



Figure 5.3.5: Principle of the Outokumpu (Outotec) Flash Furnace

The process bases on the small particle size of the concentrate of only 50-150 microns. So the dried concentrate with about 25-35 % copper is burned in a burner with air or oxygen enriched air similar to a coal burner on the top of a shaft. The concentrate burners (usually 1, but up to 4) combine dry particulate feed with oxygen enriched air and blow them downward into the hearth furnace. During the falling through the shaft the fine concentrate particles react to copper matte and the sulfur and partly iron is oxidized, evolving a lot of heat and melting the solids. A very important issue is cooling the reaction shaft to prevent the rapid wear of the chrome-magnesia brick lining because of the high temperature. The mix of slag and matte is collected in the hearth of the furnace for settling and separating matte and slag phase. Water-cooled copper block tap holes are used for periodically removing molten matte and slag. At the end an uptake removes hot sulfur dioxide and dust containing off gas.

The products of flash smelting are: molten matte at 55-65 % copper, molten iron-silicate slag containing 1 to 3% copper and hot dust-laden off gas containing a high concentration of 30-70% sulfur dioxide depending on oxygen enrichment. According to the enrichment of oxygen in the air the process can be run autogenous without adding fuels to the shaft. Nevertheless some fuel is used in the settling part of the furnace to enable a constant temperature of about 1250 °C.

The sizes of the furnace vary: e.g. in a year 2000 design the hearth is 18 m long, 6 m wide and 2 m high. It has a 4.5 m diameter, 6 m high reaction shaft and a 5 m diameter, 8 m high off gas uptake. It has one concentrate burner