Failure analysis of metallic components due to improper materials and fabrication method.

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Abstract

It is important to understand the origins of the in-use failure of metallic compounds to avoid their reoccurrence. In most cases, the causes of failures are complex and linked with external factors that were not known at the time the system was designed or that have arisen in the course of use. However, in some cases the causes are much simpler: failures are caused by the improper use of a material or the use of assembly processes without expertise. The analysis methods can then be simple and precise, and they allow to quickly find the origin of the failure and to propose solutions: visual examination, optical microscopy, X-ray fluorescence analysis, macro and microhardness.

During this presentation, we describe two cases of failure and the results of our examinations to explain their causes. The selected cases are (1) a rotating machine shaft and (2) two angles welded on a hopper.

The first case of failure is due to the use of an improper grade of stainless steel. The second one is due to the absence of preparation before welding and the use of a non adapted welding technique to make the weld beads to weld a carbon steel grade with an austenitic stainless steel weld bead.

Figure 1. The broken rotating machine shaft

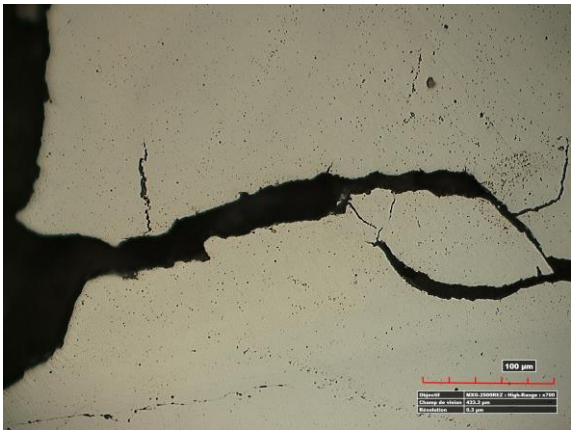

Figure 2. The broken weld

Keywords:

Failure, ferrous alloys, practical cases, shaft, welding