

RANCANGAN PENGENDALIAN TEMPERATUR PAHAT BERBASIS ARDUINO UNO MENGGUNAKAN SISTEM PENDINGIN PADA PROSES PEMBUBUTAN

Nama Mahasiswa : Ezra Kurniawan
Nim : 2204221395
Dosen Pembimbing : Razali, S.T., M.T.

ABSTRAK

Proses pembubutan menghasilkan panas akibat menggosok antara pahat dan benda kerja yang dapat meningkatkan suhu pahat sehingga mempercepat keausan pahat dan menurunkan kualitas hasil pemesinan. Penelitian ini bertujuan untuk merancang sistem pengendalian suhu pahat berbasis Arduino Uno menggunakan sistem pendingin serta mengetahui efektivitasnya dalam menurunkan suhu pahat pada proses pembubutan. Metode penelitian yang digunakan adalah metode eksperimen dengan mengukur hasil pengujian tanpa sistem pendingin dan dengan sistem pendingin pada variasi feed rate 0,10 mm/rev, 0,15 mm/rev, dan 0,20 mm/rev serta cutting depth 0,4 mm, 0,8 mm, dan 1,2 mm. Data suhu dianalisis menggunakan metode analisis deskriptif komparatif. Hasil penelitian menunjukkan bahwa suhu rata-rata tanpa sistem pendingin berturut-turut sebesar 41,79°C, 45,48°C, dan 50,92°C, sedangkan dengan sistem pendingin menjadi 39,91°C, 40,02°C, dan 41,28°C. Persentase penurunan suhu yang diperoleh sebesar 4,50%, 12,01%, dan 18,93%. Hasil tersebut menunjukkan bahwa sistem pendingin berbasis Arduino Uno mampu mengendalikan suhu pahat secara efektif, terutama pada kondisi pemotongan dengan feed rate yang lebih tinggi. Dengan demikian, sistem yang dirancang dapat menjaga suhu pahat lebih stabil sehingga berpotensi meningkatkan umur pahat dan kualitas hasil pembubutan.

Kata kunci: Arduino Uno, temperatur pahat, sistem pendingin otomatis, Pembubutan.

ARDUINO UNO-BASED TOOL TEMPERATURE CONTROL DESIGN USING A COOLING SYSTEM IN THE TURNING PROCESS

Student Name : Ezra Kurniawan
Number ID : 2204221395
Supervisor : Razali, S.T., M.T.

ABSTRACT

The turning process generates heat due to the arrangement between the tool and the workpiece which can increase the temperature of the tool thereby accelerating tool wear and reducing the quality of machining results. This research aims to design an Arduino Uno-based tool temperature control system using a cooling system and determine its effectiveness in reducing the temperature of the tool in the turning process. The research method used was an experimental method by measuring test results without a cooling system and with a cooling system at a variation of feed rates of 0.10 mm/rev, 0.15 mm/rev, and 0.20 mm/rev as well as cutting depths of 0.4 mm, 0.8 mm, and 1.2 mm. Temperature data were analyzed using a comparative descriptive analysis method. The results showed that the average temperature without a cooling system was 41.79°C, 45.48°C, and 50.92°C, respectively, while with a cooling system it was 39.91°C, 40.02°C, and 41.28°C. The percentage of temperature reduction obtained was 4.50%, 12.01%, and 18.93%. These results show that the Arduino Uno-based cooling system is able to effectively control the chisel temperature, especially in cutting conditions with higher feed rates. Thus, the system designed can maintain a more stable tool temperature so that it has the potential to increase the life of the tool and the quality of the turning.

Keywords: *Arduino Uno, Temperature Measuring Device, Automatic Cooling System, Rotation Mechanism.*