U.S. Department
of Transportation
**Research and
Special Programs
Administration**

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

MAY 20 2003

Mr. Kelly E. Richardson
Latham & Watkins LLP
701 B Street, Suite 2100
San Diego, CA 92101-6197

Reference No.: 03-0049

Dear Mr. Richardson:

This responds to your January 29, 2003 letter regarding the applicability of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) to the transportation of certain ultracapacitors. Your letter states that the ultacapacitors, which are approximately the size of a quarter, are comprised of a sealed steel container that encloses layers of activated carbon, metal and plastic. The activated carbon is saturated with an electrolyte solution and the electrolyte contains quaternary salt and a small amount (1.5 grams or less) of acetonitrile. The ultracapacitors in question are the Maxwell models PC-5 and PC-10. You also submitted photographs and a test report from Underwriters Laboratories, Inc. Specifically, you ask whether the ultracapacitors are subject to the HMR. I apologize for the delay and any inconvenience it may have caused.

Based on the information you provided, it is our determination that 1.5 grams or less of acetonitrile in a sealed steel container is in a quantity and form that does not pose a hazard in transportation. Therefore, the ultacapacitors are not subject to the HMR.

I hope this satisfies your request.

Sincerely,

Hattie L. Mitchell

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

030049

171.1

Direct Dial: (619) 238-2876
kelly.richardson@lw.com

Corbin
5171.1
Shipper's Responsibility
03-0049

LATHAM & WATKINS LLP

701 B Street, Suite 2100
San Diego, California 92101-8197
Tel: (619) 236-1234 Fax: (619) 696-7419
www.lw.com

Boston, Brussels, Chicago, Frankfurt, Hamburg, Hong Kong, London, Los Angeles, Milan, Moscow, New Jersey, New York, Northern Virginia, Orange County, Paris, San Diego, San Francisco, Silicon Valley, Singapore, Tokyo, Washington, D.C.

File No. 021083-0013

January 29, 2003

Edward Mazzullo
Director
RSPA Office of Hazardous Materials Standards
(DHM-10)
U.S. Department of Transortation
400 Seventh Street, SW
Washington, DC 20590

Re: Maxwell Technologies Ultracapacitors
Request for Written Interpretation (49 CFR Section 107.14)

Dear Mr. Mazzullo:

Maxwell Technologies ("Maxwell") has developed innovative energy storing double-layer capacitors ("ultracapacitors") for use in applications ranging from hand-held electronic devices to energy efficient hybrid-electric vehicles.[1] Pursuant to 49 CFR Section 107.14, Maxwell requests a written interpretation from the U.S. Department of Transportation ("DOT") finding that certain ultracapacitors of finite weight are not subject to the hazardous materials laws and regulations set forth at 40 CFR Sections 171-180.

This request pertains to (i) two specific ultracapacitor models that are the size of postage stamps and (ii) any structurally identical upgraded models under development that are limited to 10 grams or less in weight and contain no more than 1.5 grams of absorbed acetonitrile.[2] See Exhibit "A" (photograph). Based on a substantial amount of analytical data, transporting ultracapacitors with the particular amount and form of the hazardous material (e.g., acetonitrile) does not pose an unreasonable risk to health and safety or property under 49 U.S.C. Section 5103(a).

UN1648
Class 3
Pkg II

1 See http://www.maxwell.com

2 This request pertains to Maxwell ultracapacitor model numbers "PC5" and "PC10." Although model numbers may change as a result of marketing dynamics and other factors, the design of these models outlined in Sections B and C of this letter is expected to remain substantially the same. Accordingly, this request does not apply to all Maxwell ultracapacitors; rather, Maxwell's request pertains to ultracapacitors of limited weight and hazardous substance content, as defined herein.

A. Background

Ultracapacitors can vary in physical dimensions and weight, depending upon the energy storage capacity required. Maxwell models PC-5 and PC-10 are thin quarter-sized rectangular devices. The approximate dimensions of these models are 0.75 in. (width) x 1.0 in. (length) x 0.25 in. (thickness). The total weight of each device is approximately 4-7 grams, depending on the model. Maxwell anticipates that it may upgrade existing models to 10 grams. The ultracapacitors at issue are comprised of primarily non-hazardous materials: metal and plastic. The ultracapacitors do contain a single hazardous material -- acetonitrile -- in amounts ranging from under 0.5 grams to slightly less than 1.0 grams (less than 15% by weight). Of note, all constituents of ultracapacitors are sealed completely within a highly durable welded steel shell. See Product Diagrams, Exhibit "B".

Structurally, Maxwell's ultracapacitors (double-layered capacitors) are comprised of non-reactive porous plates suspended within an electrolyte with a voltage applied across the plates, in a system in which no chemical reactions occur. See Exhibit "B" (diagrams), Exhibit "C" (specifications). The product is an important component in energy-efficient electronic devices and numerous other energy storage applications.

Ultracapacitors are discharged after manufacturing tests and are transported without an electric charge to U.S. and international customers.

Maxwell has reviewed the hazardous materials laws and regulations to determine the appropriate shipping requirements for ultracapacitor models PC5 and PC10. Ultracapacitors (and capacitors generally) are not listed in the hazardous materials table at 49 CFR Section 172.101. The ultracapacitors at issue in this request will contain 0.5-1.5 grams of a hazardous substance: acetonitrile. The products do not exhibit any of the characteristics of a hazardous material under 49 CFR Section 173.115, et seq. because of (i) the extremely small physical dimensions (less than 10 grams); (ii) the durable structural design of ultracapacitors (metal containers), and (iii) the small amount of acetonitrile contained therein (0.5-1.5 grams). Hence, the hazardous materials regulations do not provide clear guidance concerning appropriate shipping requirements for ultracapacitors.

In light of this novel product, Maxwell representatives have had informal discussions with DOT staff on several occasions. Staff shared Maxwell's view that ultracapacitors are factually unique and warrant further DOT evaluation. In this letter, Maxwell sets forth the facts and characteristics of ultracapacitors to allow DOT to evaluate the appropriate shipping requirements. For the reasons set forth below, Maxwell requests that DOT issue a written determination that ultracapacitor models PC5 and PC10, in particular, and all ultracapacitors less than 10 grams in weight and containing 1.5 gram or less of acetonitrile pose no material risk to health, safety or property during transport and are therefore not subject to DOT's regulations governing the transport of hazardous materials.

B. Analysis

1. Ultracapacitor Design

Ultracapacitors are manufactured electronic products that are approximately the size of a quarter, and primarily contain non-hazardous substances, such as metal and plastic. The devices are comprised of sealed steel containers that enclose layers of activated carbon, metal and plastic. The activated carbon is saturated with an electrolyte solution. The electrolyte contains a quaternary salt and a small amount (less than 1.5 grams) of acetonitrile. Acetonitrile is a flammable liquid in pure form. However, the acetonitrile in ultracapacitors contains a salt and is absorbed into activated carbon. Ultracapacitors are manufactured by welding and sealing the steel container, ensuring that the 0.5-1.5 grams of absorbed acetonitrile is completely encapsulated and cannot escape during normal conditions of transportation and use.

Moreover, when ultracapacitors of less than 10 grams are shipped, the hazardous material is essentially contained within four layers of containment. The first layer is the welded outer steel casing, which cannot be breached under normal conditions of transportation. Ultracapacitors are then wrapped with plastic sheeting, placed into plastic trays or tubes, and placed in fiberboard boxes for shipment.

In light of the design of ultracapacitors and Maxwell's packaging protocol, the risk of an acetonitrile release during transport, absent a catastrophic event completely unrelated to the ultracapacitors, is highly remote. The limited quantity of hazardous material at issue would not be separated from the activated carbon or breach the multiple layers of packaging.

2. Independent Testing Confirms That Ultracapacitors Do Not Present Risks During Transport.

Maxwell contracted with Underwriters Laboratory Inc. ("UL"), an internationally recognized independent testing organization, to conduct various standardized tests on ultracapacitor Models PC-5 and PC-10, including heating, shock, vibration, overcharging, and crush tests. The UL test results demonstrate that under conditions associated with typical transport or handling accidents (and even more severe conditions), the small amount of carbon-absorbed acetonitrile is not expected to be released. See Exhibit "D" (Underwriters Laboratory Report). Ultracapacitors passed all of the UL tests and are now UL-rated. These UL data reaffirm that ultracapacitors do not pose a material risk during transport.

3. Analogous Products Have Been Deemed Non-Hazardous by DOT.

DOT has recently issued written interpretations concluding that products analogous to ultracapacitors in size and hazardous material content are not hazardous for purposes of transportation.[3]

---

3 Although it is the shipper's responsibility to determine the proper hazard class under 49 CFR Section 173.22, DOT has provided numerous written interpretations concurring with the shippers' conclusions that the materials, in the form and quantity described by the shippers, do not pose an

See Exhibits "E" (valves containing Class 4 materials, August 2002); "F" (pellets containing Class 4 materials, August 2002); "G"(sodium-vapor lamps, January 2002); "H" (vials containing small amount of Class 3 liquid, September 2001); "I" (dental amalgam, September 2001); "J" (pods containing Class 8 material, April 2001); "K" (tubes containing Class 2.3 material, November 2000); "L" (solution containing Class 8 material, June 2000); "M" (material containing Class 3 or Class 8 liquid, April 2000). In those cases, DOT found that, both in the quantity and form described, the articles do not pose a hazard in transportation and are therefore not subject to the hazardous materials regulations.

One of these products -- certain engine valves -- is highly analogous to ultracapacitors. See Exhibit "E." The valves contain 1.6 grams of a hazardous substance encapsulated within a welded outer steel shell. Similarly, ultracapacitors contain 0.5 to 1.5 grams of a hazardous substance contained within a welded outer steel shell. The valves were subjected to non-destructive testing, including shock, crushing and thermal exposure tests. Ultracapacitors were subjected to similar tests. Test results for the valves and ultracapacitors demonstrate that under normal (and even extreme) transportation conditions, the hazardous contents are not released.

In another case, DOT found that pellets containing less than 1.0 gram of a Class 4.3 hazardous material do not pose a risk during transport due to the limited quantity of hazardous material, which is hermetically sealed inside re-sealable polyethylene bags and further packed in outer fiberboard boxes. See Exhibit "F." In the case of ultracapacitors, the welded steel casing, packing tubes or trays, and fiberboard box provide even greater protection than that associated with the pellets.

DOT also found that each of the following devices contains materials in a quantity and form that are not subject to the hazardous materials regulations: uncrushed sodium vapor lamps containing Class 4 materials (Exhibit "G"); screw-top plastic vials containing small amounts of a Class 3 material (Exhibit "H"); dental amalgam containing small amounts of metals transported in watertight containers, and further contained in a sealable bag and cardboard box (Exhibit "I"); pods containing approximately one gram of hazardous liquid sandwiched between two plastic sheets coated with an absorbent material, and further packaged in a plastic cartridge and hermetically sealed foil envelope (Exhibit "J"); one-inch long glass tubes containing small amounts of Class 2.3 toxic gas packed in bubble wrap, a metal container and cardboard box (Exhibit "K"); solution containing a small amount of Class 8 liquid (Exhibit "L"); material containing small amounts of Class 3 and Class 8 liquid (Exhibit "M"). The design and packaging method for ultracapacitors provides protection during transport equivalent to, or greater than, that of all of the aforementioned products.

Hence, consistent with well-settled DOT precedent, ultracapacitors with an individual weight of 10 grams or less and containing 1.5 grams or less of carbon-absorbed acetonitrile in a sealed outer metal

---

unreasonable risk during transport and are therefore exempt from hazardous materials regulations set forth at 49 CFR Sections 171-180.

shell, do not pose a hazard for purposes of transportation and should therefore be excluded from the DOT hazardous materials transportation regulations.

C. Conclusion

The combination of a strong structural welded steel casing, small product size, absence of internal chemical reaction, protective shipment packaging, and limited (and absorbed) acetonitrile content supports Maxwell's conclusion that certain ultracapacitors present no material risk to health, safety or property in transportation. See 49 U.S.C. § 5103(a). This request pertains to ultracapacitors no greater than 10 grams in weight and containing 1.5 grams or less of acetonitrile. Maxwell respectfully requests DOT's concurrence that the ultracapacitors described herein shall not be subject to hazardous materials transportation regulations.

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

Very truly yours,

Kelly E. Richardson
of LATHAM & WATKINS LLP

cc: Mark S. Cohen