

Introduction of Products

Off-road Dump-truck HD785-8/8E0

Kenji Saito

Hiroyasu Furukawa

Natsuhiko Koyama

We developed the HD785-8/8E0, a rigid dump truck with the concept of “environment”, “safety” and “ICT” to meet the 4th generation emissions regulations introduced in Europe and the United States and delivered it to the market. The model not only meets the regulations but also incorporates the latest technologies Komatsu accumulated for many years. In this report, we would like to introduce the main features of the new model.

Key Words: Rigid dump truck, HD785-8/8E0, Tier4Final, environment, safety, ICT, KTCS, circumference monitoring

1. Introduction

The conventional model has been highly evaluated from many users as the flagship model of the rigid dump trucks since its market introduction in 2006. However, in the situation with the need of response to the 4th generation emissions regulations (United States: EPA Tier4Final / Europe: EU Stage V) and over 10 years since the sales launch of the conventional model, we developed the HD785-8/8E0 incorporating the latest technologies and introduced it to the market. We would like to introduce the outline of the product.



Fig. 1 The currently developed machine model

2. Aims of Development

With this new model, we have realized reduced fuel consumption and improved productivity, keeping “Quality and

reliability” which has been evaluated with the conventional model, while corresponding to the 4th generation emissions regulations based on “Quality and reliability”. In addition, we utilize the ICT technology and provide the function for enhanced safety which is an important feature these days with the model, which significantly enhanced its product power. Here we provide the characteristics of the product.

- (1) Improved environmental measures and economic efficiency
 - 1) New engine meeting the 4th generation emissions regulations and aftertreatment device installed
 - 2) Reduction of horsepower loss
 - 3) Auto idle stop
 - 4) High-strength axle
- (2) Productivity improvement
 - 1) High-powered engine
 - 2) Large-capacity retarder
 - 3) Komatsu Traction Control System (KTCS)
 - 4) Small turning radius
- (3) Improved safety and comfort
 - 1) Improved accessibility
 - 2) LED head lamp, Rear combination lamp
 - 3) Introduction of a newly designed cab and round type dashboard
 - 4) KomVision (Monitoring system for circumference)

- (4) Adoption of ICT technology
 - 1) Machine monitor with 7-inch high definition LCD unit
 - 2) ECO guidance to support fuel consumption reduction
 - 3) Vehicle management by KOMTRAX Plus
- (5) Improved maintainability
 - 1) Introduction of battery and starter disconnect switches
 - 2) Fuel quick coupler

3. Major features

3.1 Improved environmental measures and economic efficiency

3.1.1 New engine meeting the 4th generation emissions regulations and aftertreatment device installed

Here is the description of the engine and the aftertreatment device technologies incorporated in the new model to satisfy the 4th generation emissions regulations.

(1) Komatsu Diesel Particulate Filter (KDPF)

KDPF which catches over 90% of particulate matter (PM) in exhaust gas is mounted. KDPF is composed of oxidative catalyzer and the soot filter with catalyzer. PM is caught by the ceramic soot filter with catalyzer and only purified exhaust gas is emitted to the air. The amount of the caught PM is detected by the sensor and the engine control raises the temperature in KDPF to activate the oxidative catalyzer, which makes automatic combustion of PM and purification.

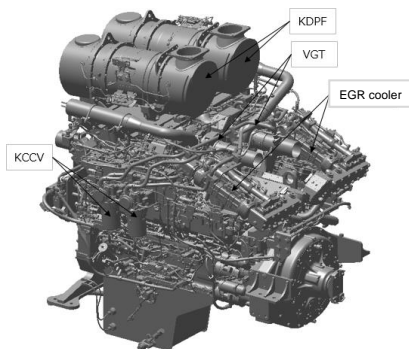


Fig. 2 SAA12V140E-7

(2) Variable Geometry Turbocharger (VGT)

The installation of the variable turbocharger enabled recirculation of exhaust gas in a wider operation range, which realized both NO_x reduction and fuel consumption performance. The reliable hydraulic drive is adopted for the driving system.

(3) Cooled EGR system

As it is important to sufficiently lower the temperature of large amount of recirculated exhaust gas to substantially reduce NO_x, the system with a flat tube and inner fins is adopted for the EGR cooler. The system also has the EGR valve with the high-accuracy, reliable hydraulic servo mechanism.

(4) Komatsu Closed Crankcase Ventilation (KCCV)

The oil contained in the blow-by gas is separated by KCCV. The purified blow-by gas is returned to the air intake and the separated oil is returned to the engine oil pan.

(5) Combustion system

Reduction in the PM quantity and improvement in the fuel economy performance were achieved together by introducing an electronic control common rail injection system with a maximum injection pressure of 200 MPa and a new combustion chamber.

(6) Electronic control system

The newly developed engine control unit is adopted for the electronic control system to enable high-accuracy, optimal control of the common rail injection system, VGT, and KDPF. In addition, by introducing the advanced control system, the trouble diagnosis system has become more sophisticated.

3.1.2 Reduction of horsepower loss

(1) Reduced losses in the steering and work equipment hydraulic circuits

A variable piston pump is newly adopted for the steering and the work equipment circuit. By the optimal control according to the condition of the vehicle, the hydraulic pressure loss is reduced.

(2) Variable transmission main relief pressure

Losses in oil pressure are reduced by switching the main relief pressure low in gear speeds which require low clutch holding pressure.

(Conventional model: 2 gears, development model: 4 gears)

(3) Adoption of hydraulic drive fan

With the radiator cooling fan, the conventional direct drive system using a belt has been changed to the hydraulic drive system. By the optimal control of the rpm of the fan, the horsepower loss due to unnecessary fan drive is reduced. Also, the fan reversing function can be used to blow away foreign material stuck in the radiator core.

3.1.3 Auto idle stop

The auto idle stop function was introduced to automatically stop the engine when the idling time continues for a preset time, for example, during a wait for loading.

At 30 seconds before the set time while idling, the monitor displays the countdown screen to announce the engine stop. The engine automatically stops at the set time to reduce unnecessary fuel consumption.



Fig. 3 Introduction of auto idle stop count down

3.1.4 High-strength axle

By the high-strength gear and the optimization of the shape of the structure, the maintenance cost is reduced. Also, the fuel consumption efficiency has been improved by lightening in weight.

3.2 Productivity improvement

3.2.1 Installation of high-powered engine

The engine output is the same as that of the highly-evaluated conventional model, having the travel performance equivalent with that of the existing machine.

3.2.2 Large-capacity retarder

The large-capacity four-wheel retarder is adopted as with the conventional model to realize safe descending of a downhill at a high speed.

3.2.3 Komatsu Traction Control System (KTCS)

KTCS calculates all the time the rear tire slip rate with the vehicle speed and the wheel rotation. When a tire slips on soft ground, etc., it controls the tire slip rate by applying a brake to the slipping tire individually.

By maintaining the tire traction optimally, a traveling performance higher than the conventional automatic spin regulator (ASR) can be attained, resulting in improved productivity and tire life.

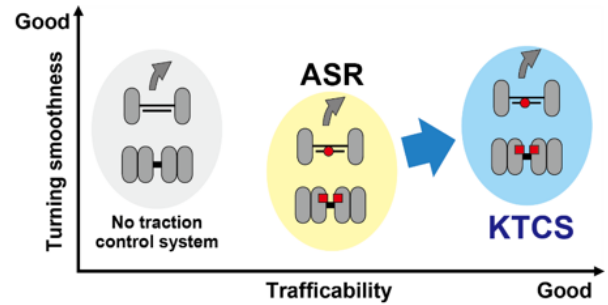


Fig. 4 Features of KTCS

3.2.4 Small turning radius

With a large steering angle obtained by Komatsu's traditional McPherson strut (A arm) type front suspension, outstanding small-turn performance is realized. The vehicle can quickly be brought to the desired position at loading or dozing sites.

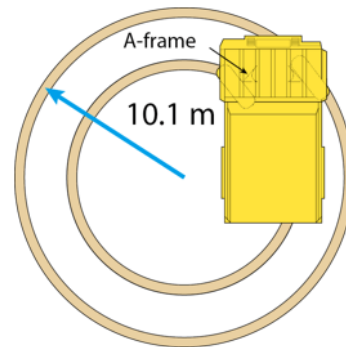


Fig. 5 Small turning radius

3.3 Improved safety and comfort

3.3.1 Improved accessibility

For the path to the cab and the deck, low-pitched oblique stairs are adopted for easy ascending and descending. The emergency ladders with the gate and the handrail are located at the right and left sides of the machine body to ensure the safety.

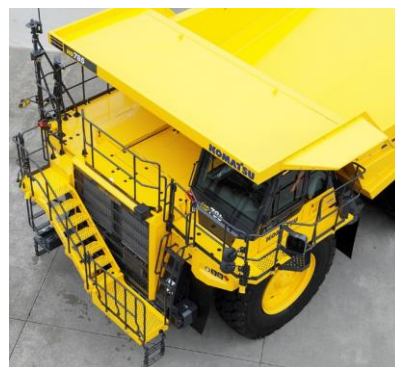


Fig. 6 Oblique stairs for elevation

3.3.2 LED head lamp, Rear combination lamp

LED lamps are used for the head lamps, the direction indicating lamps and the rear combination lamps as standard for long service life, excellent visibility and economic efficiency.

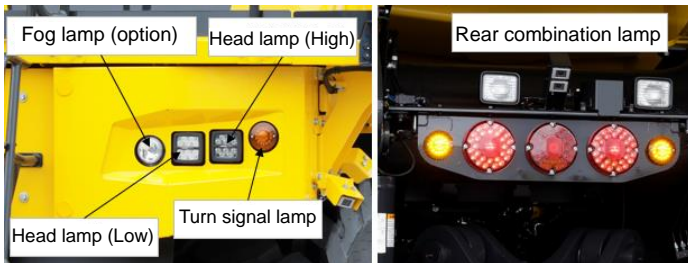


Fig. 7 LED lamp

3.3.3 Newly designed cab and round type dashboard

The cab integrated with ROPS/FOPS has newly been designed. The round-type dashboard is adopted by pursuing the operability based on ergonomics. Switches are located for easier reach by the operator, considering the operability.

In addition, a seat heater is built in the operator seat as a standard equipment to improve the comfortableness during cold weather.



Fig. 8 Round type dashboard

3.3.4 KomVision (Monitoring system for circumference)

Six cameras are mounted on the circumference of the machine body. The operator can check the safety of the circumference of the machine body with the KomVision monitor and the rearview monitor. The system assists the operator at starting or in a low-speed travel at loading and maintenance sites.

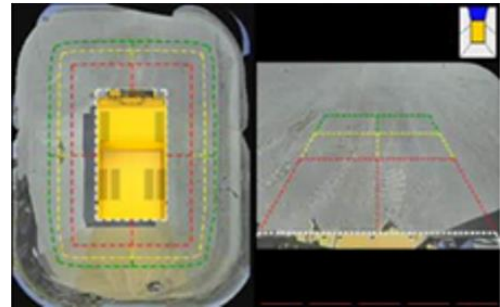


Fig. 9 KomVision, Monitoring system for circumference

3.4 Adoption of ICT technology

3.4.1 Adoption of machine monitor with 7-inch high-definition LCD unit

The advanced machine monitor with 7-inch high-definition LCD unit that is easy to see and use is adopted. With the operation on the switch panel, the view on the LCD unit is switched to the user menu screen to display each of the functions of ECO guidance, machine body setting/information, regeneration of aftertreatment device, maintenance, monitor setting, and message in a tab for easy grasp.



Fig. 10 Machine monitor with 7-inch high definition LCD unit



Fig. 11 User menu screen

By choosing “ECO guidance”, you can view the operation records, the ECO guidance records and the fuel consumption history and can utilize these data to improve the machine operation and the energy saving operation. The fuel

consumption history can be displayed in a graph of the average fuel consumption per hour for the last 12 hours or the average fuel consumption per day for the last one week.

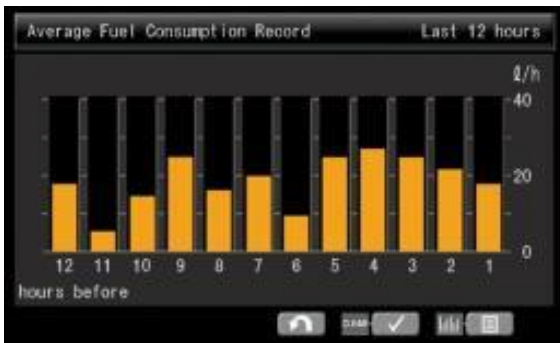


Fig. 12 Fuel consumption history display

3.4.2 ECO guidance to support fuel consumption reduction

The ECO guidance function for energy saving operation has newly been added. It provides real-time advices by pop-up displays on the LCD unit for energy saving operation to reduce the fuel consumption.



Fig. 13 LCD unit and ECO guidance

- Avoid long time engine idling.
- Release the hoist lever.
- Depressing accelerator pedal with brake actuated lowers fuel economy.
- Shift up.
- Avoid depressing accelerator pedal with lowering dump body.
- Avoid abrupt S/T.

Fig. 14 ECO guidance message examples

In addition, KOMTRAX Plus, the machine management system, is provided as standard.

3.4.3 Vehicle management by KOMTRAX Plus

As the timing of periodic maintenance such as filter replacement approaches, the time until the maintenance is displayed on the LCD. The timing to display the maintenance notice can be set between 10 to 200 hours.

Maintenance	Interval	Remain
Air Cleaner Cleaning or Change	—	—
Engine Oil Change	500 h	500 h
Engine Oil Filter Change	500 h	500 h
Fuel Prefilter Change	500 h	500 h
T/M Oil Filter Change	500 h	500 h

Fig. 15 Maintenance time display

3.5 Improved maintainability

3.5.1 Introduction of battery and starter disconnect switches

The battery disconnect switch and the starter disconnect switch are provided as standard for improving the safety during the maintenance. The jump start cable is also available as an option. They are located near the stairs for easy access.

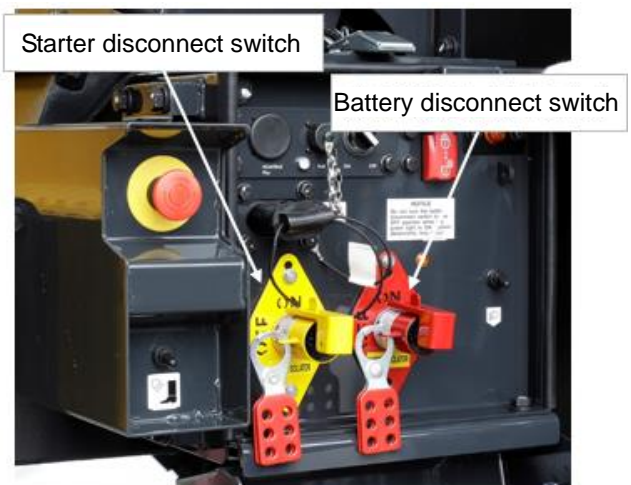


Fig. 16 Battery and starter disconnect switch

3.5.2 Fuel quick coupler

The fuel quick coupler is provided as standard to be located at the position to allow refilling fuel quickly at ground level.

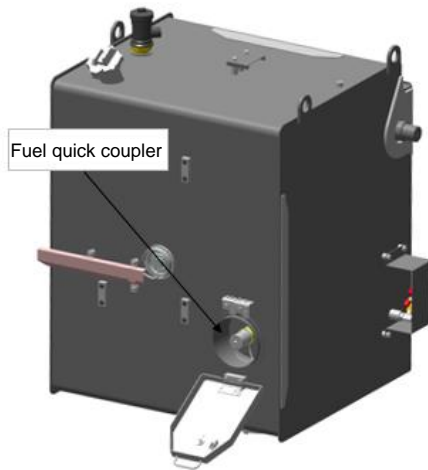
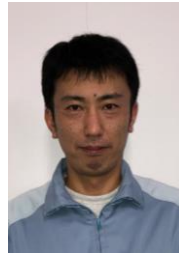


Fig. 17 Fuel quick coupler

4. Conclusion

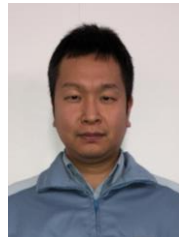
The new vehicle here we introduced incorporates the latest technologies of “environment”, “safety” and “ICT”, while keeping the high reputation which the conventional model received. As the model not only meets the regulations but also incorporates many new technologies, enhancing its product power, we are sure that this new model will be even more evaluated by the customers than the conventional model. We’d like to promptly respond to the market needs to acquire even more trust from the customers.

Introduction of the authors



Kenji Saito

Joined Komatsu Ltd. in 1998.
Vehicle Development Center 1,
Development Division



Hiroyasu Furukawa

Joined Komatsu Ltd. in 2005.
Vehicle Development Center 1,
Development Division



Natsuhiko Koyama

Joined Komatsu Ltd. in 2009.
Vehicle Development Center 1,
Development Division

[A comment from the authors]

We had many difficulties and required a long period of time for this development, but finally introduced the HD785-8 to the market as the last development model of 8-type rigid dump truck.

It has already started to be introduced to North America and Europe and will receive evaluation from the customers from now. We’d like to follow up the product to satisfy the customers even more than before. We thank not only the staff of the development and production departments but all people involved in this development.