SIEMENS

SIMATIC PCS 7

Easy, flexible and scalable

SIMATIC BATCH: Efficiently automate batch processes

siemens.com/simatic-batch

Standardized batch automation with SIMATIC BATCH

Whether producing polymers, surfactants, pharmaceuticals or beer – batch processes are indispensable in many sectors. In terms of process control and automation, batch production must meet completely different requirements than a continuous process. Selecting a suitable automation tool is crucial for the profitability of your system.

Increased requirements for batch processes...

Consistent product quality, the traceability of production and the ability to reproduce the process – the basic requirements for batch processes are always the same. Operators must also face constantly changing requirements: The market and consumers demand a variety of products, standards are expanded, testing specifications tightened, etc. The flexibility of the automation, the availability of the production equipment and optimum utilization of plant capacity are key success factors – both now and for the future.

...intelligent fulfillment.

The process control system, SIMATIC PCS 7, is the right solution for batch automation requirements and market challenges. The software package, SIMATIC BATCH, is set up in scalable modules to flexibly enable the best possible adaptation to plant and control tasks. SIMATIC BATCH can be configured from a single-user system up to a redundant client-server system and can therefore be used by small laboratory facilities up to large production plants of any size.
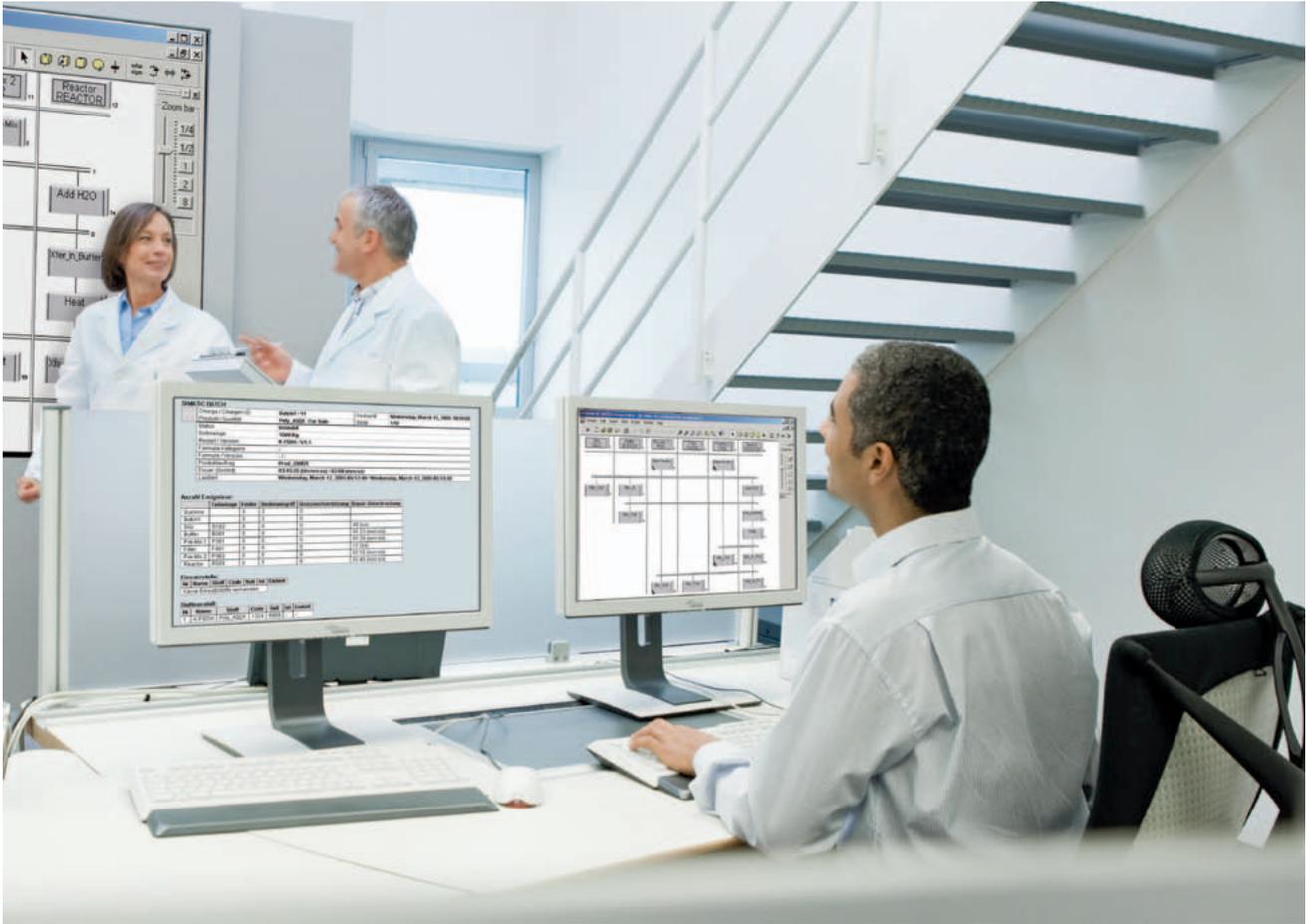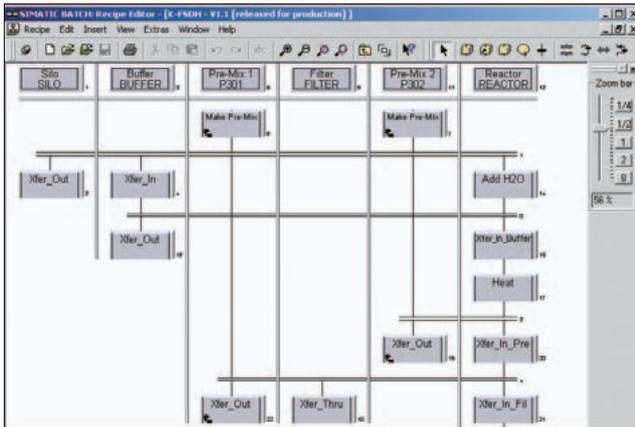
Fully integrated...

SIMATIC BATCH adds functions for batch automation to the SIMATIC PCS 7 process control system and uses its basic functions at the same time. The plant topology is created, maintained and provided to the recipe system and batch control in the central Engineering System. The objects for the visualization, such as Sequential Function Charts (SFC) instances or units, are generated automatically. All batch-relevant data are transferred to the batch server and system messages from SIMATIC BATCH are sent to the message system. The consistent display and operating philosophy is achieved without additional project planning costs and allows consistent navigation that promotes both intuitive operation and a rapid and safe response to process faults.
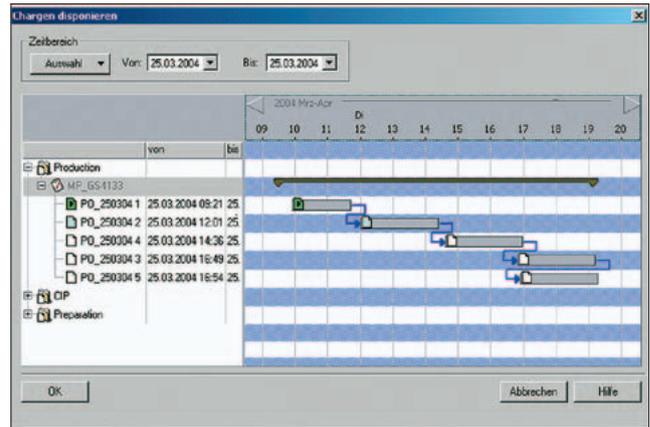
...down to the automation level

The interface to the automation level (Controller) is standardized. The component type instance concept enables the batch system to communicate with process controllers for basic functions (SFC types), from which the unit-specific phases are generated using drag & drop graphical methods.

SIMATIC BATCH is integrated with the control level as is demonstrated by the "AS Execution" function. This function can be used to load unit procedures into the controller. This provides very short step transition times that are particularly important for quick processes.

Recipe Editor

Planning

Batch Report

Control Center

Create and edit recipes

The SIMATIC BATCH Recipe Editor with its graphical user interface and the technical procedure-led operation enables recipes and library operations to be created quickly and intuitively. In addition, this convenient tool offers functions such as the processing of individual and grouped objects, as well as a structural syntax check.

Monitor and control batches

The SIMATIC BATCH Control Center (BatchCC) is the central component for managing, monitoring and controlling batch processes. The clear graphical user interface allows all batch-relevant tasks to be handled, e.g. importing and updating the plant data for basic automation, setting user rights for all functions, the management of master recipes or the creation of batches.

Plan production orders

BatchCC enables the creation of individual production orders and batches. The SIMATIC BATCH planning add-on package offers even more planning functions: It enables batches to be planned in advance for a number of production orders. All batches including their unit occupancy and any occupancy conflicts can be clearly shown.

Logging batches and recipes

SIMATIC BATCH Report documents the recipes and batch data in the form of logs. Batch reports contain all of the data required to track the process sequence (e.g. start and end time, target and actual values, operator interventions, fault messages), while the recipe logs document all structures and target values for a master recipe.

5

Maximum flexibility with the system

Optimum environment for batch processes

Recipe-controlled processes must be highly flexible – a challenge for automation technology. Batch production is too complex for a classic solution with fully programmed control processes. The automation and recipe layers must be separated so that recipe changes do not require any changes in the automation system. SIMATIC BATCH and SIMATIC PCS 7 form a functional unit that fully covers the models described in the ISA-88.01 standard. The physical model is implemented in SIMATIC PCS 7 Engineering; the resulting program structures are executed in the automation system. The procedural model is implemented in SIMATIC BATCH. The control recipes are executed in SIMATIC BATCH.

The plant model is made available to SIMATIC BATCH, so the procedural model can be shown in the form of recipes as indicated below:

- A recipe procedure runs in order to control a process and to produce a batch of a product.
- A recipe unit procedure runs on a unit to control a recipe stage.
- A unit can only be occupied by one batch at any one time.
- A recipe operation or a recipe function runs on a technical device in order to fulfill a process engineering task or function.

Process Cell

Recipe
Procedure

Unit

Recipe Unit
Procedure

Equipment
Module

Recipe
Operation

Control
Module
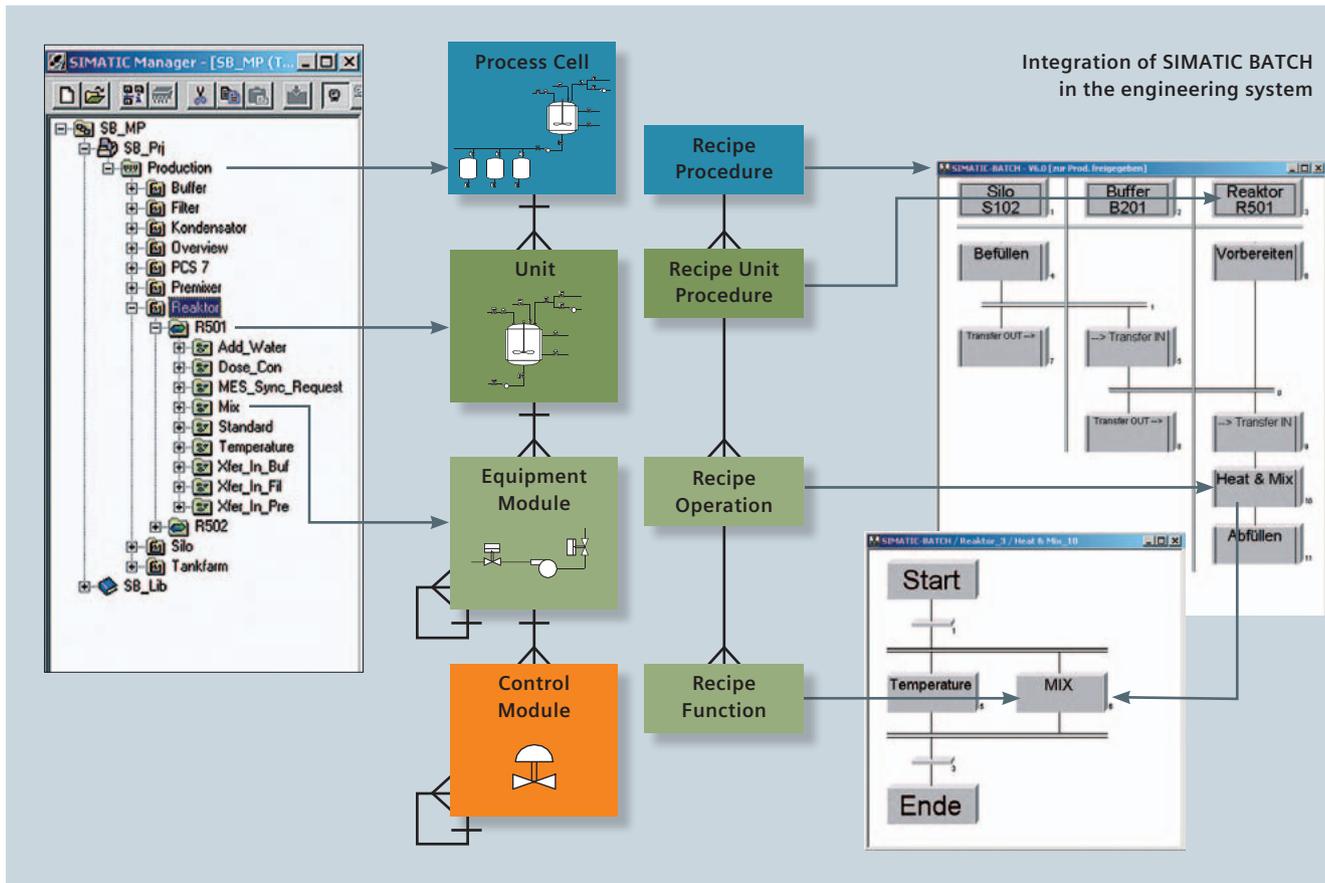
Recipe
Function

The creation of unit or device neutral recipes, that can be used on several production devices of the same type, provides you with two simultaneous advantages: the engineering cost is significantly reduced and validation is greatly simplified. The assignment of the current production equipment is implemented at the batch level. For you as the user, this means the highest level of flexibility and simple adaptation to individual plant situations:

- Units can be selected manually.
- Preferred units can be selected even when creating the recipe.
- It is also possible to select "production fittings not used for the longest time" to ensure uniform plant capacity utilization.
- Units can be stipulated by a higher-level controller, e.g. an MES system.

Customized functions – for maximum efficiency

Creating recipes

SIMATIC BATCH supports the ISA-88's procedural model completely. Recipe procedures with their lower-level sub-recipes, recipe operations and functions are formulated with SIMATIC BATCH. The recipe editor provides a convenient tool for this purpose. You can use it to reorganize production processes for different products, introduce new products or improve existing processes. No programming knowledge is required for these tasks.

The intuitive, menu-guided, graphical user interface shows the process in full. Process engineers or recipe creators use batch objects to simply insert sub-recipe procedures, recipe operations, recipe phases, transitions, loops, etc. Production equipment, units or technological functions are provided by the SIMATIC PCS 7 Engineering System. New project planning is not required. Structural syntax and plausibility checks provide additional user-friendliness and safety.

When creating master recipes, exceptions can be set that provide a defined special process if faults occur during batch production. The recipe editor enables the procedurally oriented creation and modification of master recipes and library operations. This does not require the assistance of system technicians. Master recipes and functions are stored and modified at a central location. Recipe operations can also be integrated conveniently using a library. From there exceptions can be inserted as a reference in recipe procedures. Here too the capability of centralized modification represents a significant simplification for engineering and validation.

Batch control

Batches can be created, started and controlled via the BatchCC on the basis of the device-neutral master recipes. Structural changes are possible when a batch runs. This means that sequences, i.e. control recipes, can be modified online and saved back into the master recipe to ensure that they can be reproduced. This is how SIMATIC BATCH provides important benefits, especially for experimenting with a new process or when optimizing products. Operator interventions during batch production, such as interrupting and continuing recipe processes, are possible via BatchCC as is opening detailed information directly from SFC instances. Operator instructions and dialogs support the plant operators in production monitoring with notes relating to manual intervention, for example, "take sample," and at the same time also enable such process data to be entered such as lab values.

Using BatchCC it is possible to create individual production orders and batches. The SIMATIC BATCH Planning option package expands the planning functions from the basic system and permits predictive planning for a wide range of production orders. The creation or distribution of the batches for a production order can, depending on the batch number or production quantity specified, be performed either manually or automatically.

Traceable and reproducible production

Seamless logging and connection to corporate management level

Systems must increasingly be validated these days on the basis of sales or legal requirements to ensure compliance with quality standards. SIMATIC BATCH supports you in doing this with a range of functionalities in accordance with GMP (Good Manufacturing Practice) and conforms to the specifications of the FDA (Food and Drug Administration). Traceable and reproducible production is ensured by comprehensive logging options: Batch reports include all of the data required for reproducing the batch process for demonstrating quality and complying with statutory directives.

Recipe reports include all recipe header data, recipe topology, used material, rejected material and parameter lists as well as procedure directives.

A BATCH Report is used to create recipe and batch logs. Report data are displayed and printed via BatchCC or the separately executable batch viewer.

SIMATIC BATCH can be connected to the company management level to effectively integrate production processes and material management systems, and the coordination of all production-relevant equipment and applications. Internal system interfaces are used to connect to Manufacturing Execution Systems (MES) such as SIMATIC IT from Siemens. The connection to other MES is achieved simply by using the SIMATIC BATCH API Application Programming Interface. This open interface for customer-specific expansions provides access to the data and functions of SIMATIC BATCH and allows the programming of individual industry-specific or project-specific applications.
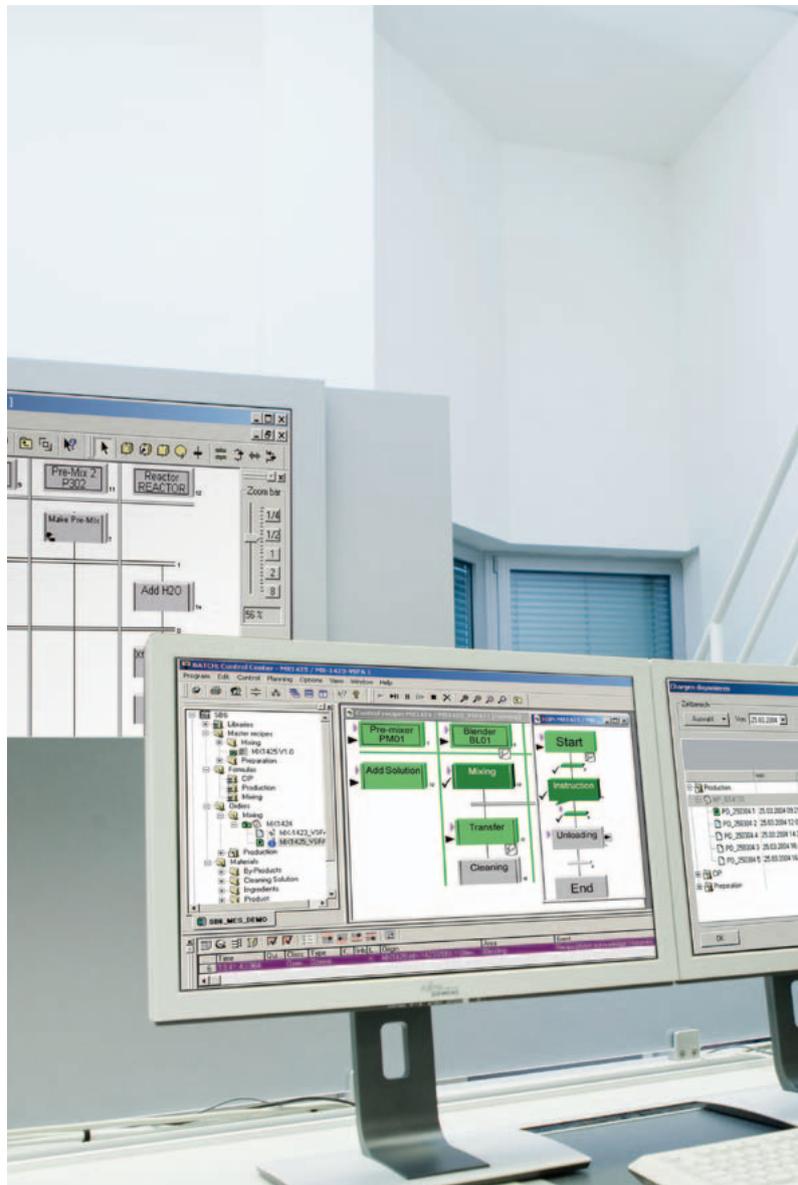
SIMATIC BATCH means for you:

- Flexibility: The configuration can be expanded at any time; therefore, plant construction can take place using individual, multi-level operation planning.
- Availability: The redundant architecture design provides fault-tolerant operation if a component fails.
- Innovation: Version-controlled recipe management helps you to optimize products and production processes.
- Reproducibility: Using recipe-based batch control, the same product quality is achieved under clearly defined production conditions.
- Traceability: Using the batch report, the traceability of the production sequences is guaranteed for each batch.
- Effective use of resources: Differentiated occupation strategies on units means the plant capacity utilization can be planned. This can contribute significantly to increased productivity of your plant and minimized energy costs.
- Ergonomics: The integrated visualization and notification concept supports plant operators with targeted navigation across the plant.
- FDA-compliant validation: Proof that the production process can reproducibly meet the acceptance criteria in practical use is facilitated by:
  - Central user administration with access control via the SIMATIC logon
  - Audit trails (change log)
  - Electronic signature in accordance with 21 CFR Part11
  - System-supported version control of recipe objects
  - Consistent standardization

Further information on SIMATIC PCS 7:
www.siemens.com/simatic-pcs7