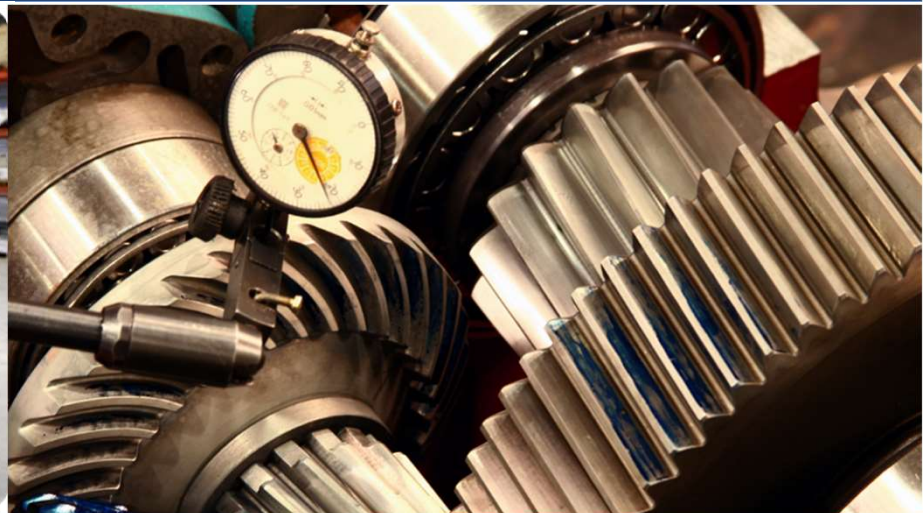


# Gearboxes

## 第三部分：齿轮箱维修、改造、定制制造

- Stork自有子品牌齿轮箱
- Stork并购的德国Ja-Ka  
齿轮箱服务业务
- 世界主要品牌齿轮箱
- 欧洲最大的全品牌齿轮箱专业维修公司
- 40多年齿轮箱设计、制造和维修的专业积淀
- 先进的激光熔覆修复和再制造技术
- 船舶、海洋、石化、电厂、风电、钢铁、水泥、煤矿等工业领域



# Company profile

## Stork齿轮箱子公司概况

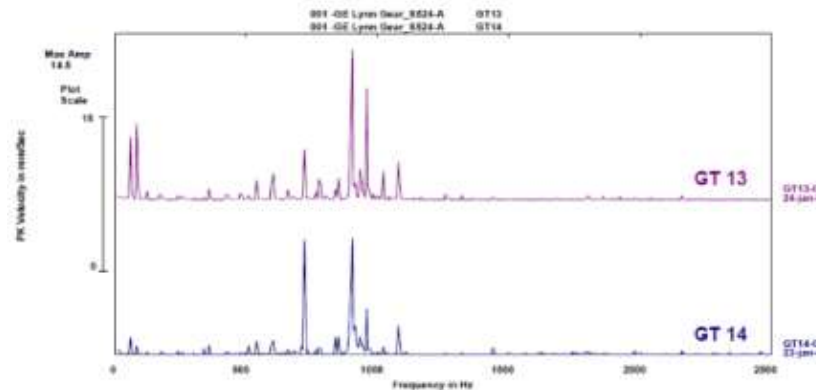
- ✓ Specialized in gearbox repair, modification, and parts manufacturing independent of any OEM  
独立和专业的各品牌齿轮箱产品维修、改造和部件制造
- ✓ Design and manufacturing of custom built gearboxes  
定制齿轮箱的设计和制造
- ✓ Specialized in fast responses and offer worldwide support, 24 hours a day  
快速和专业的反应，全球24小时服务
- ✓ Active in all major market segments, both land based and maritime  
业务涵盖陆用和海运主要市场



# Diagnostics Services

## (一) 诊断服务

- Dedicated team of diagnostic specialists  
诊断专家团队
- Trouble shooting by means of:  
故障排除方法:
  - Vibration /Spectral analysis 振动/频谱分析
  - Video scope analysis 示波分析
  - Thermographic analysis 热像服务
  - Torque Measurement 扭矩测量
- Combination of in-depth knowledge of vibration analysis  
振动分析和齿轮技术知识的深度结合
- Analyse gearbox problems before downtime is caused  
预防性故障分析

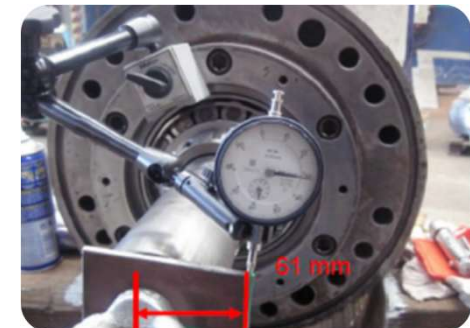




# On Site Services

## (二) 现场服务

- 24/7 Service Availability  
每周7天，每天24小时服务
- World Wide Reach  
全球可达
- Experienced Service Engineers  
经验丰富的服务工程师
- Supervision of Onsite Repair Projects  
现场修复及监护
- Onsite Reverse Engineering  
现场逆向工程设计
- Commissioning and Decommissioning  
启运和停运

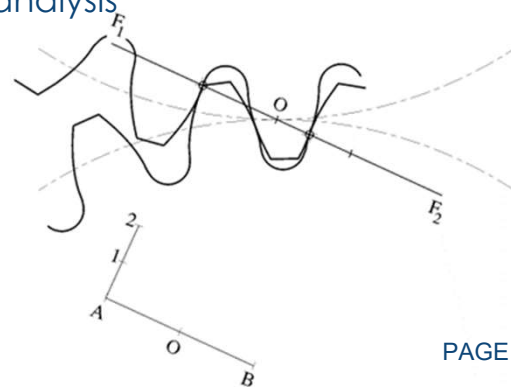
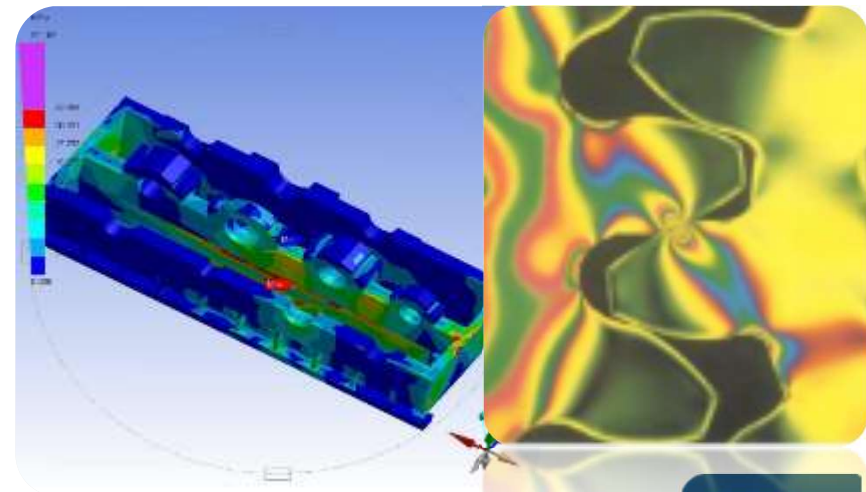


# Engineering

## (三) 设计

Combining an in-depth understanding of gear technology with state-of-the-art engineering facilities  
齿轮技术专业知识和先进设计工具：

- In house engineering, independent of OEM  
独立于齿轮箱原厂商OEM产品的设计
- Development own new gearbox designs  
新齿轮箱技术开发
- DIN, AGMA & JIS standards conformity  
符合DIN, AGMA和JIS标准
- Reverse engineering, onsite/in-house  
现场逆向工程设计
- Concept analysis, Fit for use/strength calc.  
使用和强度计算概念分析
- Modification feasibility  
改造可行性分析
- Failure / Root cause analysis  
故障原因分析



# Workshop Repair

## (四) 工厂修复和改造

Major Benefit Customer: Significant improvement on delivery time and service, no concessions on quality.

在确保质量的情况下，显著降低供货周期和提高服务。

- Workshops in Europe, Middle East and Asia 欧洲，中东和亚洲工厂
- 施托克自有品牌齿轮箱，包括：  
Own brand gearboxes: Kuypers, Rademakers, Brevo, Stork
- 80% of repairs is done on other brands such as:  
**80%的维修工作是针对其他品牌，拥有以下众多品牌的维修经验：**
  - Siemens/Flender (西门子/弗兰德), RENK(伦克), CMD, Allen Gears,
  - Hansen, Winergy, Lohmann + Stolterfoht, Moventas,
  - Valmet, Sante Salo, Eickhoff, Echesa, Millwakee,
  - JA/KE, Tacke, Thyssen Krupp, Kumera, Dorstener
- In house test run 室内测试



# STORK®



# STORK



# Laser Cladding

## (五) 激光熔覆技术 - 零件翻新再制造

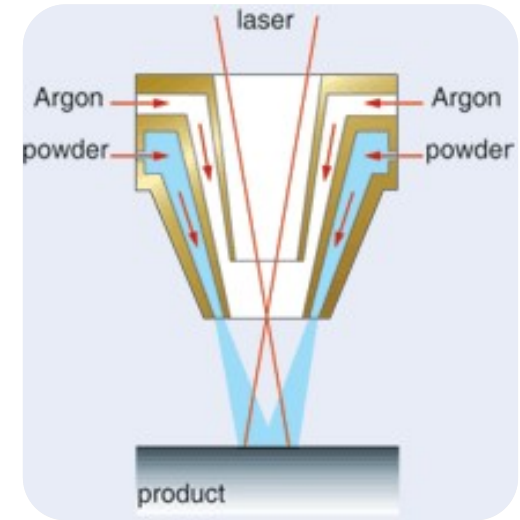
Advanced technology for applying metallic surface coatings to components using a powerful diode laser.  
采用大功率激光二极管的金属表面激光熔覆技术

- Refurbishment instead of discarding  
零件翻新延长使用
- Low heat input, no chance of deformation  
热量低，避免了热变形
- Excellent adhesion, superior option compared to metal coating  
超强粘附，是比金属镀面更好的选项

### Why use Laser Cladding:

采用激光镀覆的优点：

- To add a new coating to gearbox components such as the gearbox casing  
齿轮箱部件（如壳体）增加新的镀层
- To upgrade existing components by applying a coating that meets specific requirements  
镀覆特殊材料以升级现有部件
- To restore worn out parts back to their original dimensions  
将磨损部件恢复到原始尺寸



# Where can laser cladding be applied?

## 激光熔覆技术的应用场合

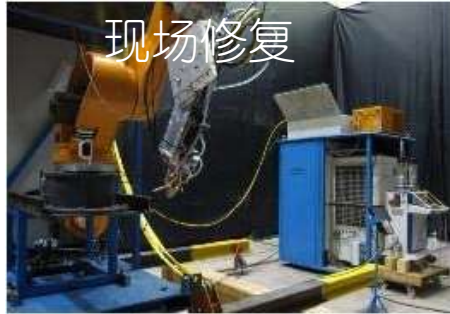
In house repair

室内修复



On site repair

现场修复



Clad nozzles

熔覆喷嘴





# Gear Manufacturing

## 齿轮箱制造车间

- In house Machining Department  
室内制造设备



### Grinding (3)

#### 磨床 (3台)

- length up to 2000 mm  
长度2000mm
- max table weight 1000 kg  
最大床重1000kg

### CNC horizontal turning lathe (9)

#### CNC水平车床 (9台)

- up to diameter 920 mm  
直径920mm
- length up to 6000 mm  
长度6000mm

### Key seating/slotting (3)

#### 开槽车床 (3台)

- up to stroke length 450mm  
450mm行程
- keyway width up to 50 mm  
槽宽50mm

### Equipment:

#### 设备:

### Gear grinding (2)

#### 齿轮磨床 (2台)

- up to diameter 1600 mm  
1600mm直径
- maximum module 25  
最大模数25
- quality DIN 3962 class 1  
DIN 3962 class 1 质量

### Gear hobbing (4)

#### 滚齿机 (4台)

- up to diameter 1600 mm  
1600mm直径
- up to module 25  
最大模数25
- quality DIN 3962 class 7  
DIN 3962 class 7 质量

### CNC horizontal boring and milling (2)

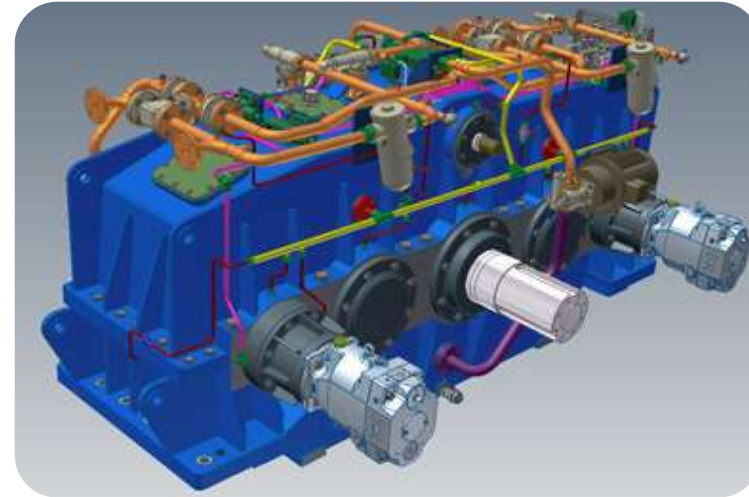
#### CNC水平钻床和磨床

- up to 2000 x 1800 x 1400 mm  
加工尺寸2000 x 1800 x 1400 mm
- max table weight 12000 kg  
最大床重12000kg

# New Built Gearboxes

## 新齿轮箱设计和制造

- Own brands and concepts  
自主品牌和概念
- One off gearboxes and small series  
一次性齿轮箱和小型齿轮箱系列
- In house gearbox design  
齿轮箱设计
- Replacement Gearboxes  
齿轮箱替换
- Short delivery times  
交货期短



# Authorized service partner for Ja-Ke gearboxes

## 全面接管德国Ja-Ke齿轮箱全球服务



### Jahnel Kestermann

Taken over by Stork:

#### 施托克接管范围:

- Drawings and intellectual property  
图纸和知识产权
- Continued delivery of spare parts and maintenance  
长期备件供应和维护
- Production - and other equipment  
生产和设备
- Design engineers and field service engineers  
设计工程师和现场服务工程师

Stork骄傲的宣布，自2016年2月开始，Ja-Ke公司选择Stork(SGS)作为全球独家授权的服务商。旨在为Ja-ke客户提供长期的服务。

Stork Gears & Services proudly announces that Jahnel-Kestermann GmbH i.L. (Ja-Ke) has nominated Stork Gears & Services B.V. (SGS) to act as their exclusively authorized service company for Ja-Ke products beginning in February, 2016. This aims at establishing a continuous support of Ja-Ke customers in the future.



# References 齿轮箱典型用户



# 典型案例：（1）越南水泥磨机：低速小齿轮轴的替换（CMD齿轮箱）

Vietnam Cement Industry Corporation (VICEM) - Vietnam, 3 projects, finished July 2016

## Challenge 挑战

- Difficult to determine root cause 很难确定根本原因
- Short lead times for installation and production 极短交付时间
- Hard to adjust tooth patterns 很难调整齿形

## Solution 方案

- Stork was able to determine root cause undo the defects caused by other service company with Faro Arm measurements  
施托克有能力找出故障的复杂原因
- Two new low speed pinions were designed and manufactured to new dimensions  
设计和制造两个低速小齿轮
- Installation was done in 6 days in day and night shifts (24h) 6天昼夜安装

## Benefits 优势

- OEM and other ISP could not repair gearbox and complete gearbox was almost renewed  
**在施托克接手前，原厂商和其他服务商没有修好齿轮箱**
- Combination of expertise on field service, engineering, diagnostics and manufacturing enabled us to succeed in this project  
在现场服务经验、设计、诊断和制造方面的综合实力，使得施托克取得了该项目的成功。
- Shortest lead times ensured no downtime and no new gearbox had to be purchased  
**最短的交付时间，避免了停工期和购买新齿轮箱。**
- Project finished one day ahead of schedule with no concessions on quality of safety  
在确保质量不受影响情况下，项目比原计划提前完工，
- Service hub in Singapore was able to provide close coordination and fast technical support  
新加坡维修中心有能力协调和快速技术支持。

## Key Figures 主要参数:

Cement mill gearbox  
水泥磨机齿轮箱

Brand 齿轮箱品牌: CMD

Type 型号: JC62

Jumborex

Power 功率: 5900kW

Input speed 输入速度:

- 980rpm

Output speed 输出速度:

- 14.37rpm

Weight重量: 123.500kg



## (2) 香港海运：船舶推进齿轮箱的紧急维修和制造 (RENK伦克齿轮箱)

用户：Anglo-Eastern Ship Management Ltd. - Hong Kong, Emergency repair of Propulsion Gearbox, July 2015

### Challenge 挑战

- Other defects discovered during regular major overhaul of both gearboxes  
在常规检修时发现双齿轮箱都发生故障。
- Stork needed to solve this issue with minimum downtime due to precious cargo
- 由于货物贵重，施托克需要在最短的时间内维修好

### Solution 解决方案

- Stork was able to manufacture parts extremely fast in Holland and supervise production of part in China 一部分零部件在荷兰以极快的速度制造，另一部分在中国监督制造。
- Our service engineers prepared the vessel to continue operations on one engine while waiting for other shaft 在维修期间，我们的工程师设法使船继续单发动机运行

### Benefits

Stork was able to overhaul and repair these gearboxes with minimum down time due to the combination of:

- Superb engineering capabilities to determine root cause analysis
- Fast production in Holland and the capabilities to source and manufacture parts in Chinese workshop
- Field service expertise to ensure the fastest repair time and to prepare the ship to continue operations despite found damages

### Key Figures 主要参数:

Propulsion Gearbox (2x)

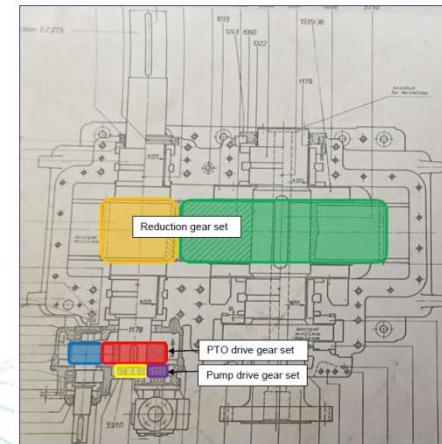
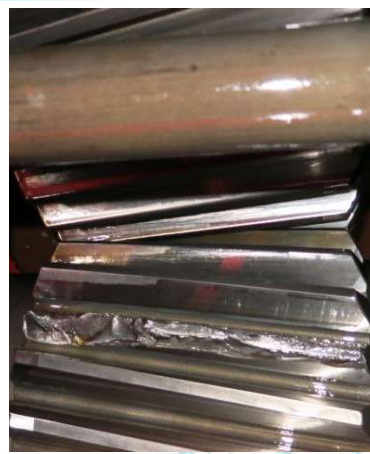
Brand 齿轮箱品牌:  
- Renk Tacke 伦克

Type 型号: HSN 710.1.C  
Rated power 功率: 3125 kW

Input speed 输入速度:  
- 570 rpm

Output speed 输出速度:  
- 195.20 rpm

PTO power : 400 kW  
PTO speed at input 570 rpm : 1819.50 rpm





### (3) 瑞典水电：水轮发电机齿轮箱改造 (L&S齿轮箱)

Vattenfall: Modification gearbox for Hydro Power

2008-2016

#### Challenge 项目描述

- Increase life time of gearbox, without changing overall design (outside dimensions, ratio, etc.)  
延长齿轮箱使用寿命, 不改变整体设计(外形尺寸, 速比等)

#### Solution 方案&执行

- Full disassembly and reverse-engineering of the gearbox  
**齿轮箱彻底解体以及反向工程设计**
- Redesign of planetary stage by increasing the module, without changing the ratio or outer dimensions of the gearbox.  
**重新设计行星齿轮, 不改变齿轮箱的外形尺寸和速比**

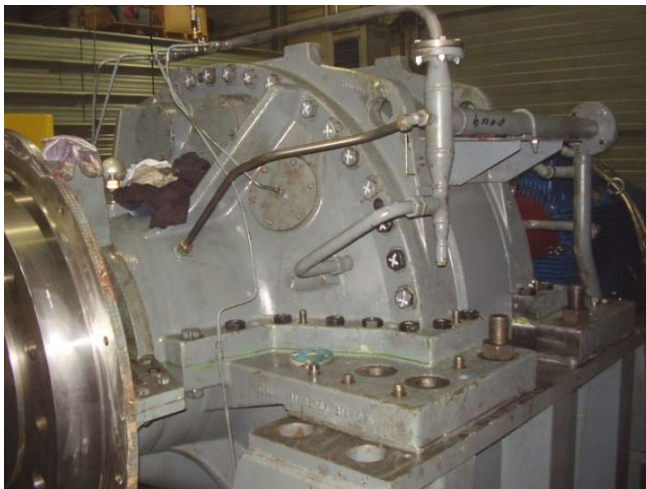
#### Benefits 优势

- Unique modification  
独特的改造
- The modified gearbox is a full drop-in replace unit  
**改造的齿轮箱是一个完全替换单元**
- Short lead time due to flexible production facility  
灵活的生产设备, 生产周期短
- Re-use of all non-gear components like housings, shafts and bearings  
全部非齿轮件得到利用, 如外壳, 轴, 以及轴承.
- Increase of lifetime  
延长使用寿命

#### Key Figures 关键数据

Power Installation:  
8 x 2MW Hydro  
8x2MW水轮发电机

Gearbox:  
齿轮箱:  
Brand L&S Type IPX 400  
P=3500kW RPM=750



## (4) 南非电厂：齿轮箱改造和更换

Client - South-Africa : Supply of five custom built gearboxes to South African power plant 客户：南非

### Challenge 项目描述

- Replace five existing Rademakers gearboxes with identical footprint, but increased power rating in short delivery time  
**短期内更换与现有5台Rademakers齿轮箱同样大小, 但输出功率更大的齿轮箱**

### Solution 方案&执行

- Supply of five modified Gearboxes  
供应5台改造了的齿轮箱
- On-site supervision & Commission  
现场监护和调试
- Manufactured in our plant in Rotterdam  
在鹿特丹的工厂制造
- Shipped and installed on-site  
发运和现场安装

### Benefits 优势

- Due to the shortage of power in South Africa, our customer requested that the gearboxes will be delivered as soon as possible  
**因为南非电力短缺, 客户要求齿轮箱尽可能快的交货**
- We designed and constructed the five new gearboxes within the requested timeline, the first gearbox has been delivered within six weeks after order. We also provided on site supervision and commissioning.  
**在要求的期限内, 设计和制造5台新的齿轮箱, 第一台齿轮箱在合同后6周发运.** 调试提供现场安装和调试.
- Stork is official OEM of Rademakers  
施托克是Rademakers的正式OEM商
- The customer appreciated our professional and fast approach  
用户非常赞赏施托克专业和快速的响应

### Key Figures 关键数据

5 Gearboxes  
5台齿轮箱

8 Weeks delivery time  
8周的供货期

Rademakers Rastar  
250/275l  
n1=6000 i=2.6



## (5) 荷兰风电：Nordex风机齿轮箱维修（Eickhoff齿轮箱）

Eneco: Root cause analysis Nordex WTG Drive train Wind Mill

2016

### Challenge 项目描述

- Due to unsuspected damage in gearbox, an independent root cause analysis was requested for insurance reasons  
齿轮箱意外损坏, 要求独立的原因调查

### Solution 方案&执行

- Full disassembly of the 43T drive train of the Nordex N80 wind turbine  
Nordex N80 风机43T驱动全拆解
- Cleaning, Measurement and Assessment of all components, incl. ultrasonic and magnaflux tests  
清洗, 测量和评估所有部件, 包括超声和磁粉探测
- Design check by Engineering department of Gears & Services  
齿轮服务公司设计部门对设计进行检查

### Benefits 优势

- Extensive know-how and experience of Stork Gears & Services in Wind Energy Gearboxes  
**施托克齿轮服务公司对风力发电机齿轮拥有丰富的经验和知识**
- Fully OEM independent service provider  
独立的OEM产品服务商
- Flexible production facilities, with 60T crane capacity  
完备的生产设备, 吊装能力60吨

### Key Figures 关键数据

WTG:  
风机型号:  
Nordex, type N80  
Netherlands

Gearbox:  
齿轮箱:  
Brand Eickhoff  
Double Planetary 2.5MW  
Weight (重量)23T





## (6) 爱尔兰电厂：燃机齿轮箱及轴的逆向设计和制造 (Flender弗兰德齿轮箱，转速3万rpm)

Aghada Generating Station- Cork, Ireland, Reverse engineering of gear shaft for Gas Turbine

### Challenge 项目描述

- Urgent request for reverse engineering of the shaft of an atomizing air compressor off the gearbox of a gas turbine  
雾化空气压缩机燃机齿轮箱轴的紧急反向工程设计

### Solution 方案&执行

- The atomizing air compressor shaft, the impellor, the drive gear and quill shaft were shipped to our workshop in Rotterdam
- 雾化空气压缩机轴，叶轮，驱动齿轮箱和中空轴被运往鹿特丹的工厂**
- After dismantling and inspection we started with reverse engineering and manufacturing of the new gears.  
在拆解和检查后，开始**反向工程设计和制造**

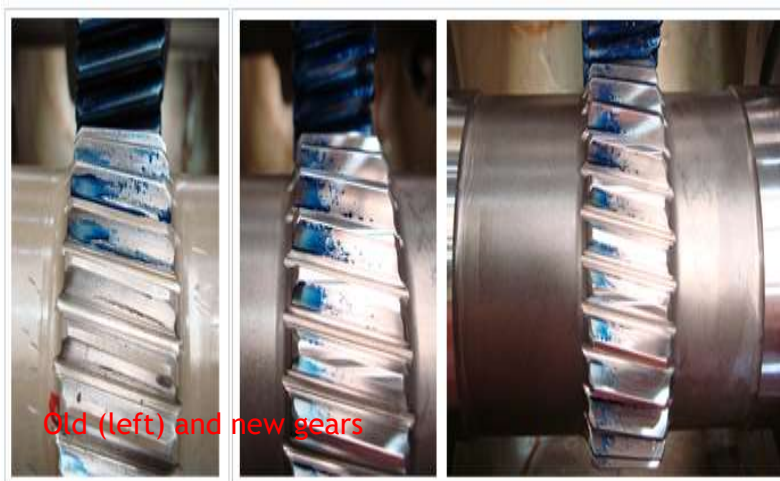
### Benefits 优势

- The customers target of a quick turnaround time of three weeks was realized  
实现了客户要求的**3周周转时间**
- The customer valued the high degree of expertise in reverse engineering skills and the high speed balancing work  
客户注重反向工程设计的高级专业知识和高速动平衡工作
- All other requirements were met  
达到所有其它要求

### Key Figures

Total completion time: 3 weeks  
完工时间:3周

Gearbox details:  
齿轮箱:  
Flender Graffenstaden  
Pinion shaft rotation speed 30.000 rpm



## (7) 荷兰电厂：球磨机齿轮箱的逆向设计和升级改造

### Orcem - the Netherlands: Supply of a new ball mill drive gearbox

#### Challenge 项目描述

- Supply of a custom gearbox with the same footprint as the original gearbox but suitable for a higher peak-load  
为客户提供一个与原齿轮箱同样占地面积但峰值功率更高的新齿轮箱

#### Solution 方案&执行

- The original gearbox was completely sent to Rotterdam because of a failure  
故障的齿轮箱被送往鹿特丹的工厂
- After the inspection the gearbox was completely reverse engineered  
检测后，对齿轮箱进行完全的反向工程设计
- Modification where engineered  
设计修改

#### Benefits 优势

- The OEM was only able to supply an identical gearbox which could not withstand the higher peak loads that occurred in the installation.  
OEM制造商只能提供完全一样的齿轮箱，而原齿轮箱不能适应装置的峰值负荷
- Stork was also able to shorten the delivery time of a new gearbox compared to the long lead time of the OEM  
与周期较长的OEM制造商相比，施托克的供货时间更短
- The customer was intrigued by our fast service and outstanding quality  
客户对施托克快速服务和杰出的质量感到惊奇

#### Key Figures 关键数据

1 custom gearbox  
1台定制齿轮箱

Stork R2HC58  
Ball Mill drive gearbox  
3400 kW  
Stork R2HC58球磨机齿轮箱,3400Kw



## (8) 南非国家电力公司：锅炉给水泵高速齿轮箱的定制制造

Eskom - Arnot power station - boiler feed pump - South Africa: Supply of 8 new high speed gearboxes

### Challenge 项目描述

- Customer is in need of 8 new gearboxes for their high speed boiler feed pumps  
客户需要为其8台锅炉的高速给水泵配置新齿轮箱

### Solution 方案&执行

- Supply of 8 new high speed gearboxes  
供应8台新的高速齿轮箱
- Designed, manufactured and tested in our plant in Rotterdam according the client specification  
根据客户的要求，在鹿特丹的工厂进行设计,制造和测试

### Benefits 优势

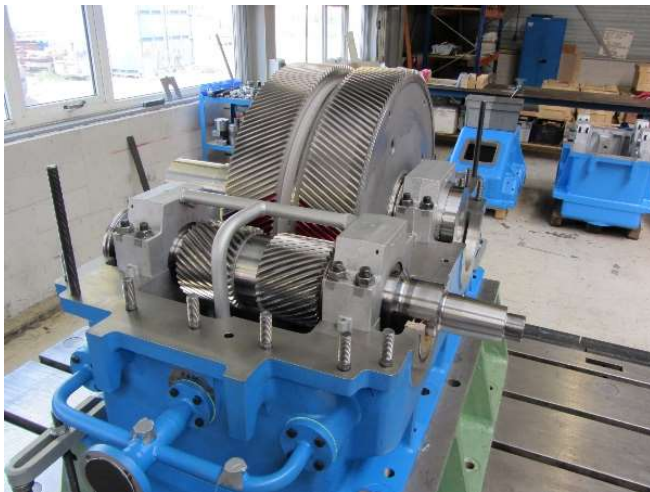
- Fast delivery time of 25 weeks for 8 gearboxes  
8个齿轮箱25周交货
- OEM quality and fast service  
OEM制造商的质量和快速服务
- Designed for the requested specifications and not a standard of the shelf design  
根据要求定制设计，非标准设计

### Key Figures 关键数据

8 custom gearboxes  
8个齿轮箱

25 weeks delivery time  
25周交货期

Stork RATA HS560  
4985 kW  
Output speed:  
输出转速:  
6768,9rpm





## (9) 荷兰水电：水电站齿轮箱的维修和改造 (Lohmann & Stolterfoht行星齿轮箱)

Nuon Energy - the Netherlands: Overhaul and modification of a hydroelectric station gearbox

### Challenge 项目描述

- The original gearbox failed due to high loads and a design error  
**原齿轮箱由于过载和设计错误发生故障**

### Solution 方案&执行

- The original gearbox was completely sent to Rotterdam because of a failure  
故障的原齿轮箱被整体运往鹿特丹的工厂
- Full disassembly, inspection and overhaul of the gearbox  
整体拆卸, 检测和检修
- Modification for the annulus was designed and implemented  
修改齿轮环的设计并实施



### Benefits 优势

- Faster service than the OEM  
**比OEM原制造商更快的服务**
- Stork was able to offer a modification to extend the life time of the gearbox  
**施托克能通过改造来延长齿轮箱的使用寿命**
- At this stage 3 of the 4 gearboxes have been modified and installed by Stork  
目前4台齿轮箱中的3台被改造和安装



### Key Figures 关键数据

Complete overhaul  
整体检修

Modification  
改造

Lohmann & Stolterfoht  
IPX 400  
Planetary gearbox  
3500 kW  
3500kW行星齿轮箱

## (10) 德国用户： BHS行星齿轮箱 & 德马格涡轮压缩机 大修和翻新

Infraserv Gendorf - Germany Overhaul of O2-Turbo Compressor & planetary gearbox

### Challenge 项目描述

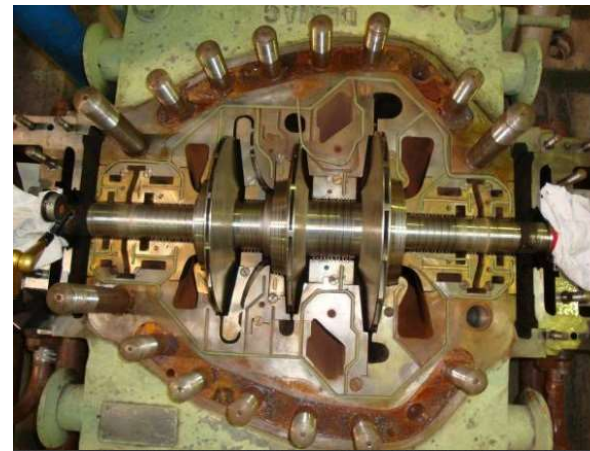
- Overhaul of DEMAG KA 16-VR / KA1-III s O2-Turbo Compressor & BHS RP 40X planetary gearbox  
检修 DEMAG KA 16-VR / KA1-III s O2 涡轮压缩机和BHS RP 40X 行星齿轮箱

### Solution 方案&执行

- Overhaul of LP & HP Turbo Compressor  
检修高压和低压涡轮压缩机
- Refurbishment of spare parts  
翻新部件
- Overhaul of planetary gear  
检修行星齿轮箱
- Shop test run of gear  
齿轮箱车间运行测试
- Commissioning  
试运调试

### Benefits 优势

- Combined overhaul of Turbo Compressor and gearbox, minimizing lead time of project  
涡轮压缩机和齿轮箱的整体检修, 节约了项目时间

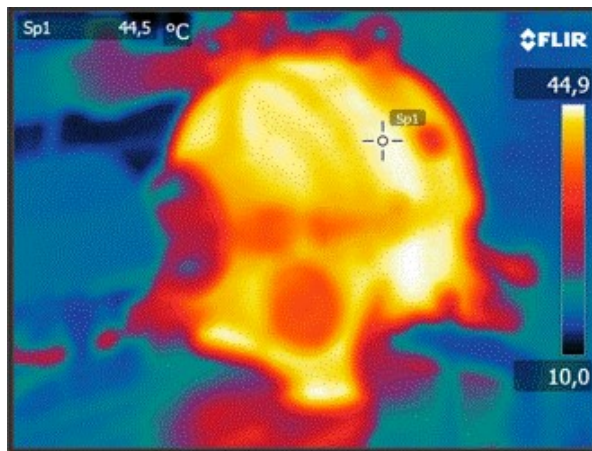


### Key Figures 关键数据

Turbo Compressor :  
涡轮压缩机:  
DEMAG KA 16-VR / KA1-3 s O2

& 和

Gearbox:  
齿轮箱:  
BHS RP 40X





## (11) 荷兰Boskalis：挖泥泵齿轮箱的定制设计和制造（特殊紧凑型，双速双输入单输出）

Boskalis - The Netherlands: Custom Build Dredge pump gearboxes

2014

### Challenge 项目描述

- Design and manufacture a 2-speed, twin-in, single out gearbox in a limited space  
设计和制造一台布置受限的双速双输入,单输出齿轮箱
- Ship and gearbox needed to be build a very short period  
挖掘船和齿轮箱的交货期非常短

### Solution 方案&执行

- In-house design and calculation  
内部设计和计算
- All internals are produced in our machine shop in Rotterdam  
所有零件在鹿特丹的工厂制造
- Installation and commissioning by our Field Service dept  
现场服务部分实施安装和调试

### Benefits 优势

Stork was able to supply these tailor made gearboxes in a short time due to the combination of:

**施托克能在短时间内提供这些定制齿轮箱, 是因为:**

- Experienced Design Engineers which are capable to design this special, compact reduction gear  
**拥有经验丰富的工程师, 能够设计这类特殊的紧凑型减速齿轮箱**
- Fast production facility and stock material  
快速的生产设备和材料储存
- Skilled Field Service Engineer to perform installation and commissioning  
熟练的现场服务工程师执行安装和调试

### Key Figures 关键数据

Dredge pump Gearboxes  
(3x)  
泥泵齿轮箱(3台)

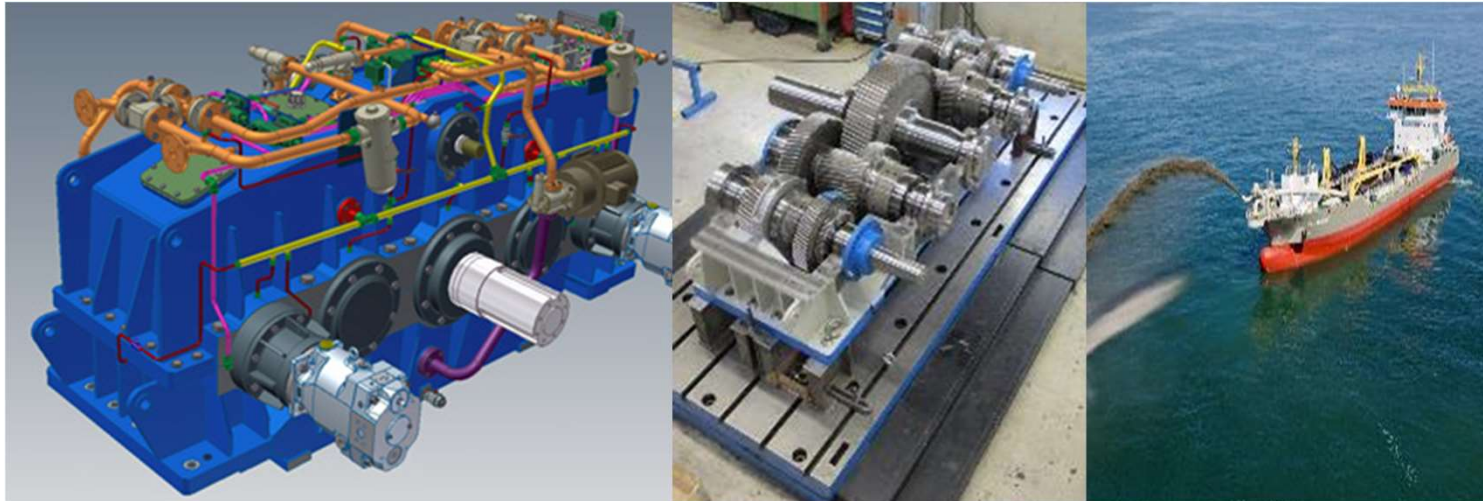
Brand 品牌: Stork

Type 型号: 2xR650 SHME

Power 功率: 2x 1825 kW

N1 转速1: 1600 rpm

N2 转速2: 420/270 rpm





## (12) 荷兰IHC：挖泥船摆动齿轮箱的定制设计和制造

IHC Holland - The Netherlands: Custom Build Dredge pump gearbox

2015

### Challenge 项目描述

- Design and manufacture a pivoting gearbox which drives a dredge pump  
**设计和制造一台驱动泥泵的摆动齿轮箱**
- Tailored for this dredging vessel  
专门为挖泥船定制

### Solution 方案&执行

- In-house design and calculation of a special, pivoting gearbox  
内部设计专门的摆动齿轮箱
- All internals are produced in our machine shop in Rotterdam  
所有零件在鹿特丹的工厂制造

### Benefits 优势

Stork was able to supply these tailor made gearboxes in a short time due to the combination of:  
施托克能在短时间内提供这些定制齿轮箱, 是因为:

- Experienced Design Engineers which are capable to design this special, compact reduction gear  
**拥有经验丰富的工程师, 能够设计这类特殊的紧凑型减速齿轮箱**
- Fast production facility and stock material  
快速的生产设备和材料储存
- Skilled Field Service Engineer to perform installation and commissioning  
熟练的现场服务工程师执行安装和调试

### Key Figures 关键数据

Dredge pump Gearboxes  
(1x)  
泥泵齿轮箱(1台)

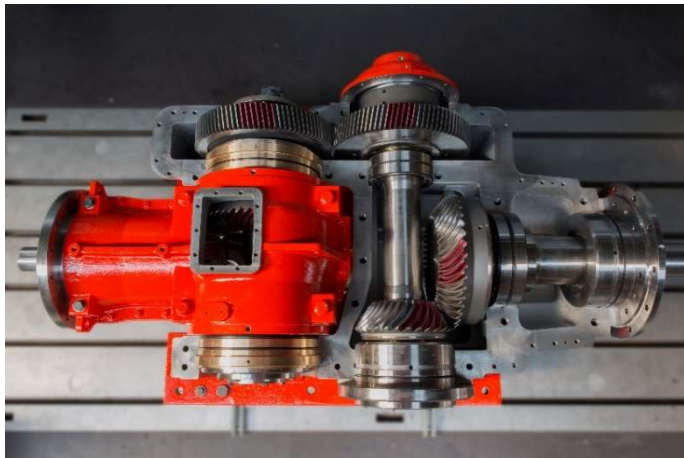
Brand 品牌: Stork

Type 型号: CRC760

Power 功率: 8125 kW

转速 n1: 1600 rpm

转速 n2: 601 rpm



## (13) 荷兰用户：巴威立式磨煤机齿轮箱维修和改造 Vertical coal Mill GB Repair Babcock

- Planetary mill gearbox  
磨煤机行星齿轮箱
- Failure of the spiral bevel gear (1st stage)  
螺旋斜齿轮（第一级）损坏
- Complete inspection and failure analysis  
全面检测和故障分析
- Manufacturing of new spiral bevel gears, based on design upgrade  
升级设计并制造螺旋斜齿轮
- Complete overhaul with new bearings and seals  
整体检修，更换新齿轮和机封
- Delivery time: 12 weeks  
交货期12周
- The Netherlands  
地点：荷兰



## (14) 马来西亚用户：IHI立式磨煤机齿轮箱维修和部件制造 Vertical Coal Mill Gearbox Repair IHI

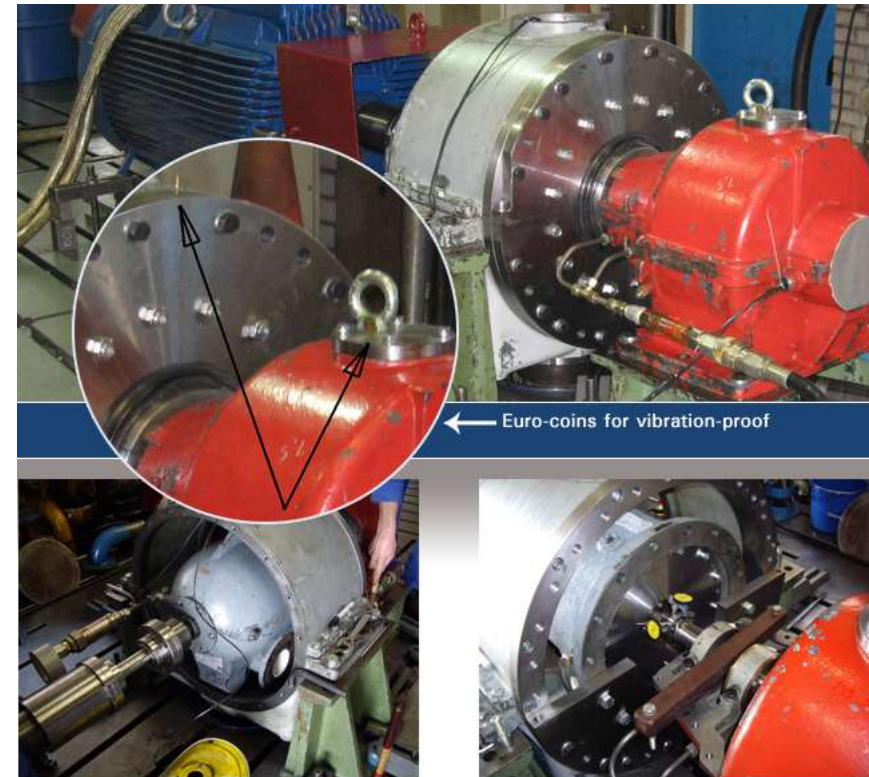
- IHI Planetary mill gearbox  
IHI磨煤机行星齿轮箱
- Failure of the spiral bevel gear (1st stage)  
螺旋斜齿轮（第一级）损坏
- Complete inspection and failure analysis  
全面检测和故障分析
- Re-design of spiral bevel gears  
重新设计螺旋斜齿轮
- Manufacturing of new spiral bevel gears  
制造螺旋斜齿轮
- Delivery time: 6 weeks  
交货期：6周
- Malaysia  
地点：马来西亚





## (15) 高速行星齿轮箱维修及内件制造 (转速37,500rpm) High speed planetary gearbox repair

- Manufacture of gearbox internals;  
planet carrier, 3 planet gears and 1  
sun gear  
齿轮箱内件制造；齿轮座，3个行星齿轮  
和一个中心齿轮。
- Gearbox test run after repair and re-  
assembly  
修理组装后的测试
- BHS planetary gearbox  
Rated power: 115 kW  
    齿轮箱功率：115kW  
Input rpm: 3000 rpm  
    输入转速：3000rpm  
Output speed: 37.500 rpm  
    输出转速：37500rpm



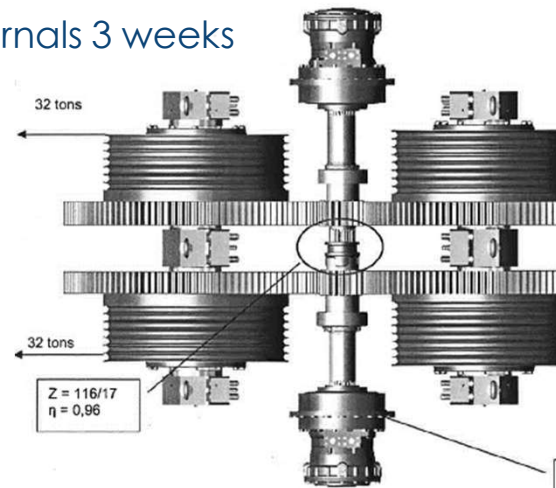
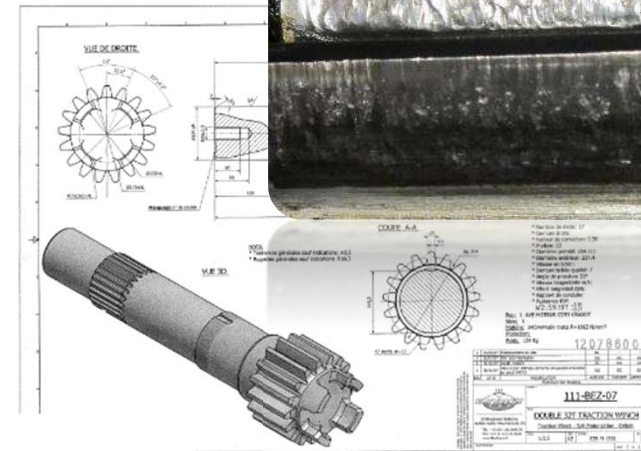
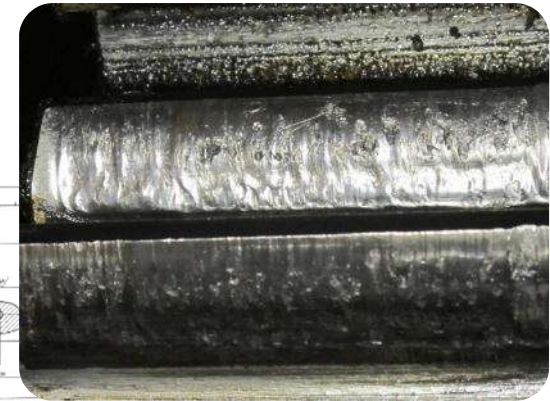
## (16) GB立式磨煤机齿轮箱维修及部件制造 Vertical Raw Mill GB Repair MAAG WPU-182

- 3000 kW Planetary mill gearbox  
3000kw行星齿轮箱
- Failure of the spiral bevel gear (1st stage)  
1级螺旋斜齿轮损坏
- Manufacturing of new spiral bevel gears  
制造新的螺旋斜齿轮
- Complete overhaul with new bearings and seals  
整体检修，更换新齿轮和机封
- Time :10 weeks, including production of gears  
工期：10周，包括齿轮制造

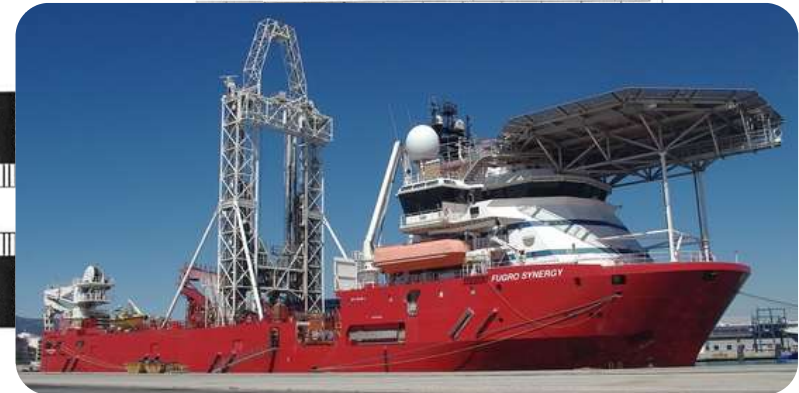


# (17) 船用双牵引绞车改造及部件制造 Modification double traction winch

- Inspection  
检查
- Design flaw detected  
查找设计瑕疵
- Engineering/modification  
设计/改造
- Manufacturing internals  
部件制造
- Under DNV Approval  
DNV船级社认证
- Delivery time for internals 3 weeks  
部件交货期3周



$$\text{Drum torque: } T_D = \frac{(32000 - 1000) \times 9,81 \times 0,960}{2} = 146000 \text{ N}\cdot\text{m} \quad 29$$

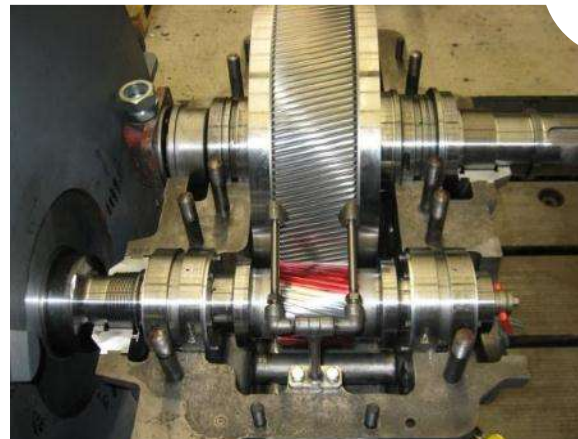


2 x CA100 + MDA10  
100 Nm/bar ;  
Ts = 48500 Nm



## (18) 加纳用户：高速鼓风机齿轮箱维修及部件制造 Blower Gearbox repair, High Speed

- Blower gearbox  
鼓风机齿轮箱
- Manufactured new internals  
新部件制造
- Assembled and testrun  
安装和测试
- Onsite assembly & commissioning  
现场安装和调试
- Lead time: 10 weeks  
供货周期：10周
- Ghana  
地点：加纳



# (19) 迪拜用户：船用透平泵和齿轮箱维修 和内件制造（MHI三菱齿轮箱） Cargo pump turbines and gears

Location 地点	Dubai, UAE 迪拜 UAE
Brand 品牌	MHI
Type 型号	CNV 320G
Power 功率	2300 kW

- Inspection resulted in repair  
检查和维修
- Re-blading of rotor  
转子叶片制造
- Precision welding and blending on diaphragms  
精确焊接
- Manufacture of new journal bearings, labyrinths and gears  
制造新的径向轴承，迷宫密封和齿轮箱
- On-site installation and commissioning  
现场安装和调试



STORK

## (20) 维斯塔斯**2MW**风机齿轮箱维修及改造 References IV – Repair

用户：维斯塔斯

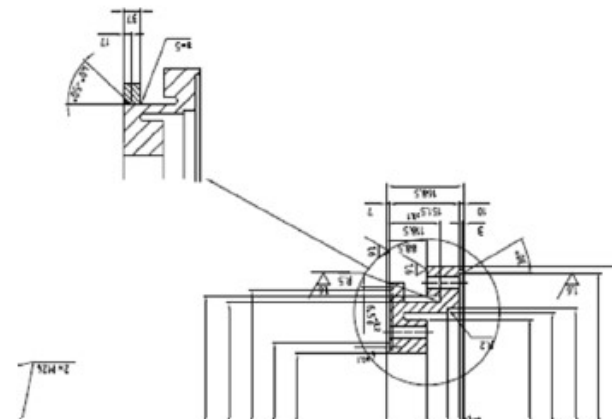
Vestas Central Europe, 2008 – 2010

Wind Park unknown

工作内容：

Re-engineering and Modification of 2.0 MW gearboxes

重新设计和改造**2.0MW**风力发电机齿轮箱





## (20) 塞内加尔海运：隧道挖掘机（劳斯莱斯）现场修理和桨叶翻新

E.R. Offshore - Dakar, Senegal, On-site overhaul of 2 tunnel thrusters

### Challenge 项目描述

- On-site overhaul of two tunnel thrusters in the Western African Country Senegal  
在西非塞内加尔现场检修两台隧道挖掘机

### Benefits 优势

This overhaul was one out of a serie of 6 overhauls  
这是6个检修系列中的一个

### Key Figures 关键数据

Vessel 船台: E.R. Athina

Brand 品牌: Rolls Royce

Type 型号: TT2200-DPN CP

Power 功率: 2 x 883 KW

### Solution 方案&执行

- The overhaul included:  
检修包括:
  - Renewal of seals and O-rings  
翻新密封和O型圈
  - haft liner  
翻新输入轴衬
  - Renewal of propeller blades  
翻新桨叶
  - MPI crack testing on all critical items  
关键部件磁粉裂纹测试
  - Pressurized testing of thruster systems  
系统压力测试



## (21) 土耳其Boskalis: 全回转螺旋桨 (劳斯莱斯) 的现场检修和翻修

Boskalis - Istanbul, Turkije, On-site overhaul of 3 Azimuth thrusters

### Challenge 项目描述

- On-site overhaul of Azimuth Thrusters  
全方位推进器现场检修

### Benefits 优势

- Lead time 24 days with 7 Service Engineers  
7名服务工程师, 24天完成检修.

### Solution 方案&执行

- The overhaul included:  
检修包括:
  - Renewal of bearings and seals  
**翻修轴衬和密封**
  - Renewal of inner lifting piston  
**翻修内提升活塞**
  - Renewal of propeller shaft  
**翻修桨叶轴**
  - Seal modification around lifting cylinder  
outboard side  
**提升缸外侧密封改造**



### Key Figures 关键数据

Vessel 船名: Seahorse

Brand 品牌: Rolls Royce

Type 型号: UL2001/6600

Power 功率: 3 x 1000 KW

## (22) 西班牙Boskalis: 隧道掘进机 (劳斯莱斯) 的现场检修和密封改造

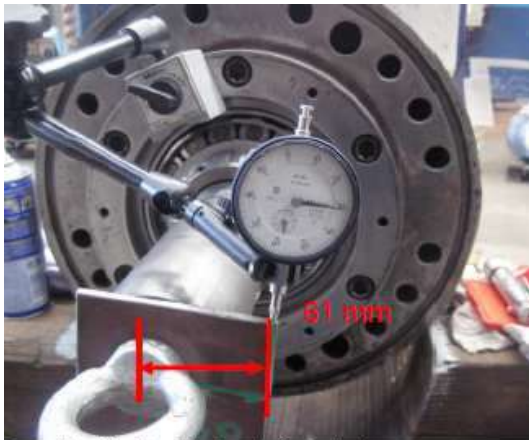
Boskalis - Vigo, Spain, Overhaul and seal modification tunnel thruster

### Challenge 项目描述

- On-site overhaul and seal modification tunnel thruster  
掘进机的现场检修和密封改造

### Solution 方案&执行

- The project included:  
项目内容:
  - Inspection revealed seal leakage  
检查密封泄露
  - Inspection became complete overhaul  
检查后全面检修
  - Renewal of seals and O-rings  
密封和O型圈检修
  - Seal were modified to prevent future problems  
改造密封以防止未来出故障



Img. Nr. 17: Backlash at pitch circle.

### Benefits 优势



Img. Nr. 12: Line boring and skimming of joint surface.



### Key Figures 关键数据

Vessel 船名: Waterway

Brand 品牌: Rolls Royce

Type 型号: KT-105 N

Power 功率: 500 KW