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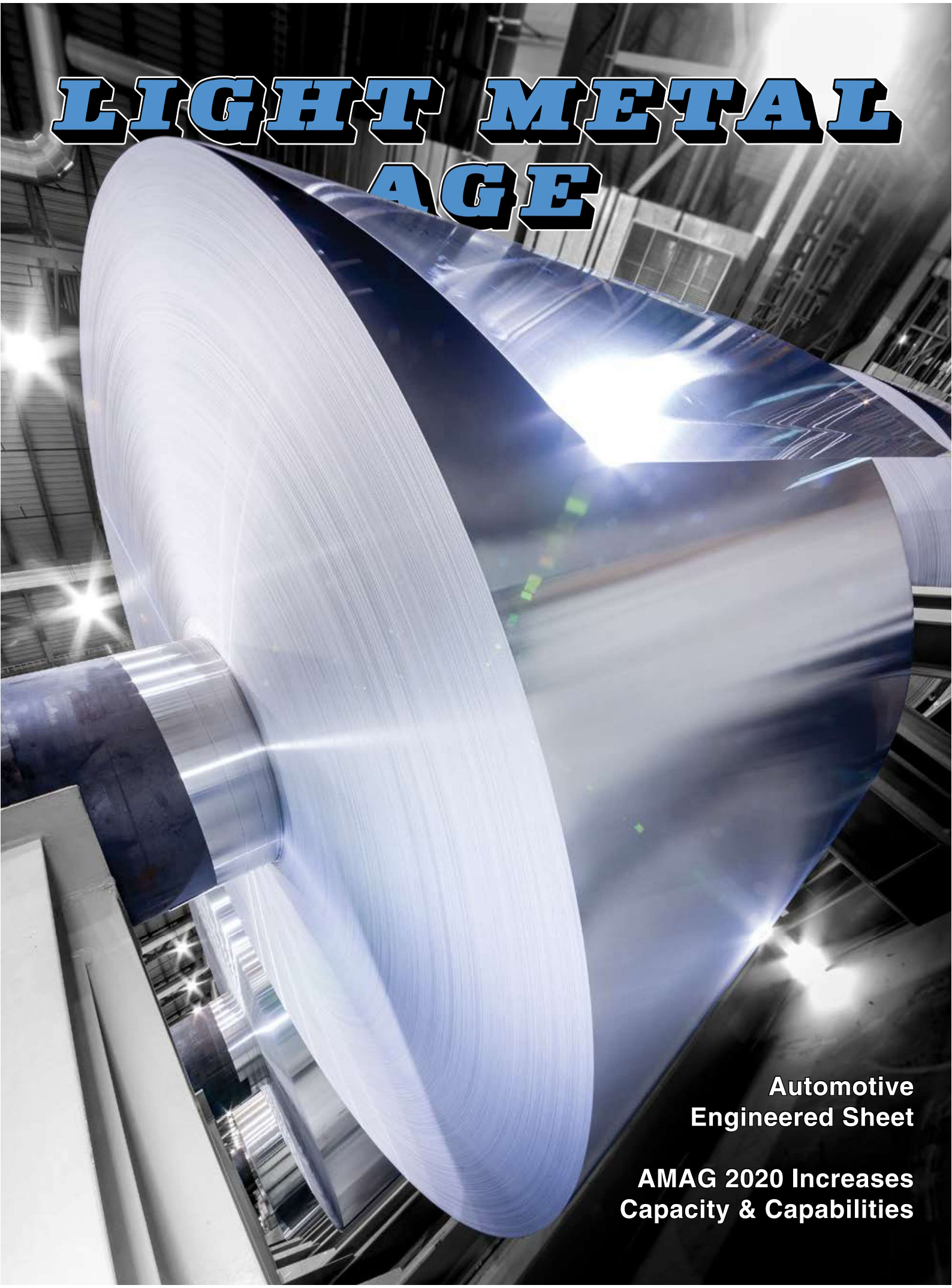

Automotive Engineered Sheet

AMAG 2020 Increases Capacity & Capabilities

The 45th Tokyo Motor Show 2017

Moving Toward Electric Vehicles

By Tai Nakada, Nalk Corporation

The 45th Tokyo Motor Show was held for ten days in October 2017 at the Tokyo Big Sight in Koto Ward, Tokyo. The slogan for the show was "Beyond the Motor, Move the World from Here." A total of 153 companies and organizations took part in the show, including all 14 Japanese automobile manufacturers, which exhibited 15 vehicle brands, and 13 foreign automobile manufacturers, which exhibited 19 vehicle brands. There were 380 vehicles displayed, with numerous models introduced as world and Japan premieres.

According to the Japan Automobile Manufacturers Association, the organizer of the event, the 2017 show attracted 771,200 visitors. The number fell slightly from the previous show in 2015 and was equivalent to 94.9% of those who had previously attended due to the typhoon that swept across Japan in the first weekend of this year's show.

Amid further tightening of environmental regulations around the world, the main attractions were electric vehicles, which automobile manufacturers are strenuously developing, and artificial intelligence systems to support the driving experience. Furthermore, a large number of companies featured virtual reality technology at their booths. Head-mounted displays were made available to the visitors featuring presentations regarding vehicle performance and virtual test-drive programs.

This article includes a look at some of the notable vehicles on display at the Tokyo Motor Show. It also provides a summary of the use of aluminum for weight reduction in the vehicles.

Noteworthy Vehicles

Nissan LEAF NISMO Concept: Nissan Motorsports International Co. (NISMO), part of Nissan Motor Co., designed the LEAF NISMO concept (Figure 1) using its racing technology to make the concept car's special exterior its feature. The model has reduced its lift without compromising the coefficient of drag and has achieved excellent aerodynamic performance. The LEAF NISMO also has an exclusive sport-tuned suspension and high-performance tires, as well as a custom-tuned computer that delivers instant acceleration at all speeds, utilizing the characteristics of the electric drive.

Figure 1. LEAF NISMO concept.

A Nissan staff member, who had participated in the design of the concept car, explained, "It is not clear as to how much aluminum will be used in concept cars, but the company is considering the use of the material to manufacture doors, hoods, and fenders. At present, Nissan Motor is partially shelving the plan to use aluminum sheet for outer panels, especially doors. The reason behind this is that use of aluminum has led to high repair costs and users have been dissatisfied with the situation.

"The movement is headed toward production of electric vehicles, but weight reduction remains essential. At the same time, use of materials, such as steel, aluminum, resin, need to be decided depending on their characteristics. The proportion of aluminum to be used will differ subject to the car model, the character of the car, and the aim of the car. For example, a family-type car stresses economy and a sports-type car emphasizes driving."

Mitsubishi e-Evolution Concept: Mitsubishi Motors Corp.'s e-Evolution concept (Figure 2) is an electric vehicle with a single motor at the front, two motors at the rear, and a mounted high-capacity drive lithium ion battery system. The concept model has adopted a triple motor four-wheel drive system with a newly developed Dual Motor Active Yaw Control (AYC) system. All of this is integrated with the Super All-Wheel Control (S-AWC) vehicle dynamic control system. The electric vehicle exhibits powerful, smooth and quiet driving that only such a model can provide in various road conditions, whether it is being driven in town or on an expressway.

Figure 2. Mitsubishi e-Evolution concept.

Furthermore, the artificial intelligence system installed in the model reads the changes in the road and traffic conditions, as well as the driver's intent from his or her control. The system supports drivers of all abilities by making it safer and more pleasant to drive. A special coaching function allows the artificial intelligence system to communicate with the driver after which it constructs a training program to enhance driving expertise. The system provides advice through voice dialogue and a large dashboard display.

A Mitsubishi staff member, who took part in designing the concept car, commented, "Although the car does not

use aluminum outer panels, we wanted to use the material entirely from the viewpoint of weight reduction. But aluminum was not adopted, and the reason for that was that the concept car represented a metallic sculpture created from a lump of metal and it was difficult to express the sharp horizontal line, a feature of the side of the body, with aluminum sheet compared to steel.

"Mitsubishi currently uses aluminum for automotive hoods. And it will be essential to use aluminum to reduce the weight of electric vehicles in the future. However, we need to take into account factors, such as the cost of aluminum and the restriction it imposes in regard to formability when designing the cars. We hope that further development of aluminum alloys will take place."

Subaru VIZIV Performance Concept: The design of the Subaru VIZIV Performance Concept (Figure 3) originated from successive models that symbolize the company's superior driving performance and the symmetrical all-wheel drive (AWD), at the core of which is the horizontally opposed engine that the company has been developing for more than five decades. As a sports sedan, the car portrays "enjoyment of driving" that the company will continue to pursue into the future. Automated driving technologies are expected to spread in the future. Subaru focused on this and installed advanced driver assistance functions by combining the next-generation EyeSight System with other devices on the sports sedan.

The company designed the VIZIV car bearing in mind its Legacy, Impreza and WRX models, which represent Subaru's driving experience to the present. At the same time, design philosophy common to the current Subaru models—Dynamic and Solid—has been introduced to show that the next-generation sports sedan provides driving enjoyment.

Figure 3. Subaru VIZIV Performance concept.

A Subaru staff member, who took part in the car design, explained, "The concept car uses aluminum outer panels for its hood and trunk. In particular, the aluminum hood has a high shock absorbing power and protects the head of a pedestrian in collision. And the material has been used from the standpoint of safety. The roof of the car is made of carbon material. It is difficult to show sharp lines and hardness with aluminum. Subaru is considering the use of aluminum in making hoods as well as rear gates in the future.

"Materials to be used are considered and selected out of steel sheet, high-tensile strength steel sheet, aluminum and resin, based on their cost and where they will be applied. However, the basic policy of the company would be to make the best use of steel and high-tensile strength steel sheet, as factors like the difficulty of combining different materials and the need to install new production lines to adopt new materials must be looked at."

Trucks and Cable: Meanwhile, another highlight of the Motor Show was that the use of aluminum in trucks has made headway in reducing their weight. Use of wide aluminum sheet and large extruded shapes in trucks, especially large ones (Figure 4), has made progress. And consequently, even in the market for spot-contract products, demand for rolled and extruded products is now reportedly high.

Figure 4. Hino new PROFIA 2RG-FW1AXHG truck concept.

In addition, use of aluminum harnesses is tracking a strong trend. According to data released by the Japanese Electric Wire & Cable Makers' Association, shipments of aluminum cable to the automotive sector rose from 795 tons in fiscal 2015 to 933 tons in fiscal 2016, marking an increase of 17.4%. The association began to announce the figures related to shipments to the automotive sector in fiscal 2015. As the number of electric vehicles will grow in the coming years, demand for aluminum wire harnesses is expected to open up a new path.

Demand Trends for Aluminum in Japan's Automotive Industry

The Japan Automobile Manufacturers Association reported the recent changes in the domestic production of autos (Table I), showing that production has been flat from 2014 to 2016. However, in 2017, production is expected to grow 5-6% from a year earlier to about 9.7 million vehicles.

On the motorcycle sector, labor costs in Asian countries are rising and a tendency to bring on-site production back to Japan has emerged. A similar situation could take place in the automotive industry, along with reorganization of the domestic production structure in the future.

	Passenger Cars	Trucks	Buses	Total
2014	8,277	1,358	140	9,775
2015	7,831	1,310	138	9,278
2016	7,874	1,201	130	9,205
Change YoY (%)	100.5	91.7	94.2	99.2

(Source: Japan Automobile Manufacturers Association)

Table I. Japan's total auto production in thousands of vehicles.

Changes in the shipments of domestically produced aluminum products to Japan's automotive and motorcycle sectors are shown in Table II. While the shipments of key products like castings and die castings remain flat, reflecting the slow growth of vehicle production, shipments of rolled and extruded products are doing well, particularly in the car and truck sectors as a result of progress being made in relation to weight reduction.

The demand trend of aluminum sheet for auto body panel applications is attracting attention. Although statistics from the Japan Aluminium Association regarding aluminum sheet products make projections unclear and difficult to grasp accurately, Nalk Corp. estimates that shipments of sheet to the domestic market will total 45,000 tons in 2017, and production, including sheet for export, will reach 80,000-90,000 tons. Nalk expects production as well as shipments to increase steadily for the time being.

Based on forecasts that demand for sheets for automotive body panels will continue to be brisk in the near term, UACJ Corp. and Kobe Steel, Ltd., two major aluminum rolling companies in Japan, have announced successively that they will install production lines for these products. Kobe Steel announced in May 2017 that it would spend about ¥20 billion (~US$179 million) to build a new sheet line at its Moka Plant in order to produce 100,000 tons per annum. It is aiming to commission the new line in January 2020. Following this announcement, UACJ said in October 2017 that it would also build a new sheet line with the same annual production capacity of 100,000 tons at the Fukui Works. UACJ plans to spend approximately ¥16 billion (~US$143 million) and start up the line in January 2020.

			2014	2015	2016	Change YoY (%)
Rolled and Extruded Products	Wheels		1,397	1,007	1,261	125.2
	Motorcycles		7,305	6,903	6,717	97.3
	Passenger Cars		117,724	118,905	130,225	109.5
	Trucks & Buses		34,580	37,361	41,840	112.0
	Heat Exchangers		119,995	118,801	119,432	100.5
	Subtotal		*281,001*	*282,977*	*299,475*	*105.8*
	(Rolled)		(145,649)	(150,761)	(161,992)	(107.4)
	(Extruded)		(135,352)	(132,216)	(137,483)	(104.0)
Castings & Die Castings	Castings		390,050	391,028	396,281	101.3
	Die Castings	Motorcycles	28,595	27,191	25,861	95.1
		Passenger Cars, etc.	869,471	847,978	857,745	101.2
	Subtotal		*1,288,116*	*1,266,197*	*1,279,887*	*101.1*
Forgings			26,261	28,657	29,558	103.1
Total			**1,595,378**	**1,577,831**	**1,608,920**	**102.0**

(Source: Japan Aluminium Association.)

Table II. Aluminum product shipments for automotive and motorcycle applications in Japan (in tons).

Tai Nakada of the Nalk Corporation publishes the monthly newsletter, The Nalk Report, *about the Japanese aluminum industry written in English and Japanese. Nalk Corporation was established in 1989 with the aim of providing a consulting service concerning the Japanese market and other materials. Additionally, in 1999, Nalk Corporation started an import and export business based on its broad business experience. Nakada can be contacted via email at: tai.nakada@nalk.co.jp. Information on the Nalk Corporation is available at: www.nalk.co.jp.*