

REFURBISHMENT & REPAIR

Reverse Engineering of Rotor Set for a GEC Parallel Shaft Gearbox driven by an RB211 Gas Turbine.

The Heidrun platform, operated by Statoil ASA (now StatoilHydro ASA) is situated in the Norwegian Sea, about 200km off the coast of Mid Norway. It has a design production capacity of 220,000 barrels oil/day and 5 mill Sm³gas/day. The production began in 1995.

On board the platform are 3 x RB211 gas turbine driven generators, these critical applications provide the complete power requirements for the platform.

Statoil (now StatoilHydro ASA) has a long term contract with Rolls Wood Group (RWG) Aberdeen. This exclusive contract designates RWG as provider of Field and Engineering Services, Repair and Overhauls for the fleet of RB211 Gas Turbine packages on the Heidrun platform. The contract includes Gas Generators, Power Turbines, Gearboxes & Auxiliaries.

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Courtesy of Statoil

recent experience case study

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Heidrun Platform – Norwegian Sea

In November 2004, Allen Gears was asked by Rolls-Wood Group to provide a field service engineer, to carry out a troubleshooting and maintenance schedule on a GEC parallel shaft gearbox, on the Heidrun platform, off Norway.

The unit, which had tripped due to high vibration, was one of 3-off generator-set gearboxes operating on the platform. One of the two remaining gearboxes was also giving some cause for concern, due to increasing levels of vibration.



Work Conducted

Upon inspection, no tooth damage was evident but further investigation revealed that the gearwheel had moved both axially and circumferentially on its shaft. This assembly relied on a heavy interference fit between wheel and shaft to transmit torque. Such a failure is unusual, with possible causes being either a substantial overload or insufficient initial interference between the manufactured parts.

The geared parts were delivered to Allen Gears for further inspection and to review options for repair. The gearwheel assembly was not considered suitable for further operation and Allen Gears undertook to design a replacement rotor set, to fit within the existing GEC gearcase. The new design included:

- A review of gearwheel/shaft interference, to ensure acceptable torque capacity and factor of safety.
- Modification of the quill shaft/hub assembly for improved ease of assembly/maintenance.
- Use of Allen Gears standard materials, design and quality standards.
- Interface detail and envelope as original parts.

Throughout the process there was regular co-operation between Allen Gears, Rolls-Wood Group and Statoil. Statoil's Danish Consultant, Mr Jørgen Colding-Jørgensen of Colding A/S was also deeply involved and his rotor dynamic calculations contributed significantly to the problem solving process.

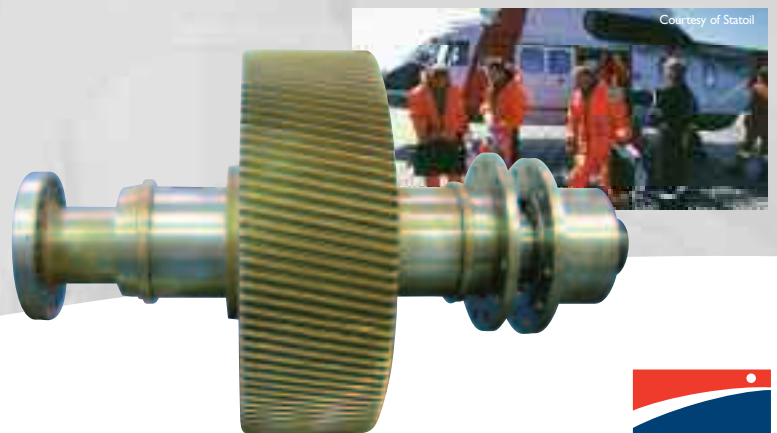
The new rotors, plus replacement bearings, were despatched to the platform and the gearbox was re-assembled by an Allen Gears field service engineer. Monitoring of this gearbox after the refurbishment has demonstrated low vibration levels, which have remained constant during the subsequent operation.

A further two sets of Allen Gears rotors were purchased, for installation into the remaining GEC gearboxes on the Heidrun platform.

One of the existing GEC gear sets has been refurbished by Allen Gears and retained as a spare.

Technical Data

Application:	Gas Turbine Drive Generator
Installation:	Heidrun Platform – Norwegian Sea
Gear Type:	GEC Alsthom Gears (David Brown)
Gear Type:	Parallel shaft complete with Quill shaft
Power:	29,255 kW
Speeds:	Input: 4,800 rpm Output: 1,500 rpm
Centre Distance:	800 mm
Weight:	12,040 kg



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