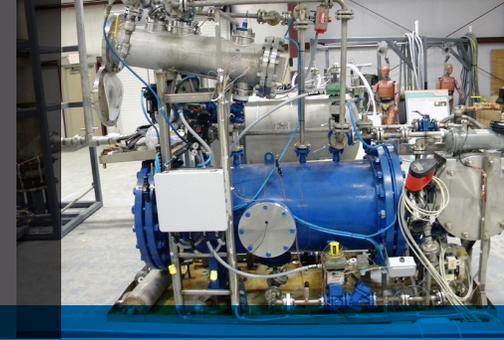


# ACID DIGESTION PROCESS



Battelle's Acid Digestion Process (ADP) is a recycling leach process used to remove or recover metals from solid streams. Within ADP, the acid is recycled in a closed-loop process to reduce costs and minimize waste and environmental impacts. ADP also can be tailored to improve selectivity of the leach or products when multiple metals are involved. Originally developed for the destruction of unexploded ordnance, it can be adapted to difficult separation and recovery applications in the mining, chemical and recycling industries and more.

## HOW IT WORKS

ADP thermally recycles acid used in the leaching process, producing dry leached solids and dry products. It is particularly useful in applications where high acidity is required because it saves on costs through acid recycling, and less expensive materials of construction can be used than other mineral acids. Additionally, the temperature of the acid recovery step can be adjusted to easily remove contaminants from the leached product, improving overall selectivity, and the process can be operated on low-grade heat sources. When combined with Battelle's other offerings in advanced separations, a purified metal product can be generated for recycle or sale.

## HOW IT DIFFERS

In any acid leaching process, chemical consumption is a primary cost driver, but leaching becomes less effective with lower acid concentrations or higher solids loadings. By thermally recycling the acid, the ADP allows for continued effective leaching without paying for additional acid reagents. There are various other benefits of the ADP over other leaching techniques:

- The process is operated in common austenitic stainless-steel grades, reducing capital costs and corrosion maintenance
- The process generates solid products and byproducts, with effectively no acid carryout that can be an environmental hazard

- The dry solid products and byproducts reduce transportation costs
- ADP does not require water washing steps to remove entrained acids, avoiding processing steps and high wastewater volumes
- The process can achieve very high selectivity over base materials such as iron, aluminum, and silica, reducing costs and contamination

## CURRENT USES

The ADP has been used for recovery of energetic materials from artillery shells by dissolving the iron casing. More recently it has been applied for the recovery of rare earth elements from coal ash, where the low chemical consumption and high selectivity are critical for competing with other rare earth element sources.

## OTHER USES

The ADP is a platform technology that can be adapted to many applications:

- **Mining:** Leaching of ores or reprocessing of tailings prior to hydrometallurgy steps
- **Recycling:** recovery of valuable metals from catalysts, electronics, or other solid waste streams
- **Etching:** rapid etching with recovery of the substrate material

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