

ERIEZ

FLOTATION DIVISION



● SPARGING SYSTEMS FOR LEACHING ●

SLAMJET SPARGERS FOR LEACHING APPLICATIONS

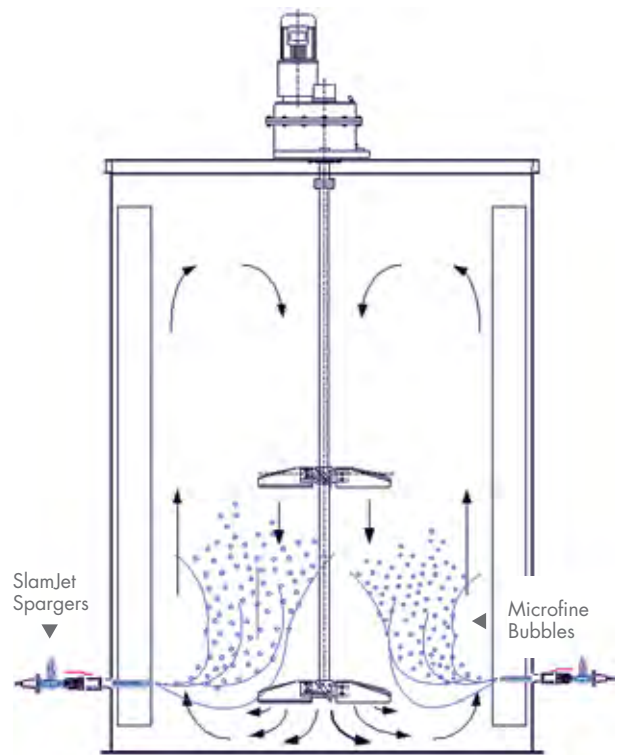
Eriez SlamJets for leaching applications have many benefits over traditional methods of injecting gas to achieve desired dissolved oxygen levels in leach circuits.

One key advantage SlamJets offer is their ability to produce micro-fine bubbles. Traditional sparging systems rely largely on agitator shear to reduce bubble size. This method is inefficient and not capable of producing fine bubbles, resulting in much of the oxygen escaping from the tank before it can be dissolved into the slurry.

Generating small bubbles increases overall bubble surface area thus speeding oxygen dissolution rates and leaching kinetics. This also results in reduced oxygen (or air) and cyanide consumption.

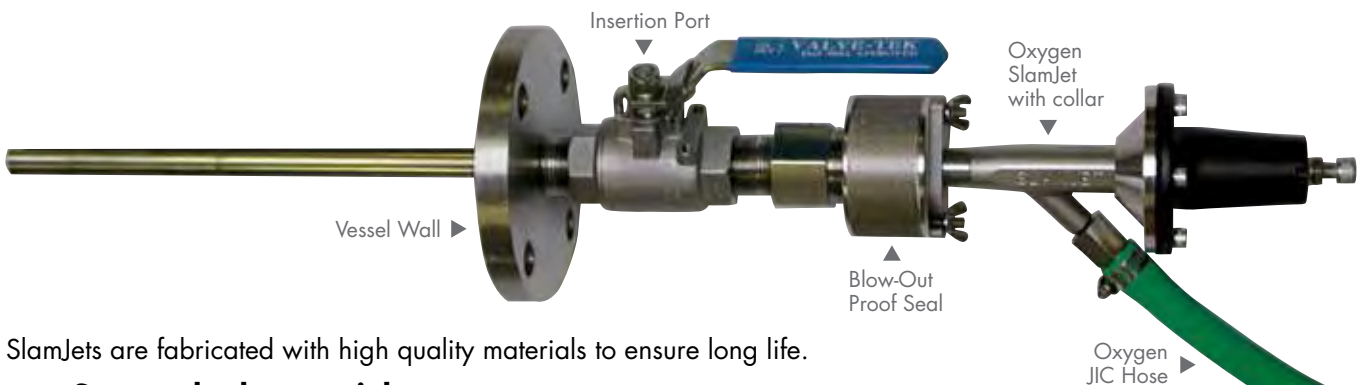
By moving the gas injection points away from the agitators, customers have reported reduced agitator and drive system maintenance, as well as eliminating areas of variable slurry density which reduces shaft wobbling and failures.

The SlamJet sparging system provides better (more even) gas distribution which reduces tank sanding. Another considerable advantage of the SlamJet system is the ability to remove, inspect and reinstall the spargers from outside the tank with no process interruptions.



SlamJet Spargers:

- Feature an "Auto-Close" response to eliminate plugging
- Can be easily retrofit into existing systems
- Can be easily installed on full tanks using a "Hot Tap"



SlamJets are fabricated with high quality materials to ensure long life.

- **Sparger body material:**
316 Stainless Steel
- **Nozzle housing material:**
2205 Stainless Steel
- **Nozzle material:** Ceramic alumina
- **Regulator diaphragm:**
Mosites 1014 with Hexcel Insert
- **Maximum pressure:** 700 kPag
- **Operating pressure range:**
415 to 550 kPag

COMMON SLAMJET GAS FLOW RATES

| SlamJet® Model Series | Flow Rate @ 550 kPag |
|-----------------------|-------------------------|
| SLJ - 25 | 21 Nm ³ /hr |
| SLJ - 35 | 35 Nm ³ /hr |
| SLJ - 40 | 50 Nm ³ /hr |
| SLJ - 50 | 78 Nm ³ /hr |
| SLJ - 60 | 103 Nm ³ /hr |
| SLJ - 75 | 198 Nm ³ /hr |

EFD SPARGING TECHNOLOGY

Improves the efficiency of oxygen utilization within leach tanks and other processes that depend on the generation of fine gas bubbles.

The sparging systems offered by Eriez Flotation Division (EFD) promote the increased concentration of dissolved oxygen in leaching systems through the generation of large amounts of small bubbles. These fine bubbles create a greater surface area than traditional gas injection methods. In these and other hydrometallurgical applications, EFD spargers improve the process kinetics by ensuring a high rate of gas dissolution. EFD offers several methods to increase oxygenation. The most popular method is through the use of our SlamJet spargers. Additionally, slurry can be directly sparged through the use of EFD's in-line Cavitation Tube sparging systems which can be installed as part of the leach tank structure, or as a pre-treatment system.

EFD Sparging Systems:

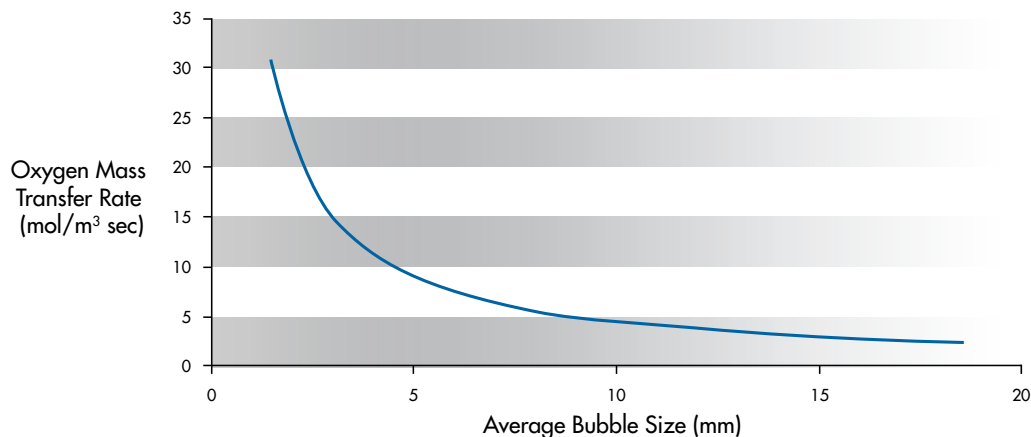
- Produce finer bubbles which increases bubble surface area, increasing leach kinetics
- Reduce oxygen (or air) and cyanide consumption
- Reduce maintenance on tank agitators
- Provide even gas distribution to reduce tank sanding
- Are removable to facilitate inspection from outside of the leach tanks
- Feature an industry-first auto-close response (SlamJet) to eliminate back-flow or plugging of slurry when gas pressure is lost
- Can be retrofit easily into existing leach systems



SlamJet Sparging



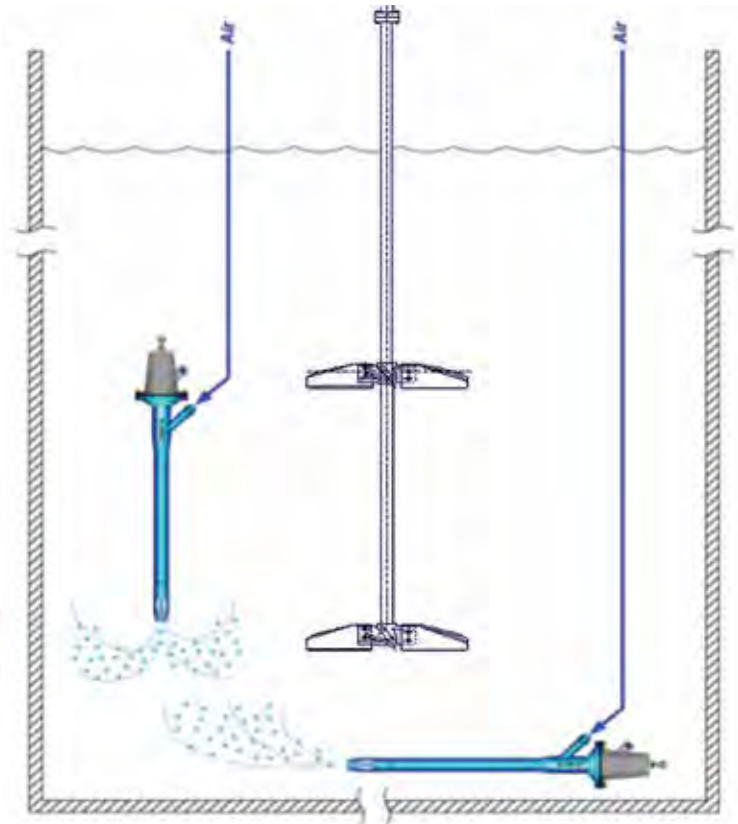
RATE OF OXYGEN DISSOLUTION FROM AIR AT STP FOR 10 M³ GAS HOLD-UP



SUBMERSIBLE SLAMJET® SPARGER SERIES

Submersible SlamJets provide greater flexibility in positioning air spargers within the leach tank to improve circuit performance. They can be installed at any position in the tank to ensure that the gas is injected efficiently into the mixing pattern.

Submersible SlamJets are designed for applications where the tank's wall can not be penetrated. This is often the case when a tank has a rubber lining and installing an insertion port might corrupt that lining. The process characteristics are the same with either configuration. The quantity of spargers varies depending on the specific requirements of the application.



SUBMERSIBLE
SLAMJET OPTION



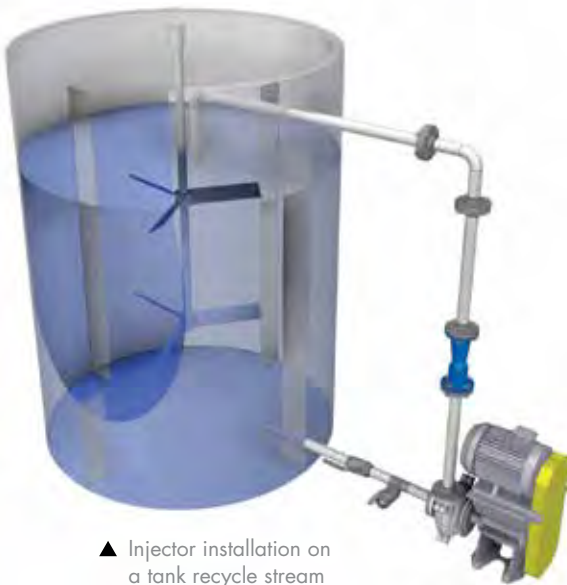
CAVTUBE™ IN-LINE LEACHING

Cavitation Tube sparging systems are designed for applications where even smaller bubbles are required and where intimate contacting can further improve process kinetics. CavTubes can be used as part of the leach tank assembly or as a pretreatment system.

Benefits:

- Improved DO (dissolved oxygen) levels
- Non-plugging
- Improved agitation
- Less maintenance than a traditional system

CavTube™ Sparging System ►



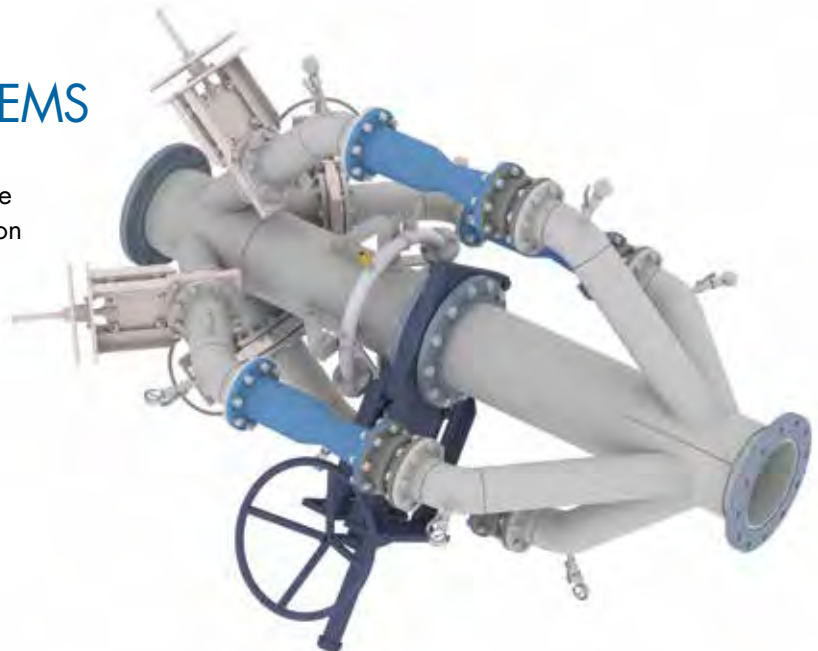
▲ Injector installation on a tank recycle stream



▲ Optimum installation with Leach Feed to the inlet of the injector and slurry returned into the base of the tank

FEED PRE-AERATION SYSTEMS

In addition to integrating CavTube technology directly into the leach tanks, circuit performance can be further improved with a feed pre-aeration system. This is achieved by aerating the slurry prior to entry into the agitated tanks. This approach can be applied independently or in combination with either system to improve the kinetics and the recovery of valuable ore.





EFD Flotation columns in a mineral flotation application.

WORLD AUTHORITY IN ADVANCED SEPARATION TECHNOLOGIES

Customer-Focused Service Spanning the World of Minerals

Eriez Flotation Division is committed to providing state-of-the-art equipment and process solutions for new and existing projects worldwide. We understand and quickly respond with integrity, competence and effectiveness to the needs of our clients. Our versatility is demonstrated by the diversity of our engineering services and the varying sizes of projects we have successfully completed around the world.

Contact the nearest Eriez Flotation Division office for technical support or design engineering to suit your specific application.

SLAMJET SPARGERS: GOLD LEACHING – INSTALLATIONS

| NORTH & SOUTH AMERICA | NORTH & SOUTH AMERICA Cont. |
|---|---------------------------------|
| Mina de San Luis Corp. | Consorcio Minero Horizonte |
| Tayoltita | Minera Aurífera S.A. (MARSA) |
| Cia. Minera Nukay S.A. | Cia. de Minas Buenaventura |
| Kinross Gold | Minera Laytaruma S.A. |
| Cia. Minera del Cubo | Mineras Bonanza, C.A. |
| Servicios Industriales Peñoles-La Cienega | MSOL Brasil |
| IMMSA - México | Barrick - Alto Chicama |
| Goldcorp Inc. | Barrick - Pierina |
| PlacerDome- Musselwhite | Cori Puno |
| Plata Pan-Americana | Minera Paititi |
| Servicios Industriales Peñoles - La Cienega | RUSSIA - EASTERN EUROPE |
| Cross Lake Minerals | Kumtor Gold Russia |
| Rice Lake Gold Corp. | Luna Polymetall Russia |
| Black Fox Mine (Brigus Gold) | Matrasova Russia |
| Bell Creek Mill (Lakeshore Gold), | Polymetal AGMK |
| Kirkland Lake Gold | Polymetal Vorontsovskoe |
| Grupo México, San Luis Potosí | Polymetal Kubaka-Birkanchan |
| Wesdome - Eagle River | OTHERS |
| GoldCorp - Red Lake Mines | Montana Exploradora - Guatemala |
| Agnico-Eagle - Goldex | Hemco - Nicaraguan |
| GoldCorp - Éléonore | CH Consult -Europe |
| AuRico Gold Inc - Young Davidson Mine | Coza Gold - Europe |
| San Gold Corporation | Iamgold Essakane - Burkina Faso |
| GoldCorp - Musselwhite | New Liberty Gold - Liberia |
| Inmaculada Project (Hochschild Mining) | Taparko Gold - Burkina Faso |
| Tambomayo Project (Buenaventura Mining) | Pharsalus Gold - Guyana. |



FLOTATION DIVISION

Eriez Flotation Division | Canada
7168 Venture St
Delta, BC, V4G 1H6
Canada
Office: +1 604-952-2300
efdca@eriez.com

Eriez Flotation Division | Brazil
Av. Getúlio Vargas, nº 456 - 120 andar
Funcionários - Belo Horizonte - MG
Brazil
Office: +55 31 3281 9108
efdbr@eriez.com

Eriez Flotation Division | Chile
Badajoz, 130 Of. 1505
Las Condes, Santiago
Chile
Office: +56 2 29523400
efdcl@eriez.com

Eriez Flotation Division | USA
2200 Asbury Road
Erie, PA 16506
USA
Office: (814) 835-6000
efdusa@eriez.com

Eriez Flotation Division | Australia
21 Shirley Way,
Epping, Victoria 3076
Australia
Office: +61 3 8401 7400
efdau@eriez.com

Eriez Flotation Division | Perú
Av. Manuel Olguin 335, oficina 1008
Surco, Lima
Perú
Office: +51 1 719 4150
efdpe@eriez.com

www.EriezFlotation.com



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