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Carbon In Leach Circuit

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The WesTech **Carbon Retention Screen** allows for the use of larger tanks in plants with higher production tonnage. The carbon retention screen also reduces downtime incidents and operating costs associated with earlier generations of screen design. Specific flow rates for the carbon retention screen can be up to four times greater than other screening methods. Carbon retention screens are used in CIP and CIL plants worldwide, and are quickly gaining a solid reputation as the premier carbon retention screens for gold recovery.

Carbon-in-Leach Circuit (CIL)

For over a hundred years, miners have used dilute alkaline cyanide solutions (e.g., sodium cyanide [NaCN] around pH 10-11) to leach (dissolve) gold and other precious metals, from their ores. The gold is usually in the form of small flakes mixed with other minerals. It is difficult to separate mechanically, so it is dissolved and then recovered by other means.

Activated carbon removes gold out of dilute cyanide solution by adsorption (sticking). Carbon adsorption (with other extraction steps) is often the best method to follow gold cyanidation.*†

Carbon-in-leach process adds the leaching agent (cyanide solution) and activated carbon together into the slurry of ore and water. This prevents other carbonaceous materials (wood, clay, etc.) in the ores from adsorbing the gold first (“preg-robbing”).

In this step:

- Mills grind the ore, exposing gold particles.
- Water joins the ore to form slurry.
- A trash linear screen rejects wood and debris so that it does not disrupt later operations.
- A high-rate thickener removes excess water from the grinding stage.

This process includes several vessels where:

- Cyanide solution leaches the gold from the slurry so that it can be adsorbed by carbon. ‡
- Slurry flows downstream (pumped or by gravity). Carbon retention screens keep the larger-sized carbon from going downstream, at each stage.
- Pumps force the carbon-rich slurry upstream.
- Countercurrent net transfer: slurry flows downstream – with less gold at each stage; carbon flows upstream – loaded with more gold at each stage.

- A high-rate or paste thickener dewateres the tails (waste), before disposal in a tailings pond, or as a paste deposition.

This process includes:

- Elution – A hot, concentrated cyanide solution pulls the gold from the carbon.
- Regeneration – A kiln reactivates carbon before the circuit reuses it.
- Electrowinning – Electricity passes through the gold-loaded (pregnant) solution, causing gold to form at a cathode, and cyanide at an anode. A smelter refines the gold.

Carbon Fines Recovery

Slurry leaves the final adsorption stage through a linear screen, which catches any residual carbon fragments. These are recycled.

A carbon sizing, linear screen ejects the carbon fines from the adsorption circuit.

A settling tank (e.g., AltaFlo™ Thickener) or filter collects carbon fines, and reclaims water.

*But if the silver content in the ore is high, see “CCD – Merrill-Crowe Gold Silver” flow sheet.

†There are three subsets of the carbon adsorption approach:

Carbon-in-Pulp – Most efficient for slurries. Process leaches the gold first, adds carbon separately.

Carbon-in-Leach – Effective for carbonaceous ore slurries. Process adds leaching agent and carbon together, keeping ‘preg-robbing’ material (like wood) from adsorbing the gold.

Carbon-in-Column – For non-slurries, solution-only. Typical for heap leach applications.

‡Leaching detention time is dependent on:

Particle Size – Finer particles dissolve quicker, less time needed

Dissolved Oxygen – Rate of dissolution is directly proportional to amount of oxygen present.