Sahara-Pak

Heat-of-Compression
Regenerative Compressed Air Dryers

Unique, Energy-Saving
Models HC & SP

World Leader in Regenerative Dryer Technology
Reduced Production Costs

The Competitive Edge
Give yourself a competitive edge by reducing production costs with the revolutionary Sahara-Pak. The first to develop a heat-of-compression regenerative dryer, Sahara Air Products has been a leader in compressed air and gas technology since the 1950’s.

Most Energy Efficient
The unique Sahara-Pak uses the normally wasted heat from the compressor to regenerate its desiccant. In addition to efficiently using the heat-of-compression, the Sahara-Pak produces extremely low dew points.

An important energy-saving design feature of the Sahara-Pak is the repositioned aftercooler. In order to use the heat-of-compression, the hot air goes directly into the regenerating tower, then to the aftercooler and drying tower. Net result, instrument quality air for free.

Two Design Awards
Sahara Air Products is the only dryer company to win an independently judged award. In fact, the patented Sahara-Pak design has won two awards for the most practical and widely applicable new developments for improving operations in specific industries.

A Long & Proud Company History

Sahara Air Products, a Division of Henderson Engineering Co., Inc., was founded in 1957 by Joe and Evelyn Henderson to provide engineered solutions for air system problems. Mr. Henderson’s philosophy was to thoroughly examine the unique requirements of each customer and to develop the most economical and reliable system solution for that application. This trademark of engineered solutions exists at Sahara today, as the third generation of Hendersons continue the tradition of product excellence and customer service. Sahara’s reputation for high quality, innovative products, and customer loyalty has continued to grow through the years.

As a family business, we know that our greatest assets are our employees. Most of our people have been with us for more than 20 years. There is no substitute for experience. Sahara employees are true team members who know what they’re doing and they truly care about doing it right the first time. This means you get what you want; a drying system that delivers performance year after year, decade after decade.

Quality and old world craftsmanship never goes out of style
Heat-of-Compression Regenerative Compressed Air Dryers

Revolutionary Energy Savings

Total Drying Cost to Deliver 1608 Nm3/H (1000 SCFM) with a -40°C/°F PDP

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<th>DRYER</th>
<th>INITIAL COST</th>
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<th>BLOWER</th>
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</table>

* Costs based on 1000 SCFM dryer operating around the clock 365 days.
Purge air at $ .25/1000 SCF; electricity at $.05/KWH.
Does not include maintenance costs.
Average purge loss.
Competing In A Global Economy

A Green Dryer, HOC Requires No CFC's
Does Not Pollute

The Ability To Remain Competitive

We manufacture all of these regenerative dryers.

Our goal is to assist you in making the best informed decision to provide you with the lowest initial cost, lowest operating cost, and highest reliability.
Choosing A Dryer Design

Which Dryer Design is Right for You?

There are two Sahara-Pak designs that allow you to choose the dryer which best fits your needs. All Heat-of-Compression dryers may only be used with an oil-free compressor; located reasonably close to the compressor. Pipe between the compressor final stage discharge and the Heat-of-Compression dryer should be insulated to minimize heat loss.

**Sahara-Pak SP Model**

The result of years of product development, the Model SP is the simplest SAHARA dryer and has the lowest initial cost. The SP design provides instrument quality air.

- SP design delivers pressure dew points in the 0°F to -60°F range, depending on your operating conditions.
- SP design consumes none of your valuable dry air.
- Like other heat reactivated dryers, the SP design has a brief temperature and dew point spike at tower shift. This bump evens out as the air moves through the piping system.
- Outlet dew points vary based on operating conditions; higher in the summer and lower in the winter.
- Typical dew points meet and exceed the requirements for instrument quality air as defined by the Instrument Society of America.

**Sahara-Pak HC Model**

The Model HC is a true process dryer. Given the proper operating conditions, it can deliver extremely low dew points with virtually no operating cost.

The HC design provides a constant dew point without temperature or dew point bumps. The HC includes a cooling and stripping cycle and delivers the highest performance of any air dryer.

- HC design includes stripping and cooling cycle for optimum performance.
- HC design deliver pressure dew points in the -40°F to -100°F pressure dew point, depending on your operating conditions.
- HC design can be equipped to provide -40°F dew points or lower, under every possible scenario, including operation of rental compressors.
Sahara-Pak Features

- Cuts operating costs to near zero by using the heat-of-compression for regeneration.
- Regenerated with “free” heat produced by your compressor.
- Eliminates costly installation charges; all components are pre-piped and pre-wired.
- Minimizes potential for wear and mechanical failure.
- Lower initial cost than other regenerative dryer designs.
- Lower operating costs vs. performance for all regenerative dryers.
- Available in capacities from 125 SCFM to 50,000 SCFM.
- SP design averages less than $45 per year total electrical cost; there are no heaters or blowers to consume electricity and there is no purge air loss.
- HC design averages less than $1,100 per 1000 SCFM per year total electrical cost; there are no heaters or blowers to consume electricity and there is an adjustable 2% purge air loss.

We can build a dryer to meet your strict performance requirements

Quality and reliability are built into every SAHARA air dryer and performance is guaranteed
Controller Comes Standard

- The standard PLC is an Allen-Bradley Micrologix with individual input/output modules which controls the dryer’s operation
- Ethernet communication
- The controller’s standard operator interface is an Allen-Bradley PanelView
- Housed in a NEMA 4 enclosure, the operator interface uses a touch sensitive screen with control functions performed by touching on-screen display buttons to change screens, modify settings, or enter values
- Dryer cycle indication
- P&ID for each cycle on operator interface screen
- Other controllers available, per customer specifications
**SP Description of Operation**

**Simple, Low Cost SP**

The flow chart illustrates the efficient SP system. Air enters the dryer directly from the final stage of compression. It is directed into the regenerating tower, where the heat-of-compression removes the moisture from the desiccant. The air then flows into the aftercooler, into the coalescing-type moisture separator, and into the drying tower where the air is dried to its final low dew point.

The SP switches towers every half hour. (With the optional Dew Point Demand System (DPDS), the cycle is extended until the drying tower reaches saturation.)

At tower shift, a small temperature and dew point bump occurs, as with most other heat reactivated dryers. The small amount of high dew point air blends in with the previously dried air to maintain a low overall dew point.

The DPDS turns off the timer and switches the towers only when the dew point at the outlet of the dryer rises to a preset level indicating the desiccant in the drying tower is saturated. Switching towers on demand uses the full capacity of the desiccant, reduces the number of tower shifts, and compensates for fluctuations in compressor flow. The DPDS allows the dryer to be operated at 15% to 100% capacity.
**HC Description of Operation**

**Lower Overall Dew Points**

These flow charts illustrate how the HC employs an 8 hour time cycle, cooling and stripping cycle to prevent dew point bumps at tower shift, and provide lower overall dew points.

**Left Tower Heating (90 minutes)**

Hot air from the final stage of compression enters the inlet of the HC and is directed by the inlet 2-way valves into the regenerating tower. This hot, thirsty air regenerates the bulk of the water from the desiccant. The air is then directed into the aftercooler where it is cooled, the coalescing separator where liquid water is removed through the drain trap system, then into the drying tower where the air is actually dried to its final low dew point.
Stripping allows the HC to deliver 30°F lower dew points than the SP

Left Tower Stripping (90 minutes)

At the end of heating, the inlet valves shift position, directing the hot inlet air directly into the aftercooler, separator, and drying tower. We now begin stripping. At the beginning of stripping, the regenerating tower is depressurized through a muffler. During stripping, a small adjustable flow of dry air is used to remove the last little bit of moisture from the regenerating tower. This allows the HC dryer to provide exceptionally low dew points.
**Cooling eliminates temperature & dew point spikes at tower shift; allows the HC to deliver flat line dew points**

**Left Tower Cooling (60 minutes)**

At the end of stripping, the regenerating tower is repressurized. The outlet cooling cycle valves open and cooling begins. During cooling, a portion of the dry outlet air is directed into the regenerating tower to reduce the temperature of the bed prior to tower shift. There is no air lost during cooling. Cooling and stripping combine to provide extremely low dew points and to eliminate dew point fluctuations during tower shift.
Optimum Performance Features for the HC

The outlet dew point from any heat-of-compression dryer is based in large part on the discharge temperature of the compressor. If the compressor, for whatever reason, does not deliver high enough temperatures, then the dryer can’t deliver low dew points. This has always been one of the problems with conventional heat-of-compression dryers; until now. The HC design can be equipped with a small optional trim heater which can be automatically energized, if the regeneration temperatures are not adequate. Because the heater is located in the stripping line, it is not heating the full flow of the compressor; rather, it is comparable to a typical heated dryer. The stripping with heat time is adjustable between 0 and 90 minutes. The heater allows the dryer to deliver low dew points under virtually any set of conditions. The heater is identical to our heated dryer design; we use an incoloy sheathed heater derated to 14 watts/sq. inch. The heater is controlled by a temperature transmitter that provides heater overtemp alarm and shutdown. Also provided is a temperature transmitter in the cold zone for heater shutdown, if there is a loss of flow across the heater.

Additionally, the HC design is also equipped as standard with a heatless mode of operation*. If, for example, the primary compressor is down and portable oil-free compressors are brought in, the inlet temperature to the dryer may be as low as 100°F. In this case, the HC dryer can operate in a heatless mode and deliver the specified dew point. As with any heatless dryer, the HC will now purge 15% of the inlet air.

When the trim heater option is purchased, the dryer can also operate as an externally heated dryer; another mode of operation, if the primary compressor is down and portable oil-free compressors are brought in. As with any externally heated dryer, the purge will be 7% of the inlet air.

With these two features, the HC can deliver any required dew point, under any set of conditions, all the time.

*Henderson HOC Patents: 3950154, 5137548, 5376164, 6171377, and 6375722 (heatless mode of operation).
Safe & Reliable

Heat-of-Compression dryers are inherently the safest and most reliable regenerative dryers available.

The SP has eight high performance switching valves that are guaranteed to operate for 5 years. There is no air loss, no heaters or blowers; so not only is the SP the most energy efficient dryer design in the world, it’s also the most reliable.

The HC design provides process quality continuous dew points. If you require -40° or lower, the HC is the dryer custom designed to deliver it day after day, year after year.

Additionally, the HC includes valves to control the stripping and cooling cycles to deliver optimum performance. Able to deliver the specified dew point under virtually any condition the HC dryer provides worry free performance.

Both Heat-of-Compression dryer designs use the same high performance switching valves; guaranteed to perform for 5 years.

Worldwide Installations

Glass & Plastics Producers

Electric & Power Utilities

Automotive & Airline Industry

Oil Refineries

Chemical Companies

Healthcare

Breweries

Waste Management

Recycling

Electronics

Paint Manufacturers

Nuclear Energy

Fabricators

Aluminum & Steel Foundries

Diagnostics
Quality Integral Components & Features

SWITCHING VALVES
- Reliable 2-way non-lubricated
- 2” & smaller are 2-way rack and pinion actuated bronze ball valves
- 3” & larger are high performance butterfly valves w/SS internals and reinforced teflon seat

ELECTRICAL
- Housed in a NEMA 4 enclosure
- Built to latest NEC Guidelines

ELECTRIC HEATER (when trim heater purchased)
- Derated to a maximum of 14 watts/sq. in. density for longer life
- Inconel sheathed
- Heating elements not in direct contact with desiccant
- Applies only if there’s a trim heater

PRESSURE TRANSMITTER (HC design)
- Controls cooling valve operation
- Adjustable setpoint

DEPRESSURIZATION MUFFLERS (HC Dryers)
- Utilized on the blowdown, keeps noise levels to a minimum
- Complies with OSHA standards by keeping noise tolerance at <85 dBA on a time-weighted average

SEPARATE PILOT AIR FILTER
- With pressure gauge and block valve to protect dryer control system
Quality Integral Components & Features

**DUCK STYLE TEMPERATURE TRANSMITTER**

*Standard*
- Used to display dryer inlet temperature, cooler inlet temperature, & cooler outlet temperature on PLC screen
- Provides low inlet temperature alarm
- Provides high cooler outlet temperature alarm

*With trim heater option:*
- For heater control & cold zone
- Transmitter regulates heater outlet temperature
- Temperature indication and alarms displayed on PLC screen
- A separate transmitter located in the cold zone of the heater provides additional protection, in case of low or lost flow

**DDT-504 DRAIN TRAP**

- Fail-safe drain trap developed by Sahara
- Most reliable drain trap available
- Consists of two separate traps; a primary and a secondary
- Alarm in PLC, if primary drain fails
- Secondary drain continues to operate until primary drain is repaired

**SEPARATOR**

- Most efficient coalescing type
- 99.5% efficient design
- Consists of a stainless steel mesh pad housed in an ASME coded pressure vessel

**SHELL & TUBE HEAT EXCHANGER**

- ASME code stamped
- Copper tubes provided as standard
- Other tube material options: 90/10 cupro nickel, 304 & 316 stainless steel
- Other shell materials available: 304 & 316 stainless steel
- Optional air cooled heat exchanger available
Other options also available.

We can custom build a dryer to meet your strict performance requirements. Contact us and our sales engineers will help you select the right system for your application.
SAHARA DEW POINT DEMAND SYSTEM
Energy conservation has always been a strong design consideration of Sahara Air Products. The Dew Point Demand System measures the dew point of the outlet air, overriding the timer, eliminating unnecessary switching of towers resulting in considerable savings through reduction of regeneration cost. Additional savings can be realized with this system by reducing wear on component parts, as well as extending the life of desiccant.

The SAHARA Dew Point Demand System utilizes a state-of-the-art moisture transmitter to accurately measure the actual PRESSURE DEW POINT the dryer is delivering at all times. The instrument reads directly to the PLC and is displayed on the Panel View screen, which constantly keeps you informed of dryer performance. An adjustable set point allows you to set the precise dew point for tower switching. Tower switching can be activated anywhere within the broad range of -148°F to +86°F.

FAIL-TO-SHIFT ALARM INDICATION
Indication that malfunction has occurred, preventing towers from shifting at the proper time or dew point sequence.

MOISTURE INDICATOR
Visual indication of outlet air moisture content by means of color change media.

TRIM HEATER
Used to enhance dew point performance.

PARTICULATE AFTERFILTER
We recommend an afterfilter downstream of the dryer to eliminate the possibility of desiccant dust carryover into the air system. For this duty, we offer a Sahara particulate afterfilter. This unit is constructed of carbon steel to ASME standards and the elements are designed to filter particles to 1 micron or better.

FILTER MOUNTING & BYPASS OPTIONS
Filters may be mounted on dryer skid for ease of installation.

MOISTURE INDICATOR
Visual indication of outlet air moisture content by means of color change media.

NEMA 7 or 12 ELECTRICAL CONSTRUCTION
NEMA 4 Standard

CONTROLLERS PER CUSTOMER SPECIFICATIONS
The standard PLC is an Allen-Bradley Micrologix with an Allen-Bradley PanelView. Other controllers are available per your required custom specifications.
### SP Specifications & Dimensions

<table>
<thead>
<tr>
<th>MODEL</th>
<th>SCFM RATING @ 100#</th>
<th>INLET / OUTLET SIZE</th>
<th>LBS. DESICCANT PER TOWER</th>
<th>A (INCHES)</th>
<th>B (INCHES)</th>
<th>C (INCHES)</th>
<th>WEIGHT (POUNDS)</th>
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Sahara reserves the right to make changes without notification. Some models not shown. Other sizes and pressures available. Metric dimensions available upon request. Ratings are based on 100 PSIG, 100°F.
Heat-of-Compression Regenerative Compressed Air Dryers

**Heat-of-Compression Keys To Success**

**Full Flow Heating**
Both the SP and the HC utilize full flow heating; all of the air from the final stage of compression is directed into the regenerating tower. We know that compressor flows vary during the course of a day or week. Heat-of-Compression designs that split flow at the inlet, and only use partial flow regeneration, are unable to perform at less than 100% flow. The SP & HC can deliver dew point as low as 15% load.

**Dry Gas Stripping**
The HC uses dry outlet air to continue to regenerate the desiccant. After 90 minutes of full flow heating, the HC begins a stripping cycle using only 2% of the dry process air to remove additional moisture from the desiccant in the regenerating tower. The net result is a lower outlet dew point.

**Dry Gas Cooling**
After 90 minutes of stripping, the HC begins to cool the desiccant in the regenerating tower with dry outlet air. No air is lost during cooling. Some competitive Heat-of-Compression designs cool with wet air; preloading the desiccant in the regenerating tower with water making it very difficult to deliver low dew points.

**High Performance Switching Valves**
All of the valves used in the SP and HC are high performance, leak tight, and fire safe. This means they work under all conditions. If a switching valve fails, or even leaks, you get wet air downstream. We recognize this fact and designed our Heat-of-Compression dryers to use bubble tight valves that don't leak.

**Fail Safe Drain Traps**
The only place that liquid water is removed is through the drain traps. Our dual drain trap system is the most reliable drain available. The truth is, if the trap fails, then the dryer fails. Any single trap will ultimately fail. The dual drain trap uses 2 separate traps; a mechanical primary, and a liquid level sensor as a back up. The primary trap will operate reliably for a long time, but like any mechanical device it will eventually fail. When that happens, water backs up into a liquid level sensor that opens a valve draining out the water while simultaneously triggering an alarm. The water is removed; the dryer performs.

**Commitment to Customer Satisfaction**

“As with any new equipment that my plant purchases, we had our doubts at first, but we have now seen first hand that the energy-free heat-of-compression dryer is a very good investment for us. It can operate continuously for a long period, the quality of outlet air is very good, especially, operating costs are very low. We are pleased to recommend the Henderson/ Sahara HC series heat-of-compression dryer to any compressed air user who desires dry compressed air with very low costs.” – Yizheng Fibre & Chemical

“The old, undersized mechanical dryer was prone to frequent failure and unable to reach the -40°F dewpoint. The heat-of-compression dryer essentially costs nothing to operate and it saves air too. It doesn’t matter how much energy one dryer saves over another, if it’s constantly down for maintenance, the minimum annual savings of the heat-of-compression dryer compared with other types of dryers is estimated at $23,000. Purchase price of the dryer is the same or less than others quoted. The new air compressor system has operated on-line continuously for 18 months without any significant downtime. In the last six months, there has been no downtime.” – Rorer Pharmaceutical

“Since desiccant regeneration in the new air dryer is accomplished using the heat-of-compression, energy consumption to dry the plant air has been substantially reduced. With the heat-of-compression air dryer, which requires no purge air, 100% of compressor capacity is reserved for plant uses. All maintenance problems encountered previously have been eliminated with the heat-of-compression type air dryer.” – Mobil

“The heat-of-compression air dryer has proven to be reliable and provides adequate energy savings to justify modernizing complete plant air compression facilities. In smaller sizes, such as used at the World Headquarters (two 600 scfm units) energy savings are not as dramatic, but installation of the equipment can be supported on the basis of reduced maintenance costs and improved quality of air.” -- Monsanto
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Sahara reserves the right to make changes without notification. Some models not shown. Other sizes and pressures available. Metric dimensions available upon request. Ratings are based on 100 PSIG, 100°F.
# Heat-of-Compression Regenerative Compressed Air Dryers

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One of the world’s largest heat-of-compression installations; operating at nearly zero cost.

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