Dry desiccant dehumidification systems
Leading dry desiccant technology

Alfa Laval Kathabar dehumidification systems are engineered solutions for temperature and humidity control for industrial, commercial, educational, institutional and green/LEED facilities. These cost-effective dehumidification and energy recovery systems have been used to clean and dehumidify air for a wide range of industries worldwide – including pharmaceutical, investment casting, healthcare, cold storage, food and beverage, and many more. These systems help to improve the reliability, economy and efficiency of any manufacturing or processing operation that is humidity, temperature or microorganism-sensitive. Whether your space conditions are 78°F and 20% RH, 45°F and 40% RH, or -20°F and -40°F dew point, the Alfa Laval Kathabar system can provide controlled conditions – resulting in an improved bottom line.

Benefits of dry technology:

- **Dehumidification independent of cooling**
  Best suited for warm, dry applications (less than 20% relative humidity)

- **Low discharge humidity range**
  Capable of achieving as low as -65°F (-54°C) dew point

- **Complete packaged systems**
  All components found in a typical air handling unit can be packaged into the dry desiccant dehumidifier

- **Humidity control (+/- 2% RH)**
  Adjustable leaving air humidity level based on wheel face and bypass along with reactivation modulation

- **Modulating capacity control**
  Lower energy requirements than traditional refrigeration sub-cool and reheat systems

- **Use readily available utilities**
  Reactivation with direct or indirect fired natural gas, electric or high pressure steam

- **Thermally insulated**
  Two inch foam insulation (R-13) in a double wall construction

- **Large capacity range**
  Standard airflow capacities up to 11,000 CFM; custom air capacities up to 25,000 CFM are also available.

Economic value comparison

With increased awareness of energy costs, companies evaluate the total cost to own and operate equipment, rather than initial cost alone. An Alfa Laval Kathabar evaluation considers the first cost, installation cost and operating costs for dry and liquid desiccant dehumidification systems. We then calculate the cost for various systems and present the economic value comparison based on specific ASHRAE local weather data, customers’ actual energy costs and system operating schedule.

To ensure the evaluation does not leave anything up to question, we then compare both liquid and dry desiccant systems to conventional refrigeration systems, in order to determine the best solution for your specific needs. Simply ask your Alfa Laval Kathabar representative to prepare an economic value comparison for your application.
Alfa Laval Kathabar dry desiccant systems operate on the principle of adsorption. This occurs as the process air comes in contact with the desiccant media, the moisture from the air is attracted to the desiccant surface much like metal filings are to a magnet.

The desiccant wheel is constructed in a parallel honeycomb matrix, which is composed of a fiberglass substrate, impregnated with silica-gel – providing the necessary surface area for the adsorption process.

The desiccant wheel is housed in a cabinet that is separated into two sections, denoted as the process and reactivation sections. While in operation, the wheel is continuously rotating in and out of the process, and reactivation sections at a rate of 6-15 rotations per hour. See the below illustration for a representation of this layout.

In the process section, moist air passes through the wheel – where the silica gel adsorbs the moisture. During this process of adsorption, heat is generated – resulting in the leaving air becoming not only drier, but warmer.

In the reactivation section of the wheel, a scavenger airstream is heated up and sent through the wheel. The moisture on the desiccant is attracted to the scavenger airstream which is exhausted, completing the reactivation process.

The performance curves provide the approximate discharge grains expected at specific inlet conditions. Each curve represents a different velocity profile across the desiccant wheel with the 300 and 500 feet per minute values correlating to the minimum and maximum airflows for each unit. For example a 65°F, 60 Gr/# process air inlet with a velocity of 300 FPM results in a discharge grain condition of approximately 10 Gr/#. (The red arrows in the first performance curve correlate to this example.)
Alfa Laval Kathabar DD – Dry desiccant system components

A. VFD driven direct drive reactivation fan with TEFC premium efficient motor
B. Filter module with filter differential pressure indication gauge
C. Standard reactivation RTD’s with programmable transmitters
D. Mineral wool insulated reactivation ducts
E. Instrument test port for ease of performance verification
F. Standard, actuated face and bypass dampers for precise and fast acting humidity control
G. Heavy duty wheel rotation confirmation limit switch
H. High purity silica gel desiccant media in a 304SS housing and heavy duty square tube framing
I. VFD driven fraction HP wheel motor with easily serviceable chain drive
J. Heavy duty 12 and 16 GA epoxy painted galvanized paneling with 2 inch, R13 insulation
K. Cable trays for ease of cable routing and servicing
L. Heavy duty industrial epoxy painted C-channel base with stitch welds
M. Modular reactivation sections offer ease of service
N. High temperature, aluminum framed reactivation filter(s)
O. Reactivation filter door with integrated differential pressure gauge
P. VFD driven direct drive process fan with TEFC premium efficient motor
Q. NEMA 3R control panel with PLC and HMI with external ethernet and power receptacle

Steam reactivation
A. Steam coil: Copper tube, aluminum finned with 16 GA galvanized steel casing and carbon steel headers. Single point utility connections. Optional coil configurations are available
B. Heavy duty 12 GA galvanized framing with mineral wool insulation

Gas reactivation
A. Low NoX aluminum direct fire NG/LPG burner
B. Heavy duty 12 GA galvanized framing with mineral wool insulation
C. NFPA 86 compliant gas train with dual acting solenoid valve; Hi/Lo limit switches and integral pressure regulator
D. Gas modulating control valve to allow for up to 20:1 turn down ratio of the burner
E. Visual flame indication sight glass

Electric reactivation
A. SCR modulated open face chromel coil with tubed and finned tubed as optional
B. One inch insulated, 304SS NEMA 4 terminal box
C. Heavy duty 12 GA galvanized framing with mineral wool insulation
Alfa Laval Kathabar DD – Dry desiccant sizing and selection

Alfa Laval Kathabar dry desiccant system sizing is primarily dependent on airflow. The table below outlines the standard equipment sizing, along with weights and recommended airflow ranges. Consult with your representative for additional sizing options.

<table>
<thead>
<tr>
<th>Unit size</th>
<th>Airflow (maximum) CFM</th>
<th>Airflow (minimum) CFM</th>
<th>Approximate dimensions L x W x H (inches)</th>
<th>Approximate weight L x W x H (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>1,700</td>
<td>1,020</td>
<td>130 x 54 x 58</td>
<td>2,100</td>
</tr>
<tr>
<td>150</td>
<td>2,200</td>
<td>1,200</td>
<td>130 x 56 x 64</td>
<td>2,300</td>
</tr>
<tr>
<td>300</td>
<td>3,100</td>
<td>2,039</td>
<td>130 x 56 x 64</td>
<td>2,700</td>
</tr>
<tr>
<td>450</td>
<td>5,200</td>
<td>2,889</td>
<td>132 x 70 x 72</td>
<td>3,700</td>
</tr>
<tr>
<td>600</td>
<td>7,600</td>
<td>3,738</td>
<td>132 x 70 x 72</td>
<td>4,600</td>
</tr>
<tr>
<td>900</td>
<td>11,000</td>
<td>5,267</td>
<td>135 x 78 x 75</td>
<td>6,600</td>
</tr>
</tbody>
</table>

Custom sizing and options up to 25,000 CFM available upon request.

Alfa Laval Kathabar dry desiccant systems can be customized to meet almost any application. Below is a list of typical pre- and post-process options. Consult your representative for additional options and configurations that may be required for your application.

**Base unit options**

- Indoor / outdoor configuration
- Process / reactivation weather hoods
- Access door windows
- Special exterior paint

**Other options**

- **Mixing box:**
  - Bottom, end, top, side inlet and outlet
  - Dampers manual or actuated

- **Panel filter:**
  - Merv 7/8 two inch pleated pre-filter
  - Filter magneti
celic®

- **Primary filter:**
  - Merv 7/8 two inch pleated pre-filter
  - Merv 8-14, HEPA cartridge or bag filters
  - Single/dual filter magneti
celic®

- **Process fans:**
  - Direct drive/belt drive
  - Radial/Bi/FC type
  - Plenum fan
  - Flow sensors

- **Process coils pre/post:**
  - Process heating
    - Steam
    - Hot water
  - Process cooling
    - Chilled water
    - Cooling tower water
    - Direct expansion
  - Process humidification

- **A.** Indoor / outdoor configuration
- **B.** Mixing box:
  - Bottom, end, top, side inlet and outlet
  - Dampers manual or actuated
- **C.** Panel filter:
  - Merv 7/8 two inch pleated pre-filter
  - Filter magneti
celic®
- **D.** Primary filter:
  - Merv 7/8 two inch pleated pre-filter
  - Merv 8-14, HEPA cartridge or bag filters
  - Single/dual filter magneti
celic®
- **E.** Process coils pre/post:
  - Process heating
    - Steam
    - Hot water
  - Process cooling
    - Chilled water
    - Cooling tower water
    - Direct expansion
  - Process humidification
- **F.** Process fans:
  - Direct drive/belt drive
  - Radial/Bi/FC type
  - Plenum fan
  - Flow sensors
Alfa Laval Kathabar DD – Dry desiccant control options and system operations

Alfa Laval Kathabar dry desiccant systems utilize a touch screen interface or (HMI), combined with a programmable logic control (PLC) with ModBus Ethernet connection. Below are some advantages of using this type of configuration – along with added options that can be provided to better suit the needs of your application.

**Panel features**
- Visual overview of the equipment – with a user-friendly touchscreen interface.
- Active visual trending which can be exported to an Excel file.
- Ethernet connection for remote monitoring and/or editing of the control points.
- NEMA 3R enclosure for weather or wash down protection.

**Panel options**
- Allen-Bradley, Siemens PLC and HMI configurations.
- BACnet and other BMS interfaces are available upon request.
- Variations in control sequences and components are available.

**System operation**
Alfa Laval Kathabar dry desiccant systems use a standard dew-point sensor to control the discharge and return air humidity precisely. Below is a general description of our standard control sequence for each reactivation type. Custom control sequences can be developed on an application basis.

**Electric reactivation**
The dew point controls the face and bypass dampers directly for immediate reaction to humidity range. The reactivation inlet wheel temperature is then adjusted by modulating the electric SCRs.

**Steam reactivation**
The dew point input controls the face and bypass dampers directly for immediate reaction to humidity range. The face and bypass dampers modulate the reactivation airflow across the coil.

**Gas reactivation**
The dew point controls the face and bypass dampers directly for immediate reaction to humidity range. The face and bypass modulate the gas control valve, to reduce the reactivation temperature set point.

**Dehumidification system dry application questionnaire**

**Customer data**
- Project name:
- Name:
- Company:
- Address:
- City, State, Zip:
- Country:
- Phone:
- E-Mail:

**Outside air requirements**
- Airflow: ________ ACFM
- OSA temp: ________ °F
- OSA humidity: ________ Gr/lb.

**Desired space conditions**
- Space temp: ________ °F
- Space humidity: ________ Gr/lb.

**Space loads**
- Sensible load: ________ Btu/Hr
- Latent load: ________ Btu/Hr
- Winter humidification required?:   Yes   No

**Delivered conditions to space**
- Airflow: ________ ACFM
- Delivered temp: ________ °F
- Delivered humidity: ________ Gr/lb.

**Utilities**
- Coolant source: ________
- Coolant temp: ________ °F
- Heating source: ________
- Hot water temp/steam pressure: ________ °F / PSIG

**Electrical characteristics**
- Voltage: (Volts)
- Phase: 
- Frequency (Hz):

Please describe the location for the equipment installation. Provide room sketches with doors, slots, etc.

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Alfa Laval in brief

Alfa Laval is a leading global provider of specialized products and engineered solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuffs, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

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