

Smelting

Smelting is the third step in Kennecott Utah Copper's production cycle. Copper, like silver and gold, can be produced directly from naturally occurring minerals by heating and oxidation.

Smelting began on the south shore of the Great Salt Lake in 1906 when the American Smelting and Refining Company (ASARCO) built a smelter to process ore from Utah Copper's Bingham Canyon Mine. In 1959, KUC bought the Smelter from ASARCO. The original Smelter has been rebuilt and modernized several times to meet the demands of improved emission control and higher productivity.

In 1992, KUC began construction of one of the most technically advanced -- and cleanest -- Smelters in the world as part of an \$880-million modernization of the Smelter and the Refinery. This project was the largest privately financed construction project in the history of Utah. The new Smelter became operational in the spring of 1995.

The Smelter processes copper concentrates from the Copperton Concentrator. The process starts with drying the copper concentrate and injecting it and oxygen-enriched air into a modern flash smelting furnace. The furnace was designed and supplied by Outokumpu, a Finnish technology company. The copper concentrate - containing 26 percent copper and similar quantities of sulfur and iron - burns, providing most of the heat to sustain the furnace temperature. Most of the iron and about two thirds of the sulfur are oxidized. The iron combines with a sand that is added to form a molten slag. The slag separates from the copper, much like cream separates from milk. The slag is skimmed from the furnace, cooled, and processed in a Concentrator at the Smelter to recover additional copper. The burned sulfur leaves the furnace as sulfur dioxide gas, which is cooled in a boiler to produce steam and then sent to a double contact Sulfuric Acid Plant. There, the sulfur dioxide is converted to high-purity sulfuric acid (1,000,000 tons per year), which is sold and transported to customers in tank trucks and rail tank cars.

Copper produced in the smelting step is a molten copper sulfide called matte, which contains approximately 70 percent copper. The molten matte is tapped from the furnace and quenched in a water spray to form a sand-like solid. This granulated matte is then dried and ground to a fine powder for injection into a second flash furnace, a step patented by Kennecott. The combination of matte granulation and flash converting, developed by Kennecott Outokumpu, represents a major improvement in smelting technology and environmental efficiency because the molten metal transfer and the resulting gas emissions are eliminated. The powdered matte burns to provide the heat for the process, liberating sulfur dioxide, and producing molten copper metal, which is 98.6 percent pure. The sulfur dioxide gas is cooled and sent to the Acid Plant.

The copper is transferred to one of two refining furnaces, where it is upgraded to 99.5 percent copper. Twin casting wheels then cast the copper into 750-pound plates called anodes, which are transported by rail to the Refinery.

The Smelter captures 99.9 percent of the sulfur in the feed, making it one of the cleanest in the world. The Smelter also recovers heat from the furnaces and the Acid Plant as steam, which is used to co-generate about 60 percent of the Smelter's electric power needs.