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## Development of Induction Heating Device Using HTS Magnet in Aluminum Extrusion Processing

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In the aluminum industry, development of highly efficient and fast heating methods of aluminum billets is expected. The induction heating by rotating the aluminum billet in strong DC magnetic field generated by HTS coils is one of the candidates for the heating methods in the aluminum extrusion processes, since this method has the large heating capacity with higher energy efficiency and faster heating than the conventional high frequency induction heating method. In our R&D, an aluminum billet heater using a high temperature superconducting (HTS) magnet has been being developed. The target heating capacity is 400 kW to heat a 6-inch x 500 mm aluminum billet from 20 degrees Celsius to about 500 degrees Celsius within 60 seconds. The R&D has been being conducted in three steps. Firstly, the HTS magnet have been developed. For the purpose of cost reduction towards commercial production, we chose the HTS magnet with iron cores to reduce the amount of HTS wire, since the necessary magnetic field is about 1 T around the aluminum billet. The cool-down and the current charging tests for the developed HTS magnet have been successfully finished. It was confirmed that the agreement of the measured magnetic field generated by the HTS magnet in the region for aluminum heating with the design value was sufficient. Secondly, the mechanism for grasping and rotating the aluminum billet in the magnetic field generated by the HTS magnet has also been developed. We confirmed that the grasping force control corresponding to the temperature dependence of mechanical properties of aluminum well worked. Based on these developments, currently, we are assembling the test apparatus for the aluminum billet heating demonstration. In the presentation, the detail of the design and fabrication of our test apparatus is summarized and the results of the heating demonstration tests are reported.

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