

Effect of plate thickness and casting position on skin effect formation in thin Wall ductile iron plate

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Abstrak

In producing Thin Wall Ductile Iron (TWDI) plate, special notice should be taken on the skin effect formation. Skin effect is a rim of flake interdendritic graphite formed in the surface. In a normal ductile iron casting, skin effect can be removed with machining process. Unfortunately this procedure cannot be applied in TWDI due to the thickness. This paper discusses the effect of casting design to the skin effect formation. Vertical casting design is used in this work. Variations are made in the thicknesses of the plate. The T1 model is equipped with 5 plates with thicknesses of 1, 2, 3, 4, and 5 millimeters; while the T1-Mod is equipped also with 5 plates, but with the same thickness, which is 1 mm. Skin thicknesses, nodule count, and nodularity are measured by NIS Element software. The result showed that skin effect formation is determined by magnesium content and cooling rate. Skin effect thicknesses are determined by cooling rate and the interaction area of molten metal with the mould. The presence of the skin effect in similar thickness and position of plate improved nodule count. In the same thickness, without the presence of the skin effect, the nodule count tends to increase as the positions of the plates increase. In the design ranging from 1 to 5 mm plate thickness, the highest nodule count is 1284 nodule/mm² gained by 1 mm plate thickness in 1st position and the lowest one is 512 nodule/mm² gained by 5 mm plate thickness in 5th position. As for the design of all 1 mm thickness where skin effect is not formed the highest nodule count is 1689 nodule/mm² gained by 1 mm plate thickness in the 5th position and the lowest is 1113 nodule/mm² gained by 1 mm plate thickness in the 1st position (near the in gate). The highest nodule count is 90 and the smallest is 85.