

InQuBator: Collaboration Project on Position-Accurate Traceability of Quality Characteristics and Process Parameters in Battery Cell Production

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Motivation & Goal

- Digitalization of battery cell production offers enormous potential for optimization to meet the high quality demands while keeping production as cost-effective as possible.
- Data-driven processes can make production more sustainable and optimize quality, by controlling processes to minimize waste.
- In the project InQuBator, we (Fraunhofer FFB, Fraunhofer IPT, and BST GmbH) demonstrate an approach for position-accurate allocation of quality characteristics and process parameters using the example of a coating and drying machine. This can serve as a basis for aggregating the data required for effective battery cell production and enables traceability.

Approach

Exemplary data of detected quality issues on coated foil

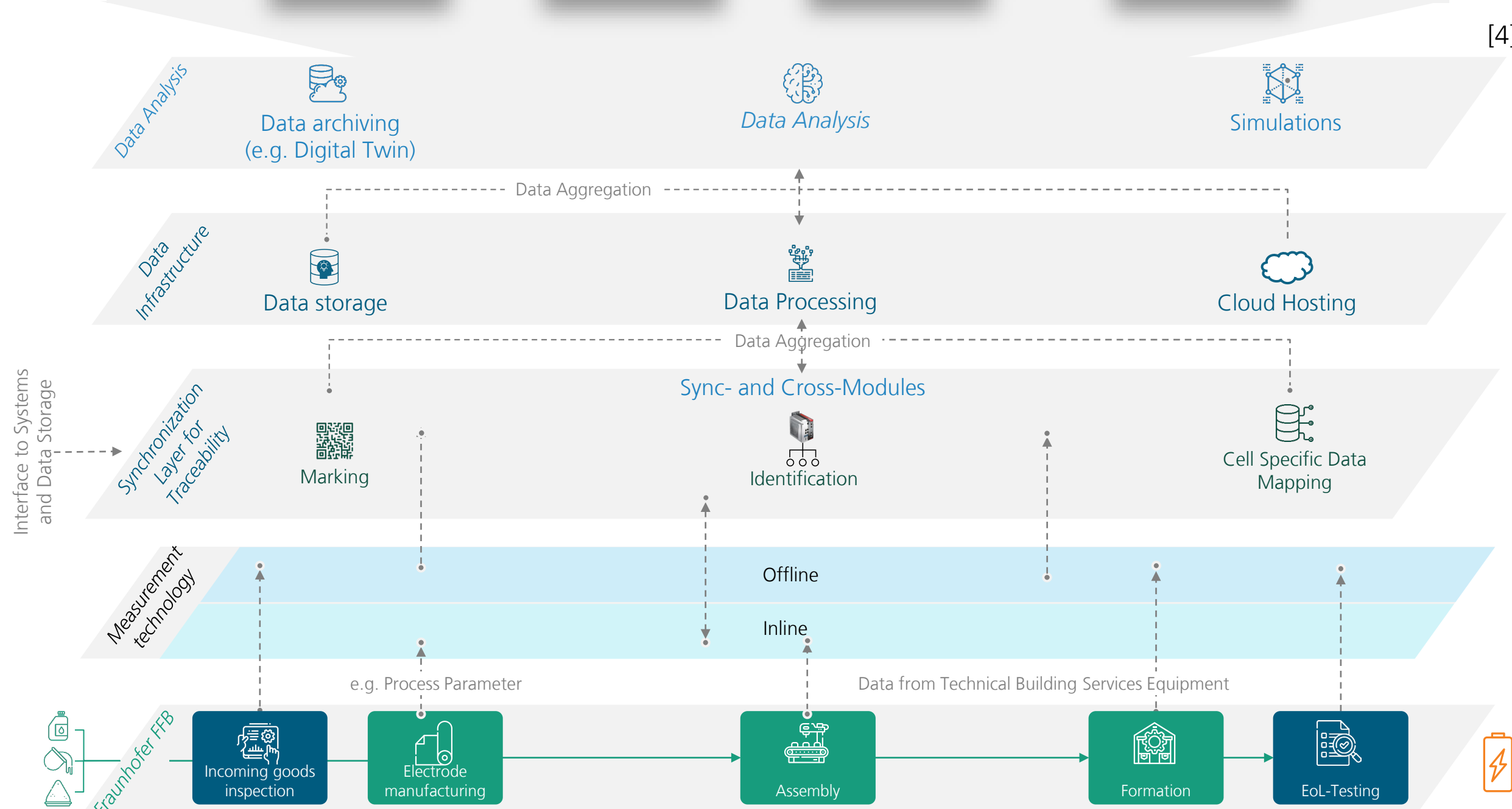
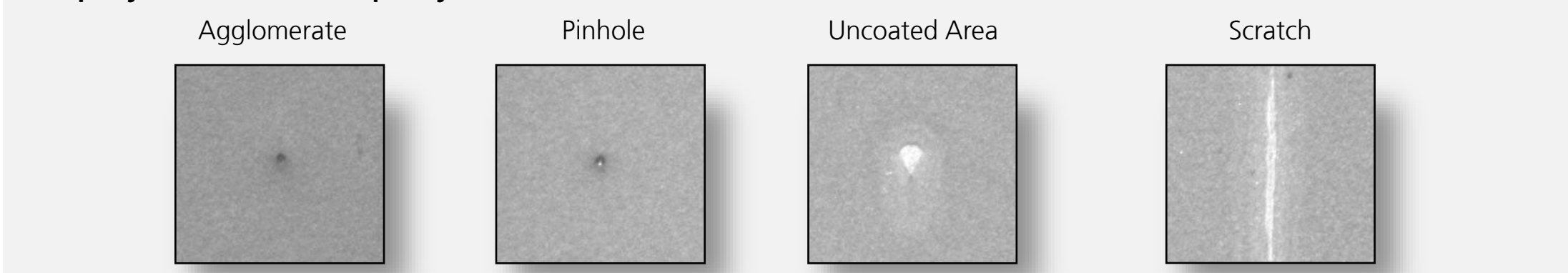


Fig. 2 Big Picture of position-accurate data documentation with exemplary data of a coating process.

Insights into collaborative project and outlook on further work



Fig. 3 DMC Laser marking



Fig. 4 Laser and laser enclosure



Fig. 5 Laser enclosure

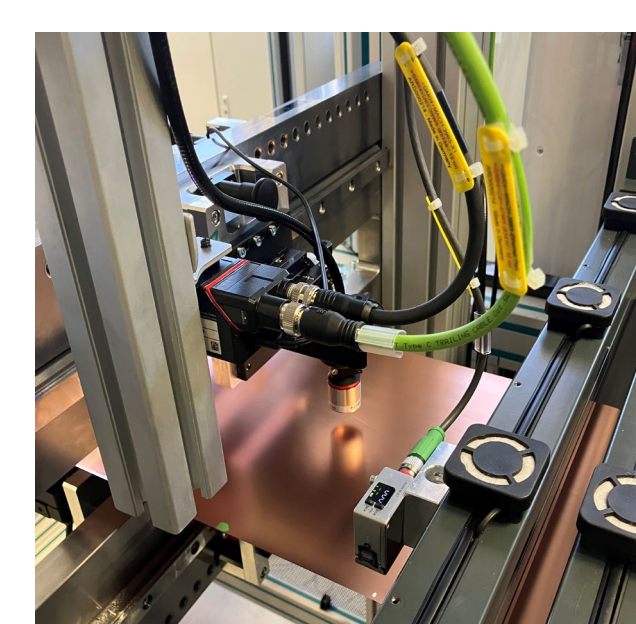


Fig. 6 Inline camera for defect detection and scanner for reading DMC codes

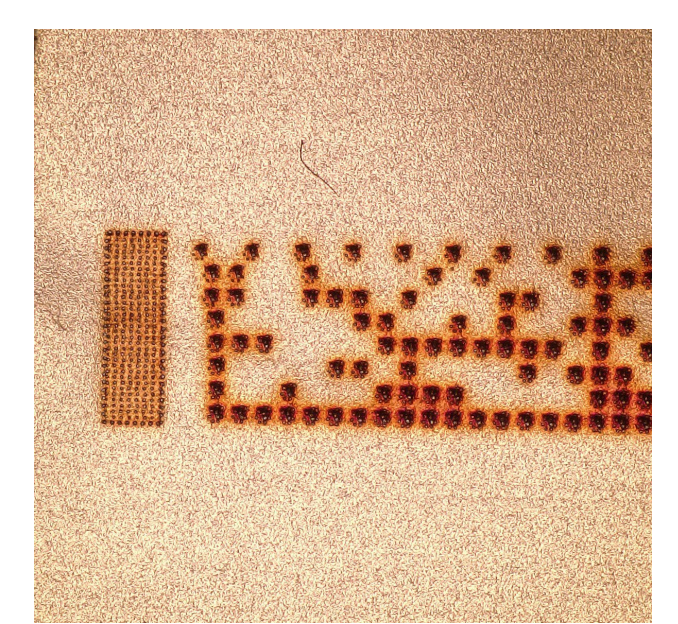


Fig. 7 Microscopic view on DMC code (2mm x 8mm)

Outlook on further work in collaborative project

- Further adaption, testing, and validation of the DMC code and its readability:
 - Size and design
 - Frequency on electrode band
 - Quality
 - Conception of code for use in production lines with line speed up to 80m/min
- Integration of further measurement technology and process data for position-accurate data allocation

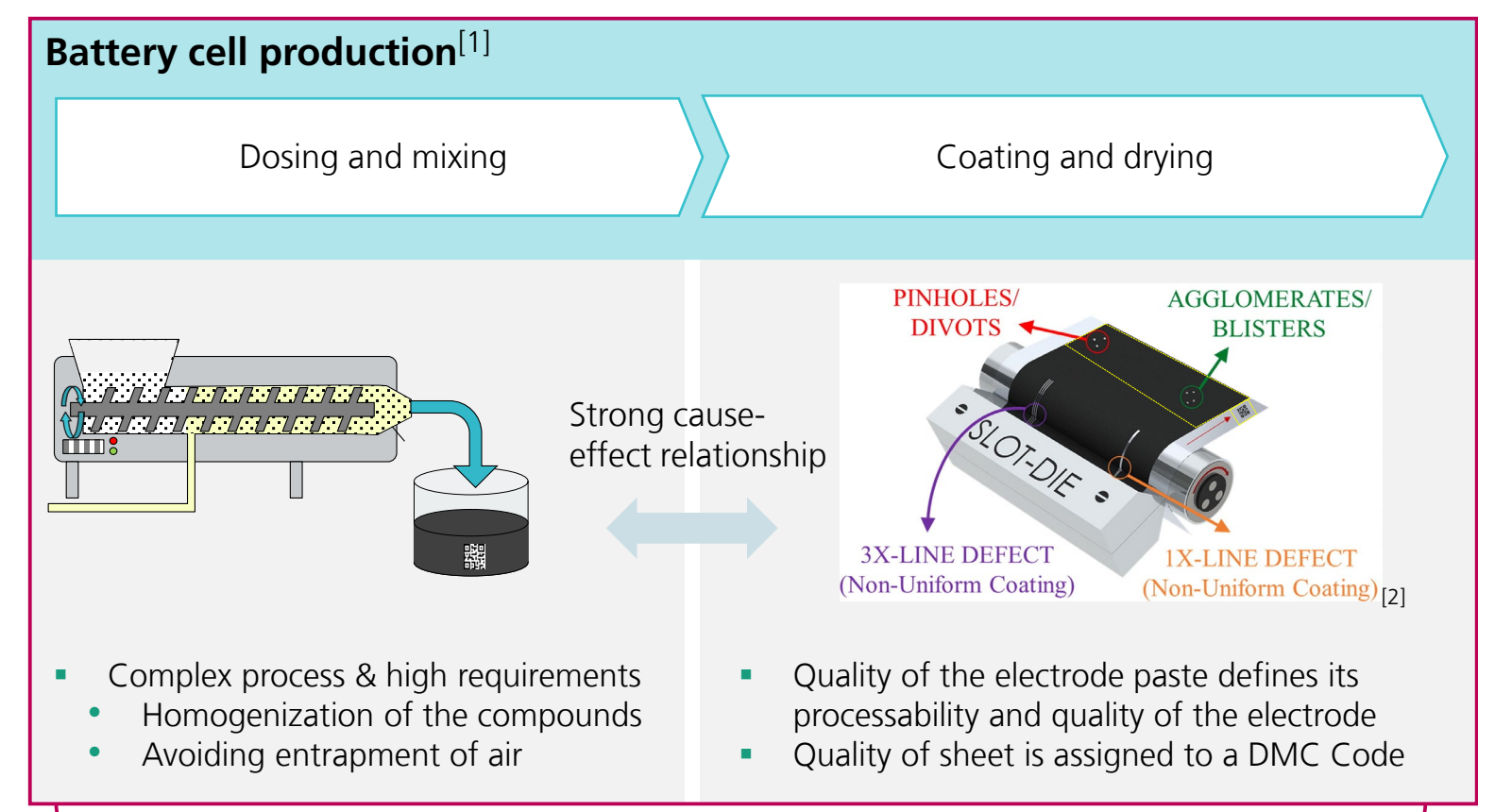
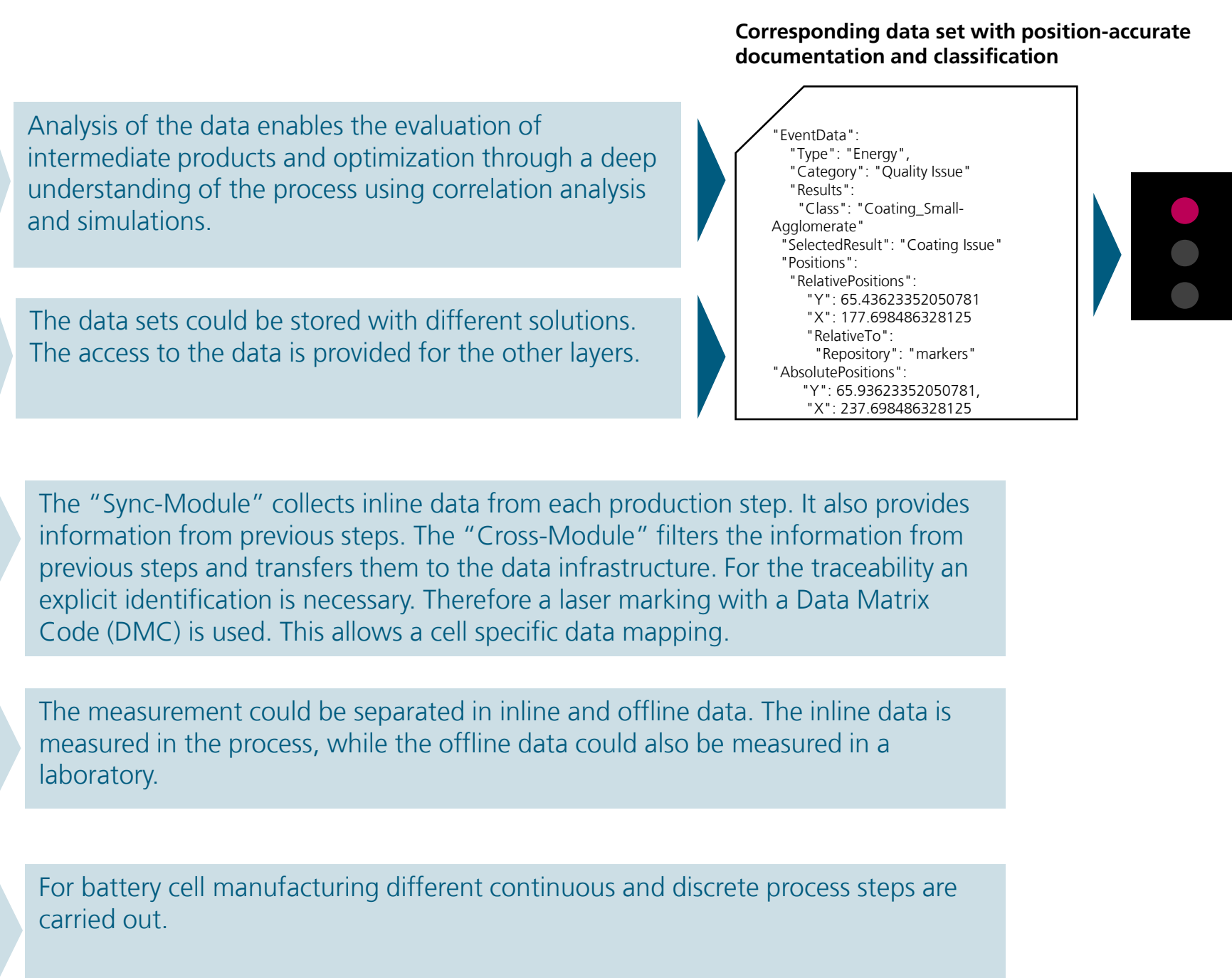


Fig. 1 Importance of understanding cause-effect relationships based on the example of the »FFB Workspace«

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Analysis of the data enables the evaluation of intermediate products and optimization through a deep understanding of the process using correlation analysis and simulations.

The data sets could be stored with different solutions. The access to the data is provided for the other layers.

The "Sync-Module" collects inline data from each production step. It also provides information from previous steps. The "Cross-Module" filters the information from previous steps and transfers them to the data infrastructure. For the traceability an explicit identification is necessary. Therefore a laser marking with a Data Matrix Code (DMC) is used. This allows a cell specific data mapping.

The measurement could be separated in inline and offline data. The inline data is measured in the process, while the offline data could also be measured in a laboratory.

For battery manufacturing different continuous and discrete process steps are carried out.

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