

Maximize yield, minimize downtime

Smart temperature monitoring in High-Pressure Acid (HPAL) Leaching processes

Benefits at a glance

- Accelerated mineral dissolution for higher metal recovery
- Reliable operation under extreme pressure and corrosive conditions
- Fast response time for optimized process control
- 90% extraction efficiency with reduced downtime

Process conditions

- Temperature: 225–275 °C
- Pressure: 33–45 bar
- Acid/Ore ratio: 0.30–0.45 g H₂SO₄ per g ore
- Stirring speed: 300–400 rpm



Maximize yield, minimize downtime – accurate and reliable temperature monitoring is key to driving High-Pressure Acid Leaching (HPAL) autoclave performance. Precise measurement ensures safe and efficient operation, helping mineral extraction process to maintain stability and maximize metal recovery. HPAL autoclaves are critical for extracting nickel and cobalt from laterite ores in the mining industry. Endress+Hauser's iTHERM ModuLine TM151 with QuickSleeve RTD sensor and robust barstock thermowell delivers reliable performance under extreme conditions, supporting operational excellence and long-term efficiency.

The challenge In HPAL processes, ore is crushed, mixed with water to form a slurry, and pumped into autoclaves where sulfuric acid initiates a chemical reaction at temperatures above 260 °C and pressures exceeding 33 bar. Precise temperature control is vital to optimize leaching efficiency, manage iron hydrolysis, and ensure safe operation.

However, slurry viscosity varies during heating, making accurate temperature measurement difficult. Conventional sensors often fail to respond quickly or withstand the harsh environment, leading to inefficiencies, safety risks, and reduced metal recovery.



Ore mining – the starting point for HPAL's high-pressure leaching process.

Our solution To meet the demanding requirements of temperature measurement in HPAL autoclaves, Endress+Hauser provides a robust and modular solution centered around the iTHERM ModuLine TM151. This industrial thermometer is equipped with a QuickSleeve RTD sensor that ensures fast response times, enabling precise detection of temperature changes within the slurry. Its barstock thermowell is designed to withstand the extreme pressure and corrosive conditions typical of high-pressure acid leaching, significantly extending the sensor's lifespan and reducing maintenance needs. The temperature signal is transmitted via the iTEMP TMT72, a HART-compatible transmitter that ensures reliable communication with the control system. For operators who require on-site visualization, the solution can be complemented with the TID10 local display. It is also possible to visualize the process values directly on the customer's mobile device using the SmartBlue-App. Together, these components form a

temperature monitoring system that enhances process efficiency, improves safety, and supports consistent metal recovery in one of the most challenging environments in the mining industry.

Result By implementing Endress+Hauser's temperature monitoring solution, the customer achieved a significant increase in metal extraction efficiency, consistently reaching rates above 90%. The fast response time of the QuickSleeve RTD sensor enabled precise control of the leaching process, resulting in optimized acid regeneration and improved iron hydrolysis. The robust design of the barstock thermowell ensures reliable operation under extreme pressure and corrosive conditions, minimizing sensor failures and reducing maintenance requirements. Overall, the solution contributed to safer autoclave operation, reduced downtime, and enhanced process stability, supporting both economic and environmental goals in metal recovery.

Components

- **iTHERM ModuLine TM151** – Modular industrial thermometer with QuickSleeve RTD sensor and barstock thermowell (materials: 316Ti, Tantalum, Titanium)
- **iTEMP TMT72** – HART temperature transmitter for robust signal transmission
- **TID10** – Optional local display for visual process feedback



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