

Article

# Effect of thermal treatment and erosion aggressiveness on resistance of S235JR steel to cavitation and slurry

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**Abstract:** S235JR steel is used in many applications, but its resistance to the erosion processes has been poorly studied. To investigate this resistance, cavitation, and slurry erosion tests were conducted. These tests were carried out at different erosion intensities, i.e., different flow rates in the cavitation tunnel with a system of barricades and different rotational speeds in the slurry pot. The steel was tested as-received and after thermal treatment at 930 °C, which lowered the hardness of the steel. To better understand the degradation processes, in addition to mass loss measurements, surface roughness and hardness were measured. Along with increasing erosion intensity, the mass loss increased as well. However, the nature of the increase in mass loss, as well as the effect of steel hardness on this mass loss, was different for each of the erosion processes. In the cavitation erosion tests, the mass loss increased linearly with the increase in flow velocity, while in the slurry tests this relationship was polynomial, indicating a strong increase in mass losses with an increase in rotational speed. Cavitation erosion resulted in stronger and deeper strain hardening than slurry. Surface damage from cavitation erosion tests was mainly deep pits, voids, and cracks during the slurry tests, while flaking was the most significant damage.

**Keywords:** cavitation erosion; slurry erosion; carbon steel; hardness; surface roughness; fracture; resistance

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