
MAINTENANCE AND SERVICEABILITY

1 Introduction

1.1. Vehicle Market in 2017

In 2017 5,234,166 new vehicles were sold in Japan, representing an increase of 263,906 vehicles or 5.3% compared to the previous year sales of 4,970,260 new vehicles.

A more detailed analysis of new vehicle sales reveals that the number of registered vehicles was 3,390,824, an increase of 146,026 (4.5%) from the previous year.

At the same time, sales of mini-vehicles reached 1,843,342 vehicles, an increase of 117,880 (6.8%) from the previous year. This is the first time in three years that the number of new mini-vehicles sold has increased.

Sales of new mini-vehicles as a proportion of all new vehicle sales peaked at 40.9% in 2014, and accounted for 35.2% in 2017.

In terms of used vehicle sales, the number of registered vehicles was 3,865,941, an increase of 103,287 (2.8%) from the previous year. Used mini-vehicle sales were 3,071,577, an increase of 78,109 (2.6%) from the previous year. Used vehicle sales also benefited from the upturn in new vehicle sales, with sales of both registered vehicles and mini-vehicles increasing.

The number of registered, domestically-produced hybrid vehicles (HVs and PHVs) sold in Japan in 2017 was 1,126,881 vehicles, an increase of 56,937 vehicles (5.3%) compared to the previous year. The number of imported hybrid vehicles was 5,380, a decrease of 1,335 vehicles (19.9%) compared to the previous year.

The number of registered, domestically-produced electric vehicles (EVs) sold in 2017 was 16,926 vehicles, while the number of imported EVs was 1,267 vehicles, bringing total EV sales to 18,193 vehicles, an increase of 2,673 vehicles (17.2%) compared to the previous year. The number of fuel cell vehicles (FCVs) sold in Japan in 2017 was 849 vehicles, a decrease of 206 vehicles (19.5%) compared to the previous year.

1.2. Vehicle Ownership Trends in 2017

At the end of December 2017, the number of vehicles owned in Japan was 81,946,036, the eighth consecutive increase from 2010 and also the sixth straight year to set a record high. Compared to the previous year (2016), this was an increase of 343,990 vehicles (0.4%).

According to model type, the number of 4-wheeled registered vehicles owned in Japan was 47,476,580, an increase of 111,652 (0.2%) from the previous year also representing two successive years of increase.

Sales of new mini-vehicles increased for the first time in three years, hinting at a recovery from the increase in the mini-vehicle tax. The number of 4-wheeled mini-vehicles owned in Japan broke through the 30-million-vehicle mark in 2015 and has continued to rise, reaching 30,771,278 vehicles at the end of December 2017. This was an increase of 219,917 vehicles (0.7%) compared to the previous year. The growth rate has declined for a third consecutive year and appears to be approaching a plateau.

The number of inspected 2-wheeled vehicles owned in Japan also increased to 1,686,196. While this was 13,758 vehicles (0.8%) more than the previous year, it represents a continued decline of the growth rate despite the increase in the total number of owned vehicles. The number of 2-wheeled mini-vehicles owned in Japan is 1,992,525. This is 2,300 (0.1%) less than the previous year, and a second consecutive year of decrease.

The number of mini-vehicles owned in Japan as a percentage of the total number of registered and 4-wheeled mini-vehicles rose by 0.1% from the previous year, reaching a record 39.3%, and leveling off just prior to hitting the 40% mark.

According to a study by the Automobile Inspection & Registration Information Association (AIRIA), the average age of registered passenger vehicles at the end of March 2017 was 8.53 years. This is 0.09 years longer than the previous year and also means that the average

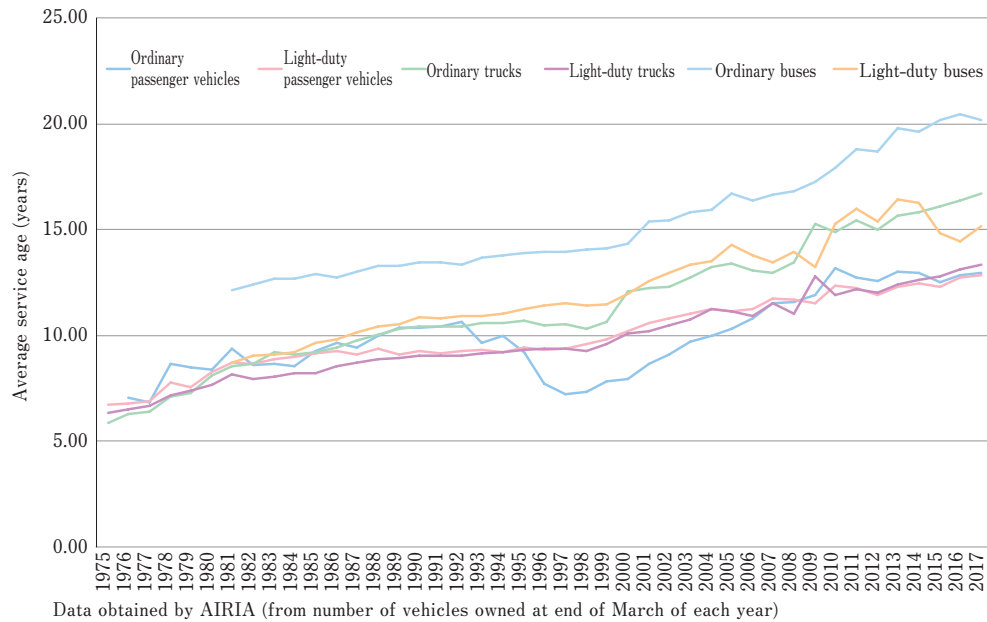


Fig. 1 Trends in average number of years of usage (average vehicle age) according to vehicle type.

vehicle age has continued to grow for 25 years in succession. This is the highest average vehicle age in history, a record that has been broken annually for the past 23 years. The average vehicle age has increased by 1.44 years compared to 10 years ago in 2007.

The average number of years of usage for registered passenger vehicles in Japan was 12.91 years, a 0.15 year increase over the 12.76 years value of the previous year, and the second increase in two years.

At the same time, the average age of registered trucks at the end of March 2017 was 11.32 years, 0.09 years more than the 11.23 year value of the previous year and the highest in history after rising for 24 years in succession. A breakdown of the different truck models shows that the average age of normal size trucks is 12.11 years, which is an increase of 0.09 years compared to the previous year. The average age of light-duty trucks is 10.80 years, an increase of 0.09 years compared to the previous year. This resets the record following 26 consecutive years of increase.

The average age of buses in Japan was 11.84 years, which was a decrease of 0.03 years compared to the previous year.

In addition, the average age of special-purpose vehicles in Japan in 2017 was 10.93 years, an increase of 0.08 years compared to the previous year. The average age of heavy-duty special-purpose vehicles was 20.58 years, an increase of 0.12 years compared to the previous year,

while the average age of light motorcycles was 14.97 years, an increase of 0.34 years compared to the previous year.

Figure 1 shows the change in the average number of years of usage for different types of registered vehicle models.

Both the number of older vehicles within the total number of vehicles owned in Japan and the proportion of the total that they represent have continued to increase. Looking specifically at registered passenger vehicles, the number of these vehicles with an age of 10 years or more as of the end of March 2017 was 14,495,086, an increase of 202,296 vehicles (1.4%) compared to the previous year. These older vehicles accounted for 36.7% of the total number of registered passenger vehicles, an increase of 0.4% (Fig. 2).

According to a study by the Light Motor Vehicle Inspection Organization (LMVIO), the current average age of passenger mini-vehicles at the end of December 2017 was 8.37 years. This is 0.17 years longer than the average age of 8.20 years recorded in 2016. This organization first started recording this data for mini-vehicles in 2005, at which time their average age was 6.13 years. It has increased by 2.24 years, or over 36%, since then, marking 12 consecutive years of increase.

The average age of mini-vehicle trucks at the end of December 2017 was 12.53 years, exceeding the average age of 12.30 years recorded in 2016 by 0.23 years.

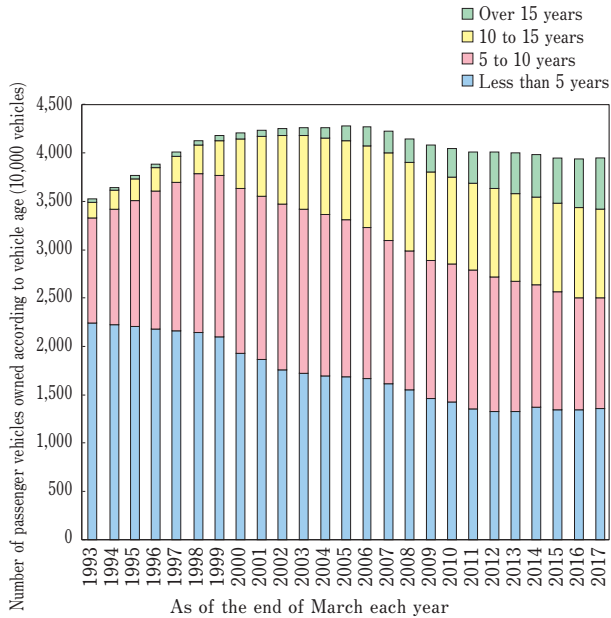


Fig. 2 Trends in vehicle age breakdown of the total number of passenger vehicles owned.

The average number of years of usage of passenger mini-vehicles was 14.36 years at the end of December 2016. In 2017 this increased by 0.19 years to 14.55 years. Therefore, the average vehicle age has increased by 3.06 years compared its 11.49 years recorded in 2005, 12 years earlier. Mini-vehicle trucks exhibit the same trend, with their average age of 15.99 years in 2016 increasing by 0.43 years to 16.42 years in 2017.

The total number of registered HVs and PHVs owned in Japan at the end of March 2017 was 6,568,960, an increase of 987,382 vehicles (17.7%) compared to the previous year. The number of EVs owned in Japan was 75,294, which is 11,534 vehicles (18.1%) more than the previous year. The number of FCVs owned in Japan was 1,813, representing a massive increase of 1,181 vehicles (186.9%) compared to the previous year. The total number of HVs, PHVs, EVs, and FCVs (electric-powered vehicles) owned in Japan was 6,646,067 vehicles, an increase of 1,000,097 (17.7%) compared to the previous year. This accounted for 8.2% of the total number of vehicles owned in Japan (81,260,206) and represents an increase of 1.2 percentage points from the 7.0% of previous year.

The total number of electric-powered mini-vehicles owned in Japan at the end of March 2017 was 18,808 vehicles, or 253 vehicles (1.4%) more than the previous year. A breakdown of these owned vehicles reveals that 18,278 of them are type designation vehicles, 296 of them are type designation vehicles with modifications, and the re-

maining 234 are parallel imports or other types of vehicles.

2 Recent Trends in the Vehicle Maintenance Industry

The Japan Automobile Service Promotion Association (JASPA) conducted its 2017 survey of the vehicle repair and maintenance industry at the end of June 2017. Targeting vehicle repair and maintenance businesses defined by the Road Transport Vehicle Act, the survey was sent to approximately 20% of the 92,001 businesses according to category and size, with responses received from approximately 10% or 8,845 of the recipients.

The sales volume and other values reported were those from the accounting period closest to the time of the survey at the end of June 2017 (e.g., from the 2016 fiscal year). According to this survey, the total maintenance sales were 5 trillion 487.5 billion yen, an increase of 93.1 billion yen (1.7%) compared to the results of the previous year's survey.

For the purpose of the 2017 vehicle repair and maintenance industry survey, the target vehicle repair and maintenance businesses were classified as follows: full-time vehicle maintenance shops (workplaces other than at vehicle dealers where maintenance sales account for over 50% of total sales), maintenance shops run as an additional business (workplaces where sales from other businesses, such as vehicle sales, parts and accessory sales, insurance sales, or gasoline sales, account for over 50% of total sales), maintenance shops at vehicle dealers (workplaces at companies that have signed an exclusive distributor agreement with an automaker or a domestic exclusive retailer), and private owner-run maintenance shops (mainly workplaces that perform maintenance work on vehicles that are privately owned).

2.1. Maintenance Facilities and Maintenance Personnel

2.1.1. Outline of Maintenance Facilities

The number of businesses in the vehicle repair and maintenance industry was 73,083 at the time of the survey on June 30, 2017, a decrease of 288 businesses (0.4%) compared to the previous year. This was the third consecutive year that this number decreased.

The total number of workplaces (number of certified maintenance shops) was 92,001. This was a decrease of 60 such workplaces (0.1%) compared to the previous year. It is also the second time in two years that this val-

Table 1 Maintenance sales volume, composition ratio, and rate of change compared to previous year according to type of business and work content.

(Sales volume units: hundred million yen)

Business type / Work content		Vehicle inspection (<i>shaken</i>) maintenance			Regular inspection and maintenance				Collision repair	Other maintenance	Total	Number of shops and composition ratio	Number of mechanics and composition ratio
		2 years	1 year	Subtotal	1 year	6 months	3 months	Total					
Full-time	Sales volume	5,944	3,411	9,355	359	100	319	778	4,009	5,805	19,947	56,868	163,019
	Proportion	29.8%	17.1%	46.9%	1.8%	0.5%	1.6%	3.9%	20.1%	29.1%	100.0%	61.8%	48.5%
	Change in sales volume compared to previous year	98	113	211	43	21	42	106	-218	97	196	133	1,702
	Ratio of increase or decrease compared to previous year	101.7%	103.4%	102.3%	113.6%	126.6%	115.2%	115.8%	94.8%	101.7%	101.0%	100.2%	101.1%
Additional business	Sales volume	2,327	635	2,962	185	33	46	264	1,375	2,010	6,611	15,332	48,536
	Proportion	35.2%	9.6%	44.8%	2.8%	0.5%	0.7%	4.0%	20.8%	30.4%	100.0%	16.7%	14.4%
	Change in sales volume compared to previous year	-38	21	-17	15	0	7	22	81	-9	77	-144	243
	Ratio of increase or decrease compared to previous year	98.4%	103.4%	99.4%	108.8%	100.0%	117.9%	109.1%	106.3%	99.6%	101.2%	99.1%	100.5%
Full-time + additional business	Sales volume	8,271	4,046	12,317	544	133	365	1,042	5,384	7,815	26,558	72,200	211,555
	Proportion	31.1%	15.2%	46.4%	2.0%	0.5%	1.4%	3.9%	20.3%	29.4%	100.0%	78.5%	62.9%
	Change in sales volume compared to previous year	60	134	194	58	21	49	128	-137	88	273	-11	1,945
	Ratio of increase or decrease compared to previous year	100.7%	103.4%	101.6%	111.9%	118.8%	115.5%	114.0%	97.5%	101.1%	101.0%	100.0%	100.9%
Dealer	Sales volume	7,217	1,333	8,550	1,935	261	183	2,379	5,360	9,858	26,147	16,180	109,385
	Proportion	27.6%	5.1%	32.7%	7.4%	1.0%	0.7%	9.1%	20.5%	37.7%	100.0%	17.6%	32.5%
	Change in sales volume compared to previous year	371	116	487	33	7	6	46	10	249	792	-33	2
	Ratio of increase or decrease compared to previous year	105.4%	109.5%	106.0%	101.7%	102.8%	103.4%	102.0%	100.2%	102.6%	103.1%	99.8%	100.0%
Private owner-run	Sales volume	645	218	863	100	45	56	201	451	655	2,170	3,621	15,420
	Proportion	29.7%	10.0%	39.8%	4.6%	2.1%	2.6%	9.3%	20.8%	30.2%	100.0%	3.9%	4.6%
	Change in sales volume compared to previous year	-50	-47	-97	7	33	10	50	-60	-27	-134	-16	-242
	Ratio of increase or decrease compared to previous year	92.8%	82.3%	89.9%	107.5%	375.0%	121.7%	133.1%	88.3%	96.0%	94.2%	99.6%	98.5%
Total	Sales volume	16,133	5,597	21,730	2,579	439	604	3,622	11,195	18,328	54,875	92,001	336,360
	Proportion	29.4%	10.2%	39.6%	4.7%	0.8%	1.1%	6.6%	20.4%	33.4%	100.0%	100.0%	100.0%
	Change in sales volume compared to previous year	381	203	584	98	61	65	224	-187	310	931	-60	1,705
	Ratio of increase or decrease compared to previous year	102.4%	103.8%	102.8%	104.0%	116.1%	112.1%	106.6%	98.4%	101.7%	101.7%	99.9%	100.5%

ue has decreased.

By type of business, full-time vehicle maintenance shops accounted for the majority of workplaces at 56,868 (61.8% of the total), representing an increase of 133 such workplaces (0.2%) compared to the previous year. Maintenance shops that were run as an additional business accounted for 15,332 workplaces (16.7% of the total), a decrease of 144 (0.9%) from the previous year. The number of maintenance shops at vehicle dealers was 16,180 (17.6% of the total), a decrease of 33 shops from the previous year. This was the second consecutive year that the number of dealer-based maintenance shops decreased. The number of private owner-run maintenance shops was 3,621 (3.9% of the total). This was a decrease of 16 (0.4%) from the previous year, and marked a third consecutive year of decrease (Table 1).

The number of designated workshops (i.e., private shops permitted to carry out the Japanese *shaken* vehicle inspection) has increased consistently since the system was established in 1962 and sets a record high every year. In the 2017 survey, the number of such workshops reached 29,983, an increase of 128 (0.4%) from the previ-

ous year. The number of workplaces that have obtained this designation (i.e., the designation acquisition ratio) is 32.6% of the total number of workplaces (Table 2).

By type of business, 13,546 of the total number of full-time vehicle maintenance shops (56,868) have obtained the designation, an increase of 103 shops (0.8%) compared to the previous year. This represents a designation acquisition ratio of 23.8%, as well as an increase of 1,243 shops (10.1%) compared to 10 years earlier in 2007.

In the case of maintenance shops run as an additional business, 4,683 of the total of 15,332 have obtained the designation, an increase of 3 workplaces (0.1%) from the previous year. This represents a designation acquisition ratio of 30.5%, as well as an increase of 71 shops (1.5%) compared to the number in 2007.

Among the 16,180 maintenance shops at vehicle dealers, 10,533 have obtained the designation. This is an increase of 29 (0.3%) from the previous year and represents a designation acquisition ratio of 65.1%, but also constitutes a decrease of 52 shops (0.5%) from 2007.

Of the 3,621 private owner-run maintenance shops, 1,221 have obtained the designation. This is a decrease of

Table 2 Number of vehicle maintenance-related personnel.

Scale of business	A1 (2 to 3 people)	A2 (4 to 10 people)	B (11 to 20 people)	C (21 to 30 people)	D (31 people or more)	Total	Change from previous year	Rate compared to previous year
Number of shops	51,092	36,750	3,594	424	141	92,001	-60	99.9%
Number of shops that obtained designation		26,935	2,634	311	103	29,983	128	100.4%
Acquisition ratio		73.3%	73.3%	73.3%	73.0%	32.6%		
Total number of personnel	157,253	290,748	65,505	13,540	7,233	534,279	-3,601	99.3%
Number of female personnel within that total	32,675	38,923	5,709	887	347	78,541	-5,194	93.8%
Total number of maintenance personnel	120,969	213,383	49,088	10,319	5,958	399,717	-996	99.8%
Number of female maintenance personnel within that total	10,975	6,109	630	108	60	17,882	-523	97.2%
Number of Class 1 auto mechanics	1,241	6,607	1,749	209	148	9,954	751	108.2%
Number of female mechanics within that total	69	31	17	0	2	119	5	104.4%
Number of Class 2 auto mechanics	76,787	153,656	35,159	6,654	2,567	274,823	363	100.1%
Number of female mechanics within that total	2,215	1,419	316	23	7	3,980	-111	97.3%
Number of Class 3 auto mechanics	19,616	24,854	5,066	1,273	774	51,583	591	101.2%
Number of female mechanics within that total	5,019	1,710	65	3	12	6,809	79	101.2%
Total number of mechanics	97,644	185,117	41,974	8,136	3,489	336,360	1,705	100.5%
Number of female mechanics within that total	7,303	3,160	398	26	21	10,908	-27	99.8%

The number of women was also surveyed starting in June 2014.

Table 3 Number of businesses according to number of employees

	2 to 5 people	6 to 10 people	11 to 15 people	16 to 20 people	21 to 30 people	31 to 50 people	51 to 100 people	101 to 300 people	More than 300 people	Private company total	Public offices	Overall total
June 2007	35,287	18,695	7,425	3,791	3,226	1,688	444	60	14	70,630	198	70,828
June 2017	45,433	16,978	5,050	2,095	2,134	722	197	38	39	72,686	397	73,083
Change	10,146	-1,717	-2,375	-1,696	-1,092	-966	-247	-22	25	2,056	199	2,255

7 shops (0.6%) from the previous year and represents a designation acquisition ratio of 33.7%. It also represents an increase of 13 shops (1.1%) from 2007.

Table 2 compares the scale of the maintenance shops based on the number of vehicle maintenance personnel employed there and other factors.

At the time of this survey at the end of June 2017, there were 72,686 private companies after subtracting the number of public offices. However, at the time of the June 2007 survey 10 years earlier, there were 70,630 private companies after subtracting the number of public offices. Table 3 compares them based on the number of employees.

2.1.2. Outline of Mechanics and Maintenance Personnel

At the time of the survey at the end of June 2017, the number of maintenance-related personnel was 534,279, a decrease of 3,601 (0.7%) from the previous year.

Examining these changes in the numbers of maintenance-related personnel by business type shows that full-time vehicle maintenance businesses employed 259,677

people, an increase of 2,069 (0.8%) from the previous year. Vehicle maintenance businesses run as an additional business employed 88,611 people, 1,266 (1.4%) less than the previous year. However, the number of maintenance-related personnel at maintenance shops at vehicle dealers increased to 160,610 people, 2,488 (1.6%) more than the previous year. In private owner-run maintenance shops, the number of such personnel decreased significantly for a sixth consecutive year, falling to 25,381 people, which is 6,892 (21.4%) less than the previous year.

The number of maintenance personnel (shop workers) was 399,717, a decrease of 996 people from the previous year.

The number of mechanics was 336,360 people, an increase of 1,705 (0.5%) from the previous year. The number of female mechanics within this total has been recorded since the June 2014 survey, when there were 9,527, with successive increases to 10,604 in 2015 and 10,935 in 2016. However, the June 2017 survey reported 10,908 female mechanics, a decrease of 27 compared to the previous year.

Tables 1 and 2 show the current situation of maintenance-related personnel in Japan.

After reaching a peak of 347,276 people in the 2011 survey results, the total number of mechanics decreased for the next five years. However, the results of the 2017 survey show an increase in the number of personnel who obtained each of the Class 1, Class 2, and Class 3 vehicle mechanic qualifications.

The average age of maintenance personnel continues to rise, reaching 45.0 years old. Broken down by the different types of businesses, full-time vehicle maintenance shops showed the most remarkable increase, crossing the 50-year-old mark at 50.3 years old for the first time. Vehicle dealers have the youngest personnel, whose average age has nevertheless increased by 3.1 years over the past 10 years to reach 35.0 years old.

(3) Measures to Ensure Sufficient Numbers of Trained Mechanics

The number of people who took the JASPA registration test to acquire a mechanic qualification was 45,016 in 2015, but has since decreased for two straight years, falling to 39,047 people in 2017. Conversely, the number of people who passed the test in 2015 was 30,808, 31,853 in 2016, and 31,045 in 2017. Consequently, the increase in the examination pass rate is compensating for the decrease in the number of people taking the test.

In 1991, the Japanese automobile industry established the Japan Automobile Education Foundation (JAEF), which has been providing automotive technology educational materials to industrial high schools and other vocational schools teaching vehicle mechanics courses. The foundation also regularly conduct activities that provide a wide range of materials related to automobiles to regular high schools, and also holds workshops for teachers to help raise interest in automotive technologies and maintenance.

In April 2014, with the cooperation of the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT), a number of different vehicle-related organizations, including JASPA, the Japan Automobile Dealers Association (JADA), the Japan Automobile Manufacturers Association (JAMA), and JAEF, established a council (composed of 16 automotive-related organizations) to promote the recruitment and training of vehicle maintenance personnel.

In addition, the Study Group Concerning Recruitment and Training of Automobile Maintenance Personnel set

up in June 2015 held discussions about increasing active participation by women, which has led to initiatives aimed at increasing the recruitment of female mechanics.

In 2017, MLIT formulated their Guidelines for creating a more comfortable working environment for women in the automobile maintenance industry.

2.2. Demand for Vehicle Maintenance

2.2.1. Trends in Total Maintenance Sales Volume

The total maintenance sales volume in the 2017 survey of the situation in the vehicle maintenance industry (results from the 2016 fiscal year) was 5 trillion 487.5 billion yen. Table 1 compares the maintenance sales volume generated by full-time vehicle maintenance businesses, those run as an additional business, those at dealers, and those at private owner-run businesses. It also compares the sales volume according to the content of the work performed, such as *shaken* vehicle inspection and maintenance, regular inspection and maintenance, collision repairs, and other maintenance (e.g., extraordinary maintenance due to a breakdown or malfunction, simple maintenance such as oil changes, voluntary inspection and maintenance requested by the owner, re-inspection of a vehicle issued a limited vehicle inspection certificate, or customization services).

By business type, maintenance sales at full-time vehicle maintenance businesses accounted for 1 trillion 994.7 billion yen, an increase of 19.6 billion yen (1.0%) compared to the previous year. A breakdown of the full-time maintenance business total by type of maintenance work shows that *shaken* vehicle inspection and maintenance sales amounted to 935.5 billion yen, an increase of 21.1 billion yen (2.3%) compared to the previous year, accounting for 46.9% of the total. Regular inspection and maintenance sales amounted to 77.8 billion yen, an increase of 10.6 billion yen (15.8%) compared to the previous year, accounting for 3.9% of the total. Collision repairs amounted to 400.9 billion yen, a decrease of 21.8 billion yen (5.2%) compared to the previous year, and representing 20.1% of the total. Finally, other maintenance sales amounted to 580.5 billion yen, an increase of 9.7 billion yen (1.7%) compared to the previous year, or 29.1% of the total.

The maintenance sales at vehicle maintenance businesses run as an additional business amounted to a total of 661.1 billion yen, an increase of 7.7 billion yen (1.2%) compared to the previous year. Breaking that total down according to the different kinds of maintenance work shows that *shaken* vehicle inspection and maintenance

sales amounted to 296.2 billion yen, a decrease of 1.7 billion yen (0.6%) compared to the previous year that accounted for 44.8% of the total. Regular inspection and maintenance sales amounted to 26.4 billion yen, an increase of 2.2 billion yen (9.1%) compared to the previous year, accounting for 4.0% of the total. Collision repairs amounted to 137.5 billion yen, an increase of 8.1 billion yen (6.3%) compared to the previous year, making up 20.8% of the total. Finally, other maintenance sales amounted to 201.0 billion yen, a decrease of 0.9 billion yen (0.4%) compared to the previous year, and representing 30.4% of the total.

The total for vehicle maintenance sales at maintenance shops at vehicle dealers amounted to 2 trillion 614.7 billion yen, an increase of 79.2 billion yen (3.1%) compared to the previous year. Broken down by type of maintenance work, *shaken* vehicle inspection and maintenance sales amounted to 855.0 billion yen, an increase of 48.7 billion yen (6.0%) compared to the previous year accounting for 32.7% of the total. Regular inspection and maintenance sales amounted to 237.9 billion yen, an increase of 4.6 billion yen (2.0%) compared to the previous year, or 9.1% of the total.

Collision repairs amounted to 536.0 billion yen, an increase of 1.0 billion yen (0.2%) compared to the previous year representing 20.5% of the total. Finally, other maintenance sales amounted to 985.8 billion yen, an increase of 24.9 billion yen (2.6%) compared to the previous year and making up 37.7% of the total.

The total vehicle maintenance sales at private owner-run vehicle maintenance businesses were 217.0 billion yen, a decrease of 13.4 billion yen (5.8%) compared to the previous year. The breakdown by type of maintenance work reveals that *shaken* vehicle inspection and maintenance sales amounted to 86.3 billion yen, an increase of 9.7 billion yen (10.1%) compared to the previous year, or 39.8% of the total. Regular inspection and maintenance sales amounted to 20.1 billion yen, an increase of 5.0 billion yen (33.1%) compared to the previous year, accounting for 9.3% of the total. Collision repairs amounted to 45.1 billion yen, a decrease of 6.0 billion yen (11.7%) compared to the previous year representing 20.8% of the total maintenance sales. Finally, other maintenance sales amounted to 65.5 billion yen, a decrease of 2.7 billion yen (4.0%) compared to the previous year that made up 30.2% of the total.

Breaking down the 2017 overall total maintenance

sales volume of 5 trillion 487.5 billion yen by type of maintenance work shows that *shaken* vehicle inspection and maintenance sales amounted to 2 trillion 173.0 billion yen, a decrease of 58.4 billion yen (2.8%) compared to the previous year and accounting for 39.6% of the overall total. Regular inspection and maintenance sales amounted to 362.2 billion yen, an increase of 22.4 billion yen (6.6%) compared to the previous year representing 6.6% of the overall total. Collision repairs amounted to 1 trillion 119.5 billion yen, a decrease of 18.7 billion yen (1.6%) compared to the previous year, or 20.4% of the overall total. Finally, other maintenance sales amounted to 1 trillion 832.8 billion yen, an increase of 31.0 billion yen (1.7%) compared to the previous year, and making up 33.4% of the overall total.

Maintenance sales from collision repair work have decreased significantly for four consecutive years, reaching a total decrease amounting to 154.6 billion yen during that period.

The number of traffic accidents in Japan peaked at 952,709 in 2004. In 2017 there were 472,069 accidents, 27,163 (5.4%) less than the previous year. Since 2004, a decrease of 480,640 cases (50.5%) has halved the number of traffic accidents. The sales volume of vehicle collision repairs reflects the effectiveness of advances in safety technologies such as automatic braking systems at reducing the occurrence of accidents.

2.2.2. Average Number of Vehicles Serviced According to Type of Business and Work Content

Over a period of one year, an average of 1,692 vehicles per shop was brought in for maintenance service, representing an increase of 49 vehicles (3.0%) from the previous year. Broken down according to the content of the work that was performed, the average number of vehicles brought in for *shaken* vehicle inspection and maintenance service per shop was 366, or 10 vehicles (2.8%) more than in the previous year. This accounted for 21.6% of the 1,692 vehicles brought in per shop. The average number of vehicles brought in for regular inspection and maintenance per shop was 242, or 3 vehicles (1.3%) more than in the previous year, and representing 14.3% of the total. An average of 89 vehicles per shop was brought in for collision repairs, which is the same as the previous year. It accounted for 5.3% of the total. The average number of vehicles brought in for other maintenance per shop was 995, an increase of 36 vehicles (3.8%) from the

previous year, or 58.8% of the total.

By type of business, the average number of vehicles brought into full-time vehicle maintenance businesses was 816, an increase of 12 vehicles (1.5%) from the previous year. For maintenance shops run as an additional business the average number of vehicles brought in for other maintenance was 1,276 per shop, an increase of 28 vehicles (2.2%) from the previous year. The average number of vehicles brought into maintenance shops at dealers was 5,289 vehicles per shop, an increase of 326 vehicles (6.6%) from the previous year.

Furthermore, looking at the content of maintenance work according by type of business, the average number of vehicles brought into full-time vehicle maintenance businesses for *shaken* vehicle inspection and maintenance during the year was 274 per shop, an increase of 1 vehicle (0.4%) from the previous year. This accounted for 33.6% of all the vehicles brought into those shops for maintenance. For maintenance shops run as an additional business, the average number of vehicles brought into was 340 per shop, a decrease of 10 vehicles (3.0%) from the previous year representing 26.6% of the total. At the same time, the average number of vehicles brought into maintenance shops at dealers for *shaken* vehicle inspection and maintenance was 723, an increase of 60 vehicles (9.0%) making up 13.7% of the total.

Next, the average number of vehicles brought into full-time vehicle maintenance businesses for regular inspection and maintenance during the year was 82 vehicles per shop, an increase of 3 vehicles (3.8%) from the previous year. This accounted for 10.0% of all the vehicles brought into those shops for maintenance during the year. For maintenance shops run as an additional business, the average number of vehicles brought in was 118 per shop, an increase of 21 vehicles (21.6%) from the previous year, accounting for 9.2% of the total. The average number of vehicles brought into maintenance shops at dealers was 948 vehicles per shop, an increase of 9 vehicles (1.0%) compared to the previous year, or 17.9% of the total.

The average number of vehicles brought in for collision repairs during the year was 64 vehicles at full-time vehicle maintenance businesses, a decrease of 2 vehicles per shop (3.0%) from the previous year that accounted for 7.8% of the total. For maintenance shops run as an additional business, the average number of vehicles brought in for collision repairs was 74 per shop, an in-

crease of 5 vehicles (7.2%) from the previous year. This accounted for 5.8% of all the vehicles brought in for maintenance service. The average number of vehicles brought into maintenance shops at dealers was 195 vehicles per shop, an increase of 6 vehicles (3.2%) compared to the previous year, representing 3.7% of the total.

Other maintenance accounted for the largest portion of vehicles brought in for maintenance or service. The average number of vehicles brought into full-time vehicle maintenance businesses during the year was 396 per shop, an increase of 12 vehicles (3.1%) from the previous year. This accounted for 48.5% of the total. For into maintenance shops run as an additional business, the average number of vehicles brought in was 744 per shop, a decrease of 8 vehicles (1.1%) from the previous year, accounting for 58.3% of the total. The average number of vehicles brought into maintenance shops at dealers was 3,423 per shop, an increase of 251 vehicles (7.9%) from the previous year, and making up 64.7% of the total.

2.2.3. Trends in Shaken Vehicle Inspection and Regular Inspection Maintenance Fees According to Type of Business

Two-year vehicle inspections account for over three-quarters of the *shaken* vehicle inspection sales volume. Comparing the unit price of those inspections at the different types of businesses shows that it was 50,313 yen at full-time vehicle maintenance businesses, an increase of 1,342 yen (2.7%) over the previous year. In contrast, the unit price at maintenance shops run as an additional business was 51,958 yen, a decrease of 1,950 yen (3.6%) compared to the previous year. Furthermore, the unit price at maintenance shops at dealers was 68,235 yen, a decrease of 1,976 yen (2.8%) compared to the previous year.

The difference between the 2-year *shaken* vehicle inspection fees at full-time vehicle maintenance businesses and maintenance shops at dealers had shrunk for several years, before growing larger in the 2016 survey. However, this difference in fees had shrunk to 17,922 yen in the results of the 2017 survey.

One-year vehicle inspections account for approximately three-quarters of the regular inspection maintenance sales volume. A comparison of the average unit price for such inspections at the different types of businesses reveals that it was 19,868 yen at full-time vehicle maintenance businesses. This was an increase of 1,252 yen (6.7%) over the previous year.

In contrast, the unit price at the maintenance shops run as an additional business was 17,943 yen, a decrease of 923 yen (4.9%) compared to the previous year. For maintenance shops at dealers, the unit price was 17,936 yen, an increase of 159 yen (0.9%) compared to the previous year.

2.3. Maintenance Technical Information and Promotion of ICT Usage

2.3.1. State of FAINES Usage

JASPA began operating the FAINES internet-based subscription service for providing vehicle maintenance technical information in 1998. At the end of 2017 the number of FAINES subscribers had reached 34,416 businesses, an increase of 769 (2.3%) over the 33,647 of the previous year.

The average number of times FAINES is used per month has increased every year from approximately 450,000 times in 2011, to about 900,000 times at present.

FAINES was used by each subscriber business 26 times a month in 2017.

The types of information accessible via FAINES that were used most often each month are the maintenance manual information, which was accessed most often at 350,000 times a month, followed by the vehicle maintenance standard work points table, which was accessed 300,000 times a month, then service data, which was accessed 90,000 times a month, and finally examples of breakdown repairs and maintenance advice, which was accessed 80,000 times a month. There is a lot of recorded information for older model-year vehicles that have been used for many years and the number of cases registered as examples of breakdown repairs is growing steadily to form, in conjunction with the maintenance manual information, the frequently searched core of the FAINES service.

The types of information that FAINES provides and the data stored in its system includes: (1) maintenance manual information: 1,465 pieces of data, 613 vehicle models (last year: 1,371 and 584, respectively), (2) vehicle maintenance standard work points table: 5,426 pieces of data from the 1995 version to the 2017 version (last year: 5,341), (3) examples of breakdown repairs and maintenance advice: 6,889 pieces of data (last year: 6,390), (4) vehicle data (sampling data) from registered vehicles equipped with OBD, mainly vehicles compatible with J-OB2 II: 209 pieces of data (last year: 209), (5) technical information: 1,775 pieces of data (last year: 1,686), and (6)

service data: 3,373 pieces of data (last year: 3,191).

In August 2006, JASPA began operating an illegal parking fee delinquent vehicle information inquiry system that allows vehicle maintenance personnel to check whether a vehicle brought in for a *shaken* vehicle inspection has unpaid illegal parking fees. By the end of 2017, some 36,085 maintenance shops (23,488 full-time vehicle maintenance businesses and vehicle maintenance businesses run as an additional business and 12,597 maintenance shops at vehicle dealers) had registered to use this system and in the same year, 1,474,685 queries were entered into the system. The system is used constantly, receiving hundreds of thousands of inquiries every month.

2.3.2. Introduction of *Shaken* Renewal Inspection One-Stop Service (OSS)

On June 14, 2013 the Cabinet Office of the Japanese government issued the Declaration to be the World's Most Advanced IT Nation. One of the central pillars of this declaration is "The realization of a Japanese society with one-stop public services that anyone can access at any time and from anywhere". Consequently, Japan has undertaken concrete efforts to establish of e-government services. Prior to these efforts, the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT) started examining the feasibility of a "One stop service (OSS) for car ownership-related procedures" with the relevant government ministries in December 1998. This service would enable the administrative procedures that differ by government agency, such as automobile registration and inspection, vehicle storage location certification, as well the payment of vehicle taxes and declaration of tax payment, to be collectively performed online. More than 40 million applications for automobile ownership-related procedures are submitted every year in Japan, an enormous volume compared to other administrative procedures. Given the many benefits for Japanese citizens entailed by an OSS, 11 prefectures began operating such a service for the first-time registration of new vehicles in December 2005.

In April 2017, MLIT expanded the application of this OSS to *shaken* renewal inspections, used vehicle sales, and changes of address, made the *shaken* renewal inspection service immediately available in all 47 prefectures. The availability of the other procedures will be extended gradually.

Designated maintenance business operators can use the OSS to carry out the procedures for *shaken* renewal

inspection requested by vehicle owners, meaning that the operators will only go to the transportation department to take delivery of documents such as new/old vehicle inspection certificates and inspection stickers. Other procedures, including the issuance of automobile liability insurance and safety regulations conformity certificate will be performed via the internet from the operator's workplace, and the processing of payments for inspection fees and the automobile weight tax will also be carried out directly from the bank account of the designated plant.

At the same time, JASPA, the regional automobile service promotion associations, and the Automobile Inspection & Registration Information Association (AIRIA) have built a *shaken* renewal inspection OSS usage framework for the maintenance industry.

On March 31, 2017, as stipulated in the Road Transport Vehicle Act, JASPA was registered with MLIT as a Registered Information Processing Organization empowered to manage the digitized safety regulations conformity certificates. The electronic safety regulations conformity certificate system for the carrying out of administrative tasks then started operation on April 1, 2017. At the same time, an ordinance from the Ministry of Internal Affairs and Communications (MIC) was also revised to exempt JASPA from the Administrative Scrivener Act, and allow that association to perform proxy application tasks for the *shaken* renewal inspection OSS. Automobile service promotion associations in the prefectures will act as JASPA branches serving as application agents handling the applications submitted by the local designated maintenance business operators in regard to the *shaken* renewal inspection OSS. In preparation, JASPA spent 2017 holding briefings regarding this consignment work for the service promotion associations.

In June 2017, the application agent service in regard to the *shaken* renewal inspection began operations and advance use of the electronic safety regulations conformity certificate system limited only to registrants. Following two rounds of improvements and updates based on opinions and improvement requests received from the businesses and service promotion associations, the general acceptance and processing of usage applications began in December 2017.

In 2017 the number of businesses registered with the electronic safety regulations conformity certificate system was 4,455, the number of registered workplaces was

12,962, and the number of registered certificates was 568,949. The number of businesses registered to perform proxy applications with the *shaken* renewal inspection OSS was 317, with the number of applications filed by proxy amounting to 5,025 cases.

JASPA plans to start full-fledged operation in April 2018 and is working to improve the convenience and safety of the system.

3 Inspection and Maintenance System Trends

3.1. Vehicle Inspections

In 2017 the total number of *shaken* renewal inspections (sum of data from MLIT, the National Agency for Automobile and Land Transport Technology (NALTEC), and the Light Motor Vehicle Inspection Organization (LMVIO)) was 32,485,866 cases, an increase of 177,687 cases (0.6%) compared to 2016. This was the third consecutive year of increase in that number.

The total number of registered vehicles and mini-vehicles specified that received maintenance was 23,636,094, a decrease of 329,579 vehicles (1.4%) compared to 2016. The specified maintenance rate rose by 0.1% from the previous year to 72.8%.

Closer analysis of the data for registered vehicles collected by MLIT and NALTEC shows that the number of registered vehicles subjected to a *shaken* renewal inspection was 20,606,415, a decrease of 729,928 vehicles (3.4%) compared to 2016. The number of vehicles subject to specified maintenance was 15,608,639, a decrease of 547,404 vehicles (3.4%). The specified maintenance rate was the same as last year at 75.7%.

In 2017, the number of inspections conducted by NALTEC at inspection centers throughout Japan to assess compliance with the Japanese Safety Regulations for Road Vehicles (total number of new inspections, *shaken* renewal inspections, structural change inspections, and re-inspections) was 6,765,820. This was a decrease of 200,167 inspections (2.9%) compared to 2016.

The number of on-street inspections was 131,300, an increase of 10,223 (8.4%) compared to 2016.

The breakdown of the number of the different types of inspections indicates that there were 1,039,746 new inspections (including preliminary inspections), an increase of 10,358 (1.0%) compared to 2016. The number of *shaken* renewal inspections was 4,997,776, a decrease of 182,524 (3.5%). The number of structural change inspections was

64,328, a decrease of 793 (1.2%) compared to 2016.

There were 663,970 re-inspections in 2017, a decrease of 6,492 (1.0%) compared to 2016.

The number of inspections performed at NALTEC inspection centers reached its peak at 8.79 million in 2005, the third year after the former National Agency of Vehicle Inspection started these inspections, but it fell below 8 million inspections in 2008, and by 2014 the number of such inspections had fallen to less than 7 million, demonstrating a clear trend of continuing decline.

Examining the data for mini-vehicle inspections reveals that there were 11,873,032 *shaken* renewal inspections, an increase of 224,827 (1.9%) compared to 2016. The number of *shaken* renewal inspections for mini-vehicles first exceeded 10 million in 2010 and continued to rise over the next few years until it decreases in 2014. However, it increased again in 2015 and now exceeds 11 million.

The number of mini-vehicles subject to specified maintenance was 8,027,455 and the specified maintenance rate was 67.6%, an increase of 0.6% from the previous year. The specified maintenance rate for mini-vehicles has risen by approximately 5.3% over the past 10 years.

The number of vehicles brought into LMVIO for *shaken* renewal inspections was 3,845,577, with 2,732,971 of those vehicles brought in by maintenance personnel and 1,112,606 vehicles brought in by the owner.

3.2. Utilization of OBD Information for Inspections

Electronic controls are increasingly being incorporated into the equipment and functions of automobiles. Advanced driver assistance technologies such as automatic braking and lane keeping functions, which will eventually lead to automated driving, have been successively introduced and are being widely adopted. In contrast, the clear possibility of an equipment malfunction creating a situation unintended the driver and potentially causing a serious accident has prompted MLIT to establish the Study Group to Examine Potential Automobile Inspection Methods that Utilize On-board Diagnostic (OBD) Systems in December 2017.

The purpose of this group is to examine possible methods of performing vehicle inspections that take advantage of OBD systems, which use sensors installed in the vehicle to self-diagnose and record any abnormalities in component parts, as well as consider the introduction of such inspection. The Maintenance Service Division of the Road Transport Bureau of MLIT serves as the secretari-

at for this group, whose membership consists of academic experts, JAMA, the Japan Automobile Importers Association (JAIA), the Japan Automotive Machinery & Tool Manufacturers Association (JAMTA), the Japan Automotive Service Equipment Association (JASEA), JAS-PA, the Japan Auto Body Repair Association (JABRA), the Japan Automobile Federation (JAF), NALTEC, and LMVIO, with the Environmental Policy Division, Engineering Policy Division, and Type Approval and Recall Division also participating as observers. Discussions have made progress over the five meetings held by the group.

The introduction, dissemination, and advancement of driver assistance technologies for automobiles will not only improve convenience and comfort, but are also essential to making vehicle traffic significantly safer. Therefore, measures for the early detection of malfunctions in electronic devices and controls and prevent serious problems are required.

In addition to warning lights that alert the driver, functional anomalies in the vehicle electronic devices can also be identified using a scanning tool to read the sensor or component part disconnection or functional anomaly self-diagnostics records made by the OBD system. Vehicle dealers and other maintenance shops have been using this tool for inspections and the troubleshooting of malfunctions. Since OBD information is also used during emissions inspections in accordance with emissions regulations, the aforementioned study group examined whether the opportunity presented by automobile inspections could be used to investigate the electronic equipment malfunction information recorded in the OBD system to discover any malfunctions that fail to comply with safety standards, particularly with respect to electronic devices malfunctions related to vehicle safety or driver assistance functions that will tie into automated driving systems in the future.

The results, which were published in the form of an interim report at the end of 2017, indicated that the group is leaning toward applying a new inspection method to the driver assistance devices, automated driving functions, and exhaust emissions devices on new passenger vehicles, buses, and trucks certified in 2021 and later. Starting in 2024, this method could result in failing the *shaken* inspection when the scanning tool detects a failure code (a specific diagnostic trouble code (DTC)) recorded in the OBD that fails to comply with the safety standards.

4 Machine Tools

In June 2017 the JASEA held the 35th Auto Service Show 2017 at Tokyo Big Sight in Koto Ward, Tokyo. Vehicle maintenance technologies are advancing quickly to keep pace with the development of vehicles equipped with electric motors and the rapid introduction of new and sophisticated control technologies that herald the advent of automated driving. In addition, in response to issues such as ensuring enough human resources, the increasing age of the personnel at maintenance shops, and the need for labor saving techniques to address the shortage of qualified workers, the machine tool industry proudly exhibited its efforts to develop and popularize a variety of easy-to-use maintenance equipment designed to respond to the innovations in vehicle technologies. The show featured many new products and proposals offering solutions to the problems faced by the maintenance industry.

In the exhibition hall, a seminar demonstrating the aiming work required during the reinstallation of brakes on a vehicle equipped with automatic braking, held for the first time, attracted a high level of interest.

Every year at the end of July, the Japan Automotive Service Equipment Association examines and announces the actual results of the automotive machine tool sales from the previous fiscal year. The latest announced machine tool sales are those of the 2016 fiscal year (April 2016 to March 2017).

In 2016, total automotive machine tool sales amounted to 106 billion 73.44 million yen, an increase of 490.03 million yen (0.5%) compared to the previous fiscal year. This is the second time in two years that machine tool sales have increased, and also the fourth consecutive year that they have exceeded 100 billion yen.

The number of scanning tools sold, for example, was 12,103 at an average unit price of 154,015 yen in 2016. This means that the sales volume stayed at around

12,000 units for two consecutive years. The price also rose by about 10,000 yen for the second year in a row.

The sales volume of the diagnostic software installed in the scanning tools was 19,305 units, a decrease of 31.0% from the previous year. Sales revenue also decreased by about 100 million yen, but the unit price rose by about 2,700 yen to 20,460 yen.

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