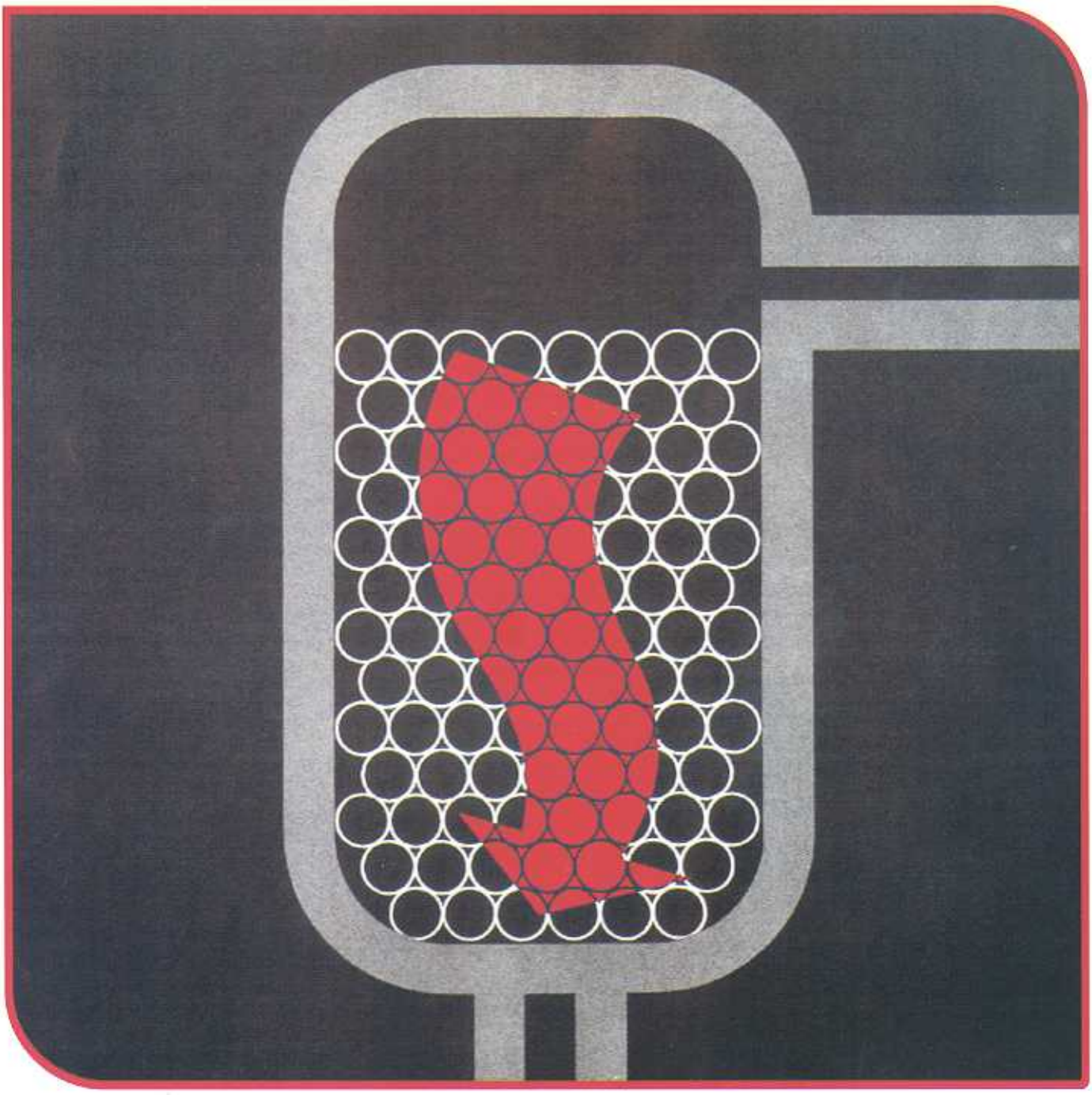
Liquid Petroleum Gas Dryers



For economical, effective removal
of water and other contaminants
from liquid petroleum gas

BS&B®

PROCESS SYSTEMS

NOW LPG drying can benefit from BS&B leadership in adsorption dehydration

BS&B Liquid Petroleum Gas Dryers are exceptionally efficient for dehydrating liquefied petroleum gases, particularly propane and butane, to meet NGPA quality specifications or other special dryness requirements. A BS&B Dryer will economically lower the moisture content of liquefied petroleum gases to 15 ppm; well below the normally accepted cobalt bromide test, which is critical to water concentrations in propane only above 40 ppm. Inlet water concentrations as high as 700 ppm can be effectively handled in a BS&B LPG Dryer.

BS&B leads the field in adsorption gas processing and can custom engineer processing units for field, station or on-the-line applications. Units can be designed to perform a combination of dehydration and sweetening.

A BS&B LPG Dryer employs a bed of highly porous desiccant which extracts water and other contaminants from the process stream. Two forces -surface attraction and capillary action -combine to adsorb these contaminants from the LPG passing through the bed.

When the desiccant bed becomes saturated, hot regeneration gas is passed through the bed to release the water from the surfaces and pores of the adsorption materials. The regeneration gas is then cooled and its condensable vapors are liquefied and collected. If the contaminant is a non-condensable it is disposed by flaring or other special methods.

BS&B design services assure you lowest initial investment and lowest operating costs.

BS&B engineers-backed by the company's leadership in manufacturing for the petroleum industry and assisted by the latest in electronic data processing equipment-will design to meet your most exacting drying requirements. They will design for maximum drying effectiveness while also effecting necessary stripping and sweetening operations with the same equipment.

BS&B custom-engineered LPG Dryers will do any required purification for the least initial expense and lowest possible operation and maintenance costs. BS&B engineers will put their engineering and design experience to work for you. They know the importance of effective regeneration, the importance of properly sized lines, correct desiccant loads, correct diameter to height ratios for the towers, and they will select the proper desiccant material to achieve desired results efficiently and at low initial cost.

How BS&B liquefied petroleum gas dryers work.

Dehydration normally occurs during an eight-hour, water-adsorption cycle (see flow diagram A). The regeneration cycle consists of a heating period of five and one-half hours (see flow diagram A) followed by a cooling period of two and one-half hours (see flow diagram B). Two vertical adsorbers are normally used. While one adsorber is drying the LPG, the other adsorber is undergoing regeneration. The units can be designed for shorter or longer cycles to suit operating requirements, and can be manually or automatically switched.

During the drying cycle, LPG flows through the desiccant bed, giving up its water to the desiccant. If inlet product is known or suspected to contain any free water, a horizontal separator is installed before the adsorber, since free water is destructive to the desiccant.

During the regeneration heating period, the main pump draws LPG from the outlet line and pumps it through the heater where it is vaporized and super-heated to temperatures as high as 500'F. The vaporized LPG enters the adsorber and flows through the saturated desiccant. Initially, the hot vapor forces liquid LPG out of the adsorber, then, as the tower temperature increases,

Typical BS&B LPG Dryer. This unit has a capacity of 1600 GPM

adsorbed LPG and finally adsorbed water are vaporized and carried away with the hot LPG vapors. Hot gases and liquids flow to the condenser where they are cooled to approximately 100°F. Water condenses out of the LPG at this temperature. The mixture of cool LPG, water and other condensed components flows to a separator where the components are separated. LPG returns to the inlet side of the tower on adsorbing service. Water collects at the bottom of the separator and is dumped periodically by a level actuated dump valve. A three phase separator will be used when other condensates must also be removed from the LPG.

After five and one-half hours of heating, the temperature of the outlet LPG vapors will rise to a point that indicates that all water has been removed from the desiccant. The valves are then switched to start the cooling cycle.

During the cooling period the pump continues to draw dry LPG from the unit outlet. Flow from the pump is direct to the adsorber, forcing the hot LPG vapors out. Vapors and hot LPG liquid leaving the adsorber flow to the condenser where the temperature is lowered. The cold LPG returns to the unit inlet. After two and one-half hours of cooling the adsorber outlet temperature will indicate that the bed is sufficiently cooled and can be switched to the drying cycle.

Salt-bath Heater

Regenerating heat is normally supplied by a salt-bath indirect heater, operating at bath temperatures up to 700°F. Other type heater can be utilized depending upon the size and application. Years of in-field operating experience have proved the dependability of BS&B's salt-bath heaters.

Dependable, long-life pump

The regeneration circulation pump is selected to give the longest between maintenance times and lowest utility consumptions possible.

Water or air cooled condenser

Either water or atmospheric air at ambient temperature is used to cool the hot LPG. Water cooled condensers employed on a BS&B LPG Dryer are usually designed and manufactured by BS&B, and are engineered to make the best use of the available cooling water.

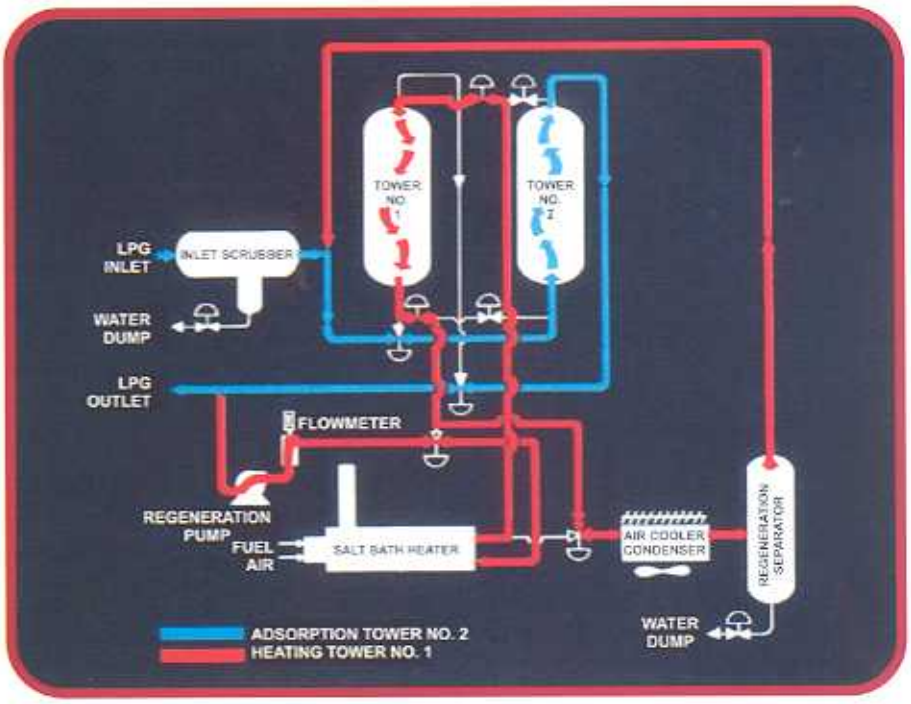


Diagram A - Adsorption cycle in Tower 2, heating Tower 1

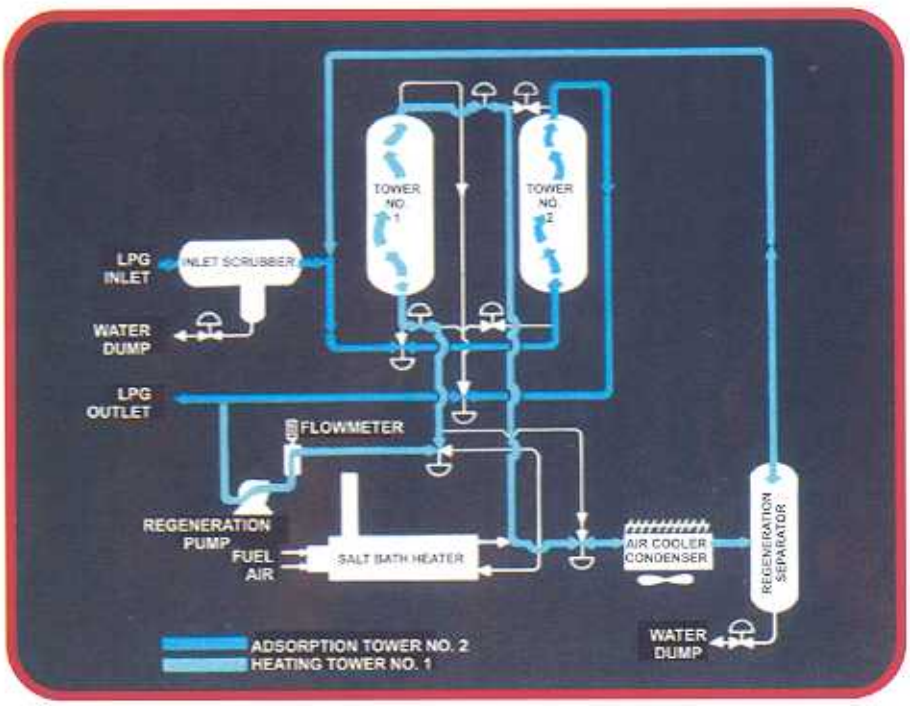


Diagram B - Adsorption cycle in Tower 2, Cooling Tower 1

When water is unavailable or if the customer desires air cooling, a standard industrial forced-draft air cooler can ordinarily be applied, even in locations with high ambient temperatures.

Available with molecular sieve desiccants

The ability of molecular sieves to selectively adsorb single or multiple components of a stream will make their use desirable when the LPG contains multiple contaminants with similar molecular weights or when an extremely low LPG dewpoint is required. These units must be individually designed to meet the specific job requirements. BS&B has designed many successful special function drying units using molecular sieves, and can give rapid engineering and cost information to prospective users.

Include this information when inquiring about BS&B Liquid Petroleum Gas Dryer:

1. Composition of stream to be purified
2. Type and amount of contaminant
3. Inlet flow rate in gallons per minute
4. Inlet temperature and pressure
5. Required designed pressure of equipment
6. Required outlet purity
7. Geographic location and elevation of equipment site
8. Is sweet natural gas available for regeneration? If so, what is available volume, temperature and pressure?
9. Available electric current: volts, phase, cycle
10. Available cooling water; GPM, temperature
11. What codes of design and construction are required (ASME, API, etc.)

Corporate Credentials

BS&B is a unique single source of supply for equipment and service to the international petroleum, petrochemical, chemical and power industries. All major components of process systems and products to supply these markets are designed by BS&B engineers, manufactured at BS&B facilities, and field tested by BS&B technologists. You can be assured that each BS&B recommendation is backed by drawing board-to-field knowledge of the products or services specified. The company maintains offices in most major cities throughout Western Canada, the United States and principal cities overseas. Translating special engineering and manufacturing projects into reality through working experience and know-how is a basic tenet of the BS&B corporate philosophy.

BS&B®
PROCESS SYSTEMS

www.bsb.ab.ca