
Question 62: What are the refiners experiences using static mixers in place of, or in conjunction with, traditional mixing valves at the desalter?

Doug Meyne (Champion)

Years ago, many refiners installed static mixers in desalters, as opposed to traditional mix valves, to improve contacting of water and oil at a lower pressure drop. In theory, this was a good idea, but in practice it has not worked well. If sized properly, the static mixer can provide uniform mixing. Unfortunately, refineries change crude slates, charge rates, and wash water rates to the point that the mixers are out of their optimal zone. A traditional mix valve allows for adjustment up and down depending on the types of crudes processed and the operational changes implemented. If a static mixer is being considered, we recommend a bypass be installed and the original adjustable mix valve be in place and available for service if needed.

Champion is not aware of any refineries in the United States that currently operate a static mixer only configuration in their desalters; however, it should be noted that the use of static mixers seems to be more accepted in Europe than in the United States. In most cases where a static mixer is in operation, it is being used in close conjunction with a traditional mix valve.

An alternate way to achieve the primary benefits associated with static mixers, better mixing and reduced pressure drop, is to relocate all or part of the desalter wash water to the suction of the crude charge pump. The success of this approach is very dependent on emulsion breaker selection. It is critical that a very robust emulsion breaker, specifically selected for the given crude slates, be utilized.

Eric Thraen (Flint Hills Resources)

We had a static mixer on one of our crude unit's desalters, but this was removed a few years ago. The static mixers were installed in series with, downstream of the mix valves, with bypass capability around the static mixers. The style of static mixer specified was chosen to limit the plugging potential in that mixer. It is possible the design chosen had too much open area and too little structural strength. During a recent revamp the static mixer was eliminated due to the need to revise the piping layout. After the mixer was removed it was found that the mixing internal element was broken. The cause of the mixer internals failure cannot be determined but it is suspected that two-phase flow during decommissioning may have contributed.

Jim Johnson (Marathon Petroleum)

In theory, a static mixer would produce more uniform water droplets, however only at a fixed charge rate

and dP. As our practice would be to install a mix valve to achieve performance over a wide range of charge rates, we do not use a static mixer to avoid installation of the additional piece of equipment.

Sam Lordo (Nalco Company)

Static mixers are a bad idea in my opinion, they limit the capability to modify the mixing energy imparted into the water/crude mixture. Different crudes will require different levels of mixing energy. When static mixers are used without bypasses then the potential of imparting too much energy and thereby create too tight of an emulsion to resolve in the desalter vessel. This can lead to a number of downstream processing issues, for example, high salts (corrosion and fouling) and

high water (increase in energy demand, reduction of throughput, etc). The same is true if not enough mixing energy is imparted, for example, during low charge rates.

Currently the desalter manufacturers are no longer recommending them in the newer desalter designs or revamps especially with crude unit processing heavy crudes.

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