Howden

HOWDEN GROUP TECHNOLOGY

Research and **consultancy**

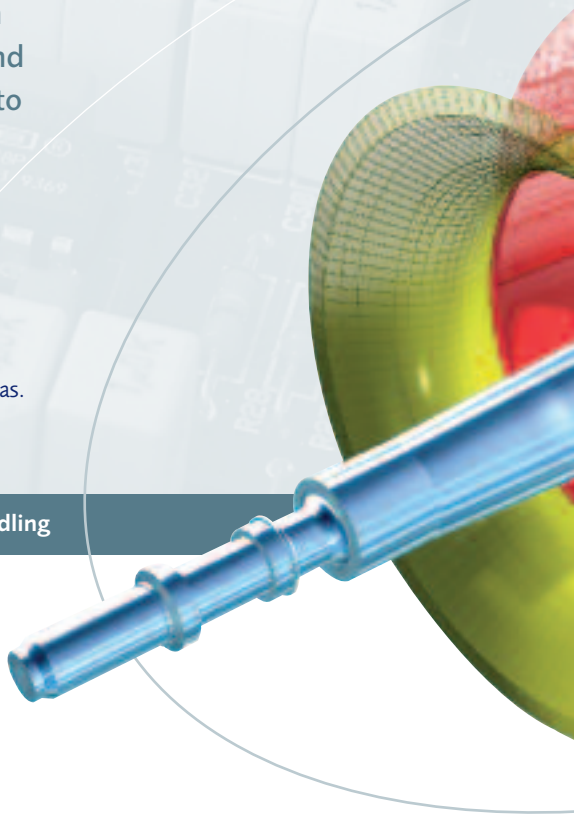
from the Group's technology specialists

Howden Group Technology

THE TECHNOLOGY SPECIALISTS

Howden Group Technology, based in Renfrew, Scotland provides a consultancy service together with core research facilities. Engaged in a whole array of technical activities and with specialists covering technologies from creep analysis to advanced acoustics, we work with all Howden companies to support Howden customers world-wide.

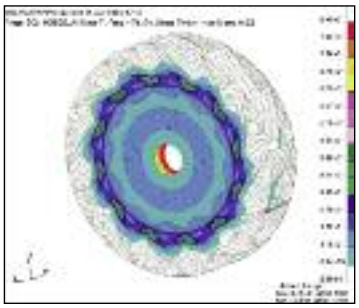
We are also engaged in research activities driven by a desire to enhance existing products and to maintain Howden as a leading global fan supplier. From studying fan noise reduction to addressing large impeller dynamics we have a team of very experienced engineers capable of operating in the most demanding of technical arenas.



Innovative, value adding solutions from Howden, the global leader in air and gas handling

Providing a technical consultancy service is paramount to our main objectives, and to this end we are committed to providing such a service to other Group companies and to Howden customers. From comprehensive in-house projects to lending an ear to our colleagues we pride ourselves in being able to assist.

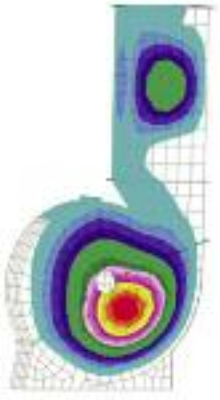
Many technical problems are complex, and on occasions require the application of a multi-disciplined approach. We are experienced in such situations and are well positioned to draw on the expertise of others, both internally and out with the company. We can operate effectively in handling such complex problems by providing a link to others with specialist knowledge. We don't just rely on local universities. On many occasions we seek out and assess the best possible consultant and are comfortable with specifying the exact requirements and liaising with the expert until a resolution is obtained. We have worked with many research institutes & universities throughout the world including Ohio State University, Cranfield Institute of Technology, The Welding Institute (UK), and Imperial College, London.

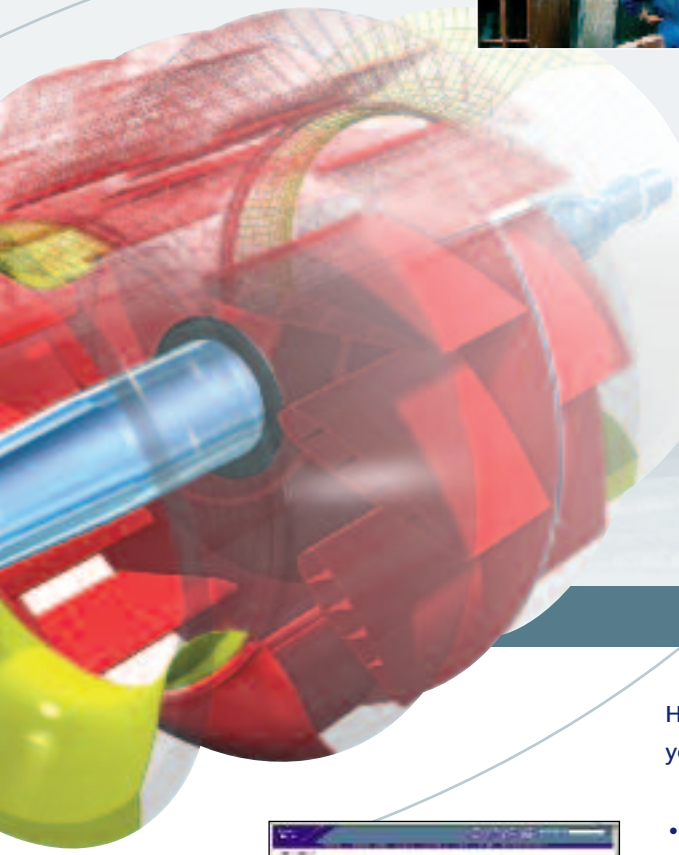


Finite Element analysis being used to investigate the natural frequencies and modal shapes of a centrifugal impeller.

Site problems and their effective solution can require a specialist familiar with actual operations & conditions.

Acoustic simulation software allows us to combine an FE model of a fan casing and duct structure together with the internal and external "fluid" environment to predict how sound propagates from a fan casing into the surrounding environment.

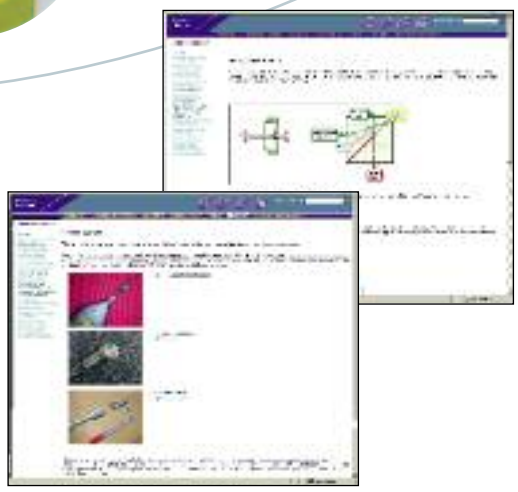




Site vibration or acoustic surveys often reveal the source of the problem. Our specialists can deal with bearing, drive coupling, and even motor problems.

Howden Group Technology is well placed to handle your technical problems in the following specialist areas:

- Linear stress analysis using Finite Elements
- Non-linear stress analysis using Finite Elements
- Advanced acoustic analysis including on-site surveys
- Computer based acoustic analysis work using Sysnoise
- Complex structural dynamics analysis of static and rotating components
- Advanced metal fatigue & fracture mechanics analysis
- High temperature metal creep assessment
- Rotor dynamics assessment of multiple shaft systems
- Site strain gauging & testing up to temperatures of 300°C
- Design & manufacture of specialist electronic equipment
- Site vibration problem assessment involving dynamic surveys
- Fan performance testing at site in accordance with International standards



Dissemination of technical information to non-specialists via our Internet web site is a major objective for us. Presented in an interesting and colourful way we aim to engage our readers and raise the general technical knowledge level within the company. From basic fan aerodynamics to fatigue and fracture mechanics analysis, our web pages have been carefully constructed.

>>> visit www.howden.com

Some case studies from Howden Group Technology

Fan foundation dynamic testing

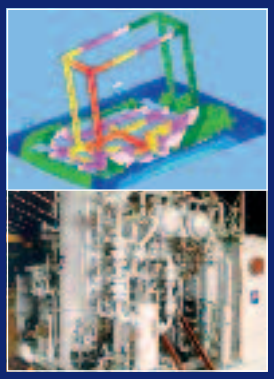
In such cases it is important to assess the existing foundations to determine if they are still in good condition. It is also necessary to provide the fan engineers and structural engineers with the dynamic stiffness values to allow them to assess the suitability of the foundations for the new fans.

In many cases where new boiler flue gas cleaning systems are being introduced, there is a requirement to upgrade existing large centrifugal induced draft fans to provide higher pressure.

It can be cost effective to utilise the existing concrete fan supports and the fan casing, with the new fans operating at a higher speed. In such cases it is of paramount importance that the existing fan foundations be tested to measure their dynamic stiffness parameters and to allow a new fan rotor system to be designed. Group Technology has developed a technique for doing this.

Paper mill noise problem

Following the commission of a new paper mill in Austria, complaints were received regarding the noise in the plant. In the locality of the fans the sound pressure level was in excess of 85dBA. Measurements and assessment of the environment indicated that the fan casing and inlet noise were not the dominant noise sources. The most significant noise source was identified as the unlagged fan discharge ducting on the floor below, together with the inlet ducting above the fans. In many cases the surface area of the inlet and discharge ducts connected to fans far exceed that of the fans and contribute significantly to the sound power radiating into the surrounding environment.



Baseplate for high speed centrifugal compressor

High-speed gas compressors supplied to offshore petrochemical installations are subjected to very onerous design conditions. In an offshore platform application the baseplate support system has to be designed to cope with more than the usual load criteria, such as torque reaction and pipework forces.

It has to satisfy conditions associated with the loads imposed by potential ship collision, inadvertent impact loads from dropped objects, and even the blast forces due to an on-board explosion. Finite element analysis was used to study the effect of each of these imposed loading conditions. In the case of the more violent loading conditions, such as blast effects, it was necessary to adopt an elastic-plastic analysis to study the behaviour. The baseplate was capable of sustaining such an event without catastrophic failure of the various mountings.

Site strain gauging of high speed rotating equipment

Group Technology has developed an impeller site testing technique, which can measure the steady and dynamic stresses in high-speed rotors during normal operation. The in-house developed telemetry and strain gauges, located at the critical zones, can be fitted in a relatively short time. The telemetry equipment, which is rotating on the impeller, can be activated remotely to allow long term testing without the requirement to stop the machine to replace the battery power source.

In this particular case we were asked by an end-user to investigate the repeated fatigue cracking of a centrifugal impellers supplied by a competitor. The measurement, and subsequent analysis, clearly demonstrated that the cyclic gravitational loading was above the fatigue limit for the impeller welds.

www.howden.com

For further information on Howden Group Technology's services or to discuss any specific technical issue, please contact:

The Director
Howden Group Technology

Howden
Howden Group Technology

Howden Group Technology
Old Govan Road
Renfrew PA4 8XJ
United Kingdom

Telephone: +44 141 885 7300
Facsimile: +44 141 885 2468
Email: jhgt@howden.com