

## Modeling of Surface Roughness in Hard Turning of DIN 1.2210 Cold Work Tool Steel with Ceramic Tools

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**Abstract :** Nowadays, grinding is frequently replaced with hard turning for reducing set up time and higher accuracy. This paper focused on mathematical modeling of average surface roughness (Ra) in hard turning of AISI L2 grade (DIN 1.2210) cold work tool steel with ceramic tools. The steel was hardened to  $60\pm 1$  HRC after the heat treatment process. Cutting speed, feed rate, depth of cut and tool nose radius was chosen as the cutting conditions. The uncoated ceramic cutting tools were used in the machining experiments. The machining experiments were performed according to Taguchi L27 orthogonal array on CNC lathe. Ra values were calculated by averaging three roughness values obtained from three different points of machined surface. The influences of cutting conditions on surface roughness were evaluated as statistical and experimental. The analysis of variance (ANOVA) with 95% confidence level was applied for statistical analysis of experimental results. Finally, mathematical models were developed using the artificial neural networks (ANN). ANOVA results show that feed rate is the dominant factor affecting surface roughness, followed by tool nose radius and cutting speed.

**Keywords :** ANN, hard turning, DIN 1.2210, surface roughness, Taguchi method

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