



Lesson Plan: Specific Cutting Force

Grade level: University level

Duration: 2 hours

Objective: Students will learn how to calculate the specific cutting force.

Materials needed:

- Oxford pendulum.
- Samples from different materials (bronze, aluminum, etc.).

Preparation:

1. The concept of specific cutting force is presented.
2. The influence of cutting regime parameters is presented.
3. The influence of tool geometric parameters is presented.
4. The Oxford pendulum is presented.
5. The working method is demonstrated.

Lesson Procedure

Introduction (50 minutes):

1. **Introduction:** Students review the paper report.
2. **Objective:** Familiarization with the concept of specific cutting force.

Activity steps (40 minutes):

1. Preparation (10 minutes):

- The working method of the Oxford pendulum is demonstrated.
- Samples of various materials (bronze, aluminum, etc.) are prepared.



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2. Measurement of energy consumed for cutting at different chip thicknesses (20 minutes):

- **Step 1:** The pendulum is brought into a working position.
- **Step 2:** The specimen is positioned relative to the knife.
- **Step 3:** The pendulum is released by pulling the release lever.
- **Step 4:** The pendulum stroke is measured by reading the indications on the graduated dial.

3. Calculation of the mechanical work done by the pendulum (20 minutes):

According to the equations in the lab manual.

4. Interpretation of results (10 minutes):

1. Determine, for various materials and different chip thicknesses, the chip thickness exponent.
2. Plot, in double logarithmic coordinates, the line of variation of the specific cutting force as a function of the chip thickness.

Assessment:

- **Participation:** The students' ability to follow the work and perform the necessary calculations is observed.
- **Achievement:** Each student correctly calculates the specific cutting force. The results obtained are compared.

Which STEM fields do you think were used in determining the specific cutting force, and how did each field play a role?

This question helps them recognize:

1. **Science** – Understanding material properties.
2. **Technology** – Using laboratories devices.
3. **Engineering** – Thinking about forces involved in the machining process.
4. **Math** – Performing mathematical calculations of medium complexity.

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