Wärtsilä 46F optimized with Doc**Hub** e-932 *WLAN*

Engine Monitoring Report

USA, January 2014

Chief Engineer Roman Rafalski

New DocHub e-932 *WLAN*
perfect monitoring system for Wärtsilä 46F, CR and Sulzer Z engines.

I had my first contact with the new Wärtsilä 46F engine together with the installation of the new online engine monitoring system DocHub e-932.

As a speciality this engine is equipped with a variable Inlet valve closure called (VIC). It offers the flexibility to apply early inlet valve closure at high load for lowest NOx levels, while good part-load performance is ensured by adjusting the advance to zero at low load. The inlet valve closure can be adjusted up to 30° crank angle.

In my opinion, this dual pump engine is currently probably the best engine in class as this VIC mechanism enables to reduce smoke on low load. A similar technique was also used on some models of the earlier Sulzer Z type engines.

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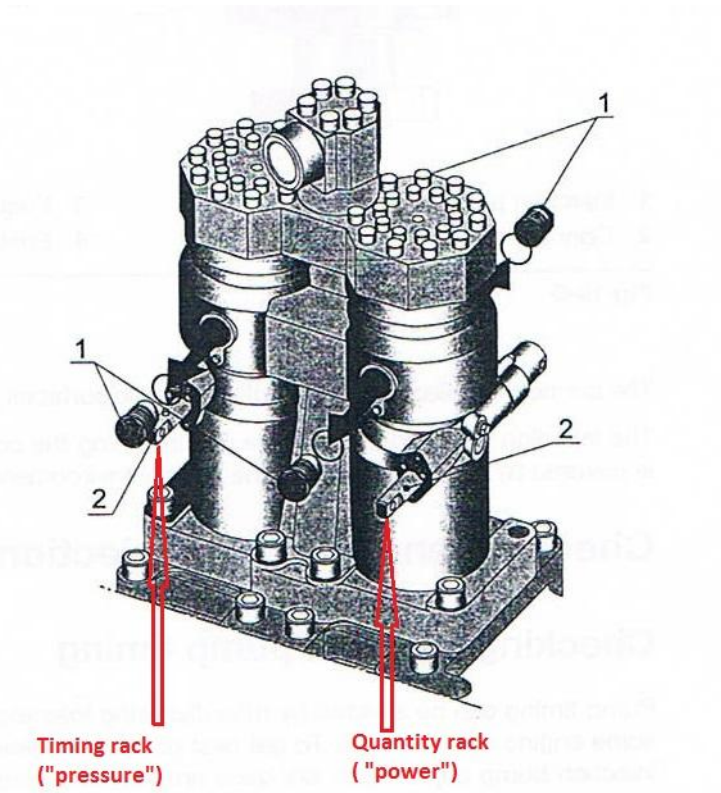
Online fuel quantity and timing can be adjusted

The engine can easily be adjusted using the new portable DocHub e-932 in combination with the VIC technology. No additional tools or software is needed. The adjustment can be done on the running engine.

Similar as the fuel quantity could be adjusted on the fuel rack of the Sulzer Z engines now also the timing of injection can be adjusted in the same way

Our first portable online monitoring system the DM 8-32 is a very good solution for CR engines. By positioning the DM8 unit close to Wärtsilä PC with the ECR Software you could just see the reaction of the changes on the DM 8-32.

However, the DM 8-32 would not be the best solution for the 46F engines as the flexibility to move around the engine was limited by the fixed harness for the sensors.



Easy optimizing Wärtsilä 46F dual pump engine with DocHub e-932 *WLAN*

However, the new DocHub e-932 WLAN is the perfect system not only for the CR type but also for F type and the older engines such as Sulzer Z engines.

If you adjust any cylinder from the A or B bank you can see the changing values on tablet. There is no cable any more which limits you to move around. The new wireless signal is strong and enables to move with the tablet to every cylinder to adjust the engine perfectly. It is strong enough to move around the whole engine room.

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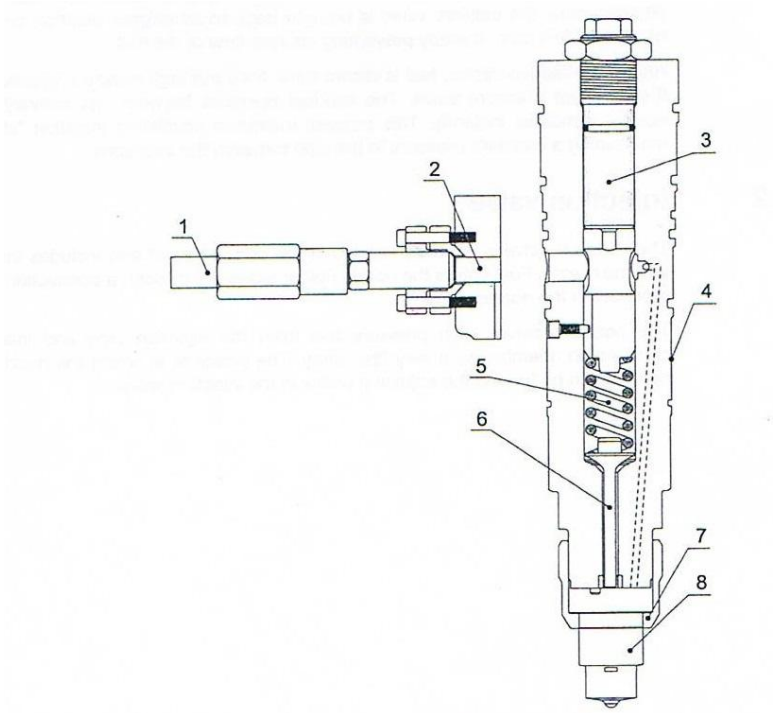
I'm convinced the crew of this cruise ship received a very good tool with the new DocHub e-932.

Also fuel valve are extremely simple and it is nice to see that also things can go simple again.



1 Injection pipe
2 Connection piece
3 Adjusting screw
4 Nozzle holder
5 Spring
6 Push rod
7 Nozzle nut
8 Nozzle

Fig 16-2 Fuel injection valve

On this new 46F engines it shows that old ideas can be very good. However, the full value of these positive developments can only be realized if old diagnostic methods and equipments like single cylinder monitoring system such as Maxi meters or Kistler Peak meters will be removed to analyze and to adjust the engines.

The new DocHub e-932 WLAN is the perfect portable online monitoring system for Wärtsilä 46F, CR and similar operating engines, which allows a balanced engine operation with lower HFO consumption and maintenance cost.

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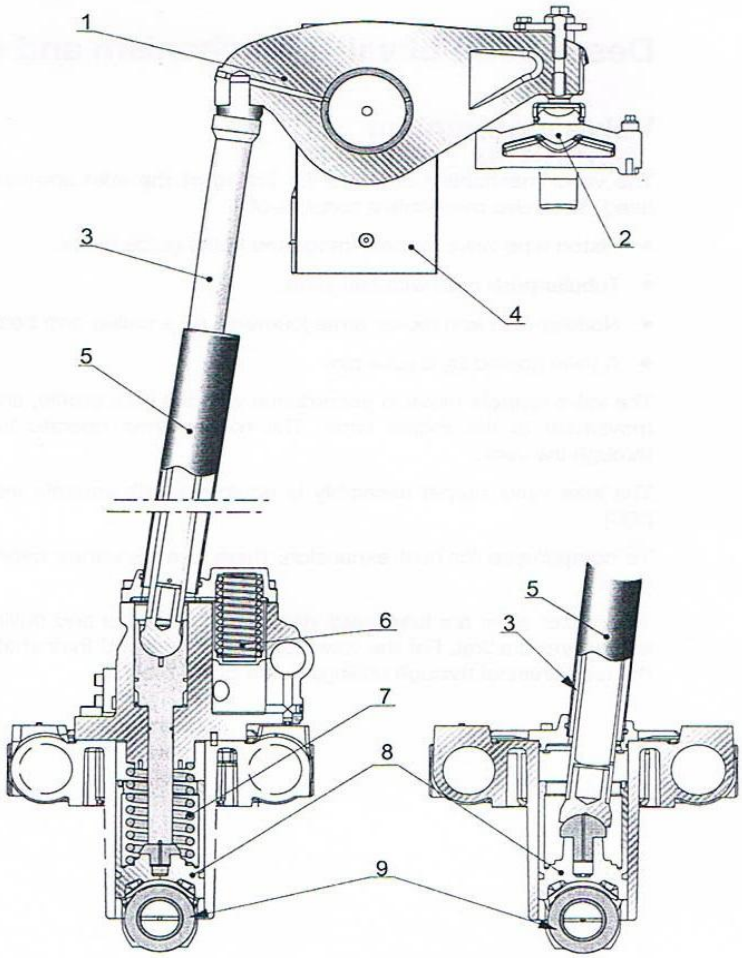
Annex:



1 Rocker arm
2 Yoke
3 Push rod
4 Bearing bracket
5 Protecting sleeve
6 Pulsation damper
7 Compression spring
8 Valve tappet
9 Tappet roller

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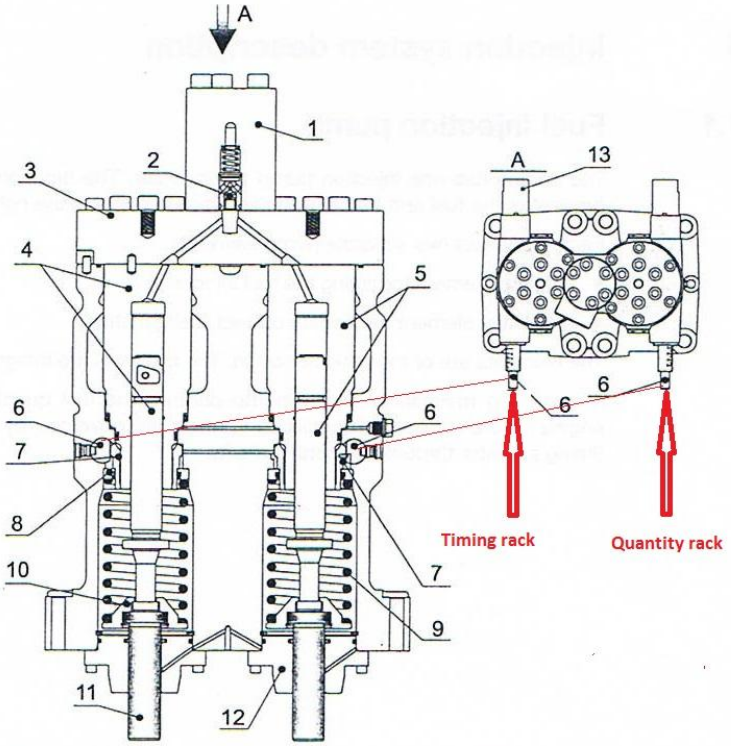

1 Connection piece
2 Main delivery valve, constant pressure valve
3 Pump cover
4 Timing pump element (cylinder and plunger)
5 Quantity pump element (cylinder and plunger)
6 Control rack (fuel rack)
7 Control sleeve
8 Spring plate, upper
9 Spring
10 Spring plate, lower
11 Push rod
12 Flange
13 Pneumatic stop cylinder

Fig 16-1 Fuel injection pump

The quantity of the fuel feed depends on the position of the quantity element plunger in relation to the fuel inlet. The amount of fuel is regulated by rotating the plunger. Fuel delivery time is determined by the timing plunger. The injection start time depends on the rotational position of the timing plunger.

The plungers are pushed up by the camshaft via the roller tappet and pulled back by a spring. They reciprocate in the respective element on a predetermined stroke. The plunger stroke during which the fuel is fed under pressure is called the effective stroke.

When the timing plunger closes the fuel opening at the pump element, the start point of the fuel delivery is reached. The plunger moves upwards and the pressure above the plunger increases. Fuel delivery is stopped when the lower edge of the plunger opens the spill bore. The distance between the plunger upper edge and the lower edge (Helix) increases as the fuel rack is pushed in, and more fuel is delivered. When the fuel rack is pulled out to "zero" position, the fuel by-passes the plunger without increase in pressure.

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