



CONTROLLING TEMPERATURE OF A GLOW PLUG DURING OPERATION IN A HOT SURFACE IGNITION ENGINE

IITM Technology Available for Licensing

PROBLEMSTATEMENT

- Generally, during **cold weather**, it becomes **difficult to ignite fuel in engines**(typically **diesel engines**) because such engines require pre-heating of the fuel above a target temperature.
- The **pre-heating of the fuel** is accomplished by **glow plugs**.
- During operation, initially the **glow plug is supplied power** so that its **temperature(surface temperature) rises up to the target temperature level** which is sufficient for ignition of the fuel-air mixture.
- Thus, it becomes essential to **precisely control the surface temperature** of the glow plug in a cost-effective and reliable manner.

TECHNOLOGYCATEGORY MARKET

Category: Automobile and Transportation

Industry: Automobile

Application: Diesel Engine

Market Drivers: Automotive **Glow Plugs**

Market size is estimated at **USD 4.67 billion** in **2024**, and is **expected to reach USD 5.69 billion** by **2029**, growing at a **CAGR of 4.01%**.

INTELLECTUAL PROPERTY

IITM IDF Ref. 2187; Patent No: IN 532113;

TRL (Technology Readiness Level)

TRL-4, Experimentally validated in Lab;

Research Lab

Prof. RAMESH A,
Dept. of Mechanical Engineering, IIT Madras.

TECHNOLOGY

- A **method and system** for controlling temperature of glow plug during operation in hot surface ignition engine.
- The present invention in which the **control system of the temperature of a glow plug** as shown in fig 1. consists of

- ❑ **Microcontroller/processor** for **controlling the temperature** of the glow plug during operation in the ignition engine.
- ❑ **Pulse Width Modulation (PWM)** driver unit to **generate a PWM pulse** to control power input provided by a DC power source to the glow plug.
- ❑ **Proportional Integral Derivative (PID)** to **adjust a power input** to the glow plug by adjusting a duty cycle of the PWM pulse by communicating with the microcontroller.
- ❑ **voltage sensor and current sensor** to measure the value of voltage across & current passing through the glow plug .
- ❑ A **Microcontroller connected with the PWM & two sensors** for the determination of
 - ✓ Determining the **Target surface temperature** of the glow plug.
 - ✓ Determining the **Target core temperature** of the glow plug.
 - ✓ Determining the **Target resistance** of the glow plug.
 - ✓ Determining the **Instant resistance** of the glow plug.

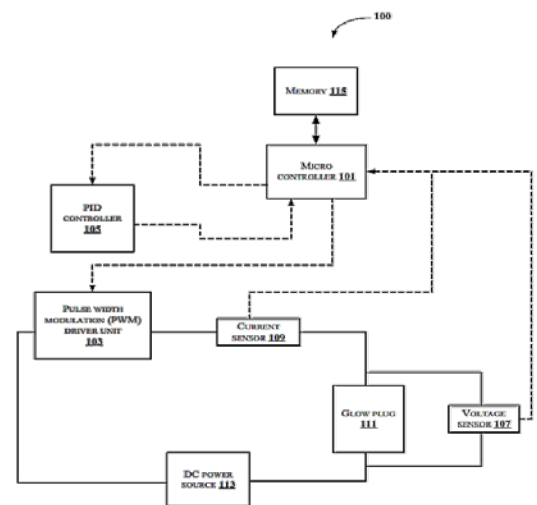


Figure 1 illustrates a control system for controlling the temperature of a glow plug, in accordance with some embodiments of the present disclosure.

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

sm-marketing@imail.iitm.ac.in

Phone: +91-44-2257 9756/ 9719

- ❖ The present invention in which the method/process of controlling the temperature of a glow plug is reproduced as below in fig 2.

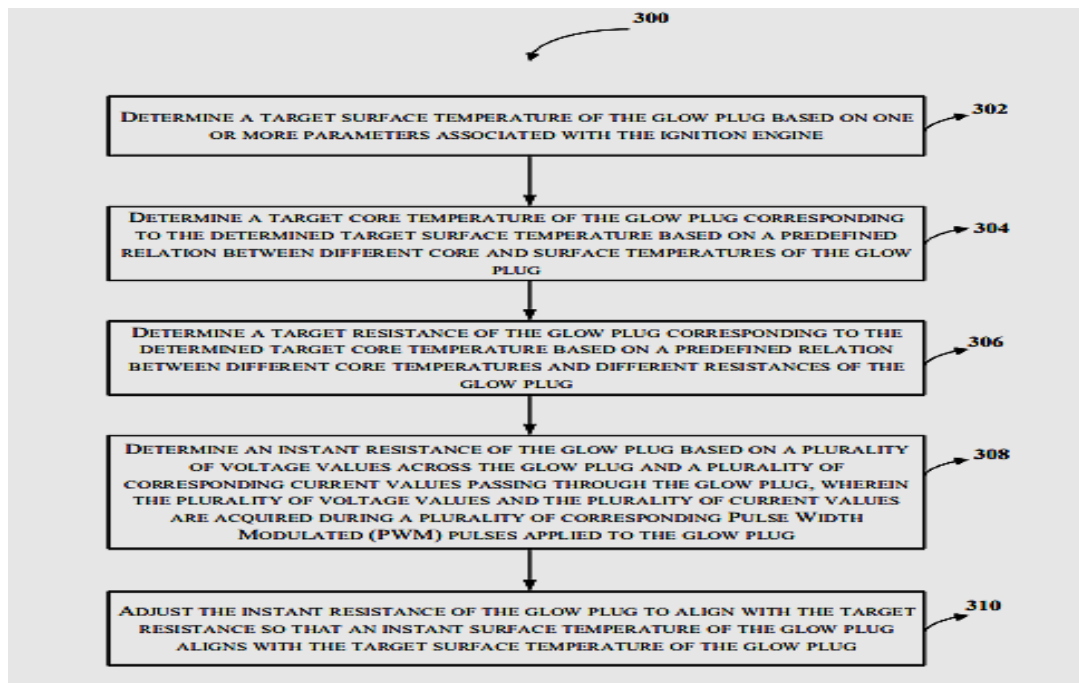


FIG. 2 shows an exemplary high level flow chart illustrating a method for controlling the surface temperature of the glow plug, in accordance with some embodiments of the present disclosure.

- ❑ The resistance of the glow plug may be calculated using the equation below.

$$\text{Average resistance} = \frac{\text{Average voltage across glow plug}}{\text{Average current through glow plug}}$$

Key Features / Value Proposition

- The Control system in which the Ignition engine is a **methanol hot surface** ignition engine.
- The **glow plug is powered by a power source** connected between the glow plug and the PWM driver unit .
- The surface temperature can be **controlled in an indirect way** by controlling the resistance of glow plug
- Sensors involved like Hall-effect sensor, a fluxgate current sensor, a magneto-resistive current sensor.
- Having **Three-dimensional Computational Fluid Dynamics (CFD) simulation** for mapping the process.
- Having **Semiconductor Memory & data can be Storable** as electronically.
- **Target surface temperature up to 1000°C.**
- **Target core temperature up to 1050°C.**
- **Target resistance value of maximum 2 Ω,**
- **Instant resistance value of maximum 1.2 Ω.**
- **Prolonged service life of the glow plug.**

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

sm-marketing@imail.iitm.ac.in

Phone: +91-44-2257 9756/ 9719