The Outotec Furnace Lining Monitoring System (FLMS) is an intelligent solution for monitoring furnace refractory linings to reduce unplanned shutdowns, improve maintenance planning, and extend the lifespan of the lining. The system continuously monitors the refractory lining and provides data to support optimization of your furnace operations. The ability to monitor refractory performance and identify the correct time to replace the lining maximizes the campaign life and reduces costs at the smelter.

**OUTOTEC FURNACE LINING MONITORING SYSTEM**

**BENEFITS**

- Improved furnace availability and longer refractory lining lifespan
- Reduced risk of unplanned shutdowns for emergency repairs
- Optimized lining campaign lifetime and improved shutdown planning
- Reduced maintenance costs
- Improved overall energy efficiency
Furnace containment is critical to your process. To obtain the longest possible campaign life and gain maximum benefit from the system, the performance of the furnace refractory linings needs to be continuously monitored.

**Principle of operation**

The solution comprises thermocouples installed at different depths in the furnace wall to enable accurate monitoring of locations that are prone to wear. Using data gathered by the thermocouples, the heat flux can be calculated throughout the lining using Fourier’s Law of Heat Conduction. The calculation uses the heat-flux data and the isotherm curves (temperature curves where metal and slag are at melting point). The collected data is used to generate user-friendly visualizations of temperature, lining condition, and isotherm curves for operators and engineering personnel.

The required analysis of the melting points and viscosity of all metal and slag components can be performed at the Outotec Research Center.

The Outotec FLMS displays information in a clean 2D interface, enabling operators to quickly and easily determine the condition of the furnace lining.

**Key components**

- Thermocouples
- Connectivity from thermocouples to distributed control system (DCS) and from DCS to the FLMS
- PC and display
- Software application including lining modeling and user interfaces

**Typical scope of delivery**

- Fact-finding inspection
- Engineering for all modifications, including third-party drawings for furnace
- Supply of proprietary equipment and technologies
- Construction planning and supervision
- Construction work and shutdown management (optional)

**Increased safety and improved sustainability**

By reducing the risk of unplanned shutdowns the Outotec FLMS also increases safety on site as it reduces the need for personnel to enter the furnace environment to perform repair work. From a sustainability perspective, fewer shutdowns mean that furnace availability and overall energy efficiency is maximized.