



CARMAKY

HEAP LEACH vs DUMP LEACH

Overview



Leaching is a hydrometallurgical process widely used in the mining industry to extract valuable metals such as copper, gold, and uranium from low-grade ores. This method involves applying a leaching solution—usually acidic or cyanide-based—over crushed or uncrushed ore, allowing the solution to percolate and dissolve target minerals. The metal-rich solution is then collected for further processing and recovery.

There are two main approaches: heap leaching and dump leaching. While they operate on similar chemical principles, the methods differ in terms of ore preparation, pad design, operational control, and typical use cases. Importantly, both methods now typically require engineered liners to comply with environmental regulations and to prevent groundwater contamination.

Heap Leaching Systems

Heap leaching involves stacking crushed and, if necessary, agglomerated ore on a geomembrane-lined pad in engineered layers. The stacked ore is irrigated with leach solution, and the pregnant solution that collects at the base is channeled through drainage systems to recovery ponds. This method allows for more precise control over solution flow, stacking geometry, and leach kinetics.

Dump Leaching Systems

Dump leaching uses run-of-mine (ROM) ore that is placed in large, loosely stacked mounds or 'dumps' over a lined pad. The ore is not crushed or agglomerated, which reduces preparation costs but also results in slower and less efficient leaching. Leach solution is applied to the top of the dump, and the metal-laden solution is collected via the liner and drainage system below for processing. Although historically dump leaching was done without liners, modern environmental standards require lined containment to prevent leachate escape.

Key Differences

- **Ore preparation:** Heap leaching uses crushed and agglomerated ore; dump leaching uses uncrushed ROM ore
- **Recovery efficiency:** Heap leaching provides higher and faster metal recovery
- **Stack management:** Heap leach stacking is engineered; dump leach piles are less structured
- **Leach time:** Heap leach cycles are shorter and more controlled
- **CAPEX:** Heap leaching involves more initial investment in pads and conveyors
- **Flexibility:** Dump leaching may be used for legacy sites or low-value ore where high recovery is not essential



Heap Leach Pro's and Con's

Heap Leach – Pros

- Higher recovery rates and faster yield\=
- Better environmental control with engineered pads and drainage
- Compatible with modular, automated conveyor systems
- Suitable for fine ore and precise irrigation
- Scalable and predictable for long-term projects

Heap Leach – Cons

- Higher initial capital expenditure
- Requires more site engineering and pad construction
- Operational complexity is higher than dump leach

Dump Leach Pro's and Con's

Heap Leach – Pros

- Lower upfront capital costs
- Simplified ore handling—no crushing required
- Can be implemented quickly for legacy or low-grade deposits

Heap Leach – Cons

- Lower and slower metal recovery rates
- Less control over leaching uniformity
- Requires larger footprint and longer leach time
- Still requires liners and drainage for compliance
- Not ideal for mechanized or automated material stacking

Conclusion

While both heap leaching and dump leaching play important roles in metal recovery, heap leach systems offer superior control, efficiency, and integration with modern material handling technologies. Dump leaching remains a cost-effective option for specific low-grade or legacy scenarios, but with modern environmental requirements, it must still adhere to liner and drainage best practices.

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*"Coming together is a beginning.
Keeping together is progress.
Working together is success."*

- Henry Ford



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