Plant i.T.

Process Control Systems. MES inside.

Works with EcoStruxure™

The IT solution for the baking industry

proleit.com

ProLeiT

by Schneider Electric

Integrated IT solution for the baking industry

You have to set market trends to win customers. Consolidation pressure in the baking industry is leading to the development of new approaches. The trend is towards industrial bakeries that produce a wide variety of products, for example pre-baked, frozen or convenience products, at a single location.

Due to increasing competition in the baking industry, all production processes must offer the highest level of flexibility – from dough production through the baking process to packaging of the finished product. For example, this means that – based on the dough – several versions of a product can be produced. This is possible thanks to a single IT system which controls and monitors all subordinate semi or fully automated process areas and is connected to ERP systems via integrated interfaces.

Integrated solutions with Plant iT

Plant iT is a modular IT system with integrated MES functionalities for process areas in the baking industry. This industry-specific feature combined with cutting-edge information technology enables data transparency from the operational and planning level to controlling and at all stages of value creation. Manufacturing Execution Systems (MES) provide production managers with new opportunities to overview the entire process chain from raw material delivery to the packaged product. This enhanced transparency optimizes processes, improves product quality, saves energy and raw materials and increases the availability of machines and systems.

Plant iT and the integrated bakery

We understand the needs of industrial bakeries, as Plant iT can cover the entire production process from raw material delivery and storage, through recipe-controlled dough production, kneader integration, dough dividing, proofing, resting and the baking and freezing stage to packaging and dispatching.

In cooperation with customers, machine suppliers, the Friedrich-Alexander University Erlangen-Nuremberg and the Technical University of Munich, we have defined standard interfaces for process and quality data per machine type based on the Weihenstephan Standards (WS Food), which were used to realize customer-specific requirements regarding the distribution and recording of process data and QA-relevant data. Thanks to this trend-setting procedure in the baking industry, it is possible, for example, to realize integrated Overall Equipment Effectiveness (OEE) analysis. Furthermore, coordination of the process control is enabled by recording all machine data up to packaging and mapping the information flow for individual process steps.

Requirements for industrial bakeries

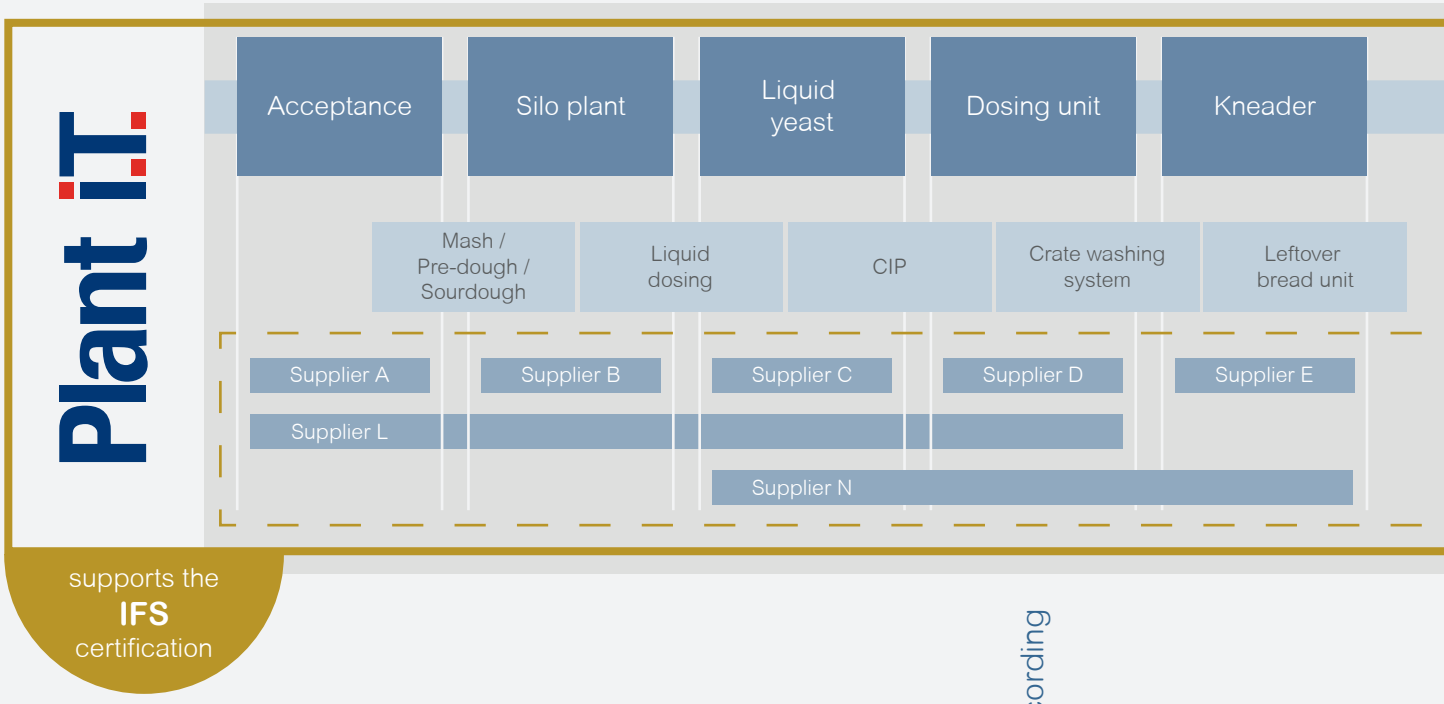
IT controlled integration of all the processes

If you take a look inside modern industrial bakeries, you will often see a production line consisting of systems and machines from various manufacturers with little or no intercommunication. If convenience and frozen products are produced at the same location as a standard bakery range, not only the number of systems and machines but also the list of suppliers usually increases considerably. This heterogeneous system and machine scenario is divided into numerous process areas and very rarely fully automated or connected to a higher-order IT system. Although many system and machine manufacturers offer information solutions in the form of SCADA systems, they are often limited to their own systems and thus to a specific process area, and are not intended for a production line or the entire production facility. The necessity of higher-order process management becomes apparent when further considering existing dispatching, storage and logistics systems or handmade pastries. The flow of information becomes an even more critical factor for production areas which map a workflow with pen and paper, as so-called routing or accompanying sheets – a typical error source for electronic material tracking.

Plant iT offers the perfect solution

Irrespective of existing systems and requirements, Plant iT can process information from all process areas and assume integrated process management thanks to defined interfaces. Therefore, Plant iT ensures quality compliance to recipe specifications, the calculation of material consumption according to the order list and complete traceability of the entire production process in line with statutory regulations.

Process chain in an industrial bakery



Consumption recording

Industry 4.0

Golden Batch

Analysis dashboards

Label printing

Scanner applications

Quality management connection

ERP interface

MES

Self-optimized dough production

Recipe management

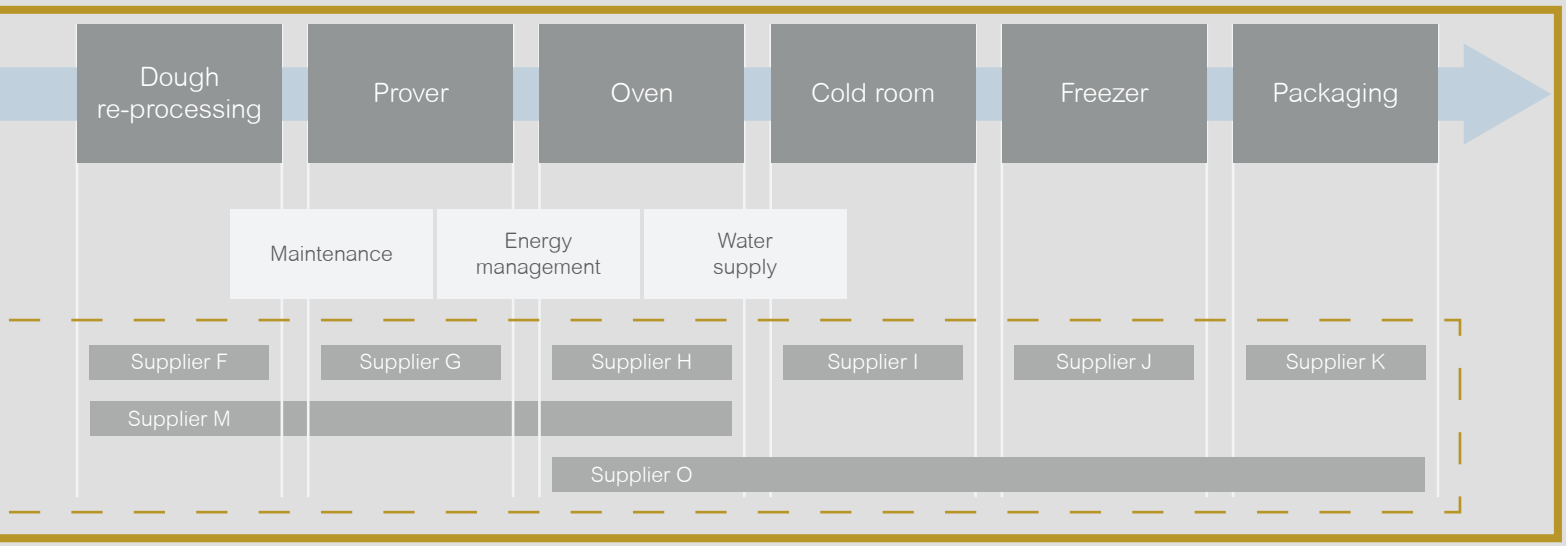
Scheduling acceptance

Inspection lot management

Manual pre-weighing

Green production

control level interfaces



Automatic dough summary

Web reporting

Packaging plant connection

Bills of material

OEE performance data

Cleaning schedules

Batch management

trolley detection

Foreign substances check

Dynamic residual batches

Plant iT

Integrated tracking and tracing

Audit Trail

Detecting optimization potentials

KPI evaluation

Line management

Integrated solution concept

Dough mixing & Silo plant

- Production order, dough order, mixing and dosing control, manual and liquid additions
- Dough and dough piece management, recipe management, production parameters
- Line allocation, plant states, CIP automation
- Consumption and batch data
- Tracking via dosing units, manual recording of all vessel components

ERP

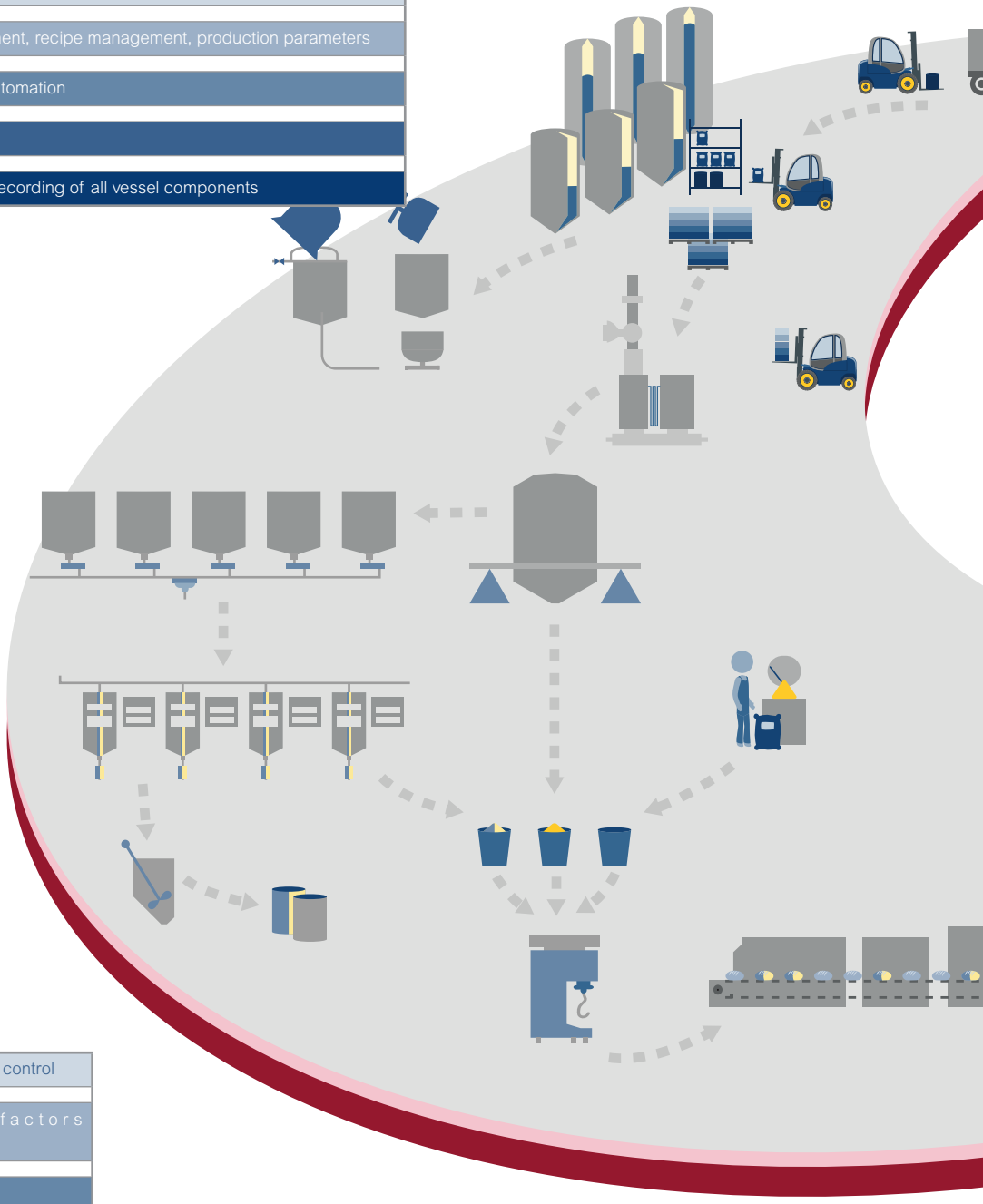
- Order dispatching

MES

- Execution management
- Specification management
- Resource management
- Data recording & analysis
- Tracking & tracing

PCS

- Process control



Dough resting

- Dough resting time management and control
- Resting times, quality factors (consistency, temperature)
- Vessel management
- Vessel recording, resting times
- Tracking via vessel

Dough shaping

- Transport orders, dough divider control
- Machine parameters, dough piece weight, quality factors (weight, etc.)
- Line and machine allocation
- Number of pieces, OEE-relevant data, faults, etc.
- Tracking via vessel and dough piece, single counter, time recording

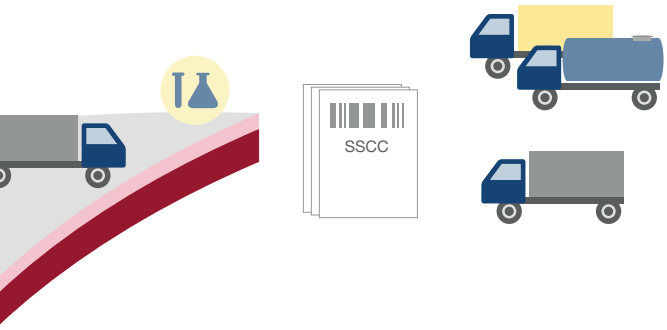
Plant i.T.

Raw materials warehouse

- Stock intake and stock transfer orders, provision orders
- Raw material management, minimum shelf-life, quality inspection
- Silo management, storage location management
- Material bookings, warehouse capacity, warehouse utilization
- Tracking via raw material batches

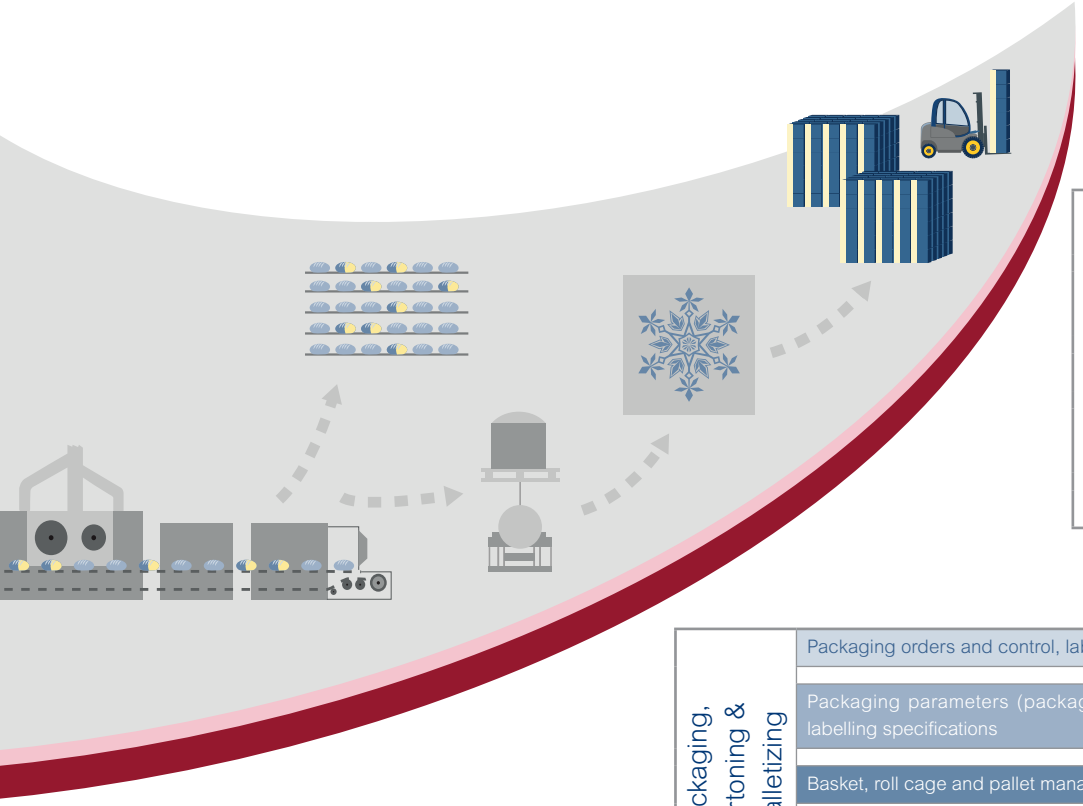
Goods intake

- Intake orders, lab sampling, silo allocation, declaration control
- Raw material management, inspection instructions, material compatibility
- Vehicle monitoring, silo monitoring
- Feedback to purchasing dep., acquisition posting in materials management
- Tracking via raw material batch, possible re-declaration



Dispatching & picking

- Dispatching order and coordination, loading orders
- Pre-packaging
- Dispatching line
- Container recording via SSCC
- Tracking via pallet tracking



Finished products / freezer warehouse

- Stock placement and stock transfer orders
- Warehouse management & locations, minimum shelf-life
- Storage location management
- Warehouse stock, stock placements and stock transfers
- Tracking via container detection

Packaging, cartoning & palletizing

- Packaging orders and control, labelling orders
- Packaging parameters (packaging weight, quantity), palletizing parameters, labelling specifications
- Basket, roll cage and pallet management
- Number of pieces, OEE-relevant data, faults, etc.
- Tracking via container detection

Proofing, baking & freezing

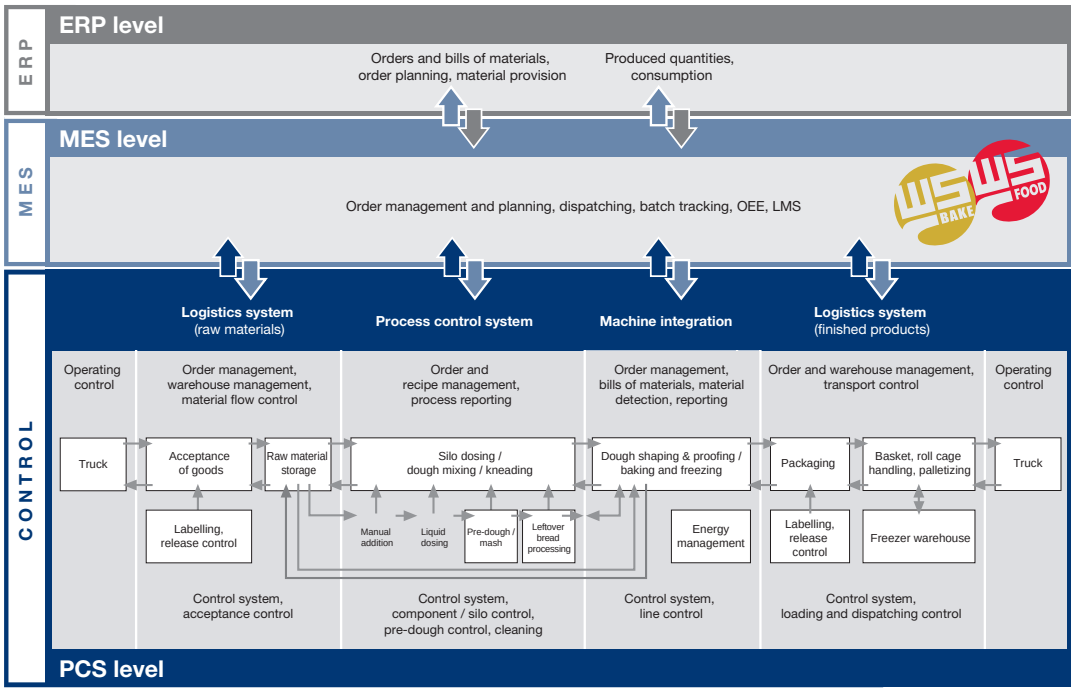
- Process orders, machine orders and control (baking order, etc.)
- Machine parameters (proofing times, oven & freezer), quality factors (degree of browning, etc.)
- Line and machine allocation
- Number of pieces, OEE-relevant data, faults, etc.
- Tracking via vessel, batch tracking, single counter, time recording

Plant iT and MES

A vertical integration

The MES and PCS levels are often seen as two separate systems in one production plant. Plant iT prevents this common separation. Unnecessary interfaces and duplicates for user groups and master data storage are avoided by combining MES functions within a PCS to create an IT system. This provides the perfect foundations for integrated information processing and increased efficiency for system operation, maintenance and repairs as well as future additions. MES tasks and parts of the PCS can thus be regarded as a central IT system. This is the reason for the development of the flexible system platform Plant iT, consisting on basic systems and modules for application in various areas of a production plant. An example of the seamless integration between MES functionalities and the PCS level of an industrial bakery is the Plant iT material module.

Since the availability of materials (usually raw, auxiliary and operating materials) is of key importance for bakeries, there is a process-oriented materials management that provides data on a permanent basis. This ensures rapid decisions about intervention in the process cycle during production. An essential criterion for the quality of these decisions is the up-to-dateness of the information on the stock, local availability and quality status of the materials being processed.



MES in the baking industry

Plant iT therefore guarantees the required integration, for example, to ensure traceability and carry out recipe optimization depending on the raw material parameters. Received raw materials with the respective workflow are also mapped in this fashion.

Thanks to the transparency of the Plant iT product group, migration times for renovation projects can be reduced to a minimum. And costs for re-qualification measures are minimized due to the object-oriented system infrastructure.

Manufacturing Execution Systems (MES) become the data hub between important areas of production. They answer, amongst other things, the following questions:

What is produced where and by whom? (execution management)

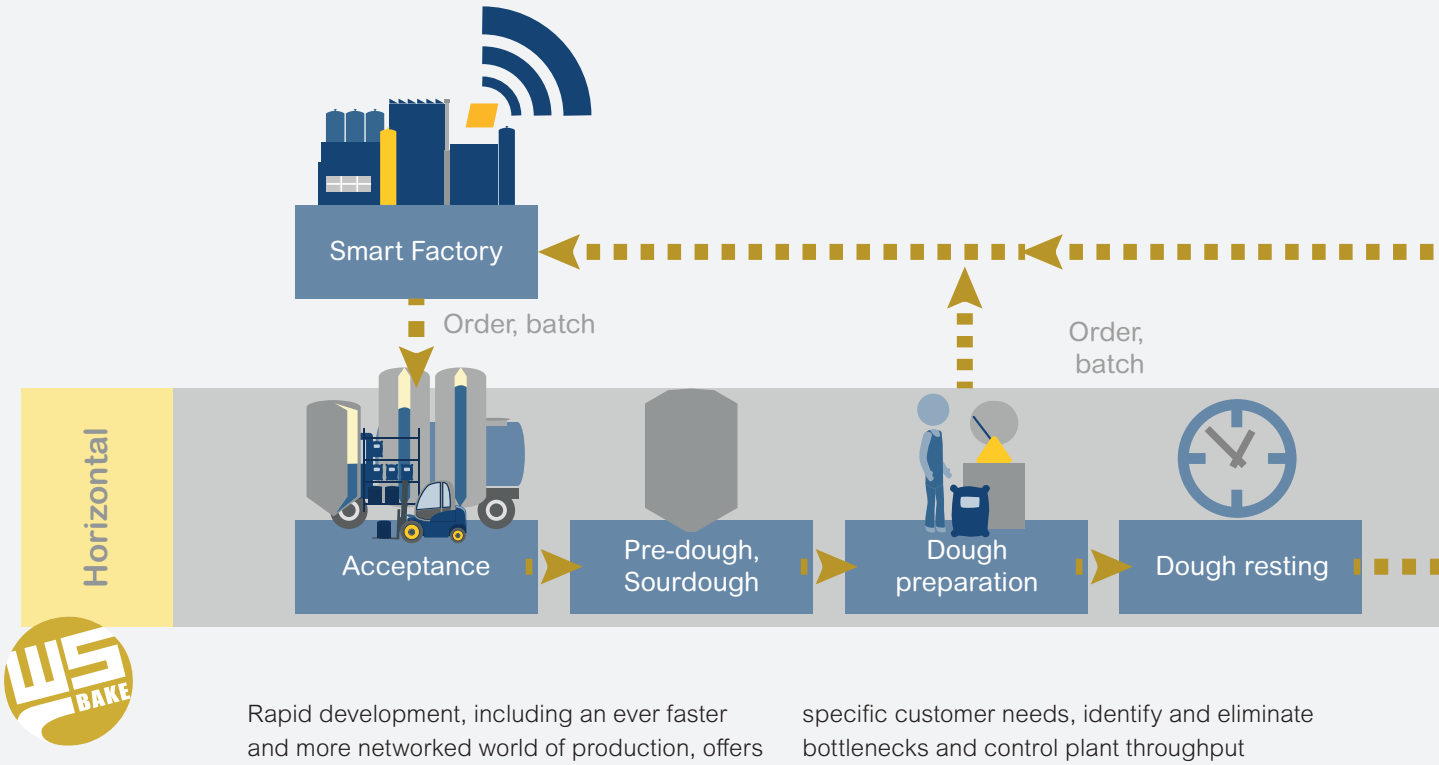
How should production occur? (specification management)

Who should produce what and where? (resource management)

How did production occur? (data recording, analysis)

When, where and by whom was some- thing produced? (tracking & tracing)

Industry 4.0 in the baking industry



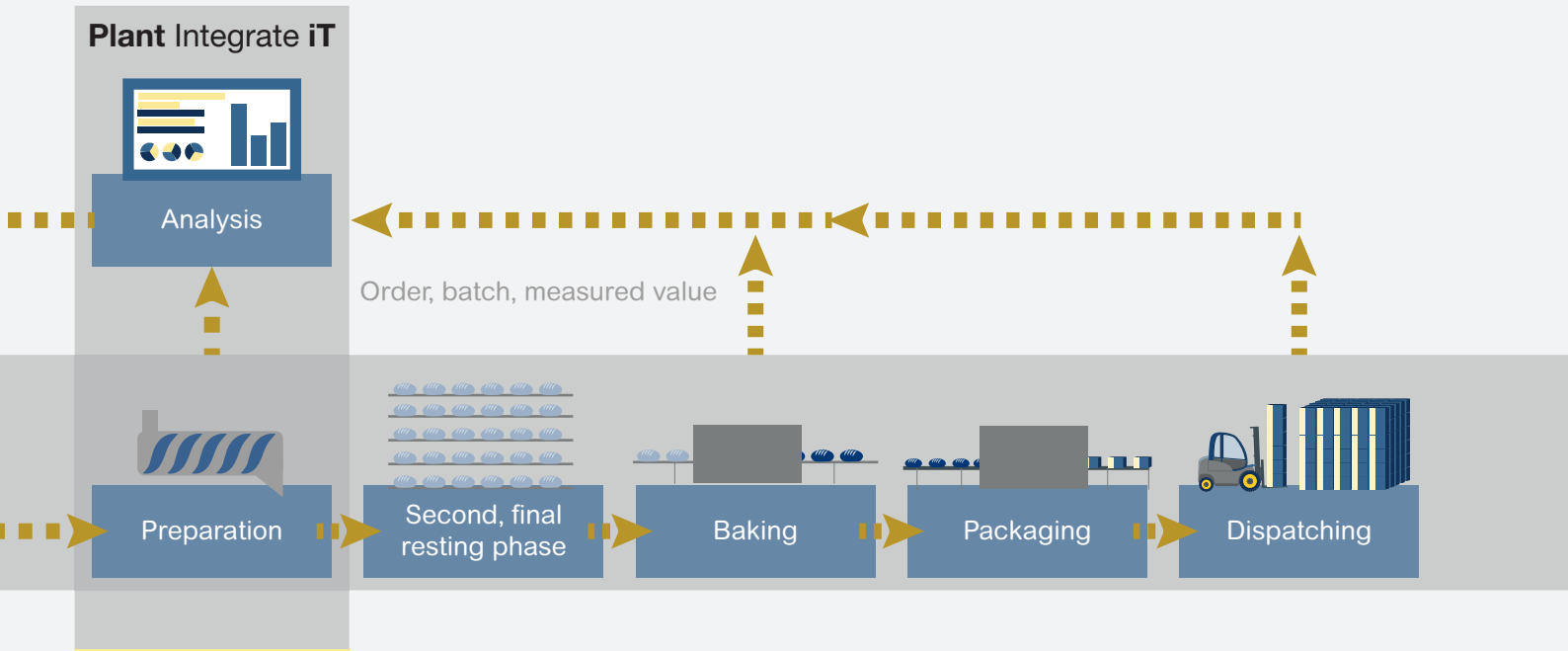
Rapid development, including an ever faster and more networked world of production, offers not only new opportunities but also creates new challenges. In this context, the keywords Industry 4.0 or Industrial Internet of Things (IIoT) are often used. Industry 4.0 is usually only associated with conventional machine and plant engineering applications; in other words, production-related activities. That said, the smart factory provides many benefits for the process industry, including digital integration of all industrial facilities and processes. Furthermore, implementation is quite straightforward when using a Manufacturing Execution System (MES) as the central analysis and reporting unit.

The smart factory

Transforming a traditional factory into an Industry 4.0 smart factory results in significant changes to the way it operates. Business processes respond dynamically to changes in the market, while production techniques adapt automatically to ensure an appropriate balance between cost, quality and environmental impact. Production technology will adapt to specific customer needs, identify and eliminate bottlenecks and control plant throughput automatically. This goal - true to the vision of Industry 4.0 - is achieved by vertically coupling technical and commercial business processes and horizontally linking processes and systems along the value-added chain. Processes can therefore be controlled and improved across the entire plant. Production becomes completely transparent from start to finish, providing the ideal platform for sound commercial and technical decisions. The smart factory additionally enables companies to identify and satisfy individual customer needs, as even the smallest batch sizes can be produced economically.

New potentials for the baking industry

These technical developments create new automation potentials for the bread and baking industry. Not only will the increased networking of the internal value creation process from procurement, through production to sales and logistics lead to significant increases in productivity and efficiency; the new possibilities for fully automated monitoring



and control of production plants also promise significant optimization of production processes. Precise examples of existing Industry 4.0 approaches in the baking industry include automated quality assurance, which is accomplished in many companies with the help of sophisticated sensor technology, as well as the possibility of tracing products throughout the complete value-added process in order to identify and eliminate sources of error.

Integration of heterogeneous systems via MES

This vision can be brought to life with a Manufacturing Execution System (MES) tailored to customer requirements. The MES solution from ProLeiT is called Plant Integrate iT and can be used independently of the process control system Plant iT. The MES integrates the heterogeneous information of the individual production plants and combines the production level with the commercial business processes. Needless to say, companies profit directly from a plant-wide and common database. The more systems that automatically exchange information, the greater the added value for the operator. The many benefits include dynamic order management and the opportunity to develop and improve plant-wide recipes, as well as being able to trace production data.

Using KPIs wisely

Key figures are necessary to monitor success and investments. These KPIs should be identified and displayed in real time to ensure problems are not only identified promptly, but also in order to initiate appropriate countermeasures. Plant Integrate iT offers freely configurable dashboards to achieve this. Recorded and archived data can be filtered according to various criteria, including time period, order, customer, product, batch, location and energy consumption, as well as interlinked and presented in real time. In many cases, this reveals connections that would otherwise remain hidden. This enables those responsible to react more quickly and effectively to deviations and to counteract them accordingly.

Overall Equipment Effectiveness

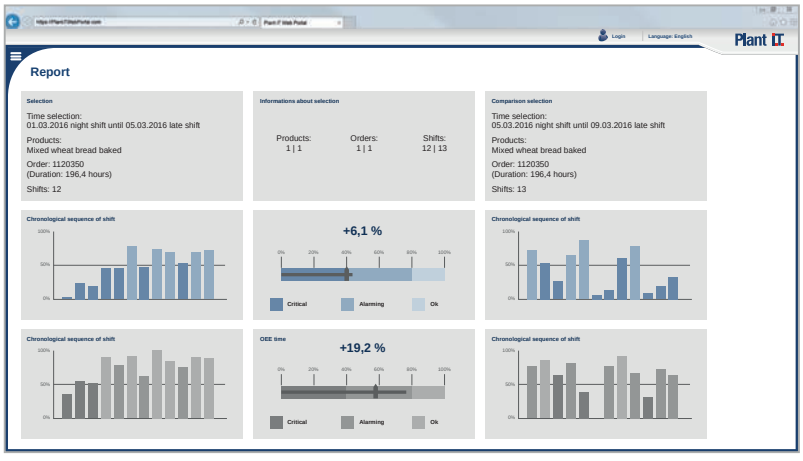
OEE – is the abbreviation for “Overall Equipment Effectiveness”, a method developed for the determination of values for monitoring and improving the efficiency of production plants. In many industries, the evaluation of process quality using the OEE method has already proven successful. There are also many advantages for bakeries, but the most important thing is: transparency.

Potentials for optimization can be systematically uncovered with the aid of plant characteristics, e.g. overall equipment effectiveness (OEE). They indicate where productivity losses occur and analyze the availability, system performance and quality of the individual production lines. They therefore form the basis for all optimization measures.

Plant iT, ProLeiT‘s process control system, delivers OEE values and reports at the push of a button – per line and across production facilities. Since all production data is interlinked, it is also possible to provide OEE analyses and detailed representations of the plant efficiency of individual lines and machines. In particular, correlations can be easily recognized on this basis, such as increased downtime at certain times of the day or a large amount of rejects for certain products. Depending on the respective customer requirements, the capacity utilization of the various lines can be compared as well as compliance with key performance figures. Dashboards, tables or lists are, for instance, available for the graphical presentation of data.

Bakery-specific standard requirements have been integrated into Plant iT and can be presented in real-time as online reports. The following information is, amongst others, evaluated:

- Performance statistics
  - e. g. utilization times of all the machines
- Energy statistics
  - e. g. consumption per machine
- Fault analyses
  - e. g. cause of downtime
  - e. g. reject detection
- Consumption analyses
  - e. g. dosing reports
- Golden batch analyses
  - e.g. process value comparison



Plant iT screenshot of an OEE display

Tracking & tracing

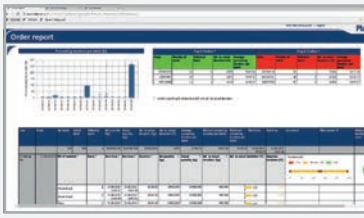
From the producer to the end consumer and back again

In the course of compliance with international food standards (e. g. IFS), the issue of „traceability of raw materials up to the finished end product within a production process“ is becoming increasingly important. ProLeiT ensures this at all times through the consistent and complete recording of raw materials and finished products within the scope of tracking & tracing.

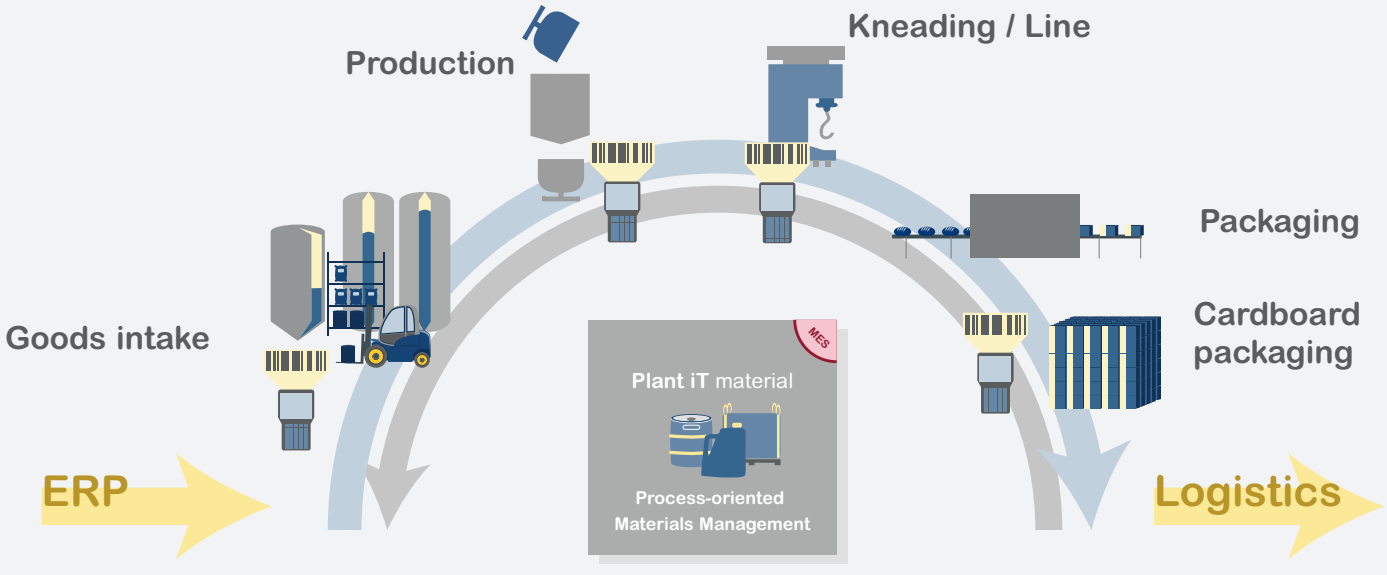
The reasons for this are not only the increasing demands of retailers and the desire for greater transparency on the part of end consumers but also the economic damage caused time and again by costly product recalls. Clear identification and the complete traceability of goods throughout the entire production cycle offer a number of advantages. Since the chronological tracking of relevant process steps allows producers, logisticians and manufacturers to be assigned exactly to the respective product or production step. Errors can therefore be avoided preventively or possible sources of errors can be found more easily retrospectively. Process-related materials management, such as the optionally available Plant iT material module, offers a transaction-accurate online view of all material transactions. They are recorded on the basis of a process-compliant warehouse structure and besides precise inventory management also enable investigation and evaluations, in particular batch traceability. At the touch of a button, you can quickly and clearly trace which raw materials have been used in which products.

Starting at a freely selectable entry point, investigations can be carried out in both directions. An overview divided into predecessors (upstream) and successors (downstream) with presentation of the information, similar to the warehouse and transaction overview, facilitates navigation.

Batch tracking



Batch report dough production



For all challenges in the baking industry

- Order management
  - Process or production orders for the operations:
  - Goods receipt
  - Dough production
  - Baking
  - Packaging
  - Dispatching
- Recipe management
  - Acceptance of bills of materials and consumption feedback to ERP systems
  - Recipe changes (no. of pieces, water quantity, dough temperature) of a current order
  - Manual component management and definition of addition times when kneading in the recipe
- Process-oriented materials management
  - Mapping the material flow across all process steps
  - Inventory management of raw, auxiliary and operating materials
  - Material provisions
  - Old and leftover bread updates
  - Batch and product tracking
- Integrated energy management
  - Energy data recording and visualization
  - Energy statistics with detailed consumption reports
  - Feedback of energy consumption to the higher-order process-cost controlling system
  - Optimization of the operating mode of energy stores
  - Display of specific energy consumption
- Quality and production optimization
  - Connection to laboratory systems
  - Workflow of QA-relevant inspection processes
  - Production data acquisition
  - OEE values for bakeries
- Maintenance and repair work
  - Monitoring of runtimes and machine operating hours
  - Definable maintenance intervals
  - Reporting

The industry-specific solution for industrial bakeries

Scalable

Demand driven

Industry-specific solution

Open, modular solution

High level of flexibility

Can be extended at any time

Tested technology

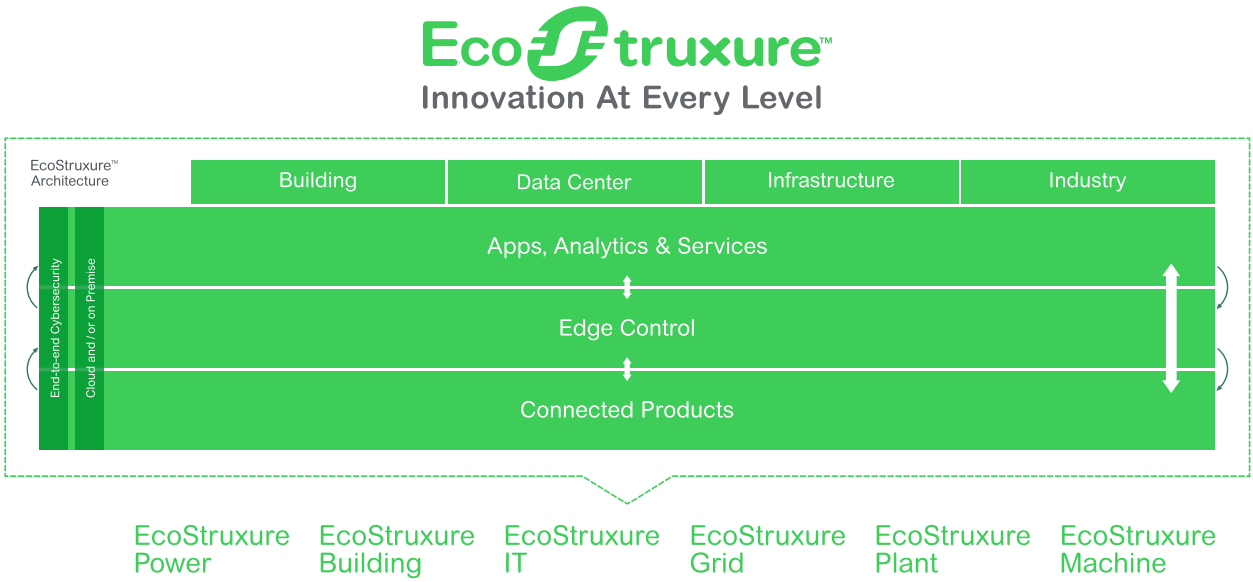
High level of standardization

EcoStruxure™

Innovation At Every Level

Since the merger of ProLeiT and Schneider Electric in August 2020, Plant iT has been complementing the Schneider Electric EcoStruxure system architecture. Bringing together the expertise of Schneider Electric SE and ProLeiT offers tremendous value to the customers of both companies to increase their productivity and efficiency. The ProLeiT solutions specifically address the consumer packaged goods (CPG) and food & beverage (F&B) sectors and thus enable broad market penetration. Through its own EcoStruxure system architecture, in which the AVEVA software plays an integral role and which is further strengthened by the ProLeiT portfolio, Schneider Electric, a company active in over 100 countries worldwide, has long been successfully driving forward digital transformation in industrial automation.

EcoStruxure is Schneider Electric's open, interoperable, IoT-enabled system architecture and platform. EcoStruxure delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for our customers. EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level. This includes Connected Products, Edge Control, and Apps, Analytics & Services which are supported by Customer Lifecycle Software. EcoStruxure has been deployed in almost 500,000 sites with the support of 20,000+ developers, 650,000 service providers and partners, 3,000 utilities and connects over 2 million assets under management.



ProLeiT

by Schneider Electric

Visit us on
proleit.com

ProLeiT GmbH
Einsteinstr. 8 | 91074 Herzogenaurach | Germany
Tel: +49 9132 777 0 | Fax: +49 9132 777 150 | info@proleit.com