

Introduction of Products

Small-size Wheel Loader WA80-8

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The WA80-8, an eco-friendly small wheel loader meeting the 2014 standards for non-road vehicle exhaust gas, has been developed based on the concept of “environment,” “safety,” and “information and communication technology (ICT)” and has been marketed.

This paper presents the aims of the development and the main features of the machine.

Key Words: WA80-8, wheel loader, electronically controlled Hydraulic Static Transmission (HST), exhaust gas regulations, KOMTRAX, environment, safety, ICT

1. Introduction

The production of the conventional machine, WA80-3, is out of production due to the third exhaust gas regulations. In response to our customers' comments that the WA100 is too large but the mini wheel loader is too small, we have developed the WA80-8 (Fig. 1), which met the 2014 standards for non-road vehicle exhaust gas in 2019 and is equipped with an efficient electronically controlled Hydraulic Static Transmission (HST), and in addition, which has significantly improved the performance and functionality by installing the latest technologies of high-end models. This paper presents the vehicle revived after 10 years.



Fig. 1 WA80-8
(from the photograph in the catalog)

2. Aims of Development and Means of Achievement

The basic concept is the pursuit of higher levels of the “environment,” “safety,” and “ICT” based on Komatsu’s “quality and reliability.” With this concept as the base, we pursued the safety and utilized ICT technology while making the machine meet the environmental regulations, and in addition, incorporated the market demands into it to significantly improve the competitiveness. The outline and features are described below.

- (1) Environment
 - Compliance with the 2014 Japanese regulations for non-road vehicle exhaust gas
 - Compliance with the MLIT standards for low noise type construction machinery
 - Adoption of electronically controlled HST
 - Addition of ECO indicator
- (2) Safety
 - Adoption of a canopy and cab compliant with Rollover Protective Structure (ROPS; ISO3471) and Falling Object Protective Structure (FOPS; ISO3449)
 - Addition of seat belt non-wearing alarm
 - Addition of secondary engine stop switch
 - Addition of battery disconnect switch
- (3) ICT
 - Equipped with Komatsu Machine Tracking System (KOMTRAX)
 - Reduction of theft risk with an ID key (option)

- (4) Improved maintainability
 - Equipped with hydraulic drive fan with the Automatic Fan Reverse Mode function
 - Gull-wing type engine side cover
- (5) More Enriched equipment
 - Adoption of reclining seat

3. Major Features

The following sections detail the incorporated items.

3.1 Environmentally-Friendly Characteristics

3.1.1 Engine with Both Excellent Environmental Performance and Economic Efficiency

- (1) Exhaust gas aftertreatment system for construction machinery

This system adopts Komatsu Diesel Oxidation Catalyst (KDOC) and removes particulate matter (PM) with a highly efficient diesel oxidation catalyst. It also reduces noise by the equipment of a high-performance silencer. (Fig. 2)

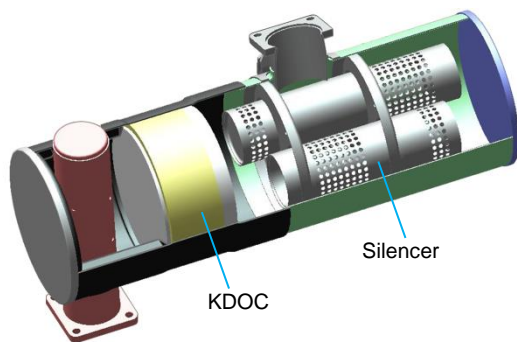


Fig. 2

(from the photograph in the catalog)

- (2) Electronic control system

This system optimally controls the engine according to the operating conditions monitored with sensors located at various locations. It contributes to reducing fuel consumption and noise as well as reducing NOx and PM. The engine status is shown on the monitor through the on-board network. Furthermore, optimal maintenance can be implemented by managing the above information with KOMTRAX.

- (3) Electrically controlled cooled exhaust gas recirculation (EGR) system

This system, which adopts a high-efficiency compact cooler, reduces NOx by reusing part of exhaust gas for combustion. It also contributes to reducing fuel consumption while reducing NOx. (Fig. 3)

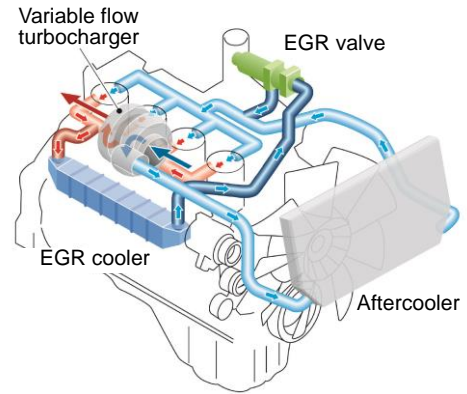


Fig. 3

(from the photograph in the catalog)

- (4) Variable flow turbocharger

The flow rate control valve controls the speed of the exhaust turbine wheel and supplies the engine combustion chamber with air at the optimal flow rate matching the load status. Through highly efficient combustion, it cleans off exhausted gas and reduces fuel consumption. (Fig. 4)

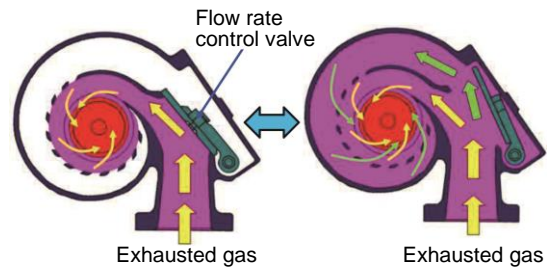


Fig. 4

(from the photograph in the catalog)

- (5) Komatsu Closed Crankcase Ventilation System (KCCV)

By using a KCCV filter, this system removes oil from the blow-by gas (unburned mixture gas) leaking into the crankcase. Then, it supplies the reduced gas to the intake side, mixes it with new mixture gas, and burns it to remove PM.

- (6) Common rail type optimum fuel injection system

This system controls the highly pressurized fuel by using the computer so that it can be optimally injected. The system brings it closer to complete combustion to reduce both PM and fuel consumption in the entire zone of the engine speed. (Fig. 5)

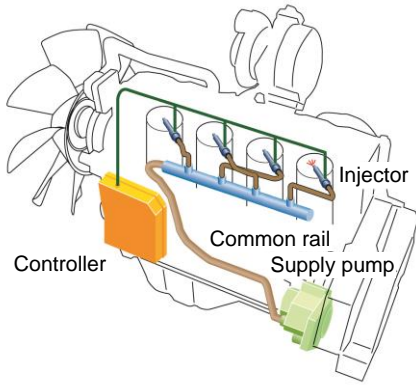


Fig. 5

(from the photograph in the catalog)

(7) Optimum combustion system

This system adopts a 16-valve cylinder head and, above the piston, has a combustion chamber with an improved shape. By significantly improving combustion efficiency, it reduces NOx, PM, and fuel consumption while maintaining power.

3.1.2 Excellent Quietness

This machine has excellent quietness by thorough low noise design such as reduction of engine noise and adoption of a hydraulic drive fan. It meets the MLIT low noise standards.

3.1.3 Enabling Smooth Operations

Following the highly evaluated electronically controlled HST of high-end models, this machine has the speed control and traction control selection functions, thereby enabling selection of the optimum performance matching various loaded objects and road surface conditions.

(1) Shift control system

This system allows the operator to select the maximum vehicle speed of four steps by using the speed range selection switch. (Fig. 6)

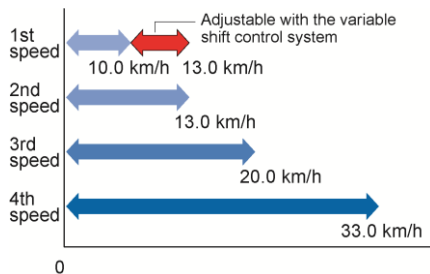


Fig. 6

(from the photograph in the catalog)

(2) Variable shift control system

By turning the travel speed adjustment dial during the first speed range, the maximum vehicle speed can be set freely in the range from 10.0 to 13.0 km/h according to the jobsite conditions. (Fig. 7)

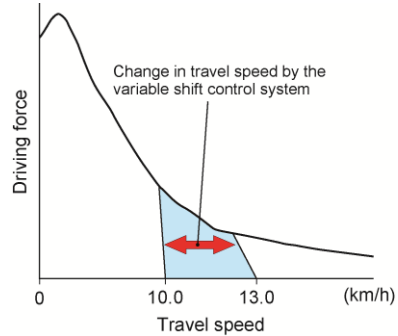


Fig. 7

(from the photograph in the catalog)

(3) Variable traction control system

With the traction control switch on, the driving force at low vehicle speed can be set to three steps. This system adopts a new mode, S, which provides the optimum driving force on slippery road surfaces. Using only one switch, this mode can reduce the tire slips, for example, during snow removal work on a snow surface and make the work easier. (Fig. 8)

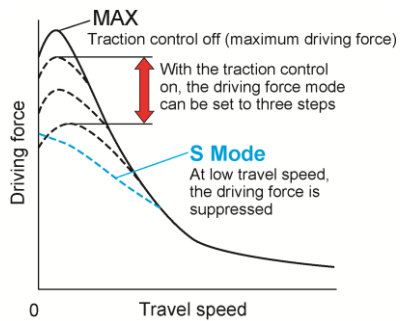


Fig. 8

(from the photograph in the catalog)

3.1.4 ECO Indicator

The main monitor of this machine has an “ECO Indicator,” which assists eco-friendly energy-saving operation. During energy-saving operation with a little CO₂ emission amount at good fuel consumption ratio, the green ECO indicator lights up.

3.2 Safety

3.2.1 Safety Equipment Meeting the Komatsu Standard

This machine with cab specification meets the ROPS, FOPS, and head guard standards, and adopts pillarless glass for both front and rear for outstanding visibility. The spacious operating space with ample room at the operator's feet has a walk-through structure that allows mounting and dismounting from either the left or right door. (Fig. 9)



Fig. 9

(from the photograph in the catalog)

3.2.2 Putting the Operator Safety First

When the seat belt is yet unfastened, this machine warns the operator by lighting on the main monitor. (Fig. 10)



Fig. 10

(from the photograph in the catalog)

3.2.3 Preparation for Emergency

A secondary engine stop switch has been added to the lower left of the operator's seat for an emergency stop of the engine if the main switch fails to stop it in the event of a vehicle abnormality. (Fig. 11)



Fig. 11

(from the photograph in the catalog)

3.2.4 Preventing Electric Shock Accidents

This machine has a battery disconnect switch as standard equipment with which the battery power can be cut off without tools, for example, before maintenance of electric circuits. (Fig. 12)



Fig. 12

(from the photograph in the catalog)

3.2.5 Reducing the Risk of Theft

Installing the optional ID key is useful for preventing theft because the engine can only start with the ID key registered in the vehicle.

3.3 ICT

3.3.1 Strong Support for Vehicle Management and Fuel Cost Reduction

As standard equipment, this machine has KOMTRAX (installed on other models and highly evaluated), thereby enabling quick service response by grasping the operating and failure status of the vehicle.

3.4 Maintainability

3.4.1 Easy Cleaning of Radiator

The hydraulic drive fan with the Automatic Fan Reverse Mode function has implemented the reduction of warm-up time in winter, the improvement in heater performance, and the reduction of fan noise by automatically controlling the fan speed according to engine cooling water temperature, HST oil temperature, and engine speed.

In addition, the Automatic Fan Reverse Mode function, already adopted in high-end models, has been added as standard equipment. Operating the fan reverse switch in the cab can reverse the hydraulic drive fan, thereby blowing off dust adhered to the radiator, aftercooler, and hydraulic oil cooler. This has extended cleaning intervals of and eased work of the cleaning for radiator clogging at the site where light loading objects such as timber chips and grass are handled.

The reverse switch has the Manual and Automatic Fan Reverse Modes; the latter can perform the automatic reversing operation at the set interval time or at the time of the set

reversal duration and can extend the cleaning interval. These interval time and reversal duration are changeable in the monitor service mode, and it is designed to allow for adjustment depending on the working conditions. (Fig. 13)



Fig. 13

(from the photograph in the catalog)

3.4.2 Easy Maintenance

The gull-wing type engine side cover is easily openable/closable with a small force by the gas spring. In addition, its large opening area makes daily inspections easy.

In addition, a large step and handrail have been added on the right rear side of the frame to allow access to the back of the engine room. (Fig. 14)



Fig. 14

(from the photograph in the catalog)

3.5 More Enriched Equipment

3.5.1 Optimum Operation Posture

A reclining function has been added to the seat so that the operator can freely take the operation posture according to his/her size. (Fig. 15)



Fig. 15

(from the photograph in the catalog)

4. Conclusion

In this paper, we introduced WA80-8 for which full model change was performed for the first time in about 10 years. In this development, we have succeeded in increasing the competitiveness of the machine by incorporating various new technologies, such as the HST system and hydraulic drive fan, into the machine while making the machine meet the 2014 regulations for exhaust gas. This machine has already been deployed in Japan, and from our customers, we have received feedback better than expected.

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[A comment from the authors]

The development of this machine involved many twists and turns since the planning stage and required a long development period; however, we finally succeeded in marketing it by close cooperation with other Development Centers, factory-related departments, and the Test Engineering Center.

This machine is a long-awaited model in the market and is a vehicle with high competitiveness that incorporated many technologies and features currently being well received for high-end models. Thus, we will keep up with market information quickly and provide our best support to satisfy our customers.