



ProMinerals® Spargers



Figure 1: BubbleJet.

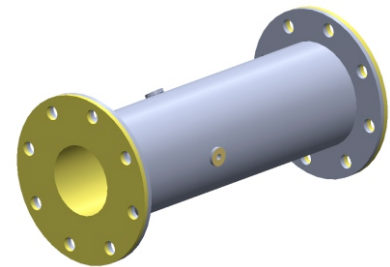


Figure 2: CavJet.

The ProMinerals® spargers were designed to improve the performance of fluid injection in flotation and hydrometallurgical processes. The efficiency of these processes is directly connected to bubble size and dispersions and, accordingly, to the superficial area created by the bubbles generated. Thus, ProMinerals® has developed its line of spargers that promotes perfect dispersion and proper size of the bubbles within the tank, resulting in greater efficiency in the collection of hydrophobic particles in the flotation column and improving chemical reaction kinetics in the leaching process.

FLOTATION PROCESS

ProMinerals® aeration systems are designed to generate the proper amount of bubbles with the ideal size for the flotation process. The spargers are designed to generate high aeration rates with a greater superficial collection area. Thus, a high probability of collision between the particles and the bubbles is obtained, optimizing the recovery of the minerals of interest.

The spargers of the **BubbleJet** and **CavJet** lines, in addition to being highly effective in flotation processes, are easy to install in tanks, and do not require major interventions or interruption of the equipment's operation. **BubbleJet** is sold with 3 different boom sizes, ensuring better air distribution within the tanks.

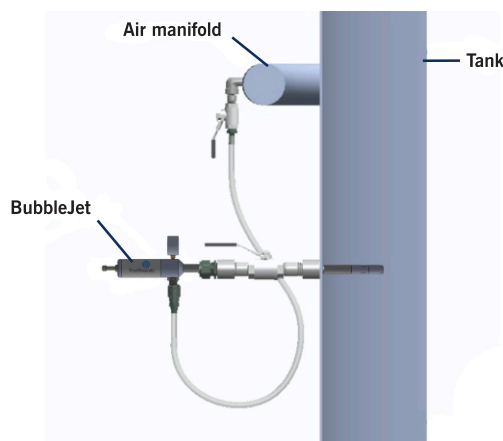


Figure 3: BubbleJet System.

Boom sizes:
450, 950, and 1450 mm

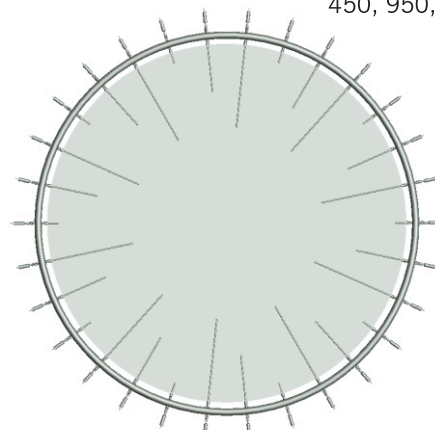


Figure 4: Placement of the booms in the tank, with up to 3 boom sizes.



ProMinerals® sparging systems were conceived in accordance with the highest quality standards in the industry, offering the following benefits:

- **Lower Maintenance Rate** - the spargers were designed to resist operational wear. This is done by applying ceramic material to critical points and using a control gasket to prevent the rupture of the diaphragm resulting from dryness between other points, which increases even more the useful life of the spargers and reduces costs.
- **Simplified Maintenance – ProMinerals®** spargers are easy to remove and replace, and there is no need to stop the tanks' operations. In the BubbleJet system, the wear nozzle may be replaced without having to disassemble the sparger, thus reducing the need to recalibrate; this significantly decreases maintenance time.

- **Failure Protection** - BubbleJet has an automatic closure system in case the gas or air feed fails. This prevents fluid backflow into the whole aeration system, preventing blockage and premature wear.
- **Better Performance** - Both **BubbleJet** and **CavJet** have multiple orifices that can generate microbubbles.
- **Reagent Addition** - CavJet allows for the addition of reagents directly in the cavitation orifice, improving the collection of the mineral particles in the flotation process. In leaching processes, this aspect improves reaction kinetics.

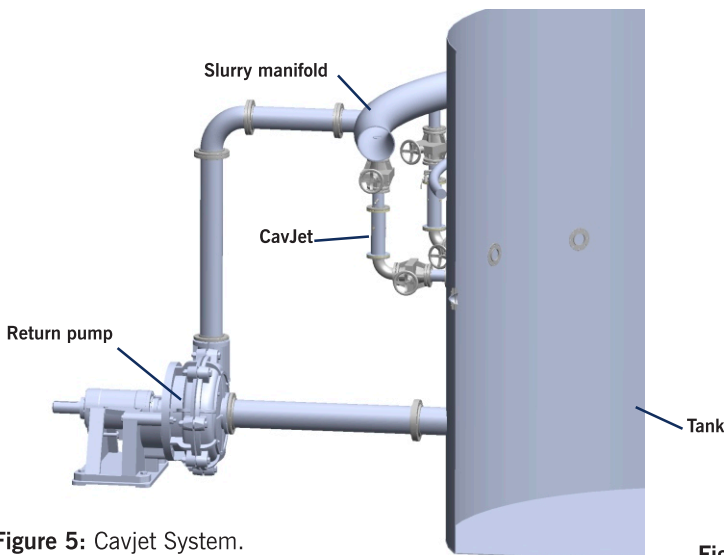


Figure 5: Cavjet System.

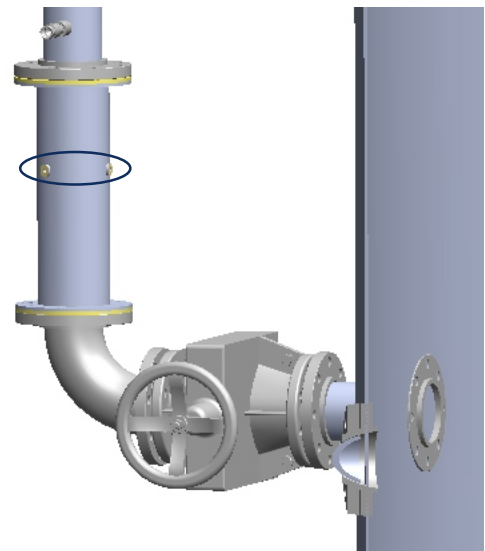


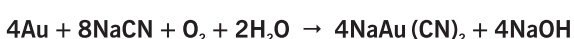
Figure 6: Options for reagent addition.

LEACHING PROCESS

In hydrometallurgical applications - such as leaching processes - the BubbleJet and CavJet spargers improve the leaching kinetics, increasing metal extraction rates by increasing dispersion and dissolution of important gases in these processes.

Gold Leaching

In the conventional gold leaching process, also known as cyanidation, metallic gold is oxidized according to the following reaction:



The dissolution rate may be limited by the

transport of any of the reagents, cyanide or oxygen, depending on their concentrations. What ends up happening is that companies operate with excess cyanide simply because the dissolved oxygen levels are very low due to an inefficient aeration system.

The ProMinerals® Solution

ProMinerals® spargers are recommended to increase dissolved oxygen levels in leaching processes or even in adsorption tanks with

activated carbon (CIP or CIL). The microbubbles produced by **ProMinerals**[®] spargers result in a high oxygen transfer rate to the pulp.

Why use ProMinerals[®] spargers?

- Higher level of dissolved oxygen (DO) than in conventional systems;
 - More cost-effective in the production of high rates of dissolved oxygen in the pulp;
 - Significant improvement in gold leaching kinetics;
 - Increase in gold extraction rates;
 - Reduced cyanide consumption;
 - Less residence time in leaching tanks, thus increasing treatment capacity;
- Less oxygen consumption (if used as the main source) to obtain dissolved oxygen superior than the one produced by merely adding compressed air;
 - Low maintenance and operating cost;
 - Easy-to-install systems;
 - Easy maintenance and removal, with zero operations downtime;
 - Reduction in the power required to agitate the leaching tank;
 - Greater productivity due to the increase in leaching kinetics;
 - Better oxygen/pulp homogeneity in leaching tanks.

Benefits of using CavJet in Flotation and Leaching Processes

The **CavJet** sparging system was designed to be applied where microbubbles are essential to collect mineral particles under 74 micra (fines and ultra-fines) in the flotation process, in addition to improving the recovery of coarse particles due to the recovering of the surface and changes to bulk density. Those particles need a very energetic sparging system that creates the forced particle-bubble contact.

In the hydrometallurgical processes that require higher dissolved oxygen values in leaching, **CavJet** is the most indicated, as it allows for gas and reagent to be added jointly in the sparger's cavity, allowing for a better reaction kinetics.

CavJet can also be installed as a pre-treatment system for ore that requires this process stage.

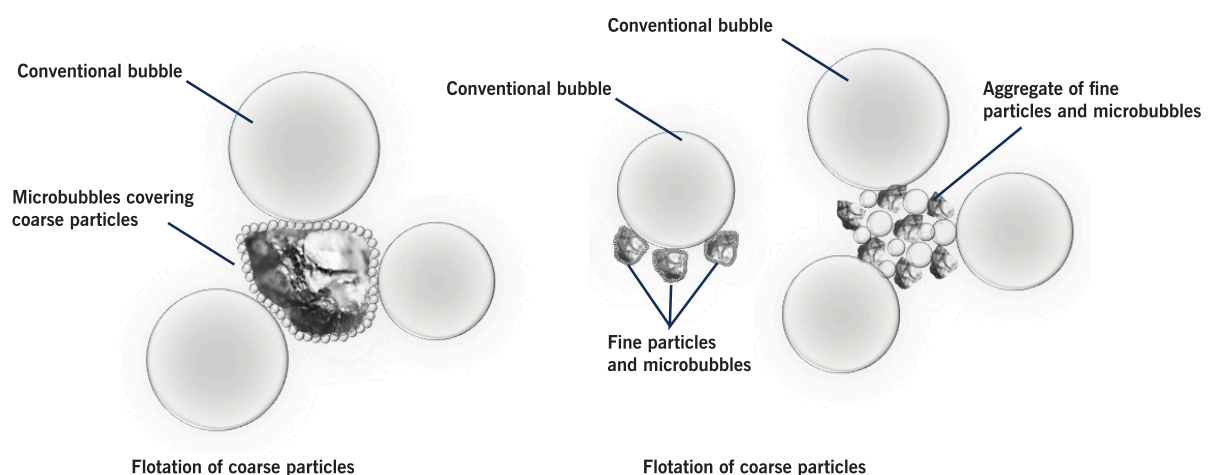


Figure 7: Importance of microbubbles in the flotation process.

BubbleJet:

Assembly of the injection system:

BubbleJet spargers are supplied separately or with accessories: 1 - air kit, 2 - hose kit, and 3 - tank connectors.

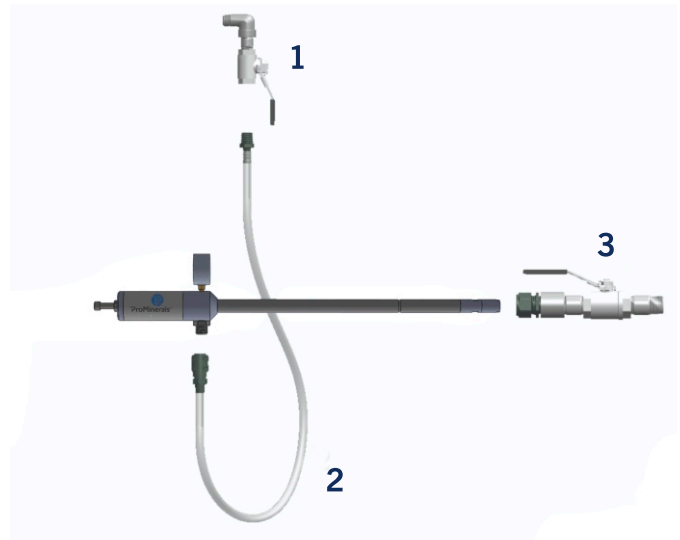


Figure 8: BubbleJet Accessories.

BubbleJet Constructive Specification	
Nominal	5.5 a 6 kg/cm ²
Maximum	7 kg/cm ²
Manufacturing material	Stainless steel 316
Sealing hole	Stainless steel 316
Nozzle	Stainless steel 316 Ceramic Insert
Gasket material	Nitrile rubber with steel core

CavJet:

Assembly of the injection system:

CavJet spargers are supplied separately or with accessories: 1 - pulp and air manifold, 2 - root valves, 3 - air injection reel, 4 - wear curves, 5 - tank feed reel, 6 - air kit, 7 - hose kit and 8 - pulp recirculation pump.

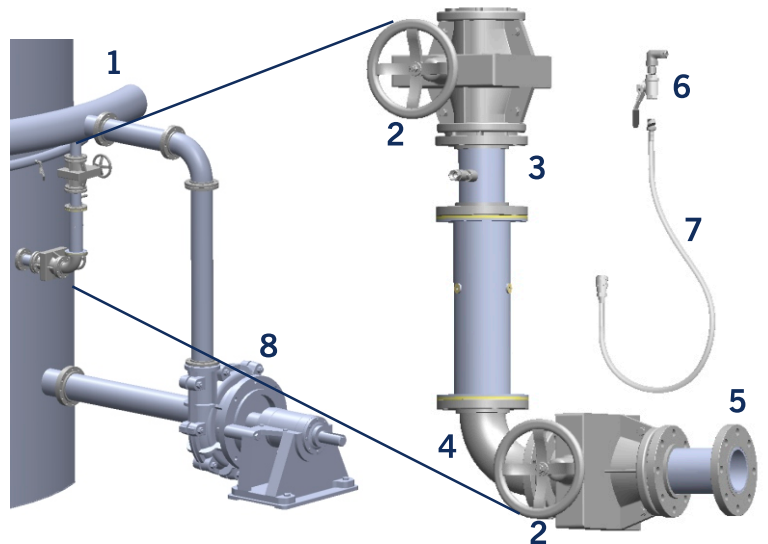


Figure 9: CavJet Accessories.