

certified by experience

**ProLeiT**



**based on Siemens PLC's**

Process control technology. MES included.



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## System solutions combined with sector know-how

ProLeiT provides complete automation solutions for the process industry. The whole sphere of automation and information technology from the field right up to the company management level is covered by extensive process know-how in the brewery, soft drinks, dairies, food, chemicals and pharma.

ProLeiT provides turnkey automation solutions beginning with concept development and compilation of the specification and including software generation and commissioning.

### The range of services includes:

- Compilation of user requirements and system specifications
- Conception, engineering, delivery and commissioning of
  - Hardware for control technology, including networks,
  - Engineering of process control systems with an emphasis of recipe-controlled batch processes,
  - Production data acquisition and management
  - MES functions for order management, batch and product tracking, management reporting
- Horizontal integration of all process layers and vertical integration of all system levels right up to connection of ERP systems (e.g. SAP R/3)
- Qualification of process control technology for plants with obligatory validation

### ProLeiT – the System Supplier

ProLeiT develops and markets technology-oriented process control systems under the brand names *Plant iT* and *brewmaxx*. *Plant iT* provides ProLeiT a system family that covers control requirements from the controller level up to the manufacturing execution level. The system family comprises the component-based *Plant Direct iT* process control system with technology-oriented recipe controlling, *Plant Liqu iT* for liquid products and *Plant Batch iT* with integrated materials management for demanding batch processes with extensive recipes.

*Plant Acquis iT* provides an efficient component for process and production data acquisition that ensures IT integration of complex automation environments with *Plant iT* integrate. The practically unlimited scalability of ProLeiT systems means that security of investment is guaranteed. In-house system development and sector-oriented targeting by the company ensure the necessary competence to be able to develop and implement customer-specific solutions both rapidly and cost-effectively.

**Standards adhered to by Ourselves and our Customers**

- **EU Regulation 178/2002**  
Regulation on foodstuffs safety, regulating in particular the requirements of batch traceability for foodstuffs and animal feed.
- **EU Regulation 1935/2004**  
Supplement to EU Regulation 178/2002, which regulates in particular the requirements of batch traceability for materials and objects that come into contact with foodstuff and animal feed
- **GMP (Good Manufacturing Practice)**  
Guideline to the quality management for industrial production processes and environments in the pharmaceutical, food and animal feed industry
- **FDA 21 CFR Part 11**  
FDA Regulation on operations documentation (audit trail) and batch documentation (electronic batch record) with electronic signature
- **ISO 9001:2000**  
Established norm for quality assurance in relation to company processes
- **QS System (Quality and Safety)**  
Standardized test procedure for reliability of guarantee of origin for production, processing and marketing of foodstuffs and animal feed
- **IFS (International Food Standard)**  
International safety standard for producers of foodstuffs for requirements relating to quality management systems, accountability of management, resource management and the manufacturing process
- **GTP / Coceral (Good Trading Practice)**  
Simplified quality assurance system for storage, preparation and transport of cereals and other crops
- **HACCP (Hazard Analysis and Critical Control Points)**  
Standardized procedure for risk analysis and risk management



### From brewer to brewer

*brewmaxx* is the result of many years of intensive cooperation between ProLeiT and GEA Huppmann. The control system was specifically developed for the brewing industry and combines extensive IT experience and expertise in brewing technology. With more than 400 applications worldwide, *brewmaxx* counts among the world market leaders for brewing process control systems.

## Joint success in brewing

Based on the components of *Plant iT* a practical, user-oriented system accrued that enables tailor-made solutions for the brewing industry.

*brewmaxx* provides the complete functionality to fully automate a brewery.

- Malt transport and silo plants
- Grist milling (wet and dry milling)
- Brewhouse (mashing, straining, wort boiling)
- Fermenting room and storage cellar, yeast store
- Filtration, bright beer tank cellar
- Auxiliary operations (CO<sub>2</sub>, refrigeration plant, waste water, water treatment)
- Energy data acquisition and load management

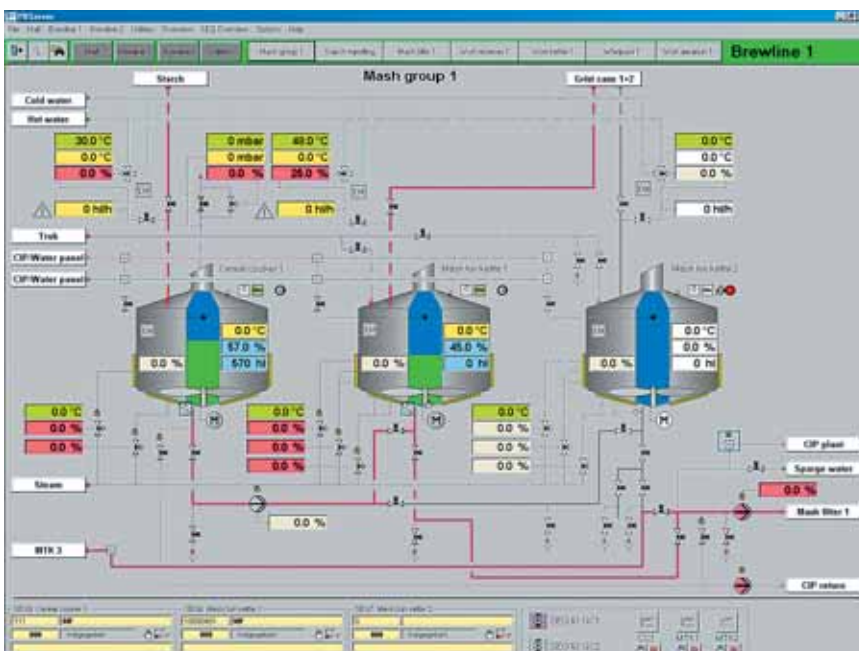
*brewmaxx* also includes additional MES functions such as job management, graphical recipe handling, comprehensive materials management with batch tracking and a powerful report system. The possibility of data exchange to ERP or LIMS systems using standardized interfaces is also provided.

The continuous automation of a brewery of course also includes utility plants. Here we can refer to a number of applications based on *brewmaxx*:

- Building system control, high-bay warehouse and ventilation plants
- CO<sub>2</sub> plants
- Water supply
- Water treatment plants
- Wastewater plants
- Cooling plants



Process graphics of the brewing vessels in a brewhouse



# brewmaxx

The following sector-specific solutions have emerged in recent years under the *brewmaxx* brand and based on the *Plant iT* system platform:

- Task planner for automated start of brews
- Equipment modules
- Route control
- Task planner in combination with selector for fermenting and storage cellar occupation
- Silo management for raw materials
- Graphical sequence overview
- Video mode
- Control and route matrix (OCM)
- Class for contamination areas
  
- Energy data management
- Intelligent load management
- Production data management for filling lines
  
- Material management/ Tracking & Tracing
- Production and effectiveness reports (DIN, OEE)
- Inter-departmental management reporting



*Brewhouse of the Royal Grolsch Brewery in Enschede/NL*



*Fermentation cellar of the Yanjing Beer Group Beijing/China*

- Link to ERP systems (e.g. SAP/R3)
- Link to LIMS (e.g. PerkinElmer, Labbase)
- Connection of inspectors (e.g. RECOP, Heuft)

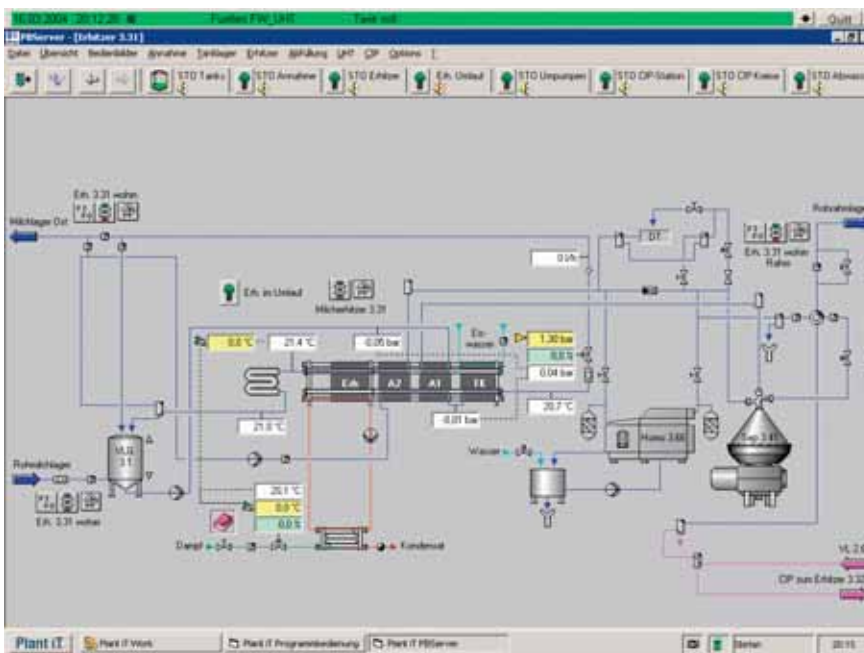
## The milk business

There is constant flux in the sphere of milk production and processing, leading to progressive developments in the field of automation and production control systems. We are developing and refining software solutions for the milk processing industry in cooperation with our customers, milk business associations and institutes.

The consistent, open and flexible *Plant iT* process control system provides the ideal software structure for dairies and producers of fresh milk products whether for new installations or as replacements for existing automation systems.

The following user-specific solutions have emerged in recent years in the field of *Plant iT* system platforms in the dairy sector:

- Material management
- Order list for production, cleaning and filling
- Recipe-controlled program sequences
- Integrated tank and route control
- Integrated monitoring functions for tanks and conveying routes
- Technological classes for aseptic plant areas (e.g. steam barriers)
- Combination of continuous and discontinuous processes for the manufacture of baby food with ingredient identification via label printer and barcode reader to ensure tracking & tracing
- Data acquisition and display facilities for milk heaters according to EU regulation 852/2004
- Production data acquisition and processing for filling plants for drinking yogurts with materials identification and batch traceability, including production
- Batch traceability (forward and backward) according to EU Regulation 178/2002
- Company-wide reporting
- Connection of various ERP systems (e.g. SAP/R3, FELIX, CSB)
- Connection of LIMS (Laboratory Information Management System)



Process graphics of the milk heating plant of a dairy

## ProLeiT sector expertise

Our know-how is based on long-term cooperation with machine and plant constructors with whom we have jointly automated a wide range of plants.

- Milk delivery
- Heating lines and coolers
- Separator control
- Storage tanks
- Fermentation tanks
- Maturing and culture tank storage
- Mixing systems and mixing tank storage
- Mixers and whisking machinery
- Powder handling plants
- UHT plants
- CIP/CIPAL plants
- Evaporation plants
- Drying plants (e.g. spray dryer)
- Milk and whey silo plants
- „Nizo“ tank, butter machines
- Curd cheese lines
- Fruit cooking plants
- UF, NF, MF, RO membrane plants
- Retentate and permeate tank storage
- Lactose plant
- Cheese production, dairy plants
- brine bath control
- Mozzarella production plant
- Cooling plants/iced water storage
- Heat recovery plants

*Plant iT* guarantees the necessary flexibility for the milk industry for modifications during running production just as it does for rapid product changes and adaptations to market requirements.



*Milk heating plants at Sachsenmilch (Müller Group), Leppersdorf/Germany*

Our experience in the sector is reflected by numerous products with varying recipes:

- Skimmed milk
- Standardized milk
- Fresh milk, ESL- and UHT-milk
- Milk-based drinks
- Cream
- Butter
- Yogurt
- Fruit preparation
- Dessert
- Pudding
- Sauce for yogurt/pudding
- Curd cheese
- Fresh and sour milk cheese
- Mozzarella cheese
- Sliced cheese
- Drinks with fruit/whey
- Milk, whey and lactose powder
- Whey protein
- Bioethanol production from molasses

Flexible, reproducible production is of vital importance in the areas of pharmacy, classical foodstuffs production by means of mixing and canning processes and in the fine chemicals industry. Our long-term experience in these sectors is based on concept development and realization of consistent automation solutions.

## Pharma, Food & Chemicals

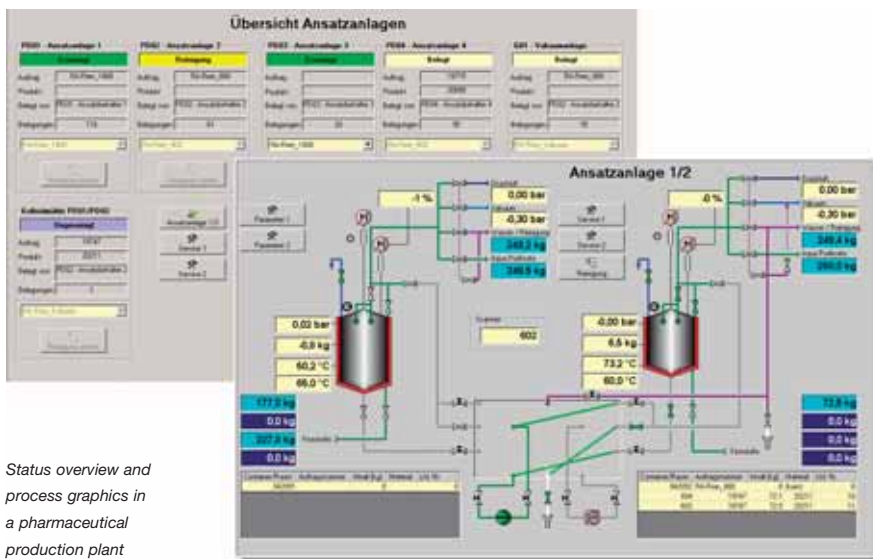
Close cooperation with our customers, with their machine and plant

suppliers and with renowned universities ensures the innovativeness of our solutions competence for these sectors. We compile tailored solutions for your requirements.

The basis for our successful projects is formed by concept studies, tender documentation, system specifications. One of our core areas of expertise consists of renovation projects with a changeover to *Plant iT* without any significant interruptions to production. Successful migrations have been executed from various automation systems to *Plant iT*.

We have been able to build up the following sector-specific know-how:

- Technical classes for network and device diagnosis of
  - PLC
  - Clients
  - Server
  - Distributed I/O systems
- Technological classes for
  - Mechanical conveying and route control
  - Frequency converter (e.g. Danfoss VLT, SEW, Simovert)
- Technological classes for weighing technology
  - SIWAREX U/M
  - Schenck Disocont / Disomat
  - Systec IT9000
  - Software scales
- Batch system according to ISA 88
- Order and recipe management
- Integrated materials management
- Tracking & Tracing (process-related)
- Electronic batch recording with batch-related messages and graphs
- Electronic signature
- Recipe optimization
- Tracking & Tracing (factory-wide)
- FDA-compliant reporting
- Label and barcode handling
- Link to ERP systems (e.g. SAP/R3, CHARISMA, FOSS)
- Link to LIMS (e.g. Unilab)
- Connection of existing weighing systems



Status overview and process graphics in a pharmaceutical production plant

## ProLeiT sector expertise

We have comprehensive technical and technological know-how for the following sectors:

### Food

Plants for production of

- Bread products (large bakeries)
- Fruit syrup
- Fruit juices and soft drinks
- Sausage products (meat processing)
- Foodstuffs – raw materials and aromas
- Fruit mixtures (fruit kitchens)
- Enteralia

### Pharma/Cosmetics

Manufacturing plants for

- Active ingredients (primary pharmaceuticals)
- Pharmaceuticals (weighing/mixing, production of emulsions/coats)
- Cosmetics

### Chemicals/Fine Chemicals

Manufacturing plants for

- Washing products (dry/tablets/liquid)
- Wax ester
- Cleaning materials
- Adhesives
- Fuels from renewable primary products
- Synthetics and synthetics products (extrusions)



*View of the production plant of Lichtwer Pharma AG Berlin/Germany*

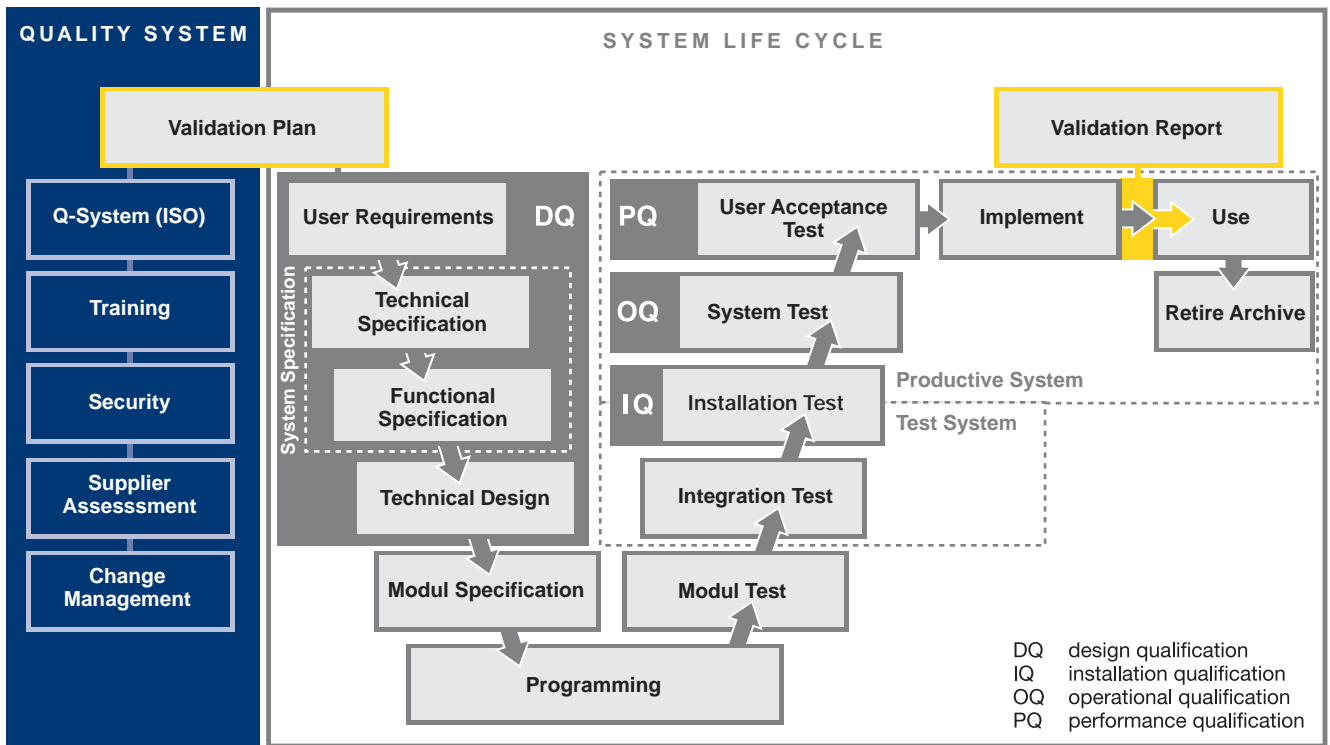


*View of the production plant of Lichtwer Pharma AG Berlin/Germany*

### Miscellaneous

Manufacturing plants for

- Salt (extraction, processing and conditioning)
- Mixed feeds
- Building materials (stucco finishes, concrete additives and flooring)
- Seeds (and in particular seed coatings)



## Right from the start of the project the processes are under control

GMP-compliant project management guarantees effective and efficient cooperation with our customers.

Depending on their requirements and the type of project (new plant, extension etc.) the peculiarity of the individual project

phases varies, but the whole process remains the same. We offer the complete range of services for all project phases right up to the 24-hour hotline after commencement of production.

When generating a user requirement specification we compile, structure and verify the requirements in close cooperation with the operator, finding the optimal concept together and using our cross-sector experience.

The system specification is based on the user requirement specification and provides a complete description of the technical and technological (functional) solution concept. The joint search for the best solution is also the focus during this stage.

During technical design phase, the solution concept is to a large extent engineered immediately (parameterized). Application modules (technical or technological *Plant iT* classes or customer-specific application software) are only developed and tested prior to utilization in the system context for functions that cannot be represented with the standard.

The executable test system is subjected to the integration test or FAT (Factory Acceptance Test) together with the customer.

Delivery only follows upon successful conclusion of this test. Subsequent commissioning is divided into technical and technological commissioning, whereby each part is completed by means of a test (installation and system test) before the next step is begun.

Conclusion of technological commissioning, i.e. of step-by-step commissioning of complete production sequences, constitutes the acceptance and performance test (SAT, Site Acceptance Test), successful conclusion of which is a prerequisite for handover of the system to the operator.

### Constructing complex plants

Production, bottling and packaging lines and also utilities are equipped by machine and plant suppliers with their preferred automation systems, the implementation of which is characterized by:

- Local operation/monitoring (isolated applications)
- Unavailable or only rudimentarily available production data acquisition and archiving
- Proprietary system concepts and operating philosophies (hardware and software technology) with minimal orientation towards integration into a standardized overall concept

### The objective

The primary objective of procuring a process control system or a production data management system stems from the development of a central view on all process levels with regard to uniformity and integration of the

- Operating philosophy,
- Production and machine data acquisition,
- Data archiving.

Further system functions among these aspects that are to be optimally configured are

- Administration of orders, recipes and bills of material including batch-related production data acquisition
- Material related view for all sequences within the overall process,
- Cross-division reporting,
- Tracking & Tracing
- Data provision in standardized form for
  - ERP systems,
  - Production planning,
  - Logistics systems including warehouse management,
  - LIMS systems,

- QM systems,
- Energy management systems and
- Maintenance systems.

- Key performance indicators for efficiency evaluation

### The significance of interfaces

The principles of uniformity and continuity necessitate the specification of interfaces in the case of integration of external subsystems in relation to

- their technical configuration (communications mechanisms) and
- the technological content to be transferred.

This applies regardless of the plant area (e.g. logistics, laboratory or service) and in particular to SCADA integration of package units. Among these are:

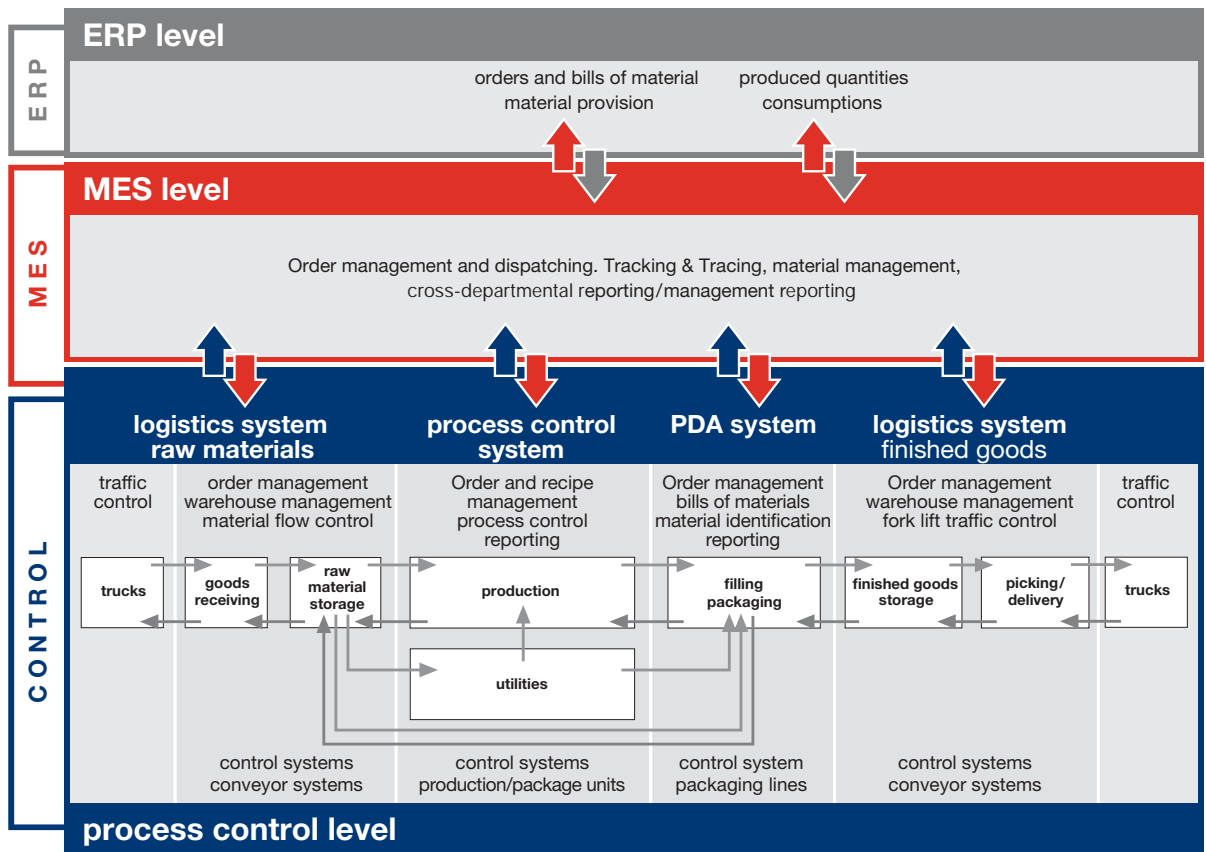
- Switching between local and central operation or
- Data specifications (formats and storage locations)

as well as definition of content to be transferred such as:

- Order data (order/batch ID, setpoints and actual values)
- Commands and responses for central operation
- Material-related data (SSCC number of a raw material, sample result) or
- Measurement data to be displayed

### The result

Complete implementation leads to a uniform and integrated system across the entire process chain from goods receipt and a raw material storage through production, bottling and packaging up to picking and delivery.



## Efficient organization of logistics and production

Our customers' success is from the perspective of a production management system fundamentally dependent on the following factors:

- Targeting of maximum effectiveness and efficiency with minimal costs relating to the life cycle of the whole system, i.e. the interplay of all production and ancillary processes right up to purchasing, disposition and delivery
- Optimal process transparency as an effective support mechanism for quality management
- Ensuring compliance with applicable statutory requirements, in particular in relation to batch traceability and accountability

System integration is the key to achieving these targets. To this end, we provide our customers with active support by keeping an overview of the complete solution during joint work on the concepts. In addition to the conception of the core system, this also includes integration of existing systems and consideration of the requirements of a step-by-step realization and ensuring consistency of accumulated production data regardless of the project phase.

The result is a system solution in which:

- *Plant iT* forms a central platform for production management
- All process layers from receipt of goods to delivery are horizontally integrated
- All systems from the ERP system to the subordinate control system of a package unit are vertically integrated.

# Plant iT and MES

Historically speaking, it is the view on discrete manufacturing processes that has characterized the understanding of MES. In discrete manufacturing comparatively large numbers of highly specialized manufacturing units work nearly autarkic. Normally they are only connected by different equipment for material transport. For the plant wide acquisition

In discrete manufacturing, functions are implemented in superordinated systems. In contrast to that, they are directly required in process industry for the entire control level. For that reason MES has to be a Manufacturing Execution Solution where essential parts of the required functionality can be directly integrated in the process control level, depending on production and organizational requirements. By doing so, the technological characteristics of the production process can be ideally integrated in the overall solution.

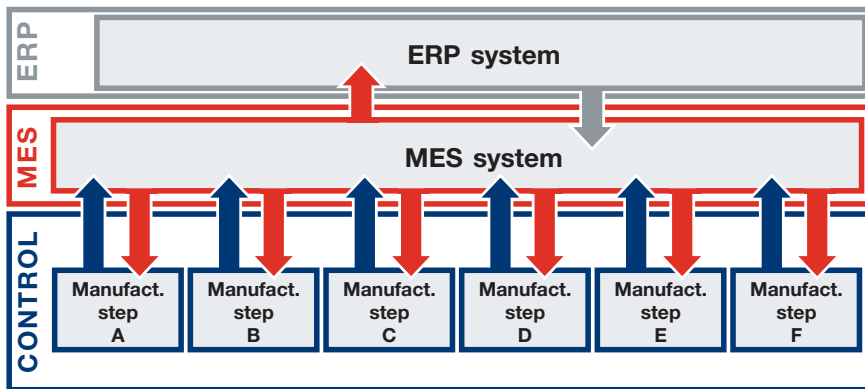
Leading institutions share this approach to MES for process industries:

- NAMUR, an international pool of users for automation and MES in process industry, postulates that MES functionality is to be considered as an integrated part of process control technology.
- According to a survey by Gartner Group, ERP systems tend to merge with the process control level, so that classical MES systems are going to be replaced in the near future.

### Material management online

Material management is one example for the importance of a seamless integration of MES functionality in the process control level.

One of the most important decision criteria within many processes is the availability of materials, e.g. normally raw materials and supplies. Often, decisions have to be made very quickly and spontaneously during running production. The quality of these decisions strongly depends on the timeliness of information regarding quantity in stock, local availability and the quality status of the materials to be used. The most efficient system is one where up-to-date information is permanently available online, without depending on data exchange with an external system.



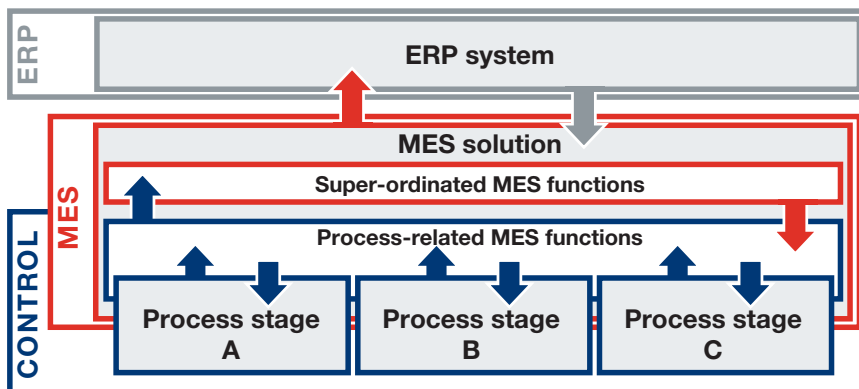
MES approach in discrete manufacturing

and processing of production data as well as the optimization of production processes there is functionality required that can only be provided by means of additional infrastructure, the MES system.

### Solution instead of system

Compared to discrete manufacturing, the number of process stages necessary in process industry is rather small. However, due to process-technological interferences between the different process stages, the required level of integration and the complexity of information exchange are significantly higher.

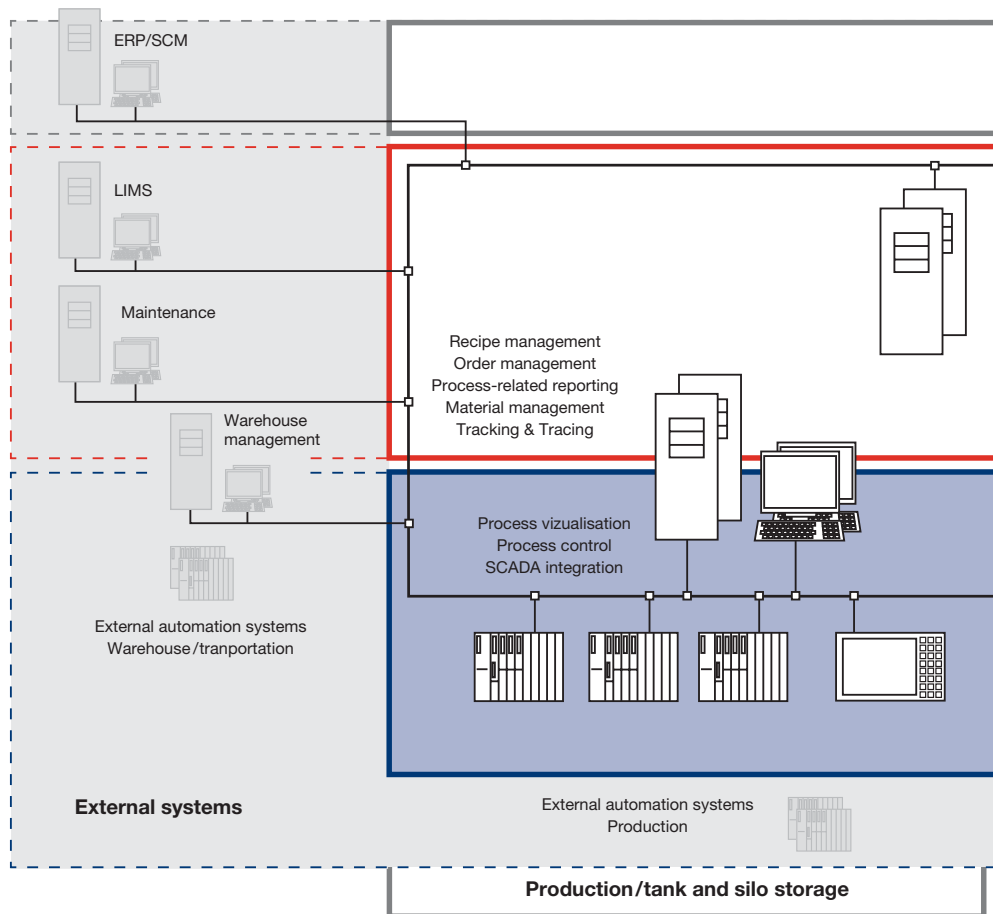
MES approach in the process industry



# Plant iT

## at a glance

*Plant iT* is a modular system platform for the process industry with a PLC-based process control system as its core component. The client-server of the system in combination with one central database and object-orientated engineering form the base for an almost unlimited scalability from a single station system up to multi-server solutions for complete sites. Graduated redundancy concepts – starting from basic RAID solutions up to failure-tolerant server systems – meet the competing requirements of economic efficiency and safety. The system is field-proven in a large number of applications worldwide.



### **Plant Direct iT – Process control system**

Originally being developed for the food and beverage industry *Plant Direct iT* now provides a large spectrum of application for almost all areas of the process industry. It fulfills the requirements for safety and transparency in controlling production processes, but at the same time it provides the maximum of openness for the integration of existing control systems and flexibility for modifications during running operation. With its class concept (technical and technological automation objects with encapsulated functionality) *Plant Direct iT* provides a future-proof basis for solving control and process technological tasks.

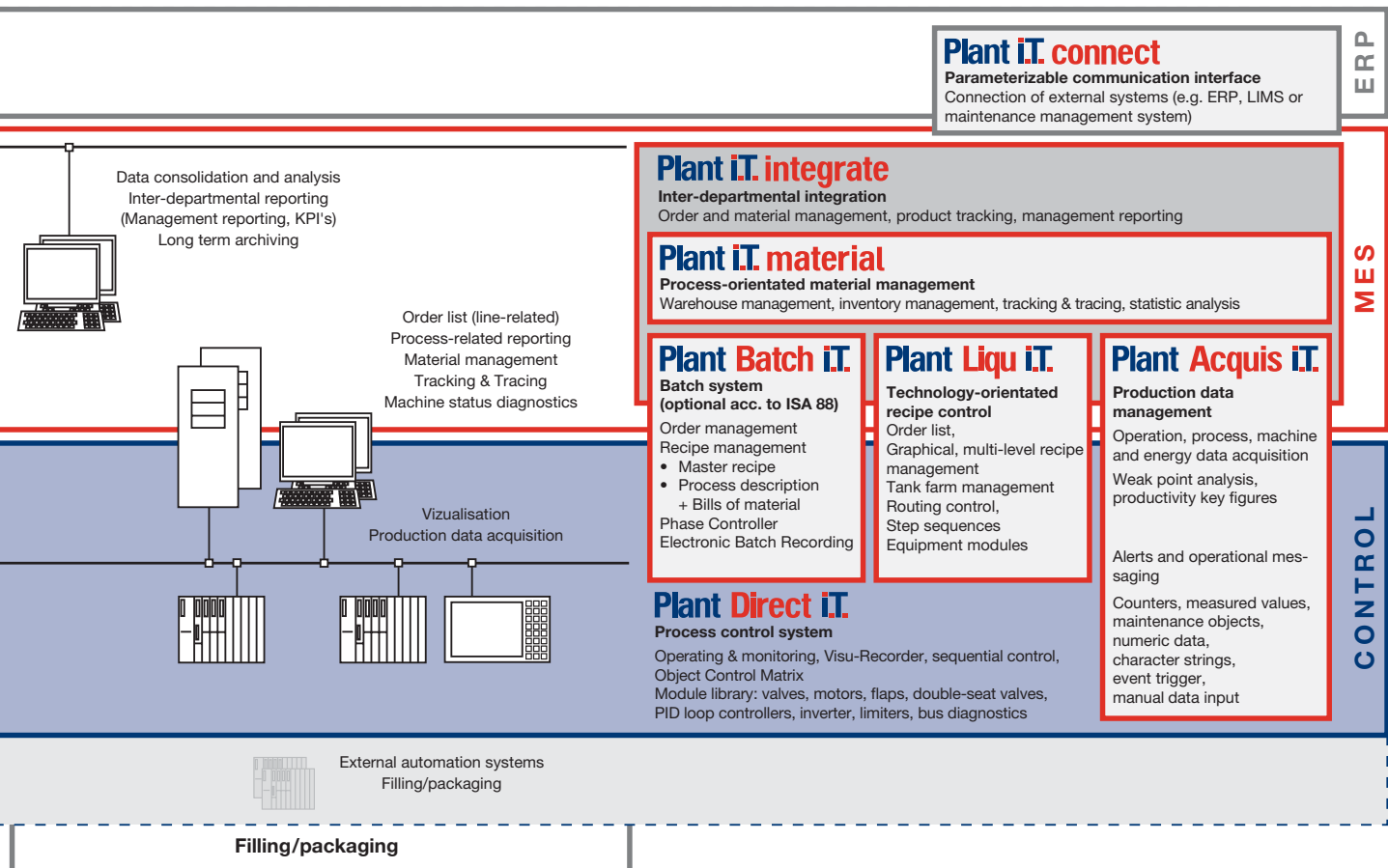
### **Plant Batch iT – the Batch-System**

*Plant Batch iT* is the system component for handling of recipe-controlled batch processes. The combination of recipe, order and resource management with the seamlessly integrated process control system *Plant Direct iT* provides optimal transparency and safety for the process. Also due

to being tooth pitched with *Plant iT material* the system complies with the current standards from physical process modeling up to Electronic batch recording as well as Tracking and Tracing. Depending on the requirements *Plant Batch iT* provides a selection of recipe models, starting from production strictly according to ISA 88/ DIN IEC 61512 through master recipes with simplified structure to production based on bills of material.

### **Plant Liqu iT – technology-orientated recipe control**

*Plant Liqu iT* was developed by consequent continuation of the *Plant iT* class concept as a supplement to *Plant Direct iT*. Originally created for use in breweries, it has in the meantime become a high performance system also for soft drink production and the dairy industry with special functions for complex liquid handling that are required in these areas. *Plant Liqu iT* enhances the process control system especially by the sequential control of processes based of



the combination of procedural components with product specific parameter sets. This technology.orientated recipe control allows to efficiently control even the most complex processes.

**Plant Acquis iT – Production data management**

The powerful production data management system can be used stand-alone as well as in combination with *Plant Direct iT*, especially also for hybrid processes, i.e. production dominated by process technology combined with adjoining areas of discrete manufacturing (e.g. filling and packaging plants). Operation, process, machine and energy data acquisition can be done continuously, event-triggered or by manual input. Standardized interfaces on technical (e.g. OPC) and on technological level (Weihenstephan standards for production data acquisition in beverage packaging lines) simplify the automatic data acquisition, but it can also be done in an applicationspecific way for other kinds of automation systems.

Purely time-related but also shift, order or batch related analysis is possible.

**Plant iT material – Process-orientated material management**

*Plant Direct iT* as well as *Plant Acquis iT* can be combined with this system component and with it provide important functions for material-related production processes. The recording of all material movements accurate to the single transaction is based on a warehouse structure that is flexibly parameterizable to fit the process. It enables detailed inventory management and – in combination with a super-ordinated order management – *Plant iT material* also provides comprehensive tracking and tracing functionality.

**Plant iT integrate – Interdepartmental integration**

*Plant iT integrate* enables the integration of different production areas, which are working more independently on the more process-related level. It is the central instance

for interdepartmental collection, consolidation and aggregation of information from these areas as well as external systems which are relevant to production (e.g. LIMS, maintenance management). On this basis *Plant iT integrate* provides a substantial, flexibly configurable reporting on MES level.

**Plant iT connect – The parameterizable communication interface**

By using *Plant iT connect* also the engineering of interfaces for data exchange with external IT systems (e.g. ERP, LIMS, inspectors, intelligent analytic devices) becomes parameterizable to a large extent. The interfaces implemented with it provide a detailed online diagnostics also transparent for production-orientated staff.

# Plant Direct iT

## The process control system

Plant Direct iT is an open, component-based process control system focusing on the technological requirements of such a system. By combining the client/server architecture with an object-orientated class concept, it offers a secure, future-proof alternative for a conventionally programmed PLC with super-ordinated visualization.

PLC with super-ordinated visualization.

### Classes – Modules for plant-wide automation

The basic requirements for a control system are a secure process control combined with maximum transparency for the operator's personnel as well as efficient project planning, independent of whether it is used for a new plant, for expansions or for modification of existing plants.

Plant Direct iT allows for extensive parameterization of technological functionalities. Only specific functions need to be programmed. The class concept of Plant Direct iT ensures highest functional quality as similar objects are controlled and monitored just by one software module. Thus, re-usability is assured. If necessary, it facilitates the effective qualification of the system. As a consequence operating expenses for validation can be reduced considerably.

Plant Direct iT provides maximum flexibility for interventions in running operations, cutting down on the frequency and duration of downtimes. The system permits modifications during running production operations without neglecting safety aspects, as all changes are logged in detail by the system. This applies for all operator interaction as well as to any intervention with the engineering of the system (Audit Trail).

### Class structure

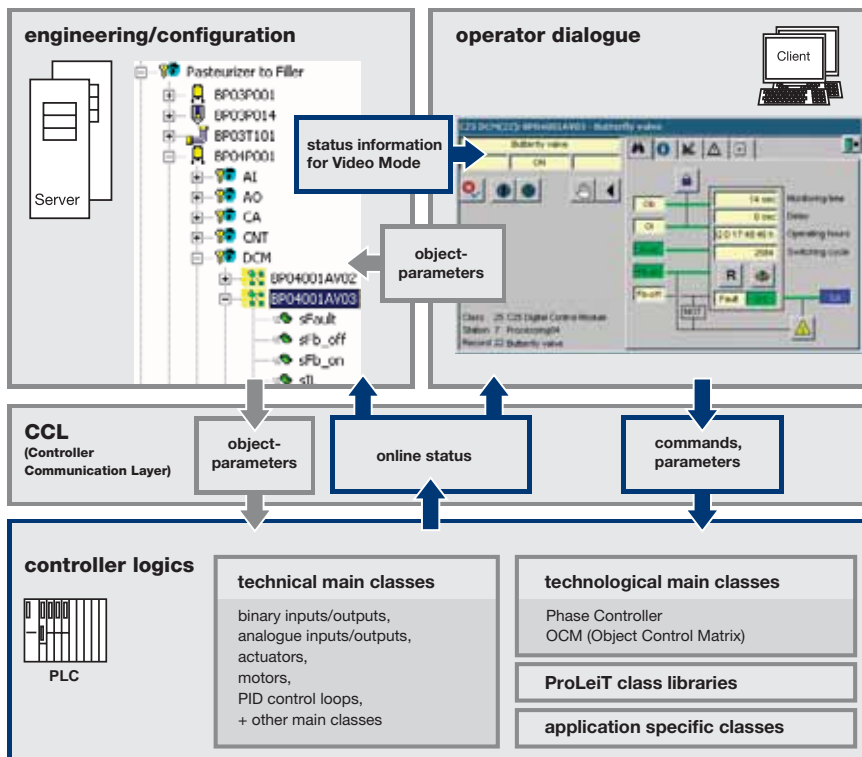
A class comprises a closed system consisting of three seamlessly integrated components. The system has complete control over the function of a technical component (e.g. a valve) or an entire step-controlled sequence:

- Class description
- Operating dialog (class dialog)
- Control logic (class handler)

The class description is stored at the central database of the system server and includes a structured mapping of all properties of this class including all status information and the command set.

The operator dialogues are available to the user within the process graphics that provided via the clients. Via the operating dialogue every single object can be controlled and monitored.

The principle of the class concept



## Plant Direct iT – The process control system

The control logic is implemented in the PLC and controls the technical device (e.g. the valve) via the I/O system.

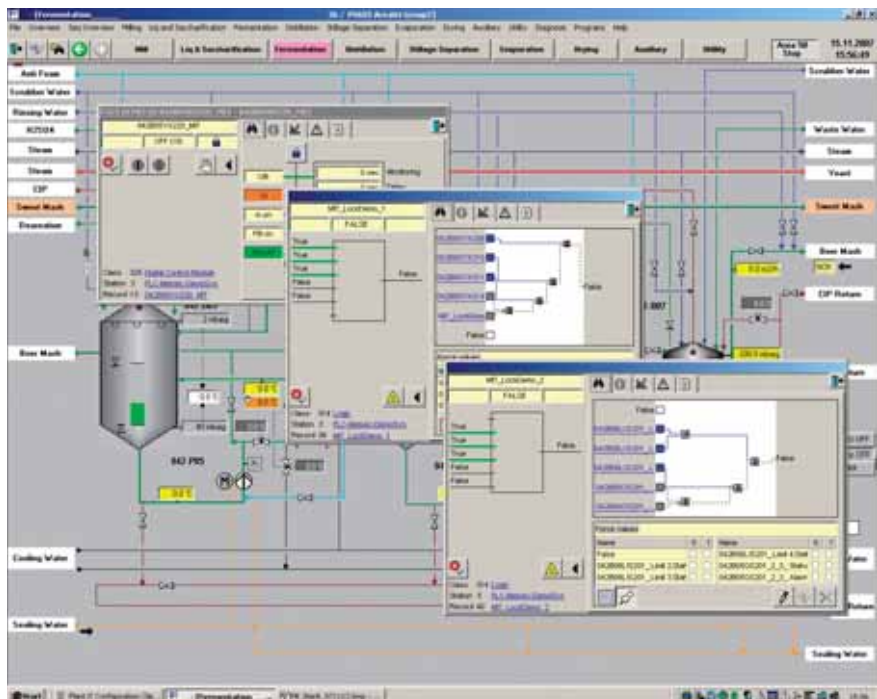
All components form one functional unit. They synchronize status information and operating parameters.

These parameters can easily be changed during running operations. In this way, there is maximum flexibility with regard to the selection of changes to be transferred as well as the time of transfer. Where necessary, a single parameter for a specific object can be selected and changed during running operations.

The system standard already contains an extensive set of the system standard already contains an extensive set of

- technical, and
- technological classes,

that are constantly being further developed. The great variety of technical basic classes includes largely equipment-neutral functionality such as valves, drives, measured values and closed-loop controllers, logical functions, and highly-qualified, equipment-



Example for interlocking of automation objects by using logic objects

specific functions, e.g. for the complete control of a certain model range of frequency converters. With the Sequence Controller and the Object Control Matrix

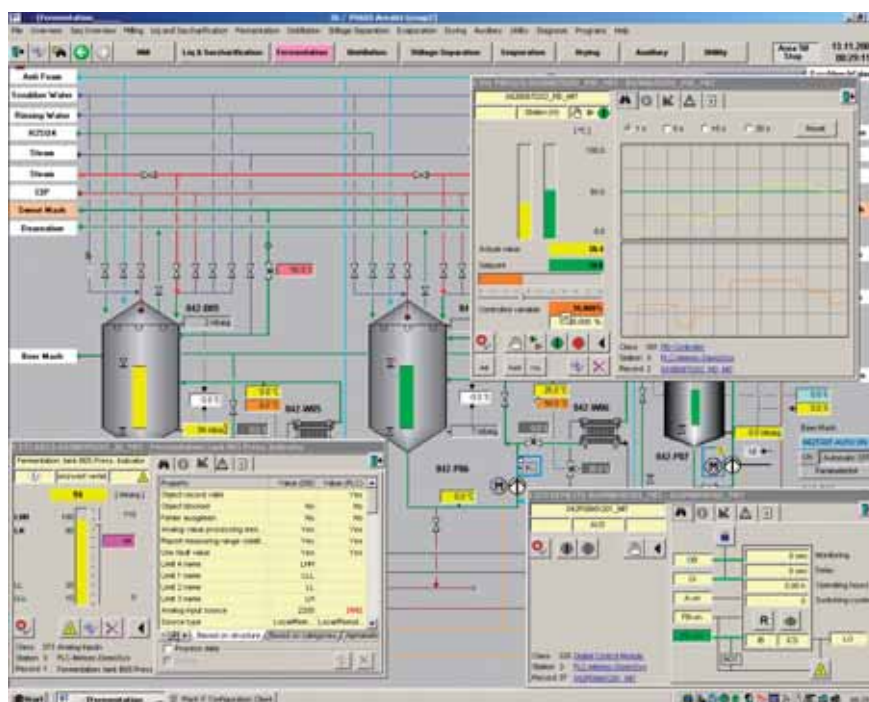
(OCM) there are two powerful classes available for the mapping of complete processes.

The system also supports the development and complete integration of additional classes or class libraries for a various applications. The required infrastructure including templates and documentation is available within the standard system.

Plant iT objects are cascable and provide an API (Application Programming Interface) that allows to access them from conventional PLC code. Because the Plant iT system software and application-specific PLC programs can be run parallel in one controller, the system allows the implementation of very complex tasks.

### Visu-Recorder

The classes also support “Visu Recorder”, a special function of Plant Direct iT. With the help of Visu Recorder past sequences can be replayed directly in the user interface to support the staff in error diagnosis.



Process graphics with open operator dialogues of objects

### Integration from valves to sequence control

*Plant Direct iT* does not only provide classes for technical objects. There are also classes for the parameterization of complete processes following different methods.

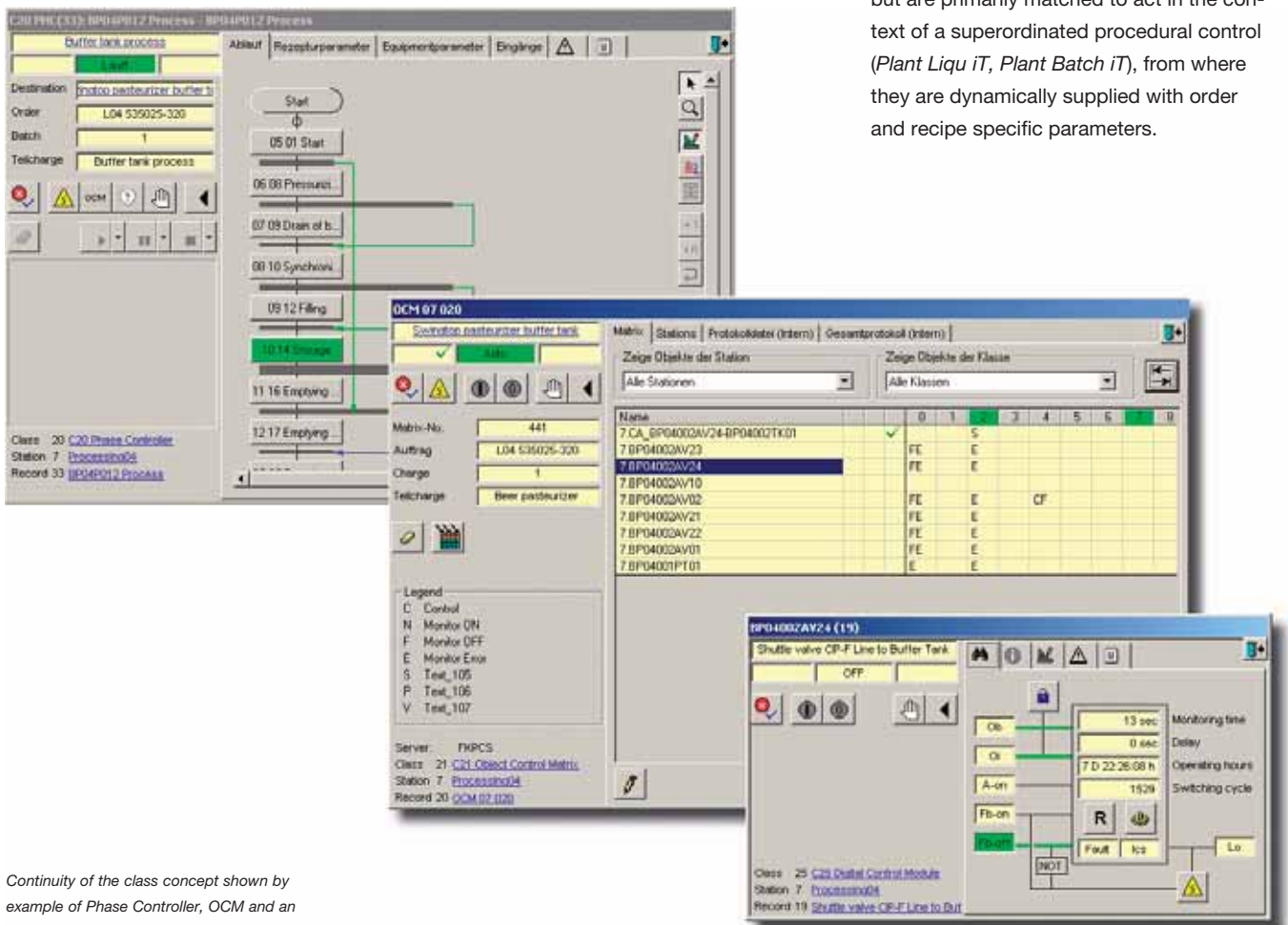
In particular, continuous processes are often mapped by using interlock-based control. In addition to classes for automation objects, a logic function class is available. With its help the conditions for the activation and interlocking of each single object can be parameterized.

The second method includes the mapping of processes by means of a step sequence and also for this *Plant Direct iT* provides the adequate classes:

The Object Control Matrix class (OCM) enables the user to parameterize the controlling and monitoring of a complete group of technical objects (actors, sensors) for a variety of activities that have to be carried out in the process sequence. In a matrix for each object is parameterized how it is to be treated if a specific activity is called (e.g. monitoring for “Off” and “Error” for activity “Inherently safe”). The activities defined by an OCM can be called by superordinated sequential control in any possible combination.

The class “Phase Controller” allows the parameterization of step sequences including the required branch targets and transitions. Calling OCM activities within these steps results in a completely parameterized sequential process control.

Objects of both classes can be implemented as independently operating instances, but are primarily matched to act in the context of a superordinated procedural control (*Plant Liqu iT*, *Plant Batch iT*), from where they are dynamically supplied with order and recipe specific parameters.



Continuity of the class concept shown by example of Phase Controller, OCM and an object for a valve

### Efficient Source/destination handling

The use of Phase Controller and OCM allows variable process control in respect of the allocated plant resources. The parameterization of the group of technical objects to be used by OCM is done by means of object lists, which then can be dynamically allocated to an OCM matrix. In this way, the activities for a specific process need to be parameterized only once.

But they combining them with different object lists they can be executed for different resources (e.g. source tanks).

### Material-related process control

*Plant Direct iT* allows the implementation of material-related process control solutions. *Plant iT material*, the system component for process-orientated material management, can be accessed directly from process control level. With the help of system-internal standard functions transaction-accurate booking records can be generated for every single material movement out of the running process and almost real-time. In that way, material-related process control including

inventory management and – in combination with a super-ordinated order management – also tracking and tracing is possible.

### *Plant Direct iT* – an open system

The openness of *Plant iT* allows the development of own classes that can be seamlessly integrated in the system and flexibly combined with the standard classes. Templates and documentation are included in the standard system. Whether an operating company, a machine or plant supplier wishes to standardize and encapsulate his specific Know-how in his own classes or a system integrator uses his class library as an efficient engineering tool and visible expression of his branch know-how, *Plant Direct iT* is the platform for it.

### Know-how concentrate for our customers

The class concept is the result of our ideas, the large number of available classes beyond the standard system is the result of our experience in various branches of the process industry. Due to the continuously increasing requirements additional classes have been developed that are

continuously improved and used within the projects that we carry out for our customers.

Diagnostic classes for Ethernet and field-bus networks for remote I/O (z.B. Profibus with Simatic ET200) enable simple and fast error diagnostics based on the visualization system integrated in *Plant iT*.

Scale classes (e.g. for Simatic Siwarex U) simplify the implementation, control and monitoring of complex dosing tasks

Conveyor classes provide integrated intelligence for coordination of switching sequences (predecessor, successor).

Equipment modules encapsulate the functionality of complete equipment groups (e.g. complete temperature control of a fermenter).

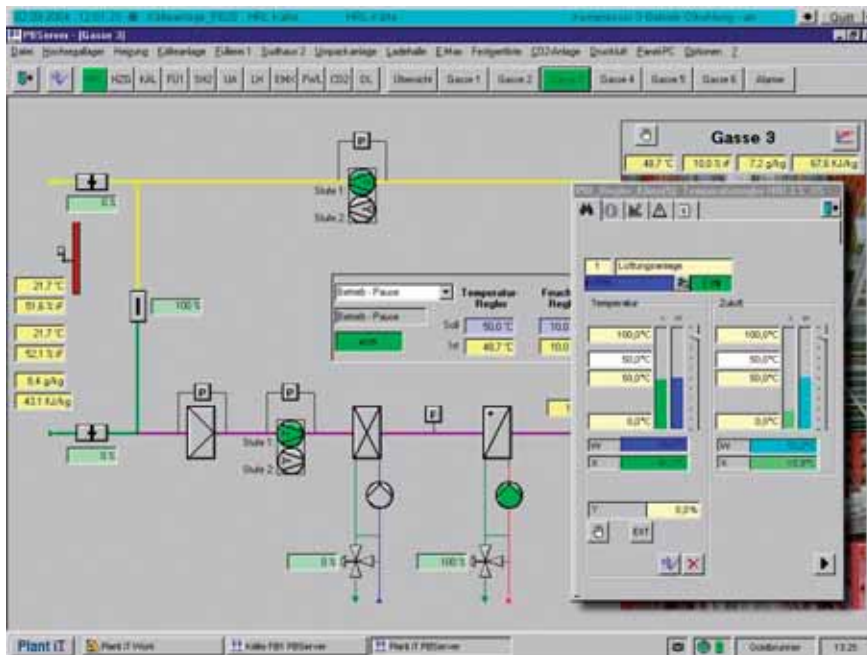
The technological classes can be supplied with order and recipe parameters by a superordinated procedural control and thus allows high flexibility and at the same time a maximum of safety for order controlled multi-product plants.

### The key to migration

*Plant Direct iT* allows also a simple migration of existing control systems. If existing system can not be replaced but in spite of that have to be integrated in a homogeneous process control system platform, special classes have to be developed that encapsulate existing software functionality in the controller and make it transparent to *Plant Direct iT*.

The Package Unit Interface provides the possibility to make actors, sensors and operating elements accessible via *Plant Direct iT*.

*Already a number of class libraries have been developed for our customers or by our system partners (e.g. libraries for building control and intelligent load management)*



# Plant Batch iT

## Batch system according to ISA 88

Recipe controlled batch processes are one of the focal points in many areas of the process industry and especially this type of process show a particular complexity. Special requirements are to be

met by an automation solution when it comes to securely master the efficient simultaneous processing of a large number of production orders for different products

in one plant. Here *Plant Batch iT* provides the ideal platform

- Current standards like ISA 88 are implemented consequently but at the same time focussed on real-world requirements.
- The process control system *Plant Direct iT* is completely integrated covering the ISA 88 structural level closest to the process.

- Order- and batch-related production data acquisition is provided by *Via Plant Acquis iT* that is also integral part of *Plant Batch iT*

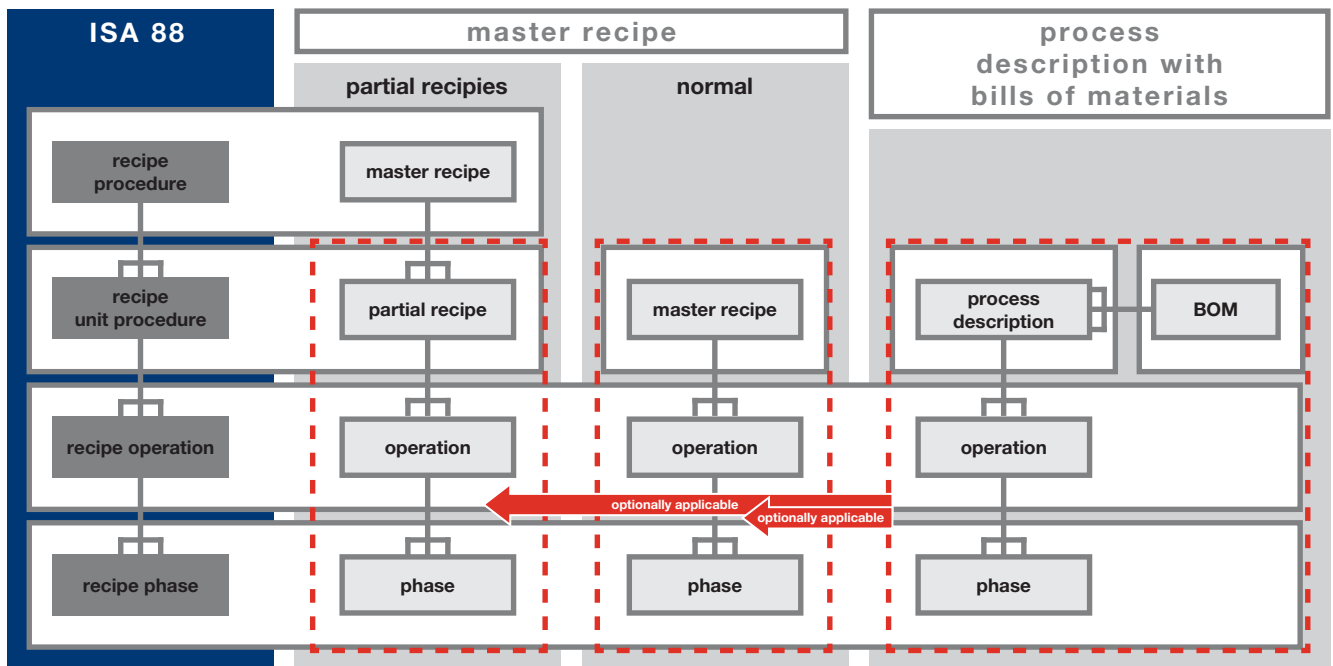
Being tooth pitched directly with *Plant iT material* provides transaction-accurate material tracking in real time.

### ISA 88 – too much and not enough

*Plant Batch iT* provides an implementation of the procedural, physical and recipe model, but also of the resource status handling according to ISA 88, combined with additional functionality that are a result of our experiences in automating recipe-controlled processes.

Beside the availability of a production line as structural element for a plant, within the physical model there are three different types of units defined and implemented.

Flexibility of the recipe model from ISA 88 compliant operation to production based on bills of material



## Batchsystem according to ISA 88

The use of

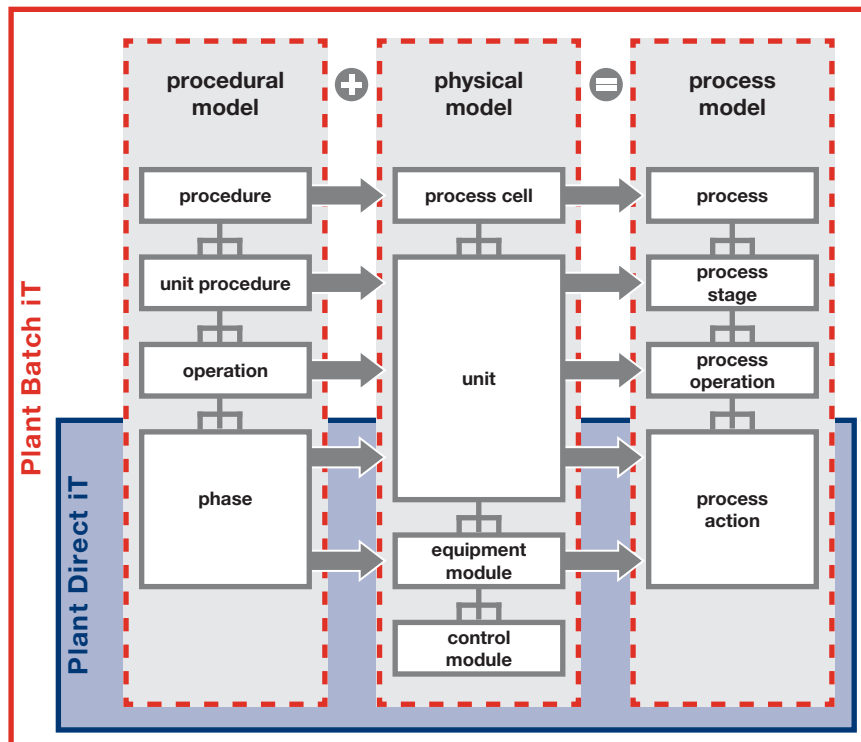
- Storage Units,
- Processing Units and
- Transfer Units

takes consideration of the fact that pure storage locations, “real” units and pure transport equipment (e.g. piping) are to be treated significantly different in the context of a batch system.

The strict interpretation of the ISA 88 recipe model causes unnecessary administrative workload in many applications without gaining a significant benefit in process transparency. For this reason *Plant Batch iT* provides simplification of the recipe model in several levels depending on the application requirements.

The partial or complete disaggregation of the unit as a structural element allows a simplification of the master recipes regarding their structure. By means of a recipe model special to *Plant Batch iT* an additional simplification can be achieved by reducing the number of recipes to be managed.

The lowermost structural level of the ISA 88 model is directly covered by classes of the process control system



## Production based on bills of material

While consequently keeping up the separation of master recipe and control recipe *Plant Batch iT* is able to process so called process descriptions. Formally seen they are master recipes which contain variables instead of finally defined product-related parameters. The creation of a control recipe takes place during runtime by order-related, dynamic combination of a process description with a bill of material that can also contain a complex set of recipe parameters beside the list of ingredients and quantities. This extended recipe model has two advantages:

- When producing a large number of different products following the same process there only a small number of process descriptions needed, i.e. the workload for managing master recipes is lowered significantly.
- The possibility of processing production orders based on bills of material provides an optimal basis for the cooperation of *Plant Batch iT* with many ERP systems, because these systems in most cases “think” in bills of materials.

## Process control system included

The seamless integration of the process control system *Plant Direct iT* in the batch system allows for a maximum of flexibility during running production and at the same time full process transparency from the production order right down to the single actor or sensor, which is currently used for processing the order. Thus the production staff can use the full range of the plant potential, because intervention in the production is possible on every level any time and are safe-guarded by *Plant Batch iT*. Furthermore the operator can carry out extensive diagnostics and corrections independent from the technical staff.

### Order management and processing

The central instrument for controlling and monitoring the production is the order management of *Plant Batch iT* that provides three levels of detail to the production staff:

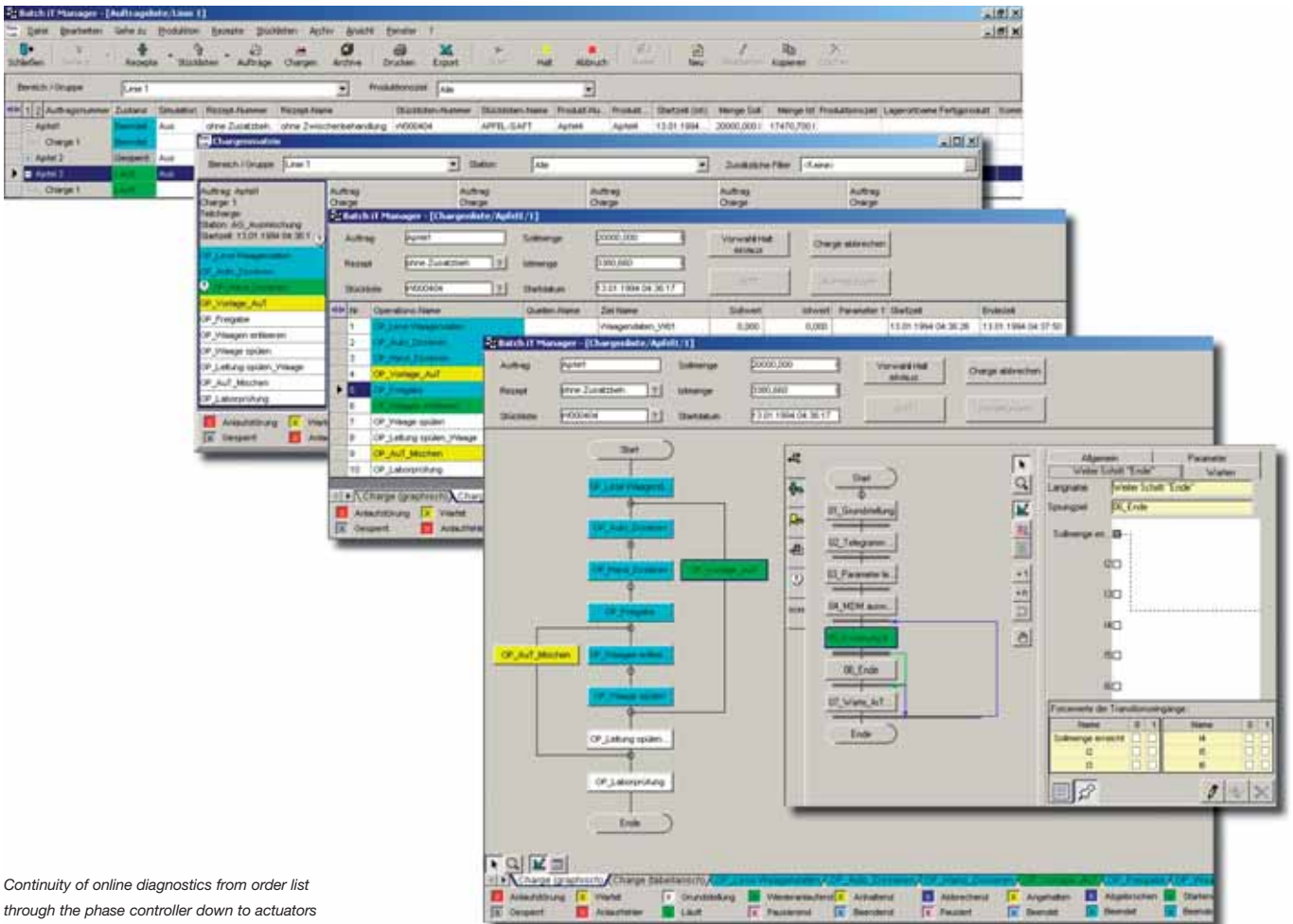
- Order list
- Batch matrix
- Batch list

The order list provides an overview of all dispatched orders and – if this possibility was used – the single batches of the order. All relevant order data as well as the current status are here visualized online.

Dispatching of orders can be done manually via the operator interface of *Plant Batch iT* but also via standard interface of Plant iT by a superordinated system (e.g. SAP-PP).

The batch matrix shows a tabular online status overview of all batches of active orders which are currently being processed, right down to the operation. The batch list provides a detailed overview of one single batch being processed and direct access to the operation-internal functionality, represented by an object of the class Phase Controller.

Intervention on order and batch level (e.g. Start, Halt, Continue, Abort) are possible from any of the described levels. The batch list allows additional modification of all recipe and order parameters of operations which have not been started by the system.



Continuity of online diagnostics from order list through the phase controller down to actuators and sensors

**Electronic Batch Recording**

*Plant Batch iT* records all order and batch relevant data and summarizes them within an Electronic Batch Record (EBR).

The batch record contains

- all relevant header data of the production order to which the particular batch belongs and
- a detailed image of all data like they would have been displayed in the batch list in the moment the batch was completed or aborted.

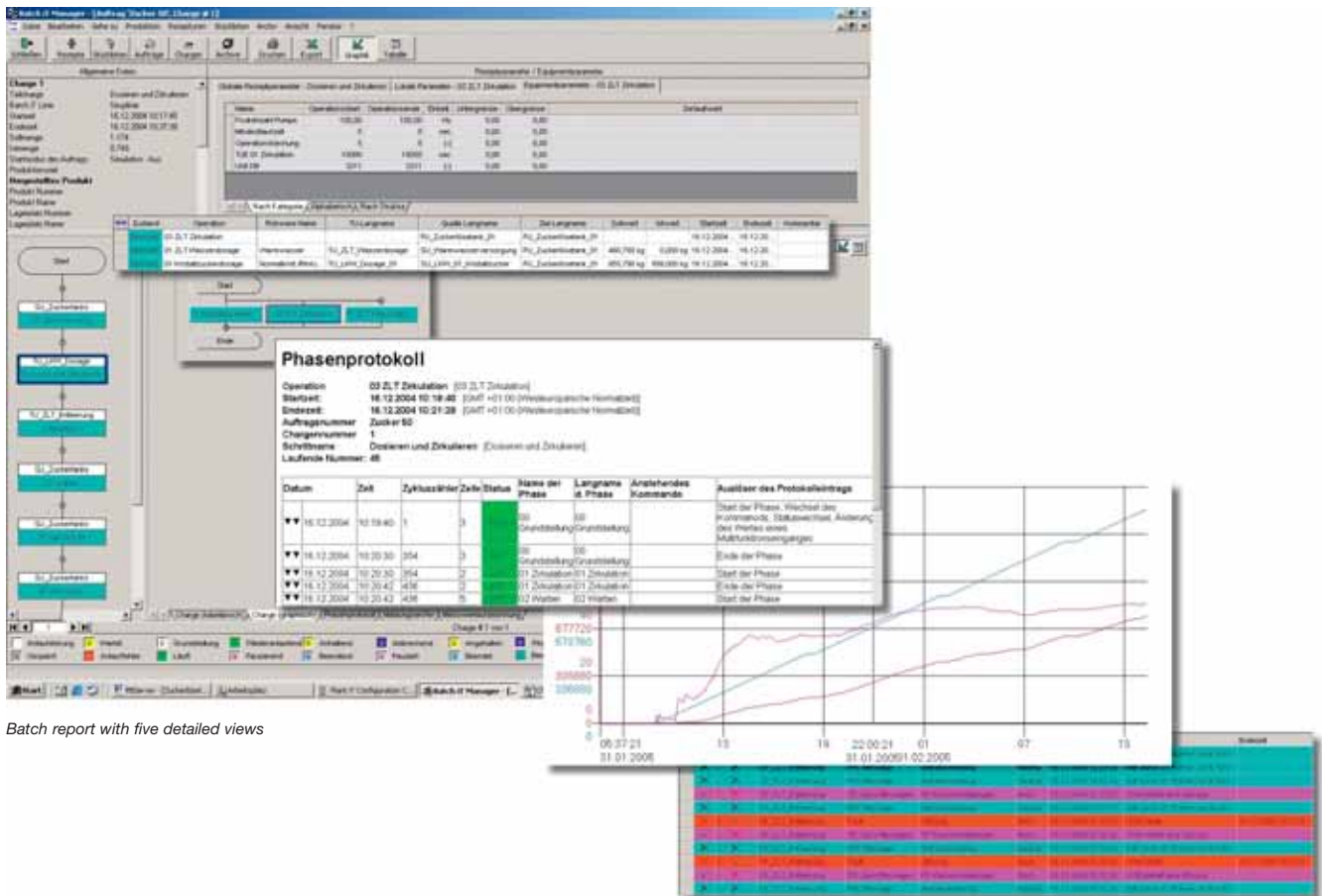
As an option the batch record contains additionally:

- Step records of the Phase Controller objects (operation-internal functionality)
- Graphical view of order-related production data and
- Order-related message lists.

The batch records are available online for a selectable period of time, but can also be exported and archived.

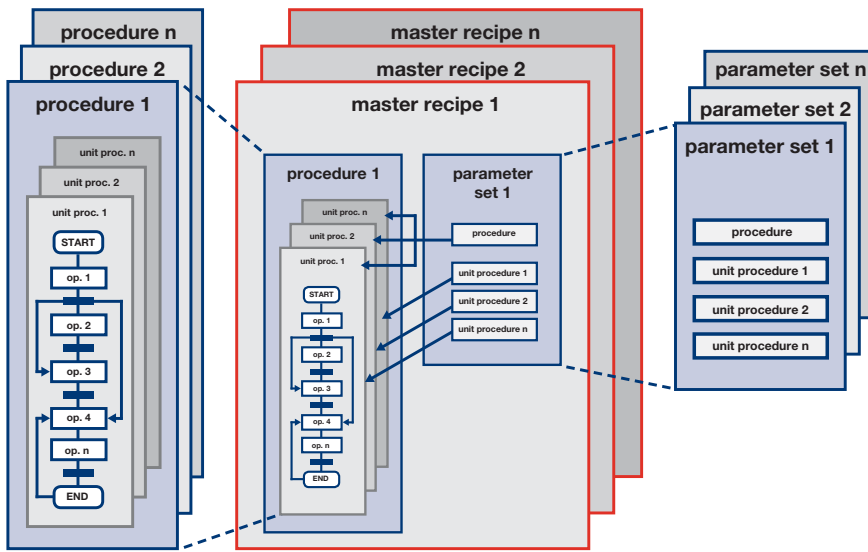
**Material – the most important resource**

Ingredients, intermediate and finished products are in actual fact the core resources of any process. In relation to batch processes their transaction accurate tracking and precise allocation to single orders and batches are of special importance. For meeting this requirement, *Plant Batch iT* is inseparably tooth pitched with the process-orientated material management *Plant iT material*. The creation of booking records necessary for inventory management as well as tracking & tracing is carried out automatically by *Plant Batch iT* to the largest possible extent and with strict allocation to order and batch ID. For enabling a consistent and comfortable tracking & tracing, the evaluations made within *Plant iT material* allow direct branching off to the electronic batch records of *Plant Batch iT* and vice versa.



Batch report with five detailed views





Creating master recipes by combining procedures with parameter sets

functionality for recipe-controlled processes based on a simplified procedural model. Processes are described by means of procedures comprising one or more unit procedures which themselves consist of one or more operations. Each unit procedure equals one object of the class "Sequence Controller" and the steps defined for this object represent the operations. Master recipes can be created by combining such a procedure with different, equally structured parameter sets, e.g. for making different products using the same process.

The system distinguishes between recipe and equipment parameters. For the recipe parameters different replacement methods are selectable which allow to define for each parameter, whether it is a constant with regards to the master recipe or it has to be defined individually each time the process is started. Equipment parameters describe technical properties of the plant and are thus generally considered as being constant.

An efficient sequence overview provides a precise view of all plant processes and their status in running operations at any time. In the event of an irregularity, the operator can intervene directly from this overview.

**Recipe control**

Especially in plants where a variety of finished and intermediate products are manufactured using the same or similar processes, *Plant LiquiT* provides special



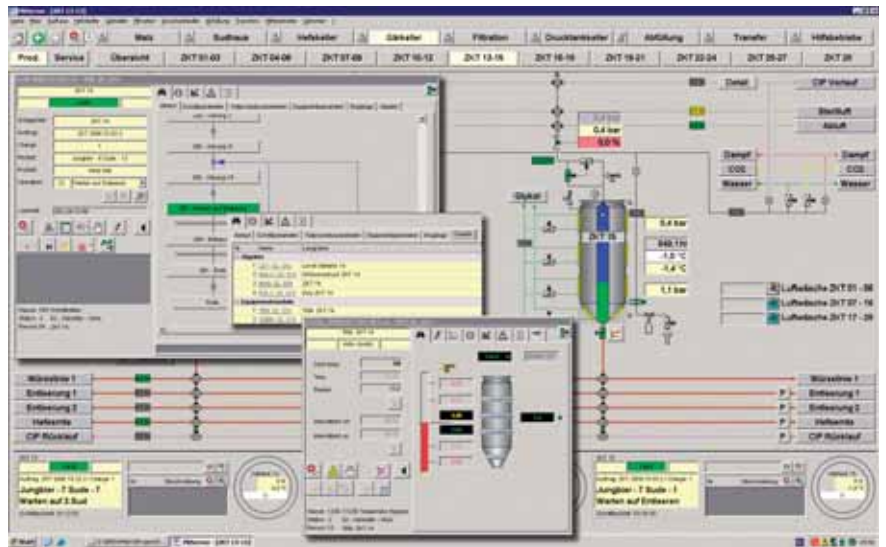
Creation of a procedure by parameterization of unit procedures, example for a parameter set of a unit procedure

**Equipment modules**

The equipment modules further increase the efficiency and security of automated processes. These particular technological classes:

- Encapsulate technical process functionality of complex technical equipment or complete units,
- ensure reproducibility and
- provide simple and secure operation of complex process functions in manual or semi-automatic operation via class operation dialogs.

Equipment modules are optimized for cooperation with sequences but can also be used with all other classes. The range of available modules spans from simple applications (for example temperature control of a fermentation tank) to functional encapsulation of complex technical equipment (e.g. chopping system of a lauter tun) or entire units (e.g. malt transportation system). In order to improve the diagnostics the operating dialog of the equipment module provides a special online overview of its communication with the objects also involved in the control of the same process.

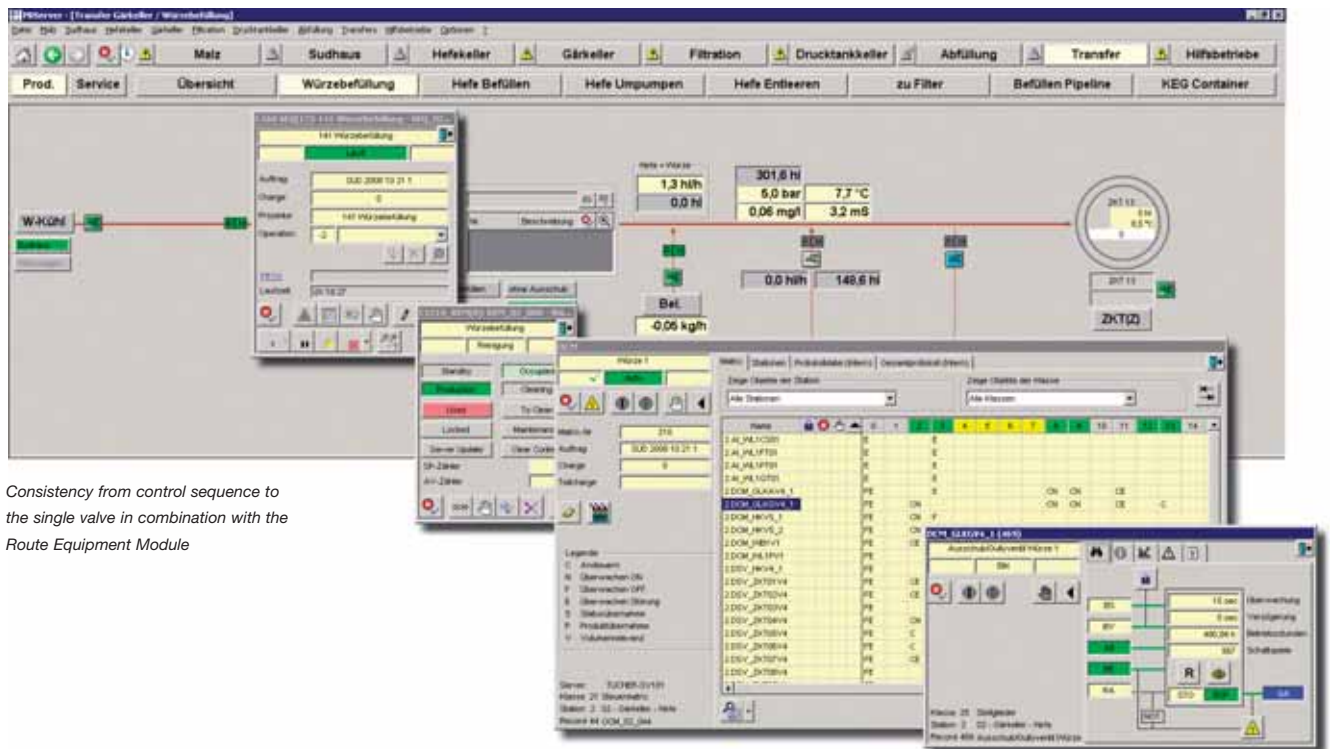


Use of an equipment module for fermenter temperature control by a control sequence

**Automatic route control**

The usually complex and time-consuming mapping of different routes that sometimes need to be selected depending on the product in multi-product plants with network structure becomes fully parameterizable with *Plant Liqui iT*. This leads to significant simplification in running operations and also when adapting the system in the course of plant modifications, upgrades or changes within the process. A special

equipment module called REM (Route Equipment Module) enables parameterization of fully automatic route control in connection with OCM objects. The sequence addresses a variable number of REM objects, which can be assigned to it either statically (technically determined routes) or dynamically (routes dependent on source, target or product). Depending on the route or units to be used, each REM addresses statically or dynamically assigned OCMs that control the assigned actors and sensors.



Consistency from control sequence to the single valve in combination with the Route Equipment Module

### Tank farm management

Especially for the mapping of processes with a large number of source/target combinations *Plant Liquor iT* provides with

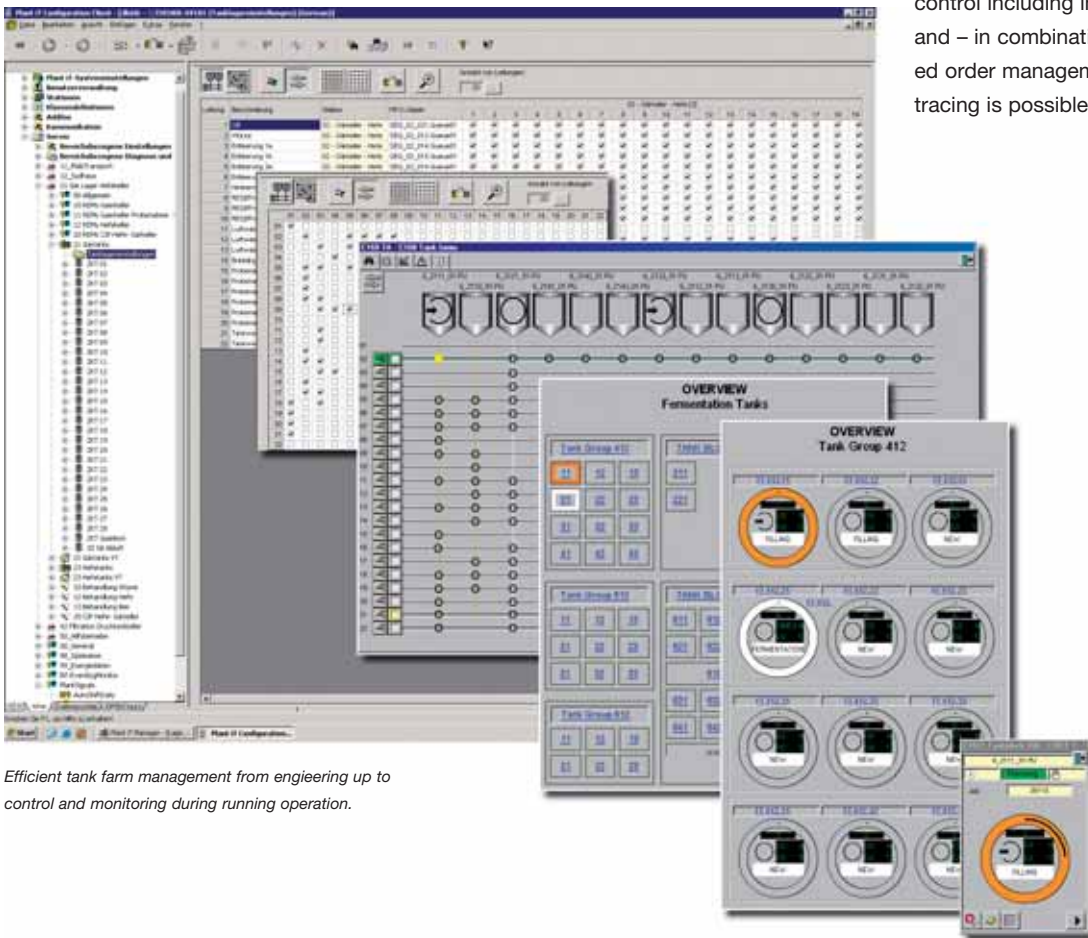
- the tank farm wizard and
- the tank farm overview

two high-performance tools for the handling of tank farms. The tank farm wizard provides assistance for parameterization that allows the simple definition of very complex tank farms and enables parameterization of generated matrices in relation to permissible function and route combinations. Modifications made in the event of plant extensions or modifications can be planned in this way both simply and securely. The tank storage overview provides a detailed online view in several

layers of the current states of the entire tank storage facility, a tank group or an individual tank. All important parameters (for example filling amount, cleaning status and current order) and the currently executed process steps (for examples bottling, emptying and cleaning) are displayed in a concise manner. In the event that an irregularity is ascertained by means of the tank status display, the operating dialog of the affected tank can be accessed directly from the process picture overview.

### Material-related process control

*Plant iT material*, the system component for process-orientated material management, can be accessed directly from process control level. With the help of system-internal standard functions transaction-accurate booking records can be generated for every single material movement out of the running process and almost real-time. In that way, material-related process control including inventory management and – in combination with a super-ordinated order management – also tracking and tracing is possible.



Efficient tank farm management from engineering up to control and monitoring during running operation.

# Plant Acquis iT.

## Production data management

Plant Acquis iT acquires, processes and files process, operational, machine and energy data for the plant-wide information management. In particular it takes into

consideration the heterogeneous and complex nature of subordinated automation systems from which data are acquired. OPC is used as preferential interface. For

systems not supporting OPC an additional, a driver-based interface is available. It is designed in such a way that it avoids interfering with the functionality of subordinated systems. Using connection methods like this, easy and flexible interfacing with various controller platforms is possible (e.g. Mitsubishi, Siemens, Rockwell, VIPA or others).

### Data acquisition

Plant Acquis iT acquires and processes various types like:

- Messages (binary values),
- Measured values (analog values),
- Counter impulses/counting results and
- Character strings

both online and offline, i.e. by means of manual input.

In accordance with the Plant iT class concept, corresponding objects are created and parameterized for the recording of these values. The standard system includes additional types of objects that provide particular functions. They can be used either for data recording or processing:

- Manual input objects allow the feed of parameterized data points by means of manual input (e.g. laboratory values).
- Formula objects enable the direct mathematical and logical processing of recorded measurements (e.g. the simultaneous calculation of derived values and the acquisition of the actually measured value).
- Event objects can trigger complex activities in the system (e.g. batch switch-over or automatic reporting).
- Maintenance objects offer the possibility of setting up counters for operating hours and switching cycles. They create the basis for using a maintenance management system.

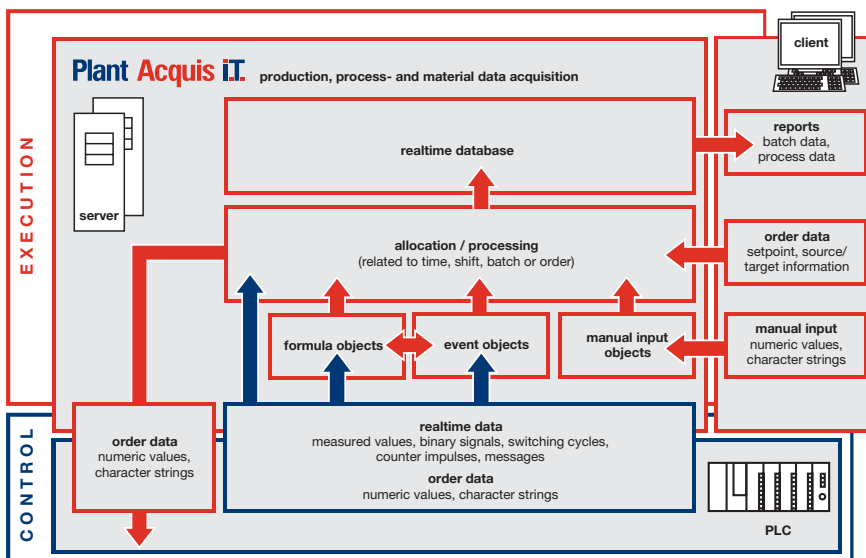
### Up-to-date standards

Plant Acquis iT is customized to the specific requirements of the Weihenstephan Standards 2005 for beverage packaging plants. In addition to using OPC and driver-based interfacing with subordinated controllers, Plant Acquis iT provides an extra communication channel for this standard.

### Material Management

Plant Acquis iT fulfils the latest requirements for product tracking by providing functions for material-related production data management. In combination with Plant iT material booking records for material movements can be generated by using special kinds of event objects. As a result, functions like inventory management or tracking & tracing are also available for processes, not directly controlled by Plant iT components.

Dataflow with Plant Acquis iT used for production data management



**Data analysis**

Plant Acquis iT provides the fundamental functions for the immediate analysis of production data:

- Curve representation of analogue and binary data in terms of freely parameterizable and storable views
- Efficient error handling by means of freely parameterizable message groups and profiles
- Weak-point analysis with the help of message hit lists, e.g. analysis of error messages according to frequency or length of appearance.

Data may be selected either by time periods, orders or batches. The results can be further refined by easily selecting from entire plant areas, individual units or single objects. For more complex analysis the system offers a data export add-in to Microsoft Excel.

**Visualization**

Plant Acquis iT also includes a visualization feature. The focus is on providing plant or unit-related status overviews in combination with single, operator-controlled transmission of set points. In respect to the

functional principle and the applied engineering tools, the visualization feature is fully compatible with the visualization Plant Direct iT offers. The use of identical infrastructure allows visualization functions of Plant Acquis iT and Plant Direct iT to be combined in a homogeneous operator interface.

**Open for extensions**

Due to its open architecture Plant Acquis iT provides optimal possibilities application-specific enhancements like

- Excel-based reporting or
- Filling and packaging management

Via system-internal standard interfaces Microsoft Excel accesses the central database and enables the flexible creation of reports. The advantages:

- Consequent utilization of analysis and presentation functions of Microsoft Excel allows design of tailor made reports based on the acquired production data.
- Users familiar with Microsoft Excel can make modifications themselves

As an alternative the system also offers open interfaces for integration into HTML- or XML-based reporting.

But Plant Acquis iT also provides a good basis for filling and packaging management and can provide functionality like

- line-related order lists including data exchange with sub-ordinated control systems,
- plant monitoring,
- error analysis and
- performance analysis (e.g following OEE).

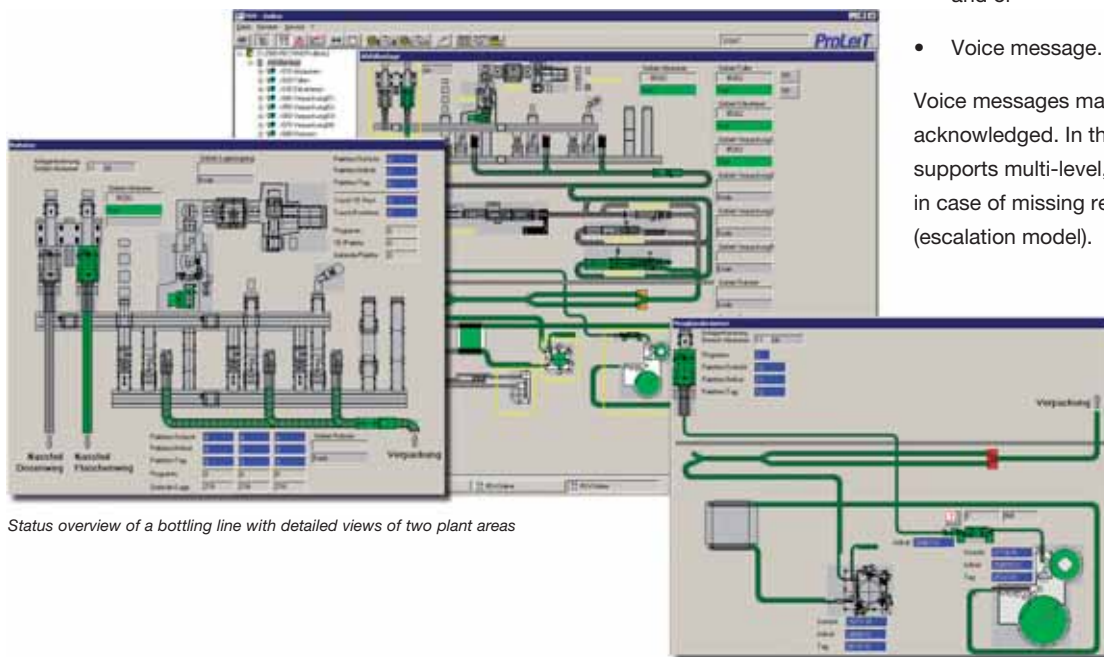
These functions strongly support the operating company in optimizing the plant performance.

**Acquis iT messenger – the whistle blower**

This Add On for Plant Acquis iT is a remote messaging system for informing responsible staff of critical alarms. The following communication channels are available:

- Short message services (SMS),
- eMail (SMTP),
- Windows warning service (NetSend) and or
- Voice message.

Voice messages may be defined as to be acknowledged. In this case the system supports multi-level, automatic forwarding in case of missing reaction of the recipients (escalation model).



Status overview of a bottling line with detailed views of two plant areas

# Plant i.T. material

## Process-orientated material management

One of the central instruments for the effective management of order or recipe controlled production processes, is a material management system working close to the process that offers transaction-accurate online views on material movements. They are recorded based on a warehouse structure defined compliant to the process and beside a precise inventory management they also allow examination and analysis, especially tracking & tracing.

*Plant i.T. material* provides this functionality as a module that is flexibly combinable with all other *Plant i.T.* components, so that especially production data management applications can be enhanced by adding a material-related view.

### Master data management

The relevant properties of storage locations, materials and storage transactions are parameterized within the system. Beside a comprehensive set of properties *Plant i.T. material* particularly considers the requirements of the process industry regarding the definition of storage locations by distinguishing between different types:

- **Automatic storage location (Storage Unit):** permanently attached to the plant, material movements controlled by automation system (e.g. tanks, silos)
- **Manual storage location:** not connected to the plant, material movements done manually (e.g. fork lift) or controlled by external system (e.g. automatic transport system)
- **Docking storage location:** temporarily connected to the plant by automated docking device, material movements controlled by automation system (e.g. containers, big bags)

Materials with an identical set of relevant properties are summarized in material classes (e.g. liquid goods, granulates, finished products) and described by parameterizing these properties. The system distinguishes between

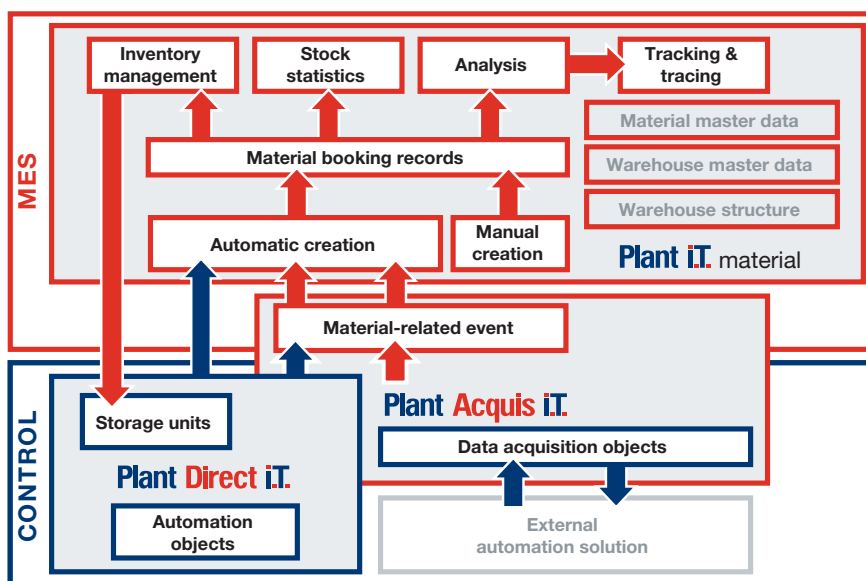
- Material parameters and
- Batch parameters,

which enable the correct consideration of material properties that may change with every single batch of this material (e.g. agent concentration).

Storage transactions are in the first step categorized by booking type (e.g. inflow, outflow) and then rendered more precisely by means of transaction keys (e.g. stock receipt bulk ingredients, automatic dosing). Each warehouse transaction is allocated to one booking type and one transaction key for allowing more accurate selections during data analysis.

The recording of material movements normally takes place automatically, triggered via system-internal standard interfaces by the single system components. But they can also be entered manually via the operator front end of *Plant i.T. material*.

Functional principle of Plant i.T. material



**Investigations and analysis**

Stock overviews (warehouse status) as well as transaction overview (list of selected warehouse transactions) are directly available within *Plant iT material*. The flexible combination of

- warehouse/storage location,
- materials/material classes,
- time period,
- order/batch ID,
- goods receipt ID,
- supplier's batch ID,
- booking types and
- transaction keys

makes these standard views to be very efficient tools.

The details of every warehouse transaction is directly accessible online and the use of special archiving methods keep the system response time high even with large quantity of data without losing detail information.

Depending on the type of storage location *Plant iT material* allows direct operator interaction ranging from spontaneous stock taking to triggering the connection or disconnection of a container.



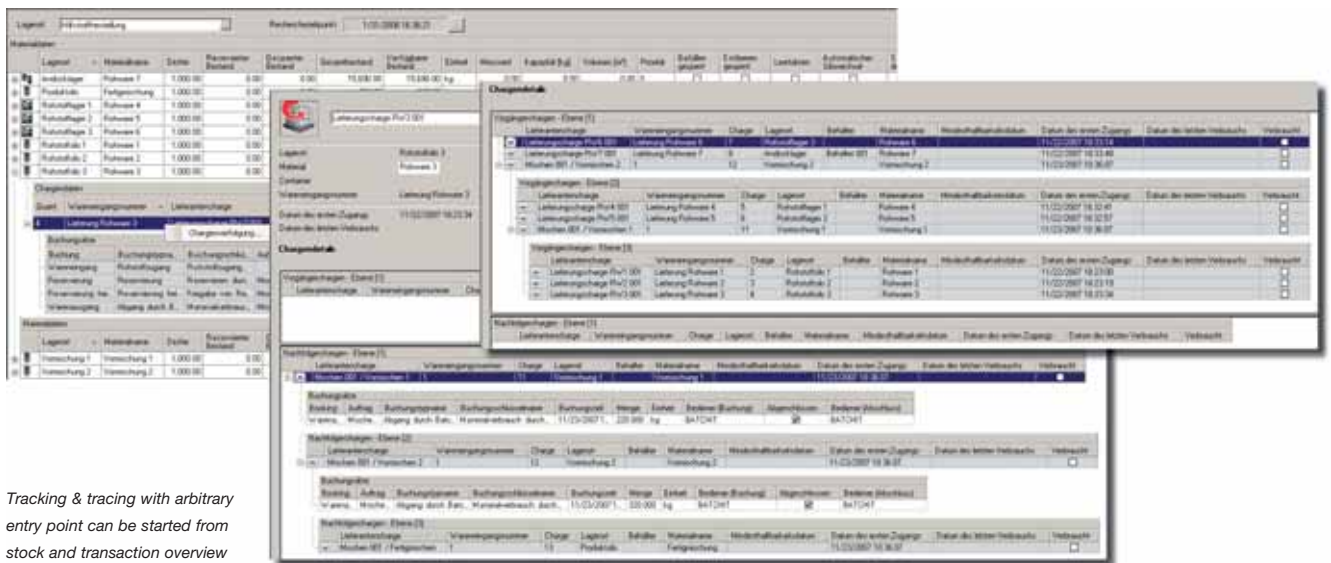
Transaction overview with flexibly combinable selection criteria

**Tracking & Tracing**

From the standard views (stock and transaction overview) there is direct access available to the consistent tracking & tracing function of *Plant iT material*. Starting from an arbitrary entry point batch tracking analysis can be carried out in both directions. A view splitted in predecessors (upstream) and successors (downstream) with visualization structured the same way

as in stock and transaction overview makes it easy to navigate and survey.

When running order-related production using *Plant Batch iT* or *Plant Liqu iT*, their batch records are seamlessly interconnected with the tracking & tracing. *Plant iT material* allows to navigate directly to the batch records of *Plant Batch iT* or *Plant Liqu iT* and back, so that even units not defined as a storage location can be subject to tracking & tracing.



Tracking & tracing with arbitrary entry point can be started from stock and transaction overview

To conduct a complex production process in an optimal way means fulfilling the concurring requirements of

# Plant i.T. integrate

## Interdepartmental integration

- maximizing turnout,
- minimizing costs,
- achieving optimal product quality under consideration of the economical framework and
- complying with legal requirements in relation to the burden of proof (e.g. tracking & tracing according to EU regulations 0178/2002 and 1935/2004)

in consideration of the available resources to the largest possible extent. One of the most important preconditions for this is an information management on MES level exceeding the borderlines between process areas and departments that provide the following core functions:

- Central consolidation and analysis of all relevant production from the different production areas
- Provision of a flexibly configurable reporting system
- Long term archiving of the relevant production data preserving the possibility to run the full range of analysis.

### Interdepartmental reporting

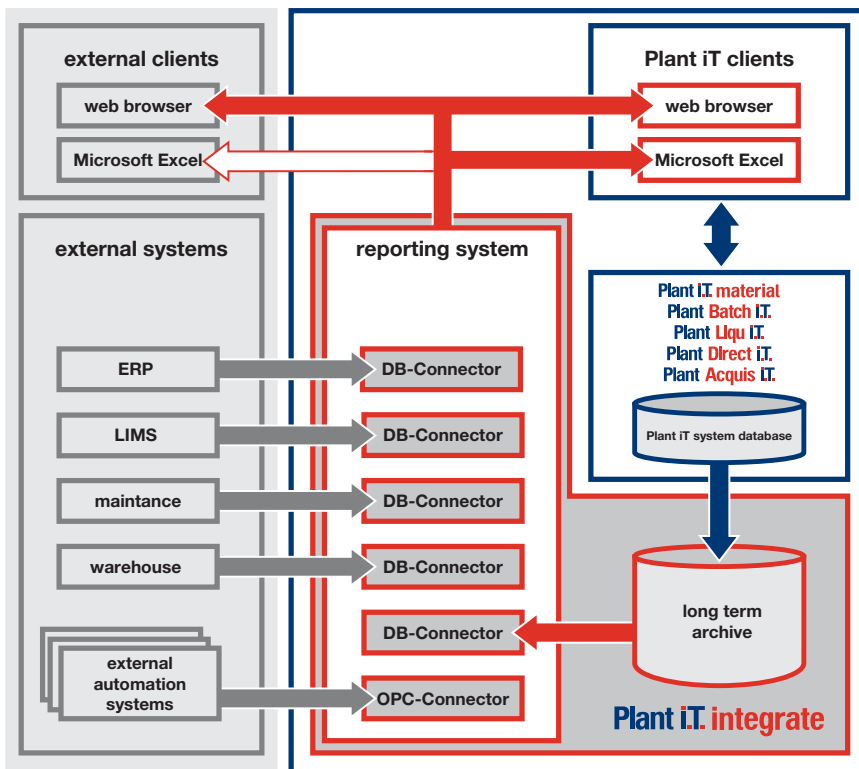
*Plant iT integrate* uses with Incuity EMI a very powerful reporting subsystem that is well-established in the market and is due to its architecture especially adapted to interdepartmental reporting. A very important feature is the capability to be interconnected with a very wide range of external systems. For this purpose a whole range of so called connectors are available, e.g.:

- MS SQL
- Oracle
- InSQL
- ODBC
- OLEDB
- OPC

From the technical point of view the full range of data exchange with external systems can be exploited. The data for the creation of reports can be taken from systems using a database but can also gathered by accessing single data points of subordinated control systems or data acquisition systems directly. Beside the information for all *Plant iT* system components (Process control system, batch system, data acquisition) also the data originating from other areas like

- Laboratory,
- Maintenance management,
- Warehouse management and internal logistics,
- Production scheduling as well as
- financial IT

Principle of interdepartmental reporting including external systems by means of Plant iT integrate



can be integrated in a consistent and continuous reporting solution. Because also the connection to remote systems is supported, *Plant iT integrate* can also be a central basis for a cross-site reporting solution.

The creation and modification of reports is done by means of a powerful engineering environment that can be accessed via a dedicated system client. For the selection and visualization of reports there is a choice regarding the operator front end between a

- Web browser and
- Microsoft Excel.

Hence practically any PC with access to the intranet of the company can be used as a reporting client. Only in case of report access via Microsoft Excel being required, an installation on the client side becomes necessary. For both client types the full

range of standard functionality provided by the front end application is available (e.g. printing, PDF export, Email transmission, forwarding as file, etc.). A parallel use of all kinds of *Plant iT* clients (e.g. those of the process control system) as a reporting client is possible.

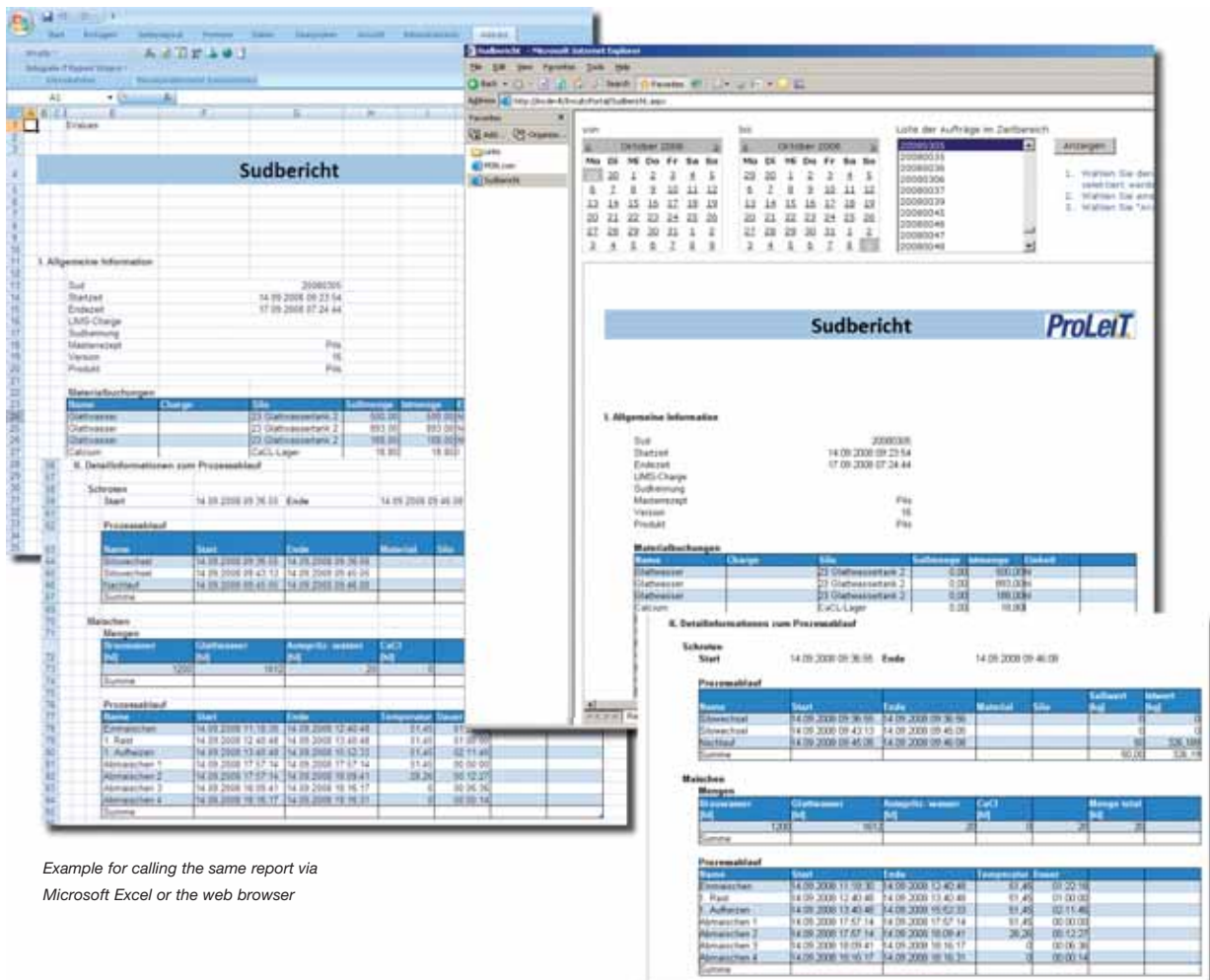
In order to avoid inconsistency due to redundant data storage the reporting subsystem does not store any data itself. Instead of this it either takes direct access to the connected data sources or uses production data archived by *Plant iT integrate*.

**Long term archive**

*Plant iT integrate* provides a special long term archive that covers all process-related data gathered by the other *Plant iT* system components. It is specifically characterized by using a loss-free archiving function, i.e. compared with the original scope no

detailed information are lost as a consequence of data compression. This is especially of crucial importance with regards to legal burden of proof, if it comes to the necessity of detailed analysis of production periods further in the past.

The long term storage of archiving of data in the long term archive strictly follows the structures that have been defined during the engineering for the other *Plant iT* system components. In order to ensure consistent data archiving with minimized engineering workload, information like physical and procedural models, warehouse structures a.s.o. are automatically transferred in the long term archive.



Example for calling the same report via Microsoft Excel or the web browser

# Plant i.T. connect

## Parameterizable communication interface

Parameterization instead of programming is one of the basic principles of the whole *Plant i.T. system platform*. *Plant i.T. connect* uses this principle to implement communication interfaces between *Plant i.T.* and various external systems. The range covers:

- Client-server or host-based systems (e.g. ERP systems such as SAP R/3, LIMS systems, maintenance systems)
- PC and PLC based systems (e.g. automation systems and SCADA systems)
- Intelligent measurement and monitoring systems (e.g. inspectors and inline analysis devices)

*Plant i.T. connect* consists of

- the engineering front end,
- the communication channels and
- the system service.

### The engineering interface

The operator interface of *Plant i.T. connect* is used exclusively for the parameterization and monitoring of communication interfaces. It seamlessly integrates into the configuration client, the central engineering environment of *Plant i.T.* The parameterization dialogues for the different communication channels are standardized in respect to structure. Contentwise they are adapted automatically to the particularities of each channel.

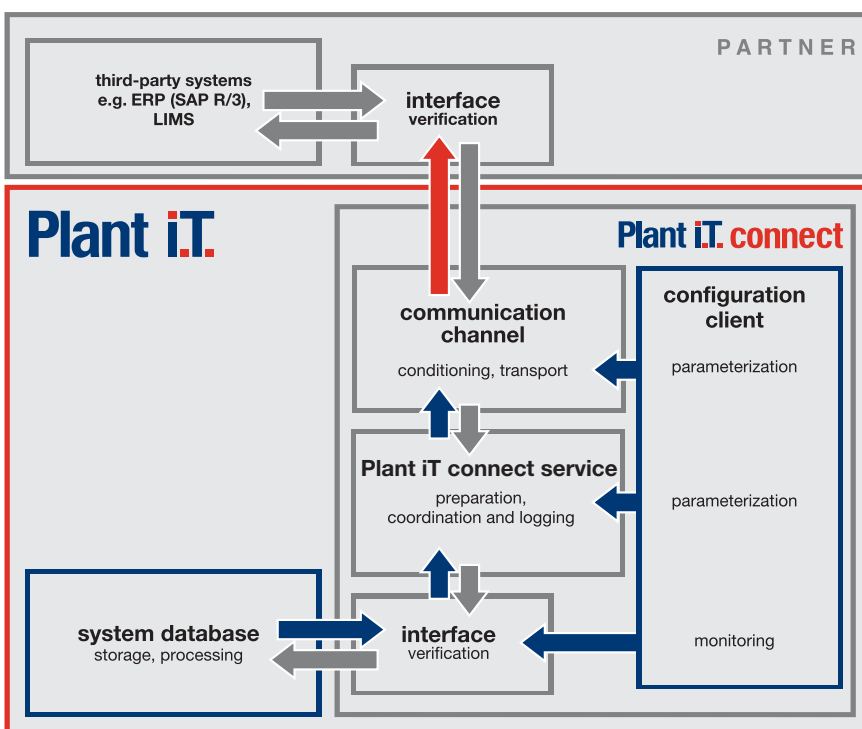
### The communication channels

For each communication to be parameterized, a communication channel is selected in order to define the communication methods to be used. The function of the communication channel is to ensure interface-orientated processing of the data to be transferred as well as the use of standardized functions for sending and receiving data packages.

The following channels are available:

- **IDoc/MQ Series**  
*Plant i.T. connect* sends and receives IDocs using message queuing as the type of communication.
- **IDoc/RFC**  
*Plant i.T. connect* transfers IDocs by sending/receiving RFCs (Remote Function Calls).
- **front end**  
*Plant i.T. connect* sends and receives XML documents and supports the B2MML implementation of ISA 95.
- **RFC Client/Server**  
*Plant i.T. connect* sends and receives RFCs (Remote Function Calls), i.e. requests for particular information. Their content and structure can be individually defined per interface. Either tRFC or sRFC can be used.

Overview of communications relationships for *Plant i.T. connect*



**SQL/ODBC**

Plant iT connect utilizes the ODBC standard interface for communication with relational databases of other systems.

**ASCII/File**

Plant iT connect sends and receives data by writing or reading ASCII files stored in an external system.

**The system service**

Plant iT connect service works on the operating system level. Its primary task is to coordinate and report communications transactions. It is here where incoming data are processed and forwarded to the appropriate communication channel. As the central authority, the service is in charge of an important part of data processing. In this way, the workload for the communication channels is reduced and the system can easily be upgraded with additional communication modes.

**Typical applications**

Among others IDoc and RFC communication are used for the data interface to SAP MM, PP and PM modules.

**Interface to SAP-MM**

Depending on requirements this interface is used for transaction-specific, bidirectional data exchange concerning individual material movements. It is also possible to alternately synchronize information on stock of materials.

**SAP-PP interface**

Production orders as well as respective bills of material can be transferred via this interface from SAP to Plant iT, which reports back order-related data to SAP, e.g. order status and actual values like quantities produced.

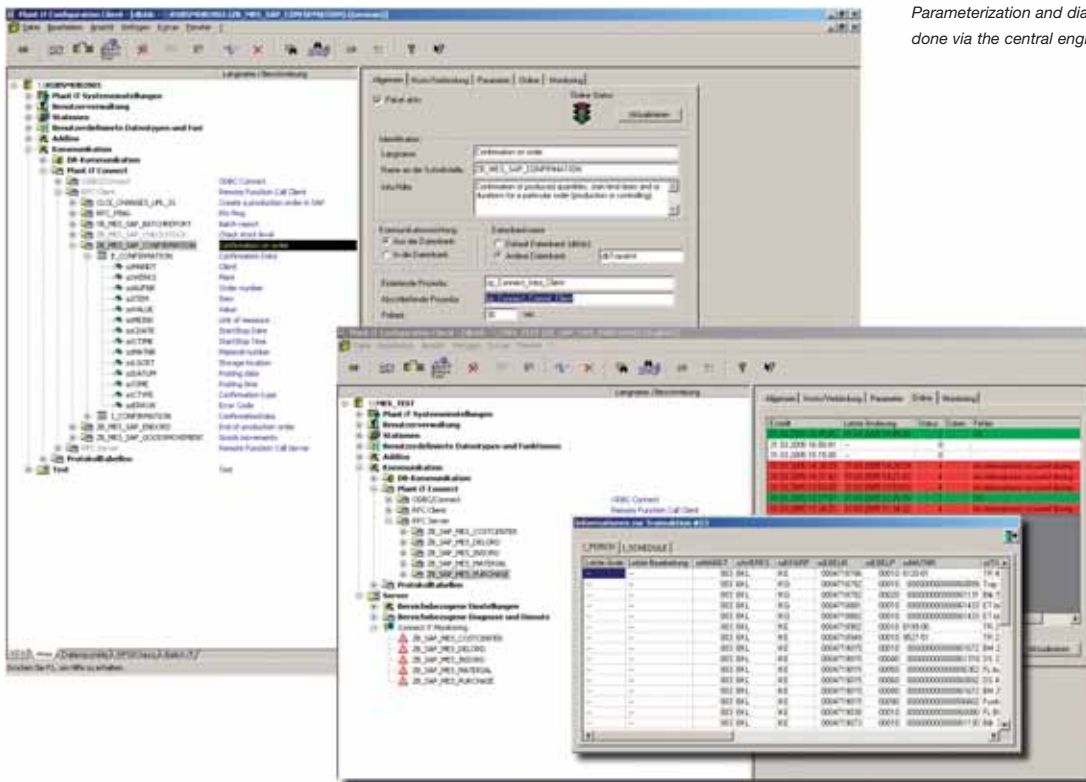
**SAP-PM interface**

This interface transfers counter and measured values to the SAP module for the planning and monitoring of maintenance activities (e.g. current status of operating hours and switching cycle counters).

**ASCII interface**

This interface can be used for the automatic transfer of various data from subordinate measurement and control systems, like for example inspector data of a bottling line. The individual inspectors (empties, full goods, empty crates) store their ASCII data files locally on a PC that belongs to the inspection system. The system service, located on the Plant iT server,

- accesses stored data via the network,
- checks stored data for any changes,
- reads them out, if necessary, and
- transfers them via the communication channel to the central Plant iT database.
- Here, data are available for further processing (visualization, reporting, investigations). Because of its flexibility, this type of communication is particularly suited for linking application-specific solutions to external systems.



Parameterization and diagnostics of the interfaces are done via the central engineering environment

# System requirements

## Servers and workstations

For servers and clients x86-based computers are required. The currently available CPU's of the manufacturers Intel and AMD can be used. The computer hardware and the driver software used with it have to be tested and approved for being operated under Microsoft Windows XP and Windows 2003 Server R2 oder Windows 2008 Server respectively.

Component		Minimum specification	Recommended specification *
CPU	Server	Performance level Intel Pentium 4 1.8 GHz	Performance level Multi core CPU by Intel or AMD (Core 2 Duo, AM2) 2.0 GHz or more
	Client	Performance level Intel Pentium 4 1,8 GHz	Performance level Intel Pentium 4 1,8 GHz
Memory	Server	1024 MB	2 GB or more
	Client	512 MB	1 GB or more
Hard disk	Server	40 GB	80 GB or more
	Client	20 GB	40 GB
Network interface	Server	Intel Etherexpress Pro 10/100 PCI	100 MBit PCI or 1 GBit PCIe NIC (Intel, 3Com)
	Client	Intel Etherexpress Pro 10/100 PCI	100 MBit PCI or 1 GBit PCIe NIC (Intel, 3Com)
Graphics interface	Server	Onboard-Graphics	Onboard-Graphics
	Client	external AGP graphics board with min. 32 MB memory	external AGP/PCIe graphics board with min. 32 MB memory

\*) The recommendation is for a mid-size system consisting of one server and three clients.

## PLC's

Plant iT components run on Simatic controllers of the model ranges S7-400 and S7-300 fulfilling the following requirements:

Component			Minimum specification	Recommended specification
CPU	Program memory	<i>Plant Direct iT</i>	256 kB	512 kB
		<i>Plant Liqu iT</i>	512 kB	1 MB or more
		<i>Plant Batch iT</i>	512 kB	1 MB or more
	Data memory	<i>Plant Direct iT</i>	256 kB	512 kB or more
		<i>Plant Liqu iT</i>	512 kB	1 MB or more
		<i>Plant Batch iT</i>	512 kB	1 MB or more
Network	One Ethernet interface for exclusive use by Plant iT that supports the protocol ISO over TCP/IP Especially not allowed are: parallel use with ProfiNet and use of onboard interfaces of teh CPU			

The recommended specification for the program memory may increase depending on the amount of application specific software implemented parallel to *Plant iT*. The recommended specification for the data program memory may increase depending on the amount of static and dynamic *Plant iT* objects allocated to a particular PLC.

## Standard software

Software requirements for servers and clients:

Component		Requirement
Operating system	Server	Microsoft Windows 2003 R2 Server Standard Edition SP2 (32 Bit) Microsoft Windows 2008 Server Standard Edition (32 Bit)
	Client	Microsoft Windows XP Professional SP2 (32 Bit)
Database		Microsoft SQL Server 2000 Standard Edition SP4 Microsoft SQL Server 2005 Standard Edition SP2
Spreadsheet for analysis and reports		Microsoft Excel 2002, 2003 or 2007
Engineering operator front end		Microsoft Visual Studio 2005 Standard Edition



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