

## **ABSTRACT**

This doctoral dissertation addresses issues related to drilling sheets of acid-resistant stainless steel grade 1.4571 (AISI 316Ti) arranged in stacks for the efficient manufacture of tube sheets used in industrial heat exchangers. The main research objective was to identify and reduce the factors causing poor repeatability and dimensional inaccuracies of holes produced during high-performance drilling with carbide drills. The work includes a detailed literature review on heat exchangers, cutting-tool geometry for drilling, and the phenomena accompanying metal drilling.

Experimental studies were carried out on an AXA HSC 3DoSPI machining center. Various types of drills (solid carbide, exchangeable-head, and indexable-insert) and variable cutting parameters, including cooling conditions, were selected and employed. Measurement-based analyses of holes, vibrations, and tool wear enabled the development of relationships among these indicators in the context of their impact on drilling accuracy and quality.

The results indicate that the proper selection of the tool and cooling parameters has a significant effect on the quality of holes drilled in stacked sheets, tool wear, and process stability. The study also identifies opportunities for process optimization aimed at extending tool life and improving machining quality.