temperature
B) Discharge air pressure
C) Percent capacity
D) Operating mode
E) Power on
F) Running hours

7.3 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown (Probes must be provided at the compressor discharge and the air/fluid separator reservoir to monitor high temperature conditions)
B) Motor overload (This should alert a motor overload for all motors on the compressor package)
C) Change inlet filter
D) Change fluid filter
E) Change Separator Element

This shutdown and maintenance annunciator panel shall be constructed in such a way that connections for remote annunciation can easily be made.

8. Electrical controls.

8.1 All electrical controls shall be designed and constructed in accordance with National Electrical Code (NEC) guidelines.

8.2 The main starter control box shall be NEMA 1 design and contain the starter for the fan motor along with other electrical controls.

8.3 All components within the main starter control box shall be UL and/or CSA approved or listed.

8.4 The main starter control box shall be UL and/or CSA approved or listed.

8.5 Remote mounted control panel boxes will not be accepted.

9. Safety system.

9.1 Pressure vessels shall be ASME coded.

9.2 A pressure relief safety valve shall be provided. This valve shall be sized to handle the full capacity of the compressor. It shall have a single, directed outlet. Multidirectional valves will not be accepted.

9.3 A high air/fluid temperature shutdown system shall be provided. This system shall operate with a minimum of two temperature sensors. One sensor must be located directly in the discharge air stream of the airend. One sensor must be located on the dry side of the air/fluid separator element. This system must be designed to prevent the compressor from running with a failed sensor.

10. Sound levels.

10.1 Sound level shall average 96 dB(A) when measured in free field conditions, 1 meter away from the compressor.

OPTIONS

Replace section in main bid spec with appropriate section below for desired option.

****** AUTO DEMAND CONTROL**

7.1 In the "LOCAL" control mode, the compressor controls shall allow for full range modulation to match compressor capacity to system demand. If system demand should fall below a predetermined percentage of compressor capacity, the compressor shall go into an unloaded condition. An adjustable timer shall be provided to shutdown the compressor if it runs in the unloaded mode for a predetermined length of time. The compressor shall automatically restart if the system pressure falls below the set point. In the "REMOTE" control mode, control of the compressor shall be transferred to a remote controller that shall operate the compressor in conjunction with one or more other compressors. The actual operation of the compressor will be identical to the "LOCAL" mode except the remote controller will determine pressure set points.

****** 575 VOLT**

3.1 The main drive motor shall be 300 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

******** **NEMA 4**

8.2 The main control box shall be NEMA 4 design and contain the starters for the fan motor along with other electrical controls.

******** **NEMA 12 (use NEMA 4)**

8.2 The main control box shall be NEMA 4 design and contain the starter for the fan motor along with other electrical controls.

******** **FOOD GRADE FLUID**

6.1 The fluid used in this compressor shall be a PAO synthetic specifically designed for compressor use. It shall meet FDA CFR 178.3570 spec for food grade lubricants.

******** **FULL CANOPY**

1.2 The compressor shall have a full metal enclosure with quick release panels for easy access to service and maintenance items.

(WITHOUT SHROUDS)

10.1 Sound level shall average 93 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WITH LOW SOUND SHROUDS)

10.1 Sound level shall average 85 dB(A) when measured in free field conditions, 1 meter away from the compressor.

(WATER-COOLED)

10.1 Sound level shall average 84 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **WATER-COOLED**

4.1 The compressor shall be water-cooled.

4.3 Coolers shall be shell and tube type water-cooled coolers. The coolers shall be sized to maintain normal operating temperatures with inlet water temperatures as high as 100°F. Water pressure drop through the cooling system shall be no more than 16 PSIG.

5.1 A water-cooled aftercooler shall be included as an integral part of the compressor package. The aftercooler shall be sized to cool the discharge air temperature to within 15°F of the inlet water temperature.

10.1 Sound level shall average 84 dB(A) when measured in free field conditions, 1 meter away from the compressor.

******** **SOLID STATE REDUCED VOLTAGE STARTERS**

8.2 The main starter control box shall be NEMA 1 and shall contain provisions to connect a remotely mounted solid state reduced voltage starter for the main drive motor. Motor protection shall include:

a) Shorted SCR detection
b) Phase loss
c) Overload
d) Current flow sensing
e) Short circuit protection
f) Anti-oscillation circuit

Torque, ramp time and current limit shall be adjustable. An LED display shall indicate the following:

a) Power On
b) Start
c) Current Flow
d) Run
e) At Speed
f) Over Temperature
g) Overload
h) Phase Loss
i) Shorted SCR
j) Short Circuit
k) Shunt Trip

Output relays shall be provided to indicate the following:

a) Run
b) Shunt Trip
c) Programmable Status Relay - Will energize on any one of the following conditions (jumper selectable): At Speed, Phase Loss, Over Temperature, Overload, Shorted SCR and Over Current

8.5 Remote mounted control panel boxes will be accepted.

**** 125 PSIG FULL LOAD OPERATION

1.1 This specification is for a fluid-flooded rotary screw compressor with a minimum capacity of 1504 CFM (measured in accordance with CAGI-PNEUROP Test Code PN2CPTC2) at a full load pressure rating of 125 PSIG. This compressor shall be capable of full load operation at 125 PSIG and have a maximum pressure capability of 140 PSIG.

3.1 The main drive motor shall be 350 nameplate horsepower rated for 460 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

**** 575 VOLT

3.1 The main drive motor shall be 350 nameplate horsepower rated for 575 volt, 60 cycle, 3 phase operation with no more than a 1.15 service factor.

**** Power$ync®

2.9 The airend shall have a method of controlling displacement at operating speed that does not introduce areas of unswept volume or clearance pockets into the rotor bores. Lift valves that extend into the rotor bore prior to final machining and are machined to the exact tolerance of the rotor bore as the rotor bore is being machined are the preferred method of capacity control. Lift valves must be double acting to use air pressure to both open and close.

7.1 The compressor controls shall be microprocessor-based. There shall be three user-selectable control methods.

A) Constant Run Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand.

B) Auto Dual Mode -- This method shall allow the operator to set an operating pressure range within which the compressor will adjust its capacity to satisfy the system demand or unload during periods of no demand. After a user-defined period of unloaded operation, the compressor will automatically shutdown and assume a standby mode. Should system demand return, the compressor will automatically restart.

C) Network Mode -- In place of the pressure deadband, the Network Mode shall use a target pressure and a variable response rate. The control shall maintain the system pressure to within two or three pounds of the target pressure. In the upper

50% of the capacity range, the control shall match system demand without restricting the inlet air flow. In the lower 50% of the capacity range, the control shall select either a load/no load or modulating control method, based on user-defined parameters.

7.2 A complete, redundant electro-mechanical control system shall be included that will safely operate the compressor in the event of a microprocessor failure. This system shall be user selectable from a switch mounted in the main electrical control enclosure.

7.3 LED displays shall be provided that will constantly indicate discharge temperature and system pressure.

7.4 A four-line by forty-character LCD display shall be provided that will allow access to the following information:

Power-Up Warning Displays:

A) Sump Pressure Sensor Failure
B) Line Pressure Sensor Failure
C) Discharge Temperature Sensor Failure
D) Sump Temperature Sensor Failure
E) Tripped Motor Overload
F) Relay Board Communication Failure
G) Diagnostic Failure
H) Setup Memory Failure
I) Control Relay Not Disengaged
J) Main Motor Contactor Not Disengaged
K) Wye Contactor Not Disengaged (on Wye-Delta starters)
L) Deadband Data Error
M) Setup Memory Error
N) Setup Data Not Initialized
O) Air Filter Vacuum Switch Faulty
P) Fluid Filter Delta-P Switch Faulty
Q) An Element Needs Servicing
R) Minor Diagnostic Failure
S) Machine ID Error

Operational Displays:

A) Sump Pressure Too High For Restart
B) Compressor Is Starting
C) **Warning** Possible Reverse Rotation
D) Compressor Is Running In Auto-Dual Mode
E) Compressor Is Unloaded
F) Time Left To Shutdown
G) Compressor Has Timed Out And Shut Down **Warning** Will Automatically Restart
H) Running In Continuous Run Mode

I) Running In Network Mode Position __ Of __
J) Programmed Shutdown
K) **Warning** An Element Needs Servicing
L) Emergency Stop Button Has Been Pressed
M) ** Warning** Setup Memory Failure
N) ** Warning** Sequence Data Error
O) ** Warning** Schedule Data Error
P) ** Warning** Compressor ID Already In Use
Q) ** Warning** High Discharge Temperature
R) ** Warning** High Sump Temperature
S) ** Warning** High Sump Pressure
T) ** Warning** Motor Overload
U) ** Warning** Contactor Is Not Engaging
V) ** Warning** Contactor is Not Disengaging
W) Discharge RTD Faulty Or Disconnected
X) Sump RTD Faulty Or Disconnected
Y) Line Pressure Sensor Faulty
Z) Sump Pressure Sensor Faulty
AA) ** Warning** Communication Failure
BB) ** Warning** Firmware Failure
CC) Compressor Not In Scheduled Sequence

Adjustable Operating Parameters:

A) Compressor Unloaded Pressure
B) Compressor Loaded Pressure
C) Timed Stop Delay In Minutes
D) Cycle Count
E) Short Cycle Time In Seconds
F) Target Pressure
G) Network Unloaded Pressure
H) Network Loaded Pressure
I) Modulation Turn Off Delay In Minutes
J) Machine ID
K) Sequence Number To Change
L) Day To Change
M) Clear Sequence
N) Clear Sequence And Schedule
O) Set Delayed Unload Mode
P) Set Immediate Unload Mode

Maintenance Displays:

A) Loaded Hours
B) Unloaded Hours
C) Hours Since Last Fluid Change
D) Control Line Filter Hours

E) Intake Filter Hours
F) Fluid Filter Hours
G) Separator Element Hours
H) View Current Time And Date
I) Set Time And Date
J) Compressor Control Test
K) Serial Number
L) Software Version Number
M) Compressor Model
N) Drive Motor Horsepower
O) Voltage
P) Starter Type
Q) Cooling Type
R) Airend Type
S) High Air Temperature Shutdown Setting
T) High Sump Pressure Shutdown Setting
U) Maximum Unloaded Pressure Setting
V) Minimum Loaded Pressure Setting
W) Current Loaded Pressure Setting
X) Current Unloaded Pressure Setting
Y) Current Target Pressure Setting
Z) Machine ID
AA) Auto Dual Shutdown Timer Setting
BB) Wye Delta Transition Time Setting
CC) Modulation Cycle Count Setting
DD) Modulation Time Setting
EE) Sump Temperature
FF) Pressure Transducer Calibration Date
GG) Temperature Sensor Calibration Date
HH) Unit Configuration Date
II) Current Time And Date
JJ) Modem Baud Rate
KK) Shutdown Log
LL) Network Diagnostics

7.5 The control panel shall include a flow diagram with properly located lights to indicate the following maintenance and shutdown conditions:

A) High temperature shutdown
B) Motor overload
C) High Sump Pressure Shutdown
D) Change inlet filter
E) Change lubricant filter
F) Change Separator Element

7.6 The control shall have the built-in capability to network up to 16 similar compressors of various sizes. In this network configuration, the sequence in which the compressors operate as base load and trim shall be user selectable. The control shall be able to store no fewer than nine different sequences. An internal clock and calendar shall be included that will allow different sequences to be scheduled no fewer than nine times per day. The controller shall have the ability to schedule each day of the week differently.

7.7 The controller shall include a shutdown log that will allow the operator to view service and shutdown alarms in the reverse order of occurrence. The log shall give plain English messages that will identify the source of the alarm.