High-Power and Low Fuel Consumption Engine for Riding Mowers: FX820V EVO

In the US's commercial lawn-related market, the demand for engines with an electronic fuel injection (EFI) unit is increasing. Although we have released models fitted with an EFI system by using the same engine block as employed for existing carburetor specifications, competing manufacturers have also brought out their own product lineups. Against this background, we have developed the FX820V EVO—a new-generation engine with high power and low fuel consumption specially designed for EFI. It supersedes conventional models to increase the take-up rate of our engines among work machine manufacturers. Mass production of this model has already started, and it has appeared in the market as a component of riding mowers built by work machine manufacturers.

Introduction

In the commercial lawn-related market (for professionals) in the U.S., engines incorporating an electronic fuel injection (EFI) unit, which can accurately control the fuel injection amount and enables the improvement of fuel efficiency and good startability, have been adopted in riding mowers from operating machine manufacturers and higher performance models are demanded.

1 Background

In the US, professional gardeners (landscapers) are generally hired to mow lawns on large areas of land, such as general household gardens, in public places, and at supermarkets. To maximize their profits, landscapers look for mowers that are reliable (to avoid downtime), are powerful enough to quickly mow large areas of lawn, offer high fuel efficiency, and deliver a low lawn-mowing cost per unit area.

Kawasaki's products have long enjoyed a strong reputation for quality and reliability in commercial markets like the US's. However, competing engine manufacturers have also improved their lineups of models incorporating EFI, which offer better fuel efficiency than carburetor models. So to release a series ahead of the others with EFI specifications, we also developed and launched the FX850V-EFI, which uses the same engine block as that for conventional carburetor specifications.

However, work machine manufacturers demand higher added value for engines with EFI specifications. In response to this demand, we developed the FX820V EVO — the new-generation engine with EFI designed into it from the beginning to create an engine that delivers higher power and lower fuel consumption than before.

2 Specifications

Table 1 shows a comparison of the main specifications between the FX820V EVO, whose main parts were newly designed to incorporate EFI, and the FX850V-EFI — a conventional model that reuses the engine block with carburetor specifications. The FX820V EVO assumes highly accurate fuel injection control through EFI, employs three valves (two inlet valves and one exhaust valve) instead of the conventional two valves (one inlet valve and one exhaust valve), and has a higher compression ratio. In addition, the model is slightly smaller with a 30-cc reduction in displacement.

Table 1 Comparison of principal specifications: FX820V EVO vs. FX850V-EFI

Item	FX850V EVO	FX850V-EFI
Engine type	Air-cooled vertical shaft V-twin	
Valvetrain type	OH-3V	OH-2V
Displacement [cm^3]	822	852
Bore × stroke [mm]	83×76	84. 5×76
Compression ratio	9. 1	8. 2
Max. power [kW]	24. 1 / 3, 600 min^{-1}	19. 9 / 3, 600 min^{-1}
Max. torque [N·m]	65. 9 / 2, 600 min^{-1}	62. 0 / 2, 400 min^{-1}
Total length × total width × total height [mm]	519×521×624	524×515×620

3 Features

The engine specially designed for EFI has increased power and improved fuel efficiency by optimizing particular parts in the inlet, exhaust, and combustion systems. It also offers the reliability of conventional models by enhancing cooling performance and improving the durability of each section. We have done this to address the increase in the amount of heat generated by the engine that comes from the power increase. Moreover, since maintainability has been improved, landscapers who manage multiple work machines can inspect and maintain more quickly than in the past.

(1) Power increase

A higher compression ratio and two inlet valves enhance the heat efficiency and charging efficiency of air-fuel mixture. The power at a regular engine speed of 3,600 min^{-1} is about 20% higher than conventional models as shown in **Fig. 1**.

(2) Better fuel efficiency

By optimizing the layout of parts in the inlet system to lower the resistance along the inlet passage and then reducing the air-fuel ratio (the mixing ratio of fuel and air), we have reduced the fuel consumption rate in the regular power region by about 20% compared with conventional models.

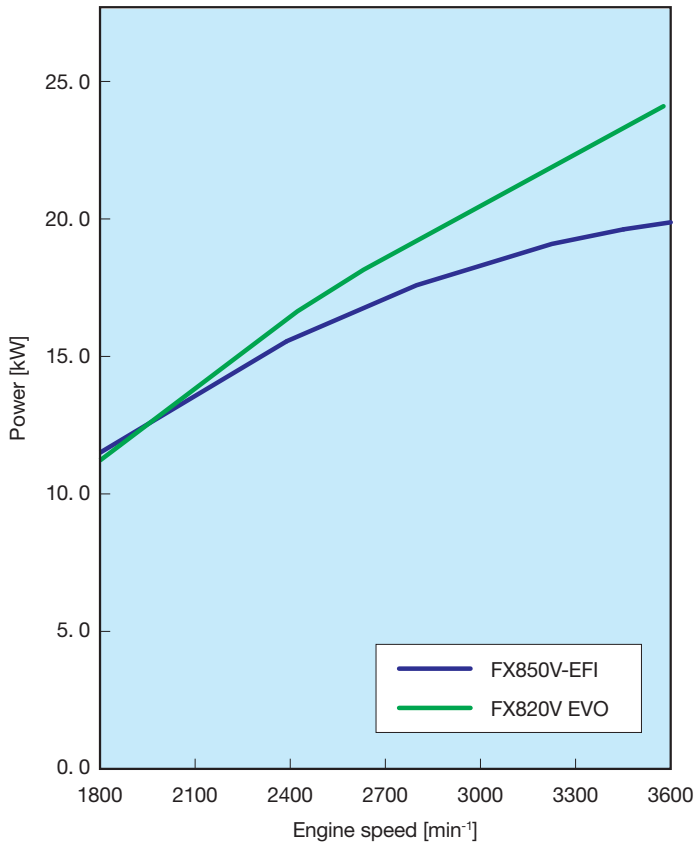

Fig. 1 Performance curves of FX820V EVO and FX850V-EFI

(3) Durability

The cylinder head is now manufactured using low-pressure casting, which offers high durability at high temperature, instead of conventional diecasting.

We also reviewed the cooling air guiding structure to concentrate cooling air onto hot portions.

This constrains the temperature rise associated with the power increase and ensures higher durability than conventional models even at high temperature.

(4) Maintainability

A wide opening for maintenance is located in one part of the engine cover. This makes it easy to clear away lawn clippings that accumulate around the cylinder and cylinder head, which causes overheating. In addition, a larger oil filler, serving as the oil inlet, is located in a high position for quick oil changes and inspections.

Fig. 2 Riding mower equipped with FX820V EVO

4 Delivery example

Mass production of this model for the US market started at the KMM factory at Maryville in January 2023. This model is mainly launched as a component of a type of ride-on mower called the zero-turn radius design shown in **Fig. 2**. This mower design can efficiently turn on a dime and is steered by applying speed differences to the right and left rear wheels.

Conclusion

The FX820V EVO has also been well received in the market because it has a power close to 1,000-cc class engines but needs fewer fuel refills. We will meet market needs by deploying this engine to other displacement classes as the EVO series.

Yasutaka Kobayashi

Contact
Kawasaki Motors, Ltd.
https://www.global-kawasaki-motors.com/en/inquiry/