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## **„Production technology of vermicular and ductile cast iron in Metalpol foundry conditions by using of hybrid cored wire”**

### **Abstract**

This doctoral dissertation concern the production technology of vermicular and ductile cast iron in Metalpol foundry condition where secondary metallurgy (nodularisation) performed by the core wire method PE (flexible core wire) used new hybrid design PE. In traditional solution the thin wall tube is filling low magnesium master alloy FeSiMg on determinate grain size. Hybrid PE is made of a thin-walled steel tube with a centrally placed wire (rod) of technically pure Mg, and the remaining space of the steel tube is filled by FeSi-based powder inoculant.

The doctoral dissertation contains the analysis of the literature on the subjects such as: graphite eutectic crystallization, graphite inoculation and the influence of key chemical elements on the properties of ductile and vermicular cast iron. The dissertation describes of methods cast iron secondary metallurgy - of implementing magnesium or magnesium alloys to the base metal, with the special focus on the PE core wire method.

The research part describes the technology of obtaining vermicular and ductile cast iron PE method by hybrid cored wire in the Metalpol foundry. A series of tests were carried out to determine the influence of technological parameters, i.e. temperature of core wire treatment, sulfur content in base liquid iron and cored wire feeding speed for magnesium yield. The optimization and adjustment of each technological parameters are crucial meanings in obtaining the set magnesium content in the final cast iron. Ductile and vermicular cast iron obtained during the trials were a subject to the chemical composition test and the examination of mechanical properties and metallographic parameters. Additionally the influence of cooling rate on the microstructure was tested by using step blocks. Samples of microstructure tests taken from step blocks ingots showed that there is a significant correlation between the wall thickness and the quantity of graphite precipitates graphite: the thicker walls are, the less graphite precipitates. The results of mechanical properties of vermicular iron EN GJV 300 and EN-GJV 350 as well as ductile iron EN-GJS 500-7 up to the standard to the grade of cast iron. The results of tensile strength  $R_m$  and elongation  $A_5$  were characterized by high repeatability.

The development in the technology of the use of hybrid cored wire application in PE method allowed the stability and repeatability in the production process of vermicular and ductile cast iron with graphite precipitates in Metalpol foundry conditions. The research on the development tin the production technology of

compacted and ductile cast iron presents the solution to the industry needs. The development technology is subject of patent PL (11) 234059 dated 28.11.2017 (13) B1: Cast iron method production especially compacted iron and ductile iron. The dissertation is completed by a list of referenced literature covering 98 items.