OUR PERSPECTIVE

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BAFFLED BY BAFFLES?

Sometimes referred to as 'cans', but we know there's more to it than that. The internals in production equipment can make all the difference when oil treating. You may wonder why a 10′ treater $ 700,000 and other one costs only $ 200,000 and both seem to be doing the same job. The difference is the baffles.

Oil gravity, water gravity as well as the relative volume of each, inlet temperature and viscosity all play a role in how well a vessel can treat the emulsion. Remember that two emulsions that share the same characteristics may separate at different rates because of the emulsion quality. For example, some end users had more trouble separating heavy oil lifted with screw pumps than when a conventional pump jack is used. It was determined that screws further emulsified the crude with water on the way to the surface.

Volume of oil gravity, water quality, inlet temperature and viscosity play a role in emulsion.

The above factors determine how elaborate the internals of the vessel need to be. If you're producing a lot of water, but not enough to use a free-water knockout, then you might make allowances for that in the treater. To understand how, let's first identify some of the components often found inside, using a horizontal treater as an example.

The first thing your emulsion "sees" on the way in is some sort of inlet diverter. These can be a simple broken plate that makes use of the splashing against the plate to break out the components, mostly the gas. The second style is the centrifugal inlet. This is a piece of pipe that leads the emulsion into a larger diameter pipe at an angle that induces a spin in the large pipe. The spin is designed to force the heavier parts of the emulsion against the wall and the lighter components are allowed to break out towards the centre of the pipe. This type of inlet is often used

BAFFLES – WHAT YOU NEED TO KNOW

- Baffles are used to move as much free water away from the firetubes to avoid heating water instead of oil for separation.
- Firetubes heat the emulsion to bring the viscosity to a point where the oil and water can start to separate more easily.
- The volume of oil gravity and water quality, inlet temperature and viscosity play a role in emulsion.
- Vertically mounted louvered baffles can be used to induce a downward flow in the emulsion.

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on treaters with gas domes. Gas domes are often used on treaters that have a larger amount of gas to deal with.

From the inlet diverter, flow might simply divert to a head on the inlet side, or into a full or part horseshoe-shaped baffle designed to bring all the emulsion to the bottom of the vessel before it reaches the firetube. The firetube heats the emulsion to bring the viscosity to a point where the oil and water can start to separate more easily.

This baffle design is effective in treaters when the goal is to get as much free water away from the firetubes so that no extra fuel is spent heating low revenue water instead of oil. Using gas to heat this emulsion is an important component of some treater designs.

A third design often used in treaters with multiple firetubes that force the emulsion along one firetube, and then moves to the next etc. This method is often used in treaters where heat is one of the primary means of separation. By forcing the flow around the firetubes you heat up all of the emulsion, including the water. Therefore, this design may cost more in fuel than necessary if a lot of free water is present. However, if the emulsion has to be brought to a higher temperature in order to break, this is a preferred design. An additional attribute of this option is the individual control now given over each tube. Now the emulsion is in the heated section and meets with the firetube. It's expected that the majority of the free water is now making its way out a first dump, as you often see on treaters with side controls, or on end-control vessels; making its way down the bottom of the vessel to the water dump on the cold end of the treater. The "emulsion" is what the treater is now working on cleaning up. This is the part where water and oil are mixed well enough that heat and settling time are needed to get pipeline specification oil. The firetubes raise the temperature of the emulsion from 10 to 15°C at a minimum, from a low of 38 to a high of 150 °C in extreme cases. But the average is typically of 55°C.

Baffles are designed to move as much free water away from the firetubes to avoid heating water instead of oil for separation.

Now it's time for the hot emulsion separate. The emulsion is sent to another section either over a weir, through a pipe, or through a box. This can aid the separation as is the case with the boxes. On some treaters, the emulsion is bubbled through what are called "sparging" boxes. Picture a box with holes at the side, near the top. The bubbling emulsion moves up and through previously already settled water or oil will help the smaller droplets combine with others to become large enough to finally separate out. This process is called coalescing.

Another box design commonly called a coalescer box or coalescing section uses hay (now often replaced with man-made materials), stainless or plastic baffles to help this coalescing process. Either one works depending on the emulsion. The plastic often works better, but is not suited to the higher temperatures or corrosive materials.

Another separation method uses vertically mounted louvered baffles that induce a downward flow in the emulsion. These baffles help quiet the oil-gas interface, but also distribute the oil flow uniformly. This is important especially in larger vessels, where oil is known to "channel" its way from one end to the other.

Within this settling section, beside a coalescing medium, you may also find an electric grid. The electric grid can be used on its own, or in conjunction with a coalescing medium. The electricity can often help with the final cleanup that mechanical means cannot provide. These grids can be mounted horizontally or vertically. It is argued that a vertical grid orientation can improve the level of performance of horizontal ones.

Some older treaters will take the best oil off the top and dump to tanks. Modern units use oil boxes. This allows the cleanest oil to spill into a smaller section that is otherwise isolated from the rest of the treater letting the treater dump oil without upsetting the emulsion in the settling section.

Some treaters use de-sand systems to help drain off the sand that settles in the bottom of the vessel. Others provide sample lines that allow the operator to take samples in different sections, and at different levels. This effectively allows the operator to "see" what's going on inside at different intervals and to pinpoint trouble spots. Thus for example, he can identify trouble spots such as "emulsion pads" which form between the water and oil interface in some treaters. These pads can be drained from somewhere in the middle of the treater and allow the treater to continue with normal operations.

Some drains are equipped with "vortex breakers". These are designed to keep vortices from sucking the wrong liquid out the vessel. They come in different designs, but a common one is a horizontal plate attached above a standing pipe that forces the draw-off from anywhere below the plate.

All of the above options improve emulsion in the treater but keep in mind that more does not always equal better. Do your homework and determine the best option for your production needs.