

SPECIAL PURPOSE VEHICLES

1 Introduction

2021 was a year of major economic headwinds, including the ongoing application of measures to curb the COVID-19 pandemic and supply chain issues for electronic components, and a full recovery has yet to materialize. Despite these trying circumstances, the automotive industry is also facing a transformation described as a once in a century event. The whole industry, including the special purpose vehicle field, is facing a wave of changes, such as the adoption of connected, automated, service-related, and electrification (CASE) technologies, the popularization of next-generation zero-emission commercial vehicles, and so on. As a result, despite the COVID-19 pandemic, battery electric trucks and similar vehicles are beginning to become more popular.

In addition, as special purpose vehicles are working vehicles, the industry must also face the issue of using these next-generation vehicles to address the continued and growing shortage and aging of drivers.

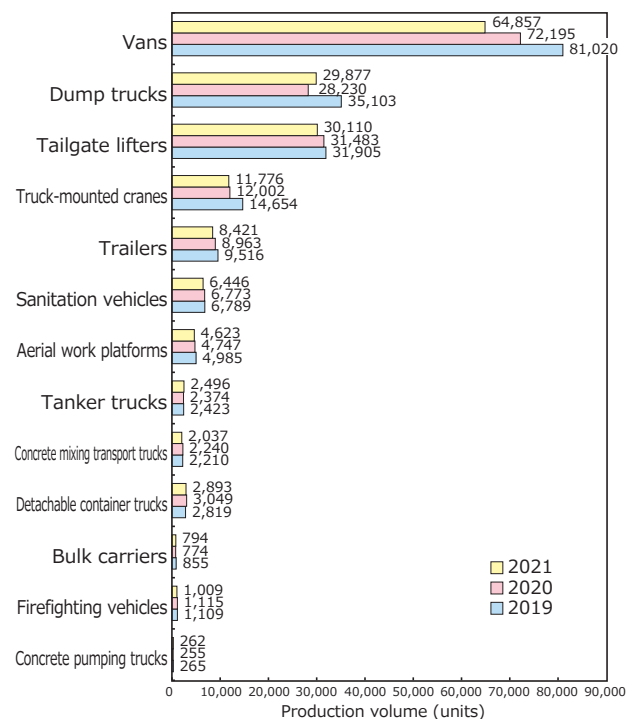
According to data compiled by the Japan Automobile Dealers Association (JADA), the number of heavy- and medium-duty truck registrations in 2021 decreased to 83,735 units, 96.9% of the level in 2020. This decline reflected the economic and logistical slowdowns spurred by the ongoing COVID-19 pandemic. In addition, although registrations of light-duty trucks in 2021 also decreased to 231,295 units, 99.8% of the level in 2020, this decline was lower than that in heavy- and medium-duty truck registrations. However, the industry expects that demand will rebound once the COVID-19 pandemic abates and the supply of electronic components stabilizes.

Furthermore, according to data compiled by the Japan Auto-Body Industries Association Inc. (JABIA), production of special purpose vehicles in 2021 rebounded slightly compared to the results of the previous year (90.0% of the level in 2019), falling to 94.7% of the level in 2020.

This article describes the main special vehicle trends based on data compiled by JABIA and the Automobile Inspection and Registration Information Association (AIRIA).

2 Market Trends

In 2021, total production of the thirteen types of special purpose vehicles shown in Fig. 1 decreased greatly by 8,599 units to 165,601 (95.1% of 2020). This was the fourth consecutive year-on-year decrease after the peak in 2017, which was reached after eight consecutive years of increase from the low point in 2009. This decline probably reflects the major impact of the COVID-19 pandemic. Although production of four out of the thirteen types of special purpose vehicles increased, the production of nine types fell. Increases in the production of these four



Source: JABIA

Fig. 1 Production Results of Special Purpose Vehicles per Product Type

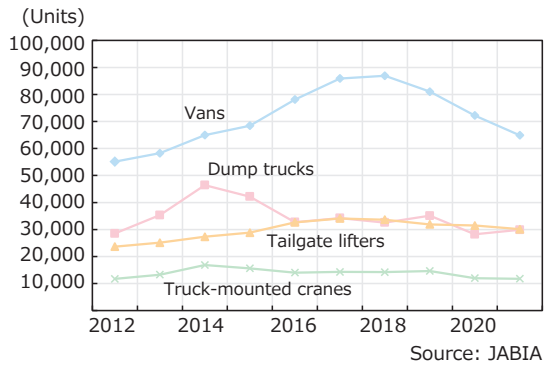


Fig. 2 Production Trends of Four Typical Special Purpose Vehicle Types

types of vehicles failed to offset the decreases in the production of vans and tailgate lifters, which account for a high proportion of the total.

Figure 1 shows the 2021 production results of special purpose vehicles per vehicle type. Compared to 2020, production of vans, which are the largest category of special purpose vehicles, decreased substantially by 7,338 units to 64,857 (89.8% of 2020), a decrease of over 10% and the third consecutive year in which production dropped by more than 5,000 units. Similarly, of the other eight types of special purpose vehicles where production fell compared to 2020, four types suffered decreases in excess of 5%. Production of firefighting vehicles decreased by the largest amount, falling by 106 units to 1,009 (90.5% of 2020), production of concrete mixing transport trucks decreased by 203 units to 2,037 (90.9%), production of trailers decreased by 542 units to 8,421 (93.9%), and production of detachable container trucks decreased by 156 units to 2,893 (94.9%). These were followed by decreases in the production of sanitation vehicles (6,446 units, 95.2%), tailgate lifters (30,110 units, 95.6%), aerial work platforms (4,623 units, 97.3%), and truck-mounted cranes (11,776 units, 98.1%). In contrast the production of the following types of vehicles increased: dump trucks (29,877 units, 105.8%), tanker trucks (2,496 units, 105.1%), concrete pumping trucks (262 units, 102.7%), and bulk carriers (794 units, 102.6%).

Figure 2 shows the production trends for four typical products (vans, dump trucks, tailgate lifters, and truck-mounted cranes) with annual production of more than 10,000 units over the past ten years. Van production, which had increased robustly year-on-year decreased substantially for the third successive year. Tailgate lifter production has also continued to decline since its peak in 2017. In contrast, the production of dump trucks in-

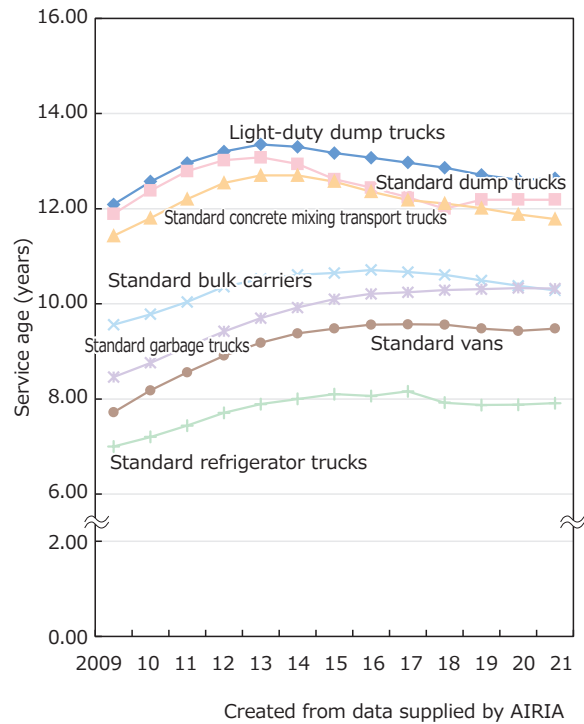


Fig. 3 Average Service Age from Initial Registration

creased in 2021 to 105.8% of the level of 2020, which probably indicates robust demand for different types of construction and infrastructure projects to those requiring vans and tailgate lifters.

Figure 3 shows the trends for the average number of years in service from initial registration. From 2008 to 2016, the service age rose. However, more recently, this increase has ceased for six out of seven of these vehicle types (excluding standard garbage trucks) and the average service age has begun to fall. However, this trend flattened out between 2020 and 2021, and has started to show signs of increasing once again. This is probably because rising production up to 2018 increased the proportion of vehicles with shorter service lives, while reducing the high proportion of vehicles with service lives of over 10 years registered before the global financial crisis. However, with new vehicle registrations falling due to the ongoing COVID-19 pandemic and insufficient supply of electronic components, users appear to be extending the service lives of vehicles through inspection and maintenance. As a result, the falling trend for the average service age is coming to an end, and is likely to remain constant or even increase in the future. In particular, the service age of standard vans has increased. Vehicles in this category are now being used for roughly two years longer than was the case in 2009. Possible reasons for

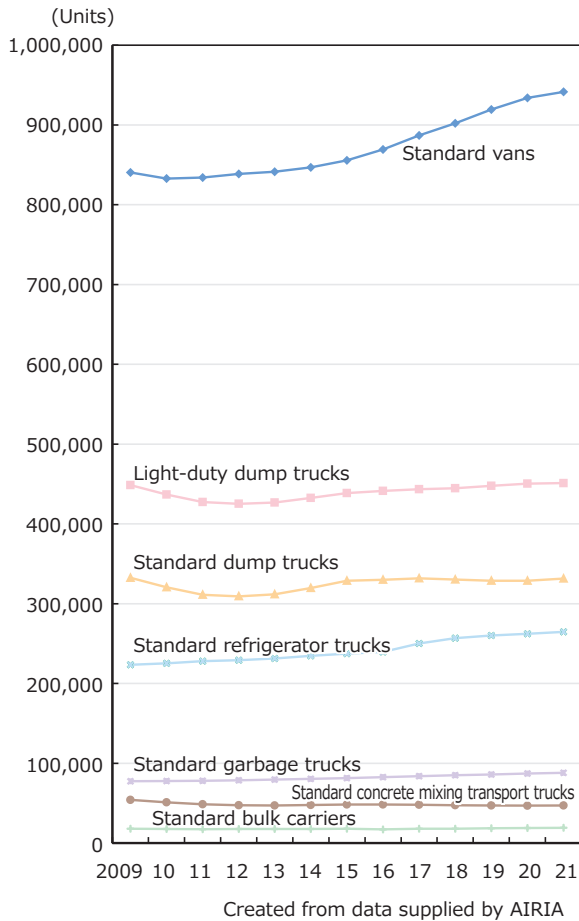


Fig. 4 Overall Numbers of Special Purpose Vehicles in Japan

this increase include the development and adoption of more durable engines and chassis parts, as well as improvements in the rate of vehicles undergoing inspections and maintenance.

The service age of construction vehicles including light-duty and standard dump trucks and concrete mixing transport trucks remains around two years longer than other logistics-related vehicles, which is affected by the distances driven and lengths of time that these vehicles are in operation, and it is likely that this clearly separated dual trend will continue in the future. There was also no change in the particular trend of standard refrigerator trucks having a much lower service age than other vehicle types.

Note: The graph in Fig. 3 (average service age from initial registration) was prepared from registration data provided by AIRIA. The original registration data includes the number of registered vehicles at the end of March 2021 for each registration year between 2003 and 2021, and as collective data for 2002 and before (i.e., vehi-

cles in service for more than 20 years). The average service age was extrapolated from these figures.

Figure 4 shows the overall number of each of these vehicle types in Japan at the end of March each year. Despite small decreases depending on the year, the total number of each vehicle type has continued to increase slightly. In 2021, the total number of logistics-related vehicles such as standard vans and standard refrigerator trucks increased to the highest level since 2008. In addition, standard garbage trucks in the sanitation-services-related category is the only type of vehicle that has increased in number every year unaffected even by the global financial crisis. The number of standard vans has increased to 112.0%, standard refrigerator trucks to 118.5%, and standard garbage trucks to 113.6% of the number in 2009, respectively. In contrast, the total numbers of small and standard dump trucks and standard concrete mixing transport trucks, which were all greatly affected by the drop in demand for construction after the global financial crisis, have still not recovered to pre-crisis levels, creating a clearly separated dual trend.

The numbers of construction vehicles such as dump trucks and concrete mixing transport trucks decreased sharply after the global financial crisis. The increase in these vehicles after bottoming out in 2012 and 2013 may be attributed to greater demand for special purpose construction vehicles for projects related to earthquake and natural disaster recovery, the Tokyo Summer Olympics, the Chuo Shinkansen maglev train line, infrastructure projects, and the like.

3 Special Purpose Construction Vehicles

3.1. Dump Trucks

Dump truck production in 2021 increased to 29,877 units (105.8% of 2020), a recovery from the substantial decline between 2019 and 2020. Production of heavy-duty, medium-duty, and light-duty dump trucks all increased: heavy-duty dump trucks by 472 units to 6,202 (108.2%), medium-duty dump trucks by 738 units to 13,956 (105.6%), and light-duty dump trucks by 834 units to 9,223 (109.9%). Although production of heavy- and medium-duty dump trucks both recovered to pre-COVID-19 pandemic 2019 levels, the production of light-duty dump trucks remains depressed at only 65.2% of the number in 2019. If the COVID-19 pandemic abates and the supply situation of electronic components stabilizes, this kind of dual trend will probably not continue as demand picks

Table 1 Production Proportions of Non-Earth and Sand Dump Trucks, and Dump Trucks with SUS or Aluminum Bodies

Type	2021			2020		
	Non-earth and sand	SUS	Aluminum	Non-earth and sand	SUS	Aluminum
2-ton trucks	2.2 %	0.4 %	0.0 %	2.7 %	0.5 %	0.0 %
4-ton trucks (GVW: less than 8 tons)	8.9 %	1.8 %	0.0 %	9.1 %	1.6 %	0.0 %
GVW: more than 8 tons (6 to 8 tons)	16.2 %	3.3 %	0.0 %	18.7 %	7.0 %	0.0 %
GVW: 20 tons	5.8 %	4.4 %	0.1 %	6.1 %	4.8 %	0.0 %
GVW: 22 tons	47.4 %	32.4 %	1.3 %	59.1 %	40.6 %	1.0 %
GVW: 25 tons	88.5 %	47.6 %	3.0 %	90.7 %	42.7 %	2.9 %

Source: JABIA

up due to infrastructure projects and projects related to earthquake and natural disaster recovery. Although total dump truck production was significantly higher than the low of 10,853 units reached during the global financial crisis in 2009, concerns are likely to grow as manufacturers are affected by rising steel prices and as employment growth in the industry remains unlikely. According to each class, the proportion of heavy-duty dump trucks increased from 15.0% to 20.8% and the proportion of medium-duty dump trucks increased from 42.4% to 46.7% between 2019 and 2021. In contrast, the proportion of light-duty dump trucks fell from 40.3% to 30.9%. These figures clearly demonstrate the impact of the COVID-19 pandemic.

Table 1 shows the proportions of dump trucks produced in 2020 for transporting material other than earth or sand (i.e., non-earth and sand dump trucks). Almost all dump trucks with a gross vehicle weight (GVW) up to 20 tons were used for transporting earth and sand, and the proportion of dump trucks in this weight class used to transport other material was low. In contrast, almost 50% of dump trucks with a GVW of 22 tons and 88.5% of dump trucks with a GVW of 25 tons were used to transport material other than earth or sand. Demand is rising for the transportation of comparatively heavy loads, such as industrial waste, debris, wood chips, and recycling materials. As a result, an increasingly high proportion of these dump trucks have long, heavy-duty bodies manufactured from corrosion-resistant long-life stainless steel (SUS). The proportion of SUS-bodied dump trucks also rises in accordance with the proportion of non-earth and sand transportation (GVW of 22 tons: 32.4%, GVW of 25 tons: 47.6%). In addition, a small number of aluminum bodies are adopted by dump trucks with a GVW of 22 or 25 tons that transport comparatively heavy loads to reduce body weight and increase the carrying capacity of the truck.

Furthermore, virtually all dump trucks produced in

2021 were equipped with diesel engines, with only three light-duty dump trucks being produced with hybrid powertrains.

3. 2. Concrete Mixing Transport Trucks

Production of concrete mixing transport trucks in 2021 decreased to 2,037 units (90.94% of 2020). According to class, heavy-duty concrete mixing truck production decreased to 1,329 units (90.7% of 2020), medium-duty concrete mixing truck production decreased to 522 units (91.4%), and light-duty concrete mixing truck production decreased to 178 units (90.8%). There were no major changes in the proportions of the light-, medium-, and heavy-duty classes compared to 2020. Although the average service age since initial registration of concrete mixing transport trucks increased from 11.15 to 12.70 years between 2008 and 2014, it has fallen since then, reaching 11.78 years in 2021. Furthermore, the overall number of concrete mixing transport trucks has not increased or decreased greatly compared to the level in 2013.

4 Fixed Capacity Special Purpose Vehicles

4. 1. Tanker Trucks

Production of tanker trucks in 2021 increased to 2,496 units (105.1% of 2020). According to class, production of heavy-duty tanker trucks increased to 648 units (103.3%) and production of medium-duty tanker trucks increased to 1,535 units (101.7%). Furthermore, production of light-duty tanker trucks increased greatly to 309 units (140.5%). The proportion of heavy-duty tanker trucks was 26.0%, compared to 61.5% for medium-duty tanker trucks and 12.4% for light-duty tanker trucks. The proportion of light-duty trucks has returned to the level in 2019. Unlike the trend for dump trucks, it is thought that customer sentiment has shifted from delaying purchases due to the impact of the COVID-19 pandemic and that demand has started to recover even for light-duty tanker trucks.

According to use, the production of oil tanker trucks was robust, increasing to 1,261 units in 2021 (104.0% of 2020). However, the amount of oil being transported has not increased. The figures suggest that users are continuing to replace older trucks in significant numbers. Production of water spraying or water supply trucks, which are in high demand for lease or rental, increased after the decline in the previous year to 106.0% of the level in 2020. Production of tanker trucks for transporting poisonous materials or foodstuffs decreased to 90.0% of the level in 2020. According to use, the proportion of oil tanker trucks was 50.5%, and the proportion of water spraying or water supply trucks was 44.2%.

4. 2. Bulk Carriers

Production of bulk carriers in 2021 increased slightly to 794 units (102.6% of 2020). According to class, heavy-duty bulk carriers accounted for approximately 99.0% of this total, demonstrating the dominance of heavy-duty vehicles in this market. According to use, production of bulk cement carriers remained almost the same (410 units, 100.5% of 2020). Production of bulk feedstuff carriers also remained almost the same (284, 101.8%). Although this demonstrates the underlying robust demand for bulk feedstuff carriers, it also suggests that the COVID-19 pandemic had a slight negative impact on demand. Although the overall number of standard bulk carriers has risen and fallen virtually year-by-year over the last ten years, the number has remained virtually stable at around 18,000 units. However, the upward trend in recent years has resulted in the total number of standard bulk carriers increasing to 19,094 in 2021. Furthermore, the average service age has shown a decreasing trend in recent years, falling to 10.3 years.

4. 3. Vans

Production of vans in 2021 decreased by 7,338 units to 64,857 (89.9% of 2020). Although van production increased steadily after the global financial crisis, more than doubling in 2018 compared to the level in 2009, production has now fallen for three consecutive years. According to class, production of large vans decreased to 19,206 units (88.4% of 2020), medium vans to 21,725 units (95.2%), small vans to 23,254 units (88.5%), and mini-vehicle vans to 672 units (48.9%). The decrease in mini-vehicle van production is particularly noticeable. This is also probably due to the negative impact of the COVID-19 pandemic on demand. Although the proportion of large vans rose above 30% and the proportion of small vans is more than 35%,

the overall proportion according to size remains equal at around 30% when medium vans are included.

According to use, the production of all types of vans decreased. Production of ordinary goods vans decreased to 15,988 units (87.1% of 2020), refrigerator and freezer vans to 19,172 units (94.4%), and side-opening vans to 26,786 units (90.6%). In total, production of these main three types of vans fell by 6,296 units. No walk-through type vans were produced in 2021. According to proportion of type, ordinary goods vans accounted for 24.7% of production, compared to 29.6% for refrigerator and freezer vans and 41.3% for side-opening vans. These main three types of vans accounted for nearly 95% of production, unchanged from 2020. According to body material, steel accounted for 865 units (a proportion of 1.3%), aluminum for 57,853 units (89.2%), and fiber reinforced plastic (FRP) for 6,139 units (9.5%). These figures demonstrate the continuing shift toward lightweight aluminum and FRP van bodies.

The total number of standard vans in use has continued to increase, rising from 832,809 units in 2010 to 941,457 in 2021.

The average service age of standard vans and standard refrigerator and freezer vans was 9.48 and 7.91 years, between two and four years shorter than that of special purpose construction vehicles, reflecting the long distances driven by these vehicles.

5 Other Special Purpose Vehicles

5. 1. Sanitation Vehicles

The category of sanitation vehicles includes garbage trucks, large capacity garbage dump trucks, cesspool emptiers (also known as vacuum trucks), as well as cleaning trucks and road sweepers (i.e., dewatering trucks and trucks that clean by spraying water or using suction). Production of these vehicles in 2021 fell slightly to 6,446 units (95.2% of 2020). According to proportion of type, the production of garbage trucks, which accounted for 73.0% of total sanitation vehicle production, fell to 4,705 units (92.71% of 2020). Production of cesspool emptiers, the next most prevalent type of sanitation vehicle (proportion: 13.8%) decreased slightly to 890 units (99.8% of 2020).

The overall number of standard garbage trucks in use has continued to increase year-by-year, virtually unaffected by the state of the economy, rising from 77,371 units in 2008 to 88,043 units in 2021 (113.8% of the level

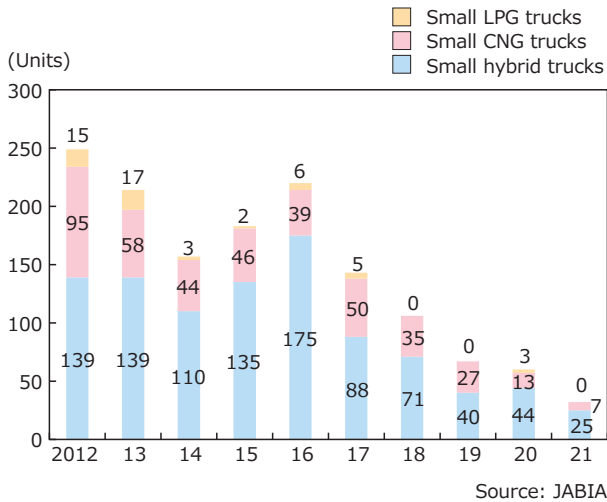


Fig. 5 Production Volumes of Hybrid and CNG Garbage Trucks

in 2008). Furthermore, although the average service age from initial registration continued to increase from 8.35 years in 2008 to 10.33 years in 2020, this trend flattened in 2021, falling to 10.32 years.

Figure 5 shows the production status of hybrid, CNG, and liquid petroleum gas (LPG) garbage trucks, which joined the market as environmental awareness increased. These trucks are currently produced only in the light-duty category. In 2021, production continued its recent year-on-year declining trend and fell to 32 units, 53.3% of the level in 2020. Production has stagnated to around 7.5% of the level in 2009 (436 units) and 2010 (424 units), when purchasing incentives were available, and the proportion of low-polluting environmentally friendly garbage truck production has fallen to 0.7% of the whole, indicating that this type of truck has failed to find mainstream acceptance. However, with electrification likely to pick up as part of the trend toward carbon neutrality, it is hoped that more electric garbage trucks will find their way onto the market in the future.

5. 2. Detachable Container Trucks

Production of detachable container trucks in 2021 decreased to 2,893 units, 94.9% of the level in 2020. According to class, production of heavy-duty detachable container trucks increased to 687 units (110.5%). In contrast, production of medium-duty detachable container trucks decreased to 1,765 units (89.1%) and production of light-duty detachable container trucks decreased to 434 units (99.1%). According to the proportion of each class, heavy-duty trucks accounted for 23.7% of the total, medium-duty trucks for 61.0%, and light-duty trucks for 15.0%. The

proportion of medium-duty detachable container trucks decreased in 2021.

5. 3. Aerial Work Platforms

Production of aerial work platforms in 2021 decreased to 4,623 units (97.3% of 2020). Categories of aerial work platforms include truck-mounted and self-propelled types. Truck-mounted aerial work platforms are mainly used for electrical and communication system engineering work, whereas self-propelled aerial work platforms tend to be found on construction sites, inside buildings and so on.

5. 4. Truck-Mounted Cranes

This category of vehicle mostly comprises a crane mounted behind the cab of a flat-bed truck and is used for construction or building work, or for handling cargo. In 2009, production of truck-mounted cranes fell to 4,565 units, only one-third of the 13,864 units produced in 2008, due to the slowdown in construction and building demand in the wake of the global financial crisis. However, production then increased drastically for five consecutive years, recovering to 16,848 units in 2014, before stabilizing at a level above 14,000 units up to 2019. In contrast, production dropped substantially in 2020 to 12,002 units (81.9% of the level in 2019) and did not recover in 2021 (11,776 units, 98.1% of 2020). Truck-mounted cranes are a type of vehicle that is greatly affected by economic trends and the COVID-19 pandemic.

5. 5. Tailgate Lifters

Tailgate lifters are mounted to the back of flat-bed vehicles or vans as a typical labor-saving device for handling cargo. Production of tailgate lifters decreased in 2021 to 30,110 units (95.6% of 2020). All categories of production fell, regardless of type or use. For example, production of vertical tailgate lifters decreased to 9,451 units (95.2% of 2020), tilting tailgate lifters decreased to 7,743 units (93.9%), retractable tailgate lifters decreased to 10,873 units (98.9%), arm-type tailgate lifters decreased to 1,488 units (87.4%), and tailgate lifters for assisted mobility vehicles and people movers decreased to 555 units (91.6%). The slowdown in truck production due to the impact of the COVID-19 pandemic and disruptions to the electronic component supply chain probably had a major effect on the production of tailgate lifters. However, once the effects of the COVID-19 pandemic recede, the production of tailgate lifters is likely to increase further, spurred on by rising demand for logistics and labor-saving equipment.

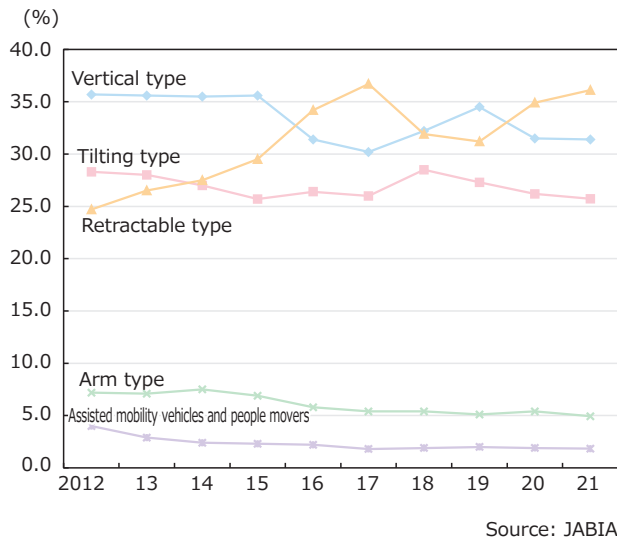


Fig. 6 Production Proportion of Tailgate Lifters per Type and Use

Figure 6 shows the proportion of tailgate lifter production per type and use. Vertical tailgate lifters accounted for 31.4% of production, retractable tailgate lifters for 36.1%, and tilting tailgate lifters for 25.7%. Although the proportions differed from 2020, these three types still account for more than 90% of total tailgate lifter production. The increase in the proportion of retractable type tailgate lifter production, which account for a high proportion of tailgate lifters attached to refrigerator and

freezer vans and the like despite the slowdown in demand for such temperature-controlled vehicles, was probably due to an increase in the number of vehicles being equipped with tailgate lifters.

5. 6. Trailers

Trailers are used to transport large volumes or heavy items. In 2021, production decreased by 542 units to 8,421 (93.9% of 2020). According to type, production of low-bed trailers increased to 262 units (111.5% of 2020), flat-bed trailers increased to 1,674 units (100.1%), van-type trailers decreased to 2,585 units (85.7%), trailers for marine containers decreased to 2,760 units (97.5%), tanker trailers decreased to 377 units (84.9%), dump trailers increased to 247 units (100.8%), car carrier trailers increased to 264 units (103.5%), and full trailers increased to 203 units (109.1%). Although the proportion of trailer types did not change greatly, the proportion of van-type trailers and trailers for marine containers decreased, while the proportion of flat-bed trailers increased. Furthermore, these three types of trailers continued to account for more than 80% of total trailer production. The increase in logistics volumes and number of large cargoes being transported indicates the presence of substantial underlying demand, creating expectations for future increases in production.