

Introduction of Products

Introduction of Bulldozer D155AX-7

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The high performance bulldozer D155AX-6 has been improved under the concept of “environment”, “safety” and “information communication technologies (ICT)” and the new model D155AX-7 which conforms to the Tier4 exhaust gas regulations is now launched. This item describes the main features of D155AX-7.

Key Words: Bulldozer, Exhaust Gas Regulation, Sigmadozer, Lockup, Automatic Gear Shift, Auto Pitch

1. Introduction

The current D155AX-6 complies with the Tier3 exhaust gas regulations and is highly evaluated in the market for its unrivalled fuel economy, productivity, durability and economy. This time, the large-sized bulldozer D155AX-7 (**Fig. 1**) which mounts a new generation engine that meets more stringent exhaust gas regulations of Japanese 2011 Off Road Law, U.S. EPA Tier4 Interim and EU Stage 3B regulations and which inherits current unrivalled performance has been developed and introduced to the market. This article introduces its features.



Fig. 1 External view of Komatsu D155AX-7

2. Development Objectives

The basic concept is pursuit of higher levels of “Environment”, “Safety” and “ICT (Information

Communication Technology)” based on KOMATSU’s “Quality and Reliability”. Based on this concept, the product competitiveness has been substantially increased by complying with environmental regulations, reducing environmental loads, pursuing safety and utilizing the ICT technology. Features incorporated into D155AX-7 are as follows.

2.1 Environment

- 1) Mounting an engine meeting the Japanese, U.S. and European exhaust gas regulations
- 2) Automatic gear shift powerline with lockup function
- 3) Support for reduction in fuel consumption with energy-saving guidance function

2.2 Safety

- 1) Installation of seat belt alarm
- 2) Installation of battery disconnect switch
- 3) Installation of secondary engine switch
- 4) Installation of rear monitor camera

2.3 ICT

- 1) Adoption of high-resolution 7-inch LCD monitor
- 2) Expansion of KOMTRAX information

2.4 Operability

- 1) Adoption of blade auto pitch

3. Main Features

(1) Environment

The amount of emission of NOx (nitrogen oxides) and PM (particulate matter) has been considerably reduced by mounting a new generation engine “Komatsu SAA6D140E-6” combining our unique engine technologies which have been accumulated for long years, and this new model has passed the 2011 Off Road Law. New technologies adopted for this engine (Fig. 2) are introduced below.

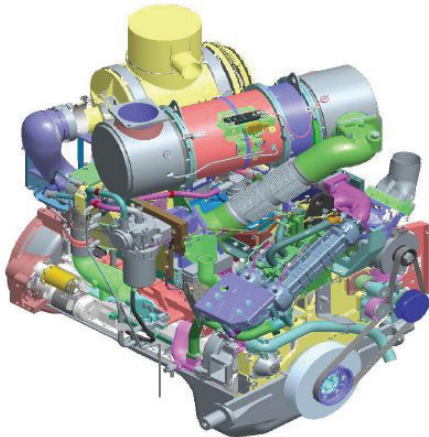


Fig. 2 External view of engine

1) Variable turbo system for construction machinery

Komatsu’s unique “Komatsu Variable Geometry Turbo System (KVGT)” uses the hydraulically-operated variable nozzle located in the turbocharger. (Fig. 3) This nozzle is controlled according to the engine load to optimize the air flow rate and pressure, realizing high efficiency combustion and allowing for low emission, low fuel consumption and good responsiveness.

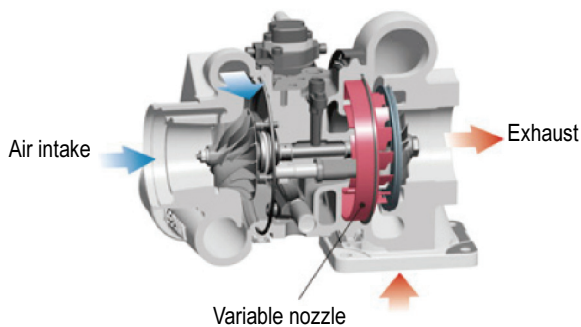


Fig. 3 Structure of KVGT

2) Exhaust gas aftertreatment system for construction machinery

The structure of “Komatsu Diesel Particulate Filter (KDPF)” is shown in Fig. 4. KDPF is a continuous regeneration type filter system in which the oxidation catalyst is arranged at the pre-stage of the soot filter. It captures soot

including PM and purifies exhaust gas, and at the same time, it burns captured soot continuously in normal operations to regenerate the filter. It is also installed with a control system which automatically detects an accumulated condition of soot via the temperature sensor and pressure sensor and forcibly burns soot. Thus, this is a system in which the filter can be regenerated under various operating conditions.

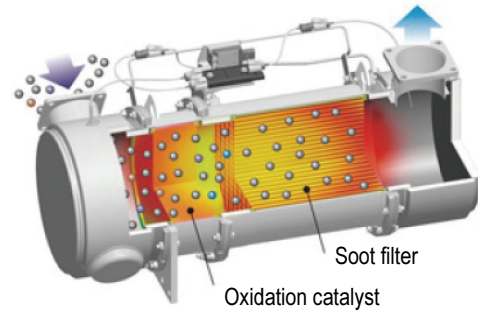


Fig. 4 Structure of KDPF

3) Electronically-controlled cooled EGR system for construction machinery

This is a system which reduces NOx by recirculating a part of exhaust gas and reusing it for combustion. The schematic drawing is shown in Fig. 5. To pass the 2011 Off Road Law, it is important to sufficiently decrease the temperature of exhaust gas to be recirculated. For this purpose, a newly designed, high cooling efficiency EGR cooler is installed. To the EGR valve which controls recirculated exhaust gas flow rate, our unique hydraulic drive system which has both sufficient reliability and durability even in the severe environment and usage of construction machinery has been applied. This has realized a highly durable EGR valve which can control gas flow rate with high accuracy in spite of its compact size.

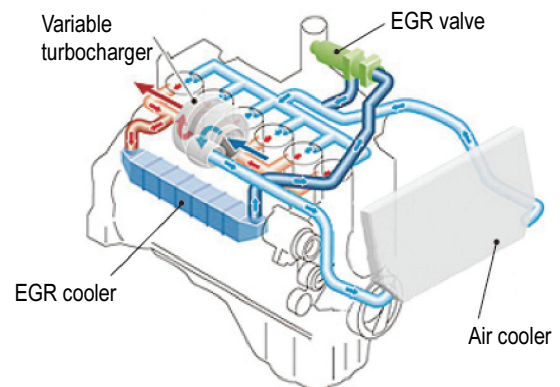


Fig. 5 Electronically-controlled cooled EGR system

4) “Komatsu Closed Crankcase Ventilation System (KCCV)”

To pass the 2011 Off Road Law, it is necessary to take in

and burn blowby gas, which was released to the atmosphere in the past. As blowby gas contains oil content, it must be removed before recirculation. Otherwise, performance of other equipment can be impaired. Therefore, KCCV with a built-in high performance filter which can remove the oil content efficiently is installed. KCCV is equipped with a pressure sensor which detects filter clogging and is placed in the engine compartment for easy filter maintenance. The external view of KCCV is shown in Fig. 6.

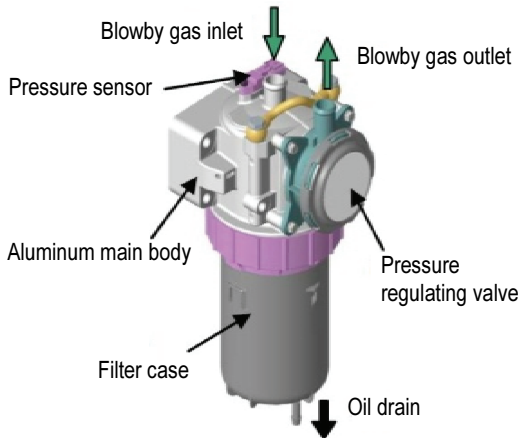


Fig. 6 KCCV

(2) Improvement in economy and work efficiency

The optimal gear shift control according to a work condition which is realized by the automatic gear shift powerline with lockup function established by D155AX-6 and several functions which have achieved the improvement in work efficiency such as Sigma dozer based on a new excavation theory are introduced.

1) Automatic gear shift powerline with lockup function

An automatic gear shift powerline with lockup function which has increased the transmission efficiency to the utmost maximum has been adopted and the optimal transmission speed gear is selected. In combination with the adoption of KVGT and advanced engine control system, it has become possible to always perform work at highest efficiency with little gear shift shock.

2) Sigma dozer

Sigma dozer (Fig. 8) characterized by projection in the central portion has been adopted to increase the work rate. Loss created between the blade and soil has been reduced by providing a projection to the center of the hollow shape of the conventional semi-U dozer (Fig. 7) to make the shape convex. Furthermore, spilling of soil over the sides has been reduced by providing bulges to the front shape and the blade can move while holding a certain amount of soil. Thus, a 15% increase

in work rate has been achieved compared to that of the conventional semi-U dozer.

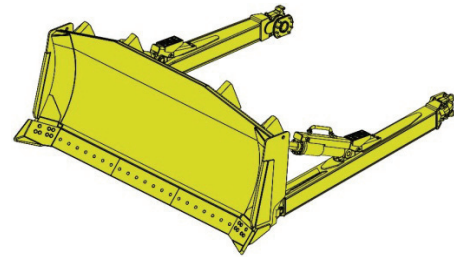


Fig. 7 Semi-U dozer

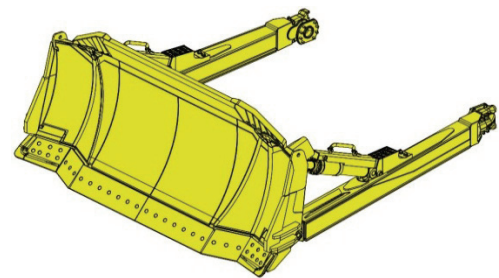
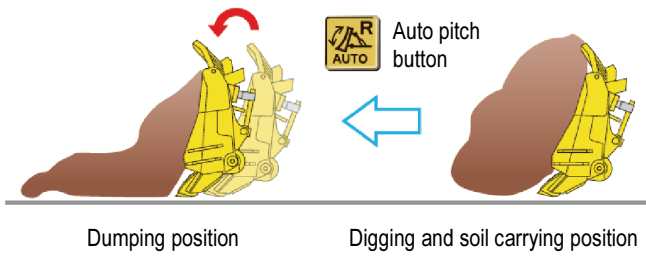


Fig. 8 Sigma dozer

3) Blade auto pitch

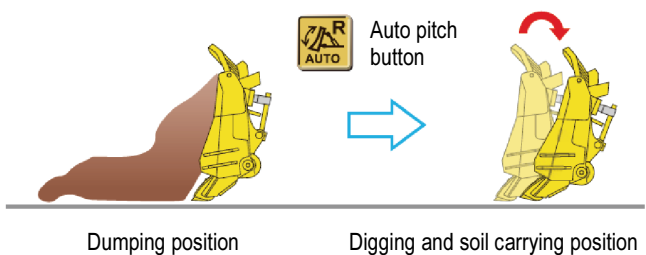
On a machine with dual tilt dozer specifications, the blade is set in two positions: the digging and soil carrying position and the dumping position. In addition to the manual operation with which the angle can be freely adjusted within this range, the same as the previous model, a blade auto pitch function in which the position is changed with just one button (after mode setting) has been newly added. Furthermore, by changing the mode, the following modes are available: Auto pitch mode (Fig. 9) in which the position is changed each time the button is pressed, auto pitch backward travel interlock in which the position is automatically changed to the digging and soil carrying position during backward travel without pressing the button, and digging position set mode in which the position is always changed to the digging and soil carrying position when the button is pressed. Efficient work can be performed by using these modes properly when digging, soil carrying and dumping are performed repeatedly.

■ When traveling forward: Each time the auto pitch button is pressed, the digging and soil carrying position and dumping position are switched alternately.



Dumping position Digging and soil carrying position

■ When traveling backward: When the auto pitch button is pressed while in neutral or traveling backward, the position is changed to digging and soil carrying position.



Dumping position Digging and soil carrying position

Fig. 9 Example - Auto pitch mode

(3) Safety and comfortability

1) ROPS integrated cab

Very high rigidity has been secured by integrating the cab, ROPS and the floor. In addition to the improvement in durability due to the above, the adoption of a hydraulic drive fan superior in quietness and low-noise engine contributes to the reduction in noise at operator's ears. (Fig. 10)



Fig. 10 ROPS cab

2) Rear monitor system

A camera for checking the rear of the machine is installed at the rear of the cab. The rear condition can be vividly checked with a high-resolution LCD monitor (Section (4)). The guideline display mode and automatic mode in which camera image is automatically displayed when the operation lever is moved to the backward position can be selected. The camera at the rear of the cab and camera image are shown in

Fig 11.



Fig. 11 Rear checking camera and camera image

3) Seat belt alarm

When the seat belt is not fastened, an icon illuminates on the upper left side of the monitor screen to urge the operator to wear the seat belt. (Fig. 12)



Fig. 12 Seat belt alarm

4) Battery disconnect switch

A switch to shut off the battery power supply circuit is provided to protect an operator and the machine body when the machine is not used for a long time, when electric circuits are repaired, or when electric welding is performed. (Fig. 13)



Fig. 13 Battery disconnect switch

(4) ICT

1) High-resolution 7-inch LCD monitor

A high-resolution liquid crystal display is newly used for the monitor screen. The visibility has substantially improved thanks to high resolution. The switch layout has followed the simple structure acknowledged in the conventional machines and the monitor system is now easy to use and is particularly easy to see. This monitor supports 33 languages. (Fig. 14)



Fig. 14 High-resolution 7-inch LCD monitor

2) Support for energy-saving operation

a. ECO guidance, ECO gauge, fuelometer

Six types of ECO guidance such as “Let’s suppress hydraulic relief” and “The use of E mode is recommended” are pop-up displayed on the monitor screen in real time according to an actual operating condition and inform the operator of the situation timely to support energy-saving operation. In addition to the ECO gauge which has been well-received from the previous model, a fuelometer which displays the average fuel consumption is equipped for energy-saving operation. (Fig. 15)

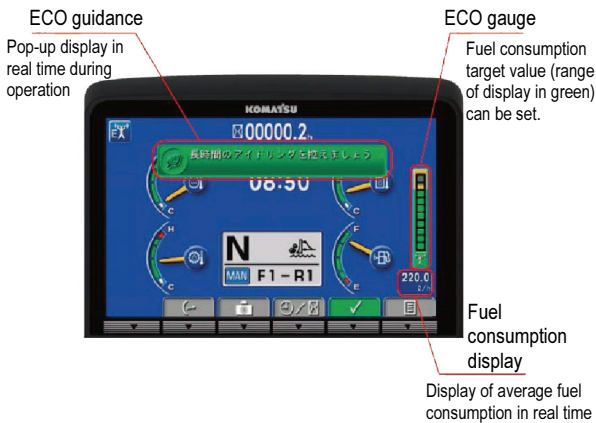
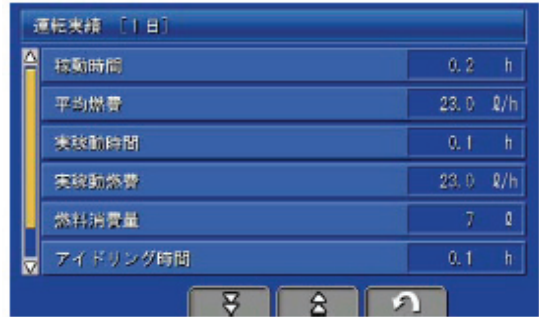


Fig. 15 ECO guidance, ECO gauge, fuelometer

b. Operation result, fuel consumption history and ECO guidance record

With one touch from the energy-saving guidance menu screen, “Operation result screen” (display of operating time, average fuel consumption, idling time, etc. for one day or any split measured time), “Fuel consumption history screen” (display of fuel consumption of latest 12 hours for each hour with bar graph or display of fuel consumption of latest one week for each day with bar graph) or “ECO guidance record”

(display of the number of times of pop-up of each ECO guidance and one point advice for one day) can be checked. (Fig. 16)



Operation result



ECO guidance record



Fuel consumption history

Fig. 16 Operation result, fuel consumption history and ECO guidance record screens

3) KOMTRAX

With regard to KOMTRAX highly evaluated as the fleet monitoring system which lets each machine send information such as the position, operating condition and machine condition and allows for grasping of the information at any time via the Internet without the need to go to the worksite, “report of support for energy-saving operation” has been newly added. (Fig. 17).

The report provides useful information including fuel consumption (average and actual operation), amount of emission of CO₂, details of travel mode use condition and history of energy-saving guidance.



Fig. 17 Report of support for energy-saving operation

4) Support system ensuring safety and reliability

Considering it important to provide support so that customers can use this high performance machine for a long time with security, Komatsu adopted a new machine warranty program “KOMATSU CARE” for all machines meeting the 2011 Off Road Law which began to be sold in the fiscal year 2012 for the first time in Japan. The program consists of a free program and a charged program. The free program adds “Extended warranty of powerline” (warranty up to three years or 5,000 hours) and “free maintenance” (engine oil and engine oil filter are replaced for every 500 hours for free up to four times, and KDPF is cleaned once for free when 4,500 hours is reached). This maintains machine’s original performance and environmental performance and contributes to the reduction in the total life cycle cost.

4. Conclusion

The features of the large-sized bulldozer “D155AX-7” have been introduced from the viewpoint of “Environment”, “Safety” and “ICT”. Komatsu is working on research and development daily for constant advancement with these three points set as the main theme. For the features this time, we are confident that we have developed a machine which will satisfy customers by improving many features while passing the exhaust gas regulations through stringent quality checks. We will continue to make efforts in the future to quickly respond to various regulations and market needs and to develop machines indispensable to customers in a body as Komatsu Group.

Introduction of the writers



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[A few words from writers]

The concerted efforts of Development and Production Divisions to put bulldozers meeting the regulations on the market are now going to bear fruit. We would like to express our deep gratitude to all parties concerned for their cooperation.