

## EVALUATION AND IMPROVEMENT OF CAVITATION EROSION BEHAVIOUR OF DIFFERENT STEELS IN SALTWATER USING ELECTROCHEMICAL METHODS

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### ABSTRACT

Cavitation is caused by rapid movement of objects in a fluid. The resulting steam bubbles are entrained by the flowing fluid and collapse in a sudden manner with increasing static pressure [1]. This results in extreme pressure and temperature peaks, which leads to massive damage and removal of the so-called cavitation erosion on surfaces. This occurs, for example, frequently in rotors of centrifugal pumps, water turbines, as well as in control valves and in motors. Furthermore, cavitation can cause noise, vibration, and loss of energy efficiency. Due to the resulting enormous economic effects, an intensive examination of the cavitation erosion is necessary. Current research focusses on the examination of the synergetic mechanisms of mechanical damage and corrosion [2].

Therefore the aim of this thesis consists in the characterization of these synergetic damage mechanisms and the quantification of static and dynamic corrosion processes during cavitation erosion with different steels using electrochemical methods [3]. For this purpose the electrochemical behavior of the different steels was investigated and the cavitation wear was influenced by the use of electrochemical methods.

At the beginning of the work an electrically insulated 3-electrode cavitation test setup was constructed, manufactured and assembled. The static and dynamic corrosion mechanisms in seawater were determined by the measurement of electrochemical characteristics. The cavitation behavior was analyzed by means of indirect cavitation experiments using a sonotrode. On the one hand, by combining these experiments with electrochemical methods, the different damage

mechanisms could be quantified and identified. On the other hand, it has been demonstrated that the removal of material by the application of externally induced cathodic potentials can be enormously reduced (Fig. 1). In addition, the damage mechanisms of the different steels were identified by various wear and surface analyzes.

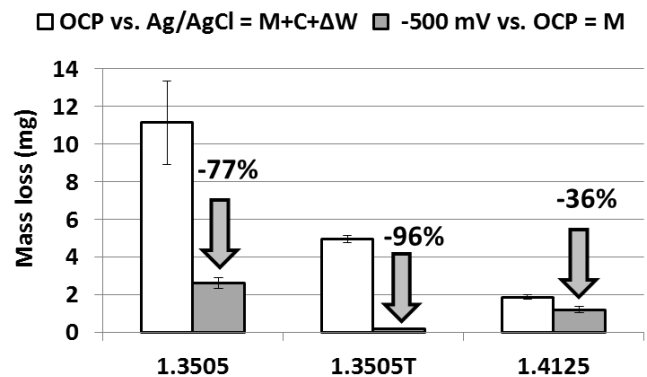


Fig.1 Comparison of material loss at open circuit potential (OCP) and at cathodic potential (-500 mV vs. OCP)

### REFERENCES

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