S2–14

Study on One Side Combustion Method in Magnesium Reduction Furnace Introduced High Temperature Air Combustion Technology

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Magnesium is the important raw material to produce the machines needed for developing the people's life and national defence economy. It is important to improve the thermal working factors and to determine the optimum production method in order to satisfy the demand of magnesium. Traditional magnesium production method consumes a lot of energy. As we introduced High temperature Air Combustion (HTAC) into the magnesium reduction furnace, we could decrease the amount of energy much. When traditional HTAC technology was introduced to the magnesium reduction furnace, the gas and air injected in furnace were moved across the reduction tubes. Therefore, the pressure loss was great and it was difficult to uniform the temperature and gas flow in furnace. From this, it is necessary to simulate and analyse the thermal working process by using the computer for the one side arrangement method in which regenerative burners are arranged on one side of furnace and both sides method in which the regenerative burners are arranged on both sides of furnace.

In this paper, we determine the optimum combustion method by means of evaluating the gas flow state and uniform level of furnace temperature in two methods by using computer simulation.

We can prolong the life period of tubes by decreasing the local thermal stress in reduction tubes and we can keep the uniform of temperature in working chamber of furnace. The simulation conditions of one and both side arrangement method are same. As the gas moves in cross direction to reduction tube in the both side method, its pressure loss is larger than one side, and the temperature distribution is not uniform. Furthermore, the high temperature zone in the head of tubes and unheated zone in the direction of wall and then, the reduction tubes arranged from fifth to tenth from the wall are not heated well. The standard deviation of both sides method is large. They are 92, 86, 80, and 84°C in sides, and then 61, 56, 52, 54°C in one side respectively. Secondly, we consider the tubes which are arranged near the regenerative burners and find that serious local thermal stress occurs in there.

From the result of simulation analysis in both side and one side arrangement method, we can conclude as follows.

First, the gas motion and temperature distribution is uniform and it is advantageous to heat exchange of gas and material in the furnace for one side method. And pressure loss is smaller than the traditional method and the temperature distribution is uniformed due to gas moves in same direction to the reduction tubes.

Second, the amount of gas consumption is very small and the blast and exhaust piping system is considerably simple. If we use the both side method, non–heated zone exists, so we should supply more gas in the center of the furnace to establish the gas burner. And then because the inside resistance of furnace is large, we should increase the jet velocity of gas and air in the reheating furnace. So, the blast and exhausting piping system becomes large and also pressure loss gets larger.

Third, the local thermal stress of reduction tubes is comparatively smaller than tradition method.

This study becomes a very significant one because it enables us to raise the quality of products and to prolong the reduction tube's life.