Cost optimization techniques for Heat Treatment and Lubrication system in a Forging Process

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Today Forging and Heat treatment technology has become a science which was earlier considered as art and the Indian Forging Industry is undergoing a major paradigm shift in terms of its production capacity and also implementing new technologies such as automation etc., leading to cost saving and increased productivity. In this paper two advanced techniques is being demonstrated using a typical example for optimization of lubrication system and heat treatment process.

Lubrication plays an important role during forging process as better lubricant assists in good metal flow and improved die life and lubricant selection is purely based on experience or trial & error method. Friction coefficient between die and forging material is a function of lubricant, die temperature, material flow stress etc. A scientific methodology is demonstrated to evaluate three different lubrication conditions for 42CrMo4 forging process and output friction coefficient is calculated. The experimentally obtained results are further implemented in simulation software for better correlation of results w.r.t dimension of the forged sample.

To manufacture high strength component with optimal cost, heat treatment process optimization is vital and component heat treatment cycle is decided generally by standard thumb rule. Quantification of the effect of time, temperature and its rate (cooling and heating) is rarely analysed for optimization. In this paper transformation temperatures and metallurgical properties such as hardness are quantified for different heat treatment cycle using dilatometry technique and the optimum cycle with reduced cost is selected for 40Cr4 material. The experimentally obtained results are further implemented in simulation software for better correlation of metallurgical results.