The importance of Static and Dynamic tooth contact checks in Single and Double Helical Gearboxes

Gears manufactured to API-613 specifications are expected to provide a minimum design life of 20 years continuous service, (API 613-5 para.2.1.2). This means in excess of 150,000 hours of operation. However, in reality our experiences have shown that typically operating plant personnel will change out distress riddled gears which have operating histories well short of that requirement. This seems to be the case without expectation of better gear life.

The most significant causes of gear tooth failures, (statistically over 90%) relate to one of two problems; improper lubrication or improper load distribution in the gear tooth mesh. The objective of inspecting a gear after running particularly at full load is verification that both of these factors are properly tuned. In highly loaded high plv gear units error of either factor can manifest itself rapidly considering the quick accumulation of load cycles.

Applying modern tooth design technology; both single helical and double helical gearset's are topologically ground to compensate for the anticipated operating gear tooth deflections and deformations. This compensation is asymmetrically applied for both types' of configurations. Both configurations require a verification check for the same reasons;

- housing distortions
- unanticipated load variations
- lubrication deviations
- unanticipated rotor dynamic load variations

Conditions on a test stand in an in house environment may be one thing, while field installation and environment may be another. Changes in these conditions could mean slight alterations in the gear mesh alignment which may not be sufficiently severe to result in tooth distress for some time but could mean shorter gear tooth life in the long term.

This service philosophy for these high capacity gears should be applied to all gear manufacturers. Many manufacturers employ elementary tooth corrections; i.e. symmetrically applied with profile grinding technique, nevertheless improper load distribution or lubrication will have similar negative results over time.

After full load check runs (either at the OEM's facility and/or on-site for commissioning) an inspection and contact verification check is strongly recommended.

Further comparisons of single and double helical gears do have differences. While double helical gears have a composite correction less dramatic than single helical, poor load distribution could result in tooth distress much earlier than single helical due to the inherent overloading of one helix relative to the other. In the event a field correction is necessary single helical gears are easier to adjust for load compensation.