Stork Gears & Services forms part of Stork Power Services

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STORK® *knows-how*

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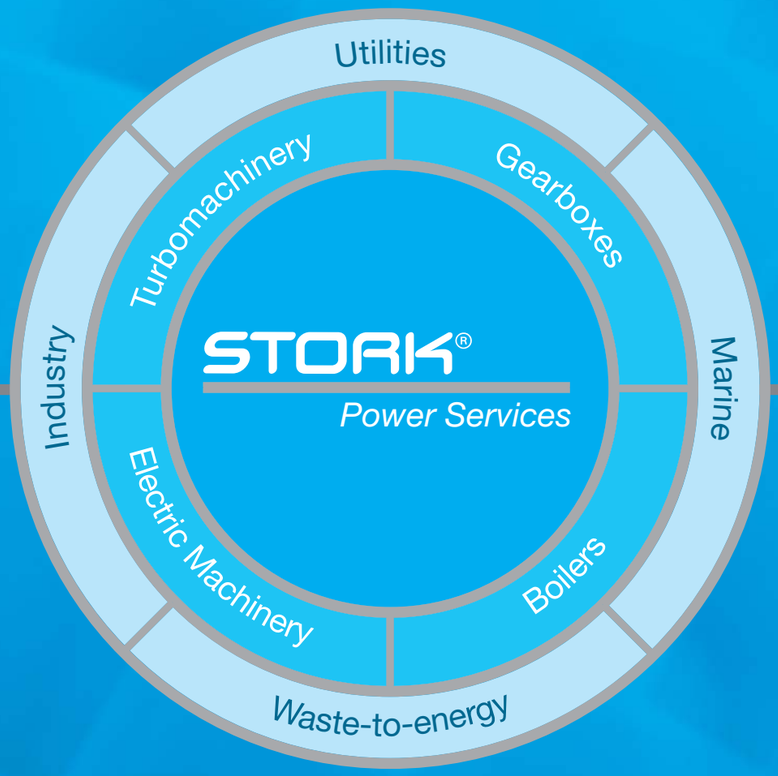
Stork Gears & Services

Fastest in gearbox repairs



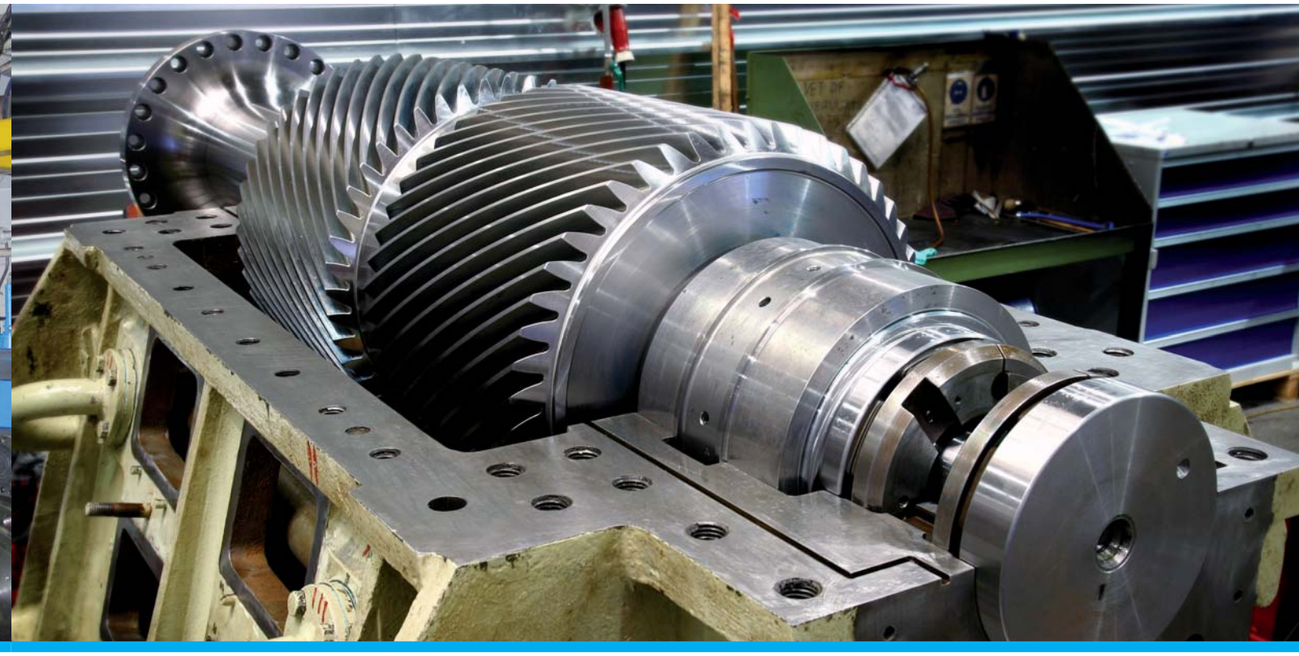
Stork Gears & Services

Stork Gears & Services has led the way in gearbox repairs and servicing for over 50 years. Our objective is to offer our clients solutions that match their wishes and requirements. These solutions are in the form of a comprehensive answer to problems and reflect the aim to extend quality in gears in ways that go beyond the inspection, repair or replacement of gearbox components. These solutions that we are able to offer reflect decades of accumulated OEM expertise and experience. Above all, solutions can be tailored and engineered to suit every type of gearbox, thereby solving every conceivable problem.

Stork Gears & Services offers inspection, overhaul, shop repair (including tests), on-site repair, reverse engineering, manufacturing assembly and on-site alignment services. Our flat organisation structure serves a single purpose: to optimise communications with our clients. Over the years, we have established a reputation for combining quality with unparalleled speed.

Stork Gears & Services is active in the following industries and segments:

- Dredging and dredging equipment
- Marine (propulsion and generator gearboxes)
- Petrochemical and offshore
- Bulk handling
- Steel
- Renewable and wind energy



Gearbox repairs

Stork Gears & Services has decades of experience in gearbox repairs and overhauls. We can repair nearly any type of gearbox or drive, and are able to meet the tightest deadlines. As we are not tied to any manufacturer, we are able to develop solutions that combine the best of several worlds.

Approach

Each gearbox is repaired in accordance with more or less the same procedures. The first step is to establish the condition of the gearbox. Gear clearances, contact patterns and bearing settings are carefully recorded before the gearbox is dismantled. The choice of whether to conduct a standard revision or a complete overhaul is decided in consultation with the client. If necessary, a team of specialists is set up to investigate the cause of complicated malfunctions.

Facilities

Our main service facilities, which are located in Rotterdam, the Netherlands, are equipped with latest machinery, including a heavy press, hydraulic pullers, bolt tensioning equipment and a range of measuring apparatus. The workshop also houses a test rig fitted with several electric motors, speed-up gearboxes and gear reducers. Once repairs have been completed, we subject the gearbox to a thorough test (at the client's request). This allows us to verify that all deliverables have been met, and that the gearbox is ready for use.

Needless to say, our service engineers play a pivotal role in everything we do. They embody our knowledge, uphold our reputation and deliver on our promises. Our engineers are always ready to assist you, wherever you may be located.

Fast gearbox repairs – 24/7

Stork Gears & Services is an independent gearbox repair company. As a consequence, we overhaul all types of gearboxes and related drives. Our customers are active in the marine and industrial sectors. To keep down-times to a minimum, our customers expect an instant response. Our gearbox support service is therefore available 24 hours a day, 7 days a week. No matter where in the world you may be, our engineers will respond with unparalleled speed.

Repair procedure

As soon as a service request for a gearbox is received, we initiate the 7-step procedure shown to the right. This can be done onsite or in one of our workshops.

Step 1 (Day 1)
Gearbox breakdown requiring emergency response

Step 2 (Day 2-3)
Onsite inspection and dismantling of gearbox

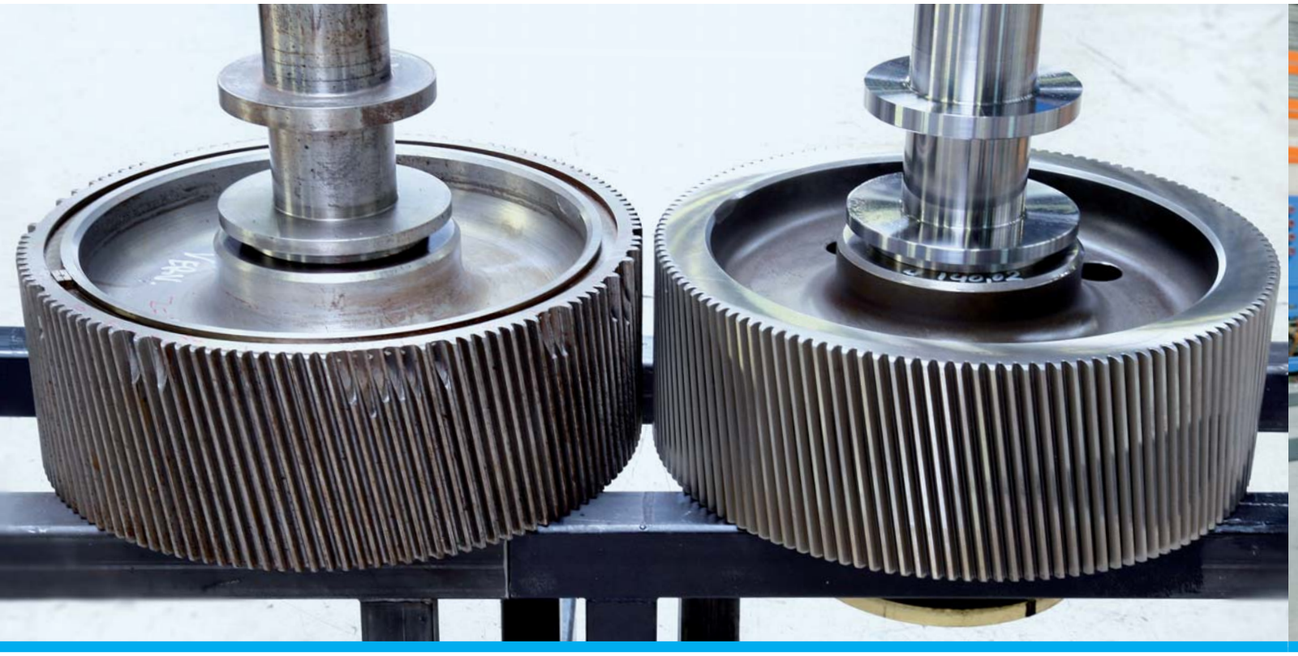
Step 3 (Day 4-5)
High-speed transport to our workshop

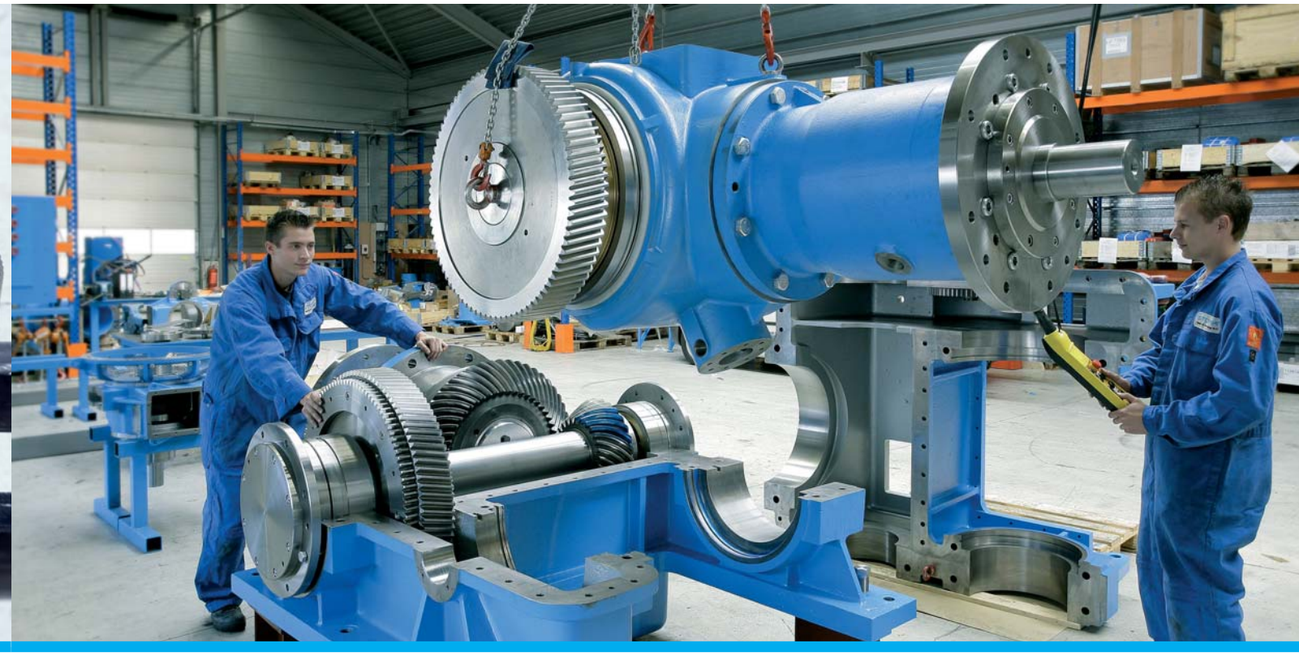
Step 4 (Day 6-8)
Inspection report and damage analysis

Step 5 (Day 9-29)
High-speed gearbox repair & manufacturing of supplies

Step 6 (Day 30-33)
Gearbox assembly and advanced test run

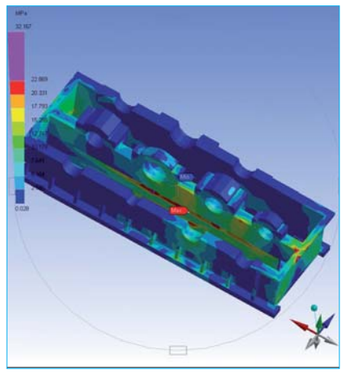
Step 7 (Day 34-39)
Transportation & onsite assembly of gearbox and related parts





Engineering services

Stork Gears & Services combines an in-depth understanding of gear technology with state-of-the-art engineering facilities. Years of organic growth and several acquisitions have created the critical mass required to rank among the world's leading gearbox specialists. We have the experience and know-how needed to introduce design modifications, and to design and assemble custom-built gearboxes from scratch. Our innovative designs and applications and our willingness to invest in the latest technology keep us in the vanguard.



Reverse engineering

We are often asked to repair gearboxes for which there are no technical specifications. In these instances, we use our reverse engineering skills to replicate the part in question. The result is a brand-new component that (at the very least) meets the specifications of the original part. Stork Gears & Services is able to deliver a simple gear in a matter of days and a carbonised internal gearing system within as little as three weeks.

Calculations

Using bespoken calculation models, our engineers establish whether the quality of the parts used for modifications, overhauls or new-builds is adequate. The following calculations are carried out, using the applications specified:

- Gear specifications are calculated using KissSoft, DIN, Neratrans and AGMA, as well as proprietary software. For gear control calculations, use is made of classification agencies such as Germanische Lloyd, DNV and ABS.
- Shaft specifications are calculated using Hexagon as well as software developed in-house.
- Bearing specifications are computed using SKF, FAG and Timken, as well as in-house software applications for reversing and sliding bearings.

All parts are designed and drawn using 2D as well as 3D modelling software. Ansys Design Space is used to calculate stress levels, displacements and resonance frequencies in complex strain situations (using the finite elements method).

Custom-built gearboxes

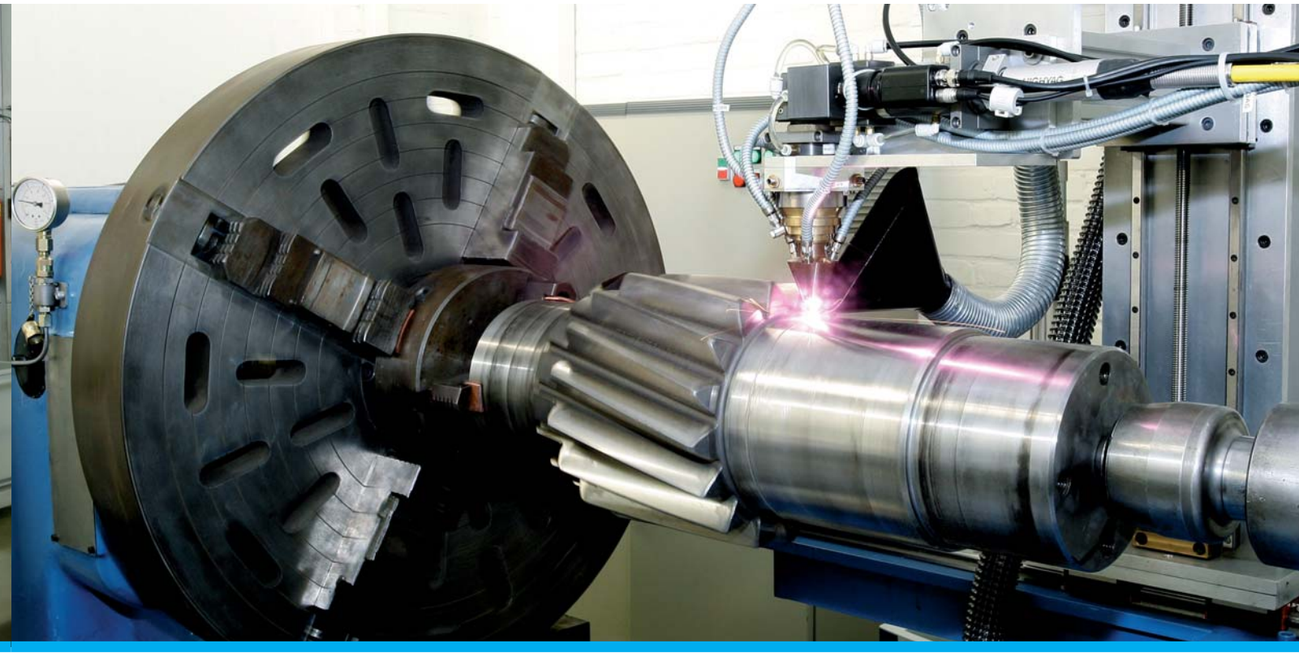
To build a new gearbox, a client need only provide us with details of the required reduction, the shaft centre-to-centre distances, and the power specifications. Our engineers will subsequently discuss the proposed design and initial calculations with the client. The production drawings are created as soon as the gearbox specifications have been agreed and the client has placed an order. These drawings are used to manufacture the actual components. Its service-oriented mindset allows Stork Gears & Services to design, manufacture and supply quality gearboxes much faster than other gearbox manufacturers.

Design specifications

As a result of previous acquisitions, we have acquired the complete design specifications for Rademakers, Conrad, Kuypers and Brevo gearboxes. Stork Gears & Services is an official OEM for these makes, and is therefore able to supply spare parts that meet the original specifications and - if possible - material types.

Manufacturing

Our in-house manufacturing facilities reflect our business philosophy. While being a gear manufacturer is not a goal in itself, it offers clients the advantage of flexibility, reliability and short lead times. Our workshop is equipped with CNC as well as conventional precision equipment.



Gear manufacturing

The cutting process defines the quality of the gears we produce. It is at this stage that gears are cut to their final geometry. Profile adjustments, such as tip and foot relief, high barrelling, end bevelling and flank line barrelling, are also made during the cutting process. Stork Gears & Services is able to produce high-accuracy gears for high-speed gearboxes as well as high load gears for durable applications (often in combination with multiple gear corrections).

The ability to measure gears accurately is of pivotal importance to the quality of the manufacturing and reverse engineering processes. The gears we produce are therefore measured using specialist equipment.

Our machining facilities enable us to grind gears on the spot. This is very useful if, for example, the contact pattern of a gear proves unacceptable during assembly. Stork Gears & Services has a variety of gear milling machines, allowing us to cut or slot nearly all types of gears, including special gears, which are often difficult to source.

Workshop
The Stork Gears & Services workshop is equipped with state-of-the art line boring equipment, grinding machines and lathes, all of which meet the highest specifications.

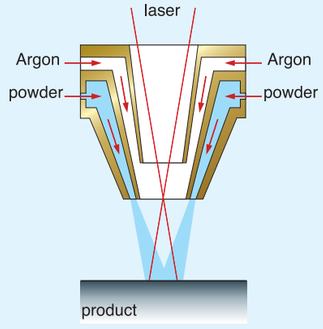
Machining department
Our large machining and metalworking department is equipped with a range of advanced machines for (CNC) horizontal and vertical turning, (CNC) boring and milling, universal milling, (CNC) grinding, and the slotting of keyways. With over 50 years of machining experience, we are able to modify nearly all gearbox components, no matter how complicated.
All machines are operated by skilled and experienced engineers dedicated to creating quality components.
The machining department is staffed around the clock.

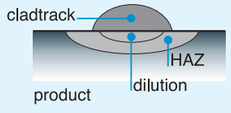
By investing in CNC equipment that perfectly matches our conventional machinery, we are able to offer enormous flexibility in terms of the size and weight of components. As we use a variety of lathes for (CNC) horizontal and vertical turning, we can make numerous modifications. We are also well equipped to carry out radial and axial adjustments to existing and new gearbox parts. It goes without saying that our machines are designed for the highest contour accuracy and reliability (within exceptionally strict tolerances).

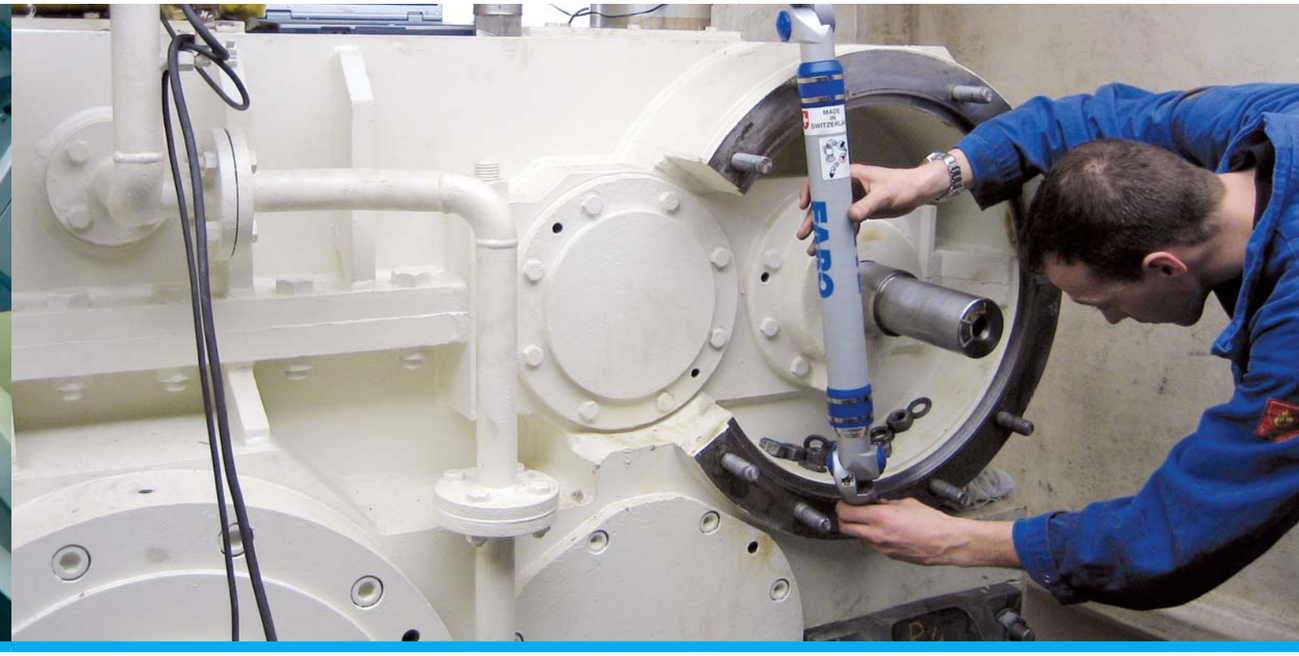
Laser cladding

Stork Gears & Services also offers laser cladding services. Laser cladding is an innovative technology for applying metallic coatings to components using a powerful diode laser. As laser cladding is a low-heat application, the component does not deform during coating. A further advantage is that it offers excellent adhesion compared with other coating techniques.

Laser cladding has many applications. It can, for example, be used to add a new coating to gearbox components such as the sealing ring, or to upgrade existing components by applying a coating that meets specific requirements. Our laser cladding equipment may be used to apply different coating and can be operated onsite.







Stork Optimization Services

Stork Optimization Services is an independent business unit that measures different operating variables and parameters. The unit is able to conduct vibration, torque, infrared and geometric measurements at short notice, anywhere in the world. These measurements allow clients to establish the dynamic behaviour of their installations.

Vibration measurement
Stork Optimization Services uses two systems to conduct vibration measurements. CSI portable spectrum analyzers are used for machines running on rolling element bearing and Bently Nevada multichannel real-time analysers for high-speed applications. Both systems are used to determine the dynamic behaviour of turbo machinery by measuring casing vibration and shaft displacement. As comparatively little time is needed to set up the hardware, we are able to measure vibration levels onsite (the spectrum analyser can detect all kinds of errors and/or defects).

Should a problem be encountered, its cause will be determined and discussed with the client. Stork Gears & Services may, at that stage, be asked to resolve it. Should a more detailed analysis be necessary, it can be conducted at short notice. The results are explained in a report.

Geometric measurement
Stork Optimization Services uses a Faro 3D measuring arm to conduct high-accuracy onsite measurements. The data obtained can be used to define overall gearbox geometry or to reverse engineer one or more parts. To this end, the data is imported into a 3D CAD program and analysed by our engineering department. 3D measurement can also be used to align gearboxes, turbines and railway bogies.

Infrared measurement
Stork Optimization Services measures mechanical and electrical equipment for thermographic infrared emissions. Our Raytek ThermoViewTM Ti30, which is used to measure the temperature of metals and non-metals, has an operating range between 0 and 2500°C (32 to 4820°F).

Torque measurement
Stork Optimization Services performs torque measurements where strain gauges are used (gearboxes and propeller shafts). Using our advanced telemetric systems, we are able to monitor torque levels continuously. Stork installed many torque systems around the world that are now successfully used to control the drivers load (most commonly diesel engines) in order to prevent unacceptable tensional stresses, which can lead to damage or failure of the installation.

SOS Management System
Stork Optimization Services has developed a web-based application that allows you to manage general rotating equipment such as fans, pumps, gearboxes and electric motors.

The application provides the following information:
- The technical status of your equipment
- An overview of the maintenance activities
- The technical specifications of your equipment
- Previous inspection reports
- Machine drawings

The main advantage of our system is that it transforms your maintenance program from being preventive (or corrective) to being situation-dependent. In other words, you service your equipment when it is actually needed, avoiding unnecessary shutdowns and the early replacement of oil or components. In turn, this improves the reliability and useful life of your equipment. Fewer shutdowns are also advantageous from a technical and insurance perspective. In short, the Stork Optimization Services system is a well-organised depository for all equipment-related maintenance data and specifications. The system can be accessed from any location, at any time.