

AN ASSESSMENT FOR FATIGUE STRENGTH OF SHAFT PARTS MANUFACTURED FROM TWO PHASE STEEL

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ABSTRACT

Duplex stainless steel (Duplex) is a new material that has superior properties compared to other stainless steels in terms of avoiding corrosion stress and extremely good yield strength, high flow resistance and cheaper than austenite stainless steel series. However, fatigue strength that always leads to destruction occurs during the working process of axle-shaped machine parts under phase changes. In this paper, the evaluation of fatigue strength of Duplex steel to predict the longevity, maintenance plan for axial-shaped machine parts as well as the advanced mechanical heat treatment mode for Duplex steel are investigated. Samples are made from Duplex SAF 2205 (ISO 1143: 2009) to run fatigue tests by "Staircase" method to determine fatigue strength for Duplex 2205. In addition, this study also provides heat treatment mode for Duplex 2205: heating temperature 950^oC, heat retention time of 15 minutes and cooling down in the same furnace. The results indicate that supplied-stage Duplex 2205 steel will not be destroyed by fatigue under load under phase changes with 360 MPa stress, which is about 50% higher than AISI 304 (240 MPa) stainless steel. Duplex 2205 steel after heat treatment is enhanced mechanical properties and better durability than Duplex 2205 steel in the supply state.

Key words: *Fatigue strength; duplex stainless steel; DSS 2205; duplex heat treatment*

1. INTRODUCTION

Duplex stainless steel is also known as two-phase steel because it has a structure consisting of ferrite phases and austenite phases with approximately equal proportions and intermingling. With such a two-phase construction they will have the best performance combination of the two phases. In the chemical composition of steel contains a high content of chromium (21-23%), it has twice the strength of austenite stainless steel and has a significantly better ductility than ferrite stainless steel. This steel can be mentioned as LDX 2101, SAF 2304, 2205, 253MA [1].

The axle-shaped machine parts are commonly used in the mechanical industry, it is often subjected to corrosion due to friction and stressed under load. During the working process, there is little downtime so machine parts may be damaged, especially shaft parts.... causing the situation of stopping production to carry out maintenance, repair, and replacement of machine parts. The replacement of shaft parts is inevitable, the shaft replacement process can be time consuming, costly, and reduces the machine's performance resulting in low productivity. Therefore, we need to research more new materials such as two-phase steel (Duplex), with higher durability and longevity to put into the manufacture of machine parts, to meet the requirements of high-strength operation of machines, increasing stability and longevity of machines are essential in the development of science and technology. Duplex stainless steel solves the above problems, it has good corrosion resistance, high durability, and cheaper price than other common stainless steels. Stainless steel manufacturing technology often involves forming methods such as rolling, forging, casting, and machining. Materials such as Duplex stainless steel will have a different internal microstructure after forming processes due to the different properties of the two phases. Duplex steel is used in the paper industry, automobile, aviation, and ship industries ... [2] to improve the durability of shaft-shaped machine parts that operate at high frequency and intensity, easily damaged