

INFORMATION ABOUT THE THESIS

Full name of PhD candidate: Mai Tat Loi

Thesis title: *“Research on machining the external cylindrical surface using electrical discharge machining (EDM) with ultrasonic vibration assistance using graphite electrodes.”*

Specialty: Mechanical Engineering

Code: 9520103

Full names of supervisors:

1. Prof. Dr. Vu Ngoc Pi
2. Assoc. Prof. Dr. Le Thu Quy

Training institution: National Research Institute of Mechanical Engineering, Ministry of Industry and Trade.

SUMMARY OF THE MAIN FINDINGS OF THE THESIS

1. Scientific significance

- The thesis introduces ultrasonic vibration into the electrical discharge machining (EDM) process of the outer cylindrical surface of hardened 90CrSi steel using graphite electrodes. This helps clarify the influence of ultrasonic vibration on the machining process and identify optimal vibration and input parameters to improve machining efficiency.

- The study contributes several findings to the research direction of EDM with ultrasonic vibration assistance.

- The results of the thesis can serve as a reference for further research in the field of machining.

2. Practical significance

- The application of ultrasonic vibration to the electrical discharge machining (EDM) of outer cylindrical surfaces enhances machining efficiency in practical applications, particularly in the manufacturing of forming punches for tablet compression.

- The research results can serve as reference materials for teaching and research activities in the field of machining.

3. Novel contributions of the thesis

- This study is among the pioneering studies on electrical discharge machining integrated with ultrasonic vibration (UV-EDM) for outer cylindrical surfaces,

particularly complex-shaped surfaces that are difficult to machine using conventional EDM due to slow material removal rate and unstable discharge conditions.

- Graphite electrodes, characterized by good electrical conductivity and machinability but relatively high wear, are employed. This enables effective evaluation of the reduction in electrode wear rate (EWR) when ultrasonic vibration is applied.

- The thesis proposes and solves both single-objective and multi-objective optimization problems involving key parameters, including material removal rate, electrode wear rate, and surface quality, thereby contributing to improved machining efficiency and quality in modern manufacturing.

- Based on a solid theoretical foundation, this study identifies research gaps and proposes clear practical application directions, thereby contributing to the development of UV-EDM technology in Vietnam and opening up new research directions in advanced machining.

Hanoi, April 12, 2026

Comments of the Scientific Supervisors

PhD Candidate

Prof. Dr. Vu Ngoc Pi

Assoc. Prof. Dr. Le Thu Quy

Mai Tat Loi