中远集团船员英语
适岗考试系列教材

高级轮机英语阅读

Advanced English Reading for Marine Engineering

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内容提要

本书是根据中远集团船员英语适岗标准的要求而编写的系列教材之一。全书共分十六个单元，主要内容包括：主机的运行与故障，MC机型的新技术，制冷装置，舵机装置，锅炉，甲板起重机，安全应急设备，电力系统，计算机与主机遥控，监测系统，港口国检查，STCW 78/95公约摘选，MARPOL公约摘选以及业务书写等内容。每个单元中含一篇课文及两篇阅读材料，并附有常用的相关词汇。书后附有轮机长与大管轮的适岗考试笔试模拟试题各一套。

本书主要作为中远集团轮机长、大管轮的适岗英语培训教材，同时也可供其他船员自学或专业技术人员参考。

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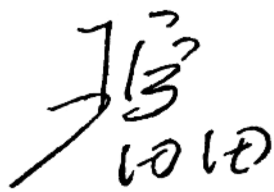
序

看到船员英语适岗考试系列教材出版，我十分高兴。这标志着我们的船员英语培训工作又向前推进了一大步。

在日益激烈的国际市场竞争中，中远集团越来越清醒地认识到——英语作为一种国际间的交流工具，已经成为衡量企业和船员素质高低的重要标尺。航运业是一种国际性行业，远洋船员是一种国际性职业。中远作为特大跨国航运企业，若想进一步加快发展的步伐，就必须使船员学会驾御英语这门语言工具。集团于 1995 年提出对船员实施英语适岗考试制度，以适应国际海事组织 STCW78/95 公约和我国海事局九七规则对船员的要求。英语适岗考试正式实施的三年间，取得了良好的效果，对提高广大船员的英语水平发挥了重要作用，为建立企业的职业岗位资格证书制度提供了有益的借鉴。船员英语适岗考试系列教材的及时出版，正是适应了集团对英语培训新的发展需要，将会对船员英语适岗考试起到良好的推动作用。同时，这套教材具有较强的针对性、实用性，能够较好地提高船员学习英语的积极性。

为此，我向为该系列教材的出版付出辛勤劳动的教师及有关人员表示衷心的感谢！我们也期待着，该系列教材能够经受实践的检验，为全面提高中远船员英语水平发挥更重要的作用。



前　言

为全面提高船员的英语水平，以适应 STCW78/95 公约和开拓外派劳务市场的需要，中远集团自 1996 年开始对全集团船员实施英语适岗考试。为配合船员英语适岗考试的顺利实施，成立了中远集团船员英语适岗考试系列教材编写委员会，组织系列教材的编写工作。

本系列教材根据《中远集团船员英语适岗标准》的规定，密切配合中远集团船员的实际工作，由青岛远洋船员学院、大连海运学校、广州海员学校、天津海员学校和上海远洋运输公司教育中心合作编写。系列教材共分十册：其中《水手英语》由广州海员学校编写，《机工英语》由天津海员学校编写，分别供参加航海与轮机 1～2 级适岗考试的船员使用；《航海英语阅读》、《航海英语口语》由青岛远洋船员学院和大连海运学校编写，供航海 3～4 级的船员使用；《轮机英语阅读》、《轮机英语口语》由青岛远洋船员学院和大连海运学校编写，供轮机 3～4 级的船员使用；《高级航海英语阅读》、《高级航海英语口语》和《高级轮机英语阅读》、《高级轮机英语口语》由青岛远洋船员学院和上海远洋运输公司培训中心编写，分别供参加航海和轮机 5～6 级适岗考试的船员使用。

航海专业英语的五册教材和轮机专业英语的五册教材根据各个岗级的岗位工作特点自成体系，又相互配合，形成整体，以适应船员参加英语适岗考试的笔试、听力和口试的考试要求。教材内容在选材与编写上紧紧围绕各级岗位的实际工作需要，同时考虑到国际海事组织 STCW78/95 公约和我国海事局船员适任考试和评估大纲对船员英语的要求以及远洋船舶在新技术上的发展和对船舶管理水平的要求。

中远集团船员英语适岗考试系列教材编写委员会

1999 年 7 月

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Unit One

New Technology for [1]MC Engine

Text

New Technology for MC Engine (I)

Cylinder Condition

Good cylinder condition is one of the key parameters in ensuring engine reliability and low maintenance costs, so improvements will always be given high priority. In the eleven year's history of the MC engine, design modifications have been introduced successively, [2]in line with increased outputs and the demand for reducing the maintenance volume. This has give a satisfactory overall cylinder condition, with low average wear rates, resulting in long overhaul intervals and component lifetimes, even though the lifetime of cylinder liners on some plants has been reduced by cracking and a few others have suffered from frequent broken piston rings and high ring wear.

Cylinder Wear/Cylinder Oil Dosage

Cylinder wear may be abrasive wear and corrosive wear, both of which are always to some extent active.

Low cylinder wear rates are basically ensured by careful running -in and subsequently by a combination of the correct cylinder wall temperature, adequate cylinder oil dosage, the correct combination of liner and ring materials —and, of course, correct fuel valve and fuel oil treatment.

[3]Cylinder wall temperature, fuel oil sulphur content, and cylinder oil dosage are interdependent —in so far as a correct [high] liner temperature will minimize the tendency to corrosion— thus permitting the neutralizing cylinder oil dosage to be kept reasonably low.

Design-wise, the cylinder wall temperature at the top part of the liner is adjusted by [4]matching cooling intensity to the layout point of the engine. MC service experience shows that our aim of ensuring low wear rates at a reasonably low cylinder oil consumption has been successfully achieved.

For the current bore-cooled cylinder liner, the cooling level at the top part can be adjusted by insulating the inserted cooling pipes.

Even so, corrosion is an active wear parameter either as a result of using fuels with a high sulphur content, or because the actual service load has led to lower combustion chamber temperatures. In such cases the wear rate may be reduced by increasing the cylinder oil dosage.

[5]In the case of corrosive wear at the center part of the liner, we have, on a test basis, successfully introduced glass fibre insulation of the zone influenced by the cooling water in the cylinder frame. Similar results have been obtained by bypassing the cooling water from the cylinder frame.

Cases of sporadic higher wear, or instances of piston ring problems due to operational or fuel related disturbances, are always easily detected by regular scavenge port inspections. Because of the complex mechanical and chemical balance, though, the reason for the problem is not always found as easily.

Cylinder Lubrication ([6]Load Change Dependent Lubrication)

Correct cylinder oil dosage is of vital importance for the cylinder condition. To enhance reliability and ensure appropriate lubrication under all conditions, the lubricators have been equipped with an intelligent dosage control, which automatically adjusts the lubrication, based on changes in the engine load. This system has been designated Load Change Dependent Cylinder Lubrication [LCD], the system is an advantage on modern ships with reduced crews, because it eliminates the need to manually adjust the lubricators during maneuvering and other situations of varying loads, such as during rough weather.

The system is controlled by a mini-computer [digital control unit], which either is a part of the electronic governor or a separate control box. On receiving a signal for the fuel pump index, the digital control units detect "large and lasting" changes in the engine load, for instance as they appear during maneuvering. In response to such signals, the control unit actuates a solenoid valve which opens for air to a cylinder fitted on the quantity adjustment shaft of the lubricator.

[7]An intelligent digital control unit is necessary to distinguish between significant load changes and false changes in index, which might be due to improper functioning of the governor, of the index actuator or to wear in the fuel regulating shaft.

The system is in service on a number of ships, and now proves to be reliable after a few [8]teething troubles have been overcome.

Piston Ring /Ring Groove

Today the piston ring condition determines the cylinder condition to a greater extent than the cylinder liner does, because the rings show relatively larger wear rate variations. The typical wear rates are around 0. 30-0. 40mm/h.

[9]The normally satisfactory piston Mean Time Between Overhaul [MTBO] of 8-12,000hours is sometimes disturbed by ring problems in the form of sticking, collapse or even breakage. The causes are usually operationally related, for instance originating from decreased turbocharging efficiency, excessive pressure rise Pmax-Pcom, insufficient cylinder lube oil dosage, irregularities in

the fuel oil system [fuel valves , fuel valve nozzles], or from the fuel oil itself.

The most severe consequences of piston ring irregularity occur when the problem is not detected by the crew at an early stage and therefore not properly counteracted by an increased cylinder oil dosage. In extreme cases this may lead to gas blow-by of the complete ring pack, and ultimately to heat cracks in the cylinder liner.

The main concern with piston rings is premature locking of the rings in the ring grooves due to carbonaceous deposits. Combustion gas will then by-pass the locked ring area and overheat the ring, which then loses its elasticity. This happens most frequently with the second and third rings from the top, as they have less differential pressure across the ring during combustion than the top ring. In view of this, the additives in the cylinder lube oil for controlling the carbonaceous deposits are essential for an optimal cylinder condition.

The continued development of piston ring materials is followed by a series of field tests in order to obtain even longer time between overhauling . An example is our test with the RM-5 ring. The results with chromed and plasma coated piston rings are also promising and will be further elaborated. Compared with the Uballoy ring, the RM5-T ring offers higher thermal stability bending strength, tensile stıength modulus of elasticity and Brinell hardness. The final T in the name indicates the pre-tapering of the running surface of the ring, made in order to facilitated the running-in of a new piston ring. Based on the above, we have changed our standard Uballoy rings to RM5-T rings.

Eleven years of MC service experience have confirmed that the chrome plated piston ring groove is every satisfactory.

In fact, it is only recently that we have received reports of the chrome layer being worn through, requiring reconditioning of the grooves on some of the very first MC engines produced, which have logged around 60. 000 service hours.

Cylinder Liners

As discussed in the previous edition of "Service experience of the MC Engines" issued in 1989, we experienced cracked cylinder liners on a number of plants. The problem is clearly limited to the first generation of MC liners, and has centred on specific plants. For the approx 1,200 second-generation cylinder liners with bore-cooling, which have entered service after this design was introduced for the latest Mk III and for all Mk V engines, we have so far logged more than 22,000 running hours for the first liners installed without any reported cracked liners.

The proven advantages of the bore-cooled liners are mainly as follow:

They are easier to produce in a high, uniform quality since they have bored cooling ducts-instead of the previously used cast-in cooling pipes.

The material has been changed from "tarkalloy" to "Tarkalloy C" ,which has significantly higher tensile and fatigue strengths. In addition, the producers have obtained a consistent and high quality.

Furthermore, an additional advantage for the MK V type is as follow:

The deeper cylinder cover reduces the risk of heat cracks in the event of inferior turbocharger performance, inefficient coolers or abnormally operating fuel equipment, fuel nozzles, etc. The reason is that the high heat input is absorbed by the cylinder cover, which is made of heat resistant molybdenum steel. This has a much higher thermal stability than the grey cast iron (Tarkalloy C) used for the cylinder liner.

The stress level was reduced, compared with earlier versions of the bore-cooled MC cylinder liners, by increasing the thickness of the liner and redesigning the cross-bore area at the cooling bores and optimizing the position of the contact surface between the cylinder cove and cylinder liner.

Practically speaking, the liners are identical for all ratings. The temperature adjustment of the running surface for lower rated engines takes place by insulating the pipes in the cooling bores as shown in Fig. 8.

The safety margins relative to the MK III bore-cooled design are increased by 30%～35%.

The foundries producing the Tarkalloy C material have been supportive in this regard. Recently, in our materials laboratory, we have invested in image processing equipment, which provides picture of the structure of materials, e. g. the amount of graphite, pearlite, cementite, etc. This gives us a better and more objective basic of judgment and a significant time-saving.

Special attention has been paid to obtaining a sufficient cylinder liner wall temperature during combustion in order to avoid cold corrosion in the cylinder liners. Our calculations were confirmed by temperature measurements in service. On the basis of the advances calculation methods, as well as experience with the Mk V bore-cooled liners, we can conclude that the cylinder liners and cylinder covers of the Mk V engines will have a very wide safety margin against abnormal service conditions and will provide a good cylinder condition.

Piston

For all practical purposes, the piston crown has not been subject to excessive burning. In plants with K-type engines and engines with a [10]Turbo Compound System(TCS), causing higher thermal loads on the piston crown, an inconel layer has been applied, as a very efficient remedy against burning, Fig. 10.

A number of the larger engines have experienced piston shirt scuffing during the initial running period, which originally was considered a cosmetic problem only. However, we have recently experienced more severe cases where the skirts are worn down to the piston crown level. As a countermeasure, we modified the skirt design, and the present standard for the 90-60MC types features lead bronze bands to achieve better running conditions. On a number of "problem-plants" this has proved to solve the problem.

The most serious problems with the MC piston occurred in a total of eight cases where the screws for fixing the piston skirts worked loose, and the skirt dropped off during running. In all cases accidents were avoided thanks to the piston cooling oil flow alarm. As a countermeasure, we introduces locking wire instead of locking plates and new types of screws for fixing the piston

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skirt to the piston crown.

A few instances of fretting between the contact faces of the piston rod and piston crown have been seen. This fretting has occasionally led to cracks in the contact face between the crown and the rod. In order to increase the contact pressure and thereby prevent fretting, a relief groove and taper have been successfully introduced. for existing components, we have developed a repair method with a cast iron spacer ring allowing machining of the affected areas.

Piston Rod and Stuffing Box

Thanks to the hardened piston rods, modified stuffing box design, and increased scraper ring pressure introduced on the MC engine from the very start, the drain-oil quality and system oil consumption/contamination have remained low. Conditions have been stable, and scratch-free piston rods and clean crankcases have been the order of the day. In view of the excellent performance of the MC type of stuffing system as retrofit for our older engine types, and have achieved similar good results.

The amount or drain oil on many MC engines is actually so low that many owners choose to dispose of it rather than to recycle it through the cleaning system on board.

New Words and Expressions

parameter	/pəˈræmitə/	n.	参数
reliability	/rilaiəˈbiliti/	n.	可靠性，安全性
priority	/praiˈɔriti/	n.	优先，重点
modification	/mɔdifeiˈkeiʃən/	n.	改进，改造，改装
successively	/səkˈsesivli/	ad.	不断地，连续地，
overall	/ˈəuvərɔːl/	ad.	总地，全面地
corrosive	/kəˈrəusiv/	a.	腐蚀的，侵蚀的
interdependent	/intədiˈpendənt/	a.	相互依赖(联系)的
minimize	/ˈminimaiz/	v.	减小，缩小
tendency	/ˈtendənsi/	n.	趋向，倾向
neutralize	/ˈnjuːtrəlaiz/	v.	中和
reasonably	/ˈriːznəbli/	ad.	合理地
design-wise	/dizain waiz/	a.	设计方式…wise：方式，状态
intensity	/inˈtensiti/	n.	密度，强度
layout	/ˈleiaut/	n.	布置，分布
insulate	/insjuleit/	v.	绝缘，隔绝
fibre	/ˈfibə/	n.	纤维
sporadic	/spəˈrædik/	a.	不规则的，偶然发生的
instance	/ˈinstəns/	n.	事例，例证
disturbance	/disˈtəːbəns/	n.	干扰

vital	/ˈvaitl/	a.	基本的，非常的，重要的
enhance	/inˈhɑːns/	v.	提高，增强，增长
intelligent	/inˈtelidʒənt/	a.	智能的
digital	/ˈdidʒitl/	a.	数字(式)的
prove	/ˈpruːv/	v.	证明，证实
teethe	/tiːð/	vi.	出牙
collapse	/kəˈlæps/	v.	塌陷，毁坏
breakage	/breikidʒ/	n.	损坏，毁坏
irregularity	/iregjuˈlæriti/	n.	不规律，不正确
ultimately	/ˈʌltimitli/	ad.	最后地，主要地，
premature	/ˈpremətˈjuə/	a.	(做法等)不成熟的，仓促的，草率的
carbonaceous	/kɑːbəˈneiʃəs/	a.	结炭的，炭化
elasticity	/elæˈstisiti/	n.	弹性
optimal	/ˈɔptiməl/	a.	最佳的，最适宜的
chrome	/ˈkrəum/	n.	铬
plasma	/ˈplæzmə/	n.	等离子体
promising	/ˈprɔmisiŋ/	a.	远景的，前景的
elaborate	/iˈlæbəreit/	v.	发挥
tensile	/ˈtensail/	a.	拉力的，拉伸的
modulus	/ˈmɔdjuləs/	n.	系数，模数，模量
pre-taper	/priˈteipə/		逐渐变细，斜削，弄尖
facilitate	/fəˈsiliteit/	v.	便于，促进，有利于
recondition	/riːkənˈdiʃən/	v.	修理，检修，重修
previous	/ˈpriːvjəs/	a.	以前的，从前的
issue	/ˈiʃuː/	v.	颁布，出版
centre	/ˈsentə/	v.	集中，使居中
proven	/ˈpruːvən/	a.	被证实的
uniform	/ˈjuːnifɔːm/	a.	相同的，一致的
cast-in	/kɑːst/	a.	嵌入，浇铸
fatigue	/fəˈtiːg/	n.	疲劳
consistent	/kənˈsistənt/	a.	一贯的，一致的，稳定的，符合的
inferior	/inˈfiəriə/	a.	低下的，次要的
molybdenum	/məˈlibdənəm/	n.	钼
version	/ˈvəːʃən/	n.	类型，模型
optimize	/ˈɔptimaiz/	v.	最佳化，优化
identical	/aiˈdentikəl/	a.	相等的，一致的
rating	/reitiŋ/	n.	(柴油机的)额定功率
foundry	/ˈfaundri/	n.	铸造厂
supportive	/səˈpɔːtiv/	a.	支持的

invest	/inˈvest/	v.	投资
image	/imidʒ/	n.	影像
graphite	/græfait/	n.	石墨
pearlite	/ˈpəːlait/	n.	铸铁珠光体
cementite	/siˈmentait/	n.	碳化铁
objective	/ɔbˈdʒektiv/	a.	客观的，真实的，实际的
conclude	/kənkˈluːd/	v.	推论，作结论
initial	/iˈniʃəl/	a.	开始的，基本的
cosmetic	/kɔzˈmetik/	a.	化妆的，粉饰的
countermeasure	/ˈkauntəmeʒə/	n.	对策，方法
fret	/ˈfret/	v.	侵蚀，磨损
spacer	/ˈspeisə/	n.	垫片，衬套
scratch	/sˈkrætʃ/	v.	擦伤，划破
scratch-free		a.	未擦伤的，未划破的
retrofit	/ˈretrəfit/	n.	改型，翻新
dispose	/disˈpəuz/	v.	处理，处置

in line with	与……一致，符合……
in so far as	就……来说，至于……，到……的程度
to some extent	一定程度上
be based on	在……基础上
in response to	相应，相符，与……一致
in service	工作，运行
in the form of	以……形式
in view of	考虑，以……观点
originate from	出于，来源于
in this regard	在这方面
on a test basis	在实验的基础上
a series of	一系列
invest in	投资
on the basis of	在……基础上
dispose of	处理，处置

Notes

1. MC engine MC 柴油机是 MAN engine 和 B&W engine 的改进机
2. in line with 与……一致的（地），符合……的（地）：This plan is in line with my ideas. 这个计划符合我的想法。
3. Cyinder wall temperature, fuel oil sulphur content,…气缸壁温度，燃油中的硫分和气

缸滑油是相互影响的。合适的缸套温度将减小腐蚀倾向，因此允许起中和作用的气缸油保持适当低的滑油量。（碱性气缸油中和酸性产物）

in so far as 到……的程度，在……范围内：In so far as you are a student, you are allowed to travel cheaply on our railways. 只要你是学生，乘我们的火车便可享受削价优待。

4. ... matching cooling density to the layout position of the engine.

……使冷却密度与柴油机汽缸的设计位置相适应。

match ... to ... 使……与……相适应：match the training programme to one's needs in the factory 使训练计划与工厂需要相适应

5. In the case of corrosire wear at the center part of the liner,…对缸套中部的腐蚀来说，在实验的基础上，对缸体中受冷却水影响的区域，我们成功地引进了玻璃纤维隔热材料。

in the case of..：对……来说，在……情况下

on a ... basis, on a basis of..., be based on ... 在……基础上

6. LCD [Load Change Dependent Lubrication] 负载可变汽缸润滑系统

7. An Intelligent digital control unit is necessary to disting wish…智能数字控制装置必须辨别重要的负荷变化和错误的燃油指数变化。这种错误的改变可能是由于调速器工作不正常或燃油调节杆装置误动作或可能是由于燃油调节轴的磨损引起的。

due to improper functioning of ... or (due)to wear in the...：是由于工作不正常和磨损……

8. theething trouble 事情开始时的暂时困难 teethe vi 出牙

9. The normally satisfaltory Piston Mean Time Between Overhaul…满意正常的活塞平均大修周期 8 000～12 000 h 有时受活塞环卡住，毁坏或损坏形式故障的影响。

MTBO [meantime between overhaul]：平均大修周期

in the form of ... 以……形式：a jelly mould in the form of a motor car 做成汽车形状的果冻

10. Turbo Compound System [TLS]　复合增压系统

Reading Materials

I

New Technology for MC Engine (II)

Cylinder Cover

The cylinder cover has not caused any serious problems. The difficulties which did arise have centred on the following:

During manufacturing the cooling bores at the starting valve position have been bores too close to the pocket. This has caused cold corrosion in the pocket. The problem was solved by insulating the relevant cooling bores and inserting a press-fitted liner of corrosion-resistant material in the starting valve pocket. To increase the safety margin, the cooling bores were moves away from the starting valve bore.

"Burnings" in the cover surface adjacent to the fuel valve nozzles. This difficulty was tackled by introducing a lengthened fuel valve nozzle tip. Repair of burned areas was done by welding-up as shown in Fig. 13 and in Service Letter SL92-301/UM.

Similar welding-up of corroded areas was done at the exhaust valve landing surface on the cylinder cover.

On the S26MC and L35MC we have experienced cracks in the welded-on cooling rings, due to poor welding quality. On the Mk V and MK VI engines, the design has been changed, eliminating the welded-on cooling rings.

Exhaust Valve

The MC exhaust valve design has established its high degrees of reliability, and recommended MTBOs have generally proved sufficient to ensure trouble-free service. It is our experience that the average time between seat grinding can be considerably increased for a large number of engines. Examples of more than 25,000 running hours on a Nimonic exhaust valve without overhaul have been logged.

Valve Spindle and Bottom Piece

Since the introduction of the coated underside of the spindle disc for the large engine types, we have seen that the inconel 625 overlay, even under severe running conditions, is able to keep the burning rate at a satisfactory low level.

Because of the increased output of the latest engines, and not least a pronounced demand from shipowners, we have advocated the Nimonic spindle on the 60-bore and upwards.

To match the increased high-temperature hardness of the Nimonic spindle, we have introduced a hardened steel bottom piece with surface hardened seat.

As a consequence of the change in materials and the aforementioned possibility of increasing the grinding interval, we now recommend an MTBO of minimum 14,000 hours for the Nimonic valve.

We have recently been faced with a well-hidden case of cold corrosion that only exists on the bottom pieces of K/L 90MC MK II. These bore-cooled bottom pieces are fitted with an insulation shield in the gas duct. The temperature levels at the seat area and around the cooling bores may thus be lower than the dew point, and if corrosive exhaust gas products enter the space behind the shield, corrosion attacks may appear.

A corrosion attack here can result in water leakage from the cooling bores to the exhaust valve duct and further to the combustion chamber when the engine is at a standstill. Leakages have been reported for bottom pieces with service lives of about 20,000 hours, fortunately without any consequential damage.

We have issued information on inspection methods, discarding criteria and repair/prevention methods to the engine builders in question and to our authorized repair shops and service centers.

Exhaust Valve Housing

Cold corrosion of the gas duct has led to durability problems on a number of the exhaust valves in service, in particular on the large bore engine.

The corrosion attack is found at the positions adjacent to the spindle guide boss, and in the duct areas at the cooling water inlet positions.

As a countermeasure, a cooling water bypass was introduced, as described in our paper. This first version was, however, not able to prevent the corrosion attack, and the matter was investigated further.

As a result, new housings have been designed with thicker gas duct walls as standard, and also with a reduced cooling water flow.

Service trials have confirmed that the below-mentioned repair methods and countermeasures are effective:

High velocity sprayed Diamalloy 1005 coating in the gas duct.

Repair welding with gas metal arc welding, preferably in connection with the sprayed coating.

Thicker gas duct walls.

Spindle Guide Sealing Air Arrangement

Cases of wear of the spindle stem chromium plating have been seen and may be related to the sealing air arrangement.

The supply of control air to the sealing arrangement resulted in a reduction of the amount of carbonaceous deposits in the sealing air chamber, but this was not always enough to prevent wear problems.

A modified sealing air system, incorporating oil mist and air supply from the exhaust valve's air spring has now been tested in service for more than a year, and has shown very promising results: a completely clean sealing air chamber, and virtually no wear on either the spindle stem or the sealing rings.

We intend to introduce the above system as standard and as a possible retrofit for existing plants in the near future.

Damped Closing of Exhaust Valve

In order to increase the safety margin against knocking of the exhaust valves in service, we have developed an internal damped closing of the exhaust valve.

The system consists of a small damper position on top of the exhaust valve piston which dampens the closing of the exhaust valve by restricting the hydraulic lubricating oil outlet.

Furthermore, this design has the advantage that it eliminates the need for adjusting the

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