COMPUTATIONAL FLUID DYNAMIC (CFD) MODELING AND RETROFIT SERVICES

Make the most of your new or existing equipment through Exterran’s unique approach to single or multiphase Computational Fluid Dynamic (CFD) modeling, a powerful technique that allows the dynamics of all fluids within a tank or vessel to be observed. Exterran’s CFD modeling identifies short-circuiting, dead zones and other problem areas, then demonstrates how recommended modifications can improve performance. Retrofitting existing equipment using Exterran’s experience in process and design allows us to consider economics and downtime when determining a solution to help lower your CAPEX and OPEX.

During the design phase of a produced water treatment facility, it is critical to understand the fluid dynamics in order to optimize tank or vessel internals. This creates conditions that maximize the coalescence of oil to micro-bubbles, the ideal environment for efficient and effective oil removal. The power of CFD allows many possible scenarios to be considered, including:

- Changes to tank and vessel geometry
- Fluid composition
- Droplet size
- Flow rates
- Temperature
- Retention time

Through systematic modeling of these variations, the separation equipment can be optimized to ensure the flow pattern and movement of all particles are within the specifications set by Exterran Water Solutions™.

CFD modeling of separation equipment incorporating Micro-Bubble Flotation (MBF®) is offered exclusively through Exterran enabling us to test and optimize designs prior to construction. With existing facilities, Exterran’s CFD results can illustrate the expected performance of any modification to help ensure the best solution is achieved. Our experience with process and product development allows Exterran to utilize single phase velocity modeling to understand flow patterns and determine if multi-phase modeling is required.
THE MAJOR OBJECTIVES OF A CFD PROJECT ARE:

1) Water Flow – the motion of the main liquid phase (water) dominates all fluid movements. As such, the modeling of this one phase provides clear insight into the expected movement of all particles to quickly identify optimal design and operating conditions.

2) Sensitivity – determines the individual impact of geometry, flow rates, inlet concentrations and droplet size on performance for both new and existing equipment.

3) Particle Tracking – traces the mean flow paths for oil droplets and gas bubbles of various sizes. This helps to eliminate short circuits (if any) and enable all oil particles to have the greatest possible opportunity to separate from the water and collect at the surface.

4) Performance – calculates the efficiency of the separation equipment under varying conditions. By measuring the number of particles that remain on the surface, relative to the number that enter the unit, an estimation of the tank or vessel performance (efficiency at removing oil) can be calculated.

5) Visualization – captures data numerically and graphically at specific periods of the MBF® process. This significantly enhances the understanding of operating conditions and the tank or vessel performance.

6) Design – supports the engineering design process for complicated multiphase (oil, water, solids, and gas) conditions helping to reduce early design flaws which can save both time and money.

CFD modeling detects the effects of flow and the movement of very small droplets, particles and bubbles. The inclusion of micro-bubbles can be shown to increase the buoyancy of oil droplets and the efficiency of the separation equipment.

Exterran is able to run several models to determine efficiencies with alternative sized tanks or vessels, recommend minimum and maximum fluid levels and flow rates, and identify the implications of upsets caused by surges of oil or other fluctuations. CFD results can be post-processed to summarize all the data or to illustrate the impact of changes across specific planes or discrete points.

Please let us know how Exterran can help you with your new or existing facility.