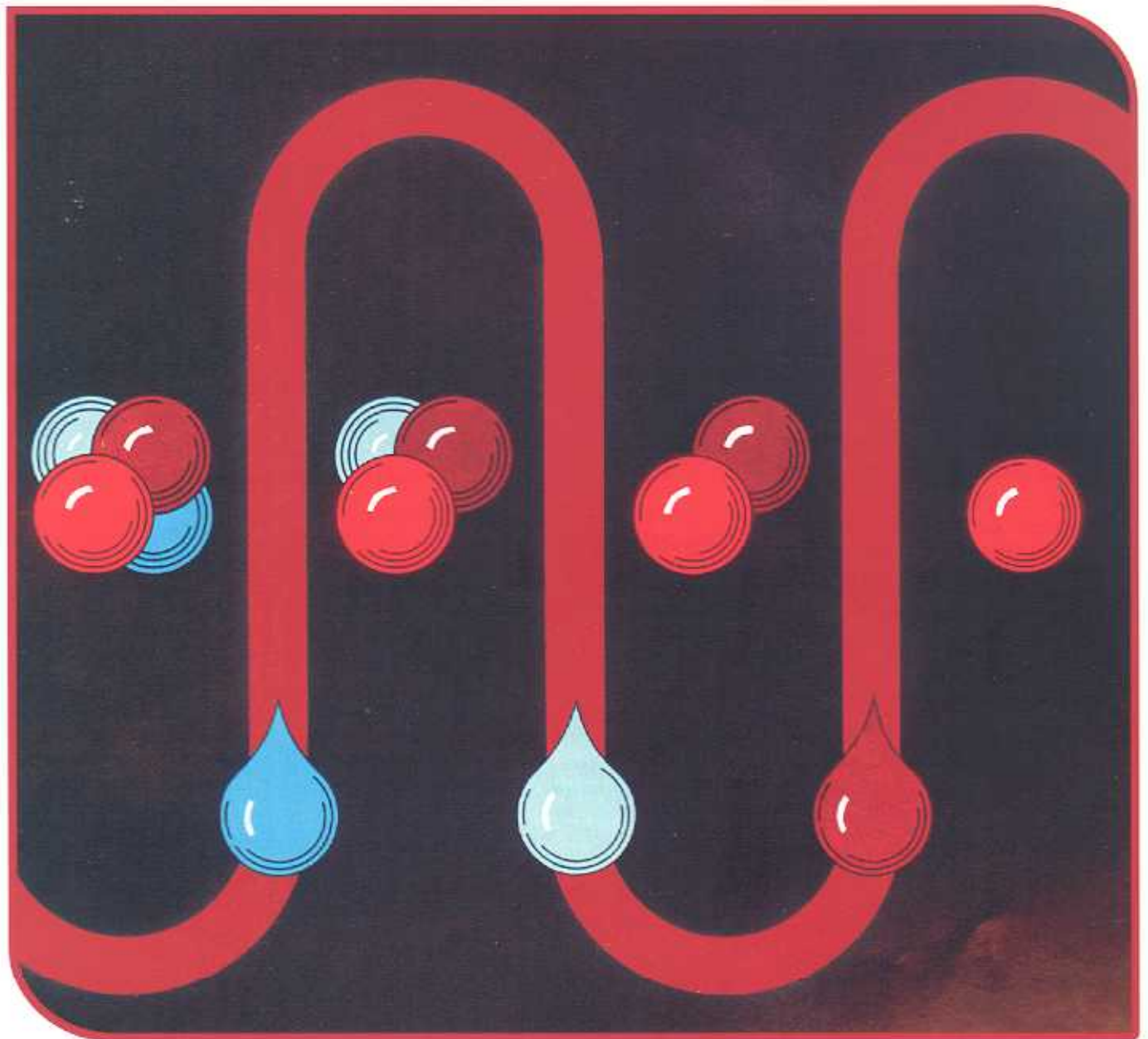


Mechanically Refrigerated Hydrocarbon Recovery Units



Profitable hydrocarbon separation on
lean, low-to-medium-pressure streams.



BS&B can custom engineer mechanically refrigerated hydrocarbon recovery units for most economical operation on normal medium pressure gas wells or marginal gas sources.

Where to use BS&B mechanically refrigerated hydrocarbon recovery units.

When flowing pressure has declined to the point where natural refrigeration through adiabatic expansion is no longer practical, a skid-mounted BS&B refrigerated hydrocarbon unit becomes the most economical solution. These units combine the basic equipment and dependable operating principles of BS&B COLD-FRAC® equipment with highest quality mechanical refrigeration components to achieve exacting dewpoint control and effective separation of low-to medium-pressure gas streams.

Broad application

BS&B engineers will design small, compact, portable hydrocarbon recovery units to match any hydrocarbon recovery task below the economical range of other types of systems. There are many opportunities for application of these BS&B mechanically refrigerated units to low yield wells and small gas sources. With refrigeration capacity as small as 4.9 tons and cooling capability down to -20°F, these units have applications never before considered economically feasible.

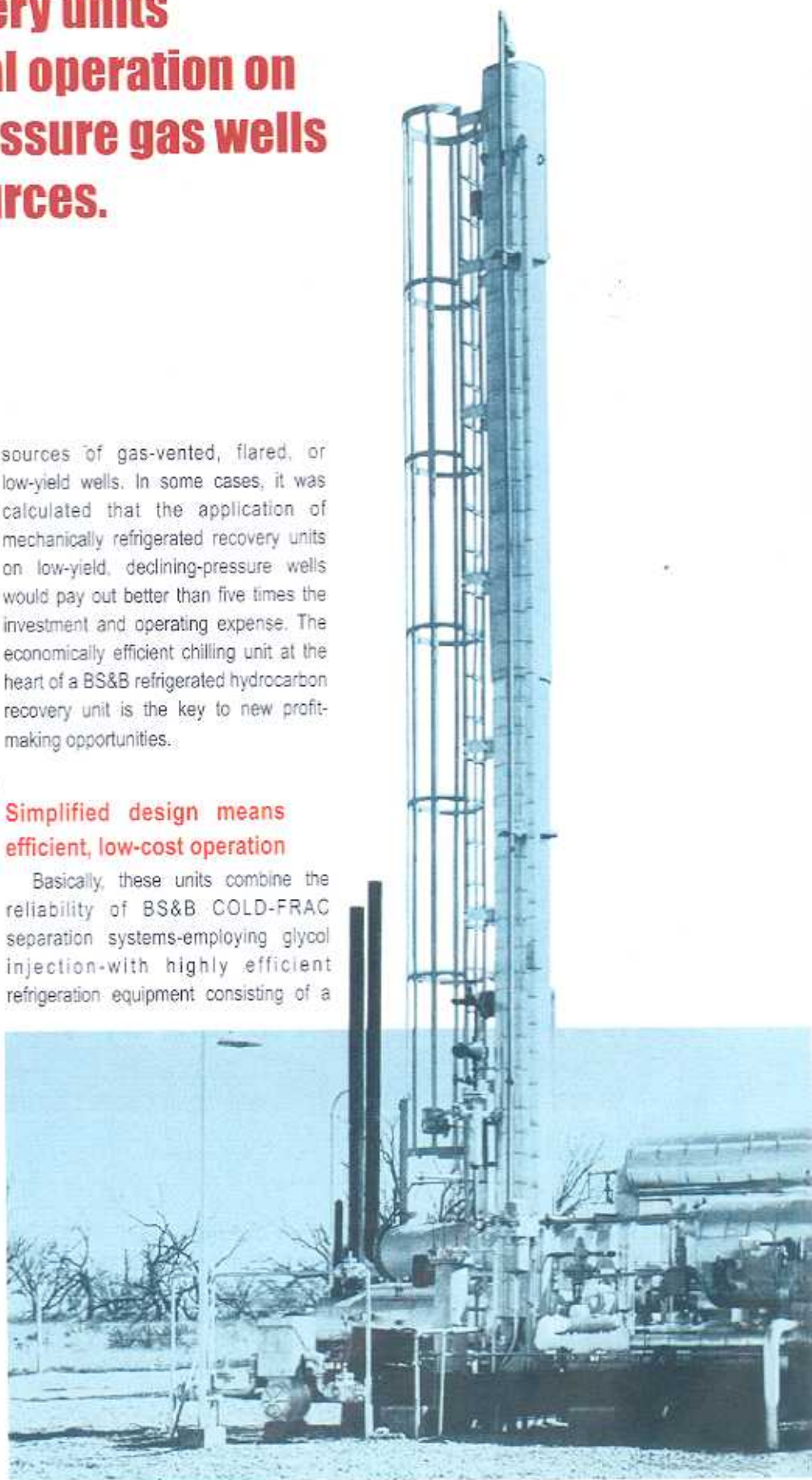
New products and markets

One major oil company discovered twenty or more applications for BS&B refrigerated hydrocarbon recovery units when it looked into all possible

sources of gas-vented, flared, or low-yield wells. In some cases, it was calculated that the application of mechanically refrigerated recovery units on low-yield, declining-pressure wells would pay out better than five times the investment and operating expense. The economically efficient chilling unit at the heart of a BS&B refrigerated hydrocarbon recovery unit is the key to new profit-making opportunities.

Simplified design means efficient, low-cost operation

Basically, these units combine the reliability of BS&B COLD-FRAC separation systems-employing glycol injection-with highly efficient refrigeration equipment consisting of a



Compressor with driver, air-cooled condenser, and a shell-and-tube chiller.

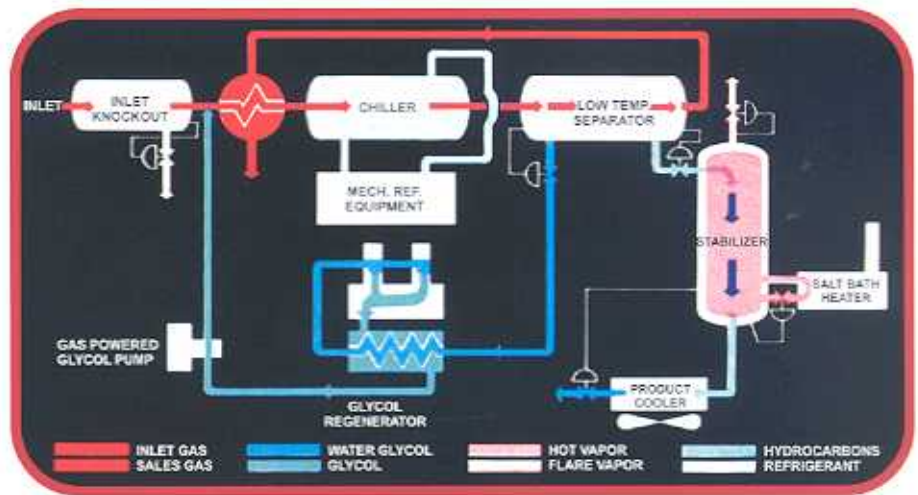
In operation, low or medium pressure inlet gas is often compressed and then cooled before entering the BS&B hydrocarbon recovery unit. Once in the system the gas passes first through to a free-water knockout, where water is removed and discharged from the System.

Glycol injection

Next, glycol is injected into the process stream to reduce hydrate formation as the temperature of the gas/liquid mix is lowered. Then, following glycol injection, the process stream a heat exchanger for additional cooling and to reduce the load on the chiller.

In the chiller, the process stream temperature is lowered to a specified temperature-as low as -20°F-to meet the customer's hydrocarbon recovery requirements. A prime design consideration is to achieve economic balance between hydrocarbon recovery and initial cost of the recovery unit.

The chilled process stream, consisting of a gas / glycol / condensate mix, passes from the chiller to a low temperature separator. Here dry gas is separated and leaves the unit through the inlet heat exchanger where it helps to pre-cool inlet gas prior to chilling. Chilled hydrocarbon liquids and glycol / water solution are



separated in the low temperature vessel aided by BS&B's novel archplate internals. The glycol-water mixture is conducted from the low temperature vessel to a reconcentrator, where it is processed for recycling in the system. The hydrocarbon may then be directed to a stabilizer for further processing.

Product stabilization

Stabilization is the preferred method of processing the liquids separated in a Refrigerated Hydrocarbon Recovery Unit. The liquid product is normally a high vapor pressure material which will lose appreciable volume when stored in atmospheric tanks. The stabilizer reduces the vapor pressure of the product to the optimum level with

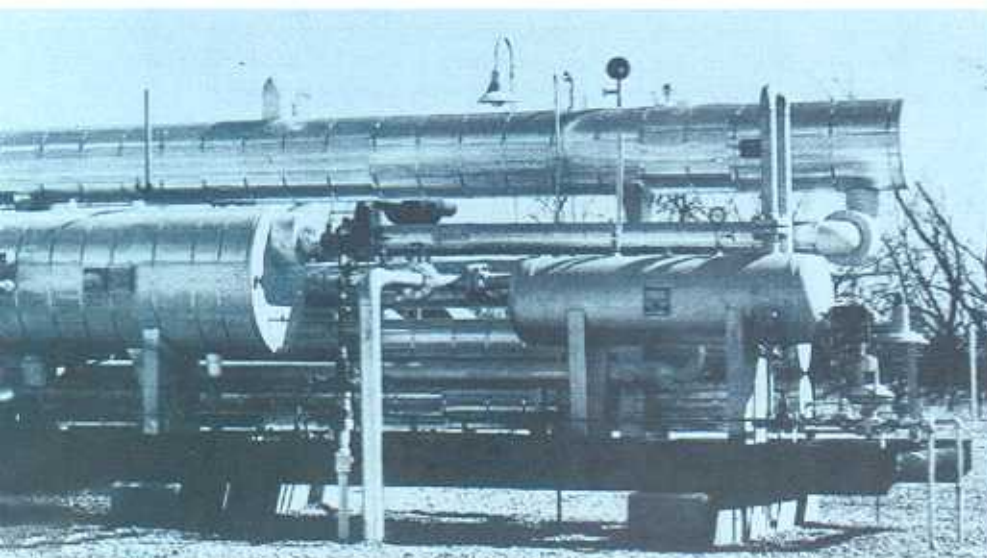
the least loss of volume.

The stabilization process consists of the cool liquid product descending in a column through ascending warm vapors produced by a reboiler connected to the lower section of the column. By controlling the pressure and temperature of the column, the fractionation will produce a bottom liquid product of the desired composition.

The product distillate moves from the stabilizer to storage or to a products pipeline.

Advantages of a BS&B mechanically refrigerated hydrocarbon recovery unit:

1. Compact and dependable ... low investment ... low operating cost
2. Recovers profitable heavier hydrocarbons from gas streams as small as 1/2 MMSCFD
3. May make low yield wells profitable again
4. Skid mounted ... automatic ... can be operated without electricity
5. Reduces water dewpoint of gas to pipeline specifications
6. Controls hydrocarbon dewpoints to acceptable levels for pipeline efficiency
7. Custom engineered for minimum cost and early payout
8. Packaged ... ready to tie in your lines, hook up utilities... minimum labor
9. Minimum attendance, easily automated



**Include this information when
inquiring about BS&B mechanically
refrigerated hydrocarbon recovery units:**

- 1-Gas inlet flow rate
- 2-Gas gravity or MW
- 3-Gas analysis-mol. % through C6
- 4-Operating pressure
- 5-Maximum working pressure
- 6-Inlet temperature
- 7-Outlet temperature
- 8-Ambient air temperature
- 9-Out water content or dewpoint
- 10-Required hydrocarbon dewpoint
- 11 -Type pump desired
- 12-Corrosion allowance
- 13-RVP product desired
- 14-Grains H₂S, inlet and outlet
- 15-Other impurities
- 16-Allowable pressure drop
- 17-Utilities available (describe)
- 18-Type and heating value of fuel
- 19-Cold weather features

BS&B natural expansion recovery units.

BS&B also designs and manufactures several types of hydrocarbon recovery plants that employ natural expansion of gas as a primary cooling method. These units are appropriate for larger volume, higher pressure streams in which a 3 to 5 year high pressure life is expected. Inlet pressures should ordinarily be at least 1000 psi higher than the sales line pressure. BS&B GDH units employ glycol injection to inhibit hydrate formation in the process.

