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Tilte : Sustainable forging : comparison between die manufacturing and thixoforging process integrating tooling

Abstract: the purpose of this work is the focuses on the analysis of manufacturing process from an environmental aspect. One of the environmental aspects in the manufacturing process is the energy consumption and one of the significant issues is the improvement of energy efficiency of production process. This paper presents the life cycle analysis of the thixoforging and the die manufacturing process. This study analyzes the main variables such as material, temperature and technology on these two. The first step in system analysis is to identify the boundaries of the system to be examined. In the case of machining, the overall system includes activities such as tool preparation, material production, material removal, and cleaning, among others. Most of the environmental impact from the material removal process stems from energy use. In estimating the energy requirements for material removal, specific cutting energies are often used. While cutting, energies for machining can depend on many factors, including material properties of the work piece, presence of cutting fluids, sharpness of cutting tools, and processing variables, ranges of approximate cutting energies in machining are available. Tooling plays a major role in the machining process, but the direct environmental impact of tooling is limited. Due to their relatively long life, the environmental cost of toolings and tooling maintenance is often amortized over numerous products, thereby making the environmental impact relatively insignificant on a per part basis. However, the effect of tool materials on allowable cutting speeds, and thus on material removal rate, should not be overlooked. Selection of appropriate tools can allow for increased material removal rates, thereby reducing the total machining energy required. The removal material has a major influence on the energy consumption during the machining operation in order to the die manufacturing and, also on the selection of tools.

In order to completing the life cycle analysis, depending on the system boundaries, the amount of iron oxides depends on the mass of the material for the thixoforging and machining of the die. This comes from the industrial practice of machining and the emission of the CO₂ can be analyzed during the thixoforging and machining of die. However, Energy consumption is depending on the scenario and selective parameter in the process which have the important rules.

Keywords: Thixoforging, Manufacturing of Die, Energy consumption, Life cycle analysis, Environment