

Pyro Fuse - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2024 - 2029)

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Abstracts

The Pyro Fuse Market size is estimated at USD 546.29 million in 2024, and is expected to reach USD 956.97 million by 2029, growing at a CAGR of 11.87% during the forecast period (2024-2029).

Key Highlights

Pyrofuses facilitate rapid clearance of fault currents and minimize cost and weight compared to conventional mechanical breakers. Pyrofuses can tune the time-current curve to fit the application's fault response characteristics.

For low-level voltages, pyro fuses can be utilized instead of a contactor, but they are not inherently safe as they require a signal. However, they can be independent of the fuse and can be set to trigger with any current from a current sensor. At over 3000 A DC, a contactor can break down, and the fuse must handle the current. Notably, the pyro fuse takes a different approach, utilizing the signal from the airbag's ECU to trigger a pyrotechnic ignitor, which punches through the busbar to sever the connection physically.

According to the United Nations Industrial Development Organization, there was a 2.3% growth in industrial sectors, encompassing manufacturing, mining, electricity, water supply, waste management, and other utilities, signaling a post-pandemic recovery globally. Some hazardous industries, including oil and gas, will remain important as affordable, reliable, and versatile energy products for a growing global population.

According to the International Energy Agency, oil and gas combined accounted for more than 50% of global energy demand in 2019, and it is expected in the long term that

energy demand will still grow by 25% by 2040. Oil and gas extraction activities have the potential to cause damage to or destruction of property and the environment. They could even lead to injury and loss of life, particularly if the activity is not controlled, monitored, or regulated appropriately.

Safety hazards associated with oil and gas extraction activities include but are not limited to vehicle collisions, explosions, and fires. Safety hazards related to confined space include ignition of flammable vapors or gases and electrical and other hazardous energy.

As a result, governments worldwide are compelled to enforce strict safety regulations due to the rising number of accidents and explosions in the industry. The expanding energy requirements and the growing exploration activities in offshore and onshore oil fields present a substantial opportunity for the market to establish a foothold in this sector.

In the oil and gas industry, modern electrical equipment is specifically engineered to withstand the demanding conditions of various processes within the oil and gas industry, including motor controls and supports. As the utilization of electrical equipment continues to rise across the industry, there is a growing requirement for pyro-fuse to mitigate the risk of explosions.

Pyro Fuse Market Trends

Automotive Segment to Hold Major Market Share

The applications of pyro fuses in the automotive industry look promising with the dominance of electric vehicles in the coming years. Pyro fuses, or thermal switches or cutoffs, can prevent overheating in automotive systems. Various systems are in place to guarantee the safety of electric vehicles in case of abnormal circumstances. Among the frequently employed mechanisms to safeguard EVs from fire and short circuits is the profuse use in electric cars.

Vehicle manufacturers place a high priority on ensuring the safety of their vehicles. To achieve this, they install a range of sensors, fuses, and switches in passenger cars and commercial vehicles. These components work together to provide optimal protection for the vehicle and its driver, all while upholding the manufacturer's brand reputation. One such safety feature is the pyro fuse, a fast-acting explosive fuse. This fuse is designed to disconnect high-voltage batteries from the circuit in the event of a significant accident.

Activated by the airbag control device or BMS, the pyro fuse reliably breaks the circuit before any potential short-circuiting can occur due to vehicle deformation.

The increasing sales of EVs and rising investments in the production of electric vehicles are expected to offer various market opportunities. Pyro fuses are frequently employed in electric vehicles as a component of the electrical protection system. These fuses utilize pyrotechnic elements to swiftly and securely disconnect the electrical circuit in case of a fault or overcurrent situation. Their purpose is to promptly interrupt the current flow, safeguarding the vehicle's electrical components and mitigating potential risks like fire or harm to the battery system. Pyro fuses find typical applications in the high-voltage systems of EVs, encompassing the battery pack, motor controller, and other vital components.

The automotive industry globally is undergoing a significant transformation, as highlighted by the International Energy Agency (IEA), with profound implications for the energy sector. The increasing adoption of electrification is projected to reduce the demand for 5 million barrels of oil per day by 2030. According to the IEA's report, the sales of electric cars globally exceeded 10 million in 2022, and this number is expected to grow by 35% in 2023, reaching a total of 14 million sales.

Similarly, in the Net Zero Scenario, electric vehicle sales will constitute approximately 67% of total car sales by 2030. To align with this scenario, the annual growth rate of electric car sales needs to be around 25% from 2023 to 2030. The leading markets for electric vehicles are China, Europe, and the United States.

For instance, China accounted for nearly 60% of all new electric car registrations worldwide in 2022, according to the IEA. In China, the share of electric cars in total domestic car sales increased from 16% in 2021 to 29% in 2022. It is expected to surpass the national target of a 20% sales share by 2025. Consequently, numerous pyro-fuse manufacturers continuously invest in significant innovations, enabling the market to gain a competitive advantage.

Asia-Pacific is Expected to Witness Significant Growth

The market for pyro fuses in the region is expected to gain traction over the coming years due to the rising EV industry and growing industrial applications across various countries like China, India, Korea, and others. The growing government initiatives in

boosting the adoption of EVs, increasing investments in the production of electric vehicles, and growing consumer demand for hybrid electric vehicles are expected to enhance the applications of pyro fuse in the region's automotive segment.

The automotive industry heavily influences the market expansion in the region. The growing concerns over carbon emissions have prompted the introduction of policies that advocate for the widespread use of electric vehicles globally. This has, in turn, accelerated the smart motors market's growth in the region due to the rising popularity of electric vehicles. It is important to note that major countries such as China, India, and other nations are seeing a significant uptick in electric vehicle adoption, which is forecasted to drive market growth.

The Asia-Pacific region has historically served as a key driver of global economic growth due to its extensive network of industrial supply chains. With major industrial hubs in countries such as India, China, and Japan, the region stands out as one of the largest industrial centers worldwide. Governments in the area are actively implementing measures to enhance industrial production capabilities by integrating advanced technologies.

The rise in concerns regarding electrical short circuits across various industries fuels the demand for advanced electrical equipment. The escalating energy issues in the region are prompting the adoption of energy-efficient electrical devices, leading to the development of compact and efficient electrical equipment and devices, thereby boosting the growth of the pyro fuse market.

Other regions like Korea, Malaysia, Japan, and other countries are expected to contribute to the market's growth. The aerospace industry, increasing adoption of EVs, and rising EV sales are expected to act as major factors driving the market's growth. According to KAMA's report, South Korea's vehicle exports in 2022 reached an impressive 2.3 million units, encompassing passenger cars and commercial vehicles. This marked a substantial 15% growth compared to the previous year's 2.04 million units.

As of May 2023, electric vehicles (EVs) accounted for approximately 1.8% of the South Korean automobile market, as stated by the Ministry of Land, Infrastructure and Transport. Looking toward the future, the South Korean government has set an ambitious goal of increasing the share of electric and hydrogen vehicles in new vehicle sales to 33% by 2030.

Per the pre-Budget 2023 declaration, the aerospace sector has been acknowledged as a fresh avenue for progress to hasten Malaysia's evolution into a high-income nation by 2025. The Malaysia Aerospace Industry Association (MAIA) predicts that the 2023 Budget will extend support for the growth of the local aerospace industry, as articulated in the 12th Malaysia Plan. As pyro fuses are extensively finding their applications in the aerospace industry, the growth in the sector is anticipated to drive the market significantly.

Pyro Fuse Industry Overview

The pyro fuse market is semi-consolidated with major players like Daicel Corporation, Autoliv Inc., Littelfuse Inc., Eaton Corporation, and Mersen Group. Players in the market adopt strategies such as partnerships and acquisitions to enhance their product offerings and gain sustainable competitive advantage.

September 2023: Daicel organized the battery show in North America, and over 775 top suppliers from the advanced battery and electric and hybrid vehicles industry participated. Special workgroup topics include battery safety, market forecasting, next-generation technology, and prevention of thermal runaway.

May 2023: Eaton announced that its eMobility business secured a contract to supply its battery disconnect unit (BDU) to a global vehicle manufacturer. The BDU will be available in 400 V and 800 V configurations and used in electrified passenger vehicles. Eaton's BDU incorporates its Breaktor circuit protection technology, effectively reducing complexity and cost. The primary function of the BDU is to act as an on/off switch for the vehicle's battery, depending on the mode of operation, such as charging or driving. Currently, most electric cars utilize one of three traditional circuit protection configurations in the BDU: fuse and contactor, pyro fuse and contactor, or fuse, pyro fuse, and contactor combined in a single BDU.

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