

Nattaporn Boonlertcharoensak 2010: Hollow-Shape Molds by Layer Manufacturing Process. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering.

Thesis Advisor: Mr. Kunayut Eiamsa-ard, Ph.D. 134 pages.

Hollow-Shape molds by Layer Manufacturing Process is a hybrid process that combines (a) Material Deposition Process using MIG/MAG welding machine to form the shape layer by layer and (b) Material Removal Process using CNC Milling Machine to enhance the surface finish. This process can greatly reduce the cost and time to manufacture because the amount of material required to form the molds is reduced. Molds are only formed in near-net shape and finished by the milling process after that. Thus, “zero” excess material has to be removed. Molds made by this hybrid process have much lighter weight compared to molds made by the conventional milling process because we introduce the hollow-shape inside the molds. The benefit of hollow-shape is absolutely appropriate for medium to large mold size; or even gigantic molds. The procedures to set up the mold are much easier because of the weight. Several tests have been done with the molds made by this process. Rockwell Hardness Test prove that the strength of the filled material is not significantly different from the substrate. This, however, depends upon the substrate and wire selected for the process. The Scanning Electron Microscopy (SEM) and Radiographic Examination are done in order to verify that the solid is fully dense and there are no cracks and pores. The stress and deformation analyses are conducted in Finite Element Method (FEM) Software. The results show that molds made by this process are in good range in terms of stress and deformation.

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