

## **SURFACE RESIDUAL STRESSES IN DRY TURNING OF 0,45% C STEEL**

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The residual stresses in a subsurface layer determine many exploitation characteristics of machined parts/components. Depending on the kind and value, their influence can be negative or positive. Tensile residual stresses usually exert highly detrimental impact on several functional aspects such as strength, fatigue life, corrosion, wear resistance, etc., whereas compressive residual stresses are considered to have a beneficial effect on these features. The residual stresses found in many mechanical parts are mainly generated in the final steps of machining processes and are highly dependent on the used machining conditions. The main reasons of residual stresses generation in machining operations are mechanical and temperature impacts which change the subsurface physical and chemical properties. Increasingly popular in industry and environmentally desirable elimination of cutting fluids from machining processes substantially changes machining conditions, influencing relationship among factors causing residual stresses. Therefore, considering the significance of residual stresses for reliability and longevity of a part, a lot of attention is paid to the residual stress problem in terms of machining zone cooling and lubrication application together with the process parameters selection. Unfortunately the mechanism of residual stresses generation is still not completely recognized, particularly the influence of lack of cutting fluids in machining processes. The main purpose of the presented investigations was to identify a relationship between residual stress in a surface layer and the mode of cooling cutting zone. On the basis of empirical results the influence of dry turning and turning with the application of emulsion on residual stresses in steel C45 was identified in a broad range of cutting parameters. The effect of cooling cutting zone, cutting speed,

feed and depth of cut on residuals stresses was determined. By X-ray diffraction the surface residual stresses were analysed in circumferential and axial directions. The results show that the modes of cooling and cutting parameters exert a substantial influence on the magnitude of residual stresses. The elimination of cutting fluid from turning process increases the magnitude of residual stresses in surface layer. The residual stress components values in the cutting direction and in the feed direction to a great extent depend on the cutting parameters. The results of presented investigation can make up the guidelines for cutting parameters selection taking into account the residual stresses constituted in the cutting process.

### **Information page**

- The abstract is being submitted for ICRS conference
- Permission to post abstract on the DXC web site and affiliated
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