Chapter VI

Conclusions

The aim of this work was to determine the effect of sand properties on pinhole and blowhole problem. The experiment was performed by using various formulas of facing sand, i.e., AFS grain finess number of about 49 and 46, clay content of about 4.5 and 6.5 %, starch content of about 0.5 and 1 %, moisture content of about 2.5 and 4 %. According to low(1550 °C) and high(1620 °C) pouring temperature as variables in foundry process. The important result obtained from this work can be summarized as follows:

1. Increasing of moisture, clay and starch will lower permeability. The higher grain finess number also cause lower permeability. The most significant factors are grain size and moisture.

2. Clay content and moisture content are the most significant factor contributing to compressive strength, the increasing of clay and moisture is the main effect to make higher compressive strength.

3. Increasing of moisture and starch can get higher % loss on ignition. The lower grain finess number also makes higher % loss on ignition, because of higher space between grains. Starch content and moisture content are the most significant factors contributing to %loss on ignition.

4. When the permeability decreased, the amount of blowholes is clearly increased.

5. When the %loss on ignition increased, the amount of blowholes is prone to be increased.

6. Using of high pouring temperature resulted in decreasing of blowholes in casting. So, the pouring temperature is the most significant factor contribution to gas cavity occurrence. The clear results are shown in a permeability chart. Thus, at high pouring temperature, molten metal has enough time for degassing, although higher pouring temperature makes more vaporized moisture. However, if the molten metal has enough time for solidification, gas can be reduced.

7. The amount of blowhole is prone to increased, following the increasing of moisture content, clay content and starch content. Otherwise, the decreasing of grain finess number (coarser grain) and pouring temperature(lower temperature) cause increased in blowhole and pinhole. Grain finess number, starch content and pouring temperature are the most significant factors.

8. From the statistical analysis and visual analysis, the best condition that minimizes blowhole and pinhole is condition 21112, which low grain finess number, low clay content, low starch content, low moisture content and high pouring temperature. The condition can signify as grain finess number of 46, clay content of 4.5 %, starch content of 0.5 %, moisture content of 2.5 % and pouring temperature of about 1620 °C. However, since cost saving is an important subject in the factories, the process, which uses grain finess number of 46, clay content of

4.5 %, starch content of 0.5 %, moisture content of 2.5 %, and pouring temperature of 1550 °C, is acceptable. The experimental conclusions prefer high pouring temperature, but actual process in the factories prefer low pouring temperature for saving cost.

In conclusions, the other three conditions of zero defect and low pouring temperature are (i) grain finess number of 49(fine grain), clay content of 6.5 % (high level), starch content of 0.5 %(low level) and moisture content of 2.5 %(low level); (ii) grain finess number of 46 (coarse grain), clay content of 6.5 %(high level), starch content of 0.5 %(low level) and moisture content of 2.5 %(low level); and (iii) grain finess number of 46 (coarse grain), clay content of 6.5 %(high level), starch content of 0.5 %(low level) and moisture content of 4 %(high level). All of these three conditions can be accepted to pour with low pouring temperature, which cannot used in the process which one ladle for a lot of molds. If this kind of process is preferred, high pouring temperature is recommended.