ORIAD® 7000 Series Internally Headed Desiccant Dryers

1.0 Scope

1.1 Work by Seller

1.1.1 Furnished under this specification: coalescing pre-filter, automatic drain valve, dual tower internally heated regenerative dryer, and particulate after filter, all pre-piped and pre-wired on a single skid.

1.2 Work by Buyer

1.2.1 Equipment installation.

1.2.2 Piping from air compressor to dryer-filtration system and from dryer-filtration system to plant air distribution system.

1.2.3 Piping from the dryer purge exhaust connections to a suitable location for venting exhaust gases.

1.2.4 One 120 volt single phase power connection and one 460 volt three phase power connection.

1.2.5 Drain connections to sump.

1.3 Codes and Standards (latest edition)

1.3.1 Seller's manufacturing facility shall be certified and registered to ISO9001 (ANSI/ASQCQ Q90 Series).

1.3.2 ASME Boiler and Pressure Vessel Code - Latest Edition, Section VIII (Unfired Pressure Vessels), Division I.

1.3.3 ASME Boiler and Pressure Vessel Code - Latest Edition, Section IX (Welding Qualifications).

1.3.4 National Electrical Manufacturer's Association (NEMA).

1.3.5 National Electric Code (NFPA 70).

1.3.6 ANSI/ISA S7.3 - 1975 Quality Standard for Instrument Air.

1.3.7 Occupational Safety and Health Act (OSHA).

1.3.8 Compressed Gas Association (CGA).

1.3.9 Vessel Registration for Canada (CRN).

1.4 Submittals

1.4.1 Seller shall provide

1.4.1.1 Equipment General Arrangement drawing showing dimensions and connection locations, suitable for site preparation and installation.

1.4.1.2 Piping and Instrumentation Diagram (P&ID).

1.4.1.3 Electrical Schematic.

1.4.1.4 Manuals for installation, operation and maintenance including specific instructions for filter element replacement.

1.4.1.5 Form U-1 “Manufacturer’s Data Report” for all code pressure vessels.

2.0 Products

2.1 General Design

2.1.1 The dryer shall be a dual tower, fully automatic, regenerative type.

2.1.2 It shall be furnished with all necessary appurtenances, equipment and accessories for continuous, fully automatic operation with simultaneous reactivation of the idle desiccant bed.

2.1.3 All equipment furnished (such as microprocessor controls, switching valves, valve operators, interconnecting piping, instruments, controls, etc.) shall be unitized into one integral assembly ready for operation after being set in place, the desiccant loaded and being connected to piping and utilities.

2.1.4 The dryer shall be designed to operate on a minimum NEMA 8-Hour time cycle. This 8-Hour cycle is the time allowed for a desiccant bed to be in drying service, reactivated and returned to drying service.

2.1.5 The desiccants used shall be the manufacturer's standard, suitable for the operating conditions and the dew point specified. The desiccant shall be shipped in separate sealed drums for installation at the job site.

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2.1.6 The velocity of the gas through the desiccant chamber shall be less than that which would damage, disrupt or upset the desiccant bed.

2.1.7 Each desiccant chamber shall be fitted with separate desiccant removal and fill ports so that the heater assembly or inlet and outlet piping manifolds need not be removed to either fill or empty the chambers of desiccant.

2.1.8 Vessels shall be designed under the provisions stated in the ASME Code for Unfired Pressure Vessels (Section VIII, Division I) for 150 PSIG with a $1/16^{th}$ inch corrosion allowance. The chambers shall be of carbon steel construction and shall have a stainless steel desiccant-retaining screen at the process inlet which is removable for easy cleaning if necessary.

2.1.9 Vessel supports shall be securely attached to both vessels and to the base. Interconnecting piping shall not be considered for vessel support.

2.2 Reactivation System

2.2.1 Regeneration of the desiccant shall be accomplished by means of internal electric heaters.

2.2.2 The electric heater elements shall be a flexible incoloy type specifically designed with a low watt density for long life and shall be enclosed in an internal stainless steel tube assembly. The heating elements shall not be in direct contact with the desiccant and shall be removable with the desiccant in place and with the tower under pressure. The tubes or heaterwells shall be evenly distributed throughout the desiccant bed and designed so that the heaters can be inserted from the bottom of the vessel eliminating any requirement for overhead room to remove the heater elements.

2.2.3 A small slip stream (maximum preferred less than 2%) of the dried process gas shall be used as a purge to sweep out moisture released from the desiccant as it is heated.

2.2.4 Regeneration purge flow is to be countercurrent to the direction of the inlet gas flow.

2.3 Controls

2.3.1 The controls provided shall be suitable for the location where the dryer is to be installed.

2.3.2 The necessary control panels shall be furnished and mounted on the unit. The panels will be provided with the microprocessor controls necessary to automatically control desiccant chamber reactivation and switch over.

2.3.3 The dryer shall be equipped with a repressurization circuit to allow the gradual rise of regeneration chamber pressure to full line pressure prior to switch over.

2.3.4 Only dry gas may be used for pilot or control gas when necessary for the operation of the dryer.

2.3.5 The dryer shall be supplied with a switching failure detection system complete with alarm light and relay which will energize if the dryer fails to shift. The detection system is to be interlocked with the heater controls to de-energize the heaters. The heaters are to remain de-energized until the alarm condition is corrected.

2.3.6 Heater controls shall be provided to maintain the proper reactivation temperature as well as provide indication of heater failure and over-temperature alarm condition.

2.3.7 The controls provided shall sense the temperature of the reactivating bed. Should the temperature of the bed fail to reach a minimum reactivating temperature, an alarm circuit energizes a light and relay to indicate possible failure of the heaters, or contactor or high voltage power.

2.3.8 These controls shall also energize a separate alarm light and relay should an over-temperature condition occur. If tripped the alarm circuit shall de-energize the heater contactor. The heaters shall remain in the unpowered condition until the "Heater Reset" push button on the control panel is depressed.

2.3.9 An automatic Moisture Load Control System shall be provided to reduce the total operating costs during periods of low moisture loading and to extend the life of the desiccant resulting in lower desiccant replacement costs. This system shall accomplish the following:

2.3.9.1.1 Sample the moisture content of the air leaving the dryer by means of a moisture analyzer.

2.3.9.1.2 Initiate tower switching only when the outlet moisture content rises to a set point on the analyzer.

2.3.9.1.3 Control all functions of the dryer so that complete reactivation of the spent tower is accomplished.

2.3.9.1.4 If a malfunction of the moisture sensing system occurs, the dryer shall automatically switch to a fixed cycle operating mode.

2.3.9.2 The moisture analyzer supplied as part of the Moisture Load Control system shall be provided with a digital display of the dew point thus giving a visual indication of the dew point performance.

2.3.9.3 A 4-20 milliamp signal is to be provided for the purchaser's use.

2.3.9.4 The analyzer will be provide with a second output which will energize contacts for alarm condition if the moisture content of the exiting air reaches an unacceptable level. A light is provided for visual indication.

2.3.10 Instrumentation

2.3.10.1 Safety relief valve for each chamber.

2.3.10.2 Pressure indicator for each chamber.

2.3.10.3 Thermocouple for each chamber with digital display on the control panel for indication of drying and reactivating tower temperatures.

2.3.10.4 Graphic panel with lights providing a visual indication of the stage of the dryer cycle. The control panel is provided with a LCD display with an 80-character back-lit readout. RS232 serial port communications is provided.

2.3.10.5 A color changing desiccant moisture indicator mounted in the reactivation piping.

2.3.10.6 Purge flow indication consisting of a calibrated orifice with pressure indicator and throttling valve located in the reactivation piping.

2.3.11 Piping and valves

2.3.11.1 Flow diversion valves shall be commercially available non-proprietary, non-lubricated two-way valves.

2.3.11.2 Outlet and purge valves shall be soft seated check valves. This eliminates back flow through the dryer during compressor shut down or valve reversal.

2.3.12 Electrical

2.3.12.1 Dryer heaters shall be energized by using 460v-3ph-60hz power.

2.3.12.2 The solid state controls shall operate at 120v-1ph-60hz power. This voltage shall be supplied by a control voltage transformer from the high voltage circuit.

2.3.12.3 In order to check the mechanical portion of the dryer operation, an operator must be able to manually advance the controller and "freeze" the sequence at any point . In addition, the controller is to be provided with an automatic test cycle lasting for 8 minutes to check the proper cycle operation. The controller shall allow the operator to display the time remaining for each reactivation function.

2.3.12.4 Electrical construction shall be in accordance with NEMA area classification and shall be wired in accordance with N.E.C. requirements.

2.3.13 Prefilter

2.3.13.1 The dryer shall be equipped with a coalescing pre-filter to remove entrained liquids prior to entering the desiccant bed.

2.3.13.2 The pre-filter shall be a high efficiency cartridge type capable of removing 99.97% of oil and water aerosols @ 0.3 microns and 98% of aerosols @ 0.02 microns.

2.3.13.3 The cartridge shall be capable of withstanding a 100 psig pressure differential in the normal flow direction without sustaining damage.

2.3.13.4 The pre-filter shall be equipped with an automatic drain valve.

2.3.14 Afterfilter

2.3.14.1 The dryer shall be provided with an after filter to remove rust, scale, desiccant dust, and other solid particulates prior to discharging gas downstream.

2.3.14.2 The filter cartridge shall be capable of retaining 98% of particulate matter 1.5 micron and larger.

2.3.14.3 The cartridge shall be capable of withstanding a 50 psig pressure differential in the normal flow direction without sustaining damage.

2.3.14.4 A manual blow down valve shall be provided to periodically allow the operator to blow down the filter and remove collected particulate matter.