Initial Separation

The mixture of liquids and gases from the wellstrearn enters the tank under pressure. Suddenly it is in a larger, unconfined space.

The mixture hits a deflector. Gas rises. Liquids drop. Baffle plates are positioned just ahead of the gas straightening vanes and below the deflector. These plates extend into the head. Liquid drops below the plates. Gas and liquid are held apart.

DISH DEFLECTOR

The dish deflector is a saucer - shaped dish. The wellstrearn mixture hits it. There is a sudden, rapid change in the direction and velocity of the mixture. The mixture splashes back against the curved end of the tank. Gas fumes and mist rise to the top of the tank. Liquids fall to the bottom. Thus, you get initial separation.

WHY A DISH DEFLECTOR?

BS&B engineers choose a dish deflector over angle or cone type deflectors for one good reason. Because it is smooth and round, the BS&B dish deflector creates less disturbance, thus cutting down on re-entrainment of gas in the liquid mixture.

CYCLONE INLET

Used normally where there is a lot more gas than liquid in the mixture coming into the tank. The liquid usu - ally appears in slugs. The slugs gush into a circular enclosure. They are diverted around the sides, at high velocity. Centrifugal action separates the liquids which, being heavier, fall to the bottom. Gases escape through an opening in the top of the deflector. Liquids are rushed to the liquid area quickly, reducing reentrainment tendencies.

With the cyclone deflector, BS&B engineers often install a weir or dam just below the deflector. The weir has a small port located near the bottom of the vessel. As liquid is trapped behind the weir, it moves into the main vessel only as fast as the small port allows it to. Thus, there is no overload on the liquid level controls at the far end of the vessel, and flooding of the mist extractor section is eliminated.

Gas Straightening

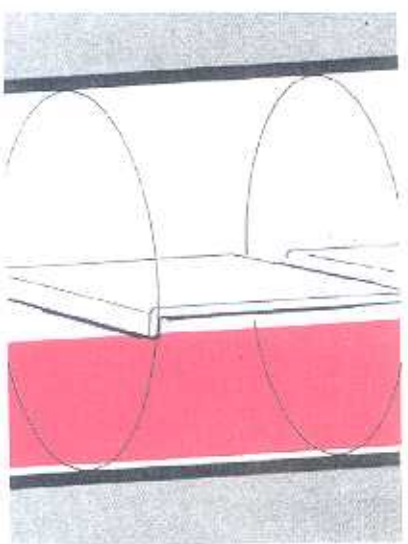
After gas leaves the initial separa - tion area, it must be straightened to remove turbulence in the gas stream. Straightening vanes are vertical plates, running lengthwise in the vessel. They extend down into the tank to a point just above the liquid level.

Gas enters the vanes, an area of controlled, one-direction movement. This reduces turbulence. And the reduction in turbulence allows the highest efficiency in recovery of liquids. This is because liquids tend to fall out naturally, through gravity, when the gas stream is in a non-turbulent state.

Settling

One function of a separator is to slow down and smooth out the mixture flow. Then, natural separation can take place.

Liquids are retained in the vessel by liquid level controls fora sufficient length of time to allow natural separation to take place. In applications that warrant steps to prevent gas eddies from entering the liquid area, horizontal plates or baffles are also placed in precise locations above the



expected liquid levels.

BAFFLES

These baffles are flat with lip edges. They are used to keep gas from creating surface turbulence and reentering the liquid stream at the surface of the liquid mixture.

CAREFUL ENGINEERING

The design and placement of these baffles is vital to efficient settling. That's why they are so carefully engineered by BS&B - designed against the exacting specifications of the individual wellstream the separator handles.

Mist Extraction Section

After the gases leave the straightening vanes, there may still be liquid droplets-very tiny-in the gas stream. There are two basic processes used to remove these liquid droplets.

IMPINGEMENT

The gas stream, moving rapidly, strikes against an object. Gas is diverted to left or right. Liquids push forward and impinge upon the object.

HOW BS&B DOES IT

BS&B uses a stainless steel knitted wire mesh mist extractordesigned to exacting specifications. It is placed to fill the upper part of the tank. All gas moves through it; liquid impinges within it, and coal-

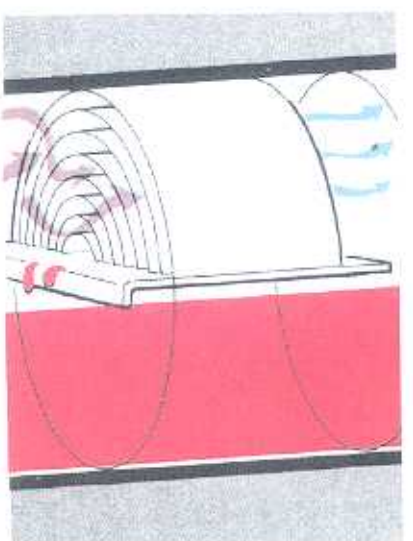
esces into large droplets which fall to bottom of tank. **With the knitted wire mesh mist extractor, BS&B is able to limit liquid carryover to 1/10 gallon per million cubic feet of gas on all particles 10 microns and larger.** Where there is slight foaming action, a second extractor is installed behind the first. (For serious foam problems check BS&B Foam Separators.)

COALESCENCE

Gas is led parallel to a baffle already wet with oil. The wet surface acts as a magnet. It attracts tiny droplets which coalesce on its surface and drain to the bottom of the tank.

HOW BS&B DOES IT

BS&B uses arch plates-curved plates of steel. They are curved to match the diameter of the tank. Each plate, gradually diminished in di-



ameter, is placed within the others in exacting relationships. With this unique BS&B design feature, maintenance problems leading to downtime are greatly reduced in separation processes where high paraffinic content is involved. Unlike the old conventional maze-like coalescence sections that divert gas into a torturous path, BS&B Arch Plates are less likely to become clogged by solid particle buildup. These plates may be complete circles or semi-circular, depending on quantity of liquid... and the tank area required to contain it. Liquids in gas flowing between the arch plates coalesce by molecular attraction. Thus, the gas is stripped of liquid droplets.

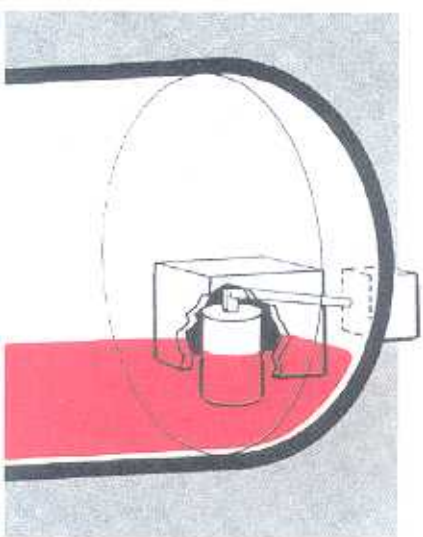
NOTE: In most BS&B separators a baffle is welded horizontally across the front of the gas outlet, reversing gas flow direction, as a final mist extraction step.

Liquid Level Control

Liquids must stay in the tank long enough for full, natural separation. So, exit from the tank is controlled. Liquid level controllers maintain the height of the liquid level. When the level reaches a pre-delermined point, the controllers dump excess into the outlet lines.

HOW BS&B FLEXIBILITY PAYS OFF

BS&B-designed controls for separation processes feature built-in



flexibility. These controls are engineered to be easily adaptable to a wide range of conditions. For instance, over a period of time the amount of oil, gas and water in the wellstream may change. The controls can be adjusted to vary the level at which liquids are dumped, up to the height of the permanent gas treatment components. This allows flexibility for liquid-gas ratios other than originally specified.

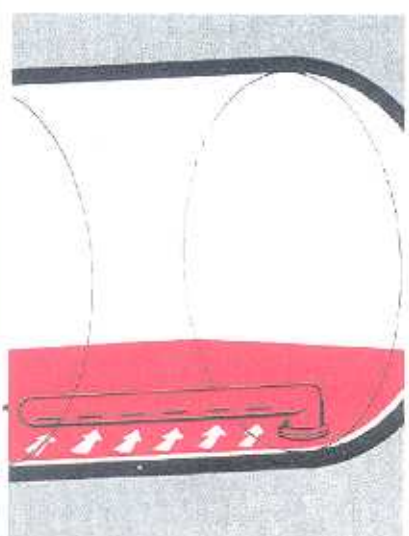
Exclusive BS&B controls are designed to be adaptable to specific separators to meet exacting requirements for every processing application. Because BS&B control equipment is versatile, rugged, simple and accurate, long, trouble-free service life and performance are assured.

Withdrawal

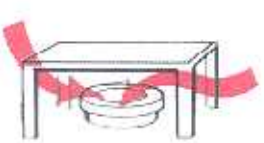
As liquids are rapidly removed from the separator, vortexes could form. If they did form, gas could reenter the liquid. Vortexing is prevented in one of two ways:

ANTI-VORTEX LIQUID DRAWOFF

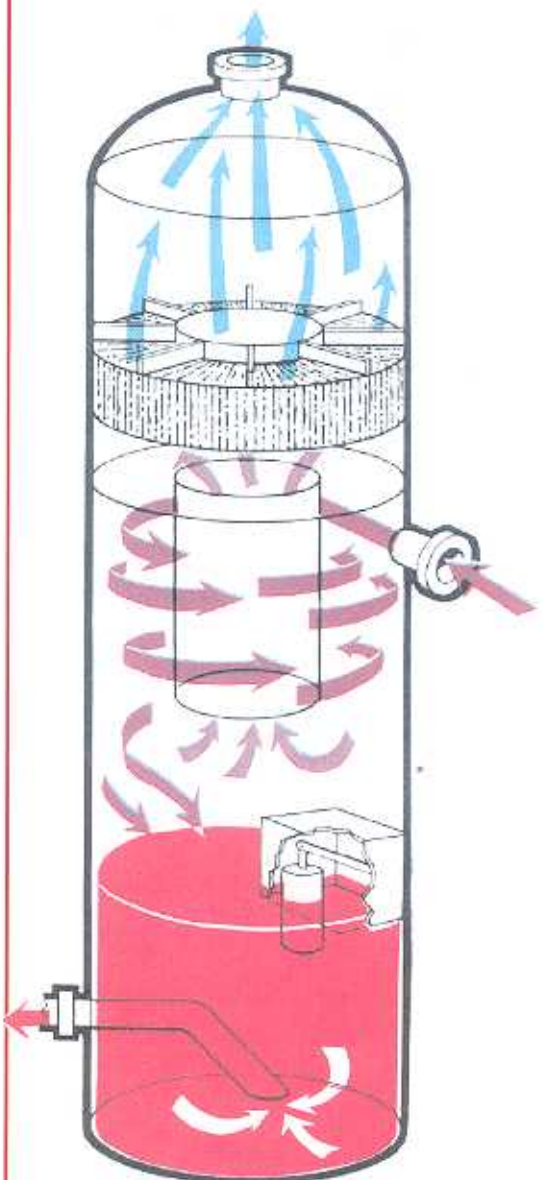
This is, simply, a horizontal pipe extending lengthwise into the tank. It is slotted along its lower diameter, and along its length. This allows liquid to be withdrawn over a larger



area at lower velocities. So, no vortexes.



This is a plate of steel welded over the outlet. It breaks the outlet stream into two parts. These plates are used in slow-moving streams, where vortexing is less of a problem.



HORIZONTAL OR VERTICAL SEPARATORS

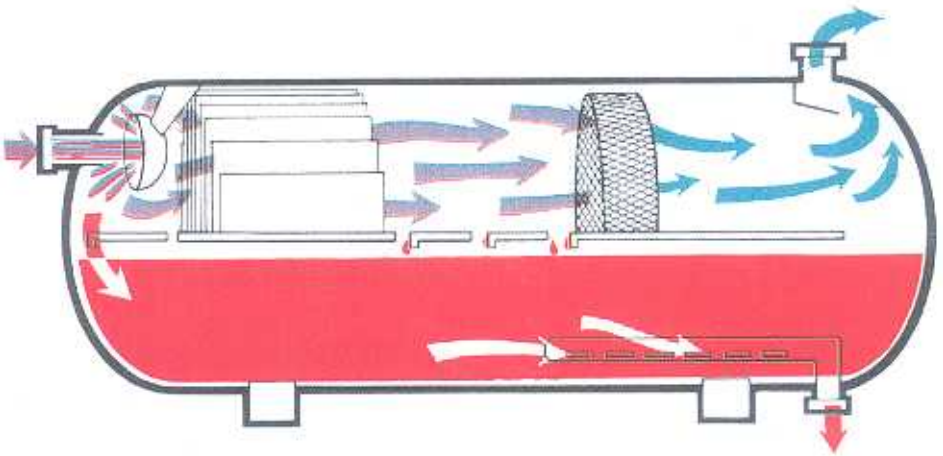
All BS&B components are, of course, adapted to either horizontal or vertical separators, though horizontal separators were used here for purposes of illustration. These components are made larger or smaller, depending on volume of liquids and / or gas, and other factors. Each is engineered to meet the specific requirements of the job.

Typical oil field problems solved solved by BS&B separators:

PROBLEM:
Two-phase separation for recycling in a gas condensate field.

CONDITIONS:
20,000: 1 GOR, 1000 psi W.P., 100' F, 10 MMSCFD, 500 _8OPD, Oil Gravity: 70' API, Gas -Gravity: 0.7

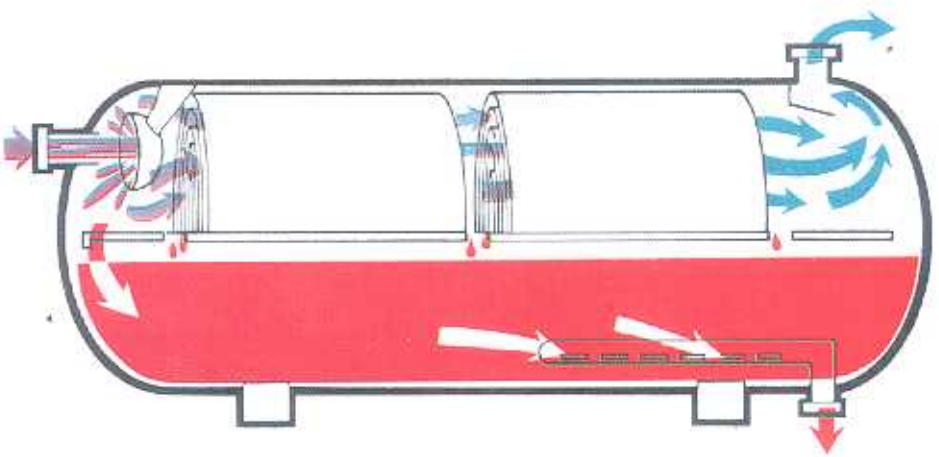
RECOMMENDED ELEMENTS:
Dish Deflector, Straightening Vane Section, Mist.EXtractor and Anti-Vortex Liquid Withdrawal.



PROBLEM:
Two-phase, primary separation; waxy gas production.

CONDITIONS:
10,000: 1 GOR, 1000 psi W.P., 80' F, 10 MMSCFD, 1000 BOPD, Oil Gravity: 0.7

RECOMMENDED ELEMENTS:
Dish Deflector, Two Arch Plates, Anti-Vortex Liquid Withdrawal.



PROBLEM:
An after scrubber needed downstream of a condensate separator that is prone to clog up, due to paraffin, and carry over.

CONDIT4ONS:
500,000: 1 GOR, 1200 psi W.P., 90' F, 150 MMSCFD, Condensate Gravity: 0.50' API, Gas Gravity: 0.65

RECOMMENDED ELEMENTS:
Dish Deflector, Full Diameter Arch plate, Anti-Vortex Liquid Withdrawal.