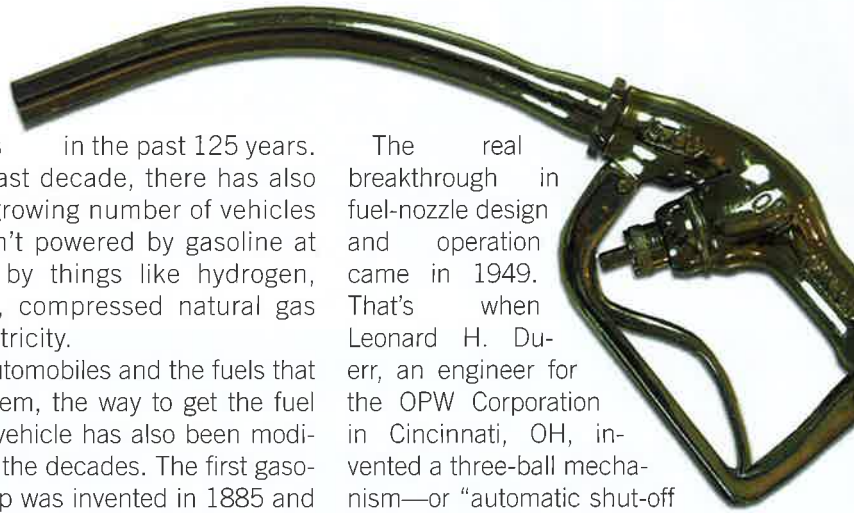
Fueling the World

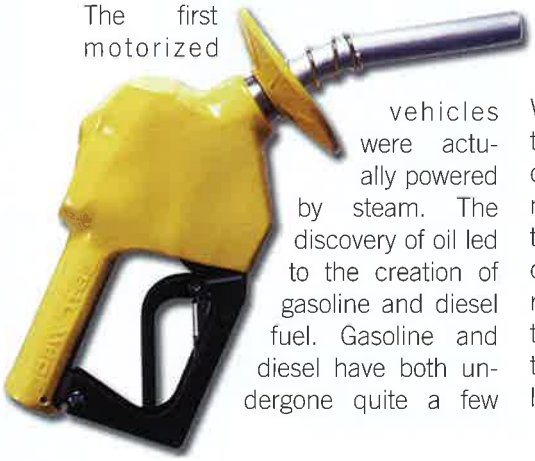
While the motor-vehicle industry has undergone seismic changes, the humble fuel nozzle still relies on standard-setting technology invented by OPW more than 60 years ago.

By Charley Sunderhaus



Over the centuries—yes, centuries—the forms of motorized transportation have undergone a staggering number of changes, both operationally and aesthetically. The first self-propelled road vehicle was invented in 1769 by French engineer and mechanic Nicolas Joseph Cugnot. About the only things that vehicle had in common with today's automobiles were wheels. The first practical automobile, invented by German mechanical engineer Karl Benz in 1885, had no roof, no steering wheel and no doors, and was started by turning a crank in the engine.

In conjunction with the revolutionary changes in design and operation of automobiles through the years, the types of fuels used to power them have also undergone radical change. The first motorized vehicles were actually powered by steam. The discovery of oil led to the creation of gasoline and diesel fuel. Gasoline and diesel have both undergone quite a few changes in the past 125 years. In the past decade, there has also been a growing number of vehicles that aren't powered by gasoline at all, but by things like hydrogen, propane, compressed natural gas and electricity.



Like automobiles and the fuels that power them, the way to get the fuel into the vehicle has also been modified over the decades. The first gasoline pump was invented in 1885 and required the fuel to be pumped by hand into the vehicle. The 1920s saw the invention of "visible" pumps that allowed the driver to see the gasoline and observe its quality. These pumps were followed by "scale" pumps that would weigh the amount of gasoline being purchased. Pumps similar to what we see today began to be used in the 1940s and 1950s.

A Revolution in Refueling

While motor vehicles, their various types of fuels and the pumps used to dispense those fuels have undergone numerous changes over the years, the actual business end of the delivery chain—the fuel nozzle—has remained relatively unchanged in that time, especially since a series of technological advancements in the late 1940s and early 1950s.

The real breakthrough in fuel-nozzle design and operation came in 1949. That's when Leonard H. Duerr, an engineer for the OPW Corporation in Cincinnati, OH, invented a three-ball mechanism—or "automatic shut-off dispensing nozzle valve"—that could be used in conjunction with the venture, located in the fuel nozzle. The use of the 3-ball mechanism allowed "the submergence of the discharge end of the nozzle in the dispensed liquid (to) cause a flexible diaphragm to function and cause the main or flow-control valve to close."

Duerr's invention of the three-ball mechanism essentially led to the creation of the automatic shut-off nozzle. More importantly, Duerr's three-ball mechanism, for which he received a patent in 1952, was incorporated into the first-ever production nozzle that featured automatic shut-off. This nozzle, which was known as the OPW 1811"Fil-O-Matic" nozzle, was first released in 1949 with the promise of "modern, safe, spill-proof service" and "positive shut-off as-

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of overflow; no loss of product; serves more customers in less time; and so easy to use that even "beginner" gasoline-station attendants could use it effectively and efficiently, no matter the size of the tank or container. Using the Fil-O-Matic, OPW proudly stated, added up to "More Gallonage, Increased Profits, Faster and Better Service."

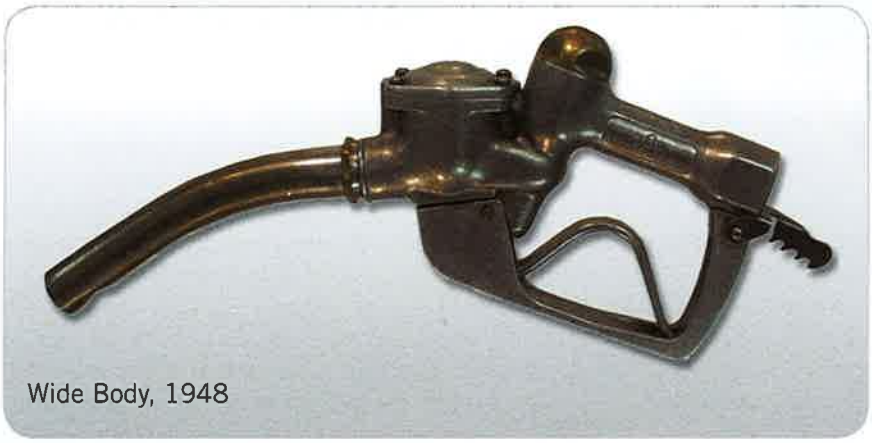
sured every time." OPW advertising for the Fil-O-Matic noted the many standard-setting features of the nozzle: quick fill with no fear

If It Ain't Broke...

Believe it or not, in the 60 years since its invention, Duerr's three-ball mechanism has remained the basic technology in automatic shut-off nozzles, despite the fact that the number and types of fuels being dispensed today has grown exponentially since the end of World War II.

Most of the fuel-nozzle enhancements since the 1950s have revolved around improving the overall reliability and performance of the nozzle. Spouts have been modified to increase flow rates. The hold-open racks were added, while enhanced flow control allows drivers to top off their tanks more precisely. Lightweight aluminum bodies make the nozzles lighter and easier to handle. Hand insulators have been created to provide a layer of protection between the cold metal of the nozzle and the refueler's hand. Pressure-sensing nozzles cannot be opened until the pumping system is pressurized and close automatically when pressure is removed, increasing safety for the refueler.

Innovations in fuel-nozzle technology over the years have also been driven by outside forces, such as federal, state or local regulations. One current issue is vapour recovery, or containing the amount of fuel vapors and fumes that are released into the atmosphere during refueling. This has led to the creation of a whole family of On-Board Refueling Vapour Recovery (ORVR) nozzles. These types of nozzles, of which OPW offers the 21Gv ORVR series, have a



Wide Body, 1948

Dover OPW, 1974

Dover OPW, 1961

built-in ORVR canister-sensing device that detects whether or not a vehicle has an on-board ORVR canister. If an ORVR canister is detected, the nozzle automatically shuts off the vapour flow to eliminate ingestion of air into the fueling site's underground storage tanks. This allows the site operator to use standard, cost-efficient and readily available vacuum-assist vapour-recovery hoses, breakaways, swivels and whip hoses rather than expensive proprietary nozzles and hardware.

Another area where regulation is creating a new market for nozzles involves limiting diesel-exhaust emissions. On Jan. 1, 2010, a new Environmental Protection Agency (EPA) regulation went into effect that requires all new cars and trucks with diesel engines that are sold in the United States to include equipment and fluids that will treat the exhaust emitted by diesel-powered vehicles, which lowers the amount of nitrogen oxide (NOx) that is released into the atmosphere. A technology called Selective Catalytic Reduction (SCR) introduces a substance called Diesel Exhaust Fluid (DEF) into the exhaust stream that converts the NOx into harmless nitrogen and water vapour. Realizing the potential in this market, OPW is marketing the 21Gu DEF Nozzle with Mis-Filling Prevention technology. Building on standards established for DEF filling in Europe, the 21Gu nozzle features a Mis-Filling Prevention Device (MFPD) that only allows DEF to be put into the DEF tank on a vehicle, not mistakenly into the diesel tank.

The growth in alternative fuels has also been a benefit to the nozzle industry. Nozzles used for dispensing biofuels like ethanol have to be constructed of materials that are compatible with ethanol's corrosive nature. Entire new markets have developed around the use of compressed natural gas (CNG), hydrogen and propane (LPG) as motor fuels.

In fact, OPW Fueling Components has created complete lines of nozzles for use with CNG, hydrogen and propane under its CleanEnergy™ Fueling Products division. These nozzles

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look very different than those with a three-ball mechanism, and may just be a glimpse into the future of the fueling nozzle. OPW has designed its various lines of CNG, hydrogen and propane nozzles with "jaw-lock" technology that is ideal for the frequent coupling and uncoupling found in the fueling applications of those products. The "jaw-lock" technology also helps distribute the contact pressures over the entire surface area of the receptacle, increasing safety. Other features of these nozzles include single-action operation that initiates fueling operation by simple engagement of the nozzle to the receptacle; high-flow/fast-fill capability that provides quick fueling without the danger of fuel leaks; an internal filter that prevents impurities from entering the fuel stream; and durable brass, aluminum and stainless-steel materials of construction, depending on application.

Conclusion

While the world of the motorized vehicle has undergone mind-boggling change, all of these changes have been incorporated as a way to help improve the industry. Part of that industry is the equipment that is used to move the fuel from a storage tank into the vehicle—in a timely, efficient, cost-effective and safe manner.

In the end, the only safe and efficient way to get the fuel into the vehicle is through the use of a fuel nozzle. While the landmark technological advancement in nozzle design and operation took place more than six decades ago, nozzle design and operation have continued to evolve around Leonard Duerr's standard-setting three-ball mechanism. Obviously, no one can accurately predict with any degree of certainty where the future of fuel nozzles is headed. Two things to keep in mind though, are that any changes in nozzle operation, type or features will be driven by the needs of the consumer and regulatory agencies. As it has for many years, OPW Fueling Components stands ready to react to those changes with the industry's best and most reliable fueling equipment. ■

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