U.S. Department
of Transportation

**Pipeline and
Hazardous Materials Safety
Administration**

400 Seventh Street, S.W.
Washington, D.C. 20590

JUL 19 2005

Mr. Craig Johnston
nanoCoolers
5307 Industrial Oaks Boulevard
Austin, TX 78735-8821

Reference No.: 05-0132

Dear Mr. Johnston:

This responds to your letter concerning the applicability of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) to your company's product, a thermal transport system. You describe the thermal transport system as being comprised of nickel and PVC based tubing, a plastic pump, and a nickel/copper block. The block allows heat transport material to flow through the block and pick up heat from a source component. All of the parts within the system are non-reactive with the heat transport material. The thermal transport material flows through a closed cooling loop that contains a source heat exchanger, an ambient heat exchanger, and piping to interconnect them. The thermal transport system contains not more than 10 mL of thermal transport material consisting of the following elements by weight: 50-76% Gallium, 0-25% Indium, 0-15% Tin, 0-4% each Zinc, Silver and Bismuth, and less than 1% Copper. The entire system is sealed and the design is tested to ensure no release of fluid. You also submitted drawings of the system and test data.

Of the identified materials, only gallium is regulated as a hazardous material. Section 173.162(c) excepts manufactured articles and apparatuses, each containing not more than 100 mg (0.035 oz.) of gallium and packaged so that the quantity of gallium per package does not exceed 1 g (0.35 oz.) from the HMR. Your company's thermal transport system exceeds the quantity of hazardous material allowed by § 173.162(c) and, therefore, is subject to the HMR.

You may wish to seek authorization to transport your company's thermal transport system under the terms of an exemption by contacting the Pipeline and Hazardous Materials Safety Administration's Office of Hazardous Materials Exemptions and Approvals (OHMEA). Exemptions are granted on a case-by-case basis to authorize relief from certain requirements under the HMR. Procedures for applying for an exemption are set forth in 49 CFR 107.105. The OHMEA may be reached at (202) 366-4512.

I trust this satisfies your inquiry.

Sincerely,

Hattie L. Mitchell

Hattie L. Mitchell
Chief, Regulatory Review and Reinvention
Office of Hazardous Materials Standards

172.101 (P)
173.22

050132

nanoCoolers

May 13, 2005

Corbin
§ 172.101 (P)
§ 173-22
Applicability
05-0132

Mr. Edward Mazzullo
Director of Hazardous Materials Standards
Pipeline and Hazardous Materials Safety Administration
U.S. Department of Transportation
400 7th Street, SW
Washington, DC 20590

Dear Mr. Mazzullo:

Request for Interpretation on Thermal Transport System

Pursuant to the meetings held at RSPA's office in Washington, DC on May 13, 2003, July 22, 2003 and 26 April, 2005 between representatives of nanoCoolers, Inc. and Dr. Charles Ke and Stan Staniszewski, I am writing to request a written determination that nanoCoolers' innovative thermal transport system that contains a small amount of hazardous material is not subject to regulation in transportation under the U.S. Hazardous Materials Regulations (HMR) since in the quantity and form described herein it does not present a hazard to life or property in transportation. (*See* 49 U.S.C. § 5103(a).)

A. Introduction

This request pertains to (i) the specific thermal management system tested and evaluated, and (ii) any other thermal management system that meets the design and test criteria set forth in this document. (See Exhibit 2 and 3) It will be used in applications ranging from personal computers to servers to consumer electronics to address the ongoing problems associated with the heat generated by integrated circuits and other heat sources. The design will be capable of meeting the tests described in Exhibit 2 and will not contain more than 10ml of the thermal transport material. The thermal transport material currently used is an alloy comprised of several elements. The table bellows shows the percentage range of each element in the alloy.

Element	Range (wt.pct.)
Ga	50 to 76
In	0 to 25
Sn	0 to 15
Zn	0 to 4
Ag	0 to 4
Bi	0 to 4
Cu	<1.0

Based on the substantial amount of analytical and testing data contained herein, it is our belief that the thermal transport systems, with a very limited amount of the hazardous material, does not pose an unreasonable risk to health or safety under 49 U.S.C. Section 5103(a) and thus is not subject to regulation.

B. Background

nanoCoolers' Thermal Transport System Design

Thermal management systems can vary in physical dimensions and weight, depending on the final system in which they will be installed. The current system is approximately 133.0 mm x 125.2 mm x 20 mm [5.23" x 4.9" x 0.78"]. However future systems could have slightly different physical designs. Each current system currently has approximately 3.5ml of thermal transport material. nanoCoolers anticipates future systems could have a maximum of 10ml of material. Of note, all of the systems are sealed to withstand severe thermal, shock, pressure, and vibration tests as described in Exhibit 2.

Structurally, nanoCoolers thermal transport systems are comprised of nickel and PVC based tubing, a plastic pump, and a nickel/copper block. The block is formed to allow the heat transport material to flow through the block and pick up a heat from a source component. Within the system, all of the parts are non-reactive with the heat transport material. The cooling loop consists of thermal transport material flowing in a closed loop, containing a source heat exchanger, an ambient heat exchanger, and piping that interconnects them. An electromagnetic pump and associated power supply are used to move the fluid throughout the system. The electromagnetic pump has no moving parts. The fluid moves by the Lorenz force. The entire system is sealed and the design is tested to ensure no release of fluid.

In light of the design of nanoCoolers' thermal transport systems, the risk of the thermal transport material being released during usage or transport, absent a catastrophic event completely unrelated to the integrity of the thermal transport system, is highly remote. The limited quantity of hazardous material at issue would not separate from the thermal transport system. In the case of a catastrophic event the thermal transport system would be contained within the laptop computer or other electrical device housing the unit.

Independent Testing Confirms nanoCoolers Thermal Transport Systems Do Not Present an Undo Risk

nanoCoolers contracted with Professional Testing, Inc. in Austin, Texas to conduct various standardized tests on the thermal transport system to ensure the product can withstand incidents normally found in transport. These include thermal, mechanical shock, pressure, and vibration tests. (See Exhibit 2) The results of PTI's tests demonstrate that under conditions greatly exceeding what normally can be expected during transport, the small amount of heat transport material will not be released. (See Exhibit 3 and 4) The results also support nanoCoolers' belief that the thermal transport system does not pose a material risk in transport, barring a catastrophic event.

UL has recently completed its investigation of our customers product has determined it complies with all the applicable requirements. UL has filed the certification under E251599 Project 05CA05208 for the USL/CNL- MODEL A+1850 SERVER (See Exhibit 3). These results also support nanoCoolers' belief that the thermal transport system does not pose a material safety risk in transport.

C. Recent U.S. DOT Interpretation Letters

nanoCoolers, along with CapAnalysis Group in Washington, DC and Wiley Rein and Fielding in Washington DC, has reviewed the hazardous materials laws and regulations to determine the appropriate shipping requirements for the particular alloy we are using as a heat

transfer material. Thermal transport systems are not listed in the hazardous materials table in 49 CFR Section172.101. The thermal transport alloys we are using as heat transport material within the system also are not listed.

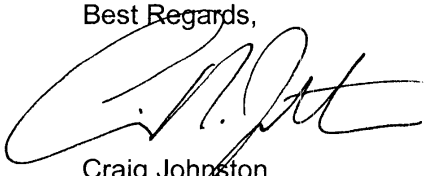
DOT recently issued written interpretations concluding that products analogous to thermal transport systems are not hazardous in the applications for which they are intended. (See Exhibit 5-15) Contained within Exhibits 5-15 are samples of products containing small amounts of hazardous material ranging from toxic gases to flammable solids and corrosives. Corrosives have a wide range of definitions. These include materials that cause full thickness destruction of intact skin tissue within an observation period of up to 60 minutes starting after the exposure time of three minutes or less to those that do not cause full thickness destruction of intact skin tissue but exhibit a corrosion rate on steel or aluminum surfaces exceeding 6.25 mm (0.25 inch) a year at a test temperature of 55 deg. C (130 deg. F). The corrosive material in our product is not destructive to skin tissue at all but is corrosive to aluminum or steel at a rate exceeding 6.25 mm (> 0.25 inches) per year. The products in Exhibit 5-15 show that the quantity and form of packaging can remove an article from the hazardous materials regulations. Without reviewing each issuance in Exhibit 5-15, the thermal transport system described herein is consistent with DOT's previous position on certain products containing small amounts of hazardous materials that are not be subject to the U.S. HMR.

D. Conclusion

We believe that the combination of a strong, robust structure, small product size, absence of internal chemical reaction, and limited hazardous content (no more than 10 ml of heat transfer material) supports our conclusion that the thermal transport system presents no material risk to health, safety or property in the intended application and thus is not subject to the U.S. HMR. . nanoCoolers respectively requests DOT's concurrence that the thermal transport system described herein is not subject to the U.S. HMR.

Please do not hesitate to contact me if you have any questions concerning this request, or if you require any additional information.

Best Regards,



Craig Johnston
nanoCoolers