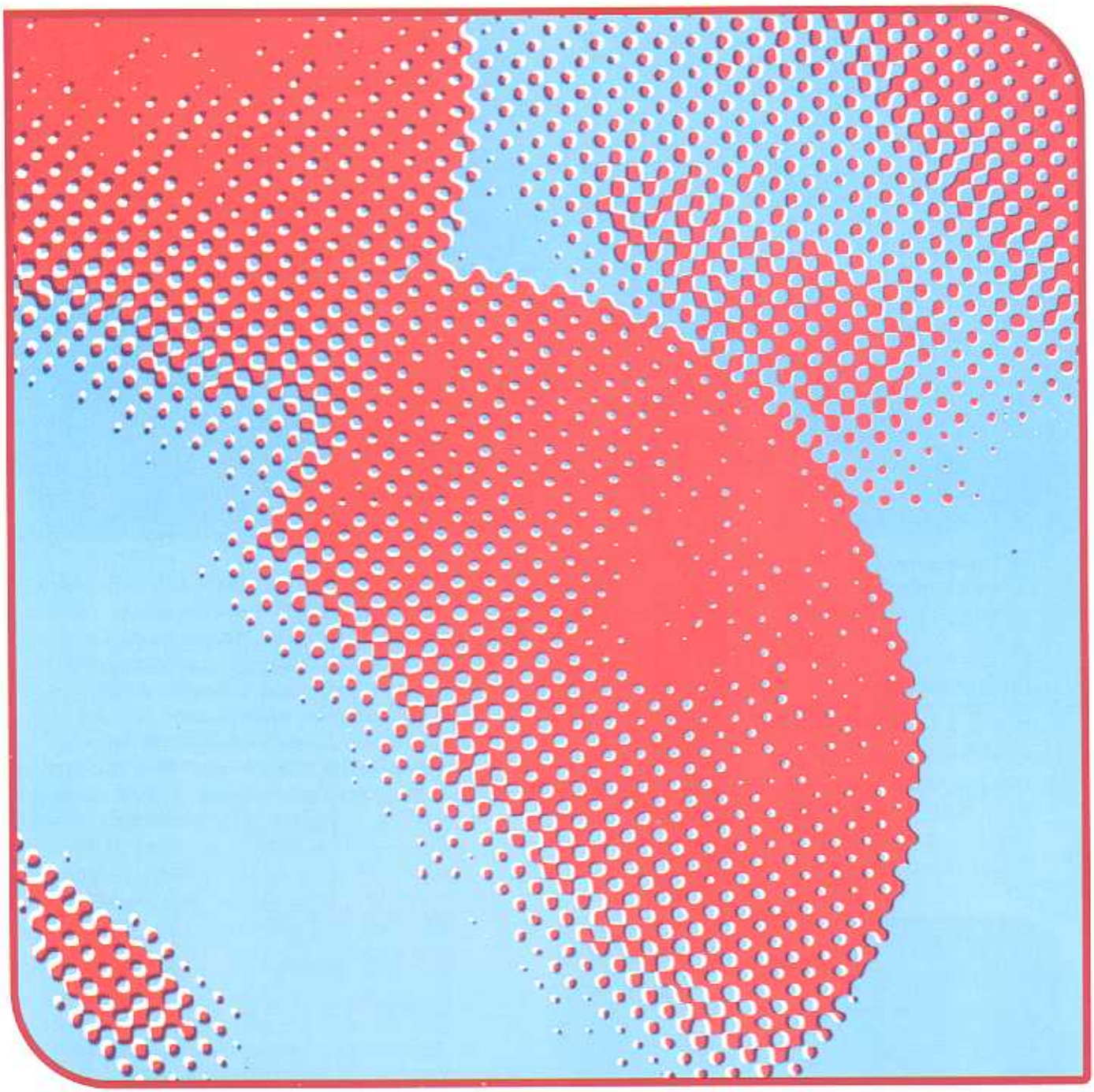
Molecular Sieve Systems



For separating, purifying and drying liquids and gases:

1. Where high outlet specification products are required.
2. Where selective removal of certain components from a stream is desired
3. Where the greatest possible freedom in process design is desired

BS&B®

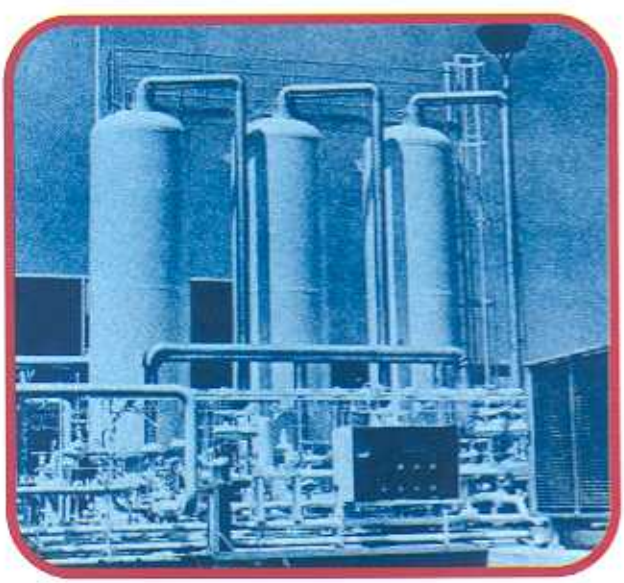
PROCESS SYSTEMS

Molecular Sieves: What are they?

Molecular sieves are pelleted powder bead mineral materials-synthetic zeolites-with three-dimensional crystalline structures. When activated, they become powerful adsorbents with a strong affinity for water, CO_2, H_2S and other polar molecules. They have a high adsorbing capacity over a wide range of operating conditions. The internal adsorbing surfaces are connected by channels or pores that are precisely uniform in size and dimensions.

BS&B Molecular Sieve Systems: Their capabilities:

1. In gas drying applications, obtain dewpoints from -40°F down to -140°F.
2. Achieve good drying results at inlet temperatures above 100°F.
3. Remove water, mercaptans, H_2S and heavier organic sulfur to meet NGPA specifications.
4. Simultaneously dry and sweeten LPG.
5. Remove CO_2 and water to meet cryogenic feed specifications of 20 ppm Co_2 and 1 ppm water.
6. Dehydrate gas streams where fouling by heavy hydrocarbons or by formation of elemental sulfur from H_2S has been a problem when other types of desiccants have been used.



Typical Molecular Sieve dehydration plant designed and manufactured by BS&B

Some typical applications of BS&B Molecular Sieve System

SERVICE	FLOW RATE	PRESSURE
Drying air to a dew-point of -90°F	2200 scfm	3500 psig
Removing water and CO_2 from air	2.6 mmscfd	3000 psig
Drying olefin and isobutane stream	2150 bpd	100 psig
Removing water and CO_2 from natural gas in LNG process	11.0 mmscfd	600 to 800 psig
Removing H_2S from propane	15,000 gpd	180 psig
Removing water and CO_2 from natural gas in LNG process	12.5 mmscfd	600 psig
Removing water from extremely sour natural gas (34% H_2S)	230 mmscfd	1250 psig

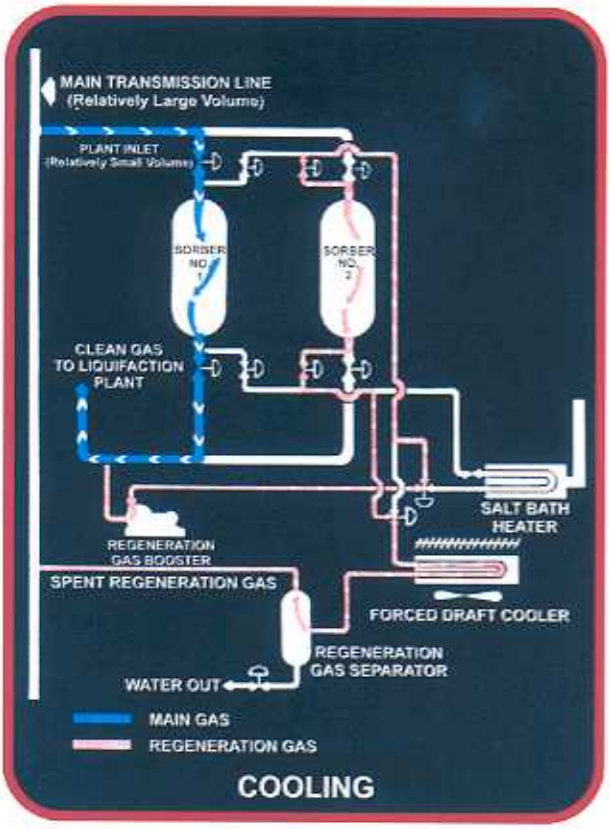
Pore size is important

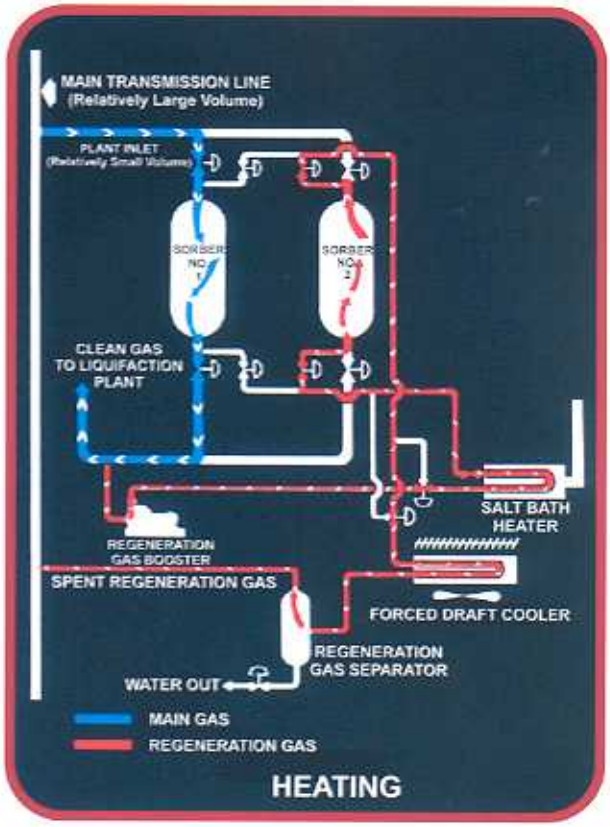
Depending on the size of the pores, some types of molecular sieves adsorb certain molecules readily, others adsorb them slowly, still others exclude them completely. Strict uniformity of pores for each type of sieve makes it possible for BS&B's applications engineers to select a sieve type that best meets the requirements of the customer.

How a typical BS&B Molecular Sieve System works

For continuous flow of gas or liquid to be processed, a molecular sieve system normally consists of two or more towers with beds of molecular sieves. While the bed in one tower is adsorbing, the bed in the other tower is being regenerated.

Process gas or liquid enters the top of the first tower and passes down through the bed of molecular sieves, usually at ambient temperature





After the sieves have been saturated to a point just below where breakthrough of the undesired contaminant will occur, the main stream is switched to the second tower. While the molecular sieves in the second tower are adsorbing, the bed in the first tower is regenerated by heating and purging with a carrier gas. Regeneration is usually carried on at temperatures from 400 to 600° F; however, the sieves will withstand temperatures to 1100°F without damage.

It is usually desirable to obtain the regeneration gas from the outlet side of the purification plant to prevent preloading of the regenerating bed during the cooling period. Uncontaminated streams of natural or synthetic gas or plant nitrogen can also be used for regeneration, when available. The use of a separate source of regeneration gas can often reduce the required bed size and increase the efficiency of the regeneration operation.

When regeneration has been completed and the bed cooled, time cycle controls switch valves which automatically route the main stream back through the first tower and the bed in the second tower goes through the regeneration and cooling cycle. Length of the operating cycle depends upon the amount of contaminant to be removed, and an economical balance between pounds of desiccant to be used and a practical size of regeneration gas heater. The normal range of cycle times is between one hour and twelve hours, although longer cycles can sometimes be attractive in the case of light inlet contaminant loads.

How BS&B design lowers your equipment costs:

BS&B design engineers know process equipment. They have been designing it for more than 20 years and have accumulated a wealth of knowledge in handling these processes:

- Dehydration with glycol adsorption, dry desiccant adsorption and molecular sieves.
- Desulfurization with amines and molecular sieves.
- Recovery of liquid hydrocarbons with natural refrigeration, mechanical refrigeration, ammonia adsorption refrigeration and quick-cycle adsorption.

Using proprietary design and performance data, patented processes and fabrication techniques, and a high-speed computer programmed to calculate, compare and select equipment, BS&B engineers can design a molecular sieve system that represents the best economic balance between equipment and operating costs for any requirement.

Is a BS&B Molecular Sieve System economically feasible for you?

Please submit the following information. BS&B process systems engineers will evaluate it and let you know if a BS&B Molecular Sieve System will be the best equipment for your requirements.

1. Stream(s) to be dried or purified:
   Inlet composition
   Temperature
   Pressure
   Flow Rate

2. Impurities to be removed:
   Type(s)
   Inlet content
   Desired outlet specifications

3. Gas available for regeneration:
   Composition of stream
   Maximum temperature available
   Maximum pressure available
   Maximum flow rate available

4. Type of control desired:
   Automatic or manual

5. Other pertinent information available.

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