The 41st Tokyo Motor Show and the Use of Aluminum in Japanese Cars

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Report from Motor Show

The 41st Tokyo Motor Show, sponsored by the Japan Automobile Manufacturers Association, took place from October 24 to November 4 at the Makuhari Messe convention center in the Chiba Prefecture. The major automakers outside of Japan did not participate in this biennial motor show nor did any of the commercial vehicle manufacturers. One reason for this was the impact of the global recession, caused by the financial crisis starting in the U.S. in the fall of 2008, on the auto industry. Furthermore, the focus of attention has shifted to the Chinese market as that country's auto production is now the largest in the world. As a result, the exhibition area was halved from the previous show to less than 22,000 sq. meters.

However, Toyota Motor Corp., Nissan Motor Corp., and Japan's other leading domestic automakers concentrated their efforts in every aspect on addressing the issue of ecology. This was demonstrated by the display of environmentally friendly electric and hybrid vehicles. From that standpoint, a very high grade can be given to the standard of the motor show.

On the whole, there was a growing tendency to downsize cars and make them lighter by using aluminum, plastic, or composite materials. As electric and hybrid vehicles took the center stage, displays of batteries also attracted attention. A summary focusing mainly on electric vehicles and the approaches taken by the automakers follows.

Electric Cars

i-MiEV, Japan's first volume-produced electric vehicle, which was displayed by Mitsubishi Motors Corp., drew attention (Figure 1). Lithium-ion battery modules, which use a large volume of aluminum foil, are made up of 88 battery cells and installed under the middle of the body floor of the i-MiEV to lower its center of gravity and also to provide stabilization. The model weighs about 1,100 kg, with the battery pack accounting for more than 20% of that at about 230 kg. Total voltage is 330 v and battery capacity is 16 kwH. A single charge enables the vehicle to travel 160 km.

Figure 1. Mitsubishi's i-MiEV.

Mitsubishi Motors released i-MiEV in July 2009 and has already delivered 6,000 units since. According to the company's projection, sale of the model is expected to reach 7,000 units in 2010, 15,000 in 2011, and 30,000 in 2012.

Nissan Motor Co. displayed four models of electric vehicles, one of which is called the Leaf (Figure 2). The

Figure 2. Nissan's Leaf.

company's president, Carols Ghosn, described the Leaf as the current main model suited for a zero-emissions society. Sale of the model is slated to begin in the U.S., Europe, and Japan in late 2010. Nissan hopes to achieve sale of 50,000 units a year.

Structure of the lithium-ion battery on Leaf is four cells in each module and there are 48 of these modules. So, Leaf has 192 battery cells, almost twice as many as those on Mitsubishi's i-MiEV. Total voltage is 345 v and battery capacity is 24 kwH. It can be charged from a household power source and can travel more than 160 km on one full charge lasting eight hours. A battery cell has a thin laminated structure composed of aluminum foil and plastic materials. Dimensions are about 30 cm long, 20 cm wide, and 0.7 cm thick. In 2007, Nissan established Automotive Energy Supply Corp. (AESC), a company specializing in the manufacture of auto batteries. AESC is planning to manufacture 65,000 lithium-ion batteries by 2011.

Although a strong feature of Toyota Motor and Honda Motor Co. are their hybrid models, attention was drawn to the concept electric vehicles displayed by the two automakers. Toyota is now moving forward with the production of hybrid models of Estima, Crown, and Lexus in addition to the Prius brand that it has been producing. At the same time, the company produced and released FT-EVII (Figure 3), its first electric vehicle with a lithium-ion battery mounted on it. Specific plans for its sale have not been announced yet, but the company expects to launch this in the North American market by 2012. The immediate goal for Honda Motor is to make hybrid vehicles more popular. To this end, two new hybrid ve-

Figure 3. Toyota's FT-EV II .

			2000 (tons)	2006 (tons)	2007 (tons)	2008 (tons)	08/07 (%)
Rolled and Extruded Products	Wheels		8,362	6,008	4,388	3,800	86.6
	Motorcycles		13,207	15,411	13,488	10,753	79.7
	Passenger Cars		53,231	116,444	124,595	118,352	95.0
	Track & Buses		30,569	34,999	29,396	29,042	98.8
	Heat Exchangers		118,581	147,786	153,844	151,161	98.3
	Sub-total		223,950	320,648	325,711	313,108	96.1
		(Rolled)	(111,026)	(162,999)	(166,527)	(162,795)	(97.8)
		(Extruded)	(112,924)	(157,649)	(159,184)	(150,313)	(94.4)
Castings & Die Castings	Castings		376,332	398,664	397,619	381,675	96.0
	Die Castings	Motorcycles	45,328	54,025	51,069	45,334	88.8
		Passenger Cars etc.	601,775	898,101	936,669	895,277	95.6
	Sub-total		1,023,435	1,350,790	1,385,357	1,322,286	95.4
Forgings			17,778	33,158	33,414	33,159	99.2
Total			1,265,163	1,704,596	1,774,482	1,668,553	94.0

Table I. Aluminum product shipments for automotive applications in Japan.

hicles, CRZ Concept 2009 and Skydeck, were on display in addition to the Insight and Civic models. Although the company showcased EV-N (Figure 4), a concept electric vehicle smaller than a minivehicle, it currently maintains the position that the use of electric vehicles is suited for short-distance commuting. Since 1997, Honda has been leasing Honda EV Plus as part of its approach to the development of electric vehicles.

Figure 4. Honda's EV-N.

Other Japanese automakers, Mazda Motor Corp., Fuji Heavy Industries Ltd., Suzuki Motor Corp., and Daihatsu Motor Corp. exhibited lightweight and hybrid models that they have developed as environmentally friendly vehicles. Kiyora, a model displayed by Mazda, uses a large volume of lightweight plastic foam and is 100kg lighter than the company's compact car Demio, which is equal in size. The Kiyora has recorded fuel efficiency of 32 km per liter. Daihatsu, which manufactures minivehicles, has announced its policy to compete in the market with lighter, high fuel efficiency vehicles at low prices. The company is not intending to mount heavy parts on its vehicles as other automakers do on their hybrid models. Its aim is to release for sale an eco-friendly car the e:S, with a vehicle weight of 700 kg and fuel efficiency of 30 km per liter, within two or three years.

Batteries will play a major part in the development of both the electric and hybrid vehicles in the future. Automakers have not disclosed details as to how much aluminum foil will be used in lithium-ion batteries, but it is safe to say that this is a growth area for aluminum foil in the future. At the same time, another important issue for all vehicles is the development of lighter materials using aluminum, plastic, or composite products.

Changes in the Demand for Aluminum Products from the Japanese Auto Industry

Table I shows the changes in the shipments of aluminum products used in the Japanese auto industry. Shipments totaled 1,668,553 tons in 2008, down 6.0% from a year earlier, reflecting the sharp downturn in the global economy that started in the fall of 2008. A noteworthy point is the significant growth in the demand for rolled and extruded products from the passenger car sector. This is based on a medium term comparison between 2000 and 2008. Growth in demand for forgings has also been strong. However, demand for castings and die castings is still at the core. By contrast, rolled and extruded products accounted for 17.7% of the total shipments in 2000. This ratio increased only to 18.8% in 2008.

The latest data shows that shipments to the auto industry almost halved to 444,262 tons from January-June in the first half of 2009 from 892,940 tons in the same period a year ago. The decline indicates the major impact the recent recession has had on Japanese auto production. Auto production is regaining its strength after hitting the bottom in the first quarter of 2009 and has now returned to about 80% of the pre-recession level.

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Electric Car Maker Plans Indiana Plant

Think Global, a Norwegian electric carmaker, is gearing up to launch its vehicles in the U.S. and has picked a site in Indiana for its U.S. manufacturing facility. Charles Gassenheimer, chairman and chief executive of lithium-ion battery producer Ener1 Inc. (which owns a 31% stake in Think Global), said that the carmaker has applied for a U.S. government loan under a program set up to encourage production of fuel efficient vehicles. Think Global has been in the electric car industry since the 1990s.