Development of Non-water cooling Induction coil of Ingot Casting Equipment for Uranium Deposits

Yoon-Sang Lee, Choon-Ho Cho, Sung-Ho Lee, Hansoo Lee
Korea Atomic Energy Research Institute, Dukjin-Dong 150, Yesong-Gu, Daejeon, 305-353, Korea
yslee@kaeri.re.kr

1. Introduction

The ingot casting equipment for uranium deposits is to make an ingot with uranium deposits produced from an electro-refiner by a pyro-processing method. [1]

The ingot casting equipment consists of crucible, feeder and mold. The crucible is heated by induction coil. Usually in industry they use a water-cooling induction coil for there is a lot of heat generation through the heating coil.

We introduce a new idea to improve safety with non-water cooling coil in ingot casting equipment for uranium deposits, because in the hot-cell operation, if there were leakage from water-cooling induction coil, there could be a troublesome accident.

In this paper, we introduce the experimental results of non-water cooling induction coil.

2. Induction Coil Design and Experiment

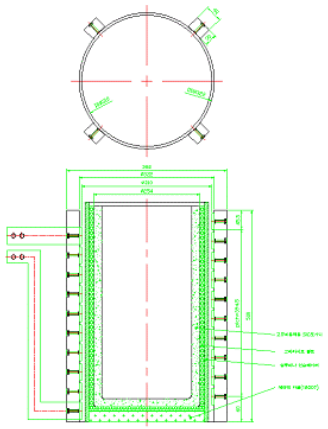

Fig. 1 Drawing of a non-water cooling coil.

This non-water cooling induction coil is made of copper plate (6 mm thick, 40 mm height), of which the outside diameter is 310 mm, the height is 500 mm, and the turns is 10.

The crucible is made of SiC whose outside dimension is 254 mm , and height is 475 mm.

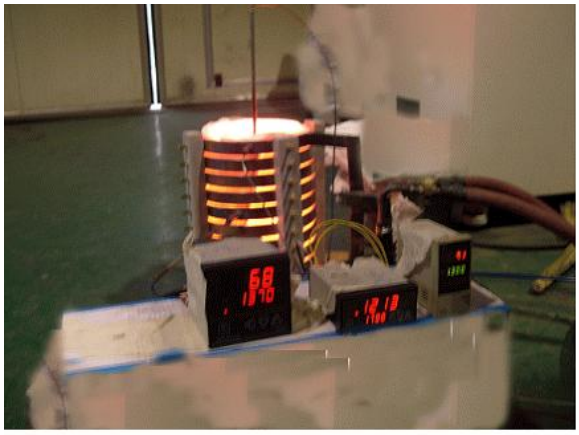

Fig. 2 Photo for a heating experiment with a non-water cooling coil.

As shown in Fig. 2, 4 thermocouples were installed to measure temperatures of upper, middle, and lower parts of the coil and crucible.

The input power of the high frequency generator was 10 kW to 15 kW.

3. Results

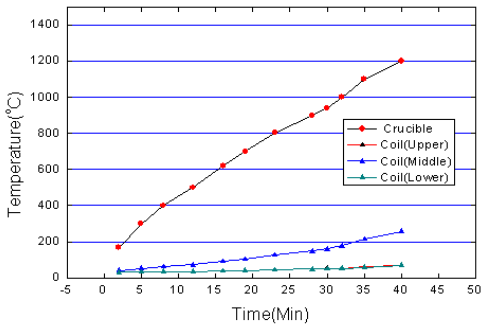

Fig. 3 Temperature profile for the non-water cooling coil experiment.

As shown in Fig. 3, the crucible was heated to 900 ℃ by 30 ℃ per minute with 10 kW, and to 1200 ℃ by 20 ℃ per minute with 15 kW. At 1200 ℃ of crucible, the inside temperature of crucible was about 1280 ~ 1300 ℃ which was measured by pyrometer.

At this temperature, the temperature of non-water induction coil at upper position was 70 ℃, middle 250 ℃ and lower 72 ℃.

4. Conclusion

We are developing ingot casting equipment for uranium deposits which will be used in a hot-cell. For the safety of the hot-cell operation, it is necessary to develop non-water cooling induction furnace. Through this experiment, we can confirm the possibility of non-water cooling induction coil systems.

Acknowledgements

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