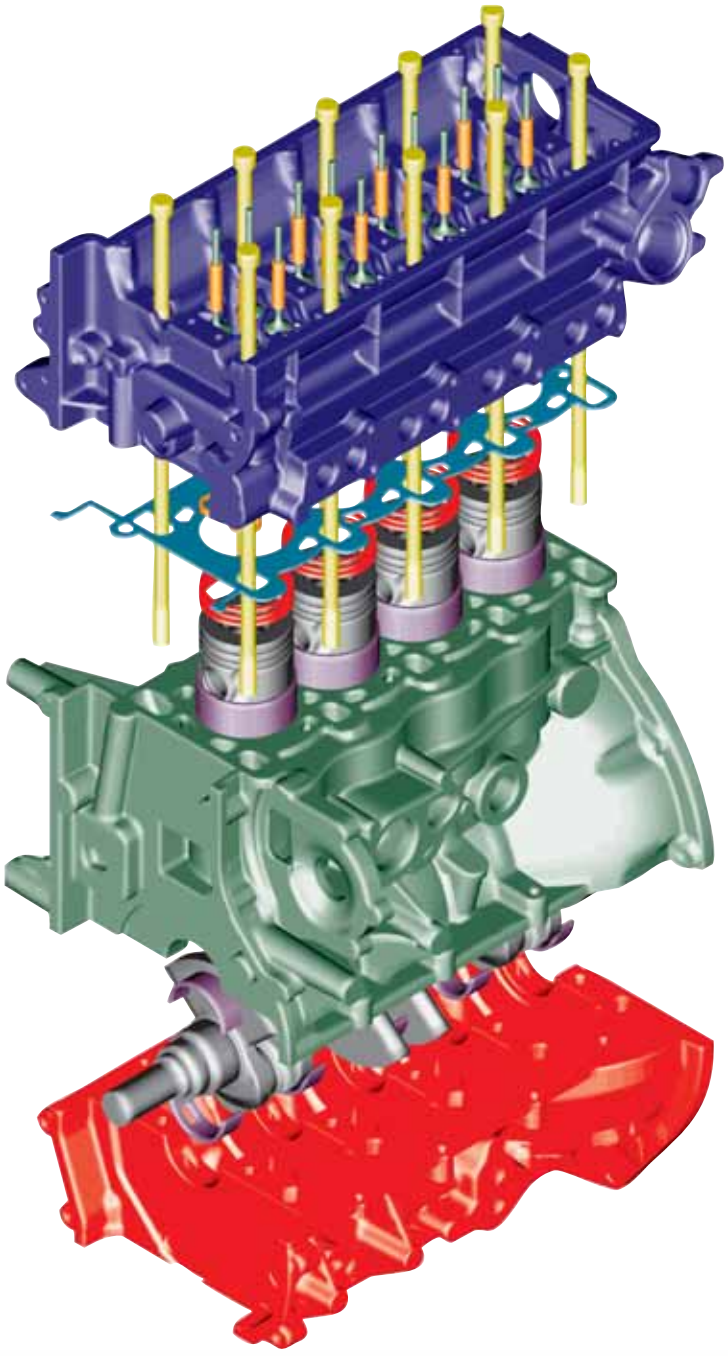
Examples of analyses performed by our FEA Consulting Group



Automotive powertrain

The FEA consulting services group has been performing design assessments of internal combustion engines and related components for over twenty years. Our mission is to provide design guidance that is cost-effective and within the design loop.

Typical projects include:

Overall engine assessment

- Steady state and transient thermal analysis
- Stress/Fatigue (high and low-cycle)
- Gasket sealing
- Bore distortion
- Dynamic analysis
- Vibration studies

Component analysis

- Crankshaft failure investigation
- Connecting rod stress
- Exhaust manifold/EGR studies
- EGR cooler analysis
- Transaxle vibration
- Final drive gear wear study

We use multi-disciplinary CAE methods, integrating developments in CFD to improve temperature prediction and understand the importance of including non-linear effects such as:

- Coolant jacket boiling heat transfer
- Nonlinear contact
- Plasticity
- Friction
- Dynamic effects

Our automated meshing techniques and the use of PERMAS, a highly scalable FEA code, decrease the duration of the analysis cycle. This allows us to perform the typically time intensive Design of Experiment analyses required for reliability studies. Our methods have continually evolved to take advantage of the latest developments in computer and software tools.

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Rotating machinery

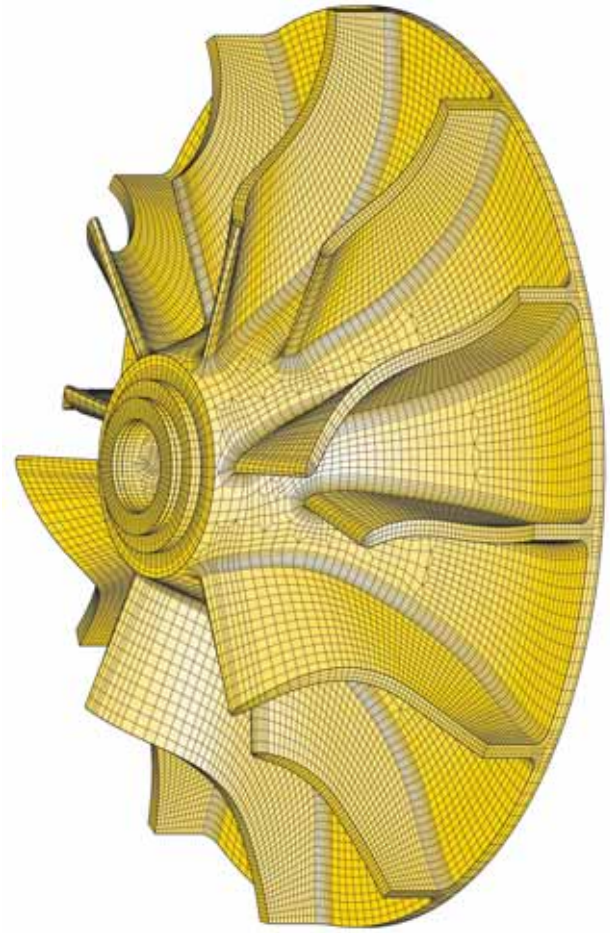
The FEA consulting services group has been providing design assessments and analytical services to the rotating machinery industry since its inception in 1980.

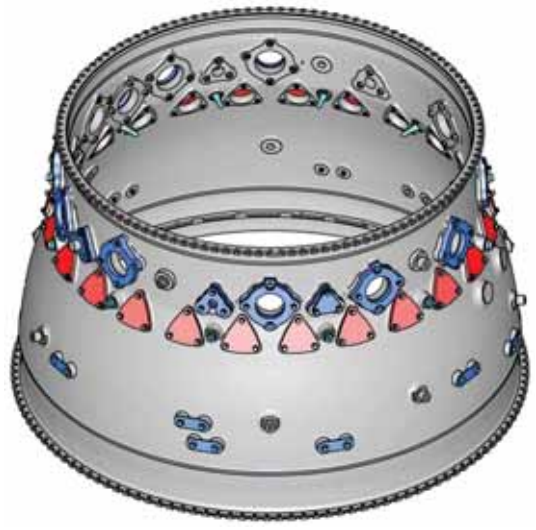
For rotating parts, such as the impeller shown, we provide complete analytical services including:

- Steady state and transient heat transfer/stress analyses
- Modal analyses (including added mass effects of fluid)
- Dynamic time history analyses

Analyses of rotating parts can be performed by using either a 360° model or by using cyclic symmetry techniques. All relevant non-linearities are included (stress stiffening/ prestress, large deflection, contact, friction, plasticity, creep, dynamic effects). Our multi-disciplinary CAE methods also allow us to integrate CFD solutions for more realistic temperature distributions.

Dynamic time history analyses can be performed in the frequency domain using harmonic analyses. The harmonic forcing functions are obtained by performing a FFT on results from a 3D CFD transient analysis. Our pre-processor, pro-fe, automates the calculations of these forcing functions and the application of these forcing functions to the FEA model.





Static structures

Throughout its history, the FEA Consulting Group has facilitated the understanding of structural behavior using CAE methods. This is particularly true when dealing with a complex structure, a complex environment, or both. The following list provides some insight into our analytical capabilities:

- Steady state and transient heat transfer analyses
- Stress analyses that include thermal, mechanical, and inertial loadings
- Large deformation
- Non-linear contact
- Non-linear contact with path dependent friction
- Material non-linearity, e.g., plasticity, creep
- Modal
- Dynamic response, e.g., harmonic, transient, spectrum

We perform various types of evaluations using results from analyses of the types listed above. Some examples are:

- Static strength
- Low cycle fatigue
- High cycle fatigue

For further information, please contact info@cd-adapco.com

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