

Graphite Foam for Power Train Cooling

Automotive Propulsion System Materials

Transportation

FOR THE 21ST CENTURY

U.S. DEPARTMENT OF ENERGY

ENERGY EFFICIENCY AND
RENEWABLE ENERGY PROGRAM

OAK RIDGE NATIONAL LABORATORY



Background

The college automotive racing competition is very demanding for the sub-scale cars built by college students. The endurance trials require lengthy running at elevated speeds and engine powers.

During the endurance trial last year, a car built by the University of Michigan club overheated in the rear differential. This overheating caused the oil to become over pressurized and leak out, resulting in poor performance.

The Technology

The Michigan club decided to bond graphite foam, licensed from ORNL to Poco Graphite, to the outside of the differential in a doughnut pattern. They anticipated that the foam would benefit the differential by improving heat removal from the surface, thereby reducing internal temperatures and oil pressures.

Results

After the foam was bonded to the differential, the car was tested to ascertain its effectiveness. The results were impressive:

- The foam lowered the differential temperature by at least 20° F. (The total temperature drop varied depending on the type of track and the ambient temperature.)
- It lowered the rear brake disc temperature by approximately 5-10° F. (The air for the rear brake passes over the differential faster. Because the differential was cooler, the air supplied to the brakes was cooler, reducing the temperature of the rear brakes.)

- The improved heat transfer eliminated downtime due to overheating of the rear end.

The University of Michigan racing team was very impressed with the performance of the graphite foam, and is looking for other ways to use it to improve the car's speed and endurance.

Commercialization

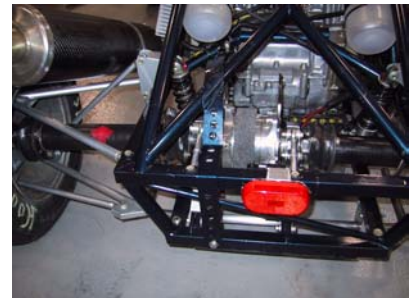
The foam has been licensed to Poco Graphite, Inc. The company is commercializing the manufacture of the foam and can produce foam for large-volume applications. Additional licenses are available.



Foam bonded to outside of differential

Benefits

- The foam dramatically improved heat transfer from the surfaces.
- Differential oil pressures were reduced, increasing the speed, endurance, and fuel efficiency of the car.
- Downtime was reduced and standings improved.



For more information on how ORNL is helping America remain Competitive in the 21st century, please contact:

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Success Story