FAME Symposium abstract

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From Casting to Additive Manufacturing: Redesign and Validation of a Rope Guide Component

- A business case was identified for developing an alternative manufacturing method for slow-moving casted products.
- Together with Etteplan, we redesigned the components based on the original paper drawings, incorporating a lattice structure to reduce overall weight.
- The parts were manufactured by Delva using aluminium alloy AlSi10Mg. They were tested with the obsolete Konecranes hoist model UN2 under a 5-ton load for 1,000 cycles at a 10-degree angle to simulate side pulling.
- Other tests done:
    - Visual inspection of the rope wear area and the possible bending on the side of
      the rope guide opening.
    - Cross-section hardness measurement using the Brinell method with 62,5 kg load
      and 2,5 mm steel ball according to standard SFS-EN ISO 6506-1
    - Elementary analysis carried out by subcontractor Metlab Oy
    - Microstructure inspection carried out by subcontractor Metlab Oy

Conclusion:

The load from the rope had not deflected the side of the rope guide opening but had left deep wear grooves to the side of the opening. As the rope guide was exposed to only 1000 cycles, the wear grooves were very large for that amount of testing but normal because of large 10 degree fleet angle.

Hardness values of the material were well within the informative ranges of additively

manufactured AlSi10Mg. In addition, there was not a significant difference between the hardnesses of differently angled (in manufacturing process) areas.

Microstructure images revealed some porosity on the sample cross section surface. However, these small pores are typical for additively manufactured materials / parts. The phases were distributed evenly.