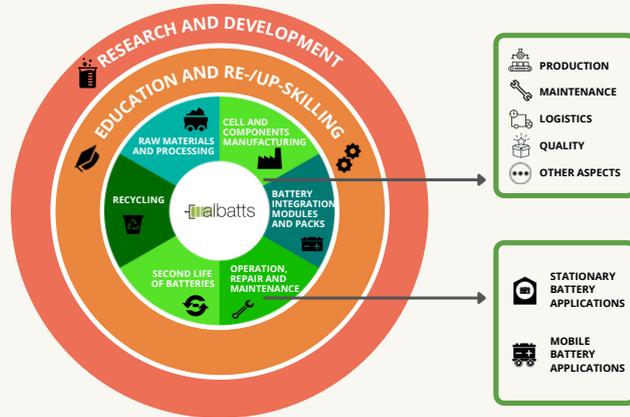




RECOMMENDATIONS FOR THE EUROPEAN BATTERY SECTOR

D3.6 – Sectoral Skills Intelligence and Strategy – Release 1

Recommendations and considerations are mapped against the battery value chain or areas of interest and propose actions to improve the re-/up-skilling of the workforce or point out to issues that need to be considered when it comes to the skills agenda of the sector. They follow the structure of the sectoral intelligence part of the report.



CELLS AND COMPONENTS MANUFACTURING



Recommendations and considerations for the value chain step of cells and components manufacturing cover aspects of (1) **production**; (2) **maintenance**; (3) **logistics**; (4) **quality**; and other aspects, such as **purchasing**, **human resources**, **sales** and **digitalisation**.

Production



Target groups: Educational institutions, battery producers, recruitment companies, headhunters, consultants.

Strengthening of skills and competencies related to battery production to provide a high level of understanding in the fields of **electrochemistry**, **electronics**, **mechanics**, **process engineering**, **manufacturing technology**, **automation (with production systems)**, and **digitalisation in manufacturing**.

In general, increase the ability to speak and understand foreign languages, particularly **English** (in Northvolt, for example).



WHITE-COLLAR SPECIFIC NEEDS

- Increasing competencies in **production and material engineering, production planning, production management, shift management, process engineering, cell design, machine learning and optimization, modelling, and simulation**;
- Strengthening the focus on **large-scale manufacturing**, understanding of **chemical processes** and **quality, risk, and safety management**;
- **Battery industry-related knowledge/skills**: battery material, battery chemistry, battery fluids, battery components, battery testing, defective products removal.

BLUE-COLLAR SPECIFIC NEEDS

- “Upstream” production – increasing knowledge to understand the **risks, envision the safety issues**, and how **chemicals** behave;
- “Downstream” production – increase **machine understanding, 5S skills**, and the ability to **troubleshoot**;
- Overall production system understanding;
- Knowledge/skills: **material handling, Clean/Dry Room Procedure/Validation, Inspect Quality of Product / Sampling, material pressing, electrode process, fine mechanics, HMI (Human Machine Interface)**.

Regarding the increased levels of production automation in the foreseeable future, increased competence concerning **data analytics, maintenance, product process optimisation**.

Maintenance



Target groups: Educational institutions, battery producers, recruitment companies, headhunters, consultants.

Apart from the general battery-related education, strengthening the skills and competencies to ensure understanding of **setting up the production, preparing the related structures, commissioning the machines, chemical, and mechanical assembly, automation experience, and mechanical understanding of the automated systems** combined with understanding the related **software** and **calibration**.

Strengthening **general IT** and **data analysis** skills to cover future needs.

Battery skills (also mentioned in the context of Production).

“Dry and clean room” maintenance (including room contamination measurement).

Predictive and preventive maintenance.

Diagnostics.



Logistics



Target groups: Battery producers, battery plants, stakeholders active within the logistics field, and the above-mentioned logistics aspects.

All aspects of logistics when it comes to battery production should be considered:

Environmental priorities

Production facility construction logistics

Inbound logistics

Outbound logistics

International logistics planning

In-house logistics

Recycling logistics

Quality



Target groups: Educational institutions, battery producers, recruitment companies, talent acquisition experts, consultants.

Battery technology and production: in the case of quality-related positions in battery production, it is vital to have skills and knowledge on battery technologies and related manufacturing processes and associated standards and legislation. Therefore, we recommend providing education and training in the following areas:

Battery technologies, systems related development

Battery production processes

- Electrode production, cell assembly, and pack formation
- Battery system components
- Automated systems
- High-volume production

Raw materials (analysis)

Material flows and inventory

Battery testing and quality control

Risk and safety procedures



Quality management systems and methods: Although universal and not specifically battery specific only, we recommend strengthening skills and knowledge related to quality management systems and methods:

Standards

Legislation

The Quality Management Systems, methods, and related aspects/issues: (1) Quality systems such as ISO 9001 and 14001, IATF16949; (2) Methods such as TQM, Kaizen, PDSA, Six Sigma, Lean Manufacturing; (3) MSA (Measurement System Analysis); (4) Quality KPI; (5) Auditing: (5a) Developing and implementing quality control audit plans; (5b) Evaluating production stages; (5c) Testing the composition appearance and functionality of completed products; (5d) Documenting defects and suggesting improvements; (5e) Reporting; (6) Overall continuous improvement

Sampling

Training other employees on quality standards and procedures

Quality control in production processes

Quality Assurance includes: (1) Material and cell validation; (2) Advanced product quality planning; (3) Production part approval process.

Testing standards

Testing methods and means: (1) Intrusive or non-intrusive and destructive or nondestructive; (2) Testing infrastructure; (3) Application of the state-of-the-art methods and devices; (4) Post-production quality checks; (5) Quality monitoring; (6) Cooperating with research and development

Supporting skills and knowledge: In addition to the above, we recommend enhancing the following: (1) Electrician, technician, and electric engineering-related VET/higher education; (2) Laboratory work skills and experience; (3) Planning and maintaining clean rooms and dry rooms; (4) IT skills; (5) Language skills (English); (6) Teamwork skills; (7) Complex problem solving and process optimization; (8) ERP systems; (9) Lifelong learning of relevant skills and knowledge; (10) Understanding and complying with customer requirements and satisfaction; (11) Developing, defining, and executing the qualification process and documentation for customer's feedback.



PURCHASING



Target Groups: Educational institutions, producers and manufacturers in the battery value chain, recruitment companies, talent acquisition experts, consultants.

Strengthening competencies related to battery specific purchasing: purchasing skills, raw materials, raw material market, managing raw material deliveries (hazardous materials – chemical safety and waste handling), identifying market requirements for documentation, raw material related production equipment, battery production equipment, equipment, and tools handling, mechanical engineering, an inspection of product quality/sampling, process improvement and product testing.

Strengthening knowledge: battery materials, the global trends, analysis methods, production processes, safety procedures, business processes, product quality assurance, laws and regulations, environmental management, social responsibility, orientation in global politics and mineral conflicts complexities, communication (with suppliers), automation. Strengthening **language skills**.

HUMAN RESOURCES



Target Groups: Educational institutions, companies in battery manufacturing, recruitment companies, head-hunters, consultants, government employment agencies.

Recruitment needs - HR-related roles include, for example: (1) Recruiters; (2) Office managers and coordinators; (3) Training specialists; (4) Training content developers; (5) HR coordinators; (6) Specialists. For the HR employees, industry background is less critical, and they do not need to have battery education. However, technical production and industry understanding is recommended.

Human resources specific: We recommend paying attention to the following **knowledge** when training and educating employees on HR-related positions in battery manufacturing companies: (1) Talent acquisition in general; (2) Human resources (management); (3) Labour legislation is important to understand in the recruitment processes (including labor unions); (4) Understanding general employee well being related issues such as health and safety standards; (5) HR strategy development, benchmarking best practices.

With the **skills** that are needed to support the human resources-related functions we recommend the following: (1) Recruitment related skills are needed; (2) Training, both organising and providing it – collaboration with various teams and persons with adequate technical background and skills inside the organization (for example manufacturing); (3) Process Improvement to continuously develop the HR mechanisms (talent acquisition and beyond); (4) Change Management – The pace of development in the battery industry is fast and continuous, especially with a start-up; (5) Sales and marketing skills (including social media) are required to sell and promote a company to potential employees and to support the recruitment processes.



Technology/industry-specific: It is beneficial to understand the industry where you are recruiting and operating. We recommend paying attention to the following knowledge when training and educating employees on HR positions in battery manufacturing:

- Manufacturing Engineering
- Battery Industry
- Process Industry

Other supporting skills and knowledge: (1) Due to an increasing share of the potential employees being from overseas, cross-cultural communication, relocation processes, and social integration are important; (2) Supervising, teamwork, networking, communication, interpersonal, and reporting skills; (3) English and language skills in general; (4) Coordination and administration; (5) Due to the increasing level of digitalising and automation also in the HR processes such as managing volumes of applications the following skills are beneficial – analysis methods, artificial intelligence as well as general IT skills; (6) Problem Solving/Troubleshooting.

SALES



Target groups: Educational institutions, companies in battery manufacturing, recruitment companies, head-hunters, consultants.

Recruitment needs - sales/business development related roles include, for example:

- Key Account Manager
- Business Development Manager
- Senior Director Business Development
- Lead Application Engineer
- Sales & Customer Support Specialist

The usually recruited staff members have a technical background and previous experience. For example, existing relationships and know-how about navigating within the target industries are challenging to find. On the other hand, those working in coordinator roles can be relatively junior and freshly graduated.

Battery technology: with sales-related positions, it is important to have at least **basic knowledge** of battery technologies. Therefore, we recommend providing education and training in the following areas: (1) Basic electrical engineering knowledge; (2) Understanding of battery systems including energy storage, design, and components as well as the related industry; (3) Safety with batteries: functional and related procedures; (4) Understanding Product Quality Assurance; (5) Basic information of the potential target markets and industries (for example automotive industry, raw materials market).

With the technical **skills** that are needed to support the sales department/functions, we recommend the following:

- Prototype and sample development
- Standardization
- Battery cell structure
- Understanding sustainability as one of the selling points



Business development/sales: we recommend paying attention to the following **knowledge** when training and educating employees to sales-related positions in battery manufacturing companies: **(1)** Market trends; **(2)** Understanding business management (how to do business in the battery ecosystem); **(3)** Value chain and overall ecosystem; **(4)** Strategy Development; **(5)** Legislation - understanding the battery-related legal framework of each market area (for example EU, North America) and the framework around setting up contracts; **(6)** Benchmarking - ability to identify and apply best practices in several areas such as how to operate in a specific market sector/area; **(7)** Cross-cultural communication when selling to foreign markets/cultures (both knowledge and skill).

With the business development related **skills**, we recommend paying attention to the following: **(1)** Understanding the markets, their requirements, how they function, and how to operate in them (product, price, place, promotion, etc.); **(2)** Product Management; **(3)** Sales related skills; **(4)** Actual sales functions/measures; **(5)** Pricing mechanisms; **(6)** Contracts; **(7)** Understanding purchasing mechanisms in the target markets (for example, auto industry); **(8)** Interpersonal skills; **(9)** Negotiating - documentation skills (documentation requirements are high among target industries); **(10)** Communication and interaction with customers - to understand customer needs and requirements (ensuring conformity to customer's specifications); **(11)** Building and managing partnerships.

Other supporting skills and knowledge: **(1)** Teamwork - Internal communication; **(2)** Leadership; **(3)** Project Management; **(4)** Presentation skills; **(5)** Language skills (English is the most important, but also other major market area related language skills recommended); **(6)** ERP systems (SAP, etc.); **(7)** Coordination.

DIGITALISATION



Target groups: Battery producers, industry, and academia in need of digital development and mentioned concepts.

Overall digital skills should be focused when it comes to the volume battery production

Concepts of traceability, digital twin, or machine learning/AI should be considered as important

Modelling and simulation on different levels – cells, packs, overall battery systems, etc.

Data analytics, data science, big data

Automation