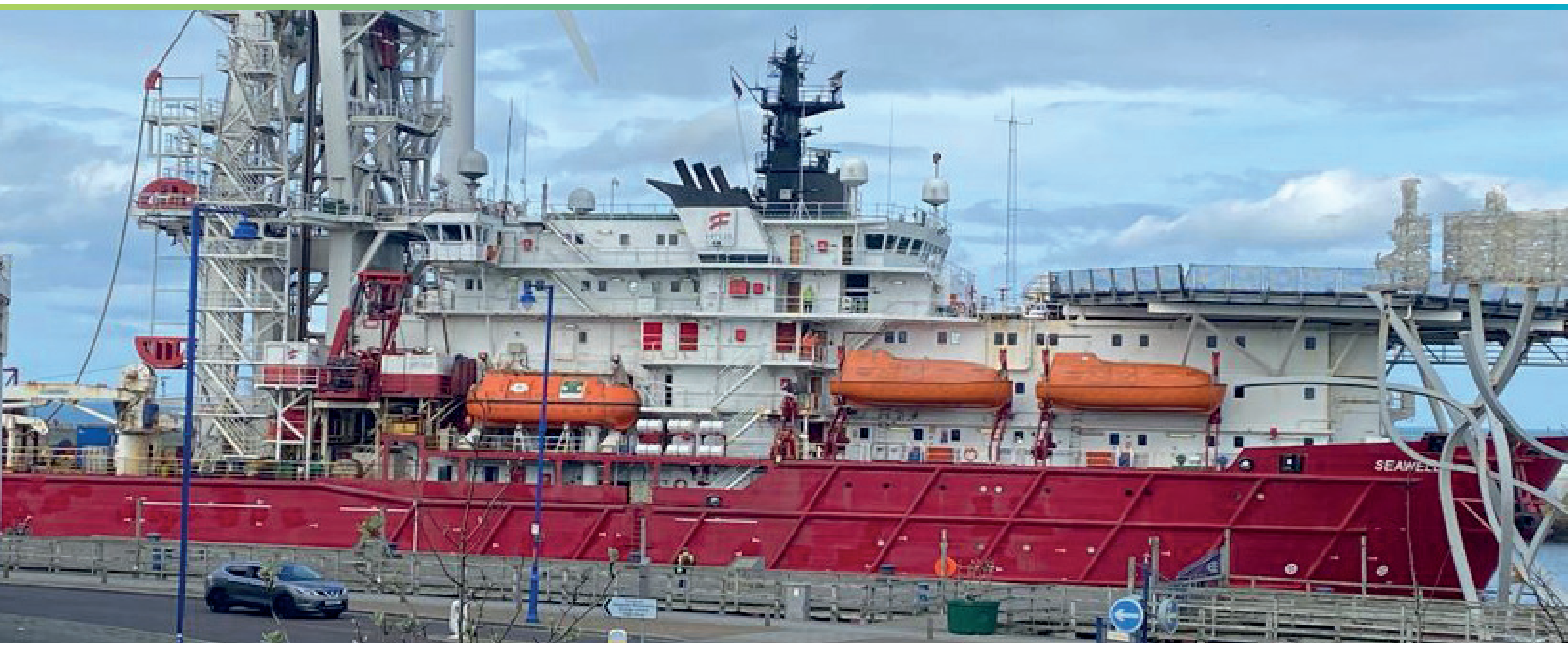
HEXAGON

Case study

Hexagon CAE software enables top-notch engineering consulting services for the marine industry

A Squared Engineering solves shipbuilding challenges with MSC Apex



"The imagined made possible"

The maritime engineering environment is unforgiving; it tests our skills of innovation and endurance with corrosive saltwater, unpredictable weather, and the relentless forces of nature. Yet, it is within these challenges that some of our greatest achievements are forged. A dynamic and vitally critical field, marine engineering contributions echo far beyond the waves. They inspire, power, protect, and connect people across the globe.

A Squared Engineering is one company tackling some of the engineering industry's most complex, toughest challenges head-on by fusing a wealth of combined engineering knowledge in traditional offshore energy, renewables and shipbuilding.

A Squared Engineering delivers outstanding engineering projects for customers as they move toward a balanced, measured and responsible energy transition. Its motto: "The imagined made possible". A Squared Engineering relies on some of the most innovative digital engineering tools available, so it can overcome these challenges and set an example for engineering excellence in the industry.

A Squared Engineering provides structural design expertise, detailing of fixed and floating steel structures, finite element analysis, and structural integration analysis for the shipbuilding industry using Hexagon CAE software solutions.

Expert analysis enabled by powerful and accurate tools

Shipbuilding, traditional offshore energy, and renewable infrastructure require specialised engineering services capable of ensuring that structures can withstand the unique forces applied to them and comply with strict regulations. A Squared Engineering meets these tough requirements by bringing decades of engineering experience and the powerful modelling and analysis capabilities of Hexagon's design and engineering software to the challenge of providing critical engineering services to the marine industry.

A Squared Engineering offers services as varied as structural design and detailing of fixed and floating steel structures, whole ship and general finite element analysis, and structural integration analysis of large equipment onto/into vessels. Its ability to provide these services is only possible thanks to a combination of decades of practical experience in the field, reinforced by Computer-Aided Engineering (CAE) software.

Diverse projects require flexible solutions

A Squared Engineering's solutions encompass a wide range of structures across the marine and offshore industry. These may include vessels as large as superyachts, or offshore wind energy structures that extend below the seabed. The company may analyse the global strength of a vessel, simulating the structural response of a floating body to wave loads, or investigate how a submersed structure will react to excessive wave particle velocities.

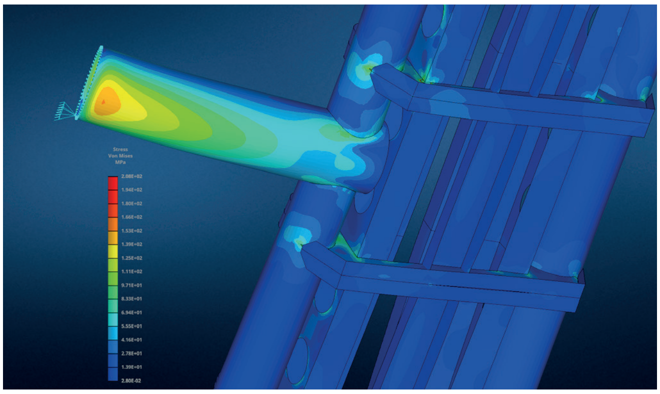
Naturally, such large, floating structures must meet strict requirements for structural integrity, safety, and durability. Each project A Squared Engineering takes on comes with requirements from DNV-GL, AISC, Lloyds, or other regulatory bodies that must be met to complete the project and certify designs.

Regulatory agencies once relied on hand-calculated data, but now they commonly require the results of Finite Element Analysis (FEA) performed with CAE software to certify a structure's strength and reliability. These results must be accurate and trustworthy, and companies like A Squared Engineering rely on a combined century's worth of practical experience to validate FEA results and ensure that the data they're generating offers an accurate picture of real-world conditions.

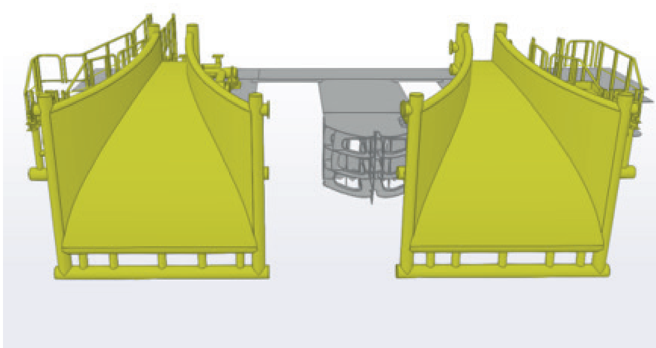
In the past, A Squared Engineering used a more traditional tool for FEA modelling and analysis, but as the company grew, limited material models, element types, load types, and nonlinear analysis capabilities were preventing it from providing analyses as quickly and efficiently as it would like. The company required more advanced CAE with powerful modelling and pre-processing tools, integrated linear, nonlinear, and fatigue analysis solutions, a deep library of material models, loads, and element types, and the high-performance computing necessary to dramatically reduce analysis times.

After speaking with long-time Hexagon partner Evotech CAE and exploring the capabilities of Hexagon's design and engineering software, A Squared Engineering decided to adopt the more robust CAE solutions offered by Hexagon. Evotech CAE was instrumental in providing the support and training necessary to get A Squared Engineering using the new software quickly and efficiently producing results that met customer and regulatory requirements.

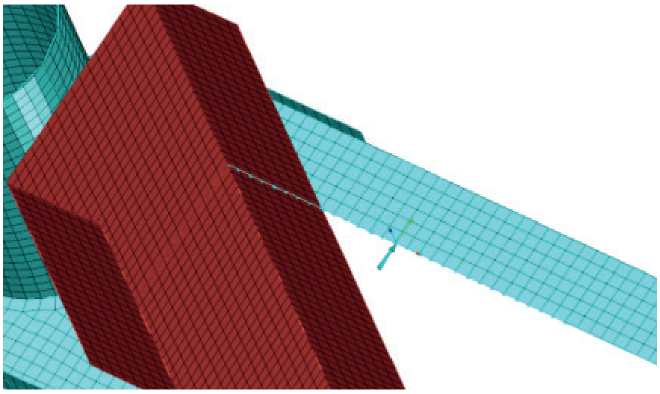
> **“We used another tool in the past before moving to MSC Apex and the transformation in terms of pre-processing was like going from a skateboard to a Ferrari”**
>
> **Andrew Robson, Founder**
> A Squared Engineering



MSC Apex is used for pre and post-processing the results of finite element analysis performed with MSC Nastran.



With MSC Apex, A Squared Engineering can manipulate models before 3D meshing to ensure that the geometry is clean and will provide accurate results.



Rapid gains in pre-processing capabilities have dramatically reduced the engineering time required for projects.

Exceptional pre-processing capabilities enable experts

The company uses MSC Apex as a pre-processing solution for FEA, along with MSC Nastran. The integrated native MSC Nastran solvers included with MSC Apex provide the solutions for linear static and nonlinear structural analysis, as well as vibration analysis of the forces generated by wave particles. These results are used to validate the scoping calculations performed by the experts at A Squared Engineering and highlight any additional areas of concern that may require further analysis.

With MSC Apex, the company can also create or manipulate models before 3D meshing to ensure that the geometry is clean and will provide accurate results. The pre-processing capabilities of MSC Apex are vastly superior to our previous solutions. Andrew Robson, the founder and Director of A Squared Engineering says, “We used another tool in the past before moving to MSC Apex, and the transformation in terms of pre-processing was like going from a skateboard to a Ferrari.”

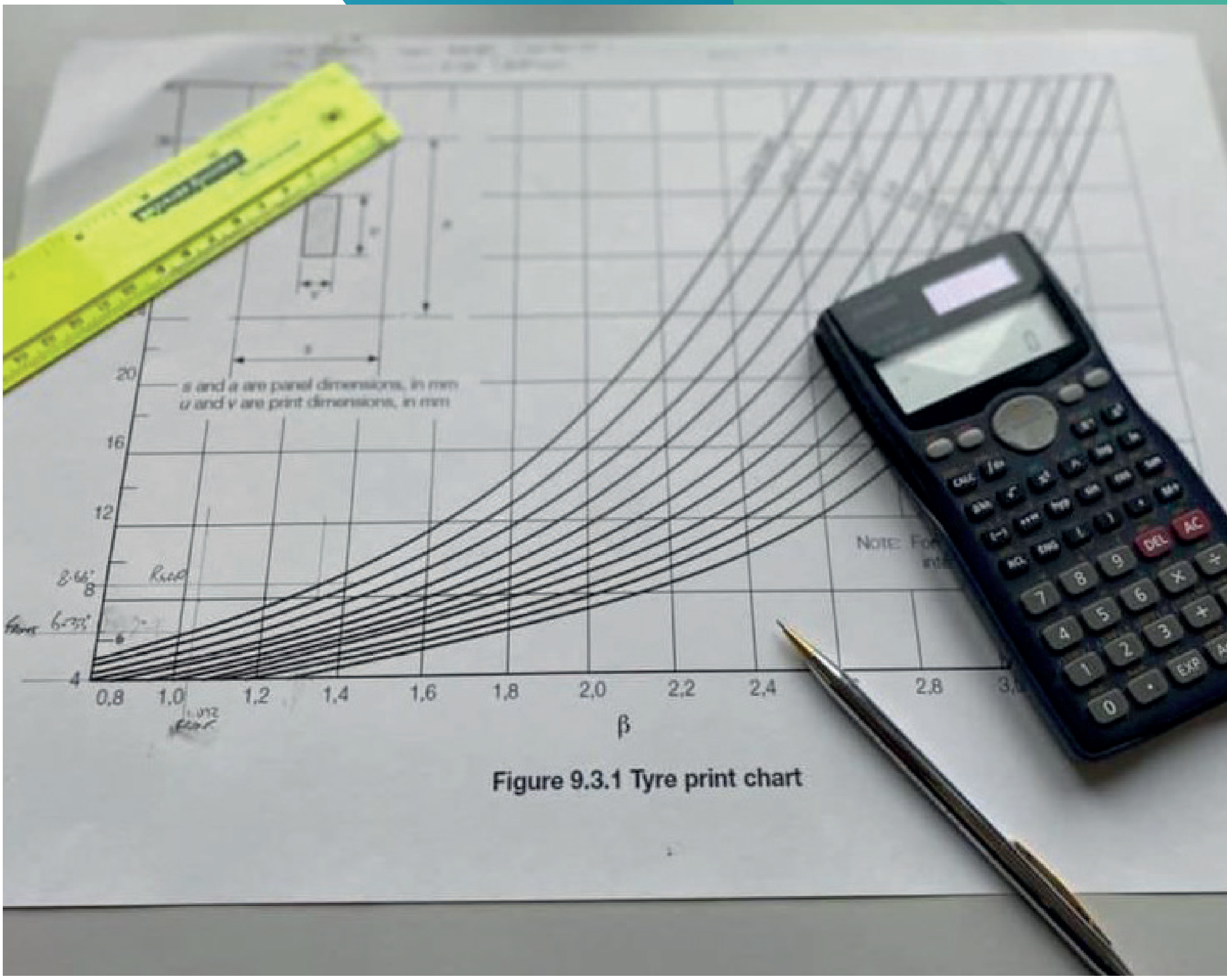
Because the powerful MSC Nastran solvers are fully integrated with MSC Apex, the company is now able to create accurate structural models, analyse the effects of fatigue, strain, vibrations, and force on those structures, and visualise the results all in one interoperable software ecosystem, rather than using disparate pre-processors, solvers, and post-processors for the analysis.

Engineering agility and code-compliant designs in less time

The most notable benefit of adopting MSC Apex has been a rapid gain in pre-processing capabilities and greatly reduced engineering time. By reducing the time required to analyse structures, the company saves a significant amount of money and can offer services at more competitive rates to clients.

Having more robust CAE capabilities also means that A Squared Engineering is more easily able to demonstrate that structures are code-compliant and can ensure that projects are certified in a timely manner.

In the future, A Squared Engineering hopes to add more capabilities, including more robust fatigue analysis, multi-body dynamics, and computational fluid dynamics (CFD) for coupled structural-fluid interactions.



Regulatory agencies once relied on hand-calculated data, but now require FEA results derived from CAE software like MSC Apex and MSC Nastran.

Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications.

Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that use data from design and engineering, production and metrology to make manufacturing smarter.

Learn more about Hexagon (Nasdaq Stockholm: HEXA B) at hexagon.com and follow us @HexagonAB.