

## Residual stress investigation in additively manufactured samples

### Corresponding author:

Jaroslav Vavřík, [jvavrik@comtesfht.cz](mailto:jvavrik@comtesfht.cz), COMTES FHT a.s.

### Co-authors:

Josef Hodek

### Abstract:

In the present study, additively manufactured (AM) samples were analysed by the Contour method in order to determine residual stresses. The Contour method is destructive and its big advantage is that there is no size limitation of the sample and this method is able to predict residual stress even in such depths where other methods are unable. Residual stresses were evaluated in three stainless steel samples (35x35x35 mm, 25x25x25 mm, 15x15x15 mm), which were prepared by the method of direct energy deposition (DED) using Insstek MX-600 AM machine. DED is the method where continuously flowing powder is completely melted by high power laser and after that, the powder/melt is rapidly solidified on the substrate. In order to protect from oxidation during the deposition, argon is used as a shielding gas that has fed continuously during the process of printing. The process of DED generates structures with a minimum amount of pores. Austenitic stainless steel 316L was chosen for this experiment because there is no presence of phase transformations during the deposition that reduces the complexity of the process. Evaluation of the Contour method was carried out based on the sectional surface area measured by Optical Precision Measuring Machine ATOS capsule scanner developed by GOM Company and analysis using FEM software MSC Marc.

### Key words:

Contour method, additive manufacturing, residual stress, 316L stainless steel,