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Induced Gas Flotation

Induced Gas Flotation Unit

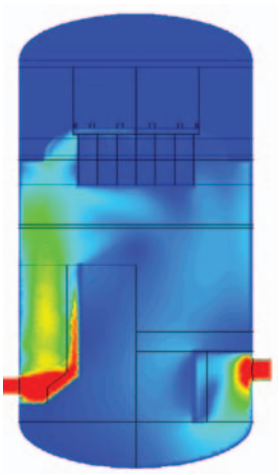
Introduction

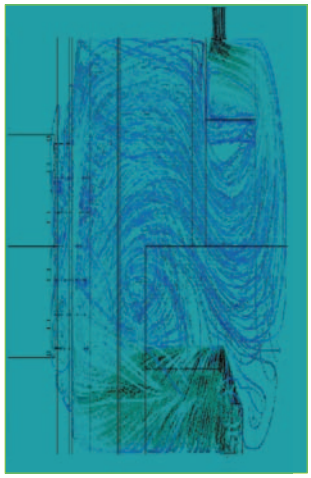
Induced Gas Flotation (IGF) is a well-proven method of oil recovery in water treatment applications.

IGF Units are used extensively around the world for the recovery of oil from produced water streams in a wide range of applications at onshore and offshore production and processing facilities, refineries, ballast treatment facilities, etc.

IGF is primarily used for the removal of oil and fine solids from oily water streams, and to deliver the following outcomes:

- High efficiency oil removal,
- Low outlet oil levels,
- Simple, efficient operation and maintenance,
- Low or nil chemical consumption,
- No fugitive gas emissions,
- Minimal environmental impact.





Description

SUEZ's IGF units are hydraulically-operated Induced Gas Flotation Units that provide efficient oil recovery from water streams with complete process containment. Oil recovery is achieved efficiently and economically, with operator and environmental safety ensured by the fully enclosed flotation process.

IGF Units separate and recover oil and fine solid particles from water through the creation of fine gas bubbles (typically ← 50 microns in diameter), that are dispersed through the incoming water stream. Oil and fine solid particles that are present in the water stream adhere to these gas bubbles and float to the surface where they are skimmed off.

The gas bubbles are dispersed into the incoming water stream by recirculating a side stream of clean water from the outlet of the IGF Vessel and pumping this back through an Eductor.

The high velocity through the Eductor induces gas into the recycle water stream, where the water and gas are mixed and sheared to create a dispersion of small gas bubbles in the water.

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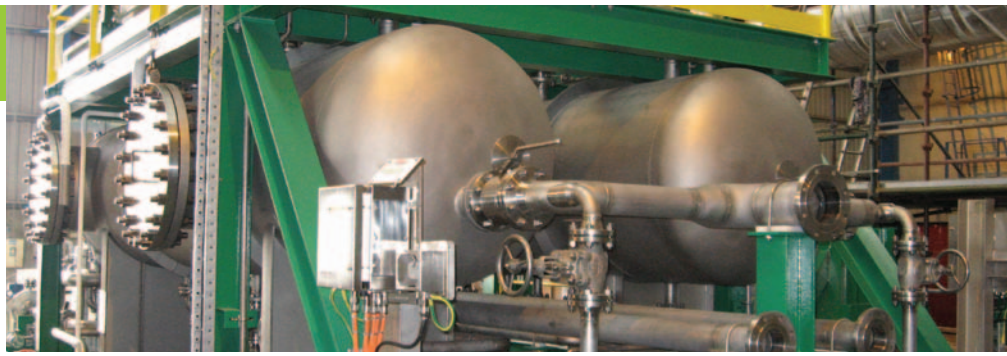

This recycled water stream is then returned to the IGF Vessel at selected entry points, where the gas bubbles are utilised for flotation of oil and fine solids from the oily water stream.

Operating Principles

The creation of small gas bubbles (typically ← 50 micron) results in efficient recovery of small oil droplets present in the water stream due to:

- High probability of bubble/oil attachment,
- High bubble concentration,
- Large surface area / volume ratio of bubbles,
- Low bubble rise velocity/less turbulence,
- Increased volume of oil and solids removed with low gas consumption.

The IGF Recirculation system incorporates a re-circulating loop, where a side-stream of clean water is taken from the outlet of the IGF Vessel, and pumped through an Educator. The Educator creates a gas-rich fluid stream of small bubbles that is fed back into the IGF unit and dispersed through the water.

Flocculant or flotation chemicals can assist in oil and or solids removal by Induced Gas Flotation.

Technical

Induced Gas Flotation Units are available for flow rates, typically from 800 - 24,000 m3/day (5,000 – 150,000 BPD), although any specific size can be catered for.

Each IGF system consists of:

- A cylindrical vessel partitioned into flotation, degassing and optional oil collection zones,
- Recirculating pump and gas eduction piping,
- Liquid level control system.

The IGF system designs include features that result in efficient operation and maintenance:

- All equipment is mounted on a single, compact skid for rapid installation and start-up,
- Low Power demand: gas induction and mixing is achieved by a recirculation pump, (no oil skimming motor is used).

IGF Units are designed and built to the required Pressure Vessel Codes required for pressurised operation, and are fully sealed to prevent fugitive gas emissions.

Materials of construction are selected to suit the process requirements, eg: carbon steel or duplex stainless steel. CFD Analysis can be used where specific applications require design performance verification.

Benefits & Features

Benefits associated with properly designed and implemented IGF systems include:

- Low or nil chemical consumption,
- Low operation and maintenance manpower,
- Retro-fit option for existing skim tanks or vessels,
- Can be vertical or horizontal,
- Removal of oil down to ←20 ppm,
- Removal of fine solids (←10 micron),
- No internal moving parts.

The IGF system has no internal moving parts, which significantly reduces maintenance downtime. The Pump and Eductor are externally located for easy access.

IGF units can be horizontal or vertical orientation. They are used on FPSO installations, where significant motion occurs. In these and other specific applications, CFD analysis can be used to provide optimum internal baffle designs to mitigate the effects of motion.

Skimming of the oil and particle-laden surface layer is controlled by the liquid level inside the vessel. The floated layer is skimmed off the surface into collection troughs.

The flotation cells are designed to provide →90% oil removal and →80% removal of fine (←10 micron) solid particles at full design capacity.