

SPECIAL PURPOSE VEHICLES

1 Introduction

Despite a relaxation in the measures imposed to help curb the COVID-19 pandemic and signs of a recovery in economic activity, the continuing disruption of the electronic component supply chain had a major impact on the production of special purpose vehicles in 2022. The supply of some electronic components has yet to stabilize. Despite this issue, the adoption of electrified trucks by the automotive industry is advancing, and different companies have begun to launch EV trucks with potential application as special purpose vehicles. Trials and other projects are also underway toward the practical adoption of connected, automated, service-related, and electrification (CASE) technologies, as well as autonomous trucks.

Special purpose vehicles are also a direct part of efforts by the logistics industry to address Japan's so-called "2024 problem" in which truck drivers are facing an overtime cap and more stringent working regulations. With the growing shortage and aging of drivers, the next generation of commercial vehicles must contribute to further labor saving and greater safety in the industry.

According to data compiled by the Japan Automobile Dealers Association (JADA), the number of heavy- and medium-duty truck registrations in 2022 decreased to 55,875 units, 66.7% of the level in 2021. This substantial decline in production reflected the major impacts of the ongoing semiconductor shortage and the cancellation of type designation plans by truck chassis manufacturers. In contrast, although registrations of light-duty trucks in 2022 also decreased to 211,772 units, 91.6% of the level in 2021, this decline was lower than that in heavy- and medium-duty truck registrations. In addition, once the type designation of heavy- and medium-duty trucks is completed, production seems likely to return to pre-COVID-19 pandemic levels combined with a rebound in de-

mand unaffected by issues such as labor shortages.

Furthermore, according to data compiled by the Japan Auto-Body Industries Association Inc. (JABIA), production of special purpose vehicles in 2022 decreased greatly to 79.5% of the previous year, even lower than the decline in heavy- and medium-duty truck registrations described above (94.7% of 2021).

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 2022, total production of the thirteen types of special purpose vehicles shown in Fig. 1 decreased greatly

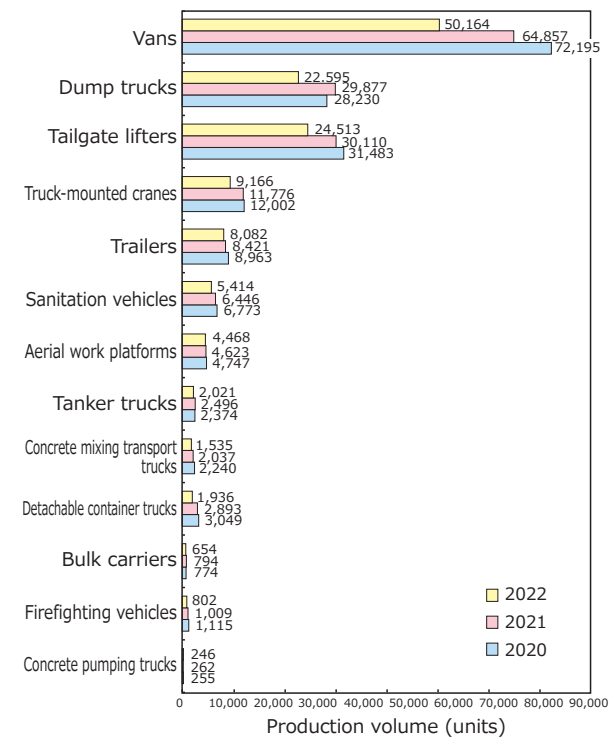


Fig. 1 Production Results of Special Purpose Vehicles per Product Type

by 34,005 units to 131,596 (79.5% of 2021). This was the fifth 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. In addition to the effects of the COVID-19 pandemic, another major cause of this decline was probably the cancellation of type designation plans by the major truck manufacturers. Production of none of these thirteen categories increased, with decreases registered in every category. The production of vans, which makes up a high proportion of total special purpose vehicle production, fell substantially, pushing the ongoing downward trend to five consecutive years.

Figure 1 shows the 2022 production results of special purpose vehicles per vehicle type. Compared to 2021, production of vans, which are the largest category of special purpose vehicles, decreased substantially, the fifth consecutive year-on-year decline. Production fell by 14,693 units to 50,164 (77.3% of 2021), a major decrease of more than 22%. The three types of special-purpose vehicles that suffered the worst decreases in production compared to 2021 were as follows: detachable container trucks, which fell by 959 units to 1,936 (66.6% of 2021), concrete mixing transport trucks, which fell by 502 units to 1,535 (75.4%), and dump trucks, which fell by 7,282 units to 22,595 (75.6%). These three types of vehicles are all used for construction purposes. In sequence, production of special purpose vehicles fell as follows: vans (50,164 units, 77.3% of 2021), truck-mounted cranes (9,166 units, 81.4%), firefighting vehicles (802 units, 79.5%), tanker trucks (2,021 units, 81.0%), tailgate lifters (24,513 units, 81.4%), bulk carriers (654 units, 82.4%), sanitation vehicles (5,414 units, 84.0%), concrete pumping trucks (246 units, 93.9%), trailers (8,082 units, 96.0%), and aerial work platforms (4,468 units, 96.6%). Of these categories, the production of trailers only fell by a slight margin, suggesting that this type of special purpose vehicle was less affected by the shortage of electronic components and the cancellation of type designation plans by the major truck manufacturers.

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 fourth successive year. Tailgate lifter production has also continued to decline since its peak in 2017. In addition, although dump truck production in-

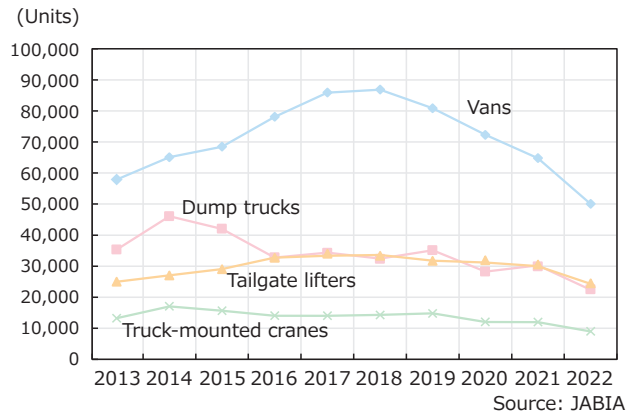


Fig. 2 Production Trends of Five Typical Special Purpose Product Types

creased briefly in 2021 (105.8% of 2020), production once again fell in 2022, continuing the general downward trend since the peak in 2014.

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. The service age remained stable from 2020 to 2021 and increased in 2022 for five types of vehicles, excluding standard concrete mixing transport trucks and standard bulk carriers. 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. In contrast, the long-lasting COVID-19 pandemic, electronic component supply chain disruption, and the cancellation of type designation plans have reduced the number of new vehicle registrations. The resulting delays to vehicle deliveries, and companies electing for inspection and maintenance to continue the use of existing vehicles have also probably contributed to rising average service ages. In addition, the service age of standard vans started to increase again in 2021. This increase is the largest of the six types of special purpose vehicles with a rising service age and amounts to an annual increase of 0.11 years. The service age is likely to continue increasing in the future as even more durable engines and chassis parts are adopted, and the rate of vehicles undergoing inspections and maintenance rises.

Furthermore, the service age of construction vehicles including light-duty and standard dump trucks and concrete mixing transport trucks remains around two years

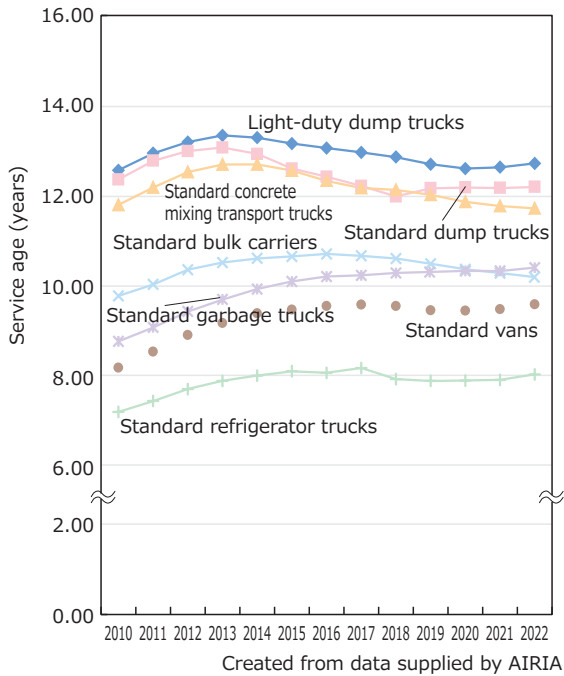


Fig. 3 Average Service Age from Initial Registration

longer than other logistics-related vehicles. This 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 major change in the 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 2022 for each registration year between 2004 and 2022, and as collective data for 2003 and before (i.e., vehicles 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 2022, 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 three types of vehicles is continuing to rise. The number standard vans in-

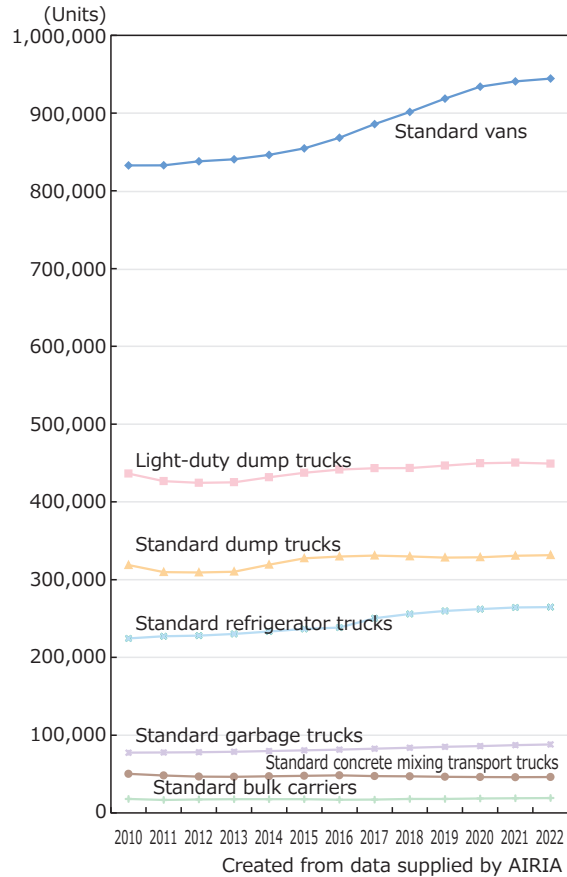


Fig. 4 Trends for Overall Number of Special Purpose Vehicles in Japan

creased to 113.5%, standard refrigerator trucks to 118.0%, and standard garbage trucks to 113.8% of the number in 2010, 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 that remained unchanged in 2022.

Construction vehicles such as dump trucks and concrete mixing transport trucks decreased sharply in number after the global financial crisis, bottoming out in 2012 and 2013 before increasing again. This trend 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. However, the numbers of these vehicles have remained flat in recent years.

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

Type	2022			2021		
	Non-earth and sand	SUS	Aluminum	Non-earth and sand	SUS	Aluminum
2-ton trucks	2.6 %	0.5 %	0.0 %	2.2 %	0.4 %	0.0 %
4-ton trucks (GVW: less than 8 tons)	10.7 %	1.6 %	0.0 %	8.9 %	1.8 %	0.0 %
GVW: more than 8 tons (6 to 8 tons)	15.2 %	4.7 %	0.0 %	16.2 %	3.3 %	0.0 %
GVW: 20 tons	6.9 %	5.3 %	0.0 %	5.8 %	4.4 %	0.1 %
GVW: 22 tons	53.4 %	35.1 %	1.1 %	47.4 %	32.4 %	1.3 %
GVW: 25 tons	91.7 %	33.1 %	4.1 %	88.5 %	47.6 %	3.0 %

Source: JABIA

3 Special Purpose Construction Vehicles

3.1. Dump Trucks

Dump truck production in 2022 fell sharply to 22,595 units (75.6% of 2021) after increasing between 2020 and 2021. Production of heavy-duty, medium-duty, and light-duty dump trucks all decreased substantially: heavy-duty dump trucks by 1,975 units to 4,227 (68.2%), medium-duty dump trucks by 3,398 units to 10,558 (75.7%), and light-duty dump trucks by 1,949 units to 7,274 (78.9%). Heavy- and medium-duty dump trucks were particularly affected by the cancellation of type designation plans by the major truck manufacturers. Production of light-duty dump trucks re-started within the 2022 fiscal year, which reduced the impact of these cancellations. In the future, once production of heavy- and medium-duty chassis re-starts after the type approval cancellations and the electronic component supply chain stabilizes, dump truck production is likely to increase as demand picks 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 fell from 20.8% to 18.67 between 2021 and 2022, the proportion of medium-duty dump trucks remained unchanged at 46.7%, and the proportion of light-duty dump trucks increased from 30.9% to 32.2%. However, the proportion of light-duty dump trucks has yet to recover to its pre-COVID-19 pandemic level of 40.3% in 2019.

Table 1 shows the proportions of dump trucks produced in 2022 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 91.7% 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: 35.1%, GVW of 25 tons: 33.1%). 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 2022 were equipped with diesel engines, with only one light-duty dump truck being produced with a hybrid powertrain.

3.2. Concrete Mixing Transport Trucks

Production of concrete mixing transport trucks in 2022 decreased substantially to 1,535 units (75.4% of 2021). According to class, heavy-duty concrete mixing truck production decreased to 1,122 units (84.4% of 2021), medium-duty concrete mixing truck production decreased to 246 units (47.1%), and light-duty concrete mixing truck production decreased to 158 units (88.8%). The proportion of the heavy-, medium-, and light-duty classes also changed compared with 2021, with the proportion of medium-duty concrete mixing transport trucks falling sharply. 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 11.72 years in 2022. Furthermore, the overall number of concrete mixing transport trucks has decreased slightly since 2013, but this represents only a minor change.

4 Fixed Capacity Special Purpose Vehicles

4.1. Tanker Trucks

Production of tanker trucks in 2022 decreased to 2,021 units (81.0% of 2021). According to class, production of heavy-duty tanker trucks decreased to 428 units (66.0%), production of medium-duty tanker trucks decreased to 1,385 units (90.2%), and production of light-duty tanker trucks decreased to 204 units (66.0%). Furthermore, the proportion of heavy-duty tanker trucks was 21.2%, compared to 68.5% for medium-duty tanker trucks and 10.1% for light-duty tanker trucks. The proportion of medium-duty trucks has increased 6.3% since 2019. According to use, the drop in production of oil tanker trucks was slightly lower than other types of tanker trucks, falling to 1,103 units in 2022 (87.5% of 2021). Production of water spraying or water supply trucks, which are in high demand for lease or rental, decreased to 828 units (75% of 2021), reversing the increasing trend of recent years. Production of tanker trucks for transporting poisonous materials or foodstuffs decreased to 64.2% of the level in 2021. According to use, the proportion of oil tanker trucks was 54.6%, and the proportion of water spraying or water supply trucks was 41.0%.

4.2. Bulk Carriers

Production of bulk carriers in 2022 decreased to 654 units (82.4% of 2021). According to class, heavy-duty bulk carriers accounted for approximately 98.0% of this total, demonstrating the dominance of heavy-duty vehicles in this market. According to use, production of bulk cement carriers dropped sharply to 290 units (70.7% of 2021). In contrast, production of bulk feedstuff carriers increased to 291 units (102.5% of 2021). This probably demonstrates the underlying robust demand for bulk feedstuff carriers to carry food for domestic animals. 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 number of these vehicles has risen in recent years, exceeding 19,000 in 2021 and increasing further to 19,412 in 2022. Furthermore, the average service

age has shown a decreasing trend in recent years, and has fallen to 10.2 years.

4.3. Vans

Production of vans in 2022 decreased by 14,693 units to 50,164 (77.3% of 2021). Although van production increased steadily after the global financial crisis, more than doubling in 2018 compared to the level in 2009, production has fallen for four consecutive years since then. According to class, production of large vans decreased to 13,261 units (69.0% of 2021), medium vans to 15,012 units (69.1%), and small vans to 20,970 units (90.2%). In contrast, production of mini-vehicle vans increased to 921 units (137.1%). The decrease in large and medium van production is particularly noticeable. These trends are also probably due to the effects of the COVID-19 pandemic and lower production by the major chassis manufacturers. The proportion of large vans was 26.4%. Whereas the proportion of medium vans fell below 30% to 29.9%, the proportion of small vans exceeded 40% and reached 41.8%. However, this is likely to be a short-term trend and the proportion is likely to fall below 40% again in the future. According to use, although production of refrigerator vans increased to 2,016 units (145.7% of 2021), the production of the three main types of van according to use all fell. Production of ordinary goods vans decreased to 12,530 units (78.4% of 2021), refrigerator and freezer vans to 14,744 units (76.9%), and side-opening vans to 19,524 units (72.9%). In total, production of these main three types of vans fell by 15,148 units. No walk-through type vans were produced in 2022. According to proportion of type, ordinary goods vans accounted for 25.0% of production, compared to 29.4% for refrigerator and freezer vans and 38.9% for side-opening vans. These main three types of vans accounted for nearly 93.3% of production, unchanged from 2021 in terms of the proportion of both the total and individual proportions. According to body material, steel accounted for 880 units (a proportion of 1.8%), aluminum for 44,466 units (88.6%), and fiber reinforced plastic (FRP) for 4,818 units (9.6%). 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 944,956 in 2022. However, the rate of increase has started to slow.

The average service age of standard vans and standard refrigerator and freezer vans was 9.59 and 8.02

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 2022 fell to 5,414 units (84.0% of 2021). According to proportion of type, the production of garbage trucks, which accounted for 72.3% of total sanitation vehicle production, fell to 3,914 units (83.2% of 2021), reflecting the impact of electronic component supply chain disruption and lower vehicle production. Production of cesspool emptiers, the next most prevalent type of sanitation vehicle (proportion: 13.9%) decreased to 751 units (84.3% of 2021).

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 88,533 units in 2022 (114.4% of the level in 2008). Furthermore, the average service age from initial registration increased from 8.35 years in 2008 to 10.33 years in 2020, rising further in 2022 to 10.39 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. In 2022, these trucks were produced only in the light-duty category. In 2022, production increased to 49 units (153.1% of 2021), reversing the recent year-on-year declining trend that continued until 2021. The proportion of low-polluting environmentally friendly garbage truck production has fallen to 1.3% of the whole, indicating that this type of truck has still failed to find mainstream acceptance. However, more electric garbage trucks are likely enter the market in the future as part of the trend toward carbon neutrality.

5.2. Detachable Container Trucks

Production of detachable container trucks in 2022 decreased substantially to 1,936 units, 66.9% of the level in 2021. According to class, production fell substantially only in the case of medium-duty detachable container trucks. Although production of heavy-duty detachable container trucks decreased to 584 units (85.0%), produc-

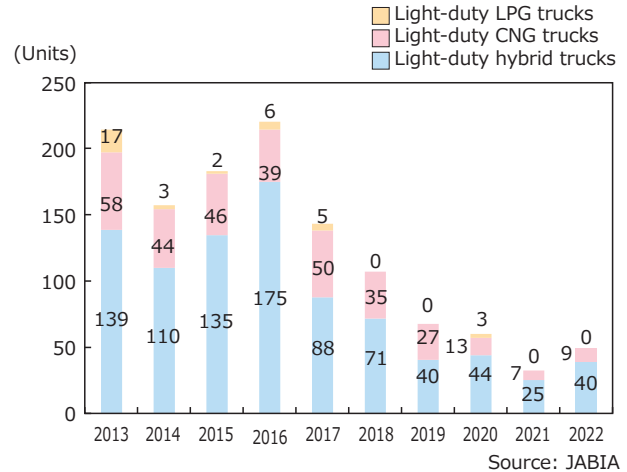


Fig. 5 Production Volumes of Hybrid and CNG Garbage Trucks

tion of medium-duty detachable container trucks decreased to 884 units (50.1%). In contrast, production of light-duty detachable container trucks increased to 461 units (106.2%). According to the proportion of each class, heavy-duty trucks accounted for 30.2% of the total, medium-duty trucks for 45.7%, and light-duty trucks for 23.8%. The proportion of medium-duty detachable container trucks continued its decline that started in 2021.

5.3. Aerial Work Platforms

Production of aerial work platforms in 2022 decreased slightly to 4,468 units (96.6% of 2021). 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 fell even further in 2022 (8,762 units, 74.7% of 2021). 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 2022 to 24,513 units (81.4% of 2021). Other than assisted mobility vehicles and people movers, all categories of production fell, regardless of type or use. In specific terms, production of vertical tailgate lifters decreased to 8,546 units (90.4% of 2021), tilting tailgate lifters decreased to 6,016 units (77.7%), retractable tailgate lifters decreased to 8,202 units (75.4%), and arm-type tailgate lifters decreased to 1,137 units (76.4%). In contrast, production of tailgate lifters for assisted mobility vehicles and people movers increased to 612 units (110.3%). The slowdown in truck production due to disruptions in the electronic component supply chain and the cancellation of type designation plans by the major truck manufacturers probably had a major effect on the production of tailgate lifters. However, once these effects recede, the production of tailgate lifters is likely to increase further, spurred on by rising demand for logistics and labor-saving equipment.

Figure 6 shows the proportion of tailgate lifter production per type and use. Vertical tailgate lifters accounted for 34.9% of production, retractable tailgate lifters for 33.5%, and tilting tailgate lifters for 24.5%. Although these proportions differ from year to year, these three types still account for more than 90% of total tailgate lifter production.

5. 6. Trailers

Trailers are used to transport large volumes or heavy items. In 2022, production decreased by 339 units to 8,082 (96.0% of 2021). According to type, production of low-bed

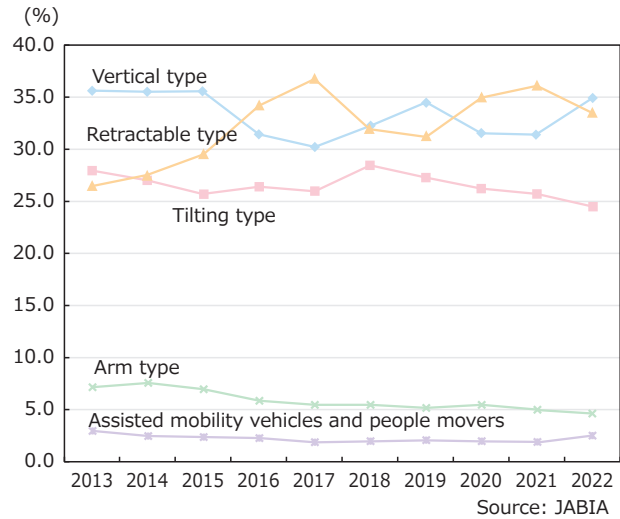


Fig. 6 Production Proportion of Tailgate Lifters per Type and Use

trailers increased to 291 units (111.1% of 2021), flat-bed trailers decreased to 1,647 units (98.4%), van-type trailers decreased to 2,526 units (97.7%), trailers for marine containers decreased to 2,572 units (93.2%), tanker trailers decreased to 331 units (87.8%), dump trailers increased to 269 units (108.9%), car carrier trailers decreased to 199 units (75.4%), and full trailers decreased to 189 units (93.1%). Although the proportions of these trailers did not change, the three categories of flat-bed trailers, van-type trailers, and trailers for marine containers continued to account for more than 80% of total trailer production. With trailer production less susceptible to disruption in the electronic component supply chain and the presence of substantial underlying demand indicated by the likelihood of continuing increases in logistics volumes and the number of large cargoes being transported, there are expectations for future increases in production.