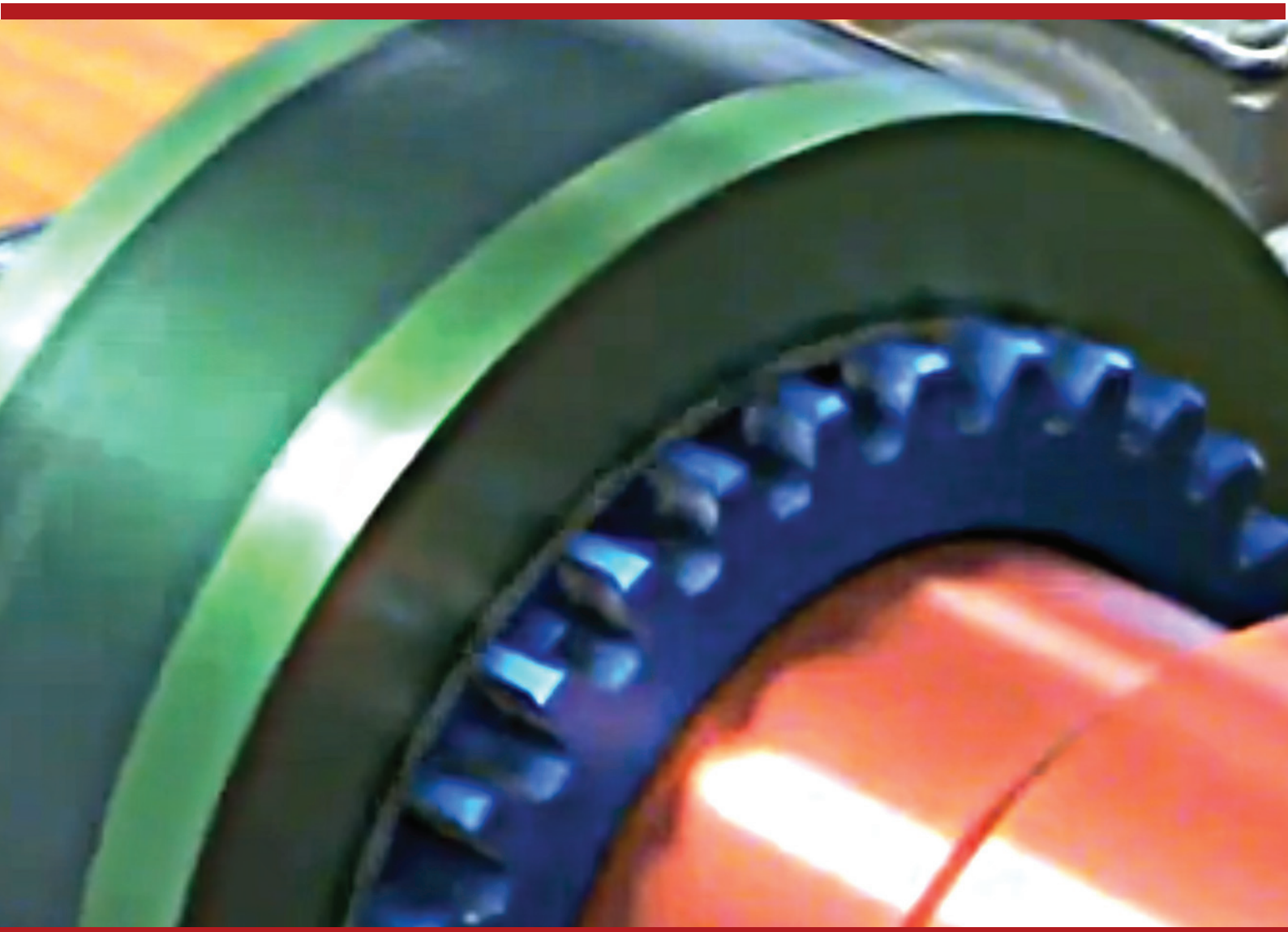
Prosig Case Study

A Balancing Act



A vibration problem arose at an Open Cycle Gas Turbine. Following an outage on the four gas turbines and two SSS clutches, the machine returned to service with unacceptable vibration levels on some generation runs resulting in a significant loss of commercial operation.

In order to analyse these conditions, temporary velocity transducers were fitted and the signals analysed and recorded using a Protor Mobile vibration monitoring system which is capable of measuring up to 16 channels of dynamic data with a bandwidth of 1 kHz per channel. Data is captured and analysed relative to a once–per revolution phase marker to allow extraction of the amplitude and phases of the harmonics of the shaft speed.

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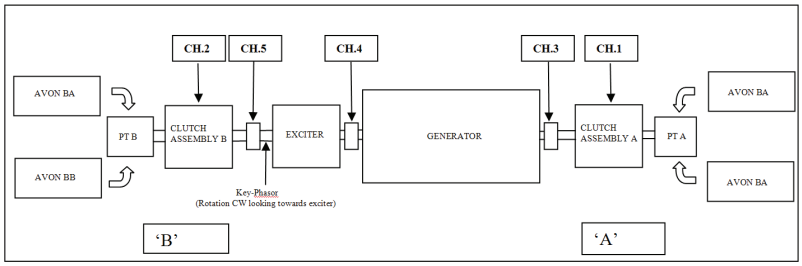


The OCGT consists of two sets of two Rolls Royce 'Avon MK 1533' gas generators (A & B side) with each side feeding into its associated Power Turbine. The Power Turbines are connected via a clutch arrangement to the exciter on the 'B' side and to the Generator on the 'A' side.

The unit can be operated in 'Generation Mode' where either 'A' and/or 'B' sides are utilised to generate and export MW's (full load ~ 55MW). Because of the station's remote location it is often requested to run in 'Synchronous Compensation Mode' where the unit is run to speed by either of the gas generator sets to rated speed and synchronised. The gas generator set is then shutdown in order to perform MVAR compensation for the transmission grid.

The complexity of this arrangement becomes evident when we consider that the overall imbalance forces throughout the system change dependent on the clutch engagement angles for both clutches. It was found that at certain engagement angles the resultant forces were significant enough to make the vibration levels unacceptable on the generator and exciter bearings.

To assess the resultant balance states the generator is held at 3000 rpm under synchronous compensation mode and each clutch disengaged and re-engaged a number of times until vibration data at a full spread of engagement angles was collected.

From this spread of engagement angle data, the first order amplitude and phases readings were displayed. Note that at some engagement angles the measured 1st order vibration exceeds 9 mm/s RMS.

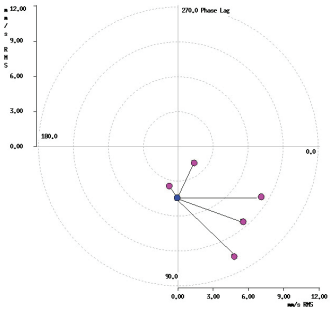
After careful analysis an in-situ balance was performed which resulted in a state where the vibration data for all clutch angles was acceptable (all below 6 mm/s RMS).

System consists of

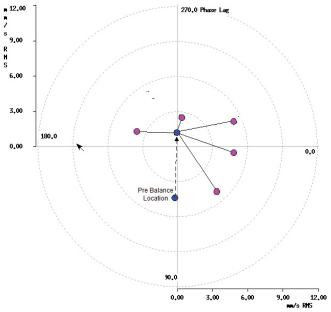
PROTOR-mobile

Portable vibration condition monitoring

1 x 16-channel PROTOR-mobile



Pre-balance vibration data



Post-balance vibration data

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