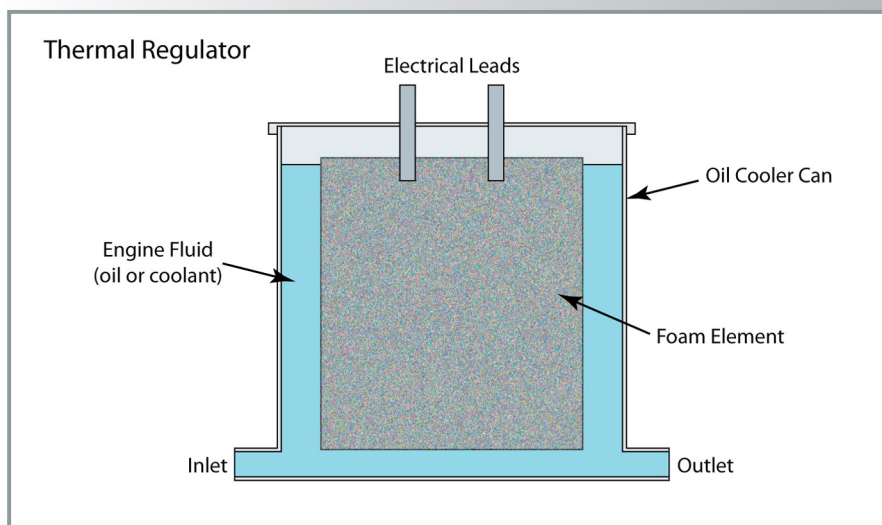


# Carbon or Graphite Foam Heating Element for Regulating Engine Fluids

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## Technology Summary

Automotive engines need to run hotter to meet requirements for better fuel economy and lower emissions, but devices to keep engine fluids from becoming too hot can add weight, cost, and complexity to engine designs. ORNL researchers developed a graphite foam heating element that can eliminate the need for a separate cooler for oil and other fluids. The invention also has the potential to cool known engine hot spots, which can increase the life of the engine.

The foam has good thermal conductivity, thermal diffusivity, electrical resistivity, and density characteristics—all traits that make for an excellent thermal regulator.

These features also permit the foam to function as both a heat exchanger and a heating element.

The invention's high electrical resistivity ensures that when the foam is submerged in a fluid such as motor oil, the fluid can be heated by an electrical circuit. At engine start-up, preheating the oil reduces emissions and engine wear. The device can both heat the engine oil at start-up, and then later cool it.

## Advantages

- Functions as both a preheater and a passive heat exchanger
- May be disposable and/or easily retrofitted to existing engines
- Preheats oil (or other fluid) to reduce emissions at start-up
- Regulates temperature during steady-state operation
- Permits the use of lighter oils for improved fuel economy

## Potential Applications

- All types of work and passenger vehicles
- Large stationary motors (such as mining equipment)

## Patent

Ronald D. Ott, April D. McMillan, and Ashok Choudhury, *Carbon or Graphite Foam as a Heating Element and System Thereof*, U.S. Patent US 6,729,269, issued May 4, 2004.

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