

Introduction of Products

Introduction of Hydraulic Excavator PC240LC-11

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The new medium-sized excavator, PC240LC-11 has been developed and launched on the market under the concept of “environment”, “safety” and “ICT”. This report explains and introduces the technologies of the new model.

Key Words: *Environment, Safety, ICT, Reduction of fuel consumption, Automatic idle stop, Tier4 Final, Operator authentication*

1. Introduction

Reduction in environmentally hazardous materials such as CO₂ has been becoming increasingly important in recent years. Along with this trend, Tier4 Final and Stage IV emission standards have been implemented in North America and Europe since 2014.

Against that backdrop, Komatsu developed the PC240LC-11, a new product that is friendly to the environment by meeting the emissions standards mentioned above and at the same time offers customer benefits including higher fuel efficiency.

The new PC240LC-11 has been launched in North America and Europe. This report aims to offer an overview of the product. (Fig.1)



Fig. 1 PC240LC-11 (North American specifications)
(Source: Komatsu data archive)

2. Development Objectives

The basic concepts of PC240LC-11 are pursuit of higher levels of “Environment,” “Safety” and “ICT (Information Communication Technology)” based on KOMATSU’s commitment to “Quality and Reliability.” Based on those concepts, the product competitiveness has been substantially increased by complying with environmental regulations, reducing environmental burden and fuel consumption, pursuing safety and utilizing the ICT technology. The following pages offer an overview of the product including its

features.

(1) Environmental performance

- Compliant with Tier4 Final and Stage IV emission standards
- Increases in fuel efficiency by 6% than the current model (based on KOMTRAX analysis of average work patterns)
- Adoption of auto idle stop function
- Fuel saving support by ECO guidance
- Compliant to EU Stage 2 noise standards

(2) Safety

The PC240LC-11 is equipped with the following safety features in addition to those available on the current model to meet the most stringent safety standards on the global market.

- Lock lever auto lock function
- Lock lever status indication

(3) ICT

- Operator identification by operator authentication
- DEF (Diesel Exhaust Fluid) level indication
- KOMTRAX communication upgrade to 3G

(4) Others

- Press molded one-piece engine hood
- Easy to adjust armrest height
- Easy to refill DEF
- Easy to service the DEF filter

3. Selling Points

The PC240LC-11 has the following selling points, which are described together with the related methods and technologies to achieve those features.

3.1 Environmental friendliness

3.1.1 Compliance with emission standards

In North America, particulate matter (hereafter “PM”) and nitrogen oxides (hereafter “NOx”) standards of the Tier4 Final for the PC240 class (130 – 560 kW engine output) have changed as follows over the years. (Fig. 2)

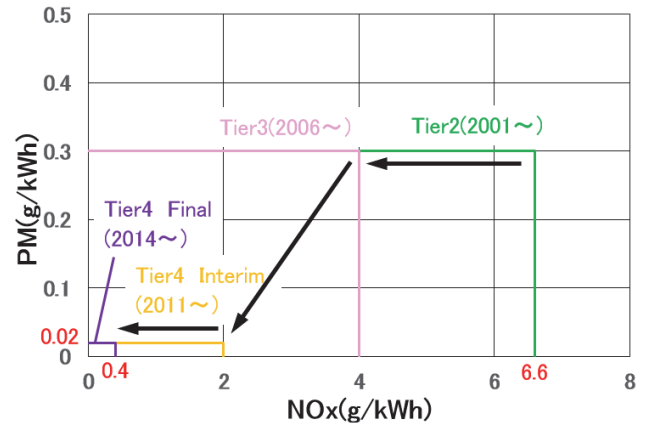


Fig. 2 PM and NOx standards in North America (Source: Komatsu data archive)

To meet Tier4 Final and Stage IV emission standards, the PC240LC-11 incorporates the following new engine technologies. (Fig. 3)

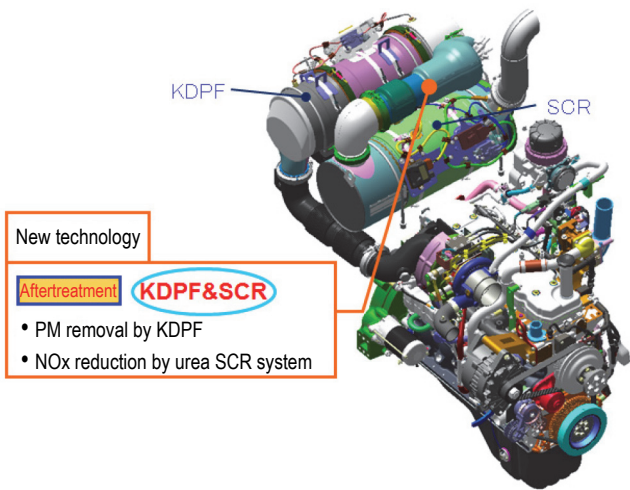


Fig. 3 New engine technologies
(Source: Komatsu data archive)

- Exhaust gas aftertreatment systems

The newly developed urea SCR (Selective Catalytic Reduction) system is combined with the KDPF (Komatsu Diesel Particulate Filter), a technology first introduced on the current model, to substantially reduce PM and NOx in exhaust gases. The urea SCR system decomposes NOx into harmless nitrogen (N₂) and water (H₂O). As shown in the figure, DEF is injected into the stream of exhaust gases, and NOx reacts with ammonia formed from the DEF within the SCR catalyst to be decomposed into nitrogen and water. (Fig. 4)

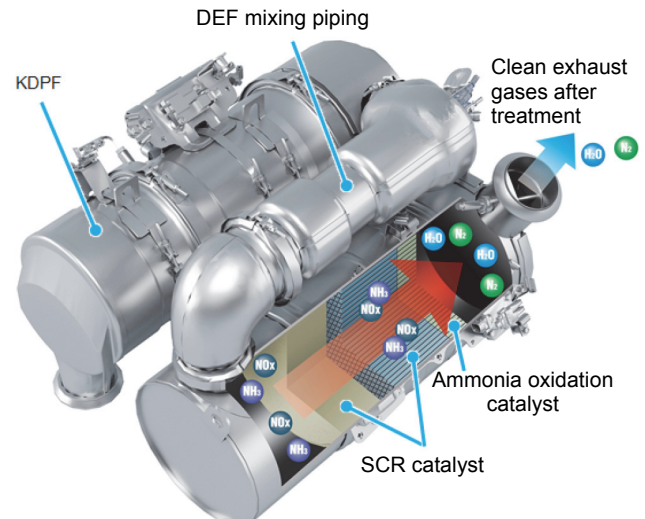


Fig. 4 Emissions aftertreatment systems
(Source: Komatsu data archive)

- Electronic control system

The newly developed CM2350 electronic engine controller offers highly precise control of not just the new urea SCR system, but of the electronically-controlled common rail fuel injection system, variable geometry turbocharger and KDPF that were introduced on the Tier4 Interim engines.

The Tier4 Final and Stage IV emission standards require engine power restriction in the event of DEF level becoming too low (referred to as SCR Inducement). To meet that requirement, the failure diagnosis system has been further improved.

3.1.2 Higher fuel efficiency

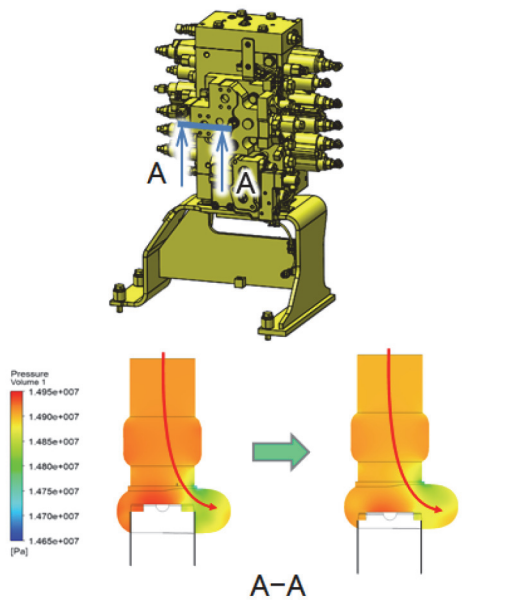
① Improved engine fuel efficiency

The new engine technologies described earlier are incorporated into the new engine to meet the Tier4 Final and Stage IV emission standards and to substantially improve fuel efficiency (fuel consumption maps).

② Reduced main valve hydraulic loss

The oil passage in the hydraulic main valve has been optimized to reduce hydraulic loss and improve fuel efficiency. (Fig. 5)

Reduced hydraulic loss across the main valve



CFD analysis-based optimization of the main valve oil

Fig. 5 Reduced hydraulic loss across the main valve
(Source: Komatsu data archive)

③ Larger dimensions of the hydraulic piping of the work equipment

The dimensions of the hydraulic piping of the work equipment have been increased to reduce hydraulic loss during work and improve fuel efficiency. (Fig. 6)

Larger dimensions of the hydraulic piping of the work equipment

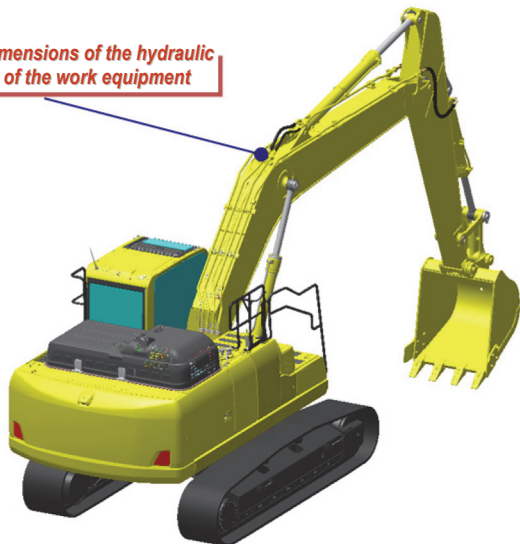


Fig. 6 Larger dimensions of the hydraulic piping
(Source: Komatsu data archive)

3.1.3 Auto idle stop function

The auto idle stop function automatically stops the engine when the engine idles for more than the preset time with the lock lever in the lock position.

A countdown window appears on the monitor screen 30 seconds before the preset time is reached, alerting the operator that the engine is going to stop shortly. When the preset time is reached but the engine is still idling, the system automatically stops the engine, minimizing idle time and reducing fuel consumption. (Fig. 7)

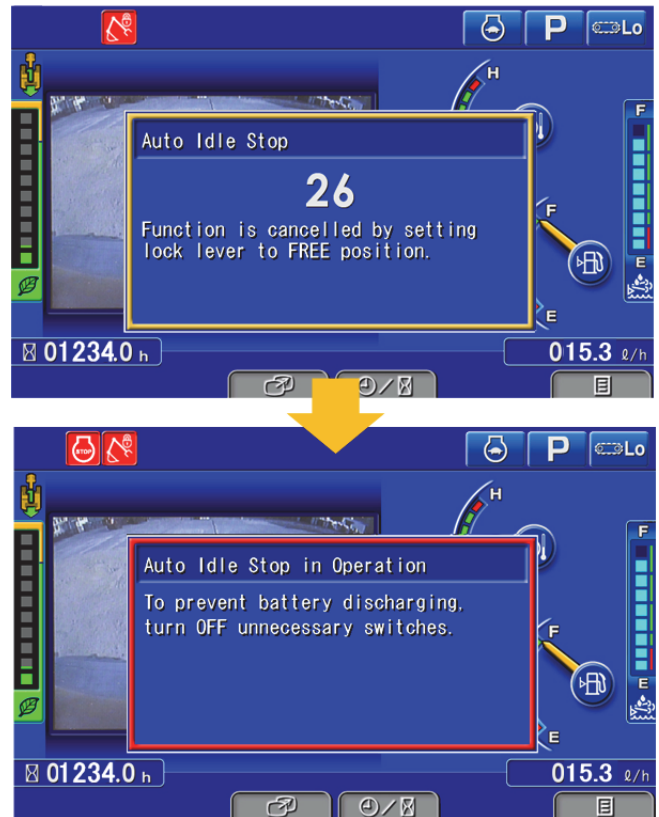


Fig. 7 Auto idle stop
(Source: Komatsu data archive)

3.1.4 ECO guidance

As on the current model, ECO guidance provides operational advice on the multi-monitor screen to help the operator run the machine efficiently and reduce unnecessary fuel consumption. The system displays a range of advice in the upper part of the multi-monitor screen whenever the machine in operation meets certain operating conditions.

3.1.5 Compliance with noise standards

As with the current model, the PC240LC-11 meets the EU Stage 2 noise standards, helped largely by the following features that are also available on the current model – the low speed matching technology reducing engine rotational speeds, cooling shroud to reduce wind noise from fans and optimum placement of sound absorbing material.

3.2 Safety

In addition to the safety and ergonomic design features

conventionally offered, the following new features have been introduced for higher safety.

3.2.1 Lock lever auto lock function

The lock lever auto lock function prevents the work equipment or the machine from moving inadvertently when the lock lever is moved out of the neutral position with any of the following conditions: when the work equipment lever, travel control levers or the attachment control pedals are in operation.

When the auto lock activates, operation of the work equipment, swing, travel and attachment operations are automatically locked and a related message is displayed on the monitor. (Fig. 8)

The lock lever auto lock function further enhances operational safety.



Fig. 8 “Lock lever auto lock active” message on the monitor screen (Source: Komatsu data archive)

3.2.3 Lock lever locked status indication

When the lock lever is placed in the lock position, a related warning symbol appears near the top left corner of the monitor screen, informing the operator that the lock lever is locked. (Fig. 9)



Fig. 9 Lock lever locked status indication (Source: Komatsu data archive)

3.3 ICT

3.3.1 Operator identification by operator authentication

By sending operational data of the machines connected with operator IDs to KOMTRAX, it is possible to record the history of machine operation by operators and manage it both by the machine and by the operator. (Fig. 10)



Fig. 10 Operator authentication screen (Source: Komatsu data archive)

3.3.2 DEF level indication

Regulations require that engine power be restricted in the event of the DEF level becoming too low.

To ensure that DEF is effectively replenished, the current DEF level is constantly displayed on the right side of the monitor screen and reminder messages are displayed when DEF level is becoming too low. (Fig. 11)



Fig. 11 DEF level indication (Source: Komatsu data archive)

DEF level can also be monitored and managed on KOMTRAX.

3.3.3 KOMTRAX communication upgrade to 3G

For communication quality upgrade, 3G terrestrial mobile

networks are adopted for KOMTRAX communication standards.

Table 1 KOMTRAX communication standards
(Source: Komatsu data archive)

Region	PC240LC-10	PC240LC-11
North America / Europe	Satellite communication	Terrestrial mobile communication (3G)

3.4 Others

3.4.1 Press molded one-piece engine hood

The addition of the urea SCR system required the entire emissions aftertreatment systems to be larger in size. That also meant the engine hood that covers these systems also needed to be larger in size. It was technically extremely difficult to develop a press molded one-piece engine hood larger than the one used on the current model.

Right from the planning stage, development was closely coordinated with the production and procurement departments and simulations were made to finalize the appropriate shape free of cracks and wrinkles that can be caused by press molding.

These efforts led to the PC240LC-11’s stylish, press molded one-piece engine hood.



Fig. 12 Press molded one-piece engine hood

3.4.2 Easy to adjust armrest height

Design review led to the new, toolless height adjustment with a knob and a plunger, enhancing operator convenience. (Fig. 13)

Easier to adjust armrest height

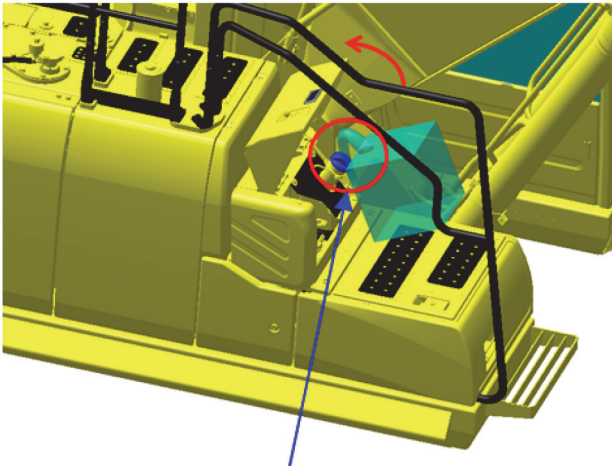


Fig. 13 Armrest
(Source: Komatsu data archive)

3.4.3 Easy to refill DEF

The urea SCR system uses DEF which must be refilled regularly just like fuel. To ensure good accessibility, the DEF tank is located just beneath the steps to the cab on the right front of the machine where the fuel tank is also located. (Fig. 14)

Easy to refilling DEF



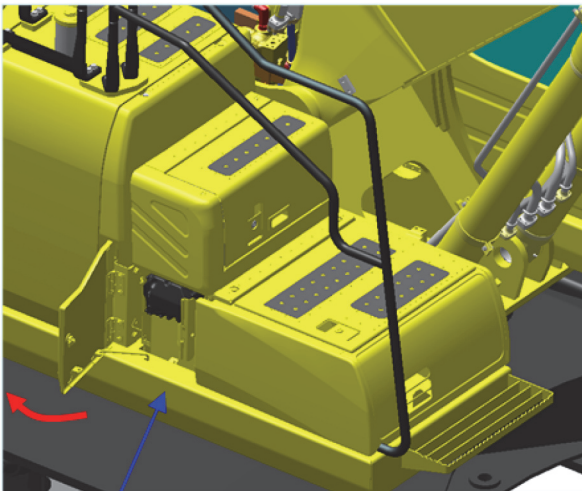
Opening the DEF tank cover provides access to the refill opening.

Fig. 14 Refilling DEF
(Source: Komatsu data archive)

3.4.4 Easy to service the DEF filter

The DEF pump is located beside the DEF tank on the right front of the machine so that the operator can access the DEF filter (which must be replaced regularly) mounted on the DEF pump while standing on the ground.

DEF mixing piping



Opening the DEF tank cover provides access to the refill opening.

Fig. 15 DEF filter
(Source: Komatsu data archive)

4. Conclusion

The PC240 is among the key products in the mid-size hydraulic excavator range of Komatsu. The PC240LC-11 not just meets Tier4 Final and Stage IV emission standards, but incorporates a range of other impressive features which enhance its product competitiveness. The product launch will continue in North America and Europe. We hope the PC240LC-11 will be well accepted in every market where it is launched.

Introduction of the writers



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[A few words from writers]

With cooperation from relevant departments and having gone through stringent processes of clearing Tier4 Final / Stage IV emission standards hurdles and verifying quality, the PC240LC-11 has been finalized as a product capable of fulfilling customer needs.

Our efforts will continue for the development of new, innovative hydraulic excavators that customers find highly valuable and indispensable in not just meeting emissions standards but offering environmental, safety and ICT benefits.