IMPROVED METHOD FOR JOB SPECIFIC CRANKSHAFT STRESS CALCULATION

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Abstract of proposed paper:

The load on a compressor crankshaft varies with the crank angle and is different for every machine and gas condition. Using Finite element calculations to check every crankshaft and load case, would result in an enormous amount of FE models.
The traditional crankshaft design rules, developed by CIMAC and prescribed by Lloyd's Register of Shipping, have been developed for internal combustion engines. The stresses calculated using these rules, are only valid for crankshafts in or around Top Dead Centre (TDC). The maximum load on a crankshaft of a reciprocating compressor however is not necessarily around TDC.

TCS has extended the design rules for the application in reciprocating compressors. The method as described in the rules is maintained. The so called form factors, used for the determination of the bending and torsion stresses have been determined for all web angles. All frame type crankshafts have been modeled in Finite Elements. Additions and corrections to the existing polynomials of the form factors have been obtained, for an easy to use but accurate calculation. With the modified analytical model it is easy to check every Thomassen crankshaft with any possible cylinder configuration.

The assessment of stresses is done by the application of the Gough quarter ellipse model. This method has the advantage that bending and torsion can be composed to a figure which should be lower than unity. In contrary with for instance, the “von Mises” method, which should be compared to a material property. The Gough assessment is more conservative than the “von Mises” approach.
Using these techniques, a contribution to a reliable operation of the compressors is obtained.