BATTERY POWER PRODUCTS & TECHNOLOGY
Solutions for OEM Design Engineers, Integrators & Specifiers of Power Management Products

The Impact of the Recent DOT Rule

Todd Sweetland, Robin Tichy
Micro Power Electronics

The regulations regarding the shipment of Li-ion batteries are confusing for a developer of portable products. For several years, the United States' regulations were distinct from those dictated by international governance. Finally, the discrepancy has been resolved and manufacturers can now be assured of consistent rules for the shipment of Lithium based batteries. The US Department of Transportation's (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) lithium battery final rule was published on August 9th, 2007 in the Federal Register. This long awaited rule will harmonize the US lithium battery hazardous materials regulations (HMR) with the regulations that have been in effect internationally since 2003.

The publication of the final rule incorporates many of the dictates from the Agency's previous proposed rule as well as changes from the 2004 interim final rule on lithium metal (Li-primary) batteries. Substantial regulatory and formatting changes to the Li-primary (disposable) and Li-ion (secondary, rechargeable) battery provisions in US HMR have been unveiled. The effective date of the rule is January 1, 2008; however, some of the special provisions will go into effect later.

Battery and cell category definitions

		Small (no more than)	Medium (between)	Large (more than)
Cells	Primary	1 g Li	1 g and 5 g Li	5 g Li
	Secondary	1.5 g ELC*	1.5 g and 5 g ELC	5 g ELC
Batteries	Primary	2 g Li	2 g and 25 g Li	25 g Li
	Secondary	8 g ELC	8 g and 25 g ELC	25 g ELC

*ELC (Equivalent Lithium Content)

All Li-primary and Li-ion battery packs, regardless of their size, will need to be tested according to the UN manual of Tests and Criteria prior to their production shipments. The requirement for testing small battery packs does not go into effect and become mandatory until October 1st, 2009. However, it is prudent to begin this testing on products currently in development. As summarized in the chart, three categories of batteries are defined in the US DOT's rule based on their "size," or a calculation of equivalent lithium content (ELC). ELC is calculated in grams on a per cell basis to be 0.3 times the rated capacity in ampere hours. For example, a battery pack consisting of 12 cells with a rating of 2.2 Ah each would just barely make it under the small/medium cut-off.

"Small" battery packs that have passed the UN testing requirements, including batteries packed with or installed in equipment, can be transported "non-restricted." "Medium" size battery packs that have passed the UN testing requirements, including batteries packed with or installed in equipment, can be transported non-restricted by motor vehicle or rail only. If these batteries are to be transported by passenger or cargo aircraft they must be shipped as fully-regulated Class 9 hazardous materials. "Large" size battery packs that have passed the UN testing requirements, including batteries packed with or installed in equipment, must be shipped as fully-regulated Class 9 hazardous materials. One of the more significant issues addressed in the US DOT's rule is confirmation that single-cell lithium battery packs do not require UN testing provided that the cell was previously tested and passed the UN testing as outlined in the Manual for Tests and Criteria. This ruling is very important for the makers of portable equipment because hazardous material shipments are costly and add to the shipping time.

The US DOT certainly has not finished their work on lithium batteries because there are further international regulations yet to take effect. Expect the agency to publish a new proposed lithium battery rule in late 2008 to harmonize its regulations with the changes recently adopted, but not yet implemented, at the international level. For example, as of January 1, 2009 under the international regulations, Li-primary batteries and Li-ion batteries will be assigned separate identification numbers, also known as UN numbers. UN3480

will be assigned to Li-ion batteries (including Li polymer rechargeable batteries), while the existing number UN3090 will only cover Li-primary battery packs. In addition, there are numbers assigned to Li-ion and Li-primary batteries contained in or packed with equipment. Those numbers are UN3481 and UN3091, respectively. Also, for international shipments the size determination will change to a watt hours (Wh) basis. Wh are defined as the rated capacity multiplied by the nominal voltage. The new limits for batteries to ship unrestricted are 20 Wh for cells and 100 Wh for battery packs. The Wh rating must be placed on the label of these battery packs, so it can be seen by users of the product. The US DOT is expected to issue a proposed harmonization ruling within a few days of the international change. This will allow all shippers in the US to use this method for air and sea shipments. Ground and rail shipments within the US will still be required to use the ELC method of determining the size of the battery pack.

While the US DOT is moving to remedy the confusing differences between the US and international regulations, the rules remain abstruse. In addition, the changes are not yet complete, so the manufacturers of portable devices will need to continuously monitor the rulings. Battery manufacturers offer expertise in this area for their customers, so a device designer should consult their battery developer before making any assumptions regarding shipping requirements.

Contact Micro Power Electronics at www.micro-power.com.

Reprinted from the March/April 2008 issue of Battery Power Products & Technology magazine. © 2008 Webcom Communications Corp.
7355 E. Orchard Rd., Ste. 100, Greenwood Village, CO 80111 USA Phone 720-528-3770. Fax 720-528-3771. www.infowebcom.com