Plant i.T.

Process Control Systems. MES inside.

Works with EcoStruxure™

The IT industry solution for the paint and coatings industry

ProLeiT

by **Schneider** Electric

proleit.com

Integrated IT solution for the manufacturers of paints and coatings

You have to set market trends to win customers. The ever-increasing requirements of the paint and coatings industry in terms of regulations, quality assurance, water consumption, plant utilization, traceability and sustainability demand new approaches. The trend is towards highly automated, modular processes – from the acceptance of raw materials, through production to dispatch, as well as from plant control level to production and back again. Integrated solutions are necessary to meet the tough requirements of networked production.

Due to increasing competition in the paint and coatings industry, all production processes must offer the highest level of flexibility – from the acceptance of raw materials and the production process to the filling of the finished product. Based on the raw material and the mixed recipe, it must be possible to produce several product variants. Preferably with an integrated IT system that controls and monitors all subordinate semi or fully-automated process areas and modules and is connected to an ERP system via interfaces.

Integrated solutions with Plant iT

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

raw materials and increases the availability of machines and plants.

Integrated production of paints and coatings

From the acceptance and storage of raw materials, the recipe-controlled mixing and production of paints and coatings and the integration of various skids / units or inline mixers to the filling, packaging and dispatching of goods – in cooperation with customers, machine suppliers and universities, we have defined standard interfaces for process and quality data for each machine of a filling and packaging plant. This also benefits the paint and coatings industry. Thanks to this trend-setting procedure, it is, for example, possible to implement integrated Overall Equipment Effectiveness (OEE) analyses. Furthermore, coordination of the higher-order process control is enabled by recording all machine data until they are transferred to internal logistics and by mapping the flow of information for individual process steps.

The requirements of industrial paint production

IT-controlled integration of all the processes

If you take a closer look at the manufacturers of industrial paints and coatings, you will often come across production areas consisting of plants and machines from various vendors with little or no intercommunication. This heterogeneous plant and machine scenario is divided into numerous process areas and very rarely fully automated or connected to a higher-order IT system. Although many plant and machine manufacturers offer information solutions in the form of SCADA systems, they are often limited to their own plants and thus to a specific process area and are not intended for a production line or the entire production facility. This often results in the development of so-called "islands" which have, for instance, their own recipe management and whose adjustment in case of original recipe modification can only take place manually and, in the worst-case scenario, can only be carried out by a programmer. Furthermore, actual data, e.g. viscosity, are not permanently recorded at these local automation systems. An excellent example of this are units / skids. The necessity of higher-order process management becomes apparent when furt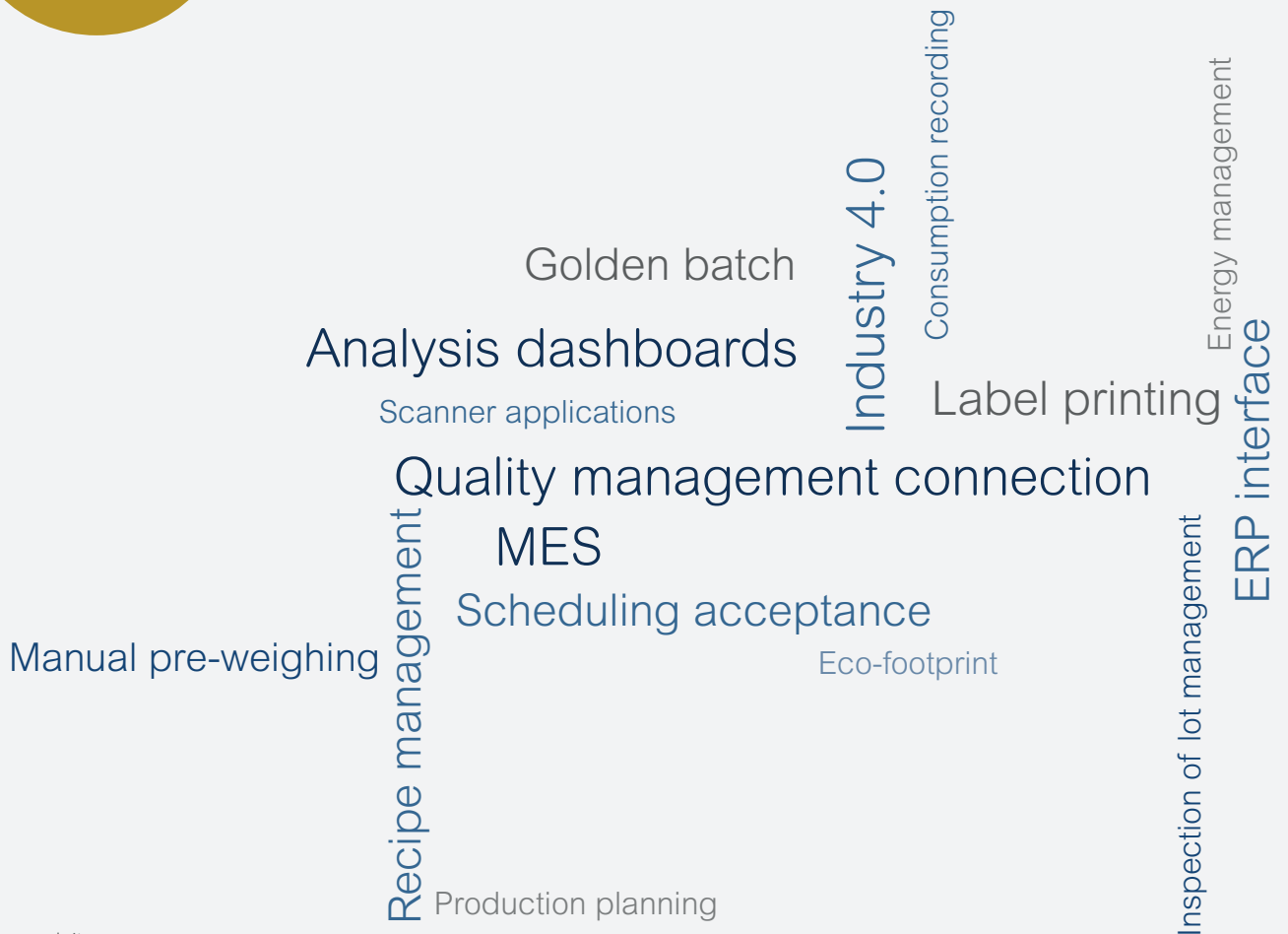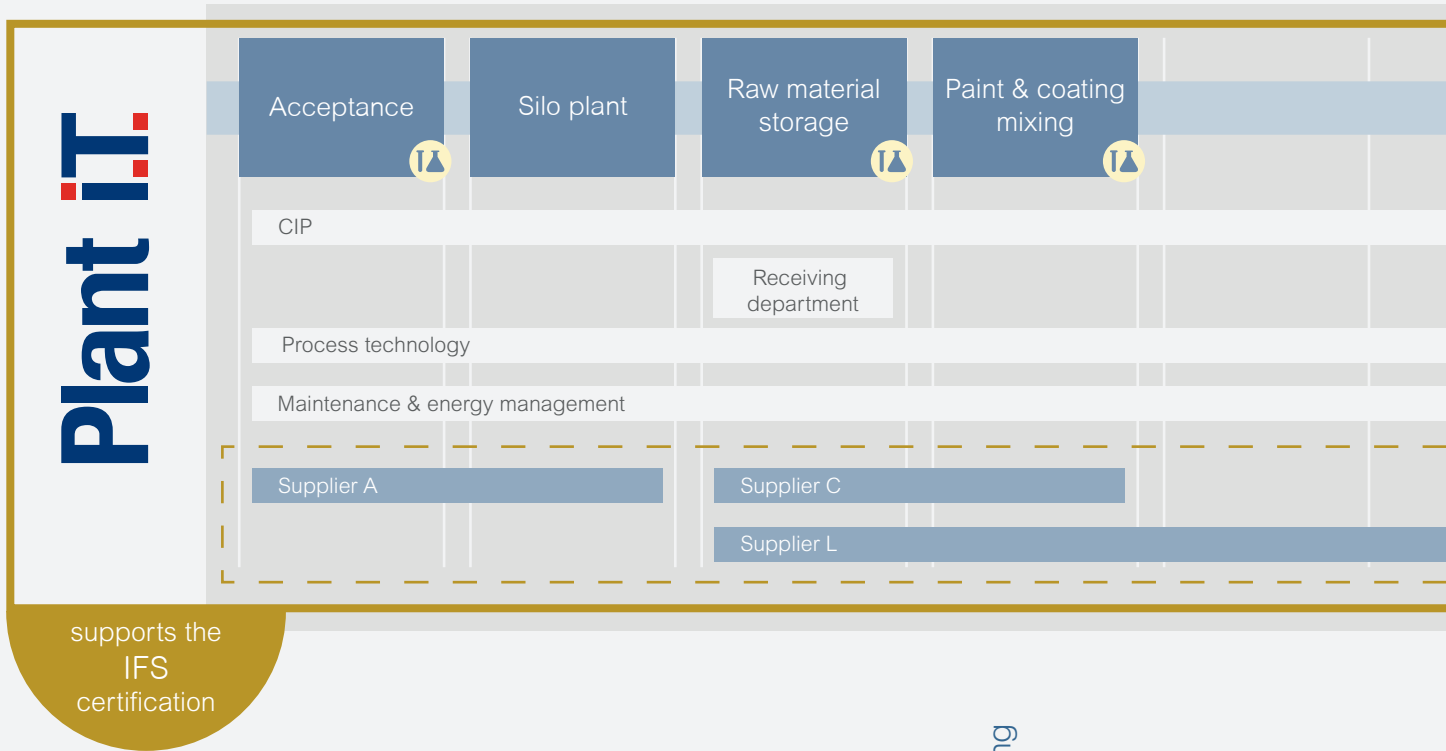her considering existing dispatching, storage and logistics systems. The flow of information becomes an even more critical factor for production areas which map workflows as so-called routing or accompanying sheets – in this case, the manual recording of production data is a typical source of errors.
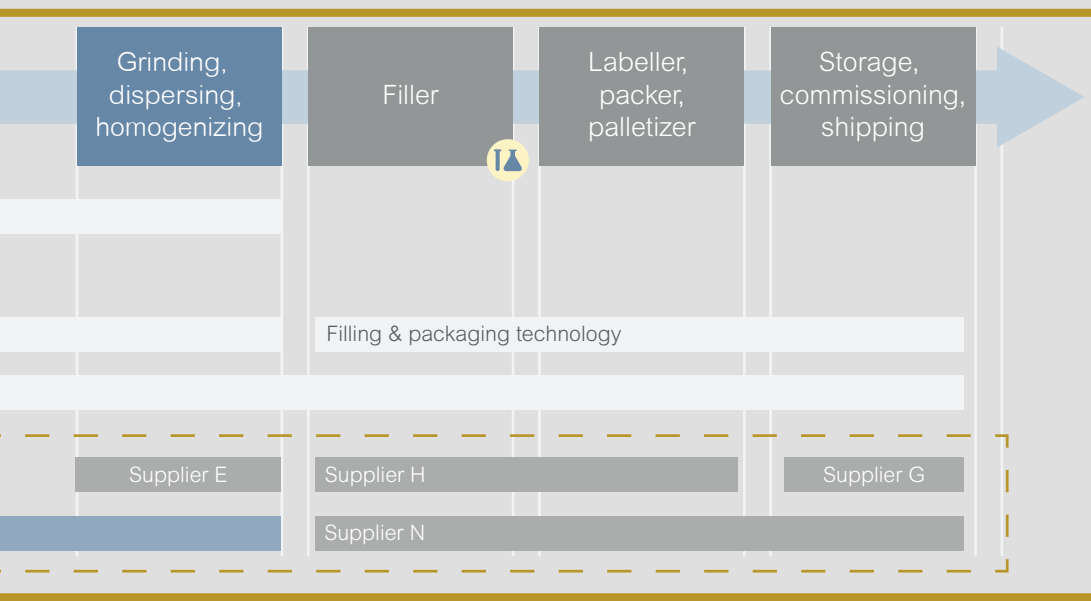
Plant iT offers the perfect solution

Irrespective of existing systems and requirements, Plant iT processes information from all process areas and assumes integrated process management thanks to defined interfaces. A feasible solution for the "island" problem could be to interlink the controls in order to, e.g., specify order parameters as well as record, analyze and send actual values to an ERP system in a condensed form. Furthermore, Plant iT can ensure compliance to quality parameters, 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 industrial paint production

Plant iT

Acceptance | Silo plant | Raw material storage | Paint & coating mixing

CIP

Receiving department

Process technology

Maintenance & energy management

Supplier A

Supplier C

Supplier L

supports the IFS certification

Golden batch

Analysis dashboards

Scanner applications

Quality management connection

MES

Scheduling acceptance

Manual pre-weighing

Eco-footprint

Industry 4.0

Consumption recording

Label printing

Energy management

ERP interface

Inspection of lot management

Recipe management

Production planning

| Grinding, dispersing, homogenizing | Filler | Labeller, packer, palletizer | Storage, commissioning, shipping |

Filling & packaging technology

Supplier E

Supplier H

Supplier G

Supplier N

Automatic recipe optimization

Web reporting

Packaging plant connection

Bills of material

OEE performance data

Cleaning schedules

Material batch parameters

Batch management

Serialization

Remaining quantity processing

Dynamic residual batches

Plant iT

Integrated tracking and tracing

Audit trail

Detecting optimization potentials

Cleaning matrix

Line management

Paperless production

Integrated solution concept

Preliminary solutions

- Production order, mixing and dosing control, manual and automatic additions
- Recipe and BOM management, production parameters
- Line allocation, plant statuses, CIP automation
- Consumption and batch data
- Tracking via dosing units, recording of all the components for manual dosing

Mixing / Preparation tank

- Production order, mixing and dosing control, manual and automatic additions
- Quality inspection
- Line and machine allocation, CIP automation
- Product quantity, temperatures
- Tracking via raw material batches

ERP
- Order dispatching

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

PCS
- Process control

Grinding & Dispersing

- ERP integration for realtime product costing
- Specification management
- Model predictive control
- Energy reporting & management
- Multivariable control and coordination
- Complex control (i.e. Auto-Tune)

Complete & Nuance

- Production order for filling / inline mixers
- Machine and quality parameters (temperatures)
- Line and machine allocation
- Temperatures, pressures, quantities, etc.
- Tracking via mixing / preparation tank
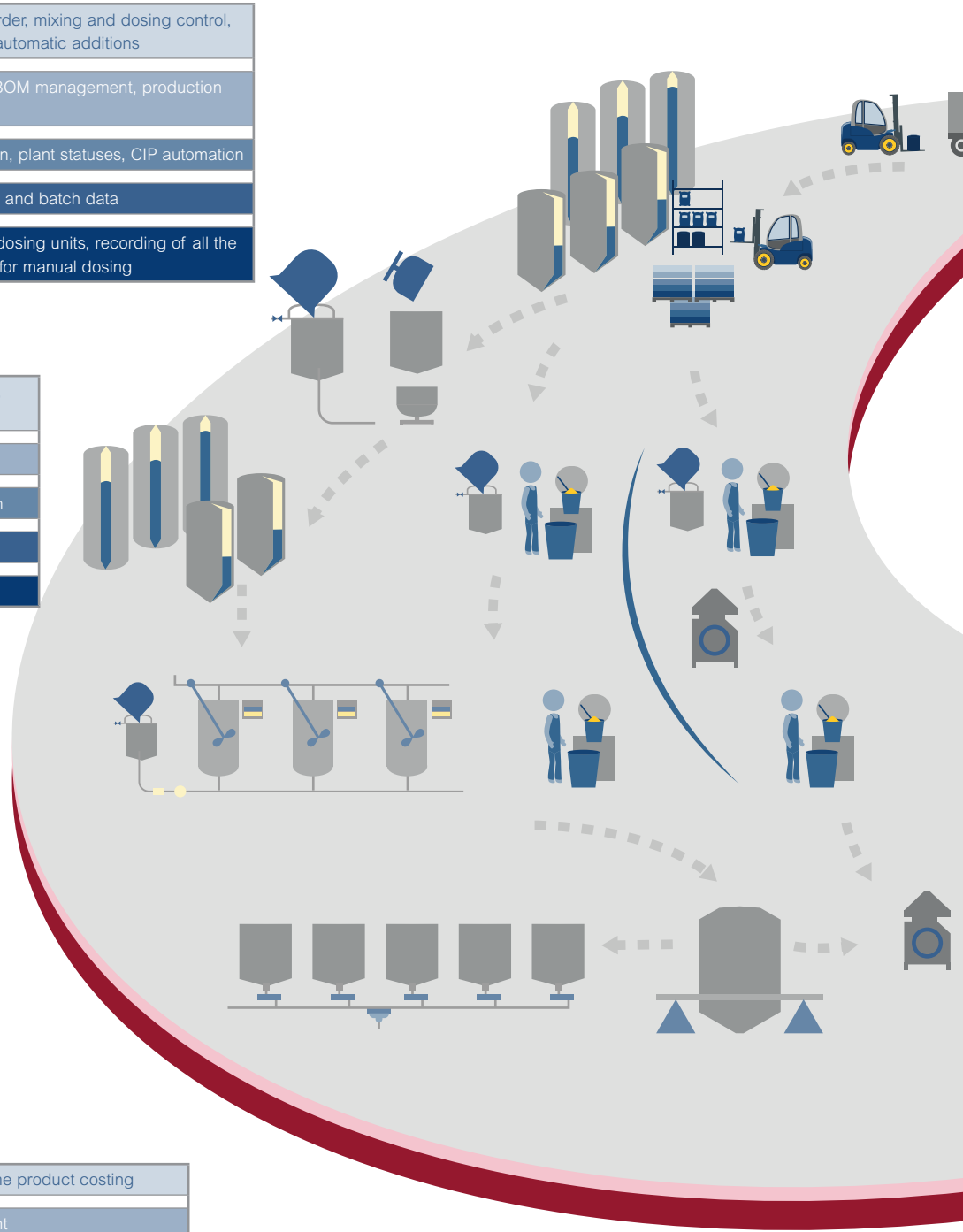
Raw materials warehouse

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

SSCC

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
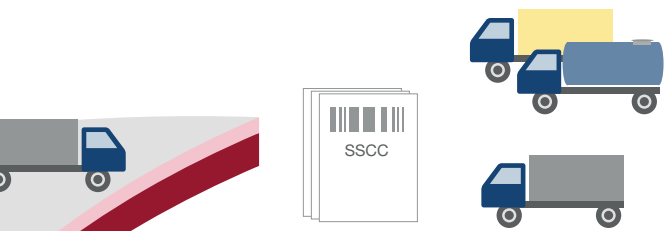
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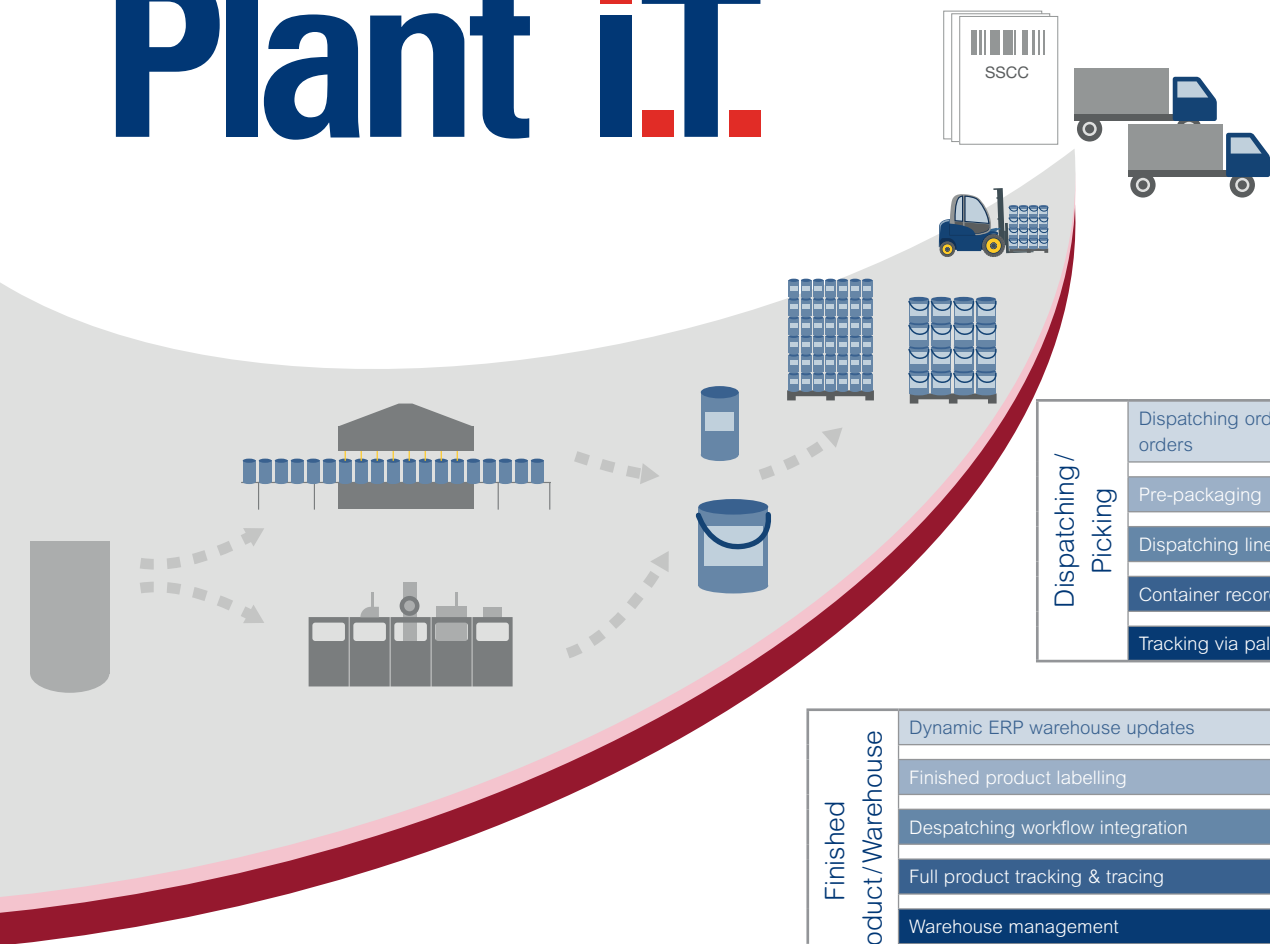
SSCC

Dispatching / Picking

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

Finished Product / Warehouse

- Dynamic ERP warehouse updates
- Finished product labelling
- Despatching workflow integration
- Full product tracking & tracing
- Warehouse management
- Tracking pallet / container via RFID / barcode

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

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 duplicate administrations are avoided thanks to the provision of MES functions in the Plant iT system. Furthermore, this provides the perfect foundations for integrated information processing and increased efficiency for system operation, maintenance and repairs as well as future extensions. ProLeiT has therefore developed the flexible system platform Plant iT, consisting of basic systems and modules for application in various areas of a production plant. The Plant iT material module is an excellent example of the modular design of the Plant iT system. Since the availability of materials is of key importance for paint plants, process-related materials management provides all the data on a permanent basis. This ensures rapid decisions on 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. Plant iT therefore guarantees the required integration to, e.g., ensure traceability and carry out recipe optimization depending on the raw material parameters. Furthermore, Plant iT can map the entire received raw materials with the respective workflow.
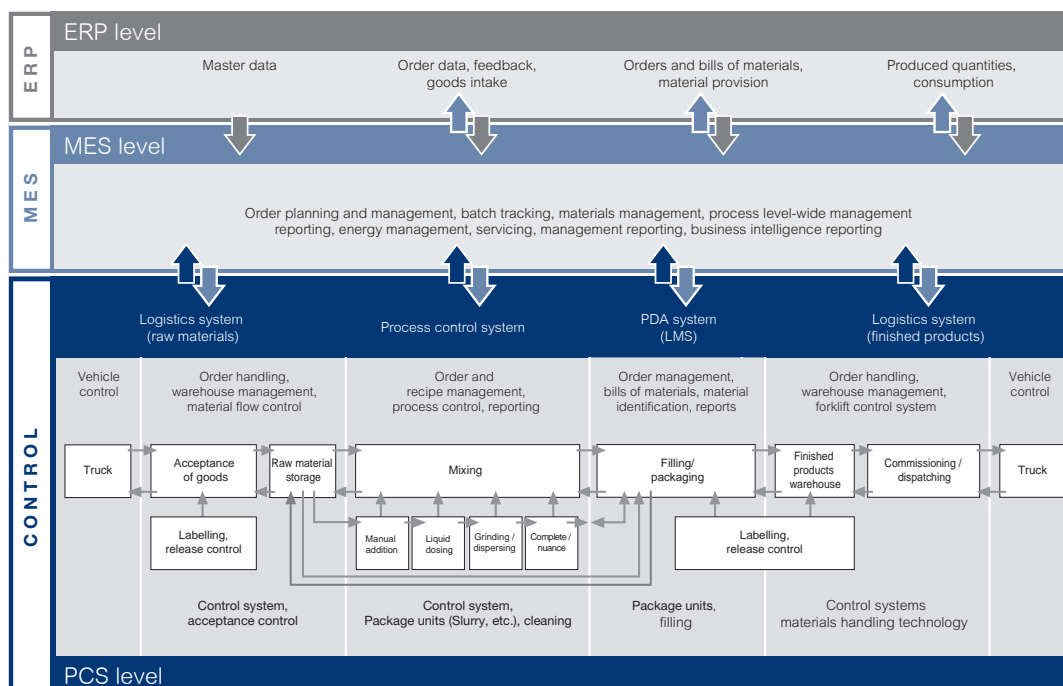
MES in the paint and coatings industry

The modularity of the process control system Plant iT supports gradual implementation in the facility. Existing plant technology and processes can thus be integrated. ProLeiT has extensive project experience and numerous testimonials in the field of consulting and MES solution implementation in the paint and coatings industry.

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)
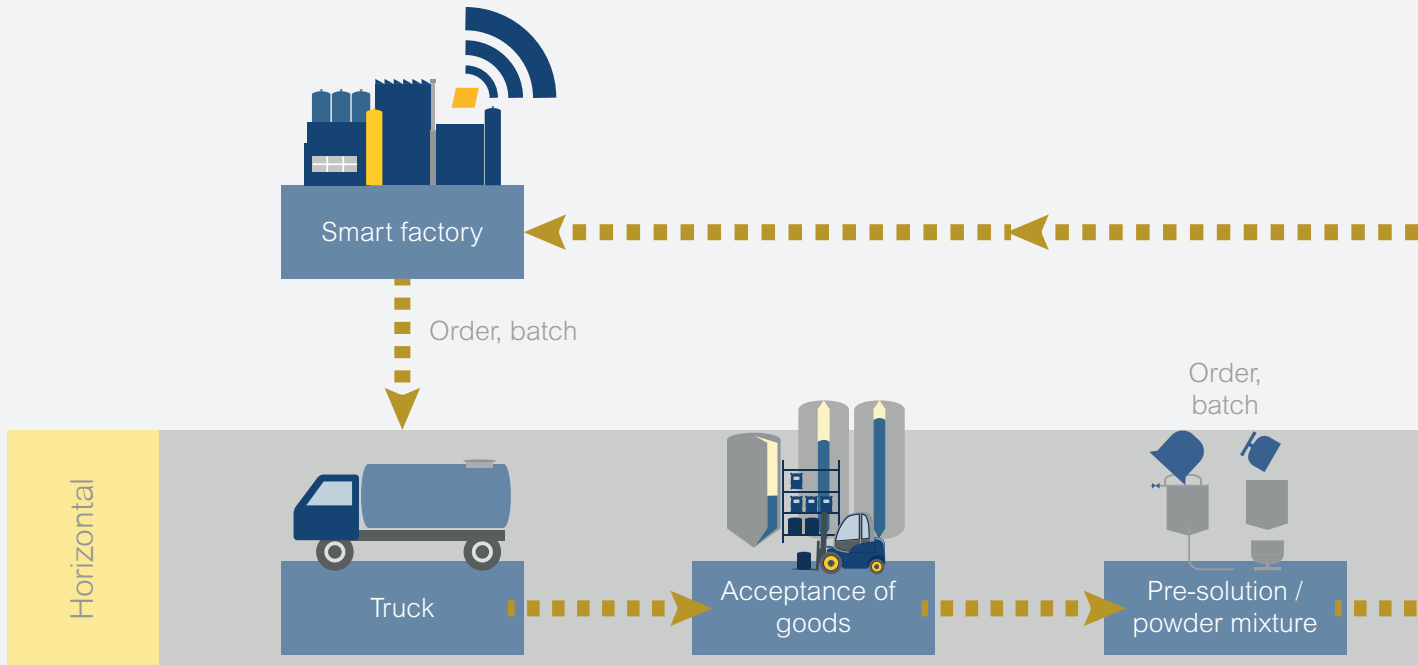
Who should produce what and where? (resource management)

How did production occur? (data recording, analysis)

When, where and by whom was something produced? (tracking & tracing)

Industry 4.0 in paint production

Smart factory

Order, batch

Horizontal

Truck

Acceptance of goods

Pre-solution / powder mixture

Order, batch

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.
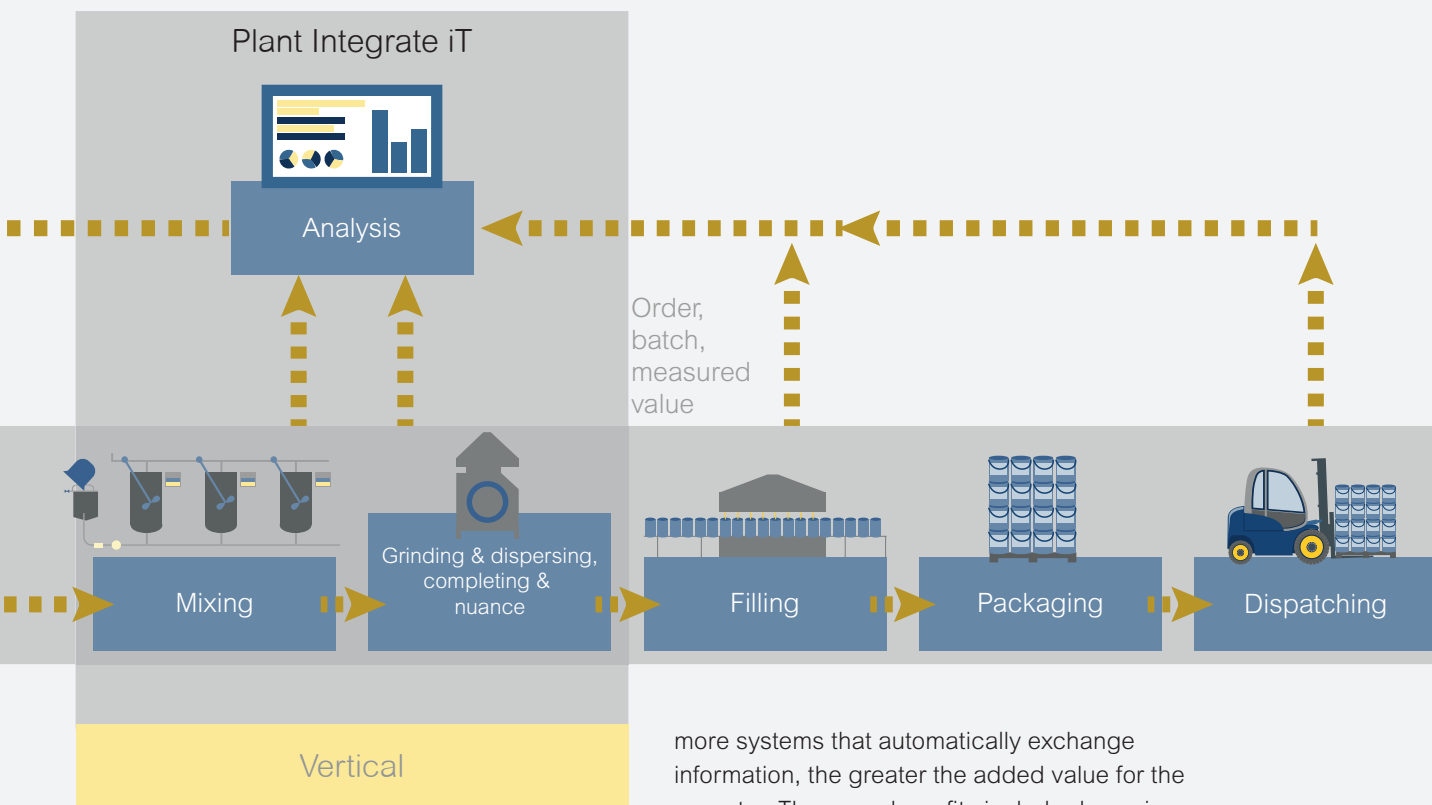
The smart factory

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 paint and coatings industry

These technical developments create new automation potentials for the paint and coatings 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

Plant Integrate iT

Analysis

Order, batch, measured value

Mixing

Grinding & dispersing, completing & nuance

Filling

Packaging

Dispatching

Vertical

optimization of production processes. Precise examples of existing Industry 4.0 approaches in the paint and coatings industry include automated quality assurance, which is accomplished in many companies with the help of sophisticated sensor technology, the paperless production 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. It also 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 paint and coatings industries, but the most important thing is: transparency. Potentials for optimization can be systematically uncovered with the aid of OEE key figures. 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 key figures 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. 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.

Paint and coating-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, line or produced container
- Fault analyses
  - causes of downtime and downtime per machine, line or product
- Consumption analyses
  - e.g. raw material / packaging materials per batch / order; waste / losses
- 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 order to comply 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.
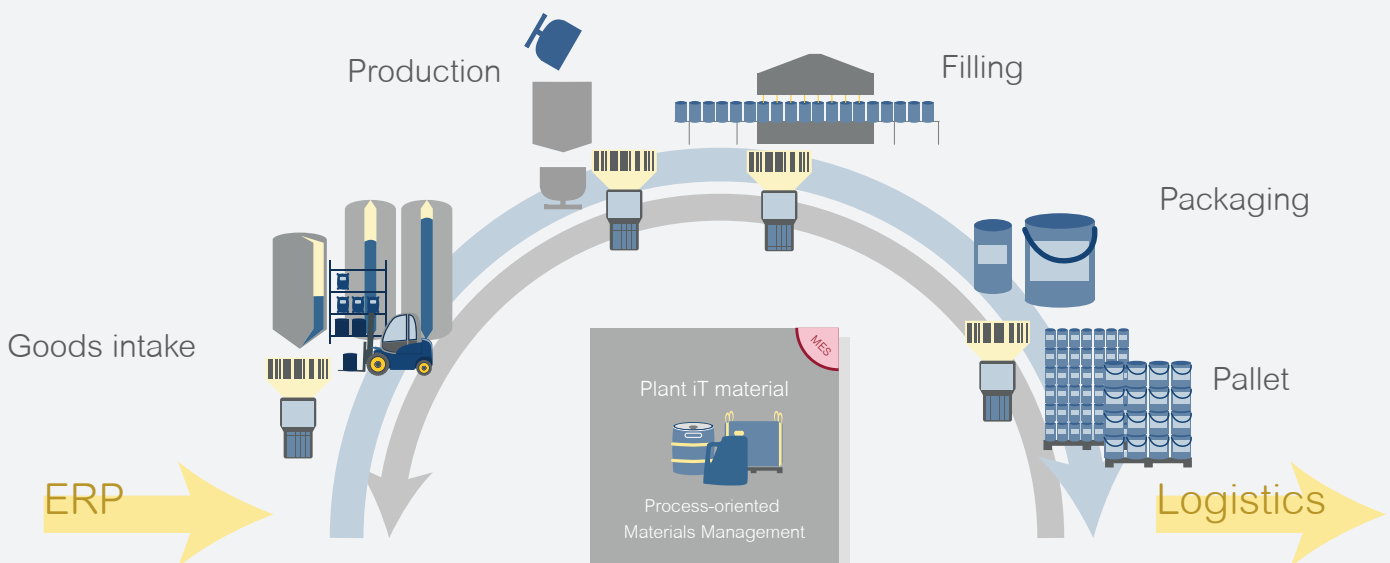
Starting at a freely selectable entry point, investigations can be carried out in both directions. An overview divided into predecessors (upstream) and successors (downstream) with a presentation of the information, similar to the warehouse and transaction overview, facilitates navigation.


Batch tracking

Batch report

For all challenges in the paint and coatings industry

- Order management
  - Goods receipt
  - Mixing
  - Grinding & dispersing
  - Complete & nuance
  - Filling
  - Packaging
  - Dispatching
- Recipe management
  - Acceptance of bills of materials and consumption feedback to ERP systems
  - Recipe changes to a current order
  - Manual component management
  - Recipe optimization
- Process-oriented materials management
  - Mapping the material flows across all process steps
  - Inventory management of all materials
  - Recording and processing of rework
  - Batch and product tracking
  - Loss analysis
  - ERP integration to optimize MRP processes

- 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 the manufacturers of paints and coatings
- Service and support
  - 24/7 support
  - System monitoring
  - Analysis and maintenance

The industry-specific solution for the paint and coatings industry

Scalable
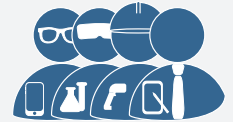
Demand driven

Industry-specific solution

Open, modular solution

High level of flexibility

Can be extended at any time

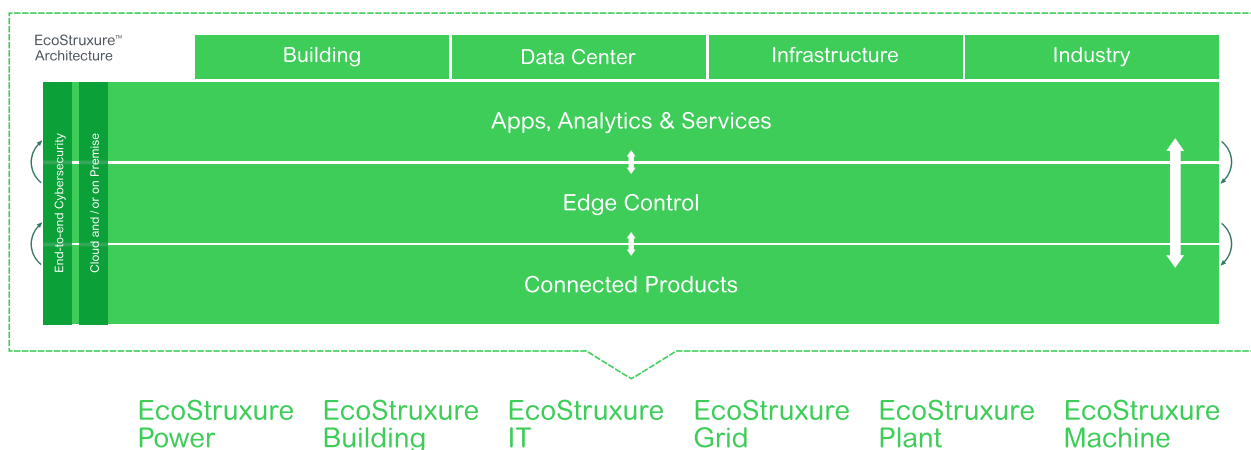Tested technology

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 chemical industry (including paints and coatings) and thus enable broad market penetration. Through its own EcoStruxure system architecture, 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.

EcoStruxure™
Innovation At Every Level

EcoStruxure™ Architecture	Building	Data Center	Infrastructure	Industry

End-to-end Cybersecurity · Cloud and / or on Premise

Apps, Analytics & Services

Edge Control

Connected Products

EcoStruxure Power · EcoStruxure Building · EcoStruxure IT · EcoStruxure Grid · EcoStruxure Plant · EcoStruxure Machine

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