UK COMMISSION FOR EMPLOYMENT AND SKILLS

# Sector insights: skills and performance challenges in the advanced manufacturing sector

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# Sector Insights: skills and performance challenges in the advanced manufacturing sector

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# Executive Summary

## Overview of the research

This report examines skills and performance challenges facing the advanced manufacturing sector with an emphasis on the mix of skills needed in specific occupations, as well as employer awareness of and engagement with National Occupational Standards (NOS). This project forms part of the Sector Insights research undertaken by the UK Commission for Employment and Skills (UKCES). The overall aim of the programme is to examine skills and performance challenges across a range of industry sectors of critical importance for the UK economy.

This study focuses on five key occupations that are prevalent in advanced manufacturing industries, and which represent a cross-section of skills levels:

- production managers and directors in manufacturing;
- biological scientists and biochemists;
- production and process engineers;
- metal working production and maintenance fitters;
- assemblers of electric and electronic products.

## Key findings

### *The advanced manufacturing sector*

Advanced manufacturing is broadly described as manufacturing that is 'intensive in its use of capital and knowledge and requires a high level of technology utilisation and Research and Development (R&D)' (UKCES, 2012). This can apply to all manufacturing industries, but is most commonly associated with medium- and high-tech industries.

The Annual Business Survey estimates that there were approximately 29,000 advanced manufacturing enterprises operating in the UK in 2013, comprising around 23 per cent of the total number of manufacturing enterprises (128,000). These enterprises generated over £72 billion of GVA in 2013 (Annual Business Survey, 2014). The number of advanced manufacturing enterprises has declined slightly in recent years, but their share of GVA has largely remained constant, indicating a degree of consolidation in the sector, alongside growth for some employers.

A high proportion (44 per cent) of the advanced manufacturing workforce holds high-level qualifications (qualifications at Level 4 and above). This is a much higher proportion than for manufacturing as a whole (31 per cent) and slightly higher than for the economy as a whole (41 per cent).

Although manufacturing employment as a whole is expected to decline up to 2022, recent forecasts have predicted that advanced manufacturing is expected to grow significantly in the coming years, particularly in Western Europe.

### *Skills and performance challenges in the sector today*

Advanced manufacturing is widely reported as an area of significant potential growth for the UK economy (UKCES, 2013; BIS 2010a). There are a range of key drivers shaping the performance of the sector, most of which have a skills dimension. They include:

- translating innovation into growth;
- increasing investment in Research and Development (R&D);
- meeting low carbon policies and legislation;
- maximising export opportunities;
- taking advantage of potentially transformative enabling technologies.

The sector is heavily-influenced by developments relating to advanced manufacturing technologies, such as:

- the growing 'computerisation' of production processes, as well as the prevalence of Computer-Aided Design (CAD) and bespoke software solutions;
- an increase in the resources required to test and inspect new products, as more complex materials and smaller components are used in production processes;
- a shift to shorter production runs and more tailored products, which is being driven by customer demand and facilitated by new manufacturing techniques such as 3D printing and plastic electronics.

### *Future Skills*

Employers perceive that these changes will continue to significantly impact on the skills required from workers in the key occupations:

- **Production managers/directors in manufacturing:** Employers report that the workload of this occupation has increased as new, more complex materials and the growing use of

smaller components have made quality assurance more labour-intensive. In addition, there is an increasing focus on business skills to identify new sources of funding and to appraise the benefits of new technologies. Employers, particularly SMEs, report experiencing skills gaps in the business aspects of the production manager role. Some employers expect that, in future, these jobs may have to split into two distinct roles. One role will focus on quality assurance and regulation, while the other will focus on the design aspects of the job. In addition, within large Original Equipment Manufacturers (OEMs), the role may also become more focused on supply chain management, purchasing, contract negotiation and large-scale project management.

- **Biological scientists and biochemists:** Employers anticipate that new digital technologies will make clinical trials less labour intensive, which will likely mean that workers in the future will be investing more time in R&D to develop new products. Although demand for biological scientists and biochemists will increase, not all these jobs will be created in the manufacturing sector. Some will be created in research facilities in universities, which are increasingly working in partnership with employers. The growing importance of R&D in advanced manufacturing is increasing demand for new entrants with higher degrees and specialisms. For a few employers, the industrial manufacture of biological products is also requiring workers to develop new skills in managing the production line and optimising production. Employers report experiencing difficulties recruiting new entrants with the appropriate research skills in the UK and, consequently, some were recruiting from abroad.
- **Production and process engineers:** Employers suggest that the increasing complexity of the production method (shorter, more varied production runs and more complex machinery) and growing use of sub-contracting may require production and process engineers to possess increased skills in project management and maintaining quality across multiple manufacturing sites. Production engineers are increasingly required to be proficient in a range of design packages and bespoke software. Most employers reported experiencing difficulties recruiting production and process engineers with appropriate practical skills. However, some employers believed that they were managing to overcome some of these issues by taking on more apprentices.
- **Metal working production and maintenance fitters:** Employers report that the use of computer-controlled machines is increasing the need for software skills and the ability to adapt to new machines. It is anticipated that software development skills will become an increasingly important part of maintenance fitters' role. In addition, some employers expect the role of maintenance fitters to become more service-focused as manufacturers outsource more complex machine calibration and system setting to specialist machine

maintenance companies. Laser technology was also reported to be an important development in simplifying metal cutting, which has required workers to develop skills in operating cutting machines safely.

- **Assemblers:** Employers report that assembler roles are expected to decrease in future, as the use of laser cutting tools and growing automation of production lines will mean that new products require less preparation and can be more easily assembled. However, this would be balanced by an increase in jobs for technicians to operate machine tools. The data suggests that there is a greater need for 'IT literacy' for assemblers to work with new production machines and components. Employers are generally willing to train staff 'on-the-job, but some had experienced difficulties in recruiting staff with appropriate attitudinal skills.

***Current and future interest in occupational standards***

The 2014 UK Commission's Employer Perspectives survey indicates that manufacturing employers have a slightly lower than average awareness of National Occupational Standards (NOS). Most employers interviewed were not aware of NOS; but, when pressed, employers generally understood that key sector training, such as apprenticeships, were based on a consistent set of national standards.

As a performance management tool, NOS were considered a useful starting point, but generally required tailoring before they could be applicable to employers' work environments. This was largely because the standards did not necessarily refer to specific machines, or always reflect the fluid and overlapping nature of job roles in the sector.

NOS were, however, generally considered to be a crucial tool in ensuring consistency in training standards, particularly apprenticeships. This creates a tension between low- and high-specificity NOS. The former is widely considered important by employers for training, as it ensures the focus is on general skills that can be applied to different technologies. As some employers noted, the pace of technological advances in manufacturing means that specific machinery soon becomes obsolete and new technology takes its place.

As a consequence of these factors, relatively few of the employers interviewed used NOS to develop performance management tools. However, NOS use is not always visible to employers. For example, recruitment companies and other specialists are increasingly being asked to develop job descriptions and may be using NOS to develop their products, although employers would not necessarily be aware of this.

***Suggested actions***

- Employers need to invest in upskilling and developing their existing workforce to ensure that they are capable of taking advantage of new technologies.
- Universities and vocational training providers also need to ensure that technology skills are embedded at the heart of a wide range of STEM-related programmes, alongside leadership and management and supply chain management skills.
- Some employers report that offering apprenticeships has enabled them to address skills and performance challenges, as well as helping to recruit production and process engineers. Other employers within advanced manufacturing could assess the benefits of offering apprenticeships, and ensure they have clear pathways in place to enable progression to higher-level technical and professional roles.
- Managers in advanced manufacturing should explore ways to take ownership over their own continuing professional development and ensure that they have the space and learning opportunities.
- Continued investment by government in collaboration between HE and industry is likely to be worthwhile in the context of industries that need to mitigate risk in order to pursue business development / innovation.
- There may also be a role for government to help foster those links and support the development of skills and knowledge beyond traditional industry silos, and to conduct more research to examine good practice in engaging SMEs in R&D and disseminate this widely across the sector.

Executive Summaries present the key findings of the research produced by the UK Commission for Employment and Skills. More detailed analytical results are presented in Evidence Reports.

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