

Third-Generation Fuel Pump Module for Medium & Large-sized Motorcycles

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As the number of electronically-controlled products complying with exhaust gas regulations installed on medium and large-sized motorcycles increases, the total weight of the motorcycles has increased and the balance between discharging and charging has deteriorated. To solve this problem, we developed the Third-Generation Fuel Pump Module which is compact, light weight, and low in power consumption by downsizing the components of the T35 fuel pump and its housing module.

1. Features of T35 Fuel Pump and Development Means

A fuel pump consists of a pump part equipped with an impeller for suction and pressure feeding of fuel, a motor part equipped with a rotor and a magnet for driving the impeller, and a power supply part for supplying power to the rotor (Fig. 1). The T35 fuel pump features the following improvements over conventional fuel pumps.

- (1) The components of the fuel pump have been optimized and the total length of the rotor that constitutes the motor in particular has been shortened, resulting in a compact and light model, with both volume and mass approximately 40% less than conventional models.
- (2) With the structure of the rotor core modified, the packing factor of the winding is improved and the current consumption has been reduced by 35%.

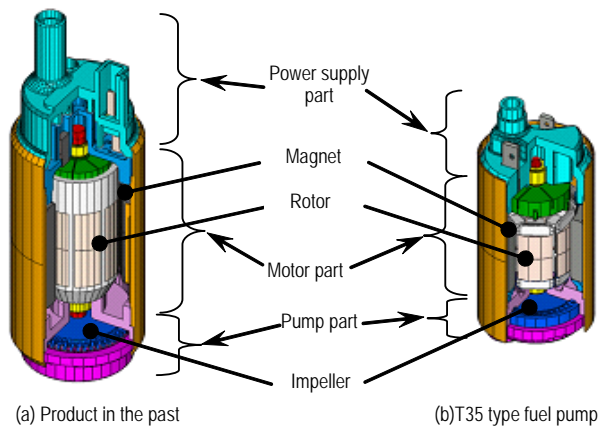


Fig. 1 Main body of the fuel pump

These achievements have been attained as follows. The winding method for the rotor has been changed

from the conventional distributed winding to concentrated winding to reduce the total length of the rotor (Fig. 2). In the conventional distributed winding method, a coil was wound across different teeth and four layers were stacked one on top of the other, so the end-winding was high and the total length of the rotor was very long. However, with the concentrated winding method, coil winding is made for each tooth without interfering with the winding on another tooth, resulting in a low end-winding.

For the rotor core of the motor, a sliding tooth division core structure has replaced the conventional integrated core (Fig. 3). With the conventional integrated core, the coil was wound via a gap between teeth. Using the sliding tooth division core structure, each tooth can be taken out for aligned coil winding. As a result, the coil winding characteristic, which has long been a technological challenge, has been improved and the packing factor has also been increased. With the combination of the sliding tooth division core structure and a powerful magnet, the new fuel pump offers improved motor efficiency and low current consumption.

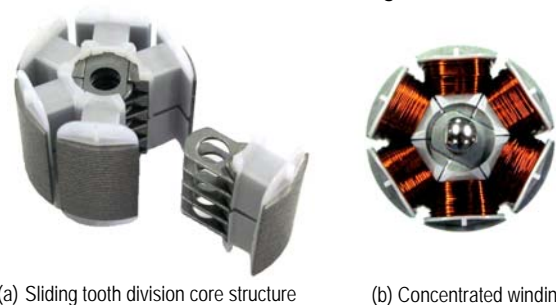
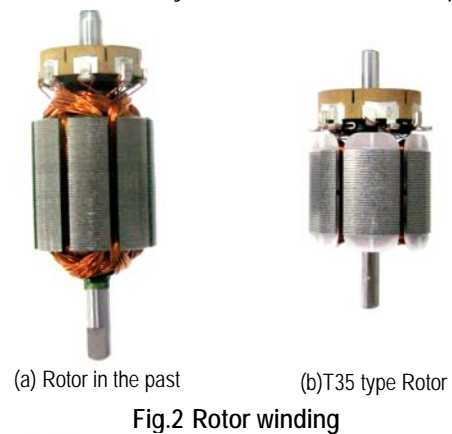


Fig.3 Sliding tooth division core structure and concentrated winding

2. Features of Fuel Pump Module and Development Means

A fuel pump module consists of fuel system components, such as a fuel pump, a suction filter, a high-pressure side filter, and a pressure regulator, and an installation bracket to support and mount these components on the fuel tank. For motorcycle-specific needs of rapid acceleration or deceleration and right or left turning, the fuel accumulation part is installed near the suction filter so that fuel suction operates reliably even when little fuel remains. A metallic material is used for the plate of the installation bracket which serves as the cover of the fuel tank installation hole, thus increasing the breaking load and preventing fuel leakage (Fig. 4).

The Third-Generation Fuel Pump Module for Medium & Large-sized Motorcycles (Fig. 4(b)) is 30% smaller in volume than the conventional model thanks to the use of a smaller T35 fuel pump. In addition, the weight has been reduced by 30% from the conventional model by changing the material from metal to resin, without sacrificing safety.

These achievements have been attained as follows. The T35 fuel pump having a short total length is incorporated in the Third-Generation Fuel Pump Module. As

a result, the cup-shaped part for fuel accumulation provided on the metal plate in the conventional model has been eliminated, so there is no protrusion at the bottom of the fuel tank. Furthermore, the fuel accumulation part, which is made of metal in conventional models, has been changed to a resin part, to reduce weight. The fuel accumulation part has been designed to support the structure of the T35 fuel pump and reduce the outer diameter of the fuel pump module. In addition, this fuel accumulation part in the new module can hold 100% of the surplus fuel unconsumed in the engine after discharging from the fuel pump and discharged from the pressure regulator, and the fuel accumulated in the fuel accumulator part is fed to the suction filter without fail. As a result, motorcycle riders no longer need be concerned about an insufficient flow of fuel when changing the position of their machines (Fig. 5).

The filtering material of the suction filter has also been changed for improved performance; the clogging-induced service life of the high-pressure side filter in the downstream has been improved. In addition, the effective filtration area of the high-pressure side filter is optimized and its dimensions effectively reduced (Fig. 6).

Thanks to the above development techniques, the

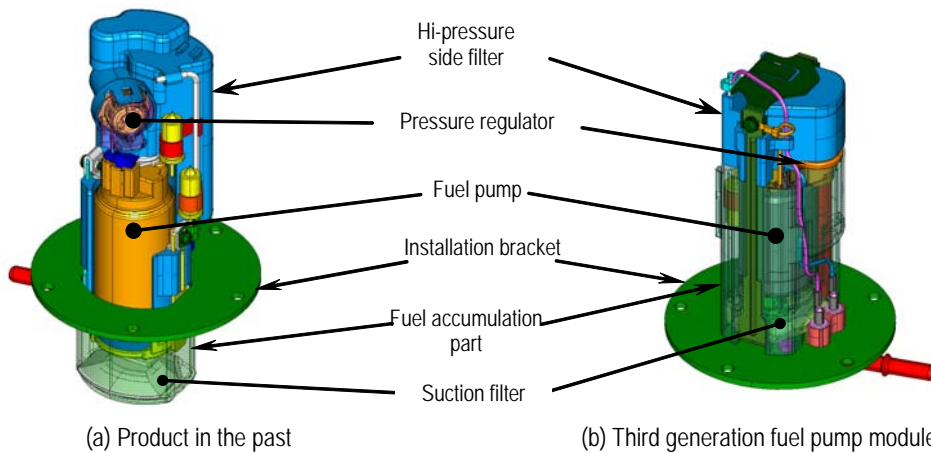


Fig.4 Fuel pump module

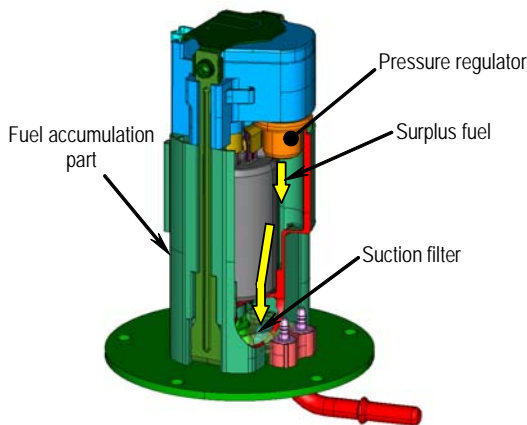


Fig.5 Structure of the fuel accumulation part

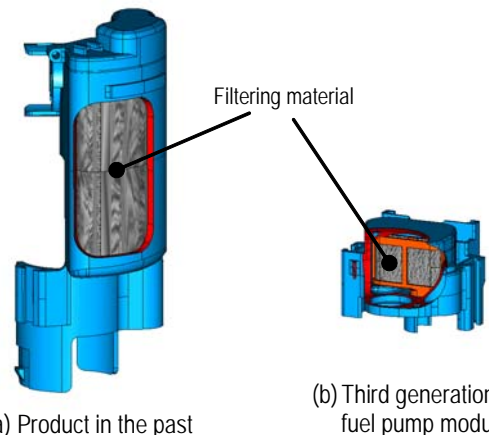


Fig.6 Miniaturization of the high-pressure side filter

Third-Generation Fuel Pump Module for Medium & Large-sized Motorcycles has a low height and weight, and so can be applied to a wide range of motorcycles, including design-conscious American type motorcycles equipped with low-profile fuel tanks and super-sports type motorcycles requiring a high power-to-weight ratio (Fig. 7).

In future, we will work on further reducing the size, weight, and power consumption to contribute to the advancement of motorcycles.



Fig.7 Third generation fuel pump module for middle & large-sized motorcycles