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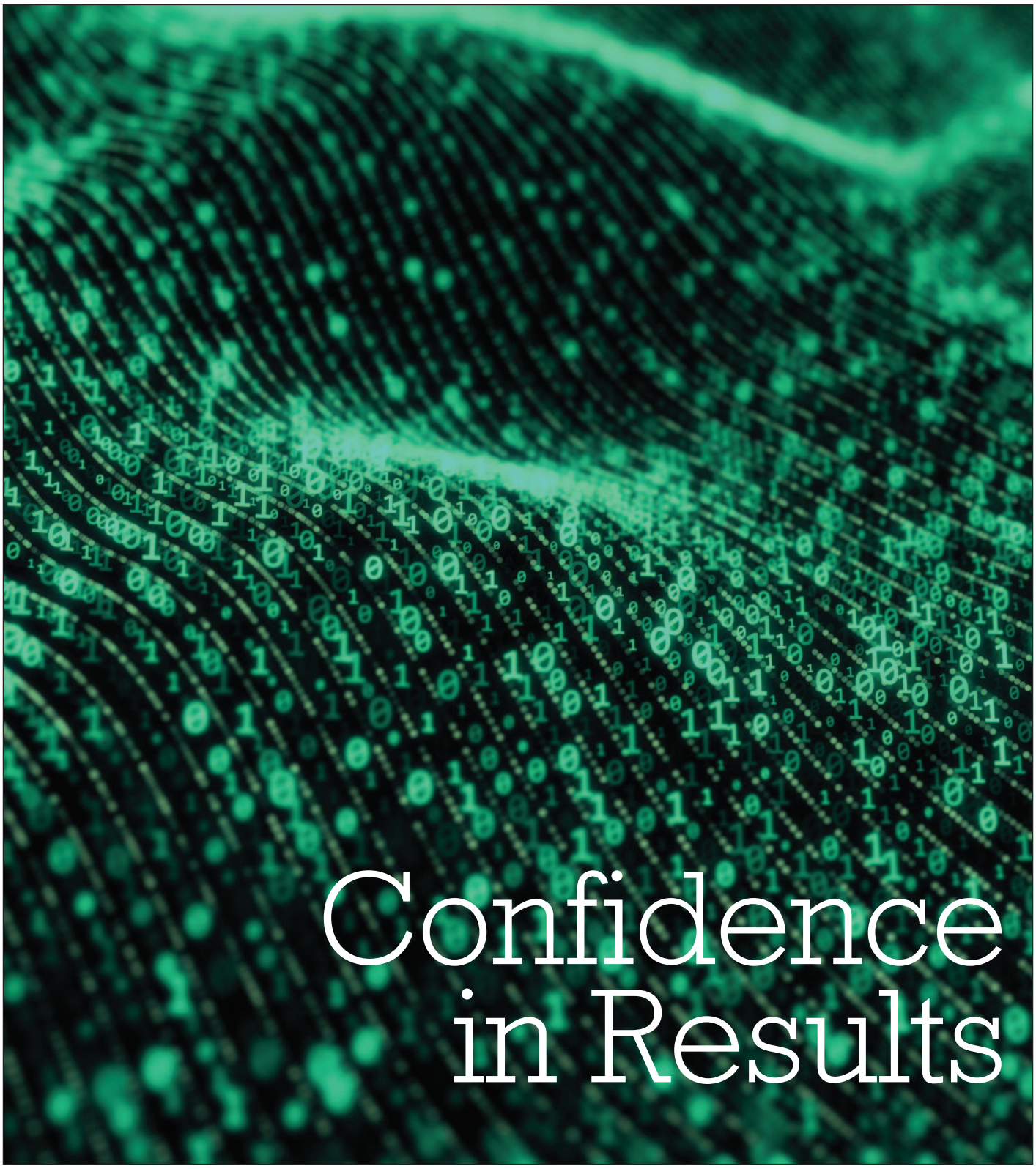
THE INTERNATIONAL MAGAZINE FOR ENGINEERING DESIGNERS & ANALYSTS FROM **NAFEMS**



Confidence in Results

ISO 9001 Accreditation from an SME Perspective

The Role of the NAFEMS QSS

Steve Howell, Abercus

Steve Howell is the Technical Director at Abercus, a consultancy specialising in advanced engineering simulation, primarily computational fluid dynamics and finite element analysis in the energy industries. Founded in 2010, Abercus' activities include consultancy, teaching and training, verification and validation, and the development of bespoke software tools. Steve is a member of both the CFD and Analysis Management working groups.

Founded in 2010, Abercus is a small consultancy specialising in advanced engineering simulation (CFD, FEA, bespoke software and training) in the energy industries. As a small consultancy, Abercus was initially hesitant to pursue formal ISO 9001 certification because of the investment required in terms of both time and money. Instead, Abercus implemented a quality management system (QMS) designed in line with its understanding of ISO 9001.

In 2015 Abercus took the strategic business decision to become formally certified to ISO 9001 by the end of that year. Now, having achieved ISO 9001 accreditation and with the benefit of hindsight, Abercus realises that this is something that could, and perhaps should, have been achieved earlier.

The purpose of this article is to share some of the lessons from Abercus' journey to becoming accredited, and to discuss the relevance and benefits of implementing a formal quality system and the NAFEMS QSS, particularly from the point of view of a small company. It is hoped that by sharing Abercus' experiences, other small companies may be encouraged to pursue a similar route towards formal ISO 9001 certification.

Lesson 1: Take the first positive step and formally make the business decision to become ISO 9001 certified. Operating a quality system designed in line with ISO 9001 is not the same as being ISO 9001 certified. The process of being interrogated by an independent assessor necessarily requires the company to consider ISO 9001 in its entirety, and in Abercus' own experience a certified QMS is likely to be more robust than an in house QMS designed in line with an understanding of ISO 9001 that may be incomplete.

The ISO 9000 Series for Quality Management and NAFEMS QSS

The ISO 9000 family of standards provide guidance and tools for companies and organizations that want to ensure that their products and services consistently meet customers' requirements and that quality is continually improved. There are three standards: ISO 9000 covers the basic concepts of quality management and the associated language, ISO 9001 sets out the requirements of a quality management system (QMS), and ISO 9004 focuses on how to make a QMS more efficient and effective. (The ISO 9002 and 9003 standards were incorporated into the ISO 9001 standard in 2000.) ISO 9001 is the only standard in the series for which companies can achieve certification.

The ISO 9000 and 9001 standards were first released in 1987 and were most recently updated in 2015. Companies certified against the previous version of ISO 9001 (released in 2008) have a three year window in which to adapt their QMS to bring them in line with the 2015 standard. Abercus is certified against ISO 9001:2008 and plans to update to the 2015 standard by the end of 2017.

The ISO 9000 standards are necessarily general – they have been designed to be used by any business, in any industry sector, in any part of the world. Since 1989, NAFEMS has published and maintained a quality system supplement (QSS) to ISO 9001 which interprets the requirements of the ISO standard in the particular context of engineering simulation. The NAFEMS Analysis Management Working Group (AMWG) is currently revising the QSS to bring it in line with ISO 9001:2015. To complement the formal QSS document, NAFEMS has also published a supporting primer document, which is designed to assist in the development and implementation of a quality management system for engineering simulation **(nafems.org/qss)**

The NAFEMS quality assurance procedures for engineering analysis was published in 1999 to supplement the 1994 version of ISO 9001 and, while it has not been kept up to date, Abercus found this to be an extremely valuable resource. In particular, Appendix D of this document includes a set of rudimentary example forms which can be used as a starting point for a QMS.

Lesson 2: If you haven't already done so, download the latest revision of the NAFEMS QSS and its associated primer from the NAFEMS website – they're free to all NAFEMS members. Also look for the quality assurance procedures for engineering analysis – the sample forms in Appendix D are worth reviewing.

Appointment of an ISO 9001 Assessor and an Independent ISO 9001 Consultant

Having set the goal of achieving formal certification by the end of 2015, the first step was to appoint an ISO 9001 assessor. Abercus appointed Ocean Certification, based in Newcastle upon Tyne.

At an initial meeting with Ocean Certification, Abercus learned that the assessor cannot also be engaged in the development of the quality management system to be assessed, since this represents a conflict of interest. Whilst the team at Abercus had collective experience of working within a number of different ISO 9001 certified quality management systems over the past 20 years, it was thought that the Abercus QMS should be interrogated by an independent expert prior to the assessment. For this reason, Abercus engaged a separate ISO 9001 consultant, SEQM (also based in Newcastle upon Tyne).

Looking back, the appointment of an independent ISO 9001 consultant was certainly worthwhile, and Abercus' certification would not have been achieved as speedily without the support from SEQM. This is not to say that an independent consultant was essential – indeed, Abercus had already incorporated most of the requirements of ISO 9001 into its pre certification QMS and would have been able to design a fully compliant QMS by reviewing the ISO 9001 standard and the NAFEMS QSS and associated primer. However, in Abercus' view there is no substitute for experience and if we had designed our QMS without engaging a separate consultant the journey towards formal certification would have taken longer and would have been more tentative. Uncertainty about the unknown is the issue, and there is always a concern that something could be missed when interpreting the ISO 9001 standard. Whilst there was a financial overhead associated with the appointment of the ISO 9001 consultant, this input saved us time and gave us the peace of mind that our QMS was fully compliant in advance of the formal assessment, saving Abercus money in the long run.

Lesson 3: Unless you already have experience of successfully implementing a certified ISO 9001 quality system, consider appointing an external independent ISO 9001 consultant to support the QMS development activities.

Managerial and Technical Aspects of a Certified QMS

ISO 9000 covers two aspects: high level managerial activities and lower level technical activities. As an engineering focused team, Abercus' pre certification QMS had concentrated on the technical aspects of the system, using simulation data management (SDM) tools to automate CFD/FEA workflows, for example, but had not captured some of the managerial aspects.

Many ISO 9001 consultancies, including Ocean Certification and SEQM, offer an off the shelf quality manual and core procedures documents and templates which can be used as the starting point for a certified QMS. These systems are quite general and tend to focus on the high level managerial aspects. The certified Abercus QMS is a consolidation of our technical pre certification QMS and a customised version of the SEQM off the shelf system covering the high level managerial aspects.

Some of these managerial aspects, with hindsight, now seem obvious. This includes, for example, the formalisation of a business map – Abercus had operated its business for five years without formalising exactly what the company does. The process of formalising our activities provided the opportunity to review and question our business activities, and this has led to a new data structure underlying the whole of the business.

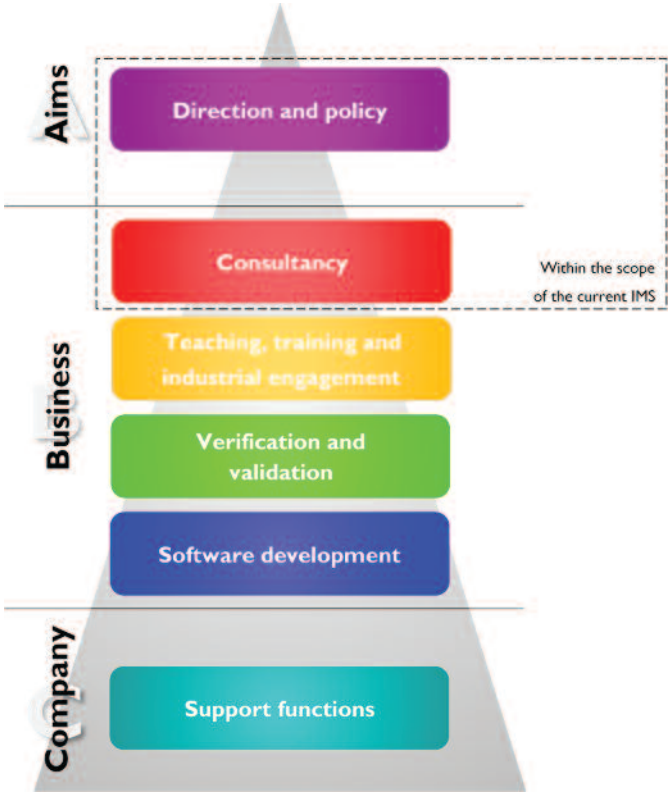


Figure 1: Business Map

Lesson 4: Formalise a business map – capturing and understanding the current practices within the business is the first step in improving those practices. One of the underlying principles of ISO 9001 is that of continual improvement. Without knowing where the business is currently, it is impossible to improve effectively.

A QMS can Save Time and Effort at the Point of use, Through the use of SDM Tools

Whilst completing QMS records to document the details of engineering simulations is essential to allow projects to be revisited, in Abercus' experience this often constitutes a separate extra physical task and, as such, can be perceived negatively since it can perhaps distract from the immediate task of getting a simulation running.

Engineering simulation is well suited to process automation and the use of SDM tools. Indeed, every simulation undertaken within Abercus is scripted so that a precise record of the simulation is stored. Each simulation is run as a background process without needing to interact with the GUI of the simulation tool. Abercus uses JET, an in house SDM tool that was originally developed in 2002 to automatically create the simulation scripts (http://www.abercus.com/SoftwareSolutions_JET.aspx). Over the years, the use of JET has saved time and effort at the point of use – the act of entering simulation specific information into JET to create the simulation scripts also acts to provide the information required for the QMS record, minimising duplication of effort.

Lesson 5: Consider using an SDM tool to automate the simulation workflow. This provides a consistent framework for undertaking routine simulations whilst automatically compiling the information required for the QMS.

Keep it Simple

The ISO 9000 standards are generic and there is no right or wrong solution – each QMS is a custom solution that is defined by the users of the QMS, since they know their own business best. But beware of making a QMS excessively comprehensive from the start. If something is included within the QMS, make sure that it does actually add value and will get done. Don't include any new activities within the QMS just because they seem like a good idea if they are not likely to be completed. If you do that, you may have unnecessarily created an opportunity for a non-compliance which could ultimately lead to the loss of certification.

Lesson 6: Keep the QMS as general as possible and ensure that it reflects the business process maps outlining the current activities within the business. Don't wait to design a perfect comprehensive QMS before trying to get certified – the whole point of ISO 9001 is that it's a framework for continual improvement. The journey towards ISO 9001 certification starts from where the company is, not from somewhere else that it would ideally like to be. The important point is to recognise this and start on the journey towards accreditation without delay.

References:

- The NAFEMS QSS – Engineering simulation, Quality management systems, requirements, Quality system supplement NAFEMS QSS:2008, 2014 (https://www.nafems.org/publications/browse_buy/browse_by_topic/qa/nafems_qss_2008_/)
- The NAFEMS QSS primer – Quality management in engineering simulation, a primer for NAFEMS QSS, NAFEMS R0116 , 2014 (https://www.nafems.org/publications/browse_buy/browse_by_topic/qa/nafems_qss_primer_2014_-_r0116/).
- NAFEMS quality assurance procedures for engineering analysis, NAFEMS R0064, 1999 (https://www.nafems.org/publications/browse_buy/browse_by_topic/qa/r0064/)