

PARTS & SERVICE NEWS

REF NO.	AT03094A
DATE	Jun. 3, 2004
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(C)

This PARTS & SERVICE NEWS supersedes the previous issue No. AT03094 dated Jun. 6, 2003 which should be discarded.

SUBJECT: APPROPRIATE FUEL FOR CRI ENGINES

PURPOSE: To introduce precautions about and appropriate measures to be taken against fuels for CRI engines because CRI engine injection system is easily affected by low viscosity fuel or fuel contaminated with dust or water.

APPLICATION: SA6D125E-3 Engines, Engine Serial No. 310001 and up
 SAA6D125E-3 Engines, Engine Serial No. 310001 and up
 SA6D140E-3 Engines, Engine Serial No. 110001 and up
 SDA6D140E-3 Engines, Engine Serial No. 110001 and up
 SAA6D140E-3 Engines, Engine Serial No. 110001 and up
 SA6D140HE-3 Engines, Engine Serial No. 110001 and up

FAILURE CODE: A010MA

DESCRIPTION:


1-1. Introduction

Components of common rail engine injection system have been machined very precisely so that the system can inject fuel at high pressure.

Therefore, the injection system is apt to be affected delicately much more than Komatsu's traditional injection system by low viscosity fuels or fuels contaminated with dust or water. This Service News introduces precautions about and appropriate measures to be taken against fuel to be used.

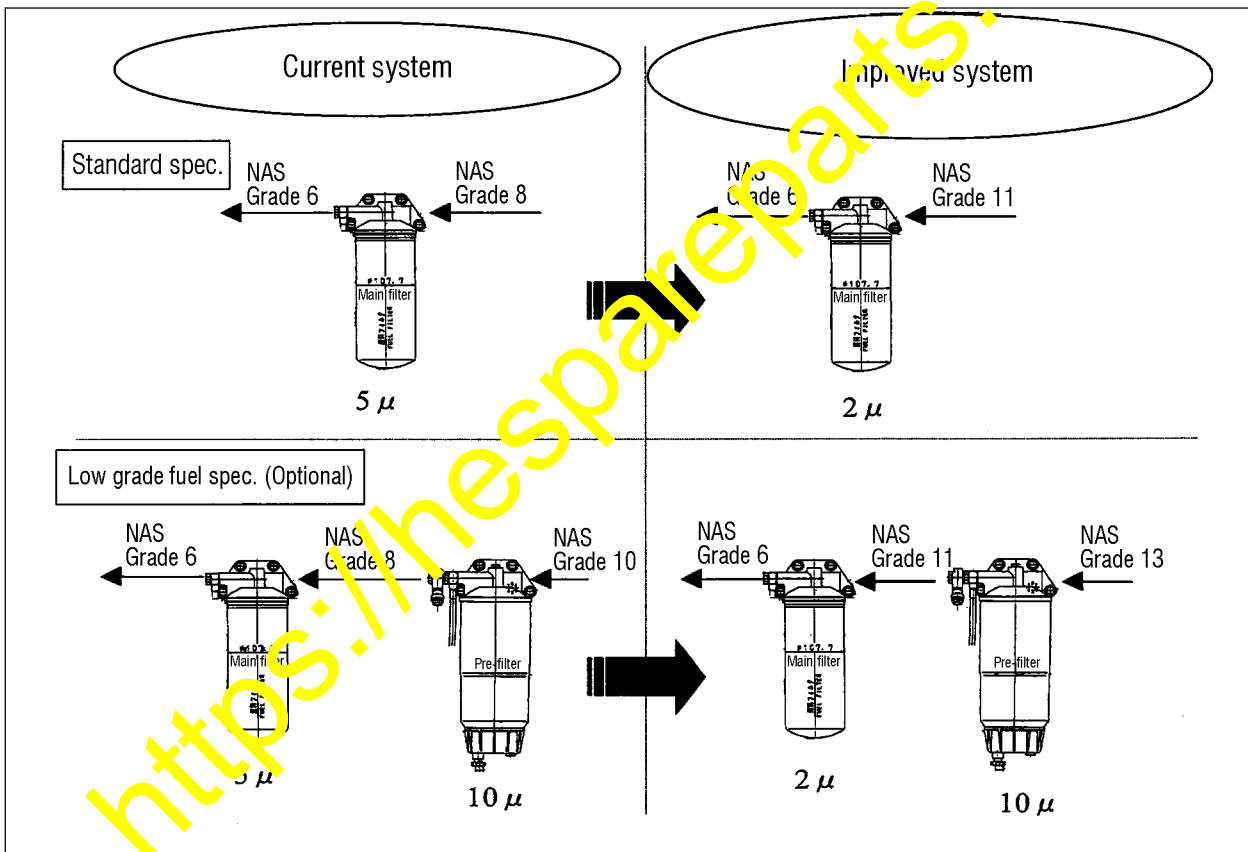
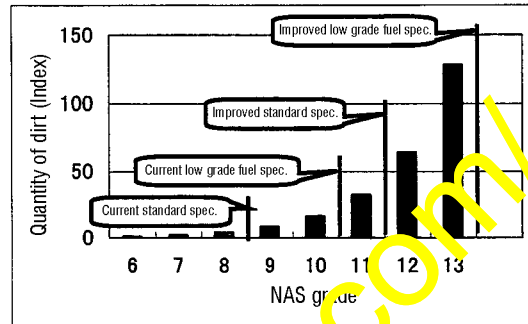
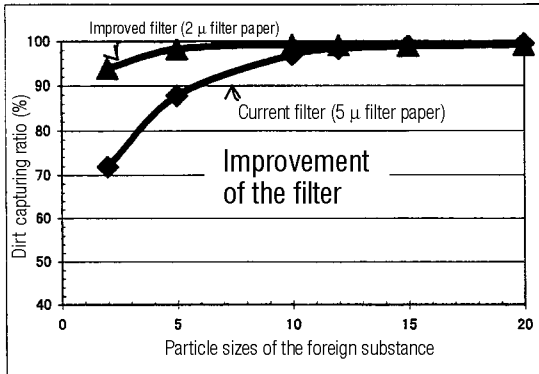
1-2. Revised places:

10 places A	Jun. 3, 2004	The fuel filter has been changed. (5 μ → 2 μ)
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 Page added

Although the current fuel filter system could accept only the fuels with upto NAS10 grade of dirt, KOMATSU has made it usable the fuels with upto the NAS13 grade of dirt.

The filter changing interval is the same.



Note 1) Light oil being sold at the gas stations in Japan is of NAS Grade 7 or NAS Grade 8.

Note 2) In case your customers possess a fuel storage tank and if the inside surface of the fuel storage tank is being corroded to cause the fuel grade exceed the NAS Grade 13, wash it properly.


 Page added

Table of related Service News's to the modification (5 μ \rightarrow 2 μ) of the fuel filter for the Common Rail Spec. Engines

No.	Service News No.	Theme
1	AT03057	Regarding the addition of the fuel filter cap and modification of the fuel filter (Refer to this Service News regarding the part numbers of the filter and the replacement procedure.)
2	AT03093	Introduction of the inspection method when pressure feeding failure error occurs on the Common Rail Spec. Engines
3	AT03094	Regarding the fuels used for the Common Rail Spec. Engines and corrective measures to take

Table of related Service News's to the additional fuel filter for the Common Rail Spec. Engines

○ Engine mount type
 ◎ Machine mount type

Engine	Machine model	Original setting		Current setting	
		Water separator	Twin type Additional fuel filter	W/S built-in type Additional fuel filter	Service news No. (Issuance month)
140	PC600	○	◎	◎	BT03041 ('03/10)
	PC750/800	○	◎	◎	BT03028 ('03/10)
	PC1800	○	-	○	BT03027 ('03/10)
	D155AX	○	-	○	AT03090 ('03/6)
	D275AX	○	-	○	AT03089 ('03/6)
	WA500	○	-	○	BT03015 ('03/5)
	HM350	○	-	◎	} Will be issued in April '04
	HM400	○	-	◎	
	HD325	○	◎	◎	
125	PC400	-	-	○	} This modification has been made from the first shipment machine.
	D65	-	-	○	
	D35	-	-	○	
	WA470/480	-	-	◎	Will be issued in April '04
	HM300	-	-	◎	Will be issued in April '04
	HD255	-	-	◎	Now under development

2. Common Rail Injection System Engines

Common rail injection system engines are friendly to the earth environment.

These engines inhibit emissions of nitrogen oxides and suspended particles and satisfy not only the EPA 2001 Regulations (Tier 2) but also European, American and Japanese Emission Gas Regulations. At the same time, the fuel consumption rate of these engines has reached the world-highest level so that these engines inhibit generation of carbon dioxide and global warming.

To attain these purposes, common rail injection system engines enable to spray high-pressure atomized fuel from low speed area. Therefore, their injectors and components are very precise and are subtly affected by low viscosity fuel or fuel contaminated with dust or water much more than the traditional injection systems.

3. To use common rail injection system engines for a long time under satisfactory conditions

For the purpose, you are requested to pay attention to the following precautions concerning fuel to be used. Observe them strictly, and you can keep the engines in good conditions for a long time.

① Be careful of low viscosity fuel.

You can freely use low viscosity fuel that fuel makers are normally selling in the market. Because, fuel makers add proper amount of extreme-pressure additive to these low viscosity fuel in order to prevent injection systems from abnormal wear. And these low viscosity fuel are as follows:

- Fuel that you can use without problem:

USA Diesel Fuel No. 2-D

Diesel Fuel No. 1-D (*)

(*) The expected actual operating condition to use this fuel is winter in cold weather areas only. (Never use it in warm areas in summer.)

- Fuel that may cause abnormal wear or other problems in durability or reliability to internal parts of injection system when used: Low viscosity fuel

USA Kerosene

Fuel blended with kerosene

(The higher kerosene rate, the higher risk.)

These fuels are easily available as a means of higher startability in cold weather areas and at high altitudes where it is hard to start engine. These fuels, though being of low viscosity and easy to start engine, worsen lubricity of sliding portions and promote wear of sliding portions and consequently malfunction parts of injection system and make the engine out of order in early stages (for example, within 1000 h).

Each fuel maker holds its HFRR (High Frequency Reciprocating Rig) by standardizing its fuel lubricity tester. To find if fuels to be used are dangerous fuels of low viscosity, users have to ask fuel makers to submit their attribute data obtained by using their testers (or have to deliver the fuels to fuel makers to let them measure attributes if attributes are not available). (The test takes about two hours.) These attributes can be evaluated as follows:

- Under HFRR 500 : The fuel can be used without restricting operating conditions and safe for injection system in durability.
- HFRR 500 – 600 : The fuel, when used in cold weather area in winter, is safe for injection system in durability.
- Over HFRR 600 : The fuel is dangerous for injection system in durability and may malfunction engines due to abnormal wear in early stage. (Low viscosity fuel)

- To protect injection system under the situation that low viscosity fuel has to be used

There are the following two measures when fuels of over HFRR 600 have to be used:

- 1) Extreme pressure improving additive are available from Komatsu Part Sales Department. For density and adding method, please consult Komatsu Service Department to get the Komatsu Guidance and be sure to follow the guidance.
- 2) There are supply pumps suitable for low viscosity fuel (and common rail injection system parts of high wear resistance). So, replace them with the low viscosity fuel supply pump mentioned in Page 8.


② Be careful of fuels contaminated with dust or water

Fuels contaminated with dust or water are harmful to the common rail injection system. Dust causes scuffing or abnormal wear to injector's sliding portions (needle, command piston and 2-way valve), wears 2-way valve sheets and finally malfunctions injectors.

Water rusts the above-mentioned sliding portions of injectors and sliding portion (plunger) of supply pump and then causes scuffing and abnormal wear to them.


The following shows how much dust and water are harmful to the injector system:

• Allowable Limit of Dust

 The cleanliness of the fuel finally reaching the fuel injection system should be of the NAS Grade 6 containing (0.5 mg/l) or less of dirt. (In other words, 1 l of fuel is to contain 0.5mg or less of dirt.)

Therefore, common rail injection system engine is equipped with high efficient fuel filter in general. In some countries of poor fuel quality, additional fuel filter is equipped on the upper stream of the standard filter to protect injection system from dust. In addition, for users who consider that fuels are not satisfactory even in countries of good fuel quality, additional filter can be equipped optionally as requested.

Komatsu has developed satisfactory filter systems, but it is requested to check cleanliness of fuels to be used in accordance with the target of allowable limit of dust on dirty side shown below:

 Guide line for allowable limit of dust in fuel tank, when only the standard filter is quipped:

Below 6 mg/l (less than 3 g of dust in 500 l fuel tank) equivalent to NAS 8-class level. In Japan, fuel supplied at gas station contains 0.5 g of dust in 500 l at worst.

Guide line for allowable limit of dust in fuel tank when additional fuel filter and the standard filter are quipped:

Below 25 mg/l (less than 12.5 g of dust in 500 l fuel tank)

When fuel used in India was inspected, the dust amount was 7 mg/l. The worst example in China was 20 mg/l. So, be sure to control fuel carefully. Fuel cleanliness at gas station needs not be worried about, but when fuel is stored individually and fuel tank is corroded, the above-mentioned allowable limit may not be satisfied. In this case, clean the fuel tank and repair it carefully.

A guide line is equivalent to NAS 10-class level.

Refer to
page 2.

• Allowable Limit of Water

The water content is fuel finally supplied to the injection system should be below 0.1% (0.5 l of water in 500 l fuel tank. Therefore, water should be drained from fuel tank before start of work as mentioned in the manual. Be sure to drain water on the following day of fuel supply on rainy day.

In countries where fuel may be mixed with water, engines are equipped with water separating filters. In this case, drain water by opening and closing the valve fitted to the bottom of the water separating filter. Water separating filters can separate water but cannot drain water. So, be sure to check the clear ball at the bottom once a day and drain water when finding water precipitated below fuel.

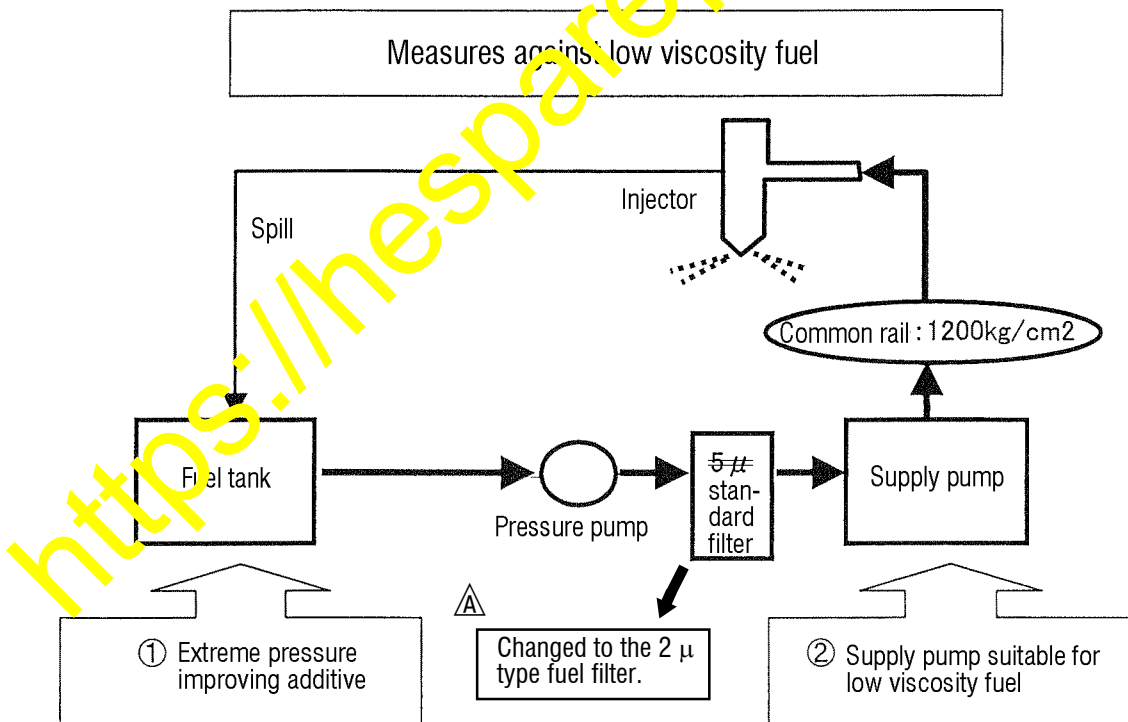
- For the latest common rail injection system engines, additional fuel filter is incorporated with water separating filter.

4. Conclusion

The necessary procedures have been mentioned for using common rail injection system engine for a long time under satisfactory conditions, and they were tabulated as follows:

4.1 Low Viscosity Fuel


Item	Satisfactory level with standard specification	Usable with standard specification when working conditions are limited.	Not satisfactory in durability (Usable when the mentioned measures (① and ②) are taken)
① Low viscosity fuel	HFRR (High frequency reciprocating rig) : Attributes with fuel lubricity tester		
	<ul style="list-style-type: none"> Below HFRR 500 	<ul style="list-style-type: none"> HFRR 500 – 600, Usable in cold weather areas in winter 	<ul style="list-style-type: none"> Over HFRR 600 Measures ① Use extreme pressure improving additive. ② Use supply pump suitable for low viscosity fuel
	<ul style="list-style-type: none"> Diesel Fuel No. 2-D (USA) 	<ul style="list-style-type: none"> Diesel Fuel No. 1-D (USA) 	<ul style="list-style-type: none"> Kerosene Fuel blended with kerosene (The higher kerosene rate, the higher risk.) (USA)



Part Numbers of Supply Pumps

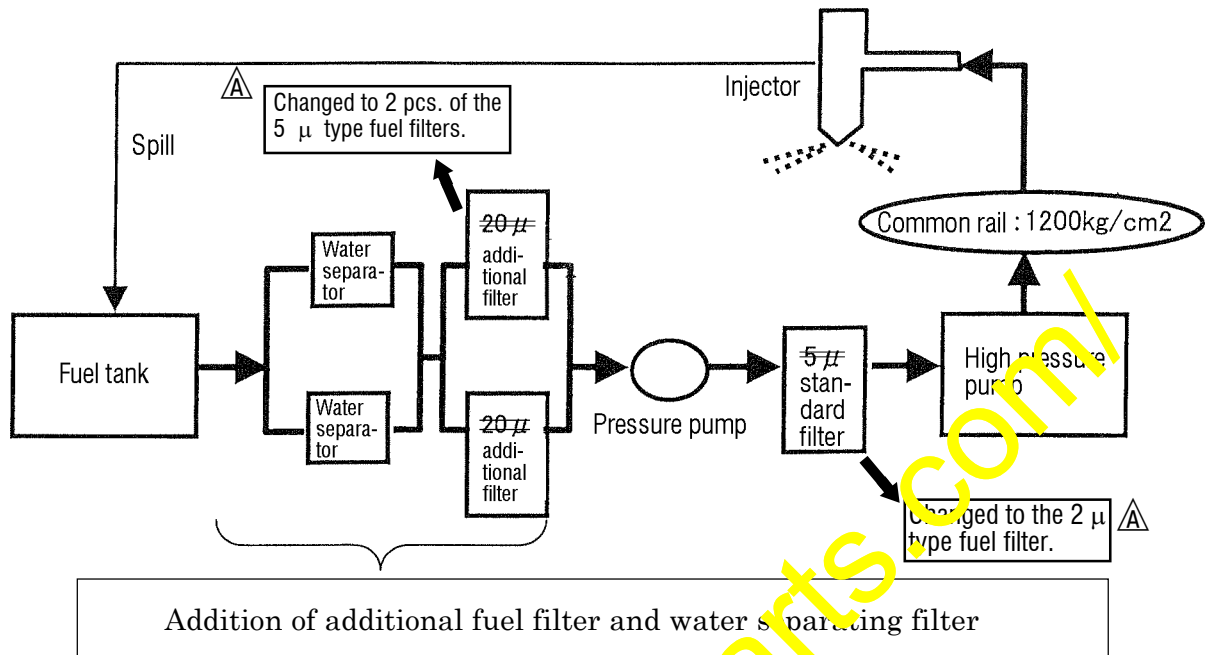
Engine	Model	Standard pump	Pump suitable for low viscosity fuel
SA6D125E-3	D65 D85	6156-71-1110	6156-71-1130
SAA6D125E-3	PC400 WA470/480 HM300		
SA6D140E-3	D155AX PC600 WA500	6217-71-1120	6217-71-1130
SDA6D140E-3 SAA6D140E-3	D275AX PC750 PC1800 HM350/400 HD325	6218-71-1110	6218-71-1130

4.2 Fuel contaminated with dust or water

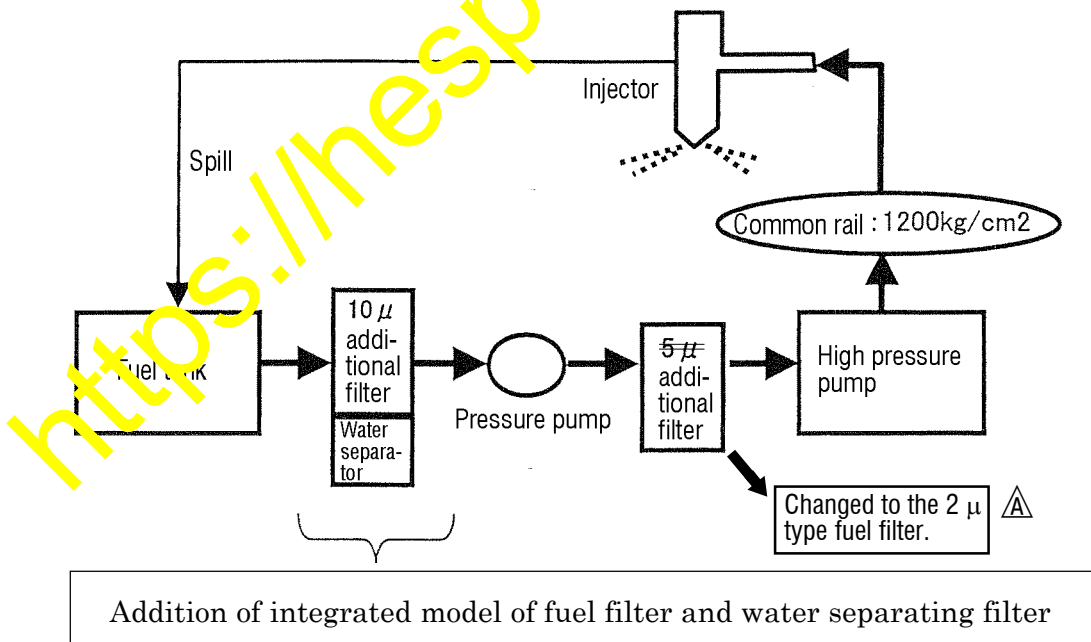
Item	Satisfactory level with standard filter equipped	Satisfactory level with additional filter and standard filter	Unsatisfactory level in durability without improving fuel cleanliness
 ②-1 Fuel contaminated with dust	<ul style="list-style-type: none"> Dust in fuel tank: Below 6mg/ℓ (Less than 3 g of dust in 500 ℓ fuel tank) NAS-8-class level is the allowable limit. 	<ul style="list-style-type: none"> Dust in fuel tank: Below 2.5 mg/ℓ (Less than 1.25 g of dust in 500 ℓ fuel tank) NAS-13-class level is the allowable limit. 	<ul style="list-style-type: none"> Dust in fuel tank: Below 25 mg/ℓ (Less than 12.5 g of dust in 500 ℓ fuel tank) NAS-13-class level is the allowable limit.

Item	Satisfactory level with standard specification	Water separating filter should be added, or additional filter integrated with water separating filter should be added. Check the clear ball at the bottom of the filter once a day and be sure to drain water if finding water precipitated below fuel.
②-2 Fuel mixed with water	Water in fuel tank: Below 0.1% (Less than 0.5 ℓ of water in 500 ℓ fuel tank)	<ul style="list-style-type: none"> When water in fuel tank is more than 0.1% (More than 0.5 ℓ of water in 500 ℓ fuel tank) <p style="text-align: center;">↓</p> <ul style="list-style-type: none"> Check the above-mentioned clear ball everyday, drain water thoroughly when finding water precipitated and also drain water from the fuel tank before start of work without fail.

- 140-engine: System set for PC600, PC800 and HD325. The following integrated type will replace this one after another.



- 125-engine: System set for WA470, WA480, D65, D85 and models to be developed in the future
- 140-engine: System set for WA500, D165, D275, HM400, HM350 and models to be developed in the future.



For the installation method of additional fuel filter, refer to page 3 on the Service News to be issued for each model in the future.