Zero-leakage gas valve sealing design introduced and confirmed in ME-GI cylinder cover

On the ME-GI dual fuel diesel engine using the high-pressure gas injection principle, a gas sealing to avoid leakage is essential, although the constantly monitored leakage detection level must be zero.

The most delicate sealing is the one between the gas injection valves and the cylinder cover. A leakage from that location as well as from all other gas sealings on the ME-GI engine is drained to the ventilated double walled piping system, where it is detected by constantly monitoring HC sensors. An alarm is triggered if the HC concentration reaches 20% (or what is otherwise set by the relevant authorities) of the lower explosion limit (LEL), and at 40% an automatic change-over from gas mode to diesel mode is set off.

Leakages from the area mentioned have been observed on the first production engines, and although the leakages observed have been nowhere near reaching the change-over limit mentioned, corrective measures have been introduced to achieve the zero leakage condition.

In the first place, special sealing rings have been fitted on the outer circumference of the gas valves to provide a seal against the cylinder cover.

Second, the sealing surface in the cover has been prepared and tested in three different ways with:

1. Bare-polished cylinder cover material
2. Hard-chrome plated surface
3. Replaceable hardened bushing

The figure on the next page shows the locations in the cylinder cover and the details of the solutions.

From the various test bed runnings it has been concluded that:

1. Bare-polished surface:
   This solution is completely tight.
2. Chrome-plated surface:
   This solution is wear resistant and with acceptable tightness characteristics. However, the hard-chrome plated surface shows occasional small leakages due to fissures in the chrome-plated surface depending on the chrome layer thickness.
3. Hardened bushing:
   This solution is completely tight, wear resistant and attractive for reasons of production, service and logistics. The advantage over the bare-polished surface solution No. 1 is that the bushing can be replaced if the surface is damaged during overhaul of the gas valves. The axial seating in the cover can be refreshed with a lapping tool, thereby using same sealing rings and bushing parts.

Based on the observations, it has been decided to apply the bushing type solution No. 3 for the new engines on order.

Solution No. 2 with chrome plating is utilised on selected engine types and will be further pursued with regards to refining the manufacturing process, and as an alternative standard.

Consequently, the issue of gas valve in cylinder cover sealing is behind us.
Confirmed sealing solutions for GI-valve in cylinder cover:

- Chrome-plated type
- Hardened bushing type

![Sealing Solutions Diagram]

Fig. 1: Two sealing solutions for the gas injection valve in the cylinder cover. The chrome-plated solution type to the left has a radial sealing interface to the cover. The hardened bushing solution type to the right has an axial sealing interface to cover.

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