Reduction in Finish Match Grinding Cycle Time of Valve Cone through Process Optimisation

Student's Name   B. H. Jaikumar   EMM (PT-2010)

Academic Supervisor(s)   Raja Hussain

Industrial Supervisor(s)   S. N. Satish, Bosch Ltd., Bengaluru

Keywords: FMG Machine, DOE, Taguchi Analysis

Abstract:

The main purpose of this project work was to achieve reduction in cycle time of a grinding process in FMG machine (Bahmuller). This study was conducted in an automobile industry (Robert Bosch India Ltd.) in delivery valve assembly line. The customer requirement forecast of next two years (2013 and 2014) is high compared to current year (2012). To meet the customer requirement for coming years we have to invest at least 2 machines, which cost 40Million rupees per machine. Based on the requirement, there was no investment plan because of budget constraint. The quantity should ramp up with present resource. The only option to meet the customer takt was to concentrate on OEE improvement. The quality loss, availability loss and performance loss was less. To improve the process the best option was to reduce the cycle time from 19s to 15s through DOE. By reducing the cycle time, there will be improvement in productivity by \(\approx20\%\).

A literature surveys was carried out to understand the finish match grinding process and its process parameters. The methodology used in this study was Taguchi, DOE. For this experiment, the four factors (input stock, Change over point air grinding, rough grinding and fine rough grinding) and three levels are considered for the process optimisation. Nine experiments were conducted and output of cycle time reduction (from 19 to 15s) and form parameters (Scat roundness, seat Rmax and roughness) were measured.

The experiment results showed that input stock, rough and fine grind were the most influencing parameters of grinding cycle time. The optimised parameters were set by increasing the values of machine parameters and decreasing the input stock. Thus confirmatory and capability study was conducted and results were tabulated. The adequacy of the developed model was tested with ANOVA. The developed model was used to select right combination of machining parameters to achieve a cycle time. The results showed improvements with a grinding cycle time reduction by 4s. This has resulted in improvement of productivity by 26%.