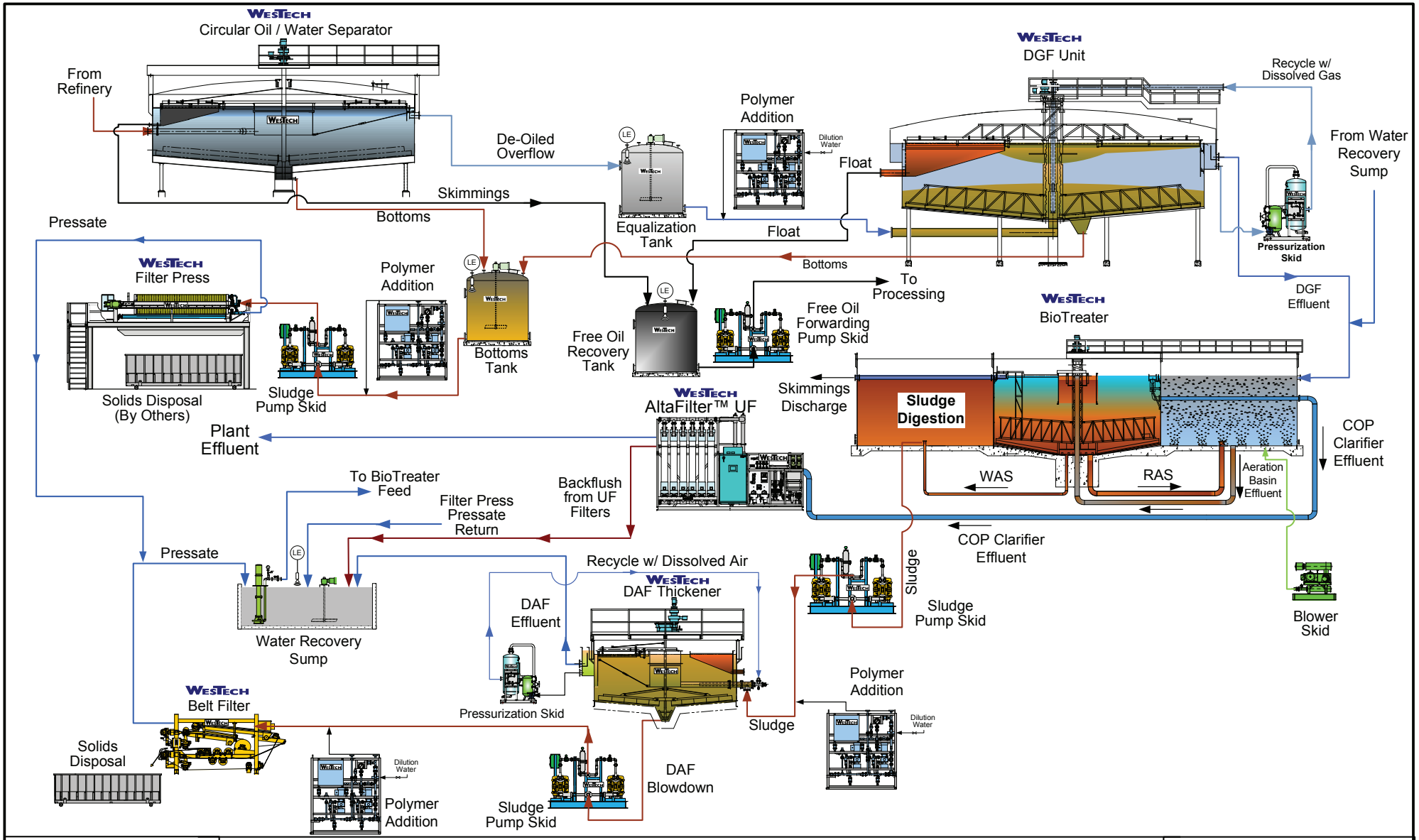

Refinery Effluent Treatment – Circular Oil/Water Separator

WesTech

DWN: **RCS** DATE:

The ***BioTreater™ Biological Treatment and Clarification System*** combines a biological treatment system with clarification in a compact design utilizing common wall construction. The biological treatment is located at the periphery in a ring-shaped area while the clarification stage is in the central region. The treatment system is fully expandable for complete biological nutrient removal. The system can also be designed to incorporate aerobic sludge holding, flow equalization, post aeration and chlorine contact chamber.

Circular Oil/Water Separators

The American Petroleum Industry (API) developed design guidelines for oil/water separators in the early twentieth century. These rectangular design guidelines have remained remarkably constant since that time, and oil/water separators have become standard equipment worldwide.

The design goal of these separators is to create a quiescent zone in which oil droplets can float and coalesce on the surface for skimming and removal. Settled solids are transported to a collection sump for disposal.

Factors governing the separation of fats, oil and grease (FOG) from wastewater include: viscosity of the fluids, temperature of the waste stream, particle size, specific gravity of the FOG, the apparent specific gravity of solids coated with oil, retention time, and turbulence created in the oil / water separator. These factors are **not** affected by separator geometry.

Rectangular Separators

Traditional separators have been rectangular. While small units have the advantage of shop assembly, all rectangular units require submerged bearing, chain and flight skimmers. With many submerged moving parts, these older units are notoriously maintenance intensive. The units are difficult to seal to prevent the escape of volatile organic carbons (VOC).

This was not an issue when the units were first put into service, but had become a matter of regulation by the EPA, causing rectangular units to require retrofit, replacement, or abandonment. Sealing difficulties lie in the many sections of the covers required for long tanks, numerous access openings in the covers required for maintenance and inspection, difficulty in sealing chain drive shaft penetrations, and retrofit difficulties with old concrete or steel tanks.

Weaknesses with rectangular separators include chain deterioration and oily sludge removal. As sludge builds up to the rakes, the submerged bearings and chain-driven rakes fail because they cannot push the viscous sludge. If the rakes fail, the separator must be shut down and emptied for repair. Repair is hindered by vapor control covers that must be removed. Operators avoid frequent equipment failures by pumping out overly dilute sludge to maintain a low sludge layer.

Circular Units

The rakes in circular units are designed to transport dense sludge loads. Circular clarifiers are commonly used for heavy oily sludge thickening in refineries. Circular units can concentrate sludges up to 5%, so no additional thickening is required before treatment. Circular unit maintenance is simplified with fewer moving parts, and the motor and gearbox are located above the domed VOC containment roof. Circular units may also be installed in existing, yet vacant, tanks at significant cost savings.

Maximum flow through rectangular units is limited by the length-to-width ratio and available real estate. Circular units easily function at diameters over 100 feet and offer much higher flow capacity.

As with other instances of technology reapplication, performance track records are short. Nevertheless, the potential increases in efficiency coupled with the decreases in maintenance costs means consideration of circular separators should be given for new installations as well as existing plants.