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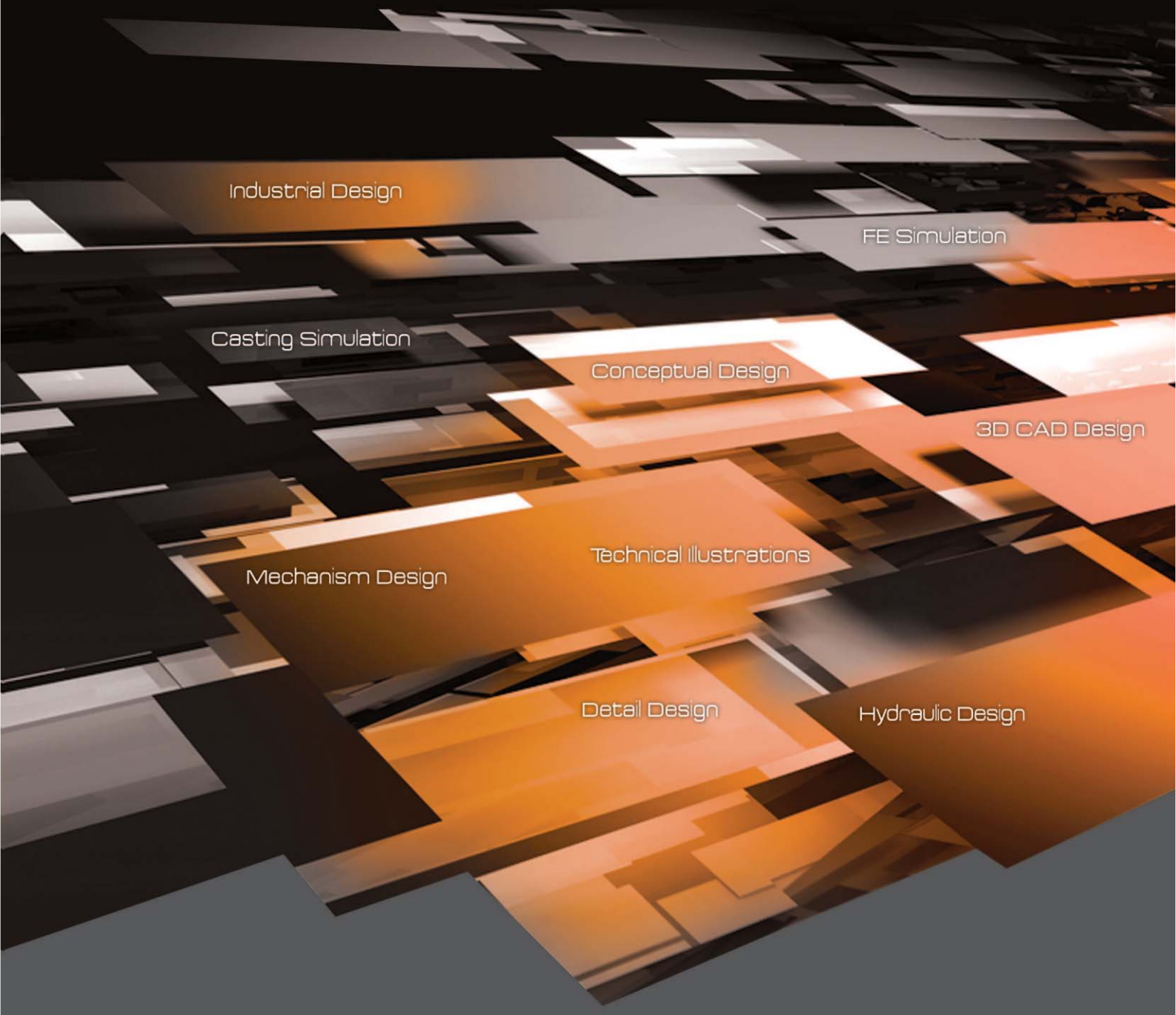
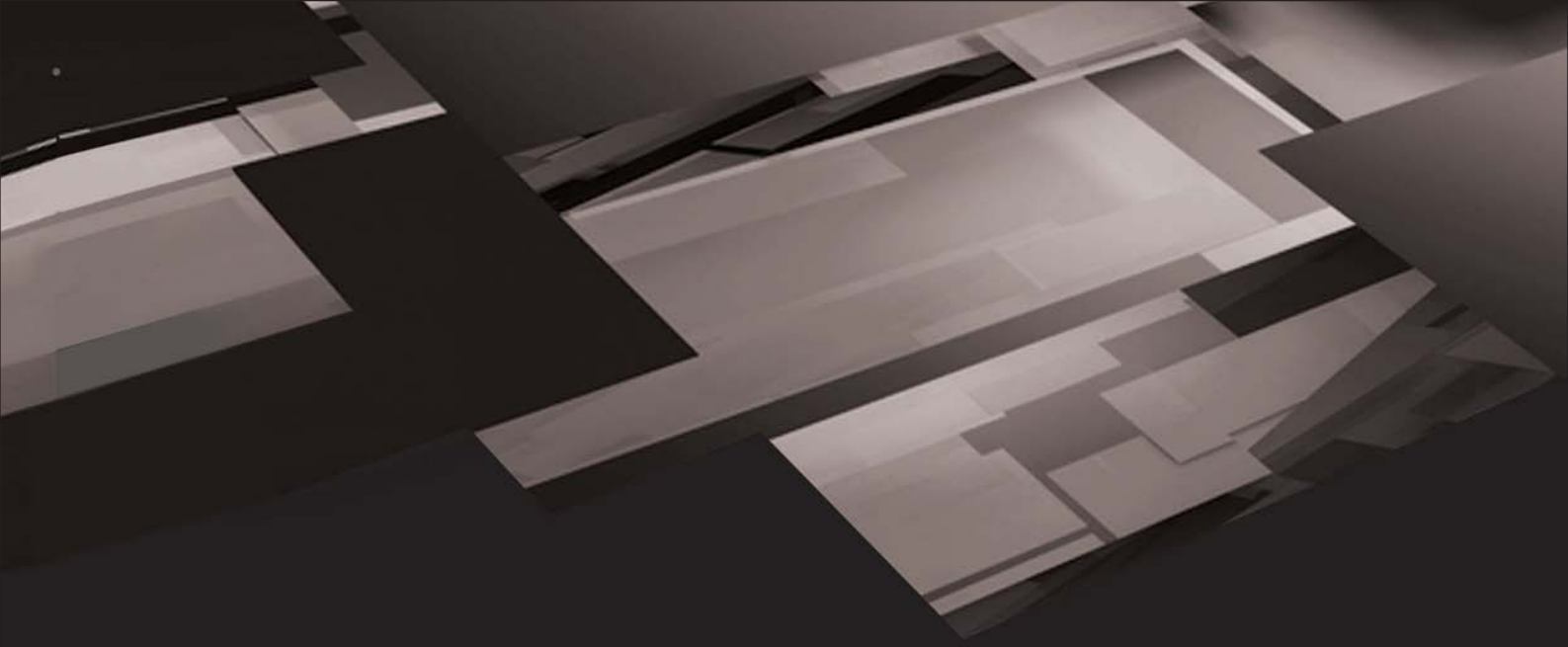


AEDesign specializes in engineering design and simulation services for the industrial and automotive sectors

ENGLISH



Welcome to AEDesign, the premier engineering design and consultancy company in Pakistan. We specialise in engineering and analytical services for Industrial and Automotive sectors. AEDesign provides its clients with professional, experienced design and engineering services while maintaining a focus on quality and on-time delivery.

AEDesign assists our clients from concept through validation to finished prototypes and/or finished products as required. Our professional in-house team brings your ideas to fruition, be it an integral part of a sub assembly or an entire system. Most of our engineers hold international degrees and bring a level of expertise adaptable to a changing manufacturing environment without compromising their professional integrity or the quality of their technical services.

I founded AEDesign in 2002 with a focus on providing engineering services to the automotive industry. Since those early days, we have expanded our horizons to include Industrial Machinery, Industrial Vehicles and Motor Sports sectors. Our client base spans many countries, but our main focus is in Europe. My continuing dedication to excellence is carried forth throughout the team. We view engineering challenges with excitement, and produce with vigor.

So why choose AE Design for your next project? Our level of expertise is unmatched. Our dedication to your project is unwavering. Our efficient engineering base allows us to bring true value to your projects .

Allow us the opportunity to discuss your engineering challenges.

Zaafir Waheed
CEO
AEDesign

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INDUSTRIAL SERVICES

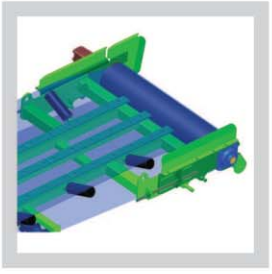
At AEDesign we specialize in creating value enhanced engineering solutions for the Industrial sector. Our services cover engineering, analysis and technical support.

- **Conceptual Design**
- **Detail Design**
- **Mechanism Design**
- **Hydro-Mechanical Design**
- **3D Model Construction / Database**
- **Management**
- **Technical Illustrations**

- **Finite Element Analysis**
  - Static
  - Dynamic
  - Non-Linear
  - Fatigue
- **Production Simulation**
  - Casting
  - Forging
  - Simulation

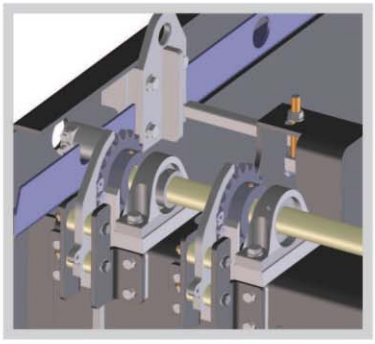
Conceptual Design

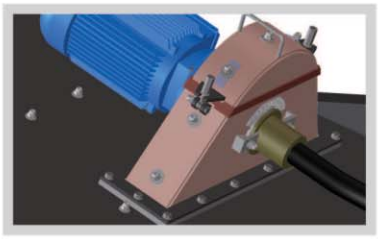
We can create design concepts working in close cooperation with clients or working independently to design parameters outlined by clients. The extensive engineering disciplines which we have in-house allow us to put together innovative and well thought out concepts whether it is for large complex machinery or for smaller simpler systems. Since we have expertise in many engineering fields, we can provide a one stop co-ordinated development service. We are able to manage a complete project from conceptual design right through to release of manufacturing drawings and service support material.



Detail Design

We are able to provide a very efficient and fast service when it comes to detailing and customizing existing designs. Whether it is a design for an existing machine that needs to be modified or modernised, or a concept that needs to be detailed and made production ready, we are able to assist you from start to finish. Our engineers work in close collaboration with your in-house team to understand your requirements and challenges. Once we are clear about your requirements we apply our engineering resources to not only implement your ideas, but also propose our own solutions where we deem appropriate.



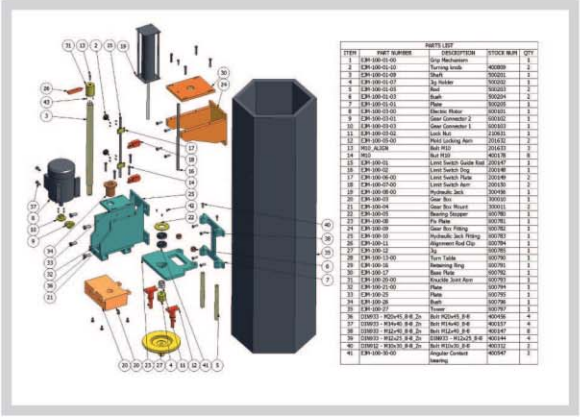


3D Model Construction / Database Management

If you find yourself in the process of upgrading your systems and designs from 2D CAD to 3D CAD, you will surely find us to be your preferred partner in this task. Although it can sometimes seem like a straight forward task, carrying out intelligent data migration is often a task that can be mishandled. In our experience, in most cases 2D CAD data shows flaws and errors when modelled in 3D. This is because it is much easier to make a design that has better fit and integration in 3D CAD than in 2D CAD, therefore we find this phase to be an ideal opportunity to not only convert the data but also to improve the quality of the design. We are also able to harmonize CAD data creating an effective database that can be linked to an ERP platform.

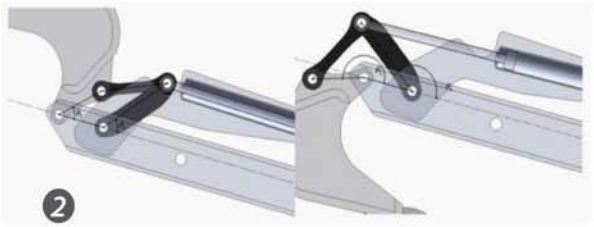
Technical Illustrations

Good product backup requires well laid out service and spare parts manuals. AEDesign can produce complete manuals including exploded and detail views. These manuals can be linked to a data base alowing automatic updation whenever any design changes are made. The key to making good manuals is to step into the shoes of the end user and then view it from their perspective for clarity and simplicity. Our engineers have extensive experience of carrying out such work for a large range of clients.



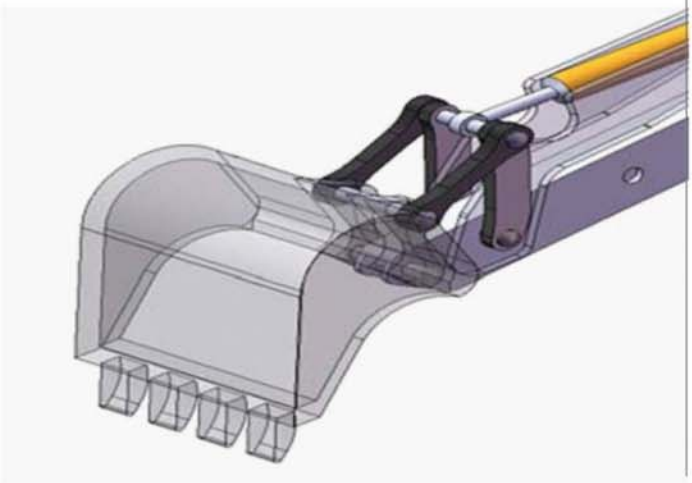
Mechanism Design

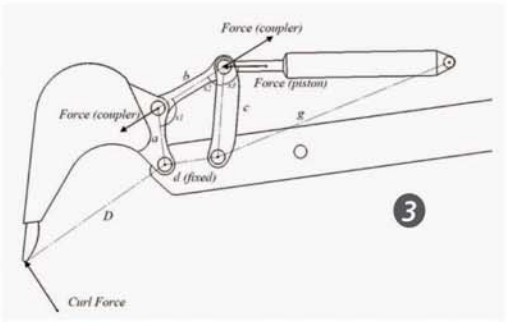
Efficient mechanism design requires inter-disciplinary experience and technical knowledge. Good design is very important in achieving full functionality and motion while at the same time minimizing unnecessary force and load buildup. Inefficient design results in not only compromises functionality but will also lead to higher production and material cost along with higher force actuators being needed.



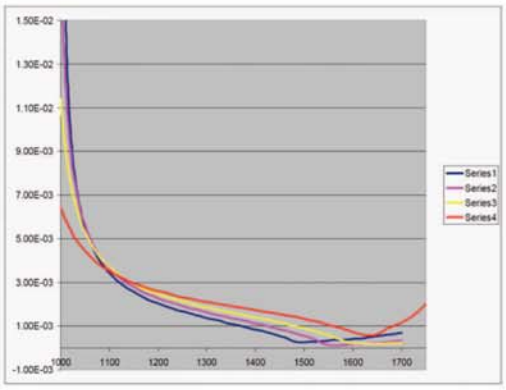
2

This four bar link was designed using two types of calculations; Force optimization and Link length along with angle optimization, while ensuring the full range as shown in Fig.2 was achieved.





Statics equations were developed for force optimization of the mechanism according to the forces acting as shown in Fig: 3



Calculated data was plotted for better representation of the results and hence selection of the optimized length combnations of links.

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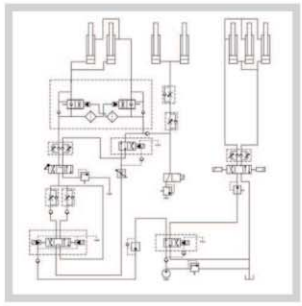
Fluid Power System Design and Analysis

Most static and mobile machinery in the extraction industry (mining, logging, farming etc) use fluid power systems because of the flexibility they offer. We have the ability to design and analyze fluid power systems for virtually any type of machine or vehicle, irrespective of loads or requirements.

Appropriate use of hydraulic components like flow restrictors, flow orifices, pressure reducing valves enable systems designed by us to function properly and smoothly.

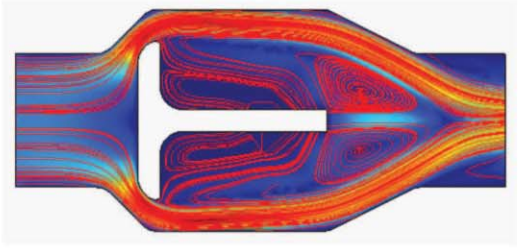
We evaluate hydraulic circuits by using multi body dynamics models, integrated with hydraulic circuits. Real time simulation of mechanisms and circuits help us in investigating the dynamics of hydraulic circuits and the structure itself. These processes allow us to specify the most suitable hydraulic system components ensuring that there are no unnecessary costs incurred by opting for excessively powerful or inappropriate hydraulic systems.

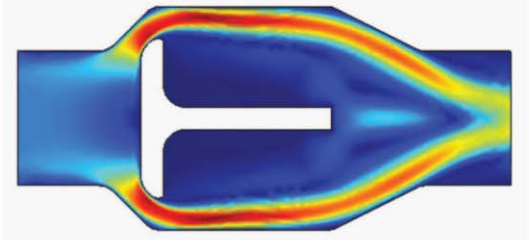


We can also carryout component level simulation on a range of hydraulic components.

- CFD Analysis for the prediction of Metering Characteristics, Compressibility Effects, Flow Forces and Pressure Drop across components
- FEA Analysis for Stress Determination
- Fluid Thermal Modeling

CFD simulations





CFD simulations show the velocity profile of the fluid passing through a check valve. Such simulations enable us to accurately predict pressure drops, flow metering, and reduce flow eddies.

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Computer Aided Engineering in Industrial Applications

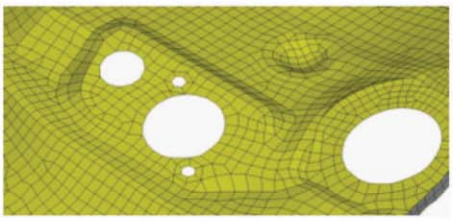
In today's world Finite Element based methods allow designs to be virtually tested and validated before prototyping, saving large amounts of time and money. It is possible to determine the behavior of the design and materials for a large number of cases ranging from basic integrity to more complex simulations predicting the estimated life of a design.

AEDesign has extensive experience in carrying out Finite Element Analysis on designs of all complexity levels. From meshing and setting up the model right through post processing and design optimisation, we can help ensure that your design functions as it was intended to.

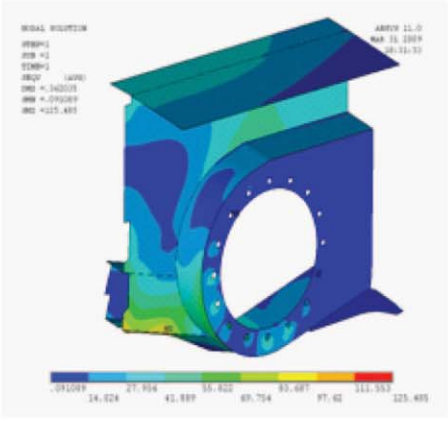
We can carry out the following types of analyses:

- Static Analysis
- Dynamic Analysis
- Modal, Sine Sweep, Random Vibration
- Life Estimation (Fatigue analysis)
- Non-Linear Analysis

Pre-Processing



The first steps in any simulation work are essential in ensuring that the results of the simulation are reliable. These steps include but are not limited to mid surface generation, mesh generation and connections modelling. For clients who are only interested in having a model that is setup and ready for simulations by their in house team we are able to offer; crash meshing, strength meshing and meshing for plastic and sheet metal parts. We are also able to generate mesh models for composite parts.



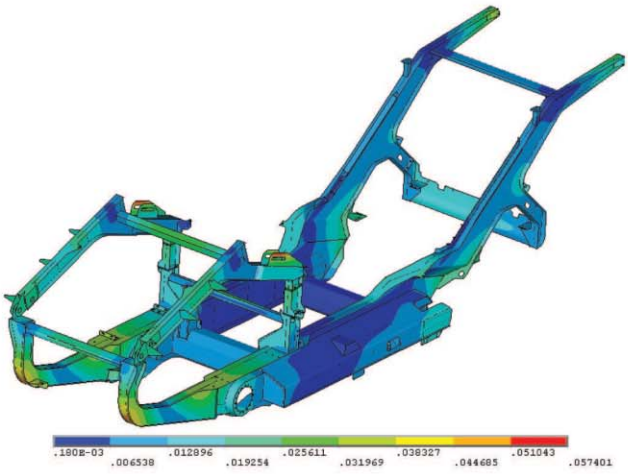
Static Analysis

AEDesign can simulate linear and non-linear cases as per your unique product requirements. Once the initial simulation results are compiled in report form, we are able to offer suggestions for design optimization and improvements depending requirements. In most cases it is possible to attain improvement in design function while at the same time achieving savings in material and production costs.

Vibration Analysis

The range of analyses that we are able to carry out includes modal analysis, sine sweep analysis and random vibration analysis(PSD spectrum). These different analyses allow us to determine natural frequencies, resonance models and maximum deflections experienced. Vibration can cause unexpectedly large amplitudes resulting in catastrophic failure of a structure. It can also cause a drastic reduction in service life of the structure while also leading to excess noise during operation.

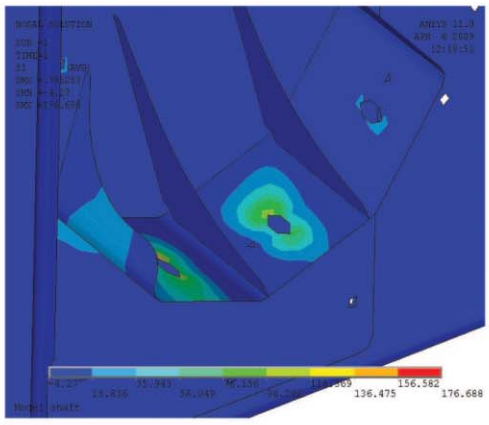
The image shows the vibration modes of a frame structure that is made of welded and bolted sheet metal construction. This structure was tested for low frequency modes, since these can produce high amplitudes resulting in premature failure.

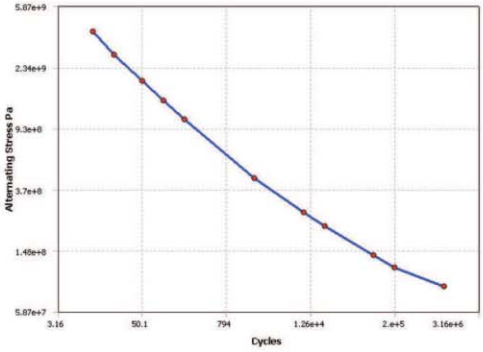


Fatigue analysis

In order to accurately estimate the operational life of a structure exposed to cyclic loading, fatigue calculations are essential. Metallic structures are most prone to failure under repeated loads and if such a failure is not predicted, it can have catastrophic effects. Fatigue failure is manifested by cracks forming in the stressed areas of the design where flexing occurs. These cracks can then propagate resulting in failure.

Materials testing produce required fatigue-life curves which are required to reference the material against the simulation results. Structural analysis is carried out on the design in question, which gives us the expected stress levels that will be encountered during operational conditions.

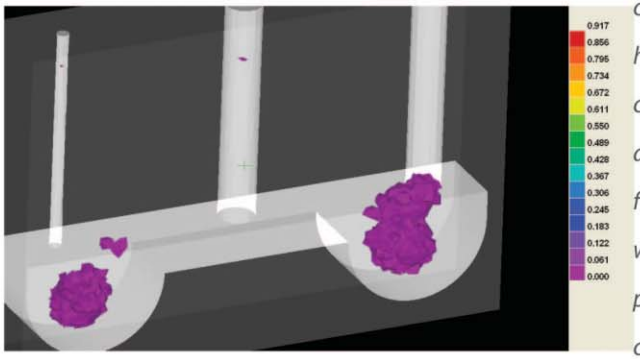




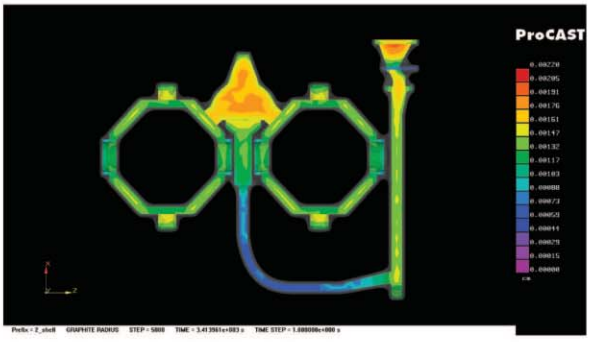
Casting Simulation

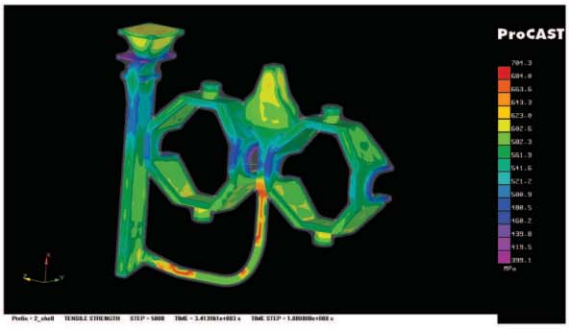
We are able to carry out simulations for different types of casting in order to determine the possibility of defects such as shrinkage, porosity and slacks forming during the casting process. In addition it is also possible to determine the solidification time and crystal structure of the solidified part in order to ensure suitable mechanical properties of the finished part.

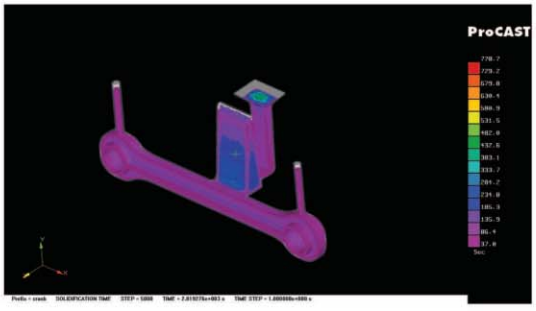
Macro and Micro porosity can be accurately predicted through careful simulation and the mould can be optimised to avoid these undesirable occurrences. Such defects can be controlled by appropriate use of cooling rates, gating systems and risers. The image below shows shrinkage porosity in the two regions. The Reason for porosity in this case is the early solidification of metal in the risers and gates which hinders the flow of liquid metal to compensate for the shrinking metal.



This image indicates the fraction of pearlite in the casting. High levels of pearlite crystals result in higher yield and tensile properties of the cast component. It can be seen that most of the regions are showing uniform percentages of pearlite apart from the four corners of the octagonal component which show a very sharp drop in mechanical properties. If closely observed it is evident that cooling rate in the sharp corners is very high, discouraging the formation of a uniform grain structure. A subsequent image of Tensile strength indicates the same four corners showing low strength properties.







Solidification time during casting is very important in influencing the level of porosity and strength of the cast part. In this image it can be seen that a uniform cooling rate ensures proper shrinkage from feed and risers.

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Let our highly capable team assist you in your requirements, using our extensive engineering knowledge combined with our expertise in simulation methods to deliver your projects to the highest quality level.

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