

### METHOD OF POWER CONTROL IN CNC HOT WIRE MACHINES INVENTORS

#### IITM Technology Available for Licensing

##### Problem Statement

- Hot wire machines with CNC Controller cut Expanded polystyrene (EPS) by melting the material while moving through the material.
- The heat produced by the hot wire needs to be controlled
- If the heat is more, then accuracy of the final object will reduce because of **over melting**. Conversely, with low heat **bowing** of wire occurs while cutting.
- There is need for an **intelligent system to control the power to the heating element as per the feed rate** of cutting to achieve precise shapes and curvatures.

##### Intellectual Property

- IITM IDF Ref. 1705
- IN 380852 - Patent Granted

##### TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

##### Technology Category/ Market

##### Category-

Robotics & Automation

##### Industry Classification:

- NIC (2008)- 28292- Manufacture of machinery for working soft rubber or plastics or for the manufacture of products of these materials
- NAICS (2022)- 335314- Relay and Industrial Control Manufacturing; 326140- Polystyrene Foam Product Manufacturing

**Applications-** Precision manufacturing, Expanded Polystyrene foam cutting

##### Market Drivers-

- Foam Cutting Machines Market is valued at **USD 166.15 Billion in 2023** and is expected to reach **USD 224.85 Billion by the end of 2030** with a **CAGR of 6.59%**.

##### Research Lab

**Prof. Sathyan Subbiah**

Dept. of Mechanical Engineering, IITM

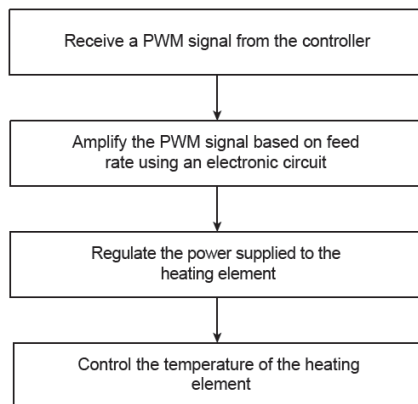


Figure: Method of controlling temperature of hating element

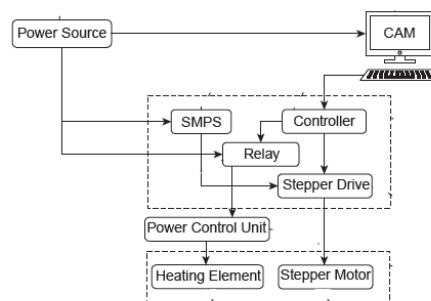


Figure: Illustration of the numerically controlled machine with power control unit

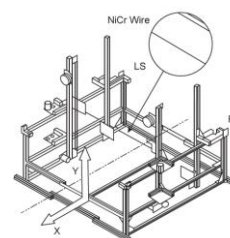
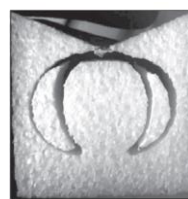
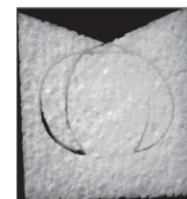


Figure: Computer Aided Design (CAD) model of a CNC hot wire machine.



Material cut with a CNC machine having no current control



Material cut with a CNC machine having the current control circuit

##### CONTACT US

Dr. Dara Ajay, Head-TTO  
Technology Transfer Office,  
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:  
<https://ipm.icsr.in/ipm/>

Email: [smipm-icsr@icsrpis.iitm.ac.in](mailto:smipm-icsr@icsrpis.iitm.ac.in)

[sm-marketing@imail.iitm.ac.in](mailto:sm-marketing@imail.iitm.ac.in)

Phone: +91-44-2257 9756/ 9719



# IIT MADRAS

Indian Institute of Technology Madras

**Industrial Consultancy & Sponsored Research (IC&SR)**

Technology Transfer Office

TTO - IPM Cell



## METHOD OF POWER CONTROL IN CNC HOT WIRE MACHINES INVENTORS

### IITM Technology Available for Licensing

#### Technology

- 1 The numerically controlled hot wire cutting machine comprises a computing machine, a control unit, a machine tool, and a power source with constant and dynamic supply modes for controlling power.
- 2 The electronic circuit of the power control unit is configured to receive a variable spindle PWM signal from the controller and amplify the received PWM signal based on the feed rate of cutting.
- 3 The hot wire heating element is configured to receive the amplified power from the electronic circuit to increase, decrease or maintain the temperature
- 4 The G-code was generated in a computer aided manufacturing (CAM) software and fed to the Arduino controller using CNC software.

#### Key Features / Value Proposition

- The method achieves effective cutting at the sharp corners and difficult curvatures achieving greater accuracy compared to conventional hot wire machines
- An intelligent system has been developed to control the power to the heating element of a hot wire machine which enables precise manufacturing reducing scope of human error.
- The dynamic mode essentially ensures that the amount of the power supplied is consistent even when the machine is accelerating or stopped.
- The power only turns on when the machine moves. This generally makes the hot wire safer to operate.

#### CONTACT US

Dr. Dara Ajay, Head-TTO  
Technology Transfer Office,  
IPM Cell- IC&SR, IIT Madras

**IITM TTO Website:**  
<https://ipm.icsr.in/ipm/>

**Email:** [smipm-icsr@icsrpis.iitm.ac.in](mailto:smipm-icsr@icsrpis.iitm.ac.in)  
[sm-marketing@imail.iitm.ac.in](mailto:sm-marketing@imail.iitm.ac.in)

**Phone:** +91-44-2257 9756/ 9719