



Barry C. Brusso

Littelfuse Celebrates 90 Years of Protecting the World

Dave Scheuerman, Guest Author

You've never heard of Littelfuse? Do you drive a car or truck? Do you watch TV or use a laptop computer or a mobile device? Do you use a washing machine or dryer for clothes, or do you adjust the temperature in your home? Assuming your answer is "yes" to any or all of these questions, then you have and continue to use Littelfuse products on a daily basis.

Littelfuse has a long history of pioneering innovative products and services to serve the engineering needs of customers and industries. This commitment started in 1927, when Edward V. Sundt (Figure 1) founded Littelfuse Laboratories and invented the first small, fast-acting protective fuse to prevent sensitive test meters from burning out. From that pioneering first step, the company has gone on to define the standards of the circuit protection industry and become a global leader in circuit protection, power control, and sensing platforms.

The company's early work was hallmarked by the introduction of fuses for the automotive, aviation, and communications industries. This foundation provided an opportunity



FIGURE 1. Littelfuse founder Edward V. Sundt and his 1921 Ford. (Photo courtesy of Littelfuse archives.)

for ongoing engineering innovation that led to circuit protection solutions for other industries and end markets, such as fuses for television sets and mission-critical, life-protecting, high-durability fuses to protect microcircuitry for NASA's Gemini space program.

Advancements and Innovations Through the Decades

1920s–1930s

Let's go back to 1927 for a minute. Edward Sundt was raised in western

Manitoba, Canada, where he worked as a lumberman, farmer, and member of the Royal Canadian Mounted Police. He attended Brandon College in Manitoba and received his degree in engineering. After graduation in 1923, he moved to Chicago, where he worked at General Electric and, later, Stewart-Warner.

In working with lamps and vacuum tubes, he found that the

Editor's Note: The author is a technical training manager with Littelfuse, Inc.

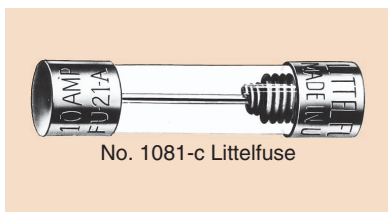


FIGURE 2. The first Littelfuse product was a low-energy fuse created by combining the heat generated by a high-resistance wire with a low-melting-temperature fuse wire. In its literature, the company described the fuse as “quicker than a short circuit.” (Image courtesy of Littelfuse archives.)

test meters were repeatedly burning out during the testing process. In 1926, after experimenting for hours with a variety of test meters, Sundt developed and received a U.S. patent for a fast-acting protective fuse rated at 1/32 A for use in test meters (Figure 2). To raise some initial working capital, he decided to sell his Chevrolet for US\$150 and started his new business in a rented room in a building on the north side of Chicago.

The importance of Sundt’s discovery was significant, as the electronics marketplace was quickly evolving. By 1928, Sundt and his coworker, Ben Kollath, had developed ten different amperage ratings of fuses, along with a couple of mountings (or fuse holders) to help protect a variety of meters commonly used in the world of electronics. He also placed an ad in the popular *Radio News* magazine, which resulted in their first order, worth US\$1.10. Not a big order, but it was the start Sundt needed, and soon demand for his innovative fuses started growing. Total sales in that first year reached US\$264.46.

As to the spelling of the company name? As the story goes, he wanted to call his new company that was now making small fuses *Little fuse*, but the U.S. Government would not allow him to trademark two such common words. The simple solution? Just invert the “l” and the “e” in *Little* to create *Littelfuse!* The rest, as they say, is history.

In 1930, automotive fuses were first introduced, building upon the

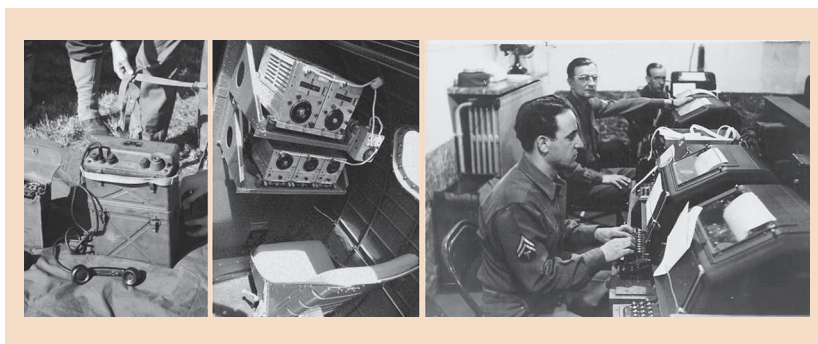


FIGURE 3. During World War II, Littelfuse supplied the military with products for aircraft and electronic communications equipment. (Photos courtesy of Littelfuse archives.)

old glass-bodied, electronics-type cartridge fuse. Four years later, the first aircraft fuse was developed for United Airlines, and within five years, nearly every plane in the sky had Littelfuse aircraft fuses. As Littelfuse neared the end of its first decade, the company was worth US\$150,000 and needed to expand its administration, financial, and accounting practices. So in 1938, Tom Blake joined the organization as secretary and treasurer to lead the company to a more sound financial future. That same year, the company was incorporated and adopted its present name of Littelfuse Inc. The company’s expanded manufacturing needs resulted in a new 10,000-ft² facility, also located on the north side of Chicago.

1940s–1950s

In 1941, Littelfuse expanded from a manufacturer of small instrument fuses for a limited market to meet the ever-growing circuit protection needs of the communications and aviation industries during World War II (Figure 3). By 1943, sales had reached US\$2.5 million, and the company had grown to 600 employees. After the war ended, the company began to pursue opportunities in the growing market for consumer electronic products.

In 1950, Littelfuse expanded into another market—this time, the rapidly expanding home entertainment market, as a supplier for television sets (Figure 4). This market con-

tinues today, as an ever-expanding variety of fuses and other protection devices still protect the complex (and expensive) technology found in current televisions and other electronic entertainment devices.

On the automotive side, in 1950 Littelfuse created the first centralized under-the-dash fuse block, the same concept still found in passenger vehicles today. That same year, the company registered US\$1.96 million in sales, and two years later built its first plant in Des Plaines, Illinois, to serve its 3,000 customers in the electronics and automotive markets. In 1954, Thomas Blake was elected president of Littelfuse and served in that role until 1965.

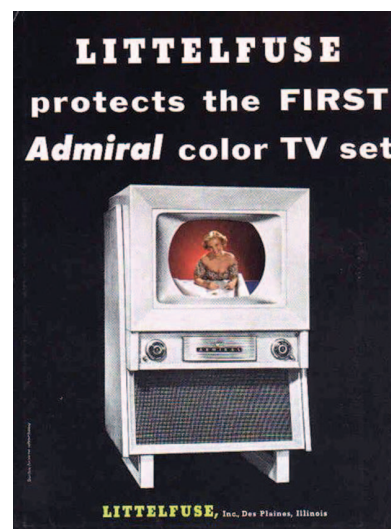


FIGURE 4. Littelfuse entered the home entertainment market in 1950 as a supplier for TV sets. (Image courtesy of Littelfuse archives.)

1960s–1970s

As a result of its growing success, Littelfuse first offered stock to the public in 1962. And then, because of the continued growth of the firm and its need for efficient, automated control of its operations, Littelfuse moved into its new 125,000-ft² manufacturing plant and eventual world headquarters in Des Plaines, Illinois, in 1963. The company would remain headquartered in Des Plaines until 2009, when it moved to new corporate offices in Chicago, near O'Hare International Airport.

The 1960s were the age of space exploration, which required sophisticated and reliable electronic components. The year 1963 also was when the Littelfuse MICRO and PICO sub-miniature fuses were introduced and promptly utilized to meet the micro-circuitry demands of NASA's Gemini space program. Littelfuse was honored as one of 31 firms in the United States to be awarded the Gemini II launch vehicle team flag for its role as a critical parts supplier of a life-saving component of the Gemini Man-in-Space program.

In 1965, sales hit a new high of US\$11 million, and Edward Sundt retired as the company's chairman, ending a 38-year tenure. He was succeeded by Thomas Blake. Tracor Inc., an international defense technology and services company, acquired Littelfuse in 1968. After this, the company operated as a wholly owned subsidiary of Tracor and continued growing operations in Europe, Asia, and the United States.

Modern computing was born in the 1970s, and once again Littelfuse was part of the technology wave, developing fuses for computers as they entered the mainstream. As an example, the company won the coveted Outstanding Supplier award from General Electric.

In 1973, Littelfuse expanded its manufacturing facilities to include operations in Piedras Negras, Mexico, where the company continues today to manufacture a variety of products in its Automotive and



FIGURE 5. (a) Littelfuse had the foresight to develop the Littelites line of indicator fuses for the office equipment market, which contributed to the role computers, gaming systems, and similar electronic devices would have in the lives of virtually everyone on the planet. (b) The ATO Autofuse was developed for miniature fuse blocks in all automotive vehicles. Introduced for General Motors, it quickly became standard for auto manufacturers throughout the United States, Europe, and Japan. (Photos courtesy of Littelfuse archives.)

Industrial Business Units. In 1976, another true innovation was introduced: the fast-acting, blade-type Autofuse, also known as the ATO fuse. Found today in most passenger vehicles around the world, the ATO fuse was a totally new concept in automotive fusing, first developed for General Motors' miniaturized fuse blocks (Figure 5). Two years later, U.S. auto manufacturers stopped using the original glass tube fuses, as the conversion to the new blade type had been accepted across the board.

1980s–1990s

The year 1981 began with Walter Clements taking over as Littelfuse's president upon the retirement of Jack Hughes. Littelfuse expanded into the electrical (or, as it's now called, industrial) market in 1982, introducing a new line of fuses for general industrial and commercial applications.

In 1983, the company became fully committed to the electrical industry by building a state-of-the-art power fuse manufacturing facility featuring the latest in automation, robotics, and computer-aided design/computer-aided manufacturing sys-

tems, along with a multimillion-dollar high-power test laboratory that allowed engineers to perform frequent testing on new and existing products to ensure quality and reliability. This new laboratory led to several major power fuse design breakthroughs in the years that have followed.

This high-power laboratory was updated and moved to the Electrical Business Unit's engineering center in Champaign, Illinois, in 2010.

In 1985 and 1986, the Watseka and Des Plaines, Illinois, plants both received the Ford Motor Company's prestigious Q1 quality award, the first of many such awards for the Automotive Business Unit. In 1986, two unique innovations were introduced on the auto-

motive side of the business. The MINI fuse was introduced as the successor to the ATO automotive fuse. The smaller design of the MINI allowed automotive original equipment manufacturers to protect additional on-board electronic accessories by adding more fuses in the same physical under-the-hood or in-cabin places. At the same time,

The Littelfuse MICRO and PICO subminiature fuses were introduced and promptly utilized to meet the microcircuitry demands of NASA's Gemini space program.

automotive fuses went larger with the MAXI fuse, designed for the U.S. auto industry to replace commonly used fusible wire and fusible links for under-the-hood electrical harnesses.

On the electronics side of the business, the FLAT-PAK fuse line was introduced, in which a new super-miniature surface-mount, rectangular-shaped fuse could now end identification confusion with other circuit board components. This new innovation quickly became the accepted choice around the world for use in computers, television sets, video-game consoles, video-cassette recorders, and a wide variety of popular consumer products.

A year later, the Electrical Business Unit introduced the KLDL and what is now called the CCMR midget-sized fuses (10 mm × 38 mm) for



FIGURE 6. UL-listed class CC fuses, optimal for space-saving motor and transformer protection. (Photos courtesy of Littelfuse.)

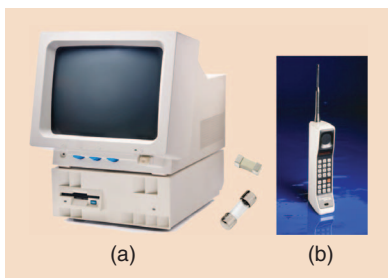


FIGURE 7. Major product breakthroughs in the 1980s included (a) the NANO line of surface-mount fuses and (b) the 2AG, the world's smallest glass tube fuse, used in computer and telecommunications applications. (Photos courtesy of Littelfuse archives.)

transformer and motor protection. Hailed by the industry as the “fuse of the future,” these products still provide optimal time-delay protection that previously required fuses ten times larger (Figure 6).

That same year, Westmark Systems, a defense contractor in Texas, led a buyout of Tracor and Littelfuse. On the product front, the electronics business introduced the world's smallest glass tube fuse, the 2AG series in 1988 (Figure 7). Just one-third the size of previous glass fuses used in circuit cards, it quickly became widely accepted by computer, power supply, and telecommunication industries around the world.

In 1991, a first occurred in the power fuse industry, with the introduction of the LDC Series UL Class L fuse. Ideal in applications such as overhead crane controls, it became the only series capable of meeting UL standards for both 600-Vac and 600-Vdc protection. This innovation in dc-rated systems is something that continues today with the ever-growing dc requirements in such industries as photovoltaic (solar), electrical vehicles, power conversion, uninterruptible power supplies, and inverters. Littelfuse continues with product innovation in each of these industries, with products that now go as high as 1,500 Vdc.

From a quality perspective, Littelfuse began a major drive to monitor quality improvement across all aspects of the business. It established Six Sigma goals and began continual benchmarking of its quality improvement process.

The year 1991 also proved to be pivotal for the entire company, as Tracor filed for Chapter 11 reorganization due to severe budget cuts by the U.S. Department of Defense. As a result, Littelfuse Inc. emerged from the Tracor Inc. Chapter 11 reorganization as an independent Illinois corporation and achieved record sales revenue of US\$135 million. Leading Littelfuse through this transition was Howard B. Witt, who had become president of Lit-

telfuse in 1990 upon Walter Clements's retirement. Witt would serve in that capacity for the next 14 years. Compare that US\$135 million to the US\$1.06 billion record sales reached in 2016: It's been an impressive and successful ride along the way.

The early 1990s were also a time in which all the U.S.-based manufacturing facilities achieved ISO 9000 certifications, while new, innovative products were released, such as the NANO electronic surface-mount fuse (electronics) (Figure 7), the UL Class RK5 IDSR Series Indicator fuse with blown-fuse indication (electrical), and the MEGA and MIDI bolt-down fuses (automotive). Products that incorporated the blown-fuse technology went on to win three Product of the Year awards from *Plant Engineering* magazine, a recognition that continued in the two decades that followed, with such products as arc-flash relays (Figure 8) and POWR-SPEED High-Speed (semiconductor) fuses.

Manufacturing expanded to China in 1994 in what would become the first of multiple manufacturing and sales facilities throughout the Asia market. By the end of the decade, the company had become truly global, with 16 manufacturing, distribution, sales, and engineering offices across four continents.

The year 1999 was pivotal in the continued growth of Littelfuse, as it included the company's first acquisition, the Suppression Products Group of the Harris Corporation, through which it started to expand from just a fuse company to one that truly helps protect, control, and sense the world today. Since then, Littelfuse has continued its growth by investing in the future through more than 18 acquisitions and with new product development that has strengthened the company's global reach and infrastructure. In doing so, it has also added value to its customer relationships. Littelfuse brands are the cornerstone of that investment and are its commitment to each customer. Offering some of the world's

best-known and top-performing brands in electronics, telecommunications, automotive, and electrical, Littelfuse stands as the world's premier provider of circuit protection.

2000s–Today

The first half of the 2000s continued with additional acquisitions on the electronics and automotive sides of the business, with companies including Semitron, Teccor Electronics, Wickmann Group, Pudenz, and Concord Semiconductor. During that time and at the end of 2004 after 25 years with the company, Chairman, President, and Chief Executive Officer (CEO) Howard Witt retired and was succeeded by the company's chief operations officer, Gordon Hunter. In 2004, the company reached US\$500 million in sales for the first time.

Hunter continued to lead Littelfuse through aggressive growth plans, both organically and through more acquisitions, each time expanding the company's portfolio of innovative, quality products that added value to customer relationships around the globe.

The end of the first decade of the 21st century also marked a strategic shift for Littelfuse. The company broadened its product and technology portfolio beyond circuit protection with the acquisition in 2008 of Startco Engineering, which advanced the electrical division's product offering from fuses to now include protection relays. This now provided a product offering better positioned to serve more of customers' electrical safety needs and requirements.

Littelfuse began 2010 with rapid growth through acquisitions and a strategy to leverage the company's expertise, innovation, and strong customer relationships in circuit protection to become the global leader in power control and sensing. On the industrial side, a complete line of high-voltage dc fuses for solar applications was introduced in 2010, the same year the company opened



FIGURE 8. Arc-flash relays, designed to improve safety and reduce equipment downtime in the event of arc-flash incidents. (Photo courtesy of Littelfuse.)

its High Power Lab in Champaign, Illinois. That year also marked a significant acquisition for the automotive business with the addition of Cole Hersee Company, a leading supplier of switches and control devices to the commercial vehicle market.

A line of arc-flash relays was added to the electrical division's portfolio in 2011, followed by the acquisition of ACCEL A/B in 2012 to expand into advanced electronic and electro-mechanical sensors and switches used in automotive safety systems. In 2013, the company acquired Hamlin Inc., a manufacturer of reed switches and relays as well as sensors based on reed, Hall-effect, and Pulsed Wave-Guide linear technologies, while the acquisition of SymCom and SSAC in 2014 added electrical current and voltage monitors, controls, and timers to its portfolio.

The year 2016 proved to be a great year from an acquisition standpoint, when Littelfuse expanded with three key additions. Transient voltage suppression diodes, switching thyristors, and ignition insulated-gate bipolar

transistor product lines were acquired from ON Semiconductor Corporation; battery switches and trailer connectors for commercial vehicles from

Member's; and, the largest acquisition to date, the circuit protection devices portion of TE Connectivity. This expansion brings with it a leading position in polymer-based resettable circuit protection devices, with a strong global presence in the automotive, battery, industrial, communications, and mobile computing markets.

As Littelfuse approached its 90th-anniversary year in 2017, it marked the milestone with several important company achievements in 2016 that help position the company for future growth. Littelfuse exceeded US\$1 billion in annual sales for the first time, while also achieving its five-year strategic goals, including delivering a 15% compound annual growth rate in revenues. It launched a new five-year strategy with accelerated organic growth while completing

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sponsorships for young industry engineering professionals to attend our annual conference. This allows several young engineering professionals, working for industry manufacturing companies, to attend our Annual Conference at a low cost. Proceeds to fund this initiative come from the James A. Rooks Memorial Fund established by the IEEE Foundation.

2017 Award Recipients

The two award recipients are Andrew Huff and Michael Meza. Huff is an electrical engineer with the International Paper Springfield Mill in Springfield, Oregon. He graduated with a bachelor of science degree in electrical engineering from North Carolina State University in 2014. Meza is an electrical engineer with Easypower, LLC, in Tualatin, Oregon.

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He graduated from Portland State University in 2015 with a degree in electrical engineering.

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HISTORY *(continued from page 13)*

acquisitions that added US\$250 million of annual revenue. To help serve the ever-expanding technological needs of its customers, the company opened its Silicon Valley Technology Center in Fremont, California, which is close to the engineering facilities of several major automotive and electronics customers. Littelfuse finished a memorable 2016 with a planned CEO transition, as Gordon Hunter became the company's executive chairman, and Chief Operating Officer Dave Heinzmann became president and CEO.

Expertise Applied and Answers Delivered

As shown through its historical milestones, achievements, and accom-

plishments over the last nine decades and with annual sales revenue growing from US\$246 to over US\$1 billion, Littelfuse has continued to stress its ongoing commitment to engineering and innovation. This commitment is rooted in the company's core values, which Littelfuse associates live every day: customer focus, teamwork, results driven, integrity, and innovation. These are part of the very fabric of what will drive Littelfuse into the future. This pioneering legacy in engineering and innovation has spanned the years from the invention of the first small, fast-acting fuse to protect sensitive test meters, to components used in the first airplanes and later in the U.S. space program, and more recently to elements vital to smartphones,

appliances, automotive electronics, and other products that are a part of everyday life. The legacy of engineering and innovation continues as Littelfuse identifies opportunities to grow and serve customers while leveraging its established presence and industry-leading products.

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