



Abstract

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Title

35-3: Virtual Prototyping technique applied to the design of a crankmechanism of a process reciprocating compressor.

Summary

Virtual Prototyping is a novel computational approach that allows reproducing a mechanism or a part of it and loading it as if it were a scale 1:1 laboratory prototype. Virtual Prototyping utilizes various CAE tools, such as 3D modeling, Structural FEA, Multibody analysis, Multiaxial fatigue prediction etc., in an integrated way, in order to obtain the same results that one could get only in a laboratory by a series of different tests.

This new approach has been utilized to design a complete 4 crank mechanism including crosshead, connecting rod, crankshaft and main bearings. The loads were applied to the crosshead pin and from it, by means of the multibody analysis, to all the other components. The loads included also the inertia forces due to the movement of the various components.

The Virtual Prototyping technique allowed considering a realistic stepless loading pattern throughout the complete revolution, thus avoiding the simplifications that are normally introduced when CAE tools are utilized separately.

The multiaxial stress level was determined for all points of the crankmechanism and a fatigue analysis automatically performed by considering the fatigue characteristics of the material and applying the appropriate criteria for safety coefficient evaluation.