



Guide to Efficiently Treating Compressed Air



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COOL



Compressed air leaves the compressor at 200°F, 300°F or 400°F (93°C, 149°C, or 204°C). Use an aftercooler to reduce temperatures to 100°F to 120°F (38°C to 49°C). The air can then be dried and filtered or safely introduced into downstream piping and pneumatic equipment.

Compressed air is effectively used in a wide variety of manufacturing and commercial operations. However, without proper treatment, compressed air contains solid, liquid and gaseous contaminants which reduce the efficiency of your compressed air system, increase your operating expenses, and jeopardize product quality.

Compressed air is contaminated because solid particles and water vapor enter the compressor with the atmospheric air. In addition, wear particles, oil aerosols, and oil vapor are introduced inside the compressor while rust and pipe scale are added into the air distribution system.

By following the steps described here, you can eliminate contaminants and provide the quality of compressed air you require.

Air-Cooled Aftercoolers

Consisting of a coil and fan, they use ambient air for cooling.



Water-Cooled Aftercoolers

Consisting of a water to air heat exchanger, they use water for cooling.

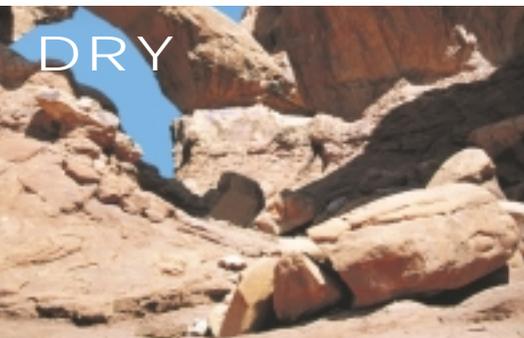


Separators

As air cools, some of the water vapor condenses into liquid water. Add a separator to remove the liquid condensate formed in the aftercooler.



HF Series
Grades 11 & 9



Because of the effects of compression, much of the water vapor in your air supply condenses into liquid water.

The right air dryer removes water vapor and prevents troublesome liquid water from forming downstream. The term dew point temperature describes how much water vapor is present and tells us simply how cold the air supply can get before liquid water forms.

To prevent water in your air system, choose a dryer that produces a dew point temperature below the lowest temperature downstream that air lines and equipment will be exposed to.

Refrigerated Dryers

For dew point temperatures from 38°F to 50°F (3°C to 10°C). They are used where the air system is installed in temperatures above freezing.

Compressed air is cooled by a refrigeration system causing water vapor to condense. The liquid condensate is separated from the air stream and discharged from the system by an automatic drain.



HPRplus & HHDplus Series

Membrane Dryers

For dew point temperatures from -40°F to +40°F (-40°C to +4°C). They are used for applications where there is limited installation space, a power source is not available, or explosive or corrosive conditions exist.

Air passes through the inside of a semi-permeable hollow membrane fiber where water vapor diffuses through the fiber walls.



HMD Series

Desiccant Dryers

For dew point temperatures of -40°F to -100°F (-40°C to -73°C) or lower. They are used where the air system is exposed to temperatures below freezing or very dry air is needed for critical applications.

Air passes through a tower containing desiccant beads (e.g. activated alumina) where water vapor is attracted to the surface of the desiccant. The type of desiccant used can be regenerated and used repeatedly. Most regenerative dryers utilize two towers. The air supply is switched from tower to tower so that one tower is on-line drying while the other tower is off-line being regenerated.



HHL Series



Filters are used to remove:

- Liquid contaminants...water droplets and oil aerosols
- Solid contaminants...dust and dirt
- Gaseous contaminants...oil vapor

Methods for Removing Liquid Contaminants:

Separators

Liquid droplets are forced out of the air stream as the air is caused to spin or change direction. Separators remove heavy liquid loads and are effective on larger water droplets. They are not, however, effective on sub-micronic oil aerosols.



HF Series Grades 11 & 9

Coalescing Filters

These filters utilize a bed of fibers to capture liquid droplets. The captured droplets move along the fibers, coalescing into larger droplets which drain to the bottom of the cartridge for removal. High efficiency coalescing filters are capable of removing oil droplets as small as 0.008 ppm (0.01 mg/m³) and provide virtually oil-free air.



HF Series Grades 9, 7, 5, & 3

Removing Solid Contaminants:

In-Depth Filters

Constructed of a fiber bed, these filters capture particles throughout the depth of the bed. They are typically designed to remove particle sizes of 3, 1, 0.1 and 0.01 microns.



HF Series Grades 9, 7, 6, & 5

Removing Gaseous Contaminants:

Coalescing Filter

These filters use a bed of activated carbon to adsorb oil vapor and eliminate its subsequent odor.



HF Series Grade 1

Installation

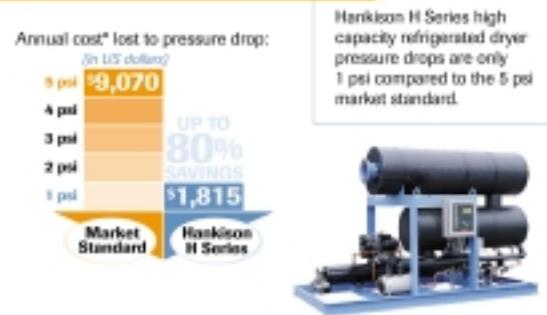
Install filters in the mainline to protect the entire system, as pre- and afterfilters with dryers, or at the point-of-use. Air quality may be improved in steps, doing coarse filtration before entering the air distribution system and adding finer filtration at the point-of-use.

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Energy Cost Management

Tip #1 - 1 psi vs 5 psi pressure drop (0,07 bar vs 0,34 bar) Most refrigerated dryers for 3,000 scfm and more (5,100 m³/h) air flow have a 5 psi (0,34 bar) pressure drop. Hankison H Series refrigerated dryers can provide a 1 psi (0,07 bar) pressure drop. What pressure drop does your refrigerated dryer have?

Compare the Bottom Line



* Costs are calculated assuming 24/7 usage at \$0.07 kw-hr and based on the following dryer inlet conditions: 5000 scfm, 100 psig, 100°F inlet, 100°F ambient.

Tip #2 - Blower Purge Desiccant Dryers Save Energy with 0.8% Average Purge Rates. If you need a -40°F (-40°C) pressure dew point, Hankison can study the energy costs associated with different desiccant dryer technologies. Example:

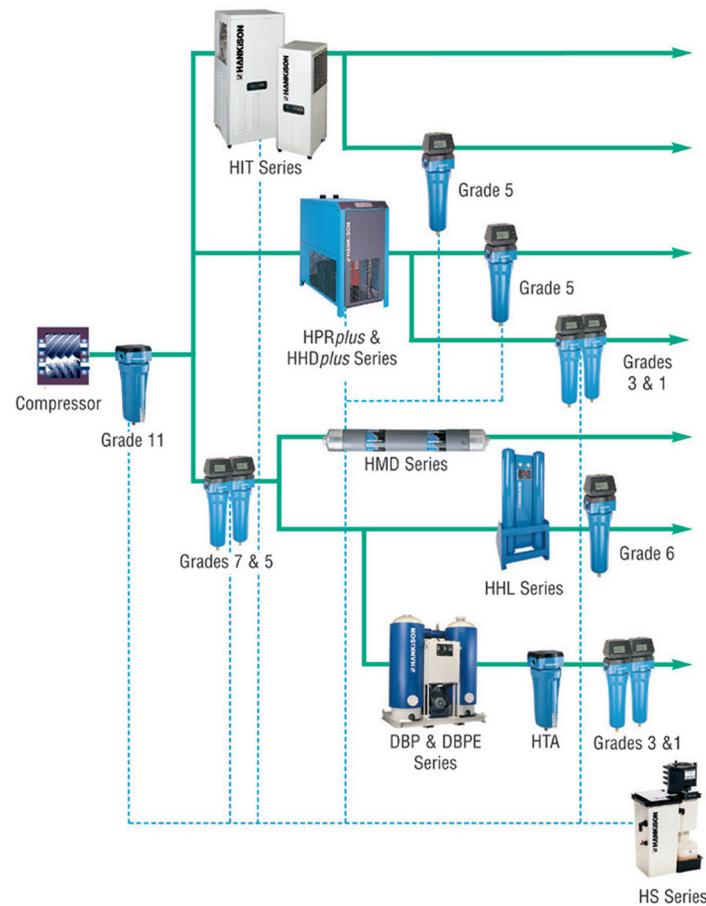
Dryer Type	Purge Air %	Purge Air	Purge Air Cost/year	Heater & Blower kW	Heater & Blower Cost/year	Total Energy Costs	-40°F (-40°C) Air Delivery at Dryer Outlet
Blower Purge	0.8	29 scfm (50 m ³ /h)	\$ 3,199 (DM 6.717)	57.9	\$ 27,792 (DM 58.363)	\$ 30,991 (DM 65.080)	3,571 scfm (6,070 m ³ /h)
Pressure-swing	14.4	518 scfm (880 m ³ /h)	57,540 (DM 120.834)	----	----	57,540 (DM 120.834)	3,082 scfm (5,239 m ³ /h)

*Based upon 3,600 scfm (6,120 m³/h) inlet air flow, 100°F (37°C), 100°F (37°C) ambient temperature, 100 psig (6.8 bar) operating pressure, 8760 working hours per year, \$0.06 (DM 0,13) per kW hour.

Tip #3 - Save Space and Installation Costs with an "Air Treatment Center." Most refrigerated dryers simply dry air. Filters are installed separately in space-consuming areas. Hankison HPRplus and HHDplus Series refrigerated dryers feature integrated cold coalescing filters which can eliminate the need and cost for separate stand-alone filter installations.

Typical Air Treatment Systems

Design a system to provide the air quality your application requires with the lowest possible system pressure drop



ISO 8573.1 Air Quality Class			System ΔP*	
Solids	Moisture	Oil	psi	bar
3 Body shops, sand blasting	6	5	<5	<0,35
1 Large pneumatic tools, spray painting	6	1	<8	<0,56
1 Powder painting, fine pneumatic tools, air gauging & conveying, pneumatic instruments & controls	4	1	<8	<0,56
1 Food packaging, cosmetics, photo labs, textile looms	4	1	<11	<0,75
1 Telephone cable, printing, photo labs, spray painting, dental, laboratory instruments	2-5	1	<10	<0,68
1 Air lines exposed to freezing ambient conditions, pharmaceutical, chemical, powder paint	1-3	1	<10	<0,68
1 Food processing, dairies, breweries, air in direct contact with foods, microchips, optics, medicines, point-of-use	2-3	1	<15	<1,02

ISO 8573.1 Quality Classes

Quality Classes	Solids max. particle size in microns	Moisture Dew Point		Oil Liquid & Gas	
		°C	°F	mg/m ³	ppm _{w/w}
0	as specified	as specified		as specified	
1	0.1	-70	-94	0,01	0.008
2	1	-40	-40	0,1	0.08
3	5	-20	-4	1	0.8
4	15	3	38	5	4
5	40	7	45	>5	>4
6	-	10	50	-	-

- HIT Series Refrigerated Dryers**
Dries to 50°F (10°C) dew point, 3 micron integral filter
- HPRplus & HHDplus Series Refrigerated Dryers**
Dries to 38°F (3°C) dew point, 3 micron integral filter
- HMD Series Membrane Dryers**
Dries from 40°F (4°C) to -40°F (-40°C) dew point
- HHL Series Heatless Desiccant Dryers**
Dries to -100°F (-73°C) dew point
- DBP & DBPE Series Heated Blower Purge Desiccant Dryers**
Dries to -40°F (-40°C) dew point
- HS Series Oil Water Separator**
Separates to 10 ppm (10 mg per liter)

- HF Series Filters**
- Grade 11** - 99% bulk water removal
- Grade 9** - 99% bulk water removal 3 micron particulate
- Grade 7** - 1 micron particulate
- Grade 6** - 1 micron desiccant afterfilter
- Grade 5** - 0.008 ppm (0,01 mg/m³) oil removal
- Grade 3** - 0.0008 ppm (0,001 mg/m³) oil removal
- Grade 1** - oil vapor and 0.003 ppm (0,004 mg/m³) oil removal
- HTA** - 1 micron particulate, high temperature filter