Plant i.T.

Process Control Systems. MES inside.

Works with
Eco🔄truxure™

The IT solution for the dairy industry

ProLeiT.

by **Schneider** Electric

proleit.com

Integrated IT solution for the dairy industry

You have to set market trends to win customers. Increasing dairy industry requirements in terms of regulatory demands, quality assurance, water consumption, plant utilization, traceability and sustainability demand new approaches. The trend is towards highly automated processes from raw milk intake through processing to dispatch, as well as from the plant production control level to the business system and back. Integrated solutions are required to meet the demands of the networked dairy.

Due to increasing competition in the dairy industry, relaxation of milk quotas, and the increasing regulation across the supply chain, all production processes must offer the highest level of security and flexibility – from the raw material intake through processing to packaging of the finished product. The focus on sustainability and the need to drive down water and utility consumptions, while increasing product diversity and maintaining product quality is presenting dairy companies with new challenges. Meeting these new challenges is made possible thanks to an integrated manufacturing system which provides real-time control and monitoring of all manual and automated processes, whilst integrating all workflows from the ERP down to the sensor.

Integrated solutions with Plant iT

Plant iT is a modular process control system with fully integrated MES functionalities for all process areas in the dairy industry. Our industry specific product features dairy processing know-how combined with cutting-edge information technology, enabling data transparency from the operational to the planning level and at all stages of value creation. Our seamless integration between Process Control and Manufacturing Execution System (MES) provide production managers with new opportunities to overview and control the entire process chain from raw material delivery to the packaged product.

Plant iT and integrated dairy production

Since 1994 we have been understanding the needs of dairy plants large and small, delivering automation and information solutions for all dairy processing areas, in collaboration with the industry OEMs. Plant iT can cover the entire production process from raw milk delivery and storage, through thermal-controlled processing, ultra filtration, evaporation and spray drying, fruit kitchen, inline mixing and packaging lines until dispatch. Our modular architecture is built upon one concept, one database, one configuration environment, and one operator environment.

In cooperation with customers, plant suppliers, the Technical University of Munich (TUM) and the Friedrich-Alexander University Erlangen-Nuremberg, we are focused on delivering new standards for data collection, interfacing, and process optimization. Through various activities like the development of award winning control philosophies, or engagement in the Weihenstephan Standards (WS Pack) for data collection, our goal is to be the market leader for dairy industry solutions.

The requirements of industrial dairy production

IT controlled integration of all the processes

If you take a close look at dairies, you will often see process areas consisting of equipment from various plant suppliers, containing often bespoke systems, with little or no intercommunication. When there is integration, seldom is it focused on optimizing workflow both horizontally (process optimization) and vertically (business optimization). This heterogeneous system and equipment 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 an entire production facility which may comprise equipment for multiple manufacturers. This often results in the development of so-called "islands" which have, for instance, their own recipe management 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, for example temperatures, are not permanently recorded at these local automation systems. Pasteurization units, membrane filters, evaporators and dryers are good example of this.

Additionally, due to these disparate systems, the ability to create, co-ordinate and execute production batches across the dairy becomes highly complex, not to mention the complexity for materials management across the process. This often results in sub-optimal use of assets, increased product losses and waste, and above all, poor levels of information for management to drive educated decision making and continuous improvement. The lack of comprehensive batch reporting to manage quality, or an ability to utilize tracking and tracing to drive down and eliminate inefficiencies and losses is a major disadvantage for a modern dairy. The necessity of higher-order process management becomes apparent when further considering existing dispatching, storage and logistics systems. The flow of information becomes an even more critical factor for production areas which map a workflow manually with pen and paper, where production staff make production decisions based upon experience rather than codified rules. In these cases, human errors caused by manual recording, missing production data, or just the delay to enter data and subsequently take action can be one of the greatest sources of losses in a dairy.
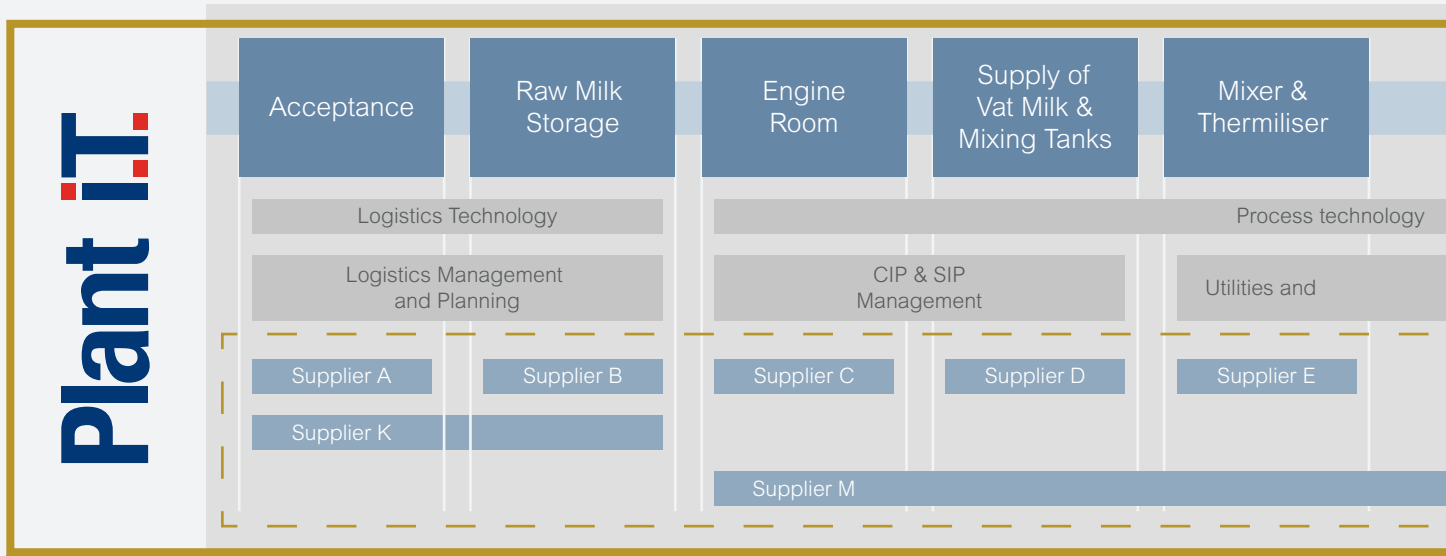
Plant iT offers the perfect solution

Plant iT is scalable enough to be implemented initially upon a single unit or completely across the dairy, making it suitable for both greenfield and brownfield dairies. For brownfields, irrespective of existing systems and requirements, Plant iT can process information from all process and packaging areas and assumes integrated process management thanks to proven and defined interfaces. Plant iT can initially integrate "islands" without full re-automation by interlinking the controls and workflow in order to, for example, specify order parameters as well as record, analyse 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. Plant iT additionally supports IFS certification.
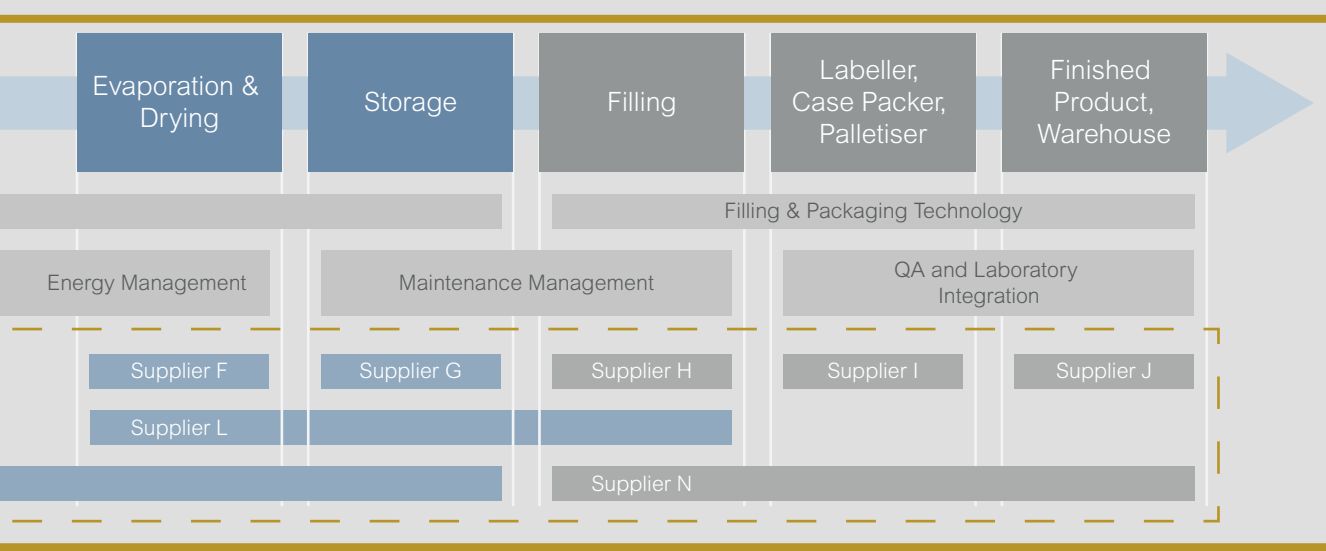
Process chain in industrial dairy plant

Plant iT.

supports the IFS certification

Acceptance	Raw Milk Storage		Engine Room	Supply of Vat Milk & Mixing Tanks	Mixer & Thermiliser
Logistics Technology					Process technology
Logistics Management and Planning			CIP & SIP Management		Utilities and
Supplier A	Supplier B		Supplier C	Supplier D	Supplier E
Supplier K					
			Supplier M		

Milk standardization

Analysis dashboards

Scanner applications

Quality management connection

MES

Scheduling acceptance

Green production

Industry 4.0

Consumption recording

Label printing

ERP interface

Inspection lot management

Evaporation & Drying	Storage	Filling	Labeller, Case Packer, Palletiser	Finished Product, Warehouse

		Filling & Packaging Technology	

Energy Management	Maintenance Management	QA and Laboratory Integration

Supplier F	Supplier G	Supplier H	Supplier I	Supplier J

Supplier L				

Supplier N

Web reporting

Packaging plant connection

Cleaning schedules

Batch management

Bills of material

OEE performance data

Foreign substances check

Dynamic residual batches

Plant iT

trolley detection

Integrated tracking and tracing

Audit Trail

Detecting optimization potentials

Line management

Integrated solution concept

Preperation
- Dynamic ERP process order integration
- Material mutation management
- Plant-wide order management
- Integrated SPC
- Integrated production order management
- Integrated control (separator / pasteuriser)

Cleaning & Sterilization
- Water usage management
- CIP / SIP recipe management
- Integrated cleaning scheduling
- CIP / SIP material tracking
- Automated CIP scheduling
- Automated Make-up and route management

Mixing & Fermenting
- Dynamic ERP stock & WIP updates
- Batch management
- Route management
- Process OEE and loss management analysis
- Dynamic recipe adjustment based upon BOM
- Dynamic unit control
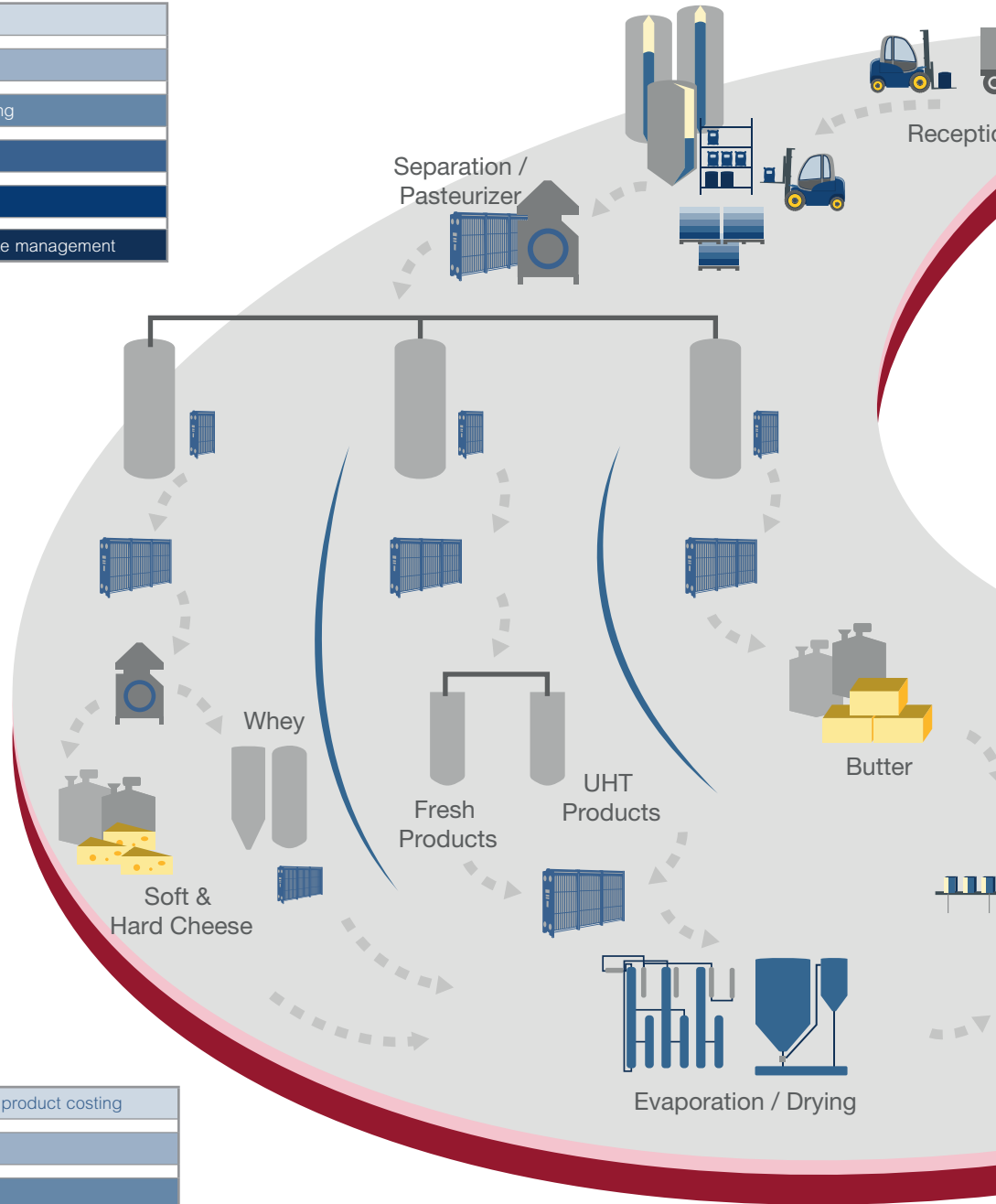
Evaporation and Drying
- ERP integration for realtime product costing
- Specification management
- Model predictive control
- Energy reporting & management
- Multivariable control and coordination
- Complex control (i. e. Auto-Tune)

Utilities Management
- Activity based costing
- Energy requirements integrated into recipes
- Mgmt. of water, air, gas, elect. & steam (WAGES)
- WAGES data collection, analysis and reporting
- Production recipes: energy as an ingredient
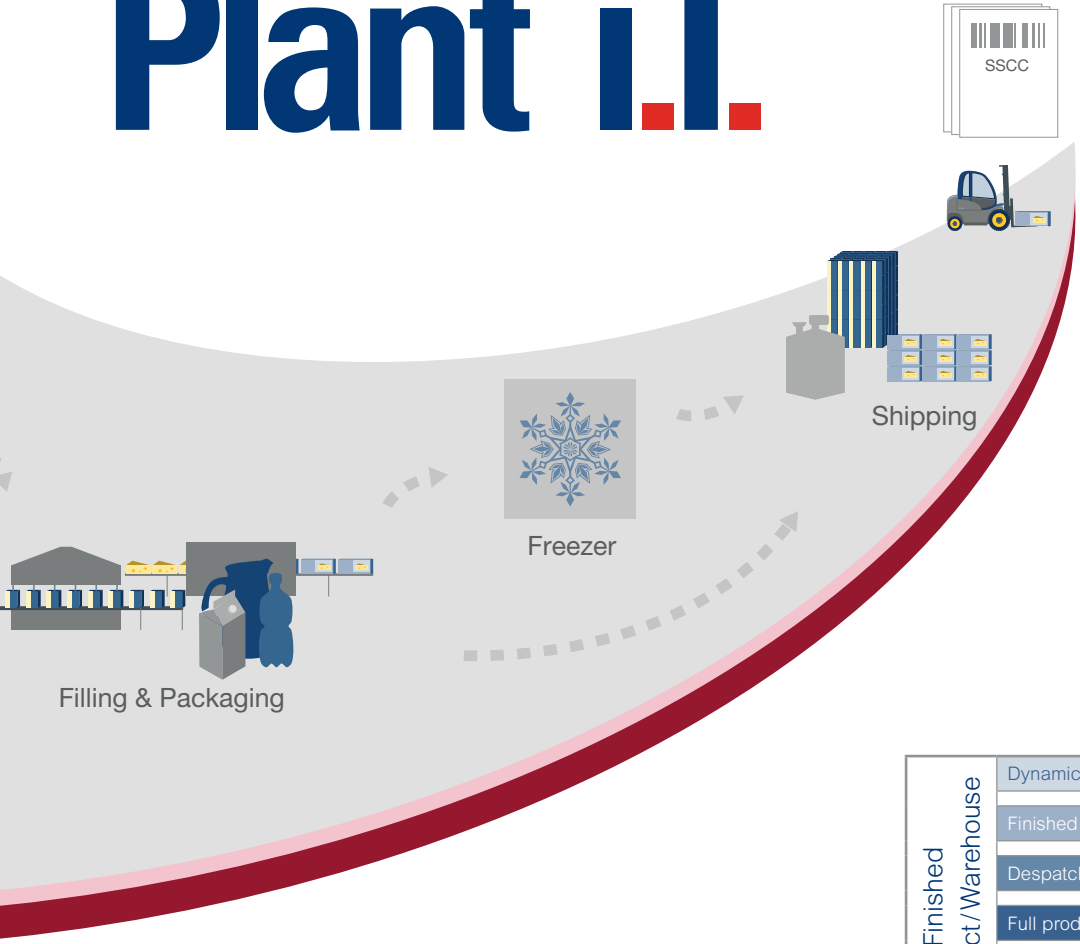- Process control to optimize utilities consumption

Reception

Separation / Pasteurizer

Whey

Soft & Hard Cheese

Fresh Products

UHT Products

Butter

Evaporation / Drying

Raw Milk Storage

Dynamic ERP/MRP Integration
Workflow Management (Inspection Instruction)
Intelligent Product Scheduling (FIFO/LIFO)
Quality Assurance Integration
Cleaning Control and Contamination Prevention
Route Management

Raw Material Reception

Execution Management
Raw Material Management, FAT & Protein Tracking
Vehicle and Tank Monitoring
Automated Material Booking and Tracking
Transfer Management
Tank Filling control

SSCC
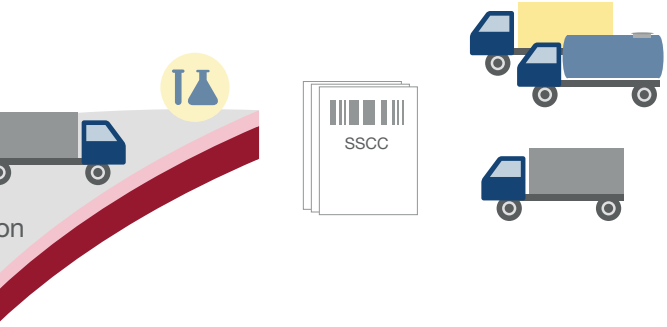
Plant i.T.

ERP	
MES	Execution Management
	Specification Management
	Resource Management
	Data Recording & Analysis
PCS	Process Management
	Process Control

SSCC

Shipping

Freezer

Filling & Packaging

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

| Dynamic ERP packaging order integration |
| --- |
| SKU and BOM tracking |
| Packaging order management |
| Packaging line management (OEE, etc) |
| Equipment scheduling and arbitration |
| Route management |

Plant iT and MES

A vertical integration

MES and PCS levels are often seen as two separate systems in one production plant. Disparate software systems, installed on multiple servers require significant interface engineering and administration overhead. Plant iT addresses this by providing a single system for both PCS and MES, built upon a single plant model, with a single configuration and user environment. Our lean approach significantly impacts your total cost of ownership. Furthermore, our integrated approach provides the perfect foundation for plant-wide information processing, increased efficiency for operations, maintenance and repairs as well as future extensions. Since 1986, ProLeiT has developed the system platform Plant iT, consisting of modules for applications 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 dairies, process-related materials management provides all the data on a real-time basis. This ensures rapid decisions on intervention in the process cycle during production. An essential criterion for the quality of these decisions is the accuracy and timeliness 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.
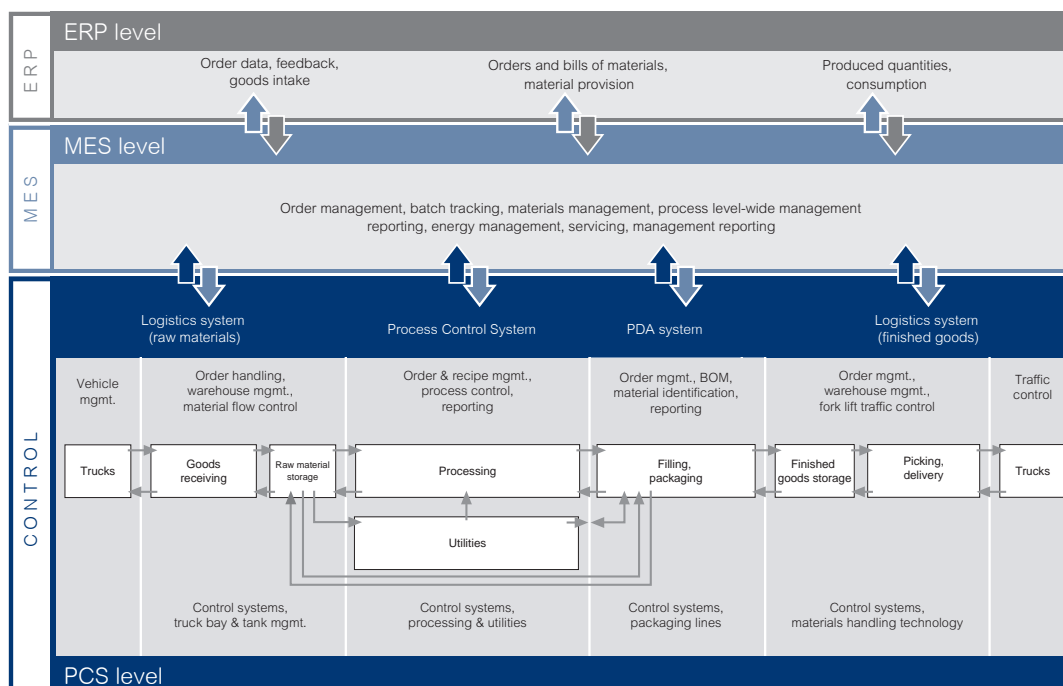

MES in the dairy industry

Furthermore, Plant iT can map the entire received raw materials with the respective workflow, integrating key process values into a comprehensive batch record. The modularity of the process control system Plant iT supports gradual implementation in the facility. Existing plant technology and processes can thus be integrated.

So ProLeiT has extensive project experience and numerous testimonials in the field of consulting, PCS and MES solutions implementation in the dairy industry.

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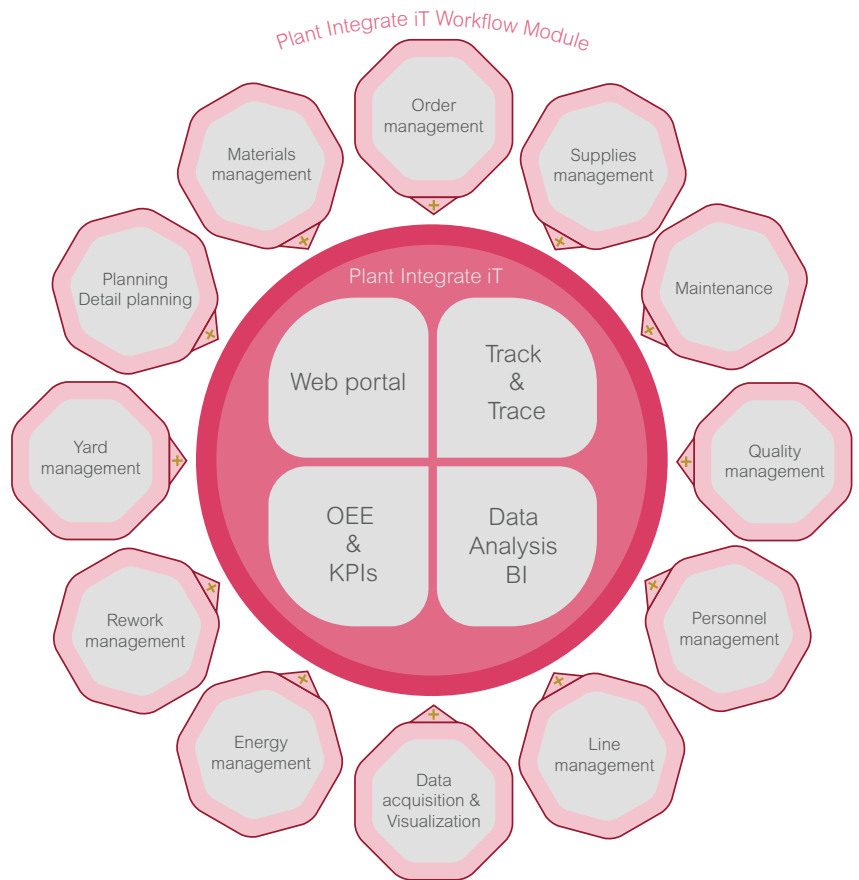
Manufacturing Execution Systems (MES) become the data hub between important areas of production. They answer, amongst other things, the following questions:

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 dairy industry
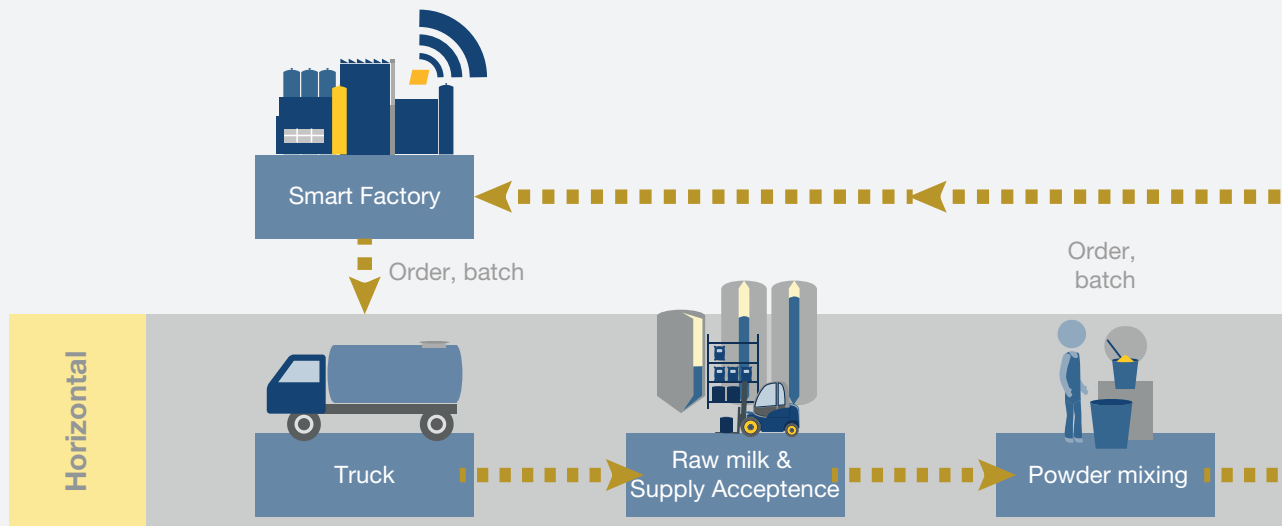
Rapid development, including an ever faster and more networked world of production, offers not only new opportunities but also creates new challenges. In this context, the keywords Industry 4.0 or Industrial Internet of Things (IIoT) are often used. Industry 4.0 is usually only associated with conventional 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.
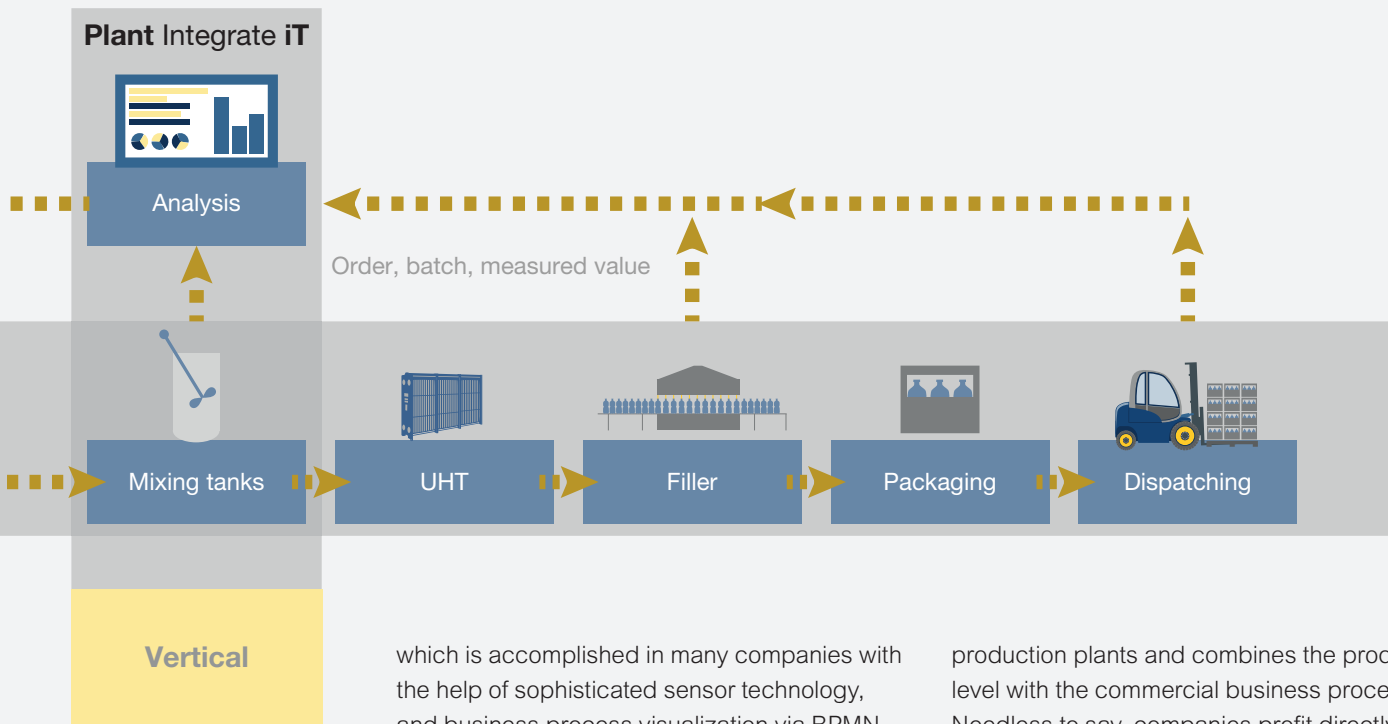
The smart factory

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 potential for the dairy industry

These technical developments are creating new automation potential for the dairy 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 dairy industry include automated quality assurance,

Plant Integrate **iT**

Analysis

Order, batch, measured value

Mixing tanks → UHT → Filler → Packaging → Dispatching

Vertical

which is accomplished in many companies with the help of sophisticated sensor technology, and business process visualization via BPMN (Business Process Model and Notation). Individual steps in work processes can therefore be displayed graphically – operators can see at a glance where problems arise in parallel processes, e.g. during goods receipt or when controlling goods replenishment, and can remedy them as quickly as possible and in a forward-thinking fashion. This helps to prevent extensive downtime, long waiting periods and time-consuming troubleshooting. A further example of Industry 4.0 approaches is the possibility of tracing products in a paperless manner 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 key figures 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 dairies, 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.

Dairy-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
- Consumption analyses
  - e.g. dosing reports
  - e.g. CIP analysis
- Golden batch analyses
  - e.g. process value comparison
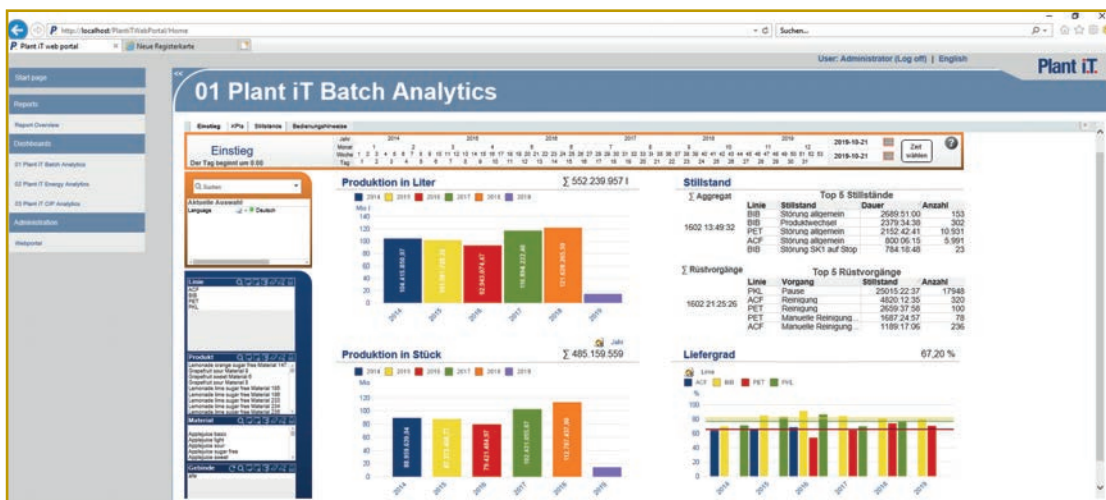
Plant iT screenshot of an OEE display

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.
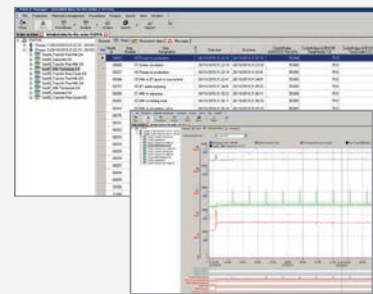
The reasons for this are not only the increasing demands of retailers and the desire for greater transparency on the part of end consumers but also the economic damage caused time and again by costly product recalls. Clear identification and the complete traceability of goods throughout the entire production 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. Thanks to this traceability, all material transfers are recorded using a paperless method. Operators thus benefit from the perfect overview and can, for example, easily and quickly identify any material losses.
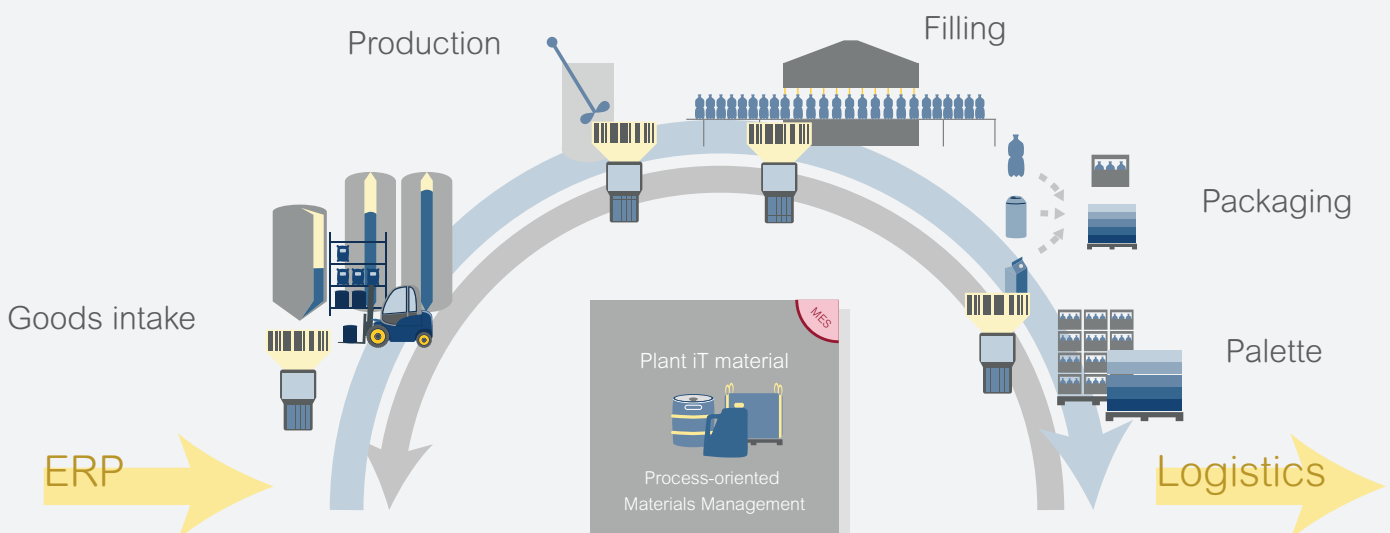
Starting at a freely selectable entry point, investigations can be carried out in both directions. An overview divided into predecessors (upstream) and successors (downstream) with presentation of the information, similar to the warehouse and transaction overview, facilitates navigation.


Batch tracking

Protocol

Goods intake

Production

Filling

Packaging

Palette

Plant iT material

Process-oriented Materials Management

ERP

Logistics

For all challenges in the dairy industry

- Order management
  - Goods receipt
  - Raw milk reception
  - Tank farm management
  - Asset and route management
  - Processing (milk, butter, cream, cheese, powder, etc.)
  - Weighing and dosing
  - Packaging
  - Dispatching
- Recipe management
  - Integration to ERP system
  - Integrated bill of materials management with consumption and production feedback
  - Dynamic recipe changes (target quantities, water/moisture content, etc)
  - Manual component management, control and integration within the batch execution
  - Recipe optimization while adhering to milk standards
- 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 utilities management
  - Utilities data acquistion per batch
  - Utilities statistics and consumption reporting
  - Integration to ERP to enable activity based costing
  - Load management, intelligent scheduling and shedding
  - Integrated recipes, treating energy as an ingredient
- Quality management
  - Cleaning and sterilization management and recording
  - Integration of laboratory systems
  - Workflow management for QA relevant inspection processes
  - Operational data acquisition and batch recording
  - Process KPIs and loss analysis reporting
  - Integration of HACCP into process workflows
- Process management
  - Plant-wide visualization and control
  - Integrated user management and process security
  - Integrated control for both batch and continuous process
  - Process historian complete with Plant iT Visu-Recorder to drive continuous improvement
  - Class based concept, simplifying the implementation of required process control strategies
- Service and support
  - 24/7 support
  - System monitoring
  - Analysis and maintenance
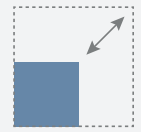
Scalable

Demand driven

Industry-specific solution

Open, modular solution

High level of flexibility

Can be extended at any time
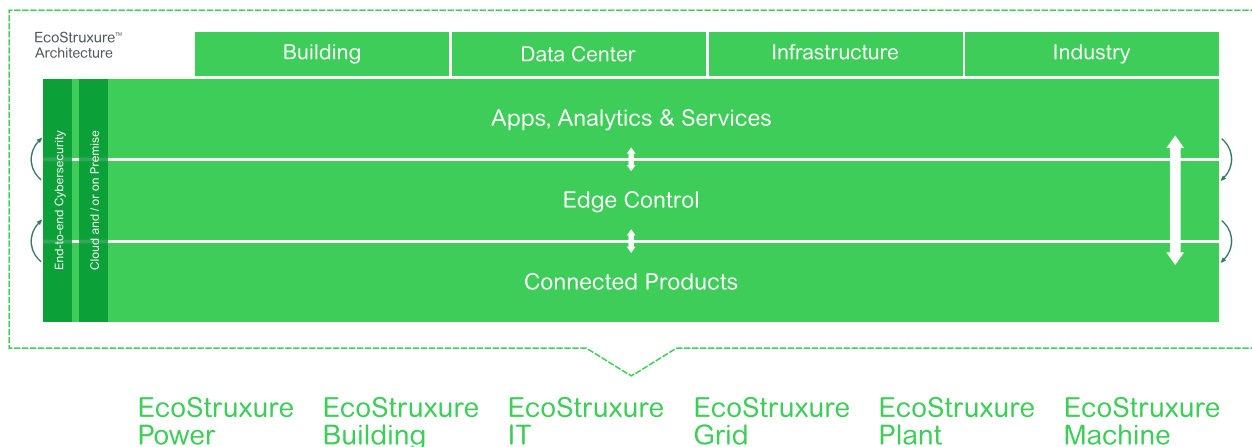
Tested technology

High level of standardization

EcoStruxure^{TM}

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.

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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