

Competence Profiles – Guidance for applicants and Assessors

PART 2 – INDUSTRY CLASSIFICATION (MI) – MANUFACTURING INDUSTRIES

Introduction

Throughout the manufacturing sector of industry, mechanical engineers are likely to be involved in a wide range of tasks requiring a professional (i.e. Chartered) level of competence. The structure of manufacturing companies has been changing rapidly in recent years and the introduction of various types, levels and grades of engineer has arisen out of many factors; for example, new company structures, new methods of working and new technology. In short, the emphasis on constant change throughout industry is a major factor in the changing responsibilities of a professional engineer working within manufacturing.

These changes in direction, technology, working practices and levels of activity in many companies now mean that an engineer's professional development is far from straightforward. For example, an engineer may move from directing many subordinates on a large design and development project to working alone on a quality system (e.g. to satisfy new business requirements) and then on to training or support duties for a shop-floor operation.

Another significant factor governing engineers' functions and activities in manufacturing is that of scale. Early manufacturing organisations may have been run and controlled by single engineer-owners, with executive responsibility for all rôles within their company, whereas we now have factories employing hundreds of professional engineers in many discrete rôles; indeed, one factory may itself be a 'specialist' centre with a relatively narrow range of functions.

Increasing specialisation within manufacturing has brought about legitimate new employment opportunities for the chartered mechanical engineer, where unlikely-sounding job titles may conceal solid engineering activity. For example, in the past it was relatively rare for packaging to be a function associated with sustained formal engineering duties. This is no longer true, with packaging (as with many other functions) requiring a detailed, in-depth engineering knowledge of materials, control systems and optoelectronics, as well as complex mechanics.

There is a notion that engineers can operate in cross-disciplinary rôles nowadays. These can embrace mechatronic system approaches (i.e. integrated mechanical and electrical/electronic structures and devices, under microprocessor control) and have particular validity in the use of robotic and automated systems. For example: FMCG production facilities, assembly of components, etc.

As a further example, the term "sales engineer" can cover many functions and levels. It has been used to describe non-technical people who run a system (which includes the provision of technical information) to expedite the selling activity. The term is also given to engineers who actually perform a sales rôle. It may be applied to some highly technical individuals that do not sell; they might be better described as "product engineers" but, because of company structure or culture, carry the title of "sales engineer".

Some organizations keep the sales function completely separate – even as discreet companies or business units on separate sites – whilst requiring significant engineering presence for their execution. The result can be that engineers report directly to non-engineer managers of sales departments – a situation that may hamper those aspects of their professional development that require on-going assimilation of knowledge and experience of engineering activities. This tendency towards non-engineer management within a company can extend down to levels where engineering sections contain large numbers of staff with little formal engineering knowledge or depth of experience. However, the majority of engineers in manufacturing live and work in a heavily technical environment.

Applications for Membership need to be carefully assessed on the basis of an applicant's individual duties and authority. In order to assess professional engineering responsibilities against the varied and changing background outlined above, it is now necessary to judge an individual's competences, as distinct from investigating time spent in designated posts previously deemed to meet the Institution's requirements for Membership. The method of assessing the various elements of

competence within sections A to E, in accordance with the benchmark profile for Membership (normally a minimum of three sections at level 3 plus two sections at level 2), is fully described in Part 1 of this manual. Information from MPDS and in-house development schemes may also assist in this area.

Requirements for election or transfer to Member

The structure of a typical manufacturing company will comprise the following four main functions or departments:

Technical	- design, development, R&D
Operations	- production, production development, procurement
Commercial	- sales, marketing, logistics
Finance	- finance, HR, IS, administration

Each of these four main areas is likely to have a director or senior manager in charge of them. Many larger manufacturing companies will have the bulk of these activities split between different sites.

The first two areas will incorporate a significant engineering content and the head of each section or department within those functions may be expected to fulfil the Institution's requirements for the class of Fellow (see below for details) and certainly those for the class of Member.

Each functional head will have a number of subordinate staff, under the following typical categories:

Team Leader(s) *
Senior Engineers
Engineers
Technical Support Staff

* This title should not be confused with the term "Team Leader" used by some older factories for functions that approximate to the old Foreman or Charge Hand level.

The third area can be more problematic to validate, although there will be applicants who may be able to demonstrate substantial engineering content within their job rôles. However, it is unlikely that those engaged within the fourth area will have involvement in engineering activity of sufficient depth or quality – though not impossible.

With the move towards "flat" or matrix-type organisational structures, the distinctions between the various categories are less clear-cut than hitherto and all staff are often on a single salary structure and common terms of employment. Team Leaders' work can typically include staff management, project management, planning, control, operation and technical leadership and might well fulfil the Institution's requirements for the class of Member. Team Leaders in this context are likely to have overall responsibility for a number of projects.

Senior Engineers assist Team Leaders in any of the work areas mentioned above but with less emphasis on project and budget planning. Their responsibilities can be appropriate to the grades of MIMechE or AMIMechE, depending on detail. The same may be true of the Engineer grade, where some individuals can have wide experience in various areas but may not have pursued wider management activity. In certain cases, therefore, the responsibilities of these "Engineers" may approach those appropriate to MIMechE level.

Assessment of Competences

Professional mechanical engineering responsibilities for the positions described above will, of course, depend to a large extent on the particular location, the type of facility and the individual's job description.

Be aware of those companies who split the company functions up between different sites e.g. most product design at one site, production at another and commercial operations at another. Particular attention must be paid to the amount of experience and involvement applicants have had in these other areas to build an all-round appreciation of their professional competences. This reinforces the importance of carefully assessing applicants' personal responsibilities, together with their direct input to projects in their work area and their degree of supervision. In addition, clear and comprehensive organisation charts will be key to the appraisal process. **It will no longer be appropriate to recommend election to Member on the basis of job title or grade alone.**

Where an applicant appears to spend the **majority** of his/her time in project engineering or project management, assessors may find it helpful to refer to the section entitled "Engineers in Project Management Roles" which appears later in Part 2 of this manual.

Competence statements A and B

Successful applicants will be able to demonstrate their use of a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging technology in their chosen field within the manufacturing industry, be it in design, operations, maintenance, engineering services, or in any of the other areas outlined above.

Applicants engaged primarily in project engineering or management should provide, and assessors should seek, evidence of responsibility for technical specifications, technical risk management, evaluation of technical solutions and monitoring against technical performance standards.

However, in either situation, applicants should demonstrate evidence to show that they apply engineering principles in a competent and professional manner in their work, whether this be in predominately engineering areas or other cross-disciplinary activities.

Examples of situations or activities that may give mechanical engineers the opportunity to achieve and demonstrate professional competence in these areas include:

- Theoretical design or feasibility studies for new manufacturing technologies or procedures either in a design and manufacturing environment or in a specialist department of a consultancy.
- Participation in the evolution, development, manufacture and commissioning of new manufacturing lines or equipment, including performance evaluation and the investigation of operational failures. Examples include novel forming techniques or materials handling methods, unconventional processes or advanced technologies.
- Applying knowledge to enhance existent manufacturing processes.
- Secondment in any of the above areas, particularly to remote or overseas locations, where support facilities may be severely limited. (Secondments to in-house production development departments and equipment manufacturers would also be expected to provide opportunities for the development of professional engineering expertise and technical judgement.)

Where, because of the diversity of services offered by their employer, applicants work in areas of engineering other than manufacturing their technical competence may be better judged by reference to the appropriate section of this manual, e.g. the electrical power generation industry in the case of engineers working on the manufacture of components or systems used in that field.

Competence statement C

As many manufacturing companies now operate a matrix management structure, applicants are not necessarily expected to have line management responsibility or experience in order to meet the required level of competence in this section. Also, engineers who have moved into

highly specialist technical rôles, e.g. in headquarters engineering departments or design companies, may have minimal management responsibilities; such applicants would be expected to have a high degree of autonomy in planning and monitoring their activities and care should be taken to explore the interface between them and their colleagues and supervisors.

Examples of situations or activities that may give engineers the opportunity to achieve and demonstrate competence in these areas include:

- The planning and personal supervision of production start-up and commissioning projects.
- Active participation in design review.
- The periodical review of production and/or operational strategies for existing manufacturing and the formulation of new procedures and systems for additional items and novel processes.
- The in-house training and development of technicians and skilled craftsmen, possibly on a project-by-project basis.

Competence statement D

Communication and interpersonal skills should be assessed by consideration of both the Professional Review Report and interview performance. Assessors should look out for a report which has a logical structure, clearly aimed at presenting a portfolio of evidence against each of the five competence statements, while providing a qualitative description of activities and achievements.

Assessment of verbal communication skills should analyse the ability to give clear, concise and relevant answers that address the question without undue digression and provide sufficient, but not superfluous detail.

Additional evidence of competence in this area may be sought by investigating:

- Whether the applicant routinely makes presentations to in-house management at various levels, outside clients and contractors; subjects could include project plans, business plans, etc.
- Whether the applicant is involved in contract liaison and negotiations - systems, procedures, method statements, safety, etc.

Competence statement E

The observance of safe working procedures, including compliance with internal and national codes of practice, is inherent in virtually all manufacturing organisations. Similarly, there are codes that cover the design and manufacture of all equipment and components. Applicants should be able to demonstrate their commitment to observing and promoting the use of any such codes that are relevant.

Evidence of professional integrity and commitment should include a Self-Development Action Plan, in any convenient format, outlining how the applicant intends to maintain and enhance competence through personal development. The Plan should include short, medium and long-term goals and explain how these are likely to be achieved. Assessors should be aware that SARTOR 3 interprets Continuing Professional Development (CPD) as commencing at the point where Chartered status is attained; therefore applicants are not required to provide a record of courses attended, etc., when applying for corporate membership.

Examples of CPD activities recognised by the Institution as acceptable include:

- extra qualifications such as an MBA, Diploma in Engineering Management
- any relevant technical or business courses
- conducting or attending workshops

- attending, presenting or participating in seminars and conferences
- presenting or attending lectures
- writing technical papers
- reading technical articles and journals
- distance or open learning
- secondments and job rotation
- updating in own and other fields of work
- Institution meetings or events
- active IMechE committee work
- learning a foreign language
- involvement in government activities
- community and charity work, including schools liaison

Requirements for election or transfer to Fellow

As outlined above, the following senior engineering posts within a manufacturing company should be considered as generally likely to meet the requirements for the class of Fellow:

Director

Operations, Engineering or Technical Manager

Project or Product Manager

The scale of responsibility for the posts can generally be verified by establishing the budgetary levels associated with it. Annual figures exceeding half a million pounds could be expected.

Applicants will generally have significant responsibilities for resources (both financial and manpower) and also have wide understanding of strategic, commercial and financial issues. They are likely to be experts in their particular fields, e.g. product design or a particular production technology and “champions” for their site, manufacturing unit, company or industry sector.

Valid applications for election or transfer to Fellow may be received from other engineers with established reputations in important positions of responsibility in engineering science or practice. This applies to engineers both in manufacturing companies and in firms which design and/or supply design or other expertise for manufacturing. In addition to demonstration of achievements and standing in their field of engineering science or practice, applicants would be expected to participate in external forums, for example by promoting the importance of engineering issues in debate with Government and other bodies, via the Institution. In any case, an involvement in the professional development of young engineers would be expected, as would documentary evidence of Continuing Professional Development.

Further examples of suitable CPD activities not covered under the requirement for Competence Statement E above include:

- MPDS mentoring
- Acting as an IMechE Membership Panel interviewer

For candidates applying directly for the class of Fellow, a Professional Review Report similar to that required for the class of Member would be required in addition to an interview. In particular, this report must contain additional supporting evidence detailing:

- The position of senior engineering responsibility held by the applicant
- The applicant’s contribution to the professional development of young engineers
- How the applicant intends to keep up to date regarding developing technologies, from both a technical and a commercial standpoint.

Finally, a Development Action Plan detailing a future programme of CPD would be required from applicants in either category (transfer from Member or direct election).