

**"Optimum dew point with lowest energy cost!
Energy savings are now a necessity, not an option."**



We care about global environment.
Eco-friendly refrigerants are used in PCM series.

SPX FLOW Technology Korea Co., Ltd.

Headquarters and factories

87, Jangansandan 9-ro, Jangan-eup, Gijang-gun,
Busan, Republic of Korea
TEL. +82-51-728-5360, FAX. +82-51-728-5359

Seoul office

14, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic
of Korea (Yeouido-dong, KT Building 11th floor)
TEL. +82-2-6297-4000, FAX. +82-2-783-0160

Contact Information:

www.spxflow.com

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(Phase Change Material)

PCM COMBINATION Air Dryer

This world's first patented technology developed by SPX FLOW produces super-dried air (up to -100°C dew point) and yet is able to maintain the lowest energy cost.

Up to 75% of the moisture in the compressed air is removed by the refrigerated air dryer, which has proven to be the most economical way to dehumidify. The remaining of 25% is then removed by a desiccant air dryer. This makes it possible to supply super-dried air in a much more cost-effective way than using a desiccant air dryer alone.

The PCM COMBINATION air dryer is a combination of a PCM air dryer and a zero loss blower purge air dryer. The PCM air dryer reduces unnecessary energy usage by using an automatically triggered (On/Off) refrigeration compressor cycle that is directly proportional to the inlet heat load. Subsequently, in the desiccant air dryer, purged air is not used to regenerate the desiccant.

Features

- Optimum discharge air temp. without the use of after cooler
- Achieves a super dry dew point, as low as -100°C
- Minimizes dew point spike during vessel switch over
- Energy savings up to 86%

Steps



1 Drastically reduces energy consumption by pre-removing up to 75% of moisture by using the PCM air dryer.

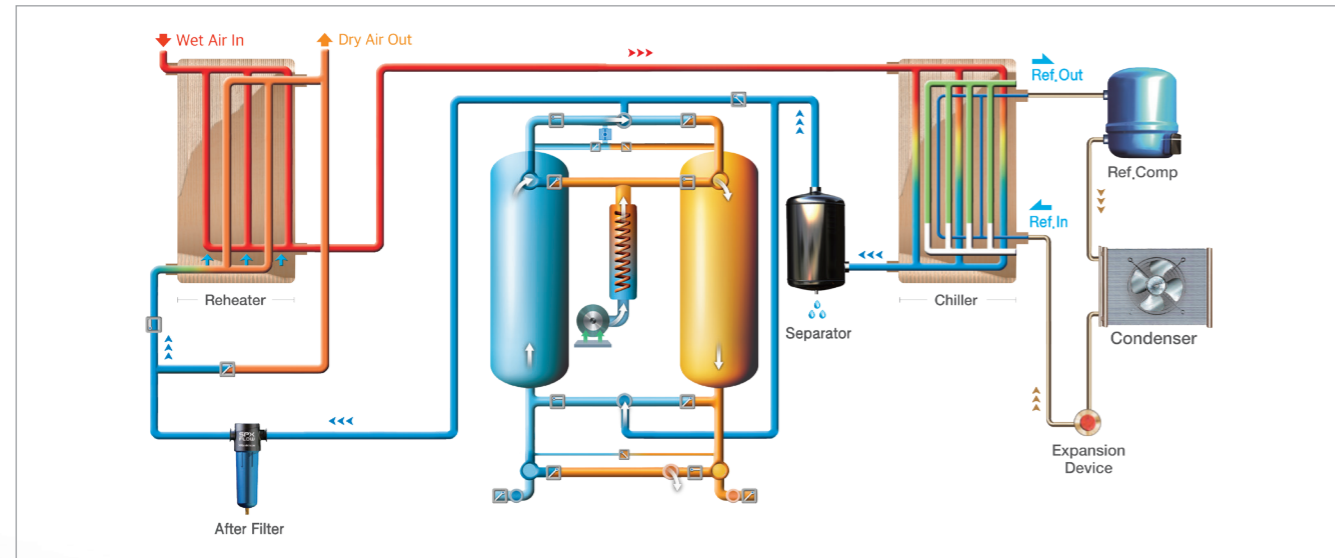
2 Reduces total energy consumption by operating PCM air dryer alone if necessary. (except winter)

3 Integrated high efficiency blower, which regenerates with ambient air. Zero loss purge.

4 PCM air dryer, cycles (On/Off) are controlled automatically according to inlet load : e.g. lunch time, season change.

5 Reduces energy consumption by controlling the desiccant air dryer cycle time according to outlet dew point, which corresponds to inlet moisture load.

How it Works

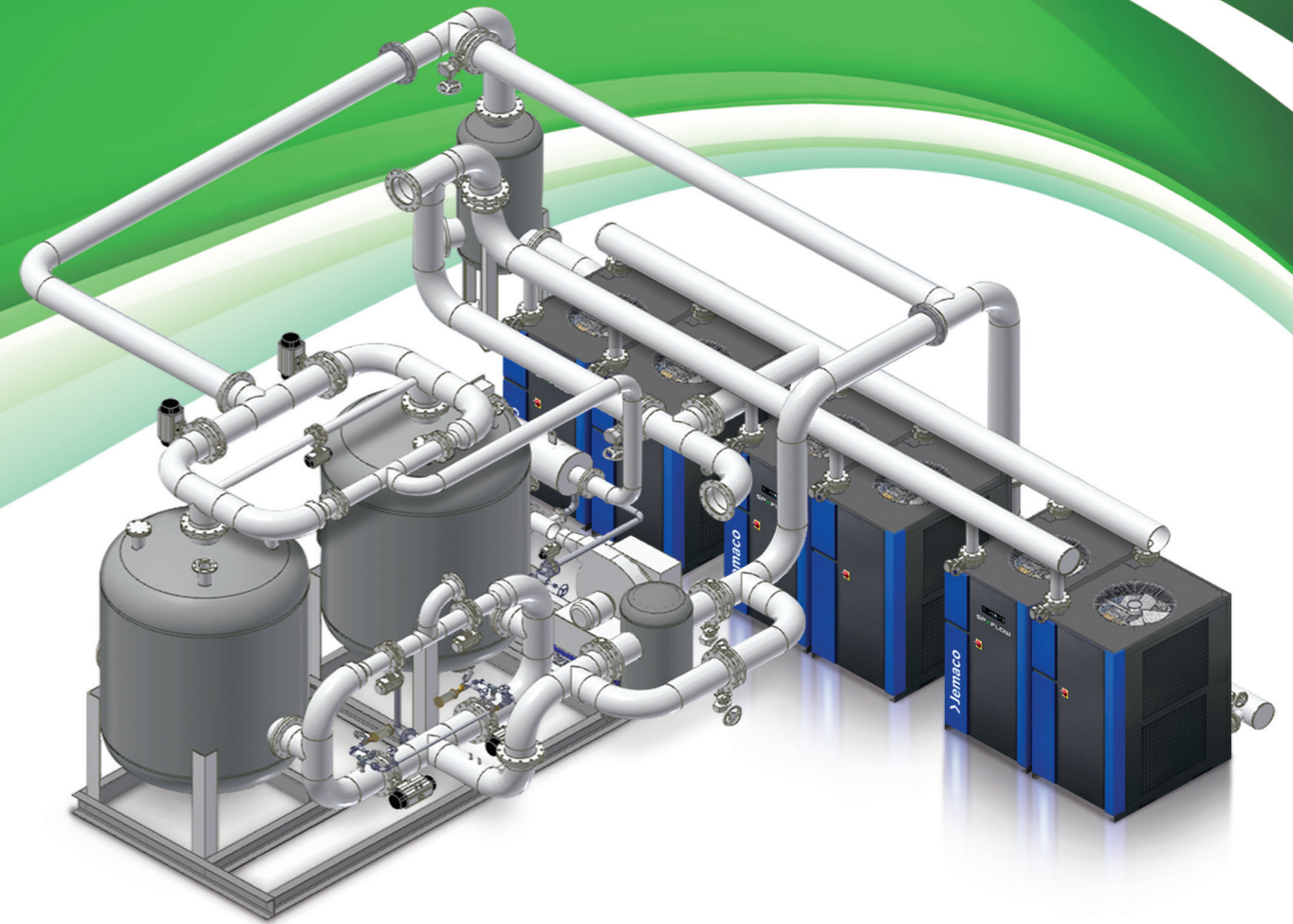


Dehydration of Compressed Air

- 1 Compressed air saturated with water vapor enters reheater, and is pre-cooled by the outgoing chilled air.
- 2 It is then directed to chiller where it is further cooled by the Phase Change Material (PCM).
- 3 As the air is cooled, water vapor condenses into liquid droplets, which are then removed by high efficiency integral moisture separator with a No Loss Drain.
- 4 Chilled air enters the heated desiccant tower to dry and supply lower than guaranteed dew point of -40°C or -70°C.
- 5 Dried air returns to the PCM air dryer's reheater, where it is reheated with very low dew point. This in turn, supplies clean and dry compressed air to point of use.

Phase Change in PCM Air Dryer

- 1 When the refrigeration compressor and condenser fan are running, the cold refrigerant in the chiller (evaporator) cools the liquid PCM and it gradually freezes.
- 2 When the PCM is sufficiently cooled and subsequently frozen, the refrigeration compressor and condenser fan will stop.
- 3 The compressed air is continuously cooled by the PCM while the refrigeration compressor is inactive. No power is consumed during this period.
- 4 The PCM gradually melts as it adsorbs heat from the compressed air, and when it is fully melted, the refrigeration compressor and condenser fan will resume to cool down the PCM.



Desiccant Air Dryer vs PCM COMBINATION

Air Dryer Type	Flow Capacity [Nm ³ /hr]	Power Consumption [kW]	Purge Air [%]	Regeneration Time [hr]	Daily Power Consumption [kW]	Daily Energy for Purging [kWh]	Annual Power Consumption [USD]	Energy Saving [%]
Heated Purge	14,000	120 (Heater 120)	15	4 (Heating 3 + Cooling 1)	2,160	5,880	352,152	
Combination Heated Purge	14,000	96 (Heater 42 + PCM air dryer 54)	5	16 (Heating 10 + Cooling 3 + Stand by 3)	1,019	1,593	114,375	68%
Blower Purge	14,000	197 (Heater 179 + Blower 18)	15	4 (Heating 3 + Cooling 1)	3,546	1,470	219,700	
Combination Blower Purge	14,000	111 (Heater 46 + Blower 11 + PCM air dryer 54)	5	16 (Heating 10 + Cooling 3 + Stand by 3)	1,244	368	70,575	68%
Zero Loss Blower Purge	14,000	250 (Heater 230 + Blower 20)	0	6 (Heating 4.25 + Cooling 1.25 + Parallel 0.5)	4,350	0	190,530	
Combination Zero Loss Blower Purge	14,000	135.5 (Heater 74 + Blower 7.5 + PCM air dryer 54)	0	16 (Heating 11 + Cooling 4 + Stand by 1)	1,779	0	77,900	59%

※ Purge cost USD 0.014 per 1 Nm³/hr ※ Power cost USD 0.12 per kWh ※ PCM air dryer energy saving of 70% ※ Daily energy for purge air [kWh] : (purge flow rate x purge cost) + power cost
 ※ Following figures varies on customer's environment

- Above table shows an energy savings comparison rate between a desiccant air dryer and a PCM COMBINATION without changing the air dryer type.
- The below example shows the detailed energy cost, when a heated purge air dryer is converted into a PCM COMBINATION - zero loss blower purge. As a result, energy savings are maximized when a desiccant air dryer is converted to a PCM COMBINATION along with their types.

Heated Purge Energy Cost (Annual)

- 1 Electric Heater **USD 124,173**
189kW x (2.5hr + 4hr) x 24hr x 365day x 0.12\$/kW
- 2 Purge Air **USD 343,392**
(14,000Nm³/hr x 20%) x (24hr x 0.014\$ + 0.12\$/kW) x 365day x 0.12\$/kW

Total ①+②
124,173 + 343,392

USD 467,565

PCM COMBIANTION (PCM + Zero Loss Blower Purge) Energy Cost (Annual)

- 1 Electric Heater **USD 53,480**
(74kW x (11hr + 16hr) x 24hr x 365day x 0.12\$/kW)
- 2 Blower **USD 7,391**
(7.5kW x (11+4)hr + 16hr) x 24hr x 365day x 0.12\$/kW
- 3 PCM Air Dryer **USD 17,029**
(54kW x Average utilization rate 30% x 24hr x 365day x 0.12\$/kW)

Total ①+②+③
53,480 + 7,391 + 17,029

USD 77,900

83%
Energy Cost Savings
USD 389,664

Return of Investment (R.O.I.) :
Less than 1year