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HEATLESS REGENERATIVE DESICCANT DRYERS
GMR SERIES
OWNER / OPERATOR MANUAL

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INTRODUCTION

You can expect many years of trouble-free service from your Great Lakes Air Heatless Regenerative Dryer. Superior dew point depression will be obtained and careful installation and proper preventative maintenance procedures will avoid operating problems.

LOCATION

The Great Lakes Air Heatless Regenerative Dryer should be located on a level floor, free from vibrations. Although your dryer package is a freestanding unit, it may be secured by bolting the dryer base plate to the floor. Allow approximately three feet on all sides to make connections and permit future servicing.

The ambient temperature for Regenerative Dryers ranges from 35°F to 100°F. A dryer will function in warmer surroundings up to 120°F but dew point suppression will suffer.

Operation of Regenerative Dryers in ambient temperatures below 35°F can cause freezing of separated liquids in the pre-filter sump or the dryer itself. If operation in this range is necessary, it is recommended that the Prefilter sump/drain trap, inlet valves, and the bottom 30% of each desiccant tower be heat traced and insulated.

When you have located your unit in its permanent placement, check all pipe and tubing for loose connections . Make power connections and be certain the unit is grounded.

INLET AIR TEMPERATURE

The Great Lakes Air Heatless Regenerative Dryers are designed to operate at rated flow with a maximum inlet temperature of 100°F. Units can be oversized to accommodate higher inlet temperatures up to 120°F. Inlet temperatures above that require custom designed dryer equipment. In most cases temperatures can be kept below maximum operating by correctly sizing or servicing the compressor Aftercooler.

As compressed air inlet temperatures rise above the design 100°F to the dryer, the moisture holding capacity of the air rises dramatically. The following table represents additional load to a dryer at elevated inlet temperatures.

Temperature	100°F	105°F	110°F	115°F	120°F
Additional Load	0%	15%	32%	51%	75%

PREFILTRATION

As all regenerative desiccant dryers are designed to remove only water vapor, any possibility of liquid water carryover to the desiccant dryer must be avoided. Coalescing pre-filtration will eliminate the carryover of droplets, aerosols, and compressor lubricant liquids. This pre-filtration is required under the Great Lakes Air Factory Warranty.

Good pre-filtration will not only enhance the dew point suppression capability of the dryer, but will also add years of life to the desiccant by preventing fouling of the desiccant caused by compressor lubricants.

A coalescing filter equipped with a differential pressure gauge is the best way to determine contaminant loading, or available life of the filter element. The element is designed to be saturated with oil and moisture. The saturated moisture and oil is drained from the element as new contaminants enter the element. Differential pressure is created by contaminants the element can not drain. The elements can stand differential pressures of 100 PSIG. The recommended maximum is 10 PSIG. The pressure at which you should change your elements should be determined by comparing the operational efficiency of your system (Cost of pressure drop vs. cost or the elements). The standard recommended element replacement schedule is twice a year. (4th of July and Christmas)

CONDENSATE DRAINS

A typical compressed air system has multiple points that require condensate removal. The compressor usually has intercooler drain points, the Aftercooler has a drain point, and the receiver tank usually has a drain and the coalescing filter before the dryer has a drain. **It is urgent that each of these drains is not piped to a common header** that will allow condensate to be pumped from a high-pressure location to a low-pressure location. Some facilities have tried to install check valves to prevent backflow in a common header system. This concept looks good on paper but is a system failure just waiting to happen.

The health of your compressed air dehydration system is contingent on a clean and properly designed condensate removal system.

AFTERFILTRATION

All regenerative desiccant dryers gradually produce hard and abrasive desiccant fines. These contaminants should be removed with a high quality Great Lakes Air Particulate After-Filter. The Great Lakes Air Particulate Filter is specifically designed to remove the desiccant dust generated by regenerative air dryers.

Particulate filters located downstream of Regenerative Air Dryers do not have automated drain systems. The material collected should be held in the bottom of the housing; no draining is necessary. Simply clean out the sump area as an element is replaced.

As with the coalescing elements, the particulate elements can stand differential pressures of 100 PSIG. The recommended maximum is 10 PSIG. The pressure at which you should change your elements should be determined by comparing the operational efficiency of your system (Cost of pressure drop vs. cost or the elements). The standard recommended element replacement schedule is twice a year.
(4th of July and Christmas)

BLOCK & BYPASS

All compressed air dryer systems should have a bypass system to facilitate servicing the dryer and filters without interrupting compressed air flow. Valves should be bubble-tight to prevent water vapor migration around the system from the regions of high relative humidity to low relative humidity. The bypass system should be capable of bypassing each filter or the dryer and any combination thereof. Operation in this condition for extended periods of time is not recommended because of possible system contamination (I.E. desiccant dust downstream, moisture downstream, or oil in the desiccant).

OPTIONAL ACTIVATED CARBON ABSORBER

An activated carbon absorber may be installed downstream of the dryer if it is desired to remove the last trace of compressor lubricant vapors as well as trace organic contaminant vapors found in compressed air. With a properly sized activated carbon absorber, the quality of the outlet compressed air will be better than that of a non-lube compressor.

Typically, absorber filters are used in a wide variety of applications. The most common and also the most necessary are that of paint and breathing air applications. Activated carbon filtration is absolutely necessary for optimum compressed air performance when applying paints whether it is powders, liquids, or high solids or to remove breathing air odors.

OPTIONAL BACK PRESSURE REGULATOR

For Regenerative Dryer applications, where sudden downstream demand for dry air frequently occurs in such a manner to cause rapid pressure loss in the compressed air system, it is recommended that a back pressure regulator be installed downstream of the dryer. The backpressure regulator will maintain a constant pressure within the dryer. It will eliminate any chance of fluidizing the desiccant bed by sudden flow surges, which accompany rapid pressure loss. By eliminating fluidization and desiccant bed "bumping", the life of the desiccant charge will increase and after-filter elements will not become prematurely clogged with desiccant fines.

Coalescing filters are also effected by dramatic flow swings or pressure changes. This problem is identified by oil carryover through the element or even the destruction of the element.

PURGE EXHAUST PIPING

To eliminate noise pollution created by frequent tower depressurization or purge exhaust noise, the purge exhaust may be piped outdoors or to a more remote area. This may also eliminate any problem caused by indoor accumulation of condensed moisture from the purge exhaust. Extended purge exhaust piping must not restrict the passage of purge air near atmospheric pressure.

If the equivalent length of extended purge exhaust piping does not exceed 5 feet, use pipe one size larger than dryer purge exhaust connection. If the equivalent length of extended purge exhaust piping does not exceed 10 feet, use pipe two sizes larger than dryer purge exhaust connection. For remote purge piping in excess of 15 feet contact the factory for recommendations.

ELECTRICAL TIE IN

Check unit voltage supply as specified on the equipment data plate. The power feed should meet the national electric code standard for amperage capacity of that unit. The (FLA) Full Load Amps of any dryer can also be found on the data plate directly below the specified voltage. The standard voltage for the GMR series is 120-1-60

OPERATION

The operation of a GMR dryer is fully automated with all sequencing and function controlled by an automatic timing module or a programmable controller.

Wet and dirty compressed air discharged from the compressor enters the Aftercooler where the compressed air temperature is reduced to near ambient. The entrained liquids are released, then removed by a separator. The coalescing Prefilter then removes any liquid moisture carryover present after the separator. The compressed air still saturated at the reduced temperature but not containing any gross liquids enters the GMR Regenerative Dryer.

The saturated compressed air enters either the right or left tower of GMR Dryer depending on the position of the control sequence. For ease of description assume the saturated compressed air is entering the right tower. The compressed air passing through the right desiccant tower gives up all of its water vapor to the Activated Alumina desiccant. This cycle will continue for 5 Minutes on a standard model, or until the vessel is saturated with the optional Demand Cycle Controller. For more information on the operation of the Demand Cycle Controller refer to that section in this manual.

While one tower is drying the process air the other tower is in the regeneration mode. The regeneration is accomplished by utilizing a regulated portion of dry compressed air called the purge stream. The stream is expanded to near atmospheric pressure by passing through an orifice. This expanded volume of dry air is then passed over the saturated desiccant bed to absorb and carry away moisture. The now saturated purge stream exits to atmosphere through the left tower purge exhaust valve and muffler. This process is maintained for 4 minutes and 30 seconds. At the end of this time period the purge valve closes and allows the purge stream to repressurize the regenerated tower preparing it for the next cycle of adsorption. In larger systems and a small solenoid valve opens to assist the purge stream in the repressurization process.

STARTUP

The first step for startup is to properly position the by-pass valves on the dryer package, leaving the inlet valve on the coalescing filter closed so the system is not pressurized, open the outlet valve and close the by-pass valve of the coalescing filter. Next open the inlet and outlet valves and close the by-pass on the dryer. Finally open the inlet and close the outlet valve and by-pass on the particulate filter.

S-L-O-W-L-Y pressurize the dryer by gradually opening the Inlet valve upstream of the Coalescer. This will allow compressed air to enter and pressurize the dryer. When the tower pressure gauges indicate line pressure, open the particulate filter outlet valve S-L-O-W-L-Y to allow compressed air to flow through the entire dryer package and out to the system.

Pressurization of the dryer should never be initiated by suddenly pressurizing the dryer towers from the dryer inlet. The sudden rush of high velocity air in the desiccant bed would cause the desiccant bed to fluidize. Desiccant fluidization will create desiccant breakdown and or excessive desiccant fines.

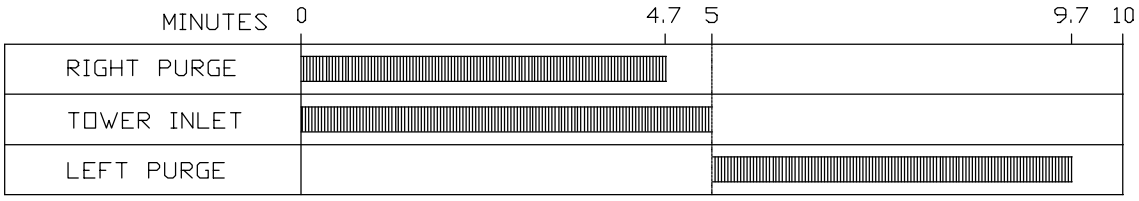
The desiccant loading procedure can cause a large amount of desiccant dust to accumulate prior to equipment startup. Most of this accumulation is blown out the purge exhaust valve during the first couple of cycles of operation. The high volume of desiccant fines can limit the life of the initial purge muffler element. It is possible to extend the life of the initial element by operating the dryer for the first few cycles without the mufflers on the dryer. After a few cycles replace the mufflers and operate the system as usual. This method of extending muffler element life will not harm the system, but it does cause very high sound levels. Be sure that everyone in the area has adequate hearing protection.

Power the unit up and almost immediately one tower will depressurize to atmospheric pressure through the purge exhaust valve and muffler. The unit will continue to cycle from left to right until the unit is de energized.

CYCLE TIMES

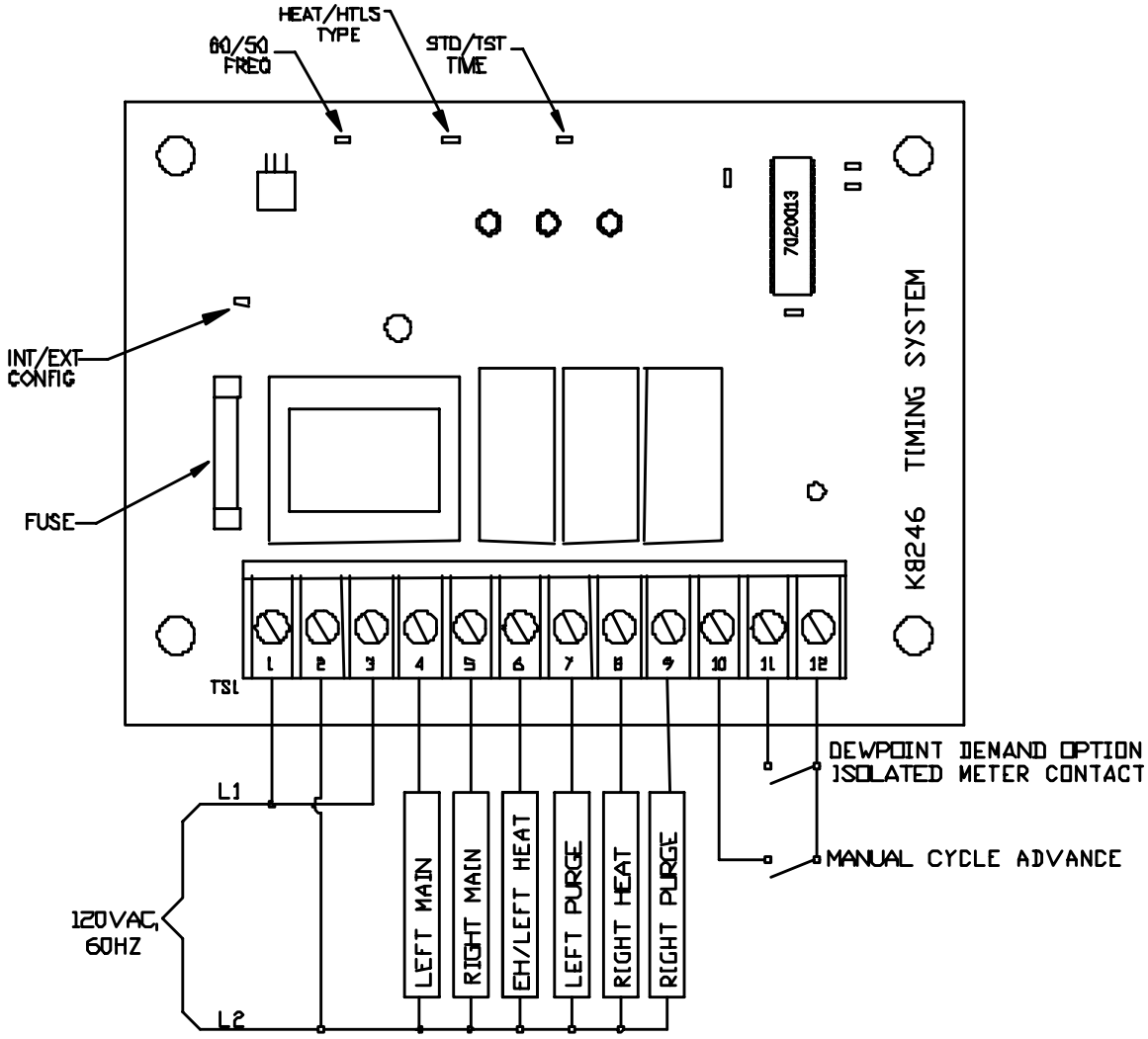
Time cycles are part of the equipment design and have been accurately set in the factory and should not be field adjusted. Timing changes are possible for custom applications but always consult the factory prior to changes. The following are the standard time cycles for your equipment.

Drying Each Tower ..... 5 Minutes
Purging Each Tower ..... 4 Minutes / 30 Seconds



SEQUENCE CONTROLLER

The GMR-5 through 15 has a preset timing module that is connected directly to the control valve. Model GMR 25 & 35 are controlled by an electronic CMOS logic system designed specifically for Great Lakes Air dryers. The controller is preset in its function with two minor adjustments available by moving jumper pins. The first adjustment is the power frequency at the dryer input. For the timing to be accurate this must be set properly. The two options are 50HZ or 60HZ most US applications are 60HZ. The second adjustment is the standard and test timing cycle. The standard cycle is 5 minutes on each tower and 10 minutes for a complete cycle. The test cycle was designed into the unit to facilitate troubleshooting. With the jumper in the "TEST" position the unit runs 2.3 minutes on each tower and 5 minutes complete. DO NOT OPERATE THE DRYER IN THIS MODE FOR REGULAR OPERATION!



PREFILTER MAINTENANCE

The Prefilter element should be replaced whenever the pressure drop over the Prefilter becomes excessive. Differential pressure is the best method to gauge the need for element replacement. The elements can stand differential pressures of 100 PSIG but the recommended maximum is 10 PSIG. The pressure at which you should change your elements should be determined by comparing the operational efficiency of your system (Cost of pressure drop vs. cost or the elements). The standard recommended element replacement schedule is twice a year (4th of July and Christmas). Placing a mechanical separator immediately upstream of the coalescing Prefilter can extend prefilter life. It is important to regularly check the operation of the drain trap device for the Coalescer and any upstream traps.

AFTER-FILTER MAINTENANCE

The after-filter element should be replaced whenever the pressure drop becomes excessive. As with the coalescing elements the particulate elements can stand differential pressures of 100 PSIG. The recommended maximum is 10 PSIG. The pressure at which you should change your elements should be determined by comparing the operational efficiency of your system (Cost of pressure drop vs. cost or the elements). The standard recommended element replacement schedule is twice a year (4th of July and Christmas).

MUFFLER MAINTENANCE

The purge muffler needs replacement on a regular basis because desiccant fines clog the muffler and cause a restriction in the purge flow. It is recommended that the mufflers be changed biannually.

DESICCANT MAINTENANCE AND REPLACEMENT

Desiccant life is estimated at 3 to 5 years, however conditions differ with location. Contamination of desiccant is a leading cause of accelerated failure. Close preventative maintenance of the coalescing pre-filters will extend the life of the desiccant. Desiccant alone is not hazardous and can be disposed of as a general landfill product. Oil contaminated desiccant must be dealt with on the basis of the amount of oil contamination .

Depressurize the dryer and remove the cylinder tie-rods allowing the top plate of the dryer to be removed. Remove the spent desiccant and replace it with fresh desiccant Always leave adequate room above the desiccant bed to permit some bed motion of the spring follow plate and expansion during dryer operation.

Be certain to only install the approved Activated Alumina that your Great Lakes representative can provide; it excels with respect to dew point suppression capability and attrition resistance. Various brands can cause excessive attrition, and poor dewpoint suppression.

TROUBLE SHOOTING GUIDE

Because almost all problems with regenerative dryers will result in bad dewpoints it is assumed that the condition of bad dewpoint applies to the entire table.

PROBLEM	POSSIBLE CAUSE	REMEDY
No / Bad regeneration	No / Low purge stream	Verify purge flow indicator setting. (See "STARTUP")
	High pressure in regeneration tanks	More than 2 PSIG in the regeneration tank will inhibit regeneration. Replace muffler elements.
	Contaminated desiccant	If compressor lubricants have contaminated the desiccant it will not regenerate properly. Remove sample for verification of quality.
Cycle / Sequence failure	Timing card failure	These cards are very reliable replacing it should be the last resort.
	Low control voltage	Control voltages or spikes below 95V will reset the timer in mid cycle. Isolate and or improve voltage.
	Process valve failure	If you believe that a process valve has failed contact the factory for assistance in identifying the failed valve.
	Solenoid valve failure	By referring to the OPERATION section of this manual you should be able to identify the firing sequence of the solenoids. DO NOT rely on voltage tests verify that the valve is passing control air.
Excessive inlet conditions	Liquid carryover	Regenerative dryers are designed to remove vapor not liquid. Adequate filtration must be employed to remove all liquid before entering the dryer.
	Liquid carryover	Check drain system integrity. Systems with multiple drains piped together are a common system problem. (See "CONDENSATE DRAINS")
	To much flow	Dryer capacities are identified by the model # in SCFM @ 100 PSIG & 100°F. Flowing more than rated capacities can damage desiccant and make complete regeneration impossible.
	Low inlet pressure	By operating at pressures less than design, the actual flow through the dryer is increased and in excess of the maximum rating.
	High inlet temperature	Temperatures over 100°F create elevated loads and require systems to be oversized. Temperatures over 120°F render the dryer ineffective. Clean or modify compressor Aftercoolers.