

SANSOX LTD

IroxFlotation



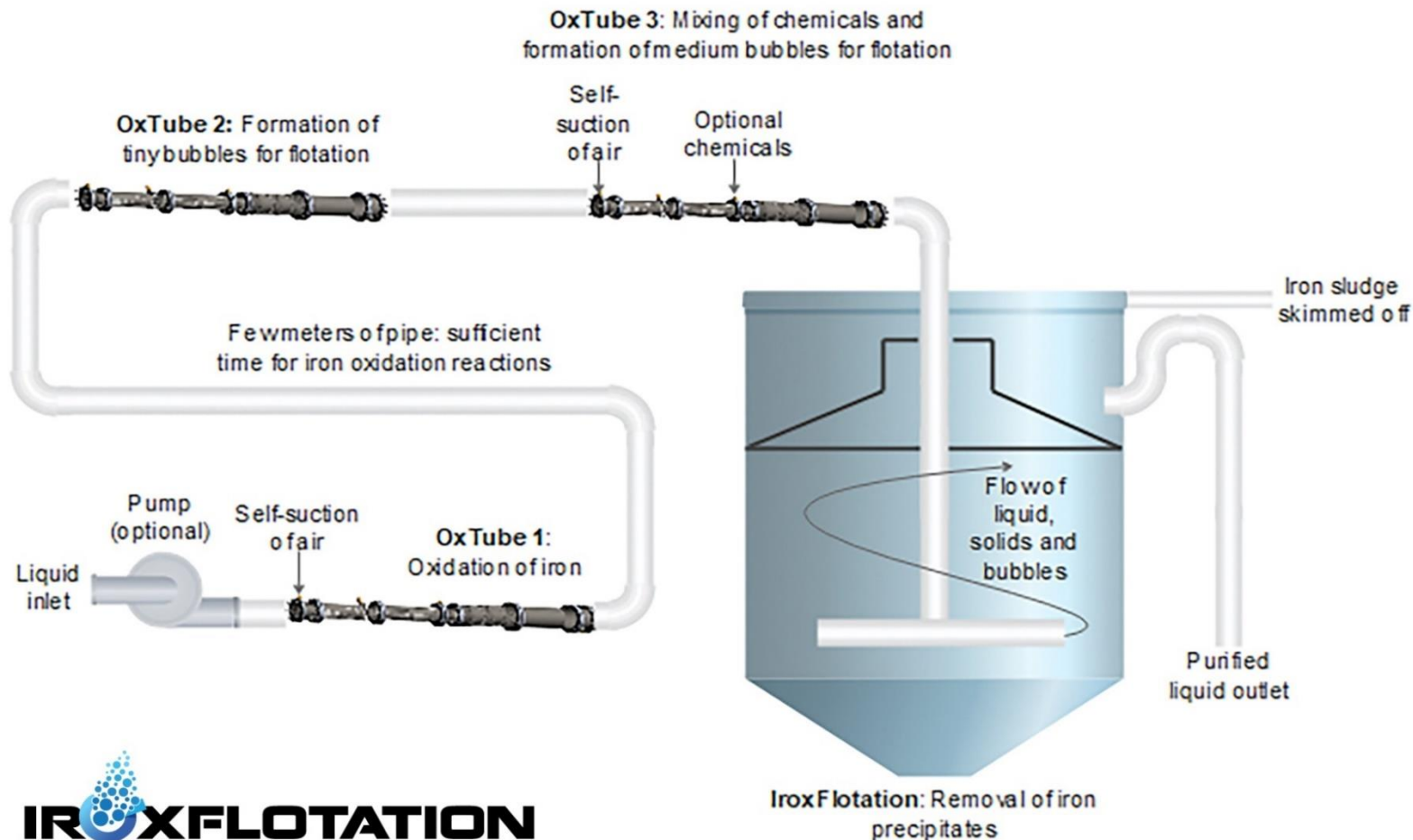
DOUBLE WINNER OF EU INNOVATION AWARD and OTHERS
The OxTube & The SaoxFuge

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IroxFlotation - Ingenious concept for removal of dissolved iron from water

Process is based on SansOx OxTube and VoxFlotation; efficient mixing and aeration system, and vortex flow particle separation technology. Applicable for various mining, industrial, and municipal ferrous waters.

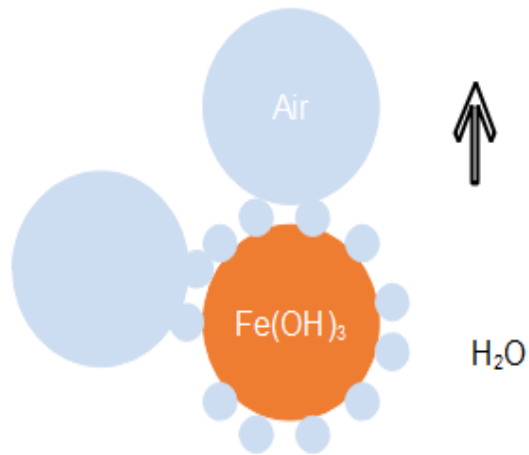


Principal advantages include:

- Low energy demand
- Continuous and fast treatment
- Adjustability
- Low chemical requirements
- High removal efficiency of iron from heavily contaminated solutions

Principles of IroxFlotation

The IroxFlotation process is based on OxTube and VoxFlotation; oxidation of ferrous, dissolved iron, and precipitation of iron, followed by its removal in an innovative vortex flotation cell.



Iron hydroxide - air bubble bridging and adsorption process in water: Small bubbles attach to the precipitates and large air bubbles provide enough buoyancy.

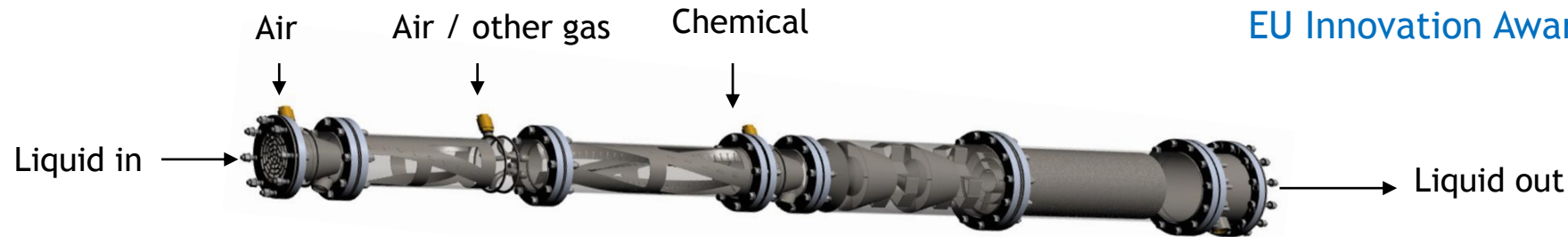
VoxFlotation is based on adsorptive bubble separation and classified to:

- Induced air flotation (IAF): Bubbles are formed by diffusers or other mechanical methods
- Dissolved air flotation (DAF): The water is saturated with gas under pressure. Bubbles are formed when the pressure is decreased in a flotation chamber

Both processes possess several challenges, e.g. bubble size and even distribution across the flotation chamber, effective separation without chemicals, optimal flotation, and bubble rise time.

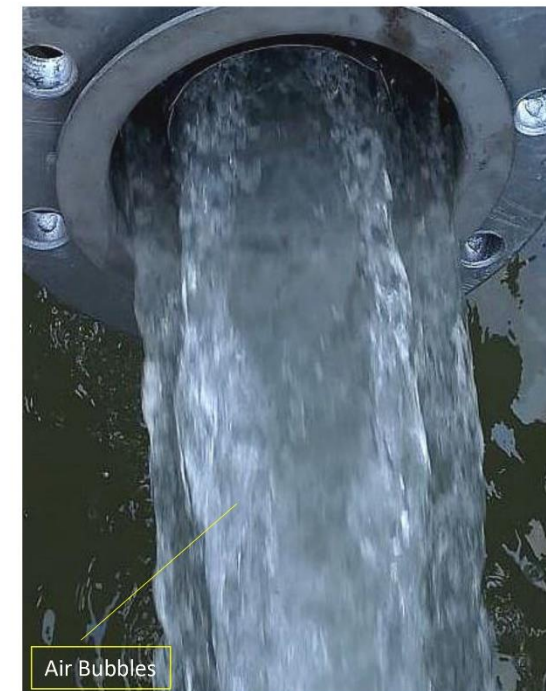
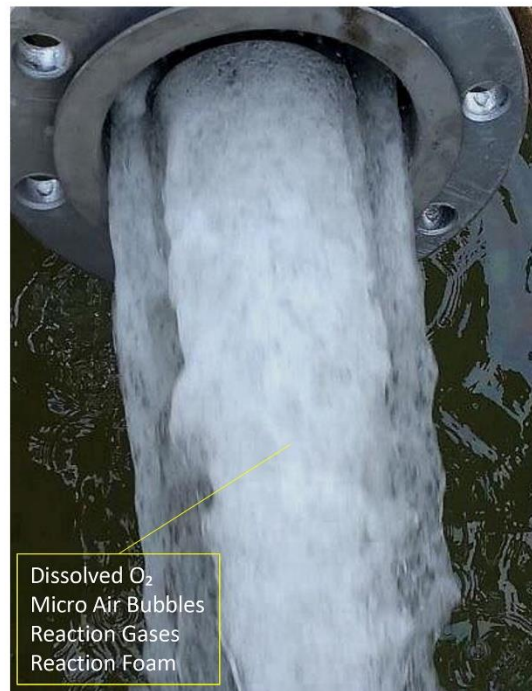
VoxFlotation combines the advantages of IAF/DAF and utilizes several flow phenomena to overcome the challenges.

OxTube - core part of IroxFlotation



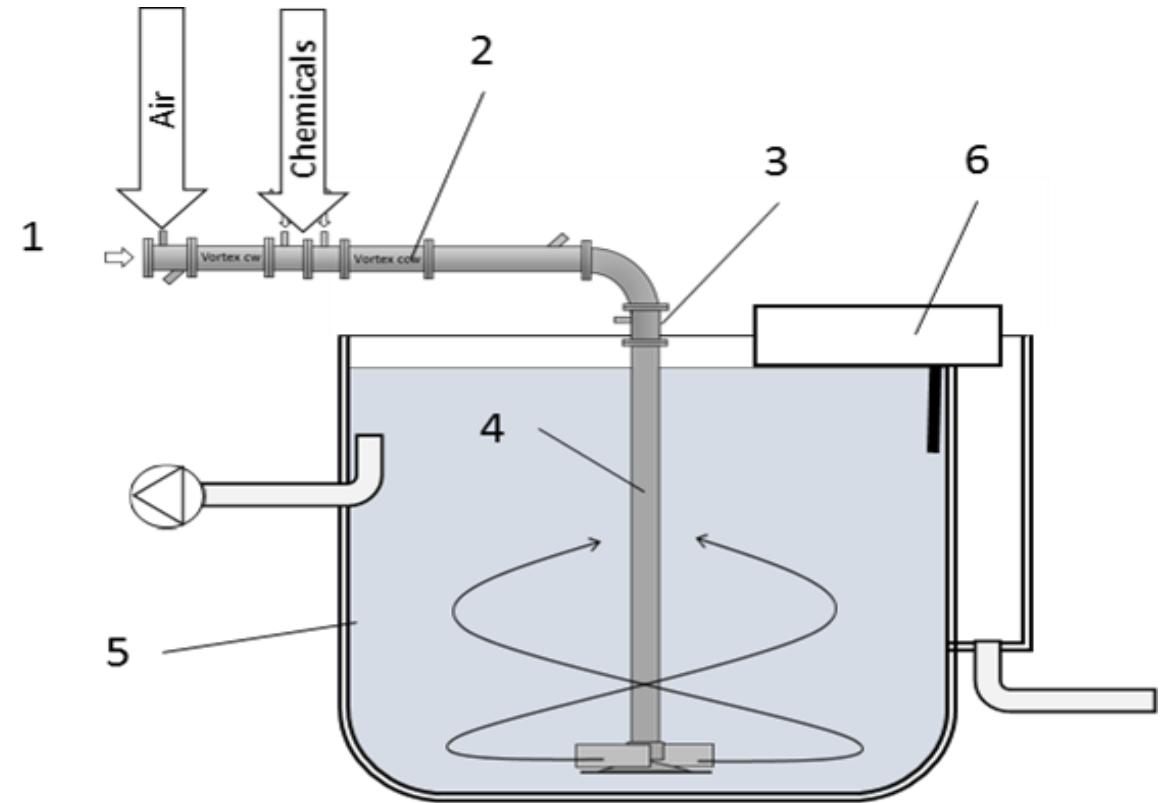
EU Innovation Award 2014 Winner

- Fast mixing of gases and liquids into liquids (seconds)
- Efficient mass transfer due to optimized, modular elements
- Self-suctioning ability (no compressed air necessity)
- Installed in several locations for aeration, oxygenation, pH adjustment etc.
- Proven efficiency.



VoxFlotation shortly

- Air for flotation and optional chemicals are injected and mixed in OxTube
- Small flotation bubbles are formed by dissolved and mixed air as well as special flow phenomena
- Air / gas bubbles and particles are moving upwards along the vortex flow created by OxTube and special elements
- Impurities are scraped from the surface of cell, while purified water is collected below

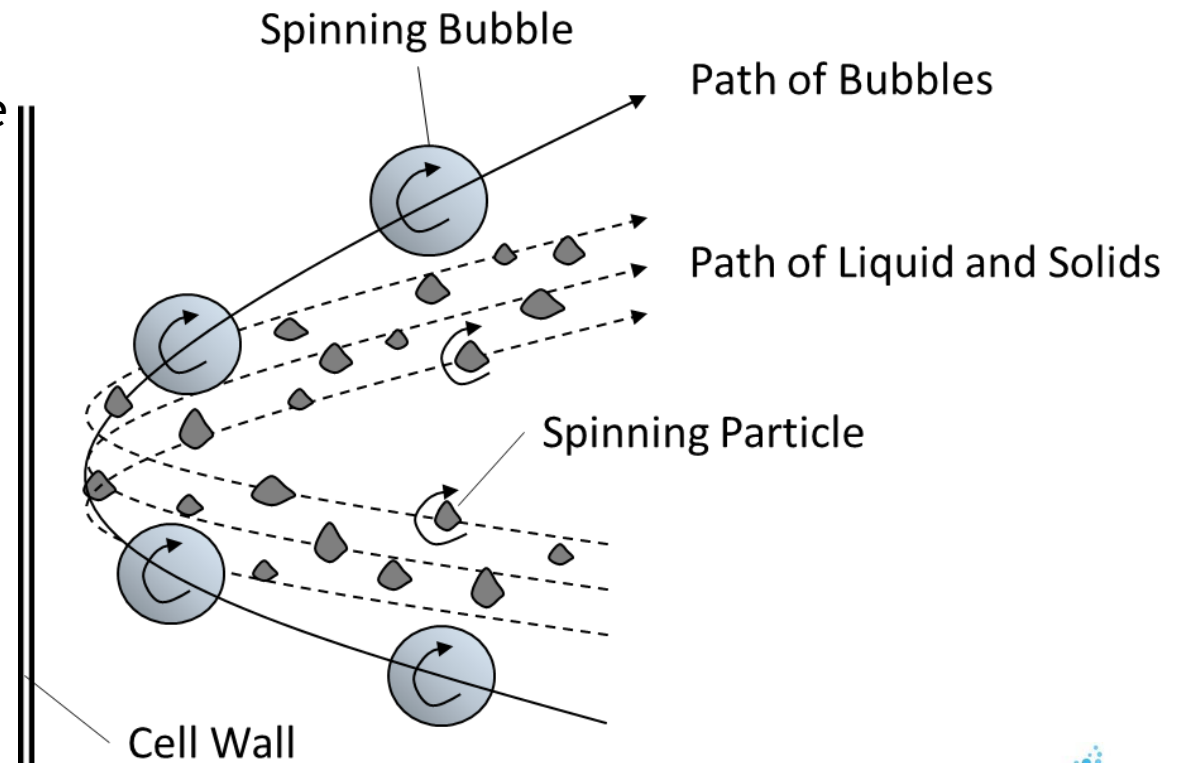


VoxFlotation Separator; 1. Liquid intake, 2. OxTube: Feed, mixing and dissolving, 3. Additional flotation gas/chemical feed, 4. Vortex flow tube, 5. Flotation cell with round corners, 6. Foam scraping wing with height control

What is special in VoxFlotation?

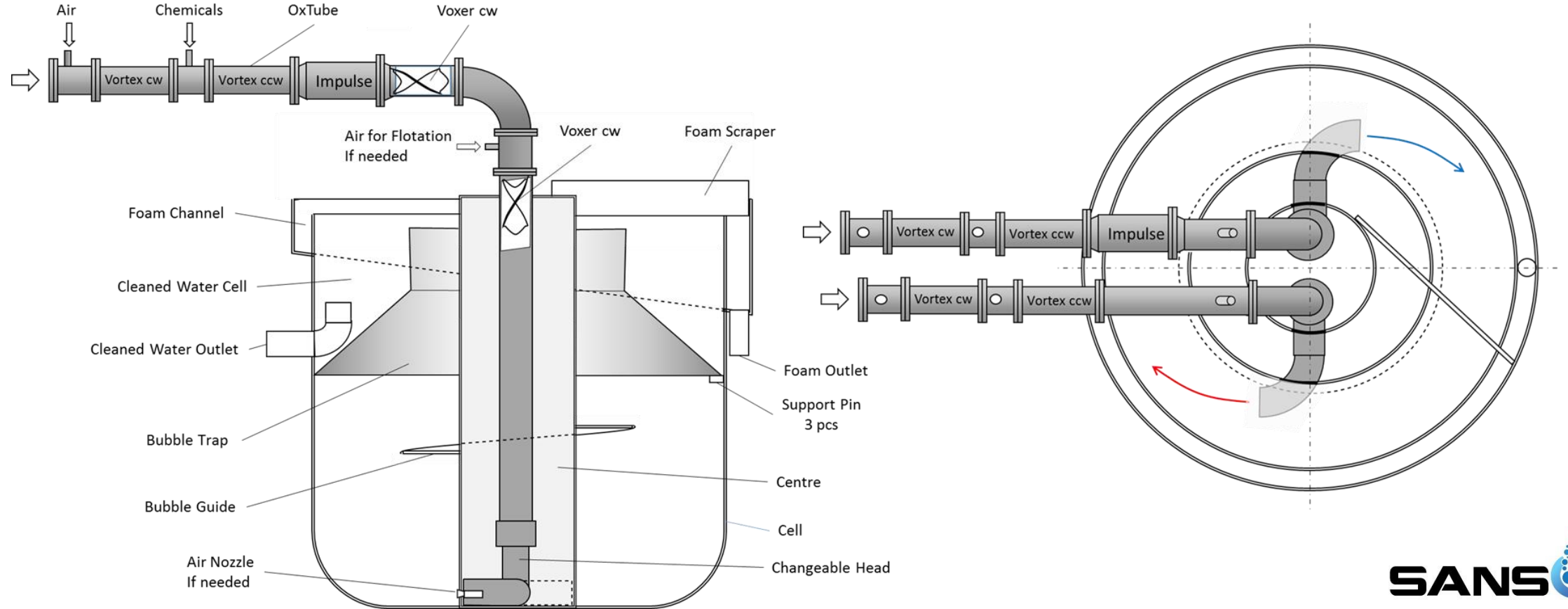
- Vortex flow along the flotation cell and spinning effect
 - Collection efficiency of impurities is enhanced
 - Short flotation time and small flotation chamber
- Formation of flotation bubbles by multiple methods
 - Savings in energy and optimized bubble size
 - Size of precipitates is not a restricting feature
 - Reduced need for chemicals
- Effective mixing and dissolving in OxTube
 - Fast process and savings in energy
- Bubble trap and other structural elements
 - High separation efficiency

Right: Vortex flow
- enhanced particle collection



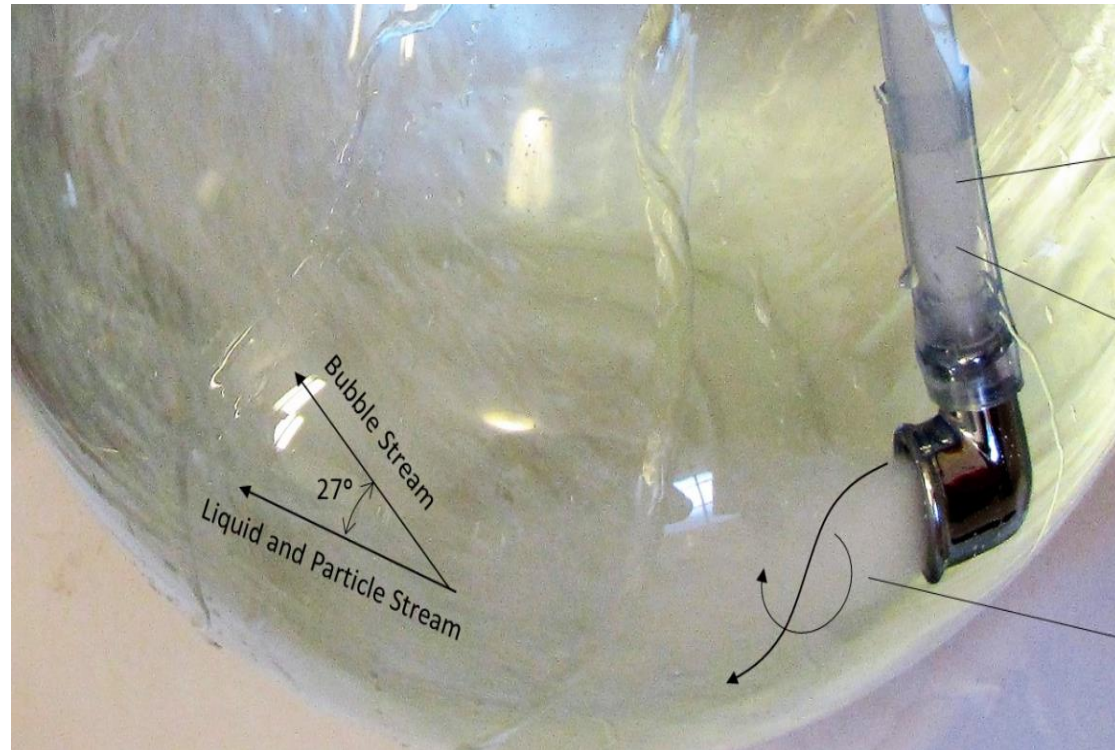
Optimized configuration

- Nozzle configuration adjustable to provide optimal sized flotation bubbles
- Bubble trap and bubble guide - increased retention time of flotation bubbles in the cell
- Optimization of mixing and dissolving in OxTube - several configurations tested
- Multiple vortex flows along the cell with several OxTube units and nozzles



Test data of VoxFlotation performance

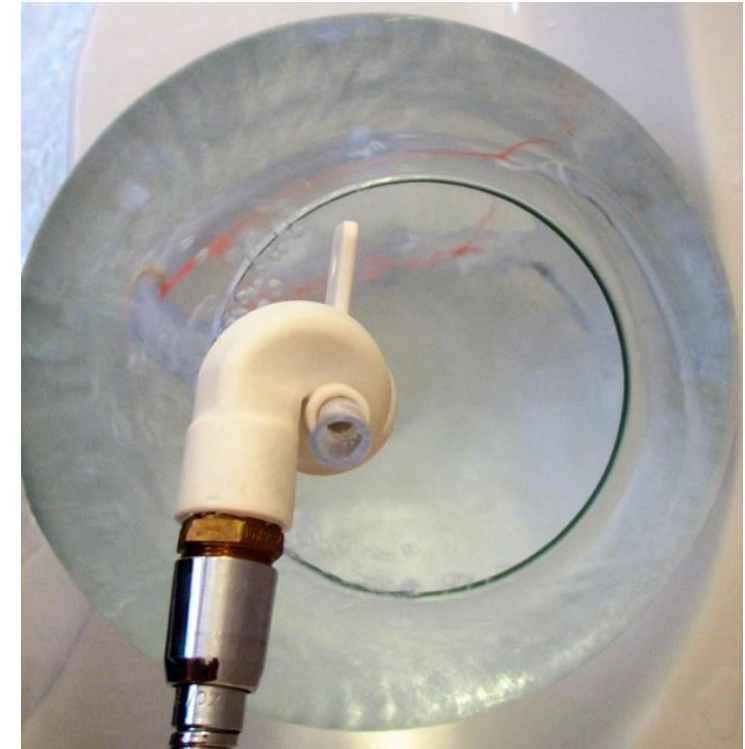
- Preliminary lab-scale experiments and a bachelor's thesis made of VoxFlotation have proven its efficiency for particle separation
- More lab- and pilot-scale experiments and optimization are still required for full-scale installation



Mixture of Micro Bubbles and Liquid generated by OxTube

Voxer ccw for Counter Force to Down Stream

Spinning Voxer Liquid Flow with Bubbles



Summary

Feature	DAF or IAF technologies	VoxFlotation
Power consumption	0,7 - 3 kWh / m ³	0,04 - 0,1 kWh / m ³
Chemical requirement	Coagulants, flocculants, frothers..	No chemicals
Separation efficiency	90% for µm - mm particles	90% for µm - mm particles
Retention time	15 min	3 min
Tank size	10 m ³	3 m ³
Operation	Removal of different particles is challenging	Good removal of different particles (size / quality)
Maintenance	High (mixing, several process stages, chemical addition, cleaning of tanks etc)	Low maintenance

*Note: the values are directive and differ from process to process



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