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TOPICS:

- Renewable Energy & Energy Conversion
- Environmental Technologies
- Earth Resources Engineering
- Metallurgy and Material Science

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INCO flash smelting technology: A general analysis

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The INCO flash smelting process is a copper smelting technology that was developed by the International Nickel Company (INCO) in the 1960s. This process was designed to efficiently extract copper from copper sulfide ores and concentrates. While it was not as widely adopted as the Outokumpu flash smelting process, it is still noteworthy in the history of copper metallurgy. It's important to note that while the INCO flash smelting process has been used in the copper industry, it did not achieve the same level of widespread adoption as the Outokumpu flash smelting process. The latter process, developed by the Finnish company Outokumpu, has been more prominent and is often recognized as a leading technology in copper metallurgy. However, the INCO process represents an alternative approach to copper smelting that was significant in its time and contributed to the development of copper extraction technologies [1].

The oxygen-torch melting process includes the following technological practices [2]:

- gas cleaning, maximum drying of slag in vertical tube dryers;
- melting of dry slag in a flow of technological oxygen;
- removal of melting products from the furnace;
- release of technological gases and recovery of heat;
- cleaning gases from fine dust in dry electrostatic precipitators.

The operation procedure of drying of the batch depends on the moisture in the material, its physical and chemical properties and the allowed heating temperature during drying.

When choosing a thermal mode for drying the slag, it is necessary to take into account its ability to oxidize and burn when heated and should not exceed the permissible temperature.

The temperature at which active oxidation and combustion of slag starts depends on its mineralogical and chemical composition, moisture and particle size, as well as the amount of oxygen in the surrounding gas environment.

Based on practical data on the operation of drying pipes, it was found that this temperature is up to 350 ÷ 550 °C.

Consumption of solids for each burner is 30-35 t/h. At the same time, technological oxygen is supplied under pressure to the last part of the burner. The oxygen stream picks up the mixture, mixes it and blows it into the working space of the furnace at a speed of up to 20 m/s. Under the influence of high temperature and as a result of exposure to oxygen, the sulfides of the frost ignite, forming a reddish torch. The temperature of the torch rises to 1550-1600 °C.

In summary, although the INCO Flash smelting process has historically been used in copper production, the specific equipment and technologies associated with it may have evolved over time or been integrated into other operations. Advantages and disadvantages are general characteristics of fast melting processes and may vary with specific implementation and technology upgrades.

[1] Sh.T. Khojiev. *International Journal of Advanced Research in Science, Engineering and Technology*, **2019**, 6(2), 8094 – 8099.

[2] B.T. Berdiyarov, Sh.T. Khojiev. *Kompozitsion materiallar*, **2021**, 4. 39 – 43.