



# VALUATION OF MONOTONIC AND LOW-CYCLE FATIGUE PROPERTIES OF A Cr-Mn-N AUSTENITIC STAINLESS STEEL AT 300°C



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## INTRODUCTION

The temperature influence on the monotonic and low-cycle fatigue properties of a Cr-Mn-N austenitic stainless steel, employed in the manufacture of drill collar connections was investigated. The temperature dependence of tensile properties was determined and it was found that the yield strength, ultimate strength and total elongation values decreased significantly in the range between room temperature and 400°C. The low cycle fatigue testing was carried out at room temperature and 300°C. The results showed great influence of temperature at 300°C in the short and long fatigue lives range. This behavior was consequence of the reduction with temperature of the monotonic parameters.

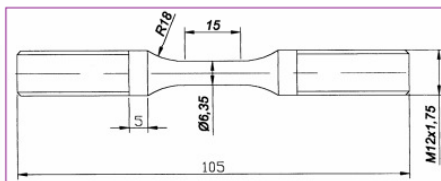


Figure 1 - Test specimen

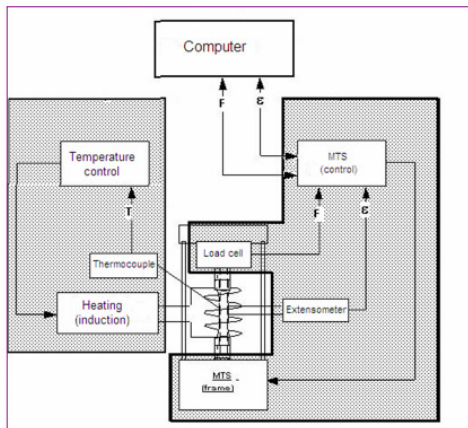


Figure 2 - Scheme of fatigue test

## RESULTS

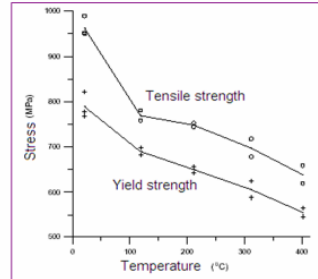


Figure 3 - Yield point and resistance in function of the temperature

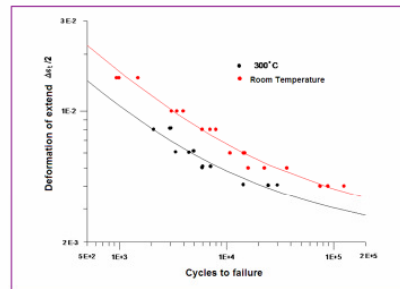
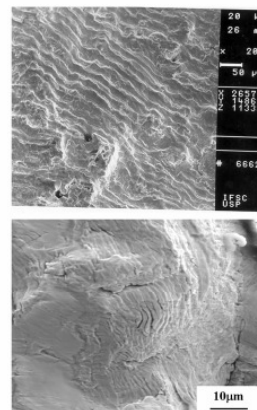


Figure 4 - Deformation-life tests obtained at room and 300°C temperatures

$$\frac{\Delta \epsilon_t}{2} = \frac{\Delta \epsilon_e}{2} + \frac{\Delta \epsilon_p}{2} = 0,0057(2N_f)^{-0,056} + 0,632(2N_f)^{-0,570} \quad \text{room temperature}$$

$$\frac{\Delta \epsilon_t}{2} = \frac{\Delta \epsilon_e}{2} + \frac{\Delta \epsilon_p}{2} = 0,0054(2N_f)^{-0,064} + 0,438(2N_f)^{-0,595} \quad \text{300°C}$$



low cycle fatigue fractographic analysis at room temperature, showing the presence of stage II striations.

low cycle fatigue fractographic analysis at 300°C temperature, showing the presence of stage II striations.

## CONCLUSION

As can be seen in figure 3 the monotonic properties of the steel are influenced by the temperature. The resistance and flow limits and the total extension decreased significantly with the increase of the temperature.

The deformation-life tests present a comparison between the total deformation – life curves obtained at room temperature and 300°C. It was observed that at 300°C occurs a significant decrease in the life in fatigue of the material.

## ACKNOWLEDGEMENTS

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