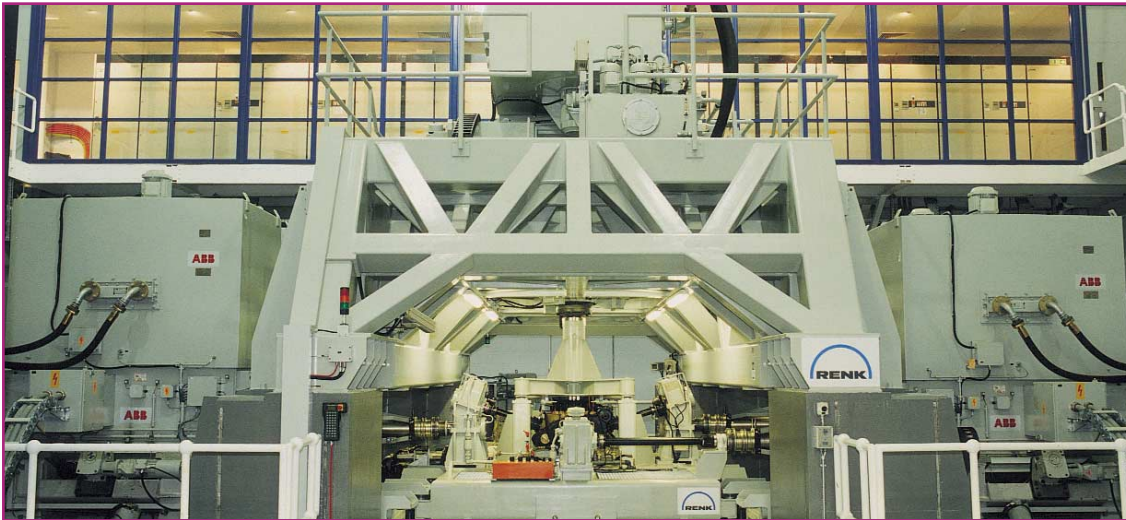


## Inducing forces in a gearbox test rig



### AC variable speed drives exert load on test gearbox

As part of a contract to develop a new test rig for future aircraft gearboxes, test rig manufacturer RENK of Germany has selected variable speed AC drives and motors from ABB.

The contract for the test rig was placed by Westland Transmissions Ltd in Yeovil to develop a more advanced method for its research. Existing methods were expensive, with different gearboxes needing individual test rigs.

The gearbox is central to the distribution of engine power to the rotors and other power outputs in the helicopter. It is subjected to a rigorous test cycle before delivery.

RENK developed a new flexible transmissions test rig (FTTR), that uses ABB AC drives and large induction motors to drive the engine inputs and to exert load onto the rotor and tail output of the test gearbox.

The FTTR utilises four identical 2,000kW AMB 560 induction motors in a symmetrical

arrangement with associated AC drives. These four motors transmit power to, or absorb power from, the gearbox. A 5,250kW ABB uQ 800 motor, powered by a variable speed drive, simulates the main rotor load.

The rig operates on a closed loop system, where the energy is re-circulated electrically by the variable speed drives to significantly reduce mains demand and cost, using a common DC link. Each motor may be used either to provide energy, or as a generator, to absorb energy.

During testing, mechanical torque is carefully applied to the gearbox input and output shafts in opposition to “wind up” the gearbox to simulate the loads and speeds imposed in flight conditions. Mechanical energy returning from the tested gearbox is re-converted into electrical energy and returned to the DC link connecting the drives.

The returned electrical energy is topped-up by the drives supply rectifier to make up for any losses. Up to 6MW of power may be needed to test a gearbox; recycling the power reduces this demand to 1 MW.



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## Case Notes

While 6MW represents over 50% of the power consumption of the Westland site, this recycling brings power consumption down to a level where it can be supported by the local grid without restrictions on operation. To accommodate the demands of each aircraft type, the rig is equipped with a different pallet for each gearbox.

The FTTR provides accurate simulation of aircraft operating conditions and set-up takes less than an hour. These factors, combined with the low running costs and high reliability, ensure that this rig is one of the most advanced in the world.

### Solved Problem

- Mechanical torque is carefully applied to the gearbox input and output shafts in opposition to “wind up” the gearbox to simulate the loads and speeds imposed in flight conditions.

### Solution

- Energy is re-circulated electrically by the variable speed drives using a common DC link to significantly reduce mains demand and cost.
- Each motor may be used to provide energy or as a generator to absorb energy.

### Benefits

- The FTTR can test different types of gearboxes, under practical conditions, for helicopter and aero-engine applications.
- Recycling the power reduces demand to a level supported by the local electricity grid resulting in no restrictions on testing.
- The rig benefits from low running costs and high reliability.
- Only a new pallet is required for each new gearbox type reducing the cost of acquiring a new test rig by 90 per cent.



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