IMPROVEMENTS TO THE SAGANOSEKI FLASH SMELTING FURNACE OPERATION

The Saganoseki Smelter, one of the largest copper producers in Japan, currently operates a single flash smelting furnace (FSF) to produce 450,000 tons of new copper annually. The FSF feeding rate was increased to approximately three times that of the original design to accommodate a change in the Cu grade of concentrate. The availability and productivity were also improved through modifications and changes to the operation scheme. Currently, the FSF is running at a feed rate of 215 DMT/h, while furnace utilization has been maintained at 97%. Figure 1 shows the general view of Saganoseki Smelter.

Improvements to increase the FSF capacity
Multiple improvements were made for each process to increase the FSF capacity.

The main improvements were:
- A process flow change of the flux supply by installing a new flux ball mill,
- A modification of the concentrate burner and feeding system,
- An increase in the capacity of the concentrate drying process (Figure 2),
- An increase in the capacity of the waste heat boiler from 47 to 60 MT/h-steam by the addition of a New steam drum,
- A reinforcement of the FSF reaction shaft cooling,
- An expansion of the capacity of the acid plant from 3150 to 4000 t/d,
- Integration of gas cooling facilities, and
- Installation of two PSA oxygen plants.

Figure 2 shows the two large stacks for the emission of cleaned off-gas. Two years ago, the old stack on the right was dismantled after the left stack was remodeled to handle the same quantity of gas as originally handled by the two stacks. The old stack on the right was 96 years old and 167 meters in height.
Improvements made to increase the FSF availability

Many improvements were made to increase the FSF availability.

The main improvements were:
• Optimization of the gas flow inside the waste heat boiler that reduces the problem of dust
• Accumulation and the erosion rate of tubes,
• Material improvements for waste heat boiler tubes that reduce the corrosion of tubes, and
• Reinforcement of the FSF settler cooling system.

We attempted to extend the shutdown interval from one to two years in response to the relaxation of regulations for the legal inspection of the waste heat boiler and oxygen plant. The most serious problem in extending the shutdown interval related to the refractory service life of the settler, especially in the area underneath the reaction shaft. The cooling effect of the existing cooling jacket was limited and almost all the refractories of the settler underneath the reaction shaft were lost after one year of operation. To extend the service life of refractories, several types of water-cooled jackets were tested (Figure 3). Consequently, we found that a jacket with zigzag-aligned cooling tongues could cool the brick from five different directions and extend the brick service life by more than four years.

Water-cooled jackets were replaced with modified jackets as a multi-year project beginning in 2009 (Figure 4), and the refractory service life was thus extended substantially. We subsequently extended the shutdown interval from one to two years in the beginning in 2011. The biannual shutdown scheme increased the FSF availability and new copper production by about 3%.

The availability and productivity of the Saganoseki Smelter was improved by making many modifications. However, the commercial environment in which custom smelters operate has become increasingly severe in recent years. To survive in this environment, the Saganoseki Smelter will need to make continual efforts to improve performance.