



*Alliance for Batteries Technology, Training and Skills*

*2019-2023*

# **Production and Manufacturing Engineer**

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## Production and Manufacturing Engineer in Battery Industry

A battery manufacturing and production engineer is responsible for the design, development, and execution of the manufacturing processes for batteries. They work with a team of engineers and scientists to create efficient and cost-effective manufacturing methods for electric vehicles, consumer electronics, and other applications. They are responsible for overseeing the production of battery cells, packs, and systems, ensuring that they meet the required quality standards and performance specifications.

### ESCO Occupations - [ESCO - Occupations - European Commission \(europa.eu\)](http://europa.eu)

| ID       | NAME                   | Concept URI                                                                                                                                                         |
|----------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2141.4.1 | manufacturing engineer | <a href="http://data.europa.eu/esco/occupation/6818c837-072a-4120-b913-bd360b7b14d0">http://data.europa.eu/esco/occupation/6818c837-072a-4120-b913-bd360b7b14d0</a> |
| 2141.4.2 | production engineer    | <a href="http://data.europa.eu/esco/occupation/d7380260-1386-4e36-98b5-8115ca4a3536">http://data.europa.eu/esco/occupation/d7380260-1386-4e36-98b5-8115ca4a3536</a> |

### Context

|                        |                                                                                                                                                                                                                                                                   |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Minimum EQF</b>     | 6/7                                                                                                                                                                                                                                                               |
| <b>Value Chain</b>     | Raw Materials and Processing<br>Cell and Components Manufacturing<br>Modules and Packs<br>Battery Integration                                                                                                                                                     |
| <b>Departments</b>     | Production and Maintenance<br>Logistics<br>Quality<br>RnD                                                                                                                                                                                                         |
| <b>Specialisations</b> | Entry level manufacturing associate<br>Manufacturing associate<br>Production engineer<br>Upstream Production Engineer<br>Manufacturing Engineer, Li-ion Engineer<br>Manufacturing Engineer<br>Powertrain Manufacturing Engineer<br>Manufacturing Product Engineer |

## Cross-sectoral Specific Competence

| Name                              | Type (S/K) | Description/Context                                                                                                                                                                                                                                                                                                                                                                                   | Level  | ESCO                                              |
|-----------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------------------------------------------|
| Project Management                | K          | <ul style="list-style-type: none"> <li>- Ensure all steps of production run smoothly and efficiently</li> <li>- Participate in and run meetings with customers and suppliers</li> <li>- Participate in and drive projects for new equipment or problem-solving workshops</li> <li>- Maximize productivity of process, machinery and workers</li> </ul>                                                | Expert | project management principles; project management |
| Data Analysis/Science             | K          | <ul style="list-style-type: none"> <li>- Analyzes product or equipment specifications and performance requirements to determine designs which can be produced by existing manufacturing or processing facilities and methods</li> <li>- Compiles and analyses operational, test, and research data to establish performance standards for newly designed or modified equipment or product.</li> </ul> | Expert | gather data; inspect data; process data           |
| Cost Estimates                    | S          | <ul style="list-style-type: none"> <li>- Design and implement cost-reductive changes</li> <li>- Drive actions or projects to improve efficiency in manufacturing</li> <li>- Determines feasibility of designing new plant equipment or modifying existing facilities considering costs, available space, time limitations, company planning, and other technical and economic factors</li> </ul>      | Expert |                                                   |
| Lean Process                      | K          | <ul style="list-style-type: none"> <li>- Support managers in setting up ways of working in manufacturing related to, for instance, lean practices</li> <li>- work with the operations team developing training material, training staff in lean manufacturing principles and methods</li> </ul>                                                                                                       | Expert | lean project management                           |
| Kaizen                            | K          | <ul style="list-style-type: none"> <li>- Assess and analyse manufacturing, suggest actions to improve efficiency</li> <li>- experience with driving actions or projects to improve efficiency in manufacturing as well as implementing cost-reductive changes</li> </ul>                                                                                                                              | Expert | identify process improvement                      |
| Process Improvement (Engineering) | S          | <ul style="list-style-type: none"> <li>- Assess and analyse manufacturing, suggest actions to improve efficiency</li> <li>- experience with driving actions or projects to improve efficiency in manufacturing as well as implementing cost-reductive changes</li> </ul>                                                                                                                              | Expert | identify process improvement                      |
| Analysis Methods                  | K          | <ul style="list-style-type: none"> <li>- Initiate and drive problem solving by using methods like DoE, 5W and 8D</li> </ul>                                                                                                                                                                                                                                                                           | Expert |                                                   |

|                           |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |                              |
|---------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------|
|                           |   | <ul style="list-style-type: none"> <li>- Compiles and analyzes operational, test, and research data to establish performance standards</li> <li>- Plans and develops experimental test programs. Analyzes test data and reports to determine if design meets functional and performance specifications</li> <li>- Perform related structural analysis (simple FEA) and classical hand calculations to determine if design meets functional / performance specifications and optimization of design before fabrication</li> <li>- Collect and analyse data in support of failure analysis, root cause, and corrective action</li> </ul>                                                                                                                                                                                                                                           |              |                              |
| Production Processes      | K | <ul style="list-style-type: none"> <li>- Analyse and evaluate production processes to maximise productivity of processes, machinery and workers (reducing downtime, lowering cost and ensuring safety).</li> <li>- Participate in different stages of production process to enhance the efficiency (problem solving, assessing and analysing performance, training etc)</li> <li>- Design processes for battery manufacturing</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                         | Expert       | production process           |
| Optimization              | S | <ul style="list-style-type: none"> <li>- Confers with research personnel to clarify or resolve problems and develops design</li> <li>- Works with different stakeholders, methods etc to optimize the production process, flow, safety, downtime etc.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Expert       | optimise production          |
| Manufacturing Engineering | K | <ul style="list-style-type: none"> <li>- Lead the design of the manufacturing operation, plant layout, production process flow, and continuous improvement, prototyping, testing, and assembly operations</li> <li>- Lead continuous improvement plans, and kaizen events to ensure optimal efficiency of assembly, testing, and manufacturing production operations</li> <li>- Create and maintain all necessary process maps, PFMEAs, and control plans</li> <li>- Produce standard work instructions</li> <li>- Develop technical specifications and standards for all equipment, tools, and fixtures</li> <li>- Design, analyze and troubleshoot mechanical and electro-mechanical products and systems by developing and testing specifications and methods from concept to manufacturing release</li> <li>- Create related technical drawings and documentation</li> </ul> | Expert       | manufacturing and processing |
| (Automated)               | S | <ul style="list-style-type: none"> <li>- Lead continuous improvement plans, and kaizen events</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Practitioner | perform product testing      |

|                          |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |              |                                                |
|--------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------|
| Product Testing          |   | <p>to ensure optimal efficiency of assembly, testing, and manufacturing production operations</p> <ul style="list-style-type: none"> <li>- Identify and help build testing capabilities required to prepare for external cell qualification tests</li> <li>- Design, carry out, and analyze experiments to test the performance of cells</li> <li>- Plans and develops test programs</li> <li>- Implement error-proofing (poka-yoke) systems with a focus on design solutions</li> <li>- Initiate and test new production procedures to improve production processes</li> </ul> |              |                                                |
| Product Design           | S | <ul style="list-style-type: none"> <li>- Analyse product or equipment specifications and performance requirements to determine designs</li> <li>- Implement error-proofing (poka-yoke) systems with a focus on design solutions</li> <li>- Design and implement cost-reductive changes</li> <li>- Lead the design of the manufacturing operation, plant layout, production process flow, and continuous improvement, prototyping, testing, and assembly operations</li> <li>- Understand product requirements and uses cases</li> </ul>                                         | Expert       | develop product design                         |
| Equipment Development    | S | <ul style="list-style-type: none"> <li>- Determines feasibility of designing new plant equipment or modifying existing facilities</li> <li>- Direct and coordinate manufacturing or building of prototype product or system</li> <li>- Participate in or drive projects for new equipment</li> <li>- Lead the design of manufacturing equipment and fixtures</li> <li>- Develop innovative manufacturing technology</li> <li>- Evaluate equipment for battery manufacturing</li> </ul>                                                                                          | Expert       | build machines; adjust manufacturing equipment |
| Requirements Engineering | S | <ul style="list-style-type: none"> <li>- defining, documenting, and maintaining requirements in the engineering design process.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                      | Practitioner | conform with production requirements           |

### Sector Specific Competence

| Name             | Type (S/K) | Description/Context                                                                                                                     | Level        | ESCO             |
|------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|
| Battery Industry | K          | <ul style="list-style-type: none"> <li>- Knowledge of battery manufacturing steps</li> <li>- Knowledge of battery technology</li> </ul> | Practitioner | battery industry |

## Soft Competence

| Name                            | Type (S/K) | Description/Context                                                                                                                                                                                                                                                                                                                                                                     | Level        | ESCO                            |
|---------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------------|
| Problem Solving/Troubleshooting | S          | <ul style="list-style-type: none"> <li>- Participate in and drive projects, investigation and actions with the purpose to solve problems and increase efficiency in manufacturing and minimise downtime and ensure process stability</li> <li>- Role in solving quality problems</li> <li>- Participate in or drive problem solving workshops or actions like DoE, 5W and 8D</li> </ul> | Expert       | Problem Solving/Troubleshooting |
| Teamwork                        | K          | <ul style="list-style-type: none"> <li>- Collaboratively define and prioritize areas of exploration and development and communicate ideas and results</li> <li>- Facilitate technical collaboration</li> </ul>                                                                                                                                                                          | Practitioner | teamwork principles             |

## General Transversal Competence

| Name                   | Type (S/K) | Description/Context                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Level  | ESCO                       |
|------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------|
| Customers/Stakeholders | S          | <ul style="list-style-type: none"> <li>- communicate ideas and results internally across diverse teams and externally to customers and partners</li> <li>- participate in and run meetings with customers and suppliers and internal stakeholder</li> <li>- Work as a member of an integrated, interdisciplinary product team to examine, discuss, and develop solutions to difficult/complex issues with both internal and external stakeholders (customers, suppliers, internal management, etc.)</li> </ul> | Expert | communicate with customers |

## Academic Competence (can be taken from University programme)

| Name                   | Type (S/K) | Description/Context                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Level  | ESCO                   |
|------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------|
| Mechanical Engineering | K          | <ul style="list-style-type: none"> <li>- Design, analyse and troubleshoot mechanical and electro-mechanical products and systems by developing and testing specifications and methods from concept to manufacturing release</li> <li>- Develops manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components. Requires close interaction with software, ERP systems, electrical and mechanical engineering functions</li> </ul> | Expert | mechanical engineering |

|                                  |   |                                                                                                                                                                                                                                                                                                                                                                                                                             |        |                        |
|----------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------|
|                                  |   | <ul style="list-style-type: none"> <li>- Coordinate build and testing of tooling, fixtures and pre-production components</li> <li>- Develop mechanical and/or electro-mechanical mechanisms including designs, drawings, performance predictions and verification requirements</li> </ul>                                                                                                                                   |        | Electrical Engineering |
| Electrical Engineering (systems) | K | <ul style="list-style-type: none"> <li>- Ability to read and analyze schematics and electrical engineering drawings</li> <li>- Ensures the use of engineering standards, methodologies and global product development processes</li> <li>- Proficient in the use and troubleshooting of test equipment including, oscilloscopes, waveform monitors, power supplies, RF test equipment, digital multi-meter, etc.</li> </ul> | Expert |                        |