Action code: WHEN CONVENIENT

Condition-based overhaul

Cermet-coated piston rings

SL2019-685/KAMO
November 2019

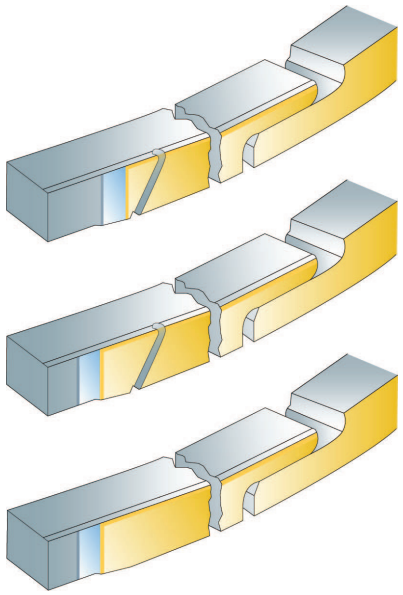
Concerns

Owners and operators of MAN B&W two-stroke marine diesel engines.
Type: All MAN B&W engines fitted with cermet-coated piston rings.

Summary

The overhaul criteria for cermet-coated piston rings are defined, and guidance on how to estimate the remaining lifetime of a cermet-coated piston ring is given based on the remaining coating thickness and wear rate.

Other relevant Service Letters are:
SL2018-659/JAP
SL2019-671/JAP
SL2019-681/SRJ



Dear Sir or Madam

This Service Letter defines the overhaul criteria for cermet-coated piston rings, and it provides guidance on how to estimate the remaining lifetime of a cermet-coated piston ring based on the remaining coating thickness.

Cermet-coated piston rings were introduced as a scuffing preventive countermeasure. The cermet-coated piston rings are now standard on most large-bore engines and are recommended for all engines operating on 0.5% S fuel or lower, as described in Service Letter SL2018-659/JAP.

The overhaul criteria in this Service Letter apply to all engines fitted with cermet-coated piston rings.

Yours faithfully

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Cermet-coated piston ring

Cermet is a composite coating material, which is partly ceramic and partly metallic. The two components combine into a material with high elastic durability from the metallic part and high-temperature and seizure resistance from the ceramic part. This improves the overall wear resistance.

Guided overhaul values

Service experience shows that piston rings do not wear equally around the circumference, thus the applied cermet coating will also not be worn equally. As Fig. 1 shows, it is not unusual to measure local wear differences of up to 50 µm.

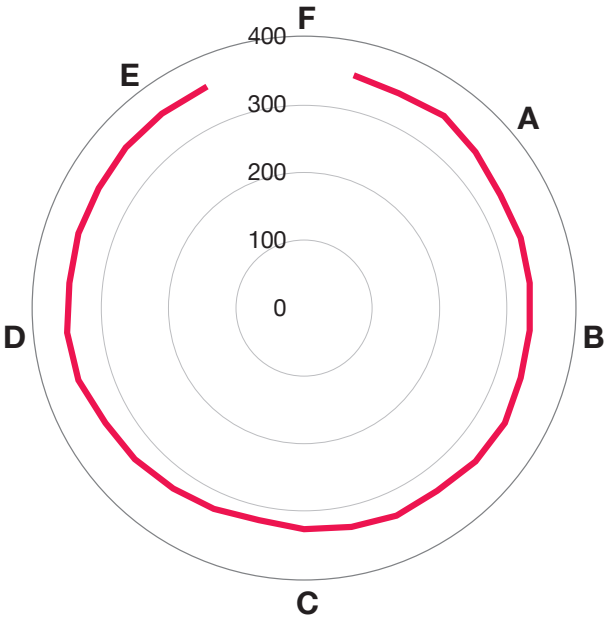

Figure 1: Unequal circumferential wear of a top piston ring

As stated in Table 1, we therefore recommend the following:

- Above 100 µm, note the value of the measured coating thickness
- Increase the inspection frequency of piston rings with a cermet coating thickness of less than 100 µm
- Schedule overhaul of piston rings with a cermet coating of 100-50 µm or less
- Overhaul piston rings with a cermet coating of 50-20 µm at first opportunity.

Cermet-coating thickness action table	
Above 100 µm	No action
100-50 µm	Plan the overhaul of the piston ring pack
50-20 µm	Overhaul at first opportunity

Table 1: Cermet coating thickness action table. Thickness measurements of 20 µm or less should be interpreted as no remaining coating due to the inaccuracy of most coating thickness mesuring gauges.

Predictive overhaul based on cermet coating wear rate

The applied cermet coating (see Fig. 2) is considered a wear part similar to other combustion chamber wear parts such as liner, piston crown, etc. The wear rate of the cermet coating depends on many of the same factors that affect other combustion chamber wear parts, e.g. corrosion, cat fines, fuel type, heavy running, and so forth.

The wear of the cermet coating can to some extent be assessed by analysis of drain oil samples. If these have a high iron content, the piston rings and the liners are worn correspondingly.

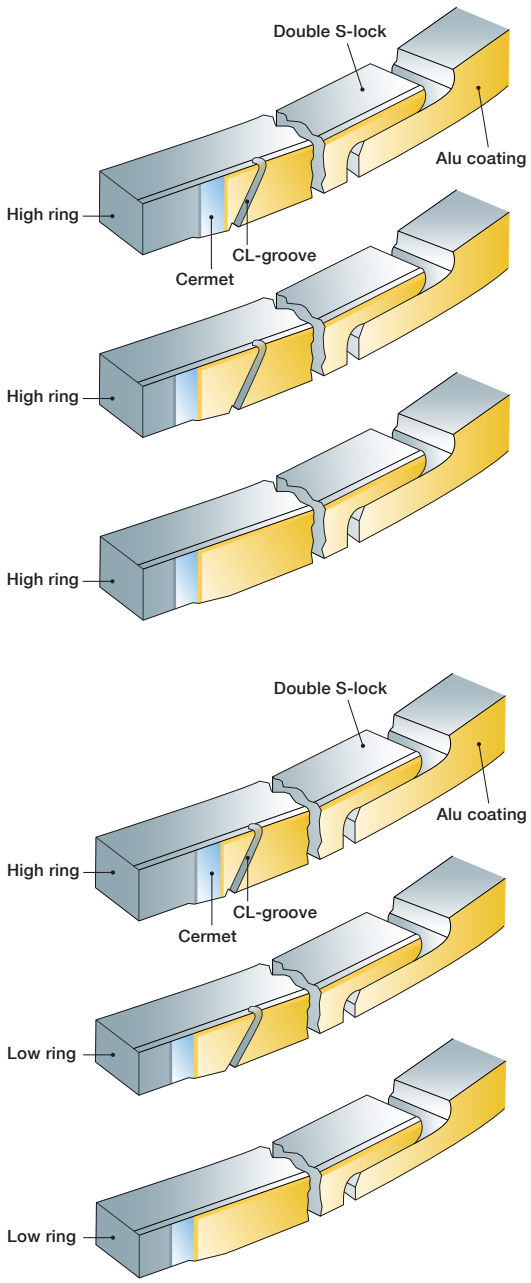

Figure 2: Examples of piston ring packs with cermet coating

Cermet coating thickness gauge

A coating thickness measuring gauge can be purchased from MAN Energy Solutions via PrimeServ and plate item number 2270-0495-0001/012. Send your request for the gauge to PrimeServ-cph@MAN-ES.com.

Prediction of the remaining lifetime of the cermet coating

With continuous measurements of the cermet coating thickness, it is possible to evaluate the wear rate [microns/1000 rh) of the cermet coating and, thereby, predict the remaining lifetime of the piston ring pack.

Calculation of wear rate and estimated remaining lifetime:

$$\frac{\Delta Cermet\ coating}{(\Delta Running\ hours)/1{,}000} = wear\ rate\ \ \mu m/1000hours$$

Example (see also Figure 3):

First coating thickness measurement:
600 µm @ 1,000 runinng hours
Measured cermet coating: 442 µm @ 7081 running hours
Min. allowed coating: 20 µm

$$\frac{600-442}{(7081-1000)/1000} \sim 25{,}9\ \ \mu m/1000hours$$

$$\frac{442-20\ [\mu m]}{25{,}9\ \ \mu m/1000hours} = 16{,}293\ [x1000hours]$$

Based on this calculation, the estimated remaining lifetime of the piston rings is 16,293 hours. This means the total lifetime of the piston ring pack is 23,374 running hours.

$$\frac{Remaining\ coating - min.allowed\ coating\ [\mu m]}{wear\ rate\ \mu m/1000hours} = Estimated\ remaining\ lifetime\ [x1000hours]$$

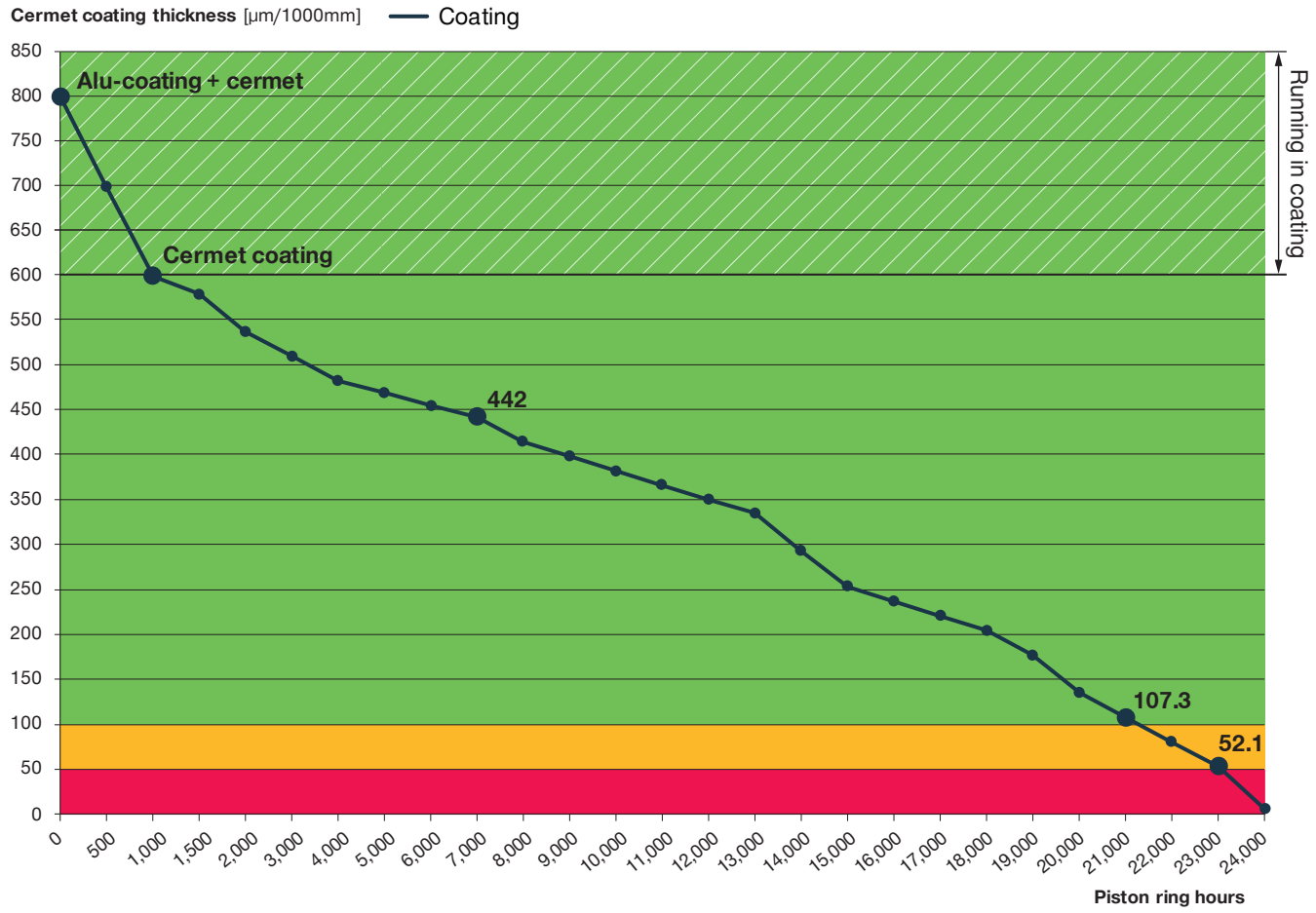

Figure 3: Coating thickness