CAVITATION TUBE SPARGING SYSTEMS
CAV-TUBE SPARGERS

Generate picobubbles to substantially improve flotation kinetics and increase the recovery of ultrafines.

Cavitation Tube spargers are the heart of the patented bubble generation technique used in EFD column flotation cells. The specially designed “Cav-Tubes” are an integral part of the hydrodynamic aeration system used to maximize fine bubble generation and improve bubble-particle collision rates.

Cav-Tubes can also be used as part of a pre-aeration system that can be applied independently in a flotation feed line or part of a separate equipment package to increase the recovery of overloaded circuits or improve the flotation response of “hard-to-flot” material.

Applications include:
- Aeration of Column Flotation Cells
- Pre-Aeration Systems
CAVITATION TUBE SPARGING

The Cav-Tube design is based on hydrodynamic cavitation. This occurs when the pressure in a moving liquid is momentarily reduced below its vapor pressure, creating ultra-fine air or vapor-filled bubbles.

These fine bubbles are carried by the flow to a region of higher pressure resulting in a bubble dispersion that resembles fine smoke.

Cavitation and the shearing of additional gas ensure the generation of fine bubbles suitable for the recovery of both ultra-fine and coarser particles.

Cav-Tubes are offered in a variety of materials-of-construction to provide a long wear life. Material selection is based on application specifics and includes polyurethane, ceramic, tungsten carbide and hardened steel.

Cavitation Tubes:

- Ensure a higher attachment probability...higher recovery of hydrophobic particles
- Produce higher recoveries for ultra-fine material...greater concentrate production
- Improve bubble/particle collision rates...lower reagent costs
- Have no direct impediments to flow...longer wear life with better materials of construction

This chart shows the relationship between bubble diameter and the generation of surface area indicating that superficial surface area (i.e., capacity) is maximized when using hydrodynamic cavitation.
PICOBUBBLE ENHANCED FLOTATION

Ultra fine bubbles naturally exist in liquids and can be created through dynamic cavitation. These picobubbles readily attach to hydrophobic particles due to their lower ascending and rebound velocities and the improved free-energy conditions.

Combining cavitation-induced bubble generation with mechanically generated bubbles produces higher flotation recoveries than by either method alone. This synergistic effect is caused by the nucleation of picobubbles on the particle surface.

Picobubbles improve the flotation response by acting as a secondary “collector,” enhancing the bubble-particle attachment probability and reducing detachment.

Cavitation-Tube sparging systems have been demonstrated on an industrial scale in base metals, sulfides and non-metallic applications. These installations have yielded improvements in recovery, reagent consumption and wear.

Improvement in sulfide recovery using the Cavitation-Tube sparging system when treating -50 micron fines.
Eriez' Cavitation Tube systems consist of a centrifugal recycle pump, a slurry distribution manifold and a series of spargers designed to induce cavitation and generate fine bubbles. In operation, a portion of underflow slurry is drawn from the column and pumped to a distribution manifold where it is divided equally between the Cavitation Tube spargers. Process air is injected under pressure at the inlet of the cavitation tube to provide additional air for flotation. The two-phase mixture passes through the Cav-Tube sparger and is reinjected into the bottom of the column cell with the air dispersed as fine bubbles.
PRE-AERATION SYSTEM

Flotation circuit performance can be improved by integrating the Cav-Tube technology with the EFD feed pre-aeration system, the *Feed Air Jet*.

This performance improvement is a result of aerating slurry where the concentration of floatable material is highest - the feed.

This approach can be applied independently to circuit feed lines to improve the kinetics and capacity of overloaded flotation cells in addition to improving the recovery of “hard-to-float” material.

![Feed Air Jet Pre-Aeration System](image)

RETROFIT INSTALLATIONS

Cav-Tube spargers, unlike static mixers, do not use “wear-prone” internal components. The slurry is forced through an orifice instead of around internal mixing vanes. As a result, customers have been able to retrofit Cav-Tubes into existing column circuits providing both improved metallurgy and maintenance. Cav-Tubes can also be used to replace older style air-lance systems to gain additional recovery in ultra-fine applications.

**Phosphate industry user stated,**
“...we replaced inline static mixers with Eriez’ Cav-Tubes and the recoveries are better, wear is negligible...”
## CAVITATION TUBE SPECIFICATIONS

**Diagram:**
- Slurry Manifold
- Down Spout W/ Air Inlet
- Cavitator Tube
- Hi-Chrome Elbow
- Hi-Chrome Protective Nozzle Insert

### Typical Gas Flow Rate (Free Air Delivery) & Typical Materials of Construction

<table>
<thead>
<tr>
<th>SERIES</th>
<th>CONNECTION TYPE</th>
<th>TYPICAL GAS FLOW RATE (FREE AIR DELIVERY)</th>
<th>TYPICAL MATERIALS OF CONSTRUCTION</th>
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<tbody>
<tr>
<td></td>
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<td>CFM</td>
<td>M3/HR</td>
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<td>48 - 55</td>
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<tr>
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<td>CT 610</td>
<td>6” FF</td>
<td>79 - 91</td>
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*Please note materials of construction will be based on application specifics.*

For more information, visit flotation.eriez.com
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Contact the nearest Eriez Flotation Division office for technical support or design engineering to suit your specific application.

Website: flotation.eriez.com

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