

NAFEMS Professional Simulation Engineer *An Industrial Case Study*

Ian Symington, Technical Officer NAFEMS, Member of the PSE Board

"Because of the ever increasing demand for FEA, ASML's Design Engineers are encouraged to perform basic FEA by themselves. By introducing a customized PSE within ASML, the chance that engineers are unconsciously incompetent on relevant areas is significantly reduced"

Fred Huzinga – Group Leader Mechanical Analysis, ASML

The NAFEMS Professional Simulation Engineer (PSE) Program was launched at the Salzburg NAFEMS World Congress in 2013. PSE functions as both an educational framework for professional development and as an independent certification program.

Most of the early interest in PSE Certification was driven by the 'super analysts', engineers with decades of simulation experience who were looking to use PSE to differentiate themselves from their peers. Candidates who have achieved Standard or Advanced Certification are able to claim they are 'PSE Certified' and allowed to use the PSE Certified logo (Figure 1).

The number of individuals on the PSE Register has increased significantly since launch (Figure 2), particularly in 2015, when we saw a growth in interest from organisations looking to embed PSE within their organisation. The driver for using PSE varies from organisation to organisation and the purpose of this article is to show some of the different ways that PSE can be used by industry, and demonstrate the key benefits to both individuals and organisations of getting involved in this unique program.



Figure 1 – PSE Certified Logo

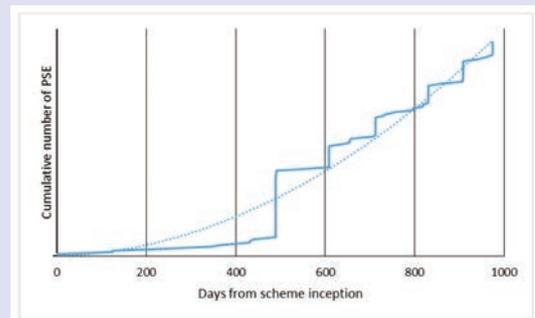


Figure 2 – PSE Certification - Progress to date

Case Study - ASML

ASML, based in The Netherlands, are one of the world's leading manufacturers of semi-conductor chip making equipment. The guiding principal at ASML is to continue Moor's Law towards ever smaller, cheaper, more powerful and energy efficient semiconductors. They have over 5000 employees working in research and development.



Figure 3 – The Next Generation of ASML's EUV Lithography Machines

ASML have embedded simulation throughout their engineering teams. Designers and mechanical architects use CAE on a range of tasks, from designing the vibration isolation systems used to transport the lithography

systems to optimising the thermomechanical control systems used to focus the light source. The designers and architects are supported by the Mechanical Competence Team, which is comprised of experienced simulation experts. PSE has been brought into ASML with the aim of setting a new standard that will lead to greater efficiency and a higher quality of the design. This will be achieved by ensuring that the all users of simulation tools have obtained a minimum level of competence.

Tailoring the PSE Process

Initially, ASML were invited by NAFEMS to take two free PSE certification interviews (basic details of the application process can be found at the end of this article). After two trial certifications a feedback meeting was held to discuss if the PSE process would meet ASML needs. A number of problems were identified during this feedback meeting:

1. The competences being tested during the interview were not focussing on the key areas that ASML wanted to evaluate
2. As the majority of the ASML candidates would be designers who are only occasional users of simulation tools, Standard level certification was viewed as being overly onerous. Entry level certification was not considered a viable option, as it does not involve an interview, the interview being viewed as a key part of the process.

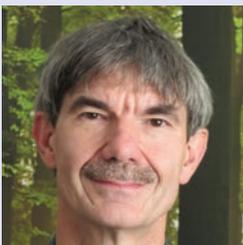
As a result, an 'Entry Level+' PSE process was created specifically to meet ASML's needs. Analysis experts from within the Mechanical Competence Team at ASML drew up a short list of competencies from the 1500 competence statements contained within the **PSE Competency Tracker**. This set of competencies has become known as the 'ASML Core Competencies' and is essentially an ASML specific technical area. The PSE assessors using the 'Entry Level+' process are asked to focus on these competencies during the certification interview. They are then required to make two recommendations following an 'Entry Level+' assessment:

1. Does the candidate demonstrate the core competencies required by ASML? – Pass / Fail
2. Where does the candidate map onto the PSE register? – Technical Area & Level

The first outcome provides ASML with information that dictates if the employee is allowed access to simulation tools. The second outcome gives the ASML candidates a personal qualification, which moves with the individual if they change employer.

Barriers

There have of course been a number of hurdles that have had to be negotiated during this process. In the beginning there was only a trickle of applications from ASML. When ASML decided to restrict access to simulation tools to engineers who had successfully been through the 'Entry Level+' process, this trickle soon turned into a flood. As the number of applications increased it quickly became apparent that web-based interviews were not an efficient way to conduct large numbers of certification interviews. These have now been replaced by regular onsite assessments, where 12 certification interviews are conducted over a 2 day period.



**Fred Huzinga – Group Leader
Mechanical Analysis, ASML**

PSE at ASML – What Next?

The way PSE is being used at ASML is still evolving. When the 'Entry Level+' process was initiated, ASML's focus was on testing whether or not the candidates were able to demonstrate the 'ASML Core Competencies'. While this outcome is still important, attention is now also paid to the level of PSE certification that a candidate achieves.

If an engineer is expected to perform FEA independently without supervision, they are required to achieve certification at either 'Standard' or 'Advanced' level.

ASML's co-developers, who are using CAE to support the design of products that they supply, are now also required to go through the PSE 'Entry Level+' process.

ASML are corporate level NAFEMS members and regularly host NAFEMS '**introduction to FEA**' training courses on site in Eindhoven. By having good communication links between the team helping to develop the competence of ASML staff, and the team responsible for checking that the competences have been obtained, problem areas can be quickly identified and addressed.

Educational References

Every single competence statement found in the **PSE Competency Tracker** is linked to an educational reference which will help the user develop the required competence. NAFEMS have provided ASML with an electronic publication that contains the educational references associated with the 'ASML Core Competencies'. This book is a handy reference guide for all applicants going through the ASML 'Entry Level+' process.

The ASML Customised Competency Tracker

The PSE Competency Tracker is a web based tool that provides a ready-made educational framework for simulation engineers. The Tracker allows engineers to record their professional development by checking off competencies as they are obtained, and to associate notes and comments against each competence. NAFEMS encourage anyone applying for certification to review the competencies found in the PSE Tracker, as it details the competencies that will be evaluated during a certification interview.

The technology behind the PSE Competency Tracker is developed by our partner organisation EnginSoft. EnginSoft have worked with ASML to provide a customised competency tracker which contains the specific modifications required for the ASML 'Entry Level+' certification.

The first modification is the inclusion of an additional technical area containing the 'ASML Core Competencies'. By clearly identifying the core competencies it makes it easy for the engineers who are being asked to participate in the 'Entry Level +' process to be aware of what will be covered in the assessment interview (Item 1 in Figure 6)

“PSE doesn't just test our Designers on their knowledge of a short list of core competencies. It's equally important that they are aware of their own limits, and how to get assistance from within the company from the analysis experts”

Fred Huzinga – Group Leader Mechanical Analysis, ASML

The second modification is the inclusion of guidance information specific to the ASML 'Entry Level+' process (item 2 In Figure 6). The guidance information includes the following documents:

- a. ASML Applicants – Frequently Asked Questions
- b. ASML Applicants – How to apply for PSE Certification
- c. Co-developers – How to apply for PSE Certification
- d. How to use the ASML Competency Tracker

The third modification is related to the educational references associated with the competence statements found in the 'ASML Core Competencies'. The educational references associated with these competence statements are available immediately to ASML employees going through the PSE Entry Level+ process and can be viewed from within the web browser (Figure 7).

The final modification is that the outcomes of the PSE Certification interview are recorded in the customised ASML PSE Tracker. This information is only available to selected individuals within ASML. The training team at ASML use this information to manage who is given access to engineering analysis software tools.

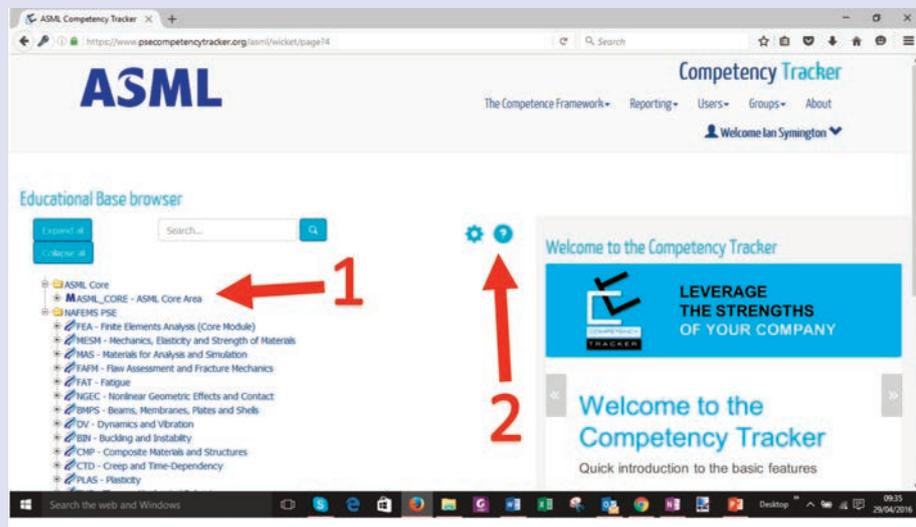


Figure 6 – ASML Customised Competency Tracker

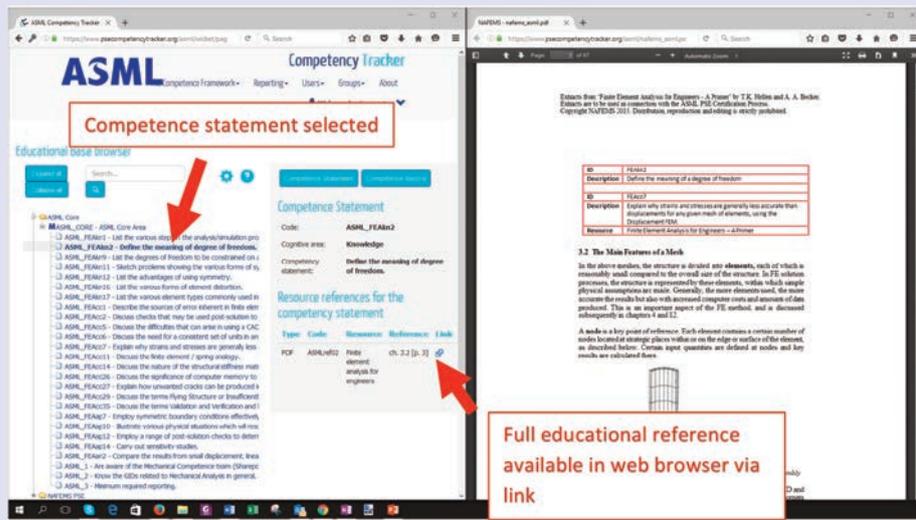


Figure 7 – Full Educational References Available and Linked to the ASML Customised Competency Tracker

Get In Touch

To discuss how your company can make use of PSE contact the NAFEMS Technical Officer. If you would like to discuss how a competency tracker can be modified to work with your internal competency management framework contact Giovanni Borzi of Enginsoft g.borzi@enginsoft.it

Overview of the PSE Certification Process

1. Candidates select the technical areas that they would like to be certified against. The selected technical areas must contain one of the 'Core' technical areas shown below in red (Figure 8)
2. Candidates select the level of certification, Entry, Standard or Advanced (Figure 9)
3. An application form is completed containing the following information
 - o Personal Details
 - o Referees
 - o Education
 - o Professional Qualifications
 - o Training
 - o Career Summary
 - o Simulation Experience
4. Candidates are invited to attend a 45-60 minute web-based assessment interview
5. The results of the assessment are fed back to the candidate

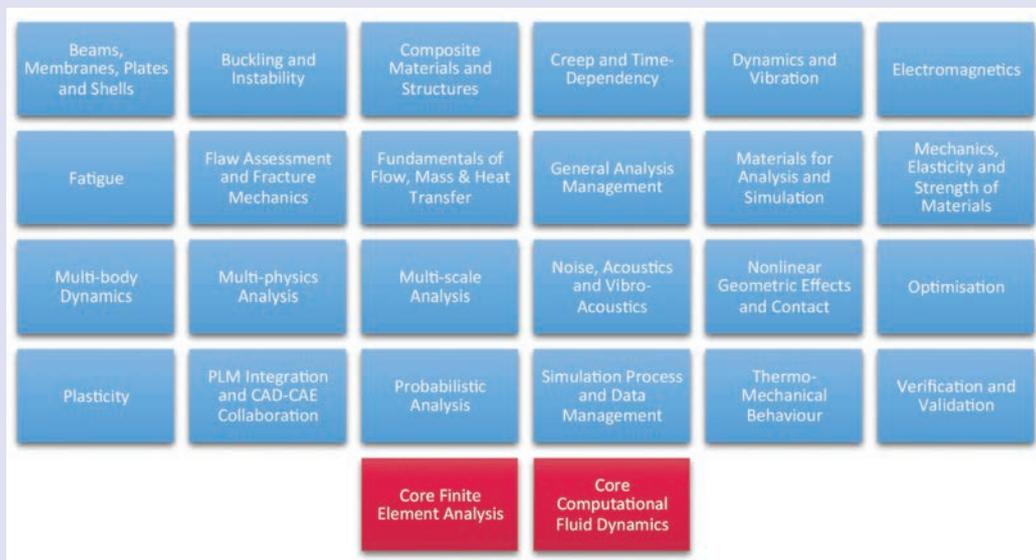


Figure 8 – PSE Technical Areas



Figure 9 – Certification Levels