

Acoustoelastic evaluation of OCTG API 5CT N80Q casing pipes welded by ERW/HFIW process

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This paper presents an acoustoelastic evaluation of six OCTG API 5CT N80Q casing pipes welded by ERW/HFIW process, which are used in oil and gas exploration and exploitation [1]. The ultrasonic technique of acoustic birefringence was employed to evaluate the acoustoelastic behavior of the steel plate used to manufacture the pipes under study.



Figure 1 - Team performing the marking of inspection points on the pipe

The pipes had been evaluated before, and after the heat treatments of quench tempering and hot straightening were performed (Figure 1). The acoustoelastic constant of the material was obtained

through an uniaxial loading test at eight predetermined loads. The results performed for the pipes show a reduced level of acoustic anisotropy, compared with the API 5L welded pipe. A reduction in the level of acoustic anisotropy was also verified after each manufacturing step, showing the efficacy of the heat treatment of quench tempering and hot straightening (Figure 2). The circumferential residual stress in a pipe was determined (Table 1) by the acoustic birefringence technique and compared with the value accomplished by the methodology of the ASTM E1928-07 Standard.

Table 1 - Circumferential residual stress in a pipe

POINTS	RESIDUAL STRESS (Kgf/mm ²)
12H+	3,76
3H	13,19
6H	6,45
9H	13,18
12H-	5,72
AVERAGE	8,46

References:

- [1] FONSECA, M. A. C. **Avaliação acustoelástica de tubos OCTG do tipo casing API 5CT grau N80Q soldados com o processo ERW/HFIW**. 2012. 118f. Dissertação (Mestrado em Engenharia Metalúrgica e de Materiais) – Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2012. (Co-Orientador: Marcelo S. Q. Bittencourt).