

LONG-TERM EXPERIENCES AND NEW DEVELOPMENTS IN AUTOCLAVE LININGS FOR HIGH-PRESSURE LEACHING AND PRESSURE OXIDATION PROCESSES

By

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ABSTRACT

Common processes to extract metals from refractory ores or laterite ores rely on high pressure applications in autoclaves, e.g. High Pressure Acid Leaching (HPAL) to extract nickel and cobalt or Pressure Oxidation (POX) in cases of copper, gold, zinc, etc.

In both processes ore is mined, crushed and a slurry is created by addition of water or acid. This slurry is treated at elevated temperature and pressure (e.g. $T > 200^{\circ}\text{C}$, $P > 30\text{ bar}$) in an autoclave. To return the slurry to atmospheric conditions, an array of flash vessels is used. Via decantation and selective precipitation the desired metal, metal oxide or metal salt can be accumulated and purified.

As each step requires a specific corrosion protection lining, different lining setups are used in autoclaves, flash vessels, etc. Especially for high pressure applications in autoclaves and flash vessels combined linings of membranes, bricks and inserts of PTFE, titanium or Inconel are used.

Looking at various ore processing plants around the world, different kinds of membranes are combined with different types of brick linings aiming for a long-lasting and efficient corrosion protection. Membranes protect the steel vessels against chemical attack. Widely used in pressure vessels are lead membranes, glass fiber reinforced coatings or rubber linings. Also explosion plated titanium or welded on Inconel is partially used. The main task of the additional brick lining is to protect the membrane against abrasion or mechanical impact. Acid resistant ceramic bricks, carbon bricks, graphene bricks or different specialties are widely used. Depending on the local load (e.g. liquid phase, gas phase, transition zone) different types of mortars are used to install the brick lining.

During the presentation, we will look back on decades of experience with different lining combinations and show pros and cons in application, operation, maintenance, repair and relining

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