

# News

## Small Engine Injection Connection

**Delphi is providing small engine fuel delivery modules adaptable for a range of fuel injection system applications.**



**Delphi's small engine fuel modules include the top-mount (left), the bottom-mount (center), and the in-line (right).**

From motorbikes to commercial lawn mowers to boats, small engines are a vital component of everyday life for many people. But with so many small engines out there—and countless more produced daily—pressure is mounting on small engine manufacturers to comply with increasingly stringent emissions regulations and, in some cases, even fuel economy targets, particularly with commercial equipment.

One of the best solutions available to manufacturers is to equip small engines with fuel injection systems rather than traditional carbureted systems. Delphi, with decades of experience developing fuel injection systems for automobiles and trucks worldwide, is uniquely positioned to help small engine manufacturers redesign products to incorporate fuel injection systems.

"Delphi offers a range of [fuel injection products](#), including injectors and fuel delivery systems, to help manufacturers meet emissions reduction requirements being legislated around the world," said Sean McDonald, global marketing manager, fuel handling and evaporative emissions. "Fuel injection systems can also help maximize fuel efficiency, a factor in the development of commercial lawn mowing equipment, for example. These mowers run all day, every day, and with the increasing cost of fuel, even a small boost in fuel economy helps lawn care businesses minimize operating costs."

As a key part of its small engine fuel injection system capabilities, Delphi has a series of fuel modules in its portfolio that can be adapted to fit nearly any application. Delphi offers top-mounted, bottom-mounted, and in-line and in-tank modules complete with fuel pump and all required fuel and electrical connections. The pressure regulator is always included, and a fuel filter and fuel level sensor are optional components. Delphi offers several options to meet the specific needs of its customers. The modules can help streamline production by minimizing the number of parts required, and are ideally suited to deliver fuel at injection pressure in engines ranging in size from 50 cc to 1500 cc. Close collaboration with customers determines which module is appropriate for a given application, and then Delphi modifies the module to fit.

"For example, a motor scooter with the fuel tank located under the seat might necessitate a top-mounted module," said Mike McHale, staff engineer, fuel handling. "Then, based on the geometry of the tank, maybe we have to alter the outlet tube configuration slightly. We'd like to be able to develop a common bottom-mount and a common top-mount that can be used by everyone, but the market just isn't there yet. In the meantime, we will continue to work with individual customers to tailor unique solutions."

Delphi top-mounted modules feature a thermoplastic cover, while bottom-mounted modules are fitted with a metal cover (both with proven sealing designs). Either one can fit in a variety of tank sizes to provide options for designers or packaging engineers. In-line systems are even less intrusive than in-tank modules, and allow additional placement flexibility. These external modules enable easy maintenance—there is no need to open the fuel tank—and their easy-fit design can even help lower engine assembly costs. And by locating the module outside the tank, tank capacity naturally increases.

Regardless of the packaging selection, Delphi can develop modules for use with gasoline as well

as gasoline-ethanol fuels (such as E85 or E100) for added versatility.

### Strong heartbeat

At the heart of any Delphi fuel module is the [Delphi T-11 Small Engine Fuel Pump](#). Suitable for use in bottom-mount, top-mount, and in-line configurations, the T-11 pump can be regulated for flow and pressure (with an optional pressure regulator). It provides superior low-fuel delivery performance, reduced noise levels, and excellent durability.

"Obviously if there is no pump, we have no module," said McHale. "With the T-11 pump already developed and proven in a number of applications, taking it to the next step of integration with a module was an easy progression."

### Ready for change

As emissions legislation in Europe and elsewhere becomes more widespread, manufacturers will need to accept fuel injection as the wave of the future.

Delphi is familiar with [environmental regulations](#) put in place for other vehicles, and with 100 million fuel modules for automotive applications produced since 1982, Delphi is prepared to leverage that expertise to help both high-volume and low-volume small engine manufacturers reach their target objectives when it comes to the design and production of fuel injected small engines. However, there are significant differences for a small engine application, such as limited availability of packaging space. But McHale said Delphi engineers are thriving on the challenges.

"Our willingness to customize and manage variation is appreciated by our customers, and it's something Delphi has done for a long time," noted McDonald. "While that might appear to cost a little more up front than picking up an off-the-shelf component, our customers really appreciate our ability to work with what they have, rather than forcing complete redesigns, which can be more costly and can delay product releases in a competitive market. The change to fuel injection systems is going to happen, and Delphi is pleased to be able to help our customers be as prepared as possible."



**A conventional automotive fuel pump (left) shown with the Delphi T-11 Small Engine Fuel Pump (right) shows the significant difference in size of these designs.**