Pengaruh ketebalan isolator glasswool terhadap kecepatan pendingingan dalam pembentukan lapisan kulit pada besi tuang nodular dinding tipis = The influence of thickness glasswool isolator on cooling rate in skin effect formation of thin wall ductile iron

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Abstrak

Pada pengecoran Besi Tuang Dinding Tipis terjadi fenomena unik, yaitu terbentuknya lapisan kulit. Lapisan tersebut menjadi pusat stress konsentrasi untuk terjadinya retak material. Salah satu cara untuk meminimalisir terbentuknya lapisan kulit adalah menjaga kecepatan pendinginan pada keadaan optimum. Penelitian ini dilakukan untuk mengetahui pengaruh ketebalan isolator glasswool terhadap kecepatan pendinginan dalam pembentukan lapisan kulit. Variasi modifikasi cetakan yang digunakan adalah tanpa isolator (P4M1), isolator glasswool tebal 40mm sebelah kiri benda dan 50mm sebelah kanan benda(P5M1), dan isolator ketebalan 50mm dikedua sisi benda(P7M1). Dilakukan karakterisasi metalografi non etsa dan etsa, uji mekanis berupa uji tarik, dan uji kecepatan pendinginan pada plat urutan ketiga masing-masing benda cor.
Hasil menunjukkan bahwa adanya pengaruh ketebalan isolator terhadap kecepatan pendinginan benda cor. Kecepatan pendinginan tertinggi hingga terendah adalah 21,59C/menit, 3,75C/menit, dan 3,61C/menit. Lapisan kulit ketebalan rata-rata yang didapat P7M1 324m, P4M1 105m dan P5M1 71m. Jumlah nodul tertinggi hingga terendah P4M1 1121 nodul/mm2, P7M1 916 nodul/mm2, dan P5M1 801 nodul/mm2. Nodularitas yang didapat P4M1 78%, P5M1 75% dan P7M1 64%. Nilai tensile strength yang didapat dengan nilai 287MPa, 288MPa sampai 383 MPa. Matriks yang didapat adalah full ferit.
<hr>Thin wall ductile iron has unique phenomena in manufacturing called skin effect. Skin effect becomes stress concentration to form crack initiation. One of many methods to decrease skin effect is providing optimum cooling rate. This research used the influence of glasswool isolator thickness leading to different cooling rate as variable. Variation of casting also investigated which are molding without isolator (P4M1), molding using isolator glasswool with thickness 40mm on the left side and 50mm on the left side of plate (P5M1) and the last is molding using isolator glaswool with 50mm on both of sides (P7M1). Samples were characterized using metallograpy technique (etching and non etching), mechanical testing especially tensile test and cooling rate testing.
The result shows that thickness of isolator glasswool has influences on cooling rate. The cooling rate varies from fastest to slowest which are 21,59C/minutes, 3,75C/minutes, and 3,61C/minutes. The skin thickness is produced from the thickest to thinnest on the mold using 50mm thickness glaswool isolator, the mold without glasswool isolator and the mold using 40mm glasswool isolator on left side and 50mm glasswool isolator on the right side. High nodul counting resulted from the mold without isolator, the mold using 50mm glasswool isolator and the mold using 40mm glasswool isolator on left side and 50mm glasswool isolator on the right side. Highest nodularity was produced on the mold without isolator which is 78%, the mold using isolator glasswool 40mm and 50mm thickness produced 75% nodularity dan the mold using glasswool isolator 50mm produced 64% nodularity. Tensile test showed tensile strength alter from 287MPa, 288MPa until 383 MPa. The matrix obtains full ferritic