

Introduction of Product

Introduction of Medium Size Wheel Loader WA380-6

This article may include specs that apply only to Japan. Product specs may vary worldwide.

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Changing of models of the medium size wheel loader WA380-6 was put on the market in Japan in July, further refining “environment,” “safety,” “IT” and “economy” which are the “Dantotsu” keywords of Komatsu. The new technologies and improvements incorporated in the new model are described.

Key Words: WA380-6 wheel loader, EPA tier-3 exhaust gas regulation, EU tier-3 exhaust gas regulation, EU tier-2 noise regulation, “Dantotsu,” low fuel consumption, Hydrau MIND system, lock up clutch

1. Introduction

Since it was introduced to its market in 2001, the WA380-5 has won a high reputation globally as the wheel loader of a global standard higher in dimension featuring quality, reliability and economy.

Based on this WA380-5, a medium-size wheel loader, the WA380-6, has been developed and sold, further refining “environmental friendliness,” “safety,” “IT” and “economy,” which are the “Dantotsu” keywords of Komatsu. This report overviews the latest addition to Komatsu’s product lineup.



Photo 1 WA380-6

2. Aims of Development

The fuel price accounting for about 30% of vehicle operating expenses remains stationary at a high level reflecting the unstable Middle East situation and the global high demand for oil including demand in China. High fuel prices are becoming a heavy burden to users, and balanced enhancement of economy and productivity has been desired. A reduction in environmental load has been demanded and exhaust gas regulations have gradually become stricter in Japan, the U.S.A. and Europe.

Examining the usage of vehicles of this class, the largest use is the loading of gravel and crushing as crushed rock. Additionally, the ratio of snow removal work and port work as

in the loading of timber is increasing, raising needs for the versatility of vehicles. In addition to enhanced safety and operation comfort, which are common needs, more wheel loaders are used in places near residential areas rather than mountains and riversides. This makes low noise and low vibration all the more important.

Incorporating “quality, reliability and economy” that have been verified by its predecessor, the WA380-5, as a base, activities to meet changes in social and market trends have been undertaken, and improvements in “environmental friendliness,” “safety,” “IT” and “economy,” which are the “Dantotsu” keywords of Komatsu, have been made

The following product concepts were incorporated to implement “environmental friendliness,” “safety,” “IT” and “economy.”

- : New concept incorporated into new model
 - : Concept already incorporated into conventional machines
- (1) Balanced implementation of both excellent productivity and “Dantotsu” economy
 - High-efficiency hydraulic system assuring a minimum of losses by the Hydrau MIND system
 - Low fuel consumption by Komatsu’s engine technology “ecot3”
 - Eco mode made easier to use by the dual-mode power select system and new kick-down mechanism
 - Addition of operational guidance for low fuel consumption by eco indicator lamps
 - (2) Support of comfortable operation
 - Large pillarless cab
 - Adoption of large armrests integral with a console
 - Accurate management of loading volume by a monitor with a load meter
 - Air conditioner installed in the fore for enhanced cooling and heating performance
 - Active travel damper to lessen fatigue and prevent cargo

- spilling
- (3) Reputable reliability and durability
 - Adoption of major components of Komatsu’s original design
 - Face-seal joint
 - Electrical part inside cab contained in a waterproof box
 - Waterproof DT connectors
 - Bucket side edges installed as standard specification
 - Bucket cylinder covers installed as standard specification
- (4) High maintainability and safe design
 - Good visibility through pillarless front window and center layout of muffler
 - Rear underview mirror (compliant with new ISO standard)
 - Tilted ladder steps
 - New cab of FOPS/ROPS construction
 - Hydraulic driven fan with an automatic reversing function
 - Gull-wing side panels
- (5) More friendly to humans and the environment
 - Compliant with exhausted gas regulations by Komatsu’s engine technology “ecot3”
 - Compliant with EU Stage 2 noise regulation
- (6) Advanced KOMTRAX
 - Vehicle management of users supported by KOMTRAX report and KOMTRAX My Construction Machinery Net services
 - Provisioning of peace of mind to users by e-mail dispatch service and just-on service

3. Principal Features

The following features are incorporated into the WA380-6.

3.1 Hydrau MIND system

The newly developed Hydrau MIND system (variable displacement piston pump + CLSS [closed-circuit load-sensing system]) is installed to automatically feed only the needed quantity of oil when the work equipment requires it, thereby drastically reducing losses. The hydraulic pressure of the hydraulic system has been raised from 21.4 MPa to 31.4 MPa to miniaturize the hydraulic equipment and also to make it efficient.

The hydraulic circuits for operations of the boom, bucket and attachment are parallel circuits, affording a flow rate using a pressure compensation valve during simultaneous operation

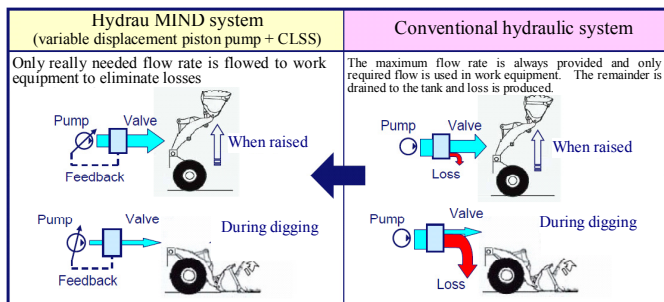


Fig. 1 Comparison of Hydrau MIND system and conventional hydraulic system

of the bucket and attachment commensurate with lever operation without depending on the load level. Workability has been enhanced in simultaneous operation in snow-removing work and log handling operation to grab timber.

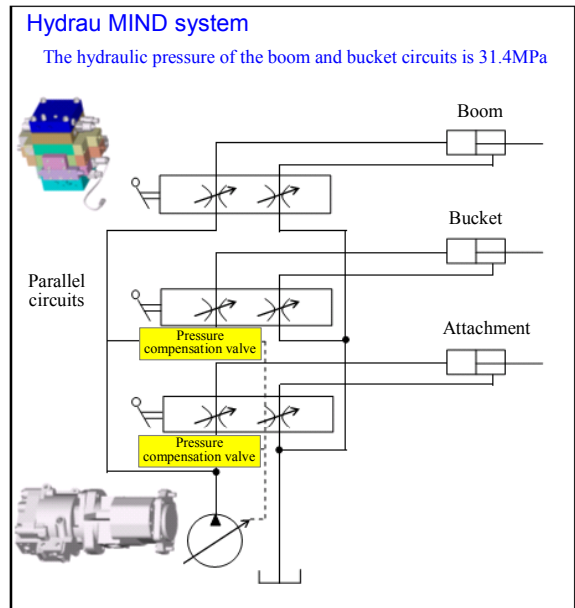


Fig. 2 Hydrau MIND system circuit (Conceptual diagram)

3.2 Low fuel consumption and exhausted gas regulation compliance by “ecot3” (ecology & economy technology 3)

The SAA6D107 engine in a new series installed in the PC208-8 is also adopted, instead of the SAA6D114 engine installed in the WA380-5.

Instead of two air supply and exhaust valves + mechanical governor, four air supply and exhaust valves + electronically controlled high-pressure fuel injection system (HPCR: high-pressure common rail) are adopted to optimally control fuel injection. In combination with a newly designed combustion chamber, ecot3 has cleared Tier-3 exhaust gas regulations of three poles, Japan, the U.S.A. and Europe. Even though its displacement is small, this fuel injection system features high output and produces large output, accomplishing acceleration performance equal to or higher than that of conventional machines as well as improving fuel consumption.

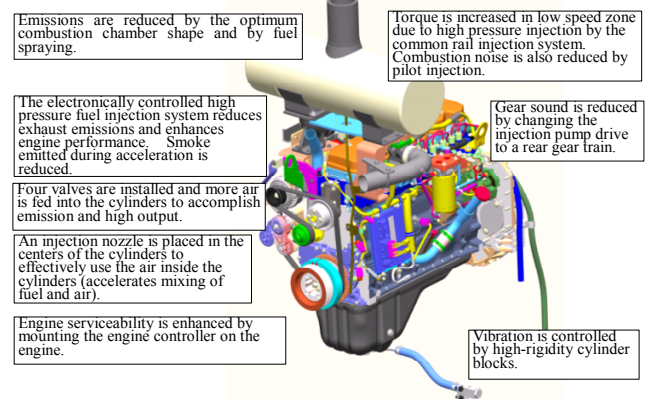


Fig. 3 Engine technologies

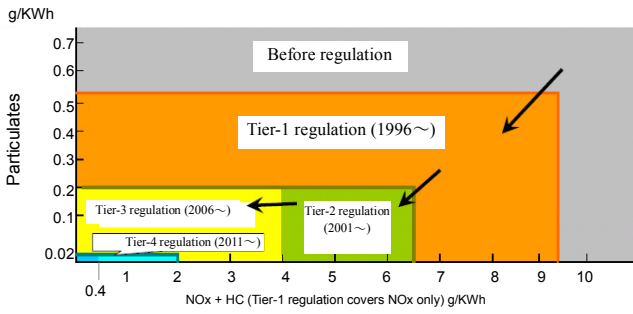


Fig. 4 History of exhaust gas regulation (Regulation by EPA, USA)

3.3 Dual-mode power select system

An engine power select system is adopted to select the engine output characteristic from two modes.

Selecting Mode E, the engine matches in a high fuel efficiency zone and fuel consumption lowers, achieving enhanced work efficiency and low fuel consumption.

Mode E	Suits normal V-shape loading work when work rate and low fuel consumption (fuel consumption efficiency) are desired.
Mode P	Used when largest power is needed, in uphill travel or when the production quantity is given the highest priority.

Fig. 5 Selection of modes

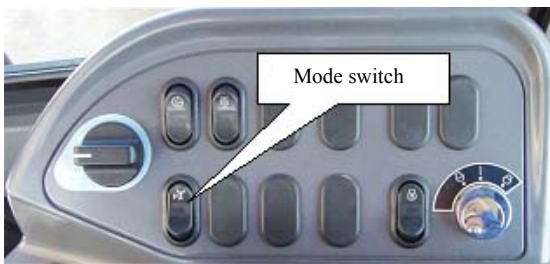


Fig. 6 Dual mode power select switch

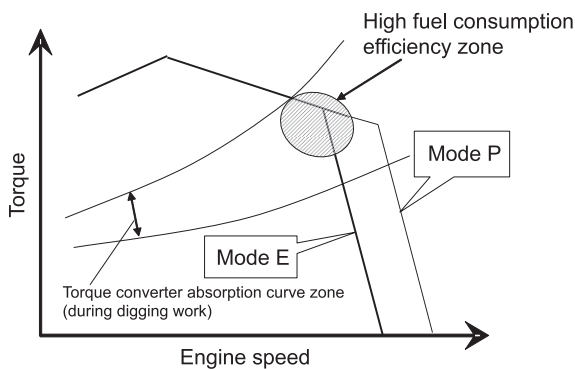


Fig. 7 Engine torque curve (Modes P and E)

A one-touch power-up function is added to the kick-down switch. By only pressing the kick-down switch when changing from hard digging to scraping work in Mode E, Mode P can be set. This mechanism enhances the usability of Mode E.

Reductions in hydraulic pressure losses achieved by the Hydraul MIND system directly increase the drive power, and the engine becomes more powerful. Mode E that is optimized to normal product loading can be set.

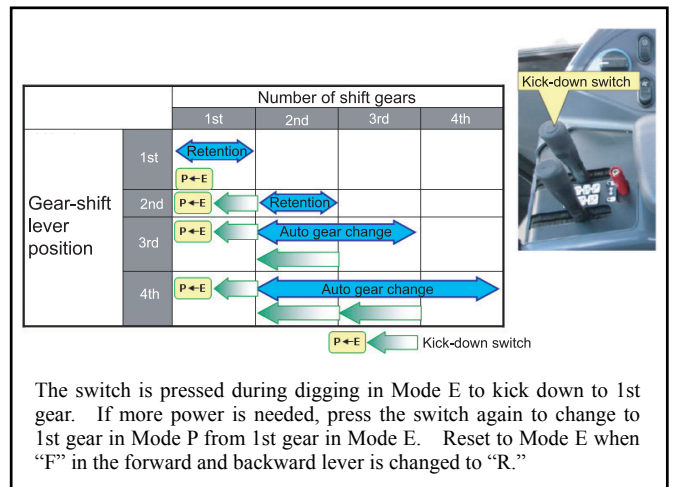


Fig. 8 One-push power-up function

3.4 Automatic transmission

The shift point varies according to condition of stepping on the accelerator pedal for easy shift control tailored to the road surface condition to make automatic transmission easier to use. Three automatic modes in the past have been reduced to two modes.

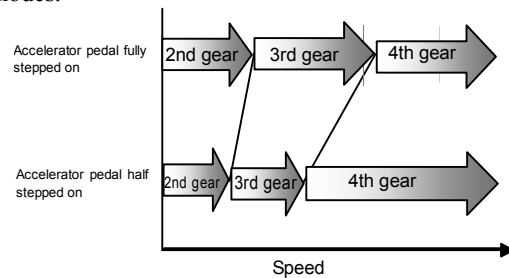


Fig. 9 Accelerator pedal response formula

3.5 Torque converter lock up system (option)

As in WA380-5, the WA380-6 features the lock up torque converter as an option. Fuel consumption during travel can be improved by high-speed travel while traveling to sites such as loading and carrying work and snow removal work and by an increase in travel speed in uphill traveling.

In 3rd gear and 4th gear, the lock up clutch system automatically activates when the vehicle reaches a preset travel speed.

Table 1 Fuel consumption improvement by lock up clutch system (option)

3rd gear 6° uphill road 15km/h (ℓ/h)	△25%
4th gear flat road 33km/h (ℓ/h)	△30%

3.6 Eco indicator lamps

As in the WA500-6 and WA600-6, the WA380-6 features an eco indicator on its monitor panel, adding an eco drive guidance function.

3.7 High fuel economy

The combination of the “ecot3” engine technology, “Hydrau MIND” system hydraulic technology and machine body core technology described above has accomplished a “Dantotsu” fuel consumption efficiency and excellent productivity.

Table 2 Fuel consumption improvement over conventional Komatsu model

Fuel consumption efficiency* (m ³ /ℓ)	△10%
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*: In-house test data (Mode P, V-shape dump loading)
Efficiency differs in actual work depending on the conditions and nature of the work.

A further fuel consumption improvement will be possible by actively using Mode E, the eco indicator lamps and lock up clutch (option) in traveling at high speed.

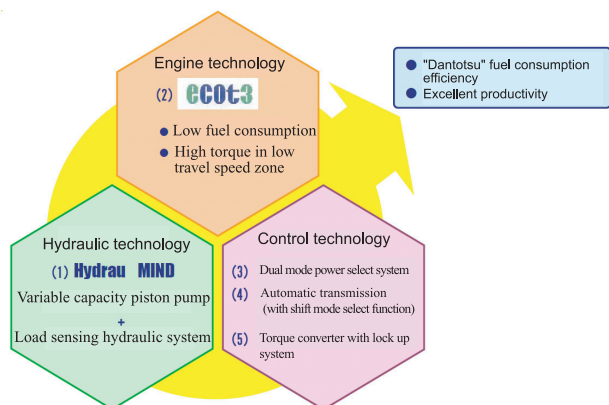


Fig. 10 Factors for high fuel economy

3.8 Large pillarless cab

A new FOPS/ROPS cab with a frame built with formed pipes is adopted. Instead of the simple square pipes that were used, formed pipes are used in pillars. Contact between pillar seals and the door is improved while maintaining rigidity and improving tightness of the cab from 50 to 100 Pa and reducing operator noise from 72 to 71 dB (A).

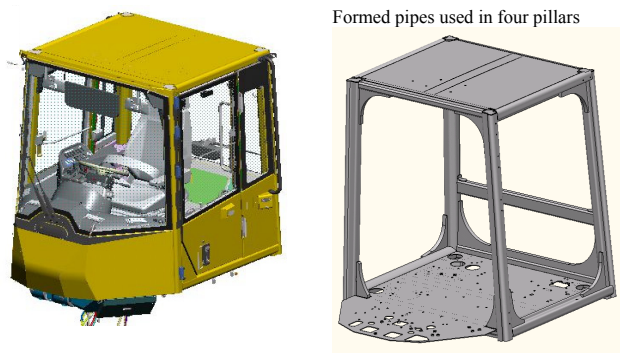


Fig. 11 New FOPS/ROPS cab

3.9 Air conditioner installed under dashboard

In the past, the air conditioner was installed behind the operator’s seat and hot air and cold air were mixed in the left console. A long path is needed to the air outlet on the dash panel passing through the duct under the floor. In the WA380-6, the air conditioner unit is installed under the dashboard and a duct is eliminated to reduce heat loss as well as airflow loss caused by ventilation resistance.

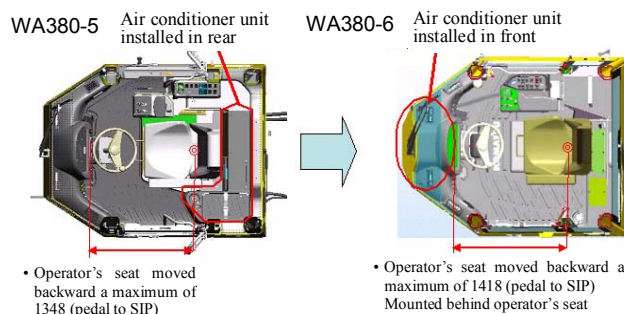


Fig. 12 Comparison of air conditioner layout

Installation of the air conditioner unit in the front affords a wider space behind the operator’s seat. The seat is installed 100 mm backward, providing ample space even for an operator of large build.

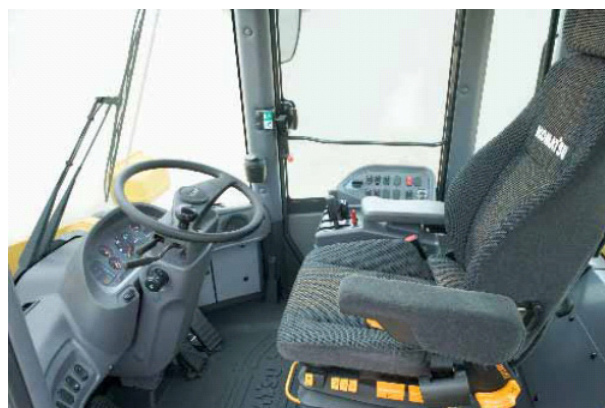


Fig. 13 Inside cab

The outside air filter installed in the front can be accessed from the ground, thereby improving filter maintainability.



Fig. 14 Left: outside air filter, right: inside air filter

3.10 Other improvements on cab

Other improvements made on the cab include large armrests, wider door opening width, roof shape and load meter controllability.



Fig. 15 Large armrest



Fig. 16 Wider door opening width

A roof band drains rainwater accumulated on the roof through the rear of the roof, preventing rainwater from falling through the roof front or sideways. This is useful when getting into and getting out of the cab and during operation in rain.



Fig. 17 Improved roof shape

3.11 Electrical part inside cab contained in waterproof box

Electrical part is installed in a waterproof box in the rear inside the cab. High reliability is ensured by installing more waterproof DT connector and face seal joints.



Fig. 18 Waterproof box inside cab



Fig. 19 DT connector and face seal joint

3.12 The bucket side edges and bucket cylinder covers are standard specifications.

Wearing of the bucket requires repair by welding, causing downtime and cost problems. Requests for improvement were voiced. The bucket side lips especially are worn and spilling of cargo is caused when wear advances. Beginning with the WA380-6, side edges are installed as a standard specification for the prevention of wear and for easy change.

When loading a product into the bucket from a hopper, stones collide with the bucket cylinders, damaging the cylinder rods and causing oil bleeding. The Komatsu distributors and users have installed guards by themselves. Beginning with the WA380-6, bucket cylinder guards are installed as a standard specification to enhance cylinder durability.



Fig. 20 Bucket side edge and bucket cylinder cover

3.13 Muffler center layout and rear underview mirror as standard specifications

The ISO (International Standards Organization) has set a new standard on operator ambient visibility to prevent accidents during operation. The WA380-6 complies with the

new ISO standard by installing a rear underview mirror to check obstacles to the rear. The safety functions are provided globally. The muffler center layout, which was a request item with the WA380-5, has been implemented in the WA380-6, improving ambient visibility in conjunction with the pillarless cab design that has been implemented for some time.



Fig. 21 Muffler center layout and rear underview mirror

3.14 Hydraulic driven fan with automatic reversing function

Suctioning of sand of fine grain size that easily scatters in the air, light wood chips and other suspended solids into the radiator deteriorates the cooling performance and causes overheating. At sites where these suspended solids scatter, the radiators have to be cleaned periodically by air blowing. The WA380-5 incorporated a function to manually reverse revolutions of the fan. The WA380-6 additionally incorporates a function to automatically reverse fan revolutions periodically. The new function is expected to lessen the cleaning work load of the radiator cores.

The interval to change to reverse the fan revolutions in the cleaning mode and the duration to continue reverse revolutions can be changed in the monitor service mode, allowing adjustment in accordance with the operating condition. The side-by-side radiator cooler is adopted for radiator cooler cleaning.

The radiator construction allows changing the cores merely by the auxiliary work of removing the plastic grills.

(In the initial setting, fan operation is reversed for 2 minutes every 2 hours)

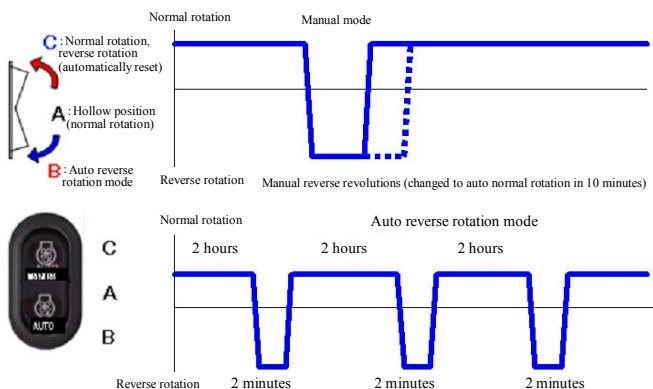


Fig. 22 Auto reverse rotation function

4. Conclusion

After introducing the WA380-5 to the market in 2001, surveys of users at sites were conducted in Japan, the U.S.A. and Europe, enabling user requests to be actively incorporated into the WA380-6.

I am confident that the hydraulic excavator technology as in the “Hydrau MIND” system and the new engine incorporating the “ecot3” technology, while retaining the product exterior design of the WA380-5 that has won a high reputation and identity of the GALEO series, will demonstrate the high technological power of Komatsu globally.

Introduction of the writer



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[A few words from the writer]

The development of the WA380-6 represents the development of the third series after the development of the medium-sized WA380-5 following the transfer of wheel loader production from Komatsu Mec to Komatsu’s Awazu Plant. The manufacture of the WA380-6 was started almost simultaneously in Japan, the U.S.A. and Europe and its sale was first started in Europe and the USA where regulations were enforced ten months earlier, ahead of Japan. Thanks to the cooperation of the Awazu Plant, the mother plant, and of local production companies in North America and Europe in making minute studies and preparations beforehand, production started very smoothly in each of the plants.