

MES TECHNOSERVICE CO., LTD.

TECHNICAL DEPARTMENT / DIESEL PRODUCT GROUP

Slide Fuel Valve		No.037	
		GENERAL MANAGER	K. Katayama
		MANAGER	K. Higasa
		STAFF	H. Miyake
ENGINE TYPE	50MC/-C, 60MC	DATE	2003/11/12

We are pleased to introduce a low pollution / low fuel consumption fuel valve named the “Slide Fuel Valve”.

In order to optimize combustion and to achieve a cleaner engine for large bore engines, MAN B&W have developed Slide Fuel Valves. This fuel valve will be the future standard on all of our new engine types. The Slide Fuel Valve is available as a retrofit option for engines in service with minor modification. The main benefits of this design compared with the conventional design are as follows:

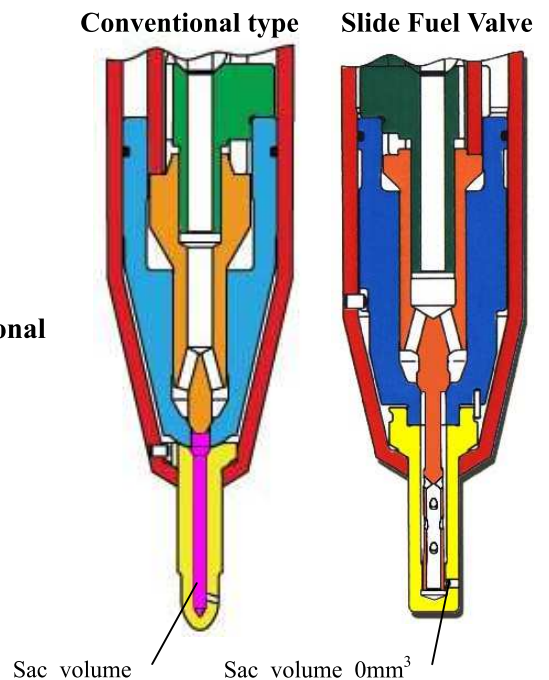
Benefits of the Slide Fuel Valve

- *Reduced fouling in gas passage*
- *Reduced fouling of piston topland and exhaust gas boiler*
- *Less PM & Smoke formation*
- *Lower NOx & CO emission levels*
- *Reduced fuel consumption at partial engine load*
- *Improvement of minimum engine speed*
- *Applicable slow-steaming operation*

The difference between the slide fuel valve and the conventional fuel valve is the reduced sac volume*¹, and is actually non-existent, as shown in Fig-1.

*¹Remaining fuel volume in the atomizer after injection.

Figure 1



PRIORITY

IMMEDIATELY

EARLIEST CHANCE

DRY DOCK

ADDRESS

1-1, Tama 3-Chome, Tamano, Okayama Japan

Tel : +81-863-23-2385 / Fax : +81-863-23-2349

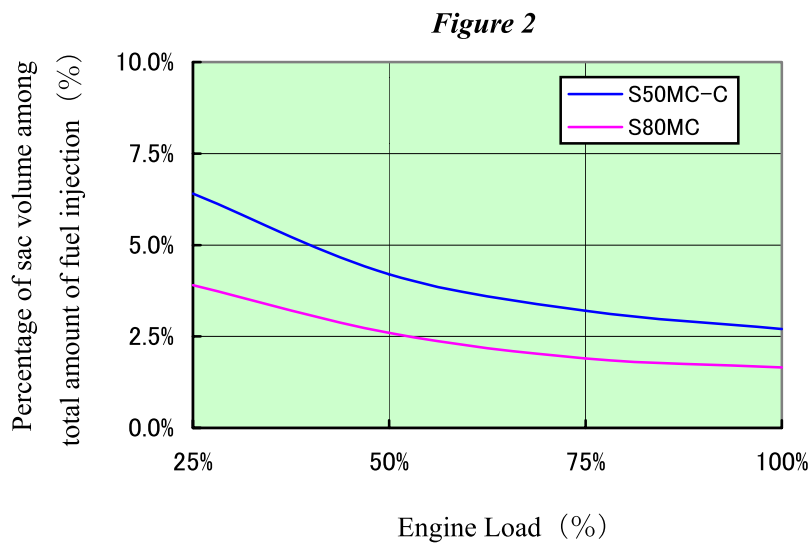
E-mail : tech_de@mes.co.jp



- Influence of sac volume

On the conventional atomizer, a small amount of fuel oil remains in the atomizer after injection. A part of the residual fuel oil will enter the combustion chamber, then, it leads to incomplete combustion; therefore, hydrocarbon (HC) and particulate matter (PM) are generated into exhaust gas. This nonflammable carbonized matter accumulates on the exhaust passage as a deposit.

With the slide fuel valve, sac volume is almost zero; therefore HC and PM is greatly reduced. The percentage of sac volume among total amount of fuel injection becomes larger at low engine load; accordingly, the Slide Fuel Valve shows its effect at especially low engine load operation.



- HC and Smoke emissions

The effect on HC emissions for S50MC-C is shown in Fig-3. A reduction of about 75% of the HC emissions is obtained at all loads by Slide Fuel Valves. The smoke emission level at low engine load, at 25% load in particular, is greatly decreased by Slide Fuel Valve, as shown in Fig-4.

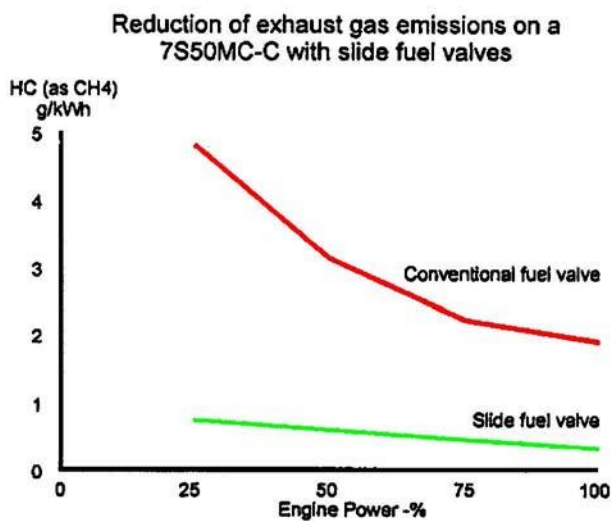


Figure 3: HC emission measured with and without slide fuel valves

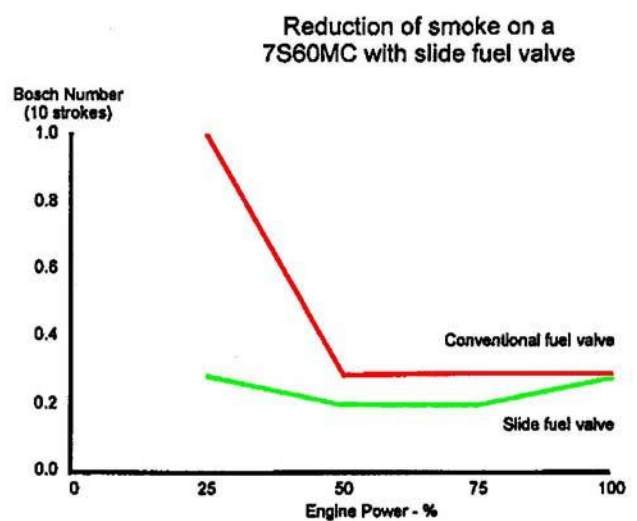


Figure 4: Smoke level measurement with and without slide fuel valves

- PM (Particulate Matter) emissions

PM is major cause of carbon deposit accumulation. The measured effects for the S60MC and K90MC are shown on Fig-5. Cylinder oil can be another cause of the generation of PM, therefore, PM reduction is not the same as for HC. However, a reduction of up to 50% has been confirmed.

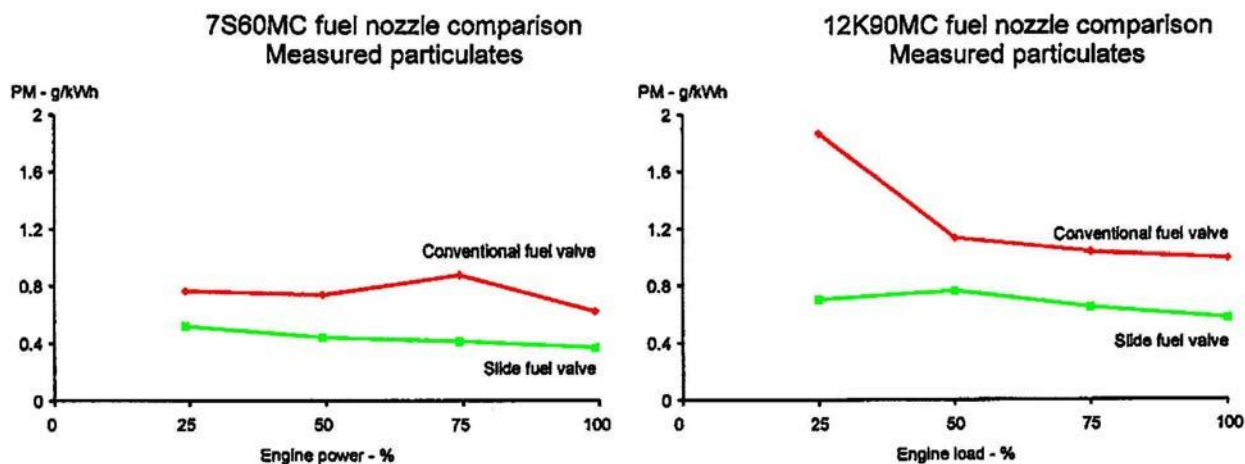


Figure 5: Influence of fuel valve design on deposits in gasways

- Reduced deposits in gas passage

Fig-6 shows an example of the difference in the fouling condition of the exhaust valve duct on an S60MC engine when using slide fuel valves, compared to conventional fuel valves.

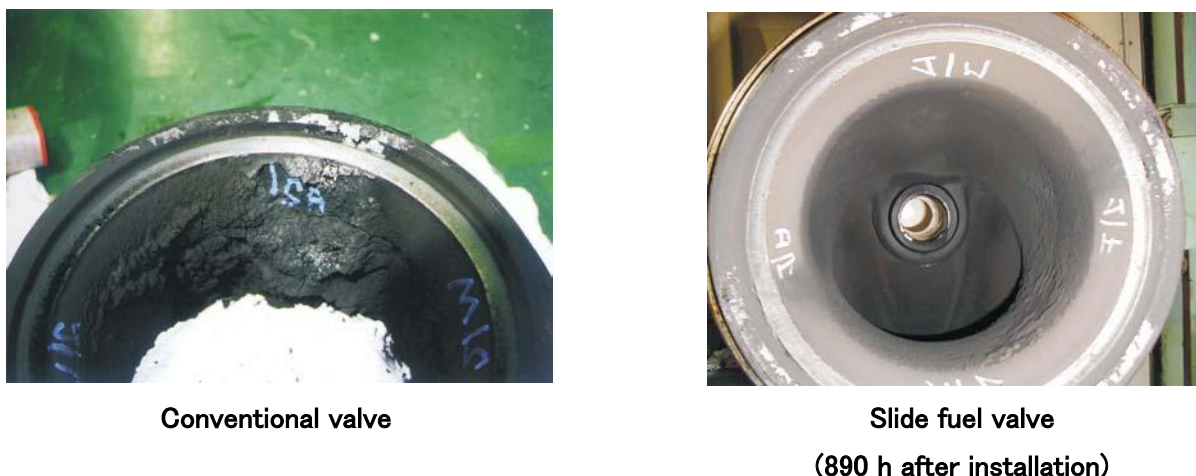


Figure 6: Influence of fuel valve design on deposits in gasways

HC and smoke formation are greatly reduced at the partial engine load of less than 50%, as shown in Fig-3 and Fig-4. Therefore, this results in the reduction of accumulation in the exhaust passage. By the reduction of contamination, it is possible to extend the overhaul interval for exhaust valve, turbocharger, exhaust gas boiler and piston.

- **Improvement of fuel efficiency under partial load**

The Slide Fuel Valve can improve fuel efficiency because consumed fuel oil such as PM, which does not contribute to effective combustion, is reduced. With the PM and HC in K90MC, the reduction rate is converted into fuel efficiency, as is 1.5 to 0.6g/kW·h.

- **Improvement at slow speed performance**

With the conventional fuel valve, smoke increases at slow engine speed; therefore, carbon deposits accumulate on the exhaust passage. Accordingly, replacing to slow-steaming atomizer has been recommended if vessel will be operated at low speed at less than 30% engine load. By using the Slide Fuel Valve, the lowest engine operation speed can be reduced because fine adjustment can be done by the zero sac volume effect. Meanwhile, smoke emission is greatly reduced; therefore continuous operation can be done at wider engine load without replacing atomizer.

- **Lower NOx emission level**

With the Slide Fuel Valve, NOx emission can be reduced approximately 15% on average. The Slide Fuel Valve can satisfy IMO's NOx regulation^{*1)} or local regulations by choosing low NOx atomizer.

^{*1)} With 70MC or smaller engines, conventional atomizer can be conformed to IMO's NOx regulation.

Reference) IMO's NOx regulation

International NOx regulation, "MARPOL Annex VI Regulation13" by IMO will be enforced. The regulation has not been enforced so far; however, it will apply to all diesel engines with a power output of more than 130kW (175bhp), installed on a vessel constructed on or after January 1st 2000, or that undergoes a major conversion on or after January 1st 2000. After entry into force, the vessels that do not satisfy the regulation will be subject to penalty.

On some engines, IMO's NOx regulation can be met without replacing engine parts, but other engines require installing a low NOx atomizer.

If a low NOx atomizer is installed, re-matching of the turbocharger, such as replacing Nozzle-ring or Diffuser, will be necessary.

To comply with IMO's NOx regulations, a NOx Technical File is required.

To apply Slide Fuel Valve to the engines subject to IMO's NOx regulation, an amendment of the NOx Technical File is necessary.

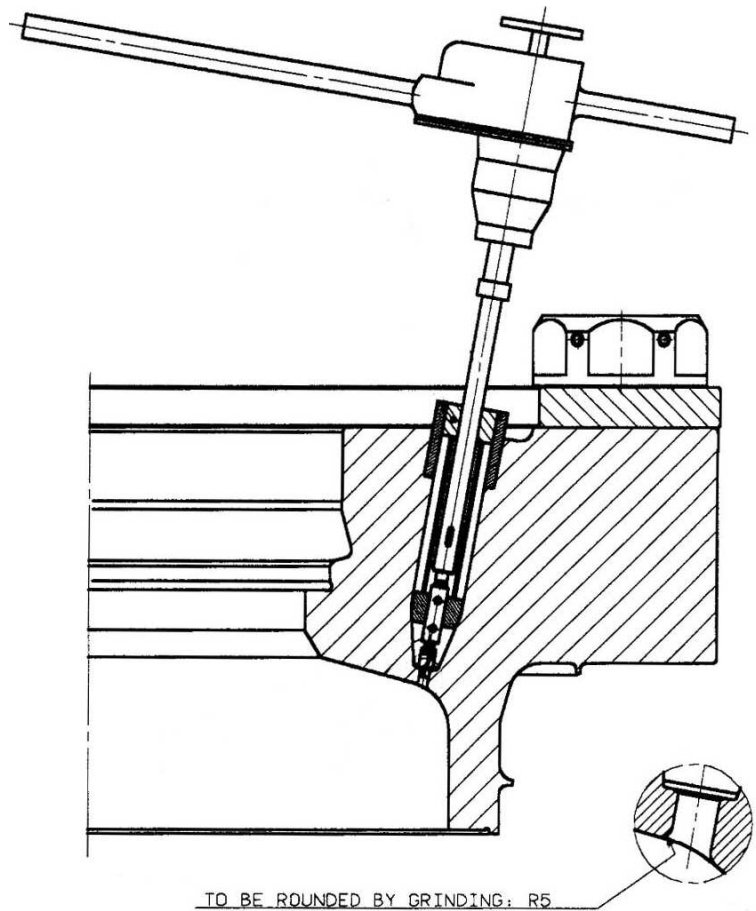
Necessary modification for Installation of Slide Fuel Valve

When fitting new slide fuel valves as a retrofit, it is necessary to modify the cylinder covers, as the original holes in the cylinder covers for the fuel valve nozzles are too small.

This modification can be done while the vessel being moored.

The modification shall be done with a specially developed tool as shown in the drawing to the right.

The slide fuel valves should be applied on all cylinders at the same time, including spares.



Renewal interval of Slide Fuel Valve

The Atomizer must be renewed at every 8000 hours, and Atomizer + Spindle guide must be renewed at every 16000 running hours.

Lineup of applicable engine type at the present

- S60MC (with 2 fuel valves per cylinder)
- S50MC-C (//)
- K/S50MC (//)

Slide Fuel Valves will successively be released for other engine types. Slide fuel valves lead to a significant reduction in operating cost, reduce environmental pollution, and meet NOx regulations; hence, we recommend the adoption of Slide Fuel Valve at the earliest opportunity.

For inquiries and questions, please contact our local sales office.