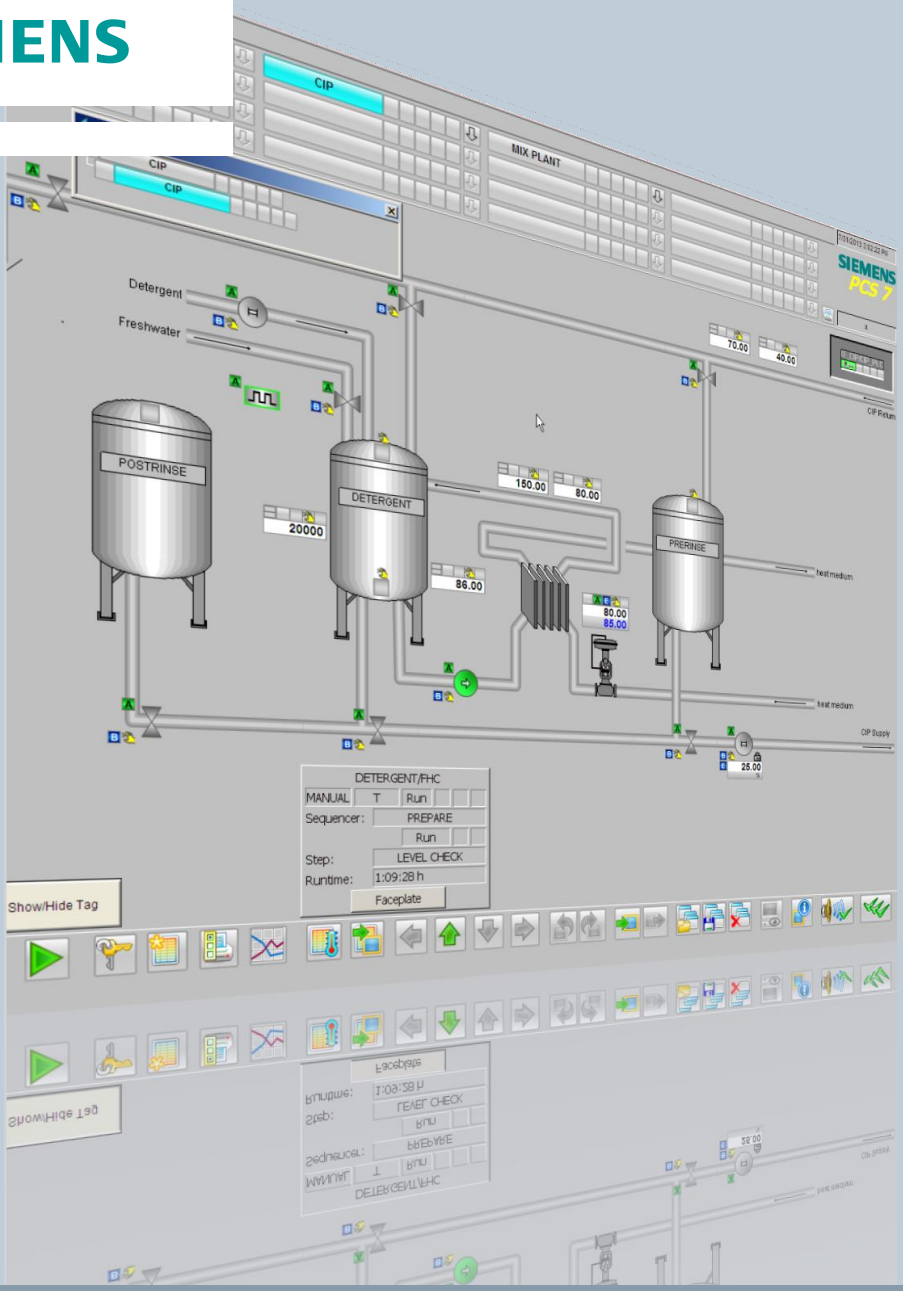
SIEMENS



Application example • 09/2016

PCS 7 Unit Template “CIP – Cleaning in Place”

SIMATIC PCS 7 V8.2

https://support.industry.siemens.com/cs/ww/de/view/78463886

Warranty and liability

Note

The Application Examples are not binding and do not claim to be complete regarding configuration, equipping and any eventuality. The Application Examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for proper operation of the described products. These application examples do not relieve you of the responsibility to use safe practices in application, installation, operation and maintenance. When using these Application Examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these Application Examples at any time without prior notice. If there are any deviations between the recommendations provided in these Application Examples and other Siemens publications – e.g. Catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document.
Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data etc., described in this Application Example shall be excluded. Such an exclusion shall not apply in the case of mandatory liability, e.g. under the German Product Liability Act ("Produkthaftungsgesetz"), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract ("wesentliche Vertragspflichten"). The damages for a breach of a substantial contractual obligation are, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change of the burden of proof to your detriment.
Any form of duplication or distribution of these Application Examples or excerpts hereof is prohibited without the expressed consent of the Siemens AG.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines, and networks.

To protect plants, systems, machines, and networks against cyber threats, it is necessary to implement – and to continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions form only one element of such a concept.

The Customer is responsible for preventing unauthorized access to plants, systems, machines, and networks. Systems, machines, and components should only be connected to the enterprise network or the internet if necessary and only to the extent necessary, and with appropriate protective measures (e.g., use of firewalls and network segmentation) in place.

In addition, you should pay attention to Siemens' recommendations on appropriate protective measures For more information about industrial security, go to http://www.siemens.com/industrialsecurity.

The products and solutions of Siemens are being constantly developed further in order to render them even more secure. Siemens strongly recommends applying product updates as soon as they are available and to always use the latest product versions. The use of obsolete versions or versions that are no longer supported can increase the risk of cyber threats.

In order to be informed about product updates at all times, be sure to subscribe to the Siemens Industrial Security RSS Feed on http://www.siemens.com/industrialsecurity.

Table of contents

1 Automation Task

Introduction

In facilities for the production of food or pharmaceutical products and its technical processes certain process steps, procedures and devices are repeated in the same or similar form.

An important process in this regard is the automated cleaning of the apparatus and plant sections.

This process is becoming more and more important with increasing plant size, since manual cleaning is no longer possible. One efficient process is the "Cleaning in Place" process, called "CIP Process" for short.

The CIP process enables the cleaning of apparatus and plant sections in place. Disassembly is not necessary. As a result of this kind of automated cleaning, valuable working time is also saved.

Overview of the automation task

The CIP system is used for cleaning the other plant sections and fittings. The individual fittings are controlled by the automation program.

Description of the automation task

The fluids required for cleaning are prepared and held ready in the CIP system. There are different fluids for the different cleaning phases, and these must always be available in sufficient quantities. For this reason, the fill level in the storage tanks must be continuously monitored. If the levels are too low, fluid must be supplied to the tanks.

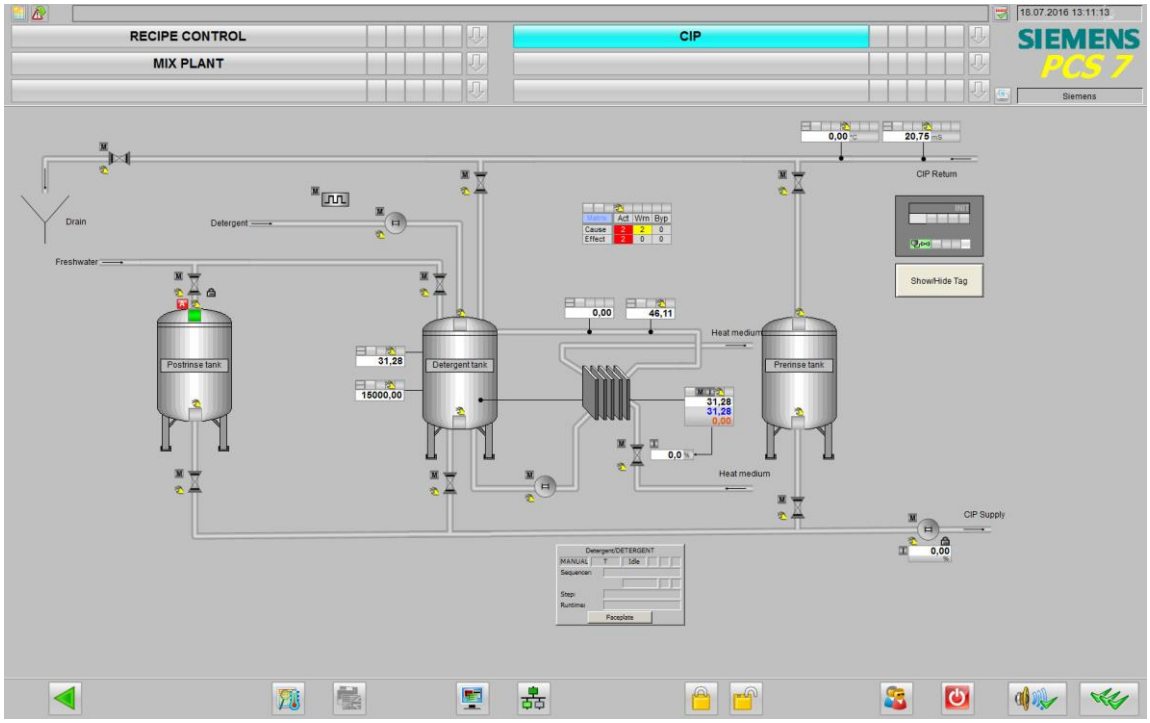
In addition to the fill level, the quality of the fluid is also important. For this reason, the fluids in the tanks are controlled to a predefined temperature and concentration of detergent. Consequently the temperature and concentration are also continuously monitored and adjusted if necessary.

A further task is to reuse as much cleaning fluid as possible after use. To this end, the quality in the return line is checked again. If the quality meets the specifications, the fluid will be automatically fed back to the tanks if these are not full. If the quality is not adequate or the tanks are full, the fluid is disposed of.

2 Automation Solution

2.1 Overview of the complete solution

The figure below shows schematically the structure of the solution:



The Application Example “CIP" is implemented as a SIMATIC PCS 7 multiproject in accordance with ISA S88.01.

The multiproject consists of an AS project (user program), an OS project (visualization with process pictures), as well as a SIMATIC BATCH system (production and cleaning recipes).

The AS project was created using the APL library (Advanced Process Library), the BRAUMAT Library and SIMATIC BATCH blocks.

Benefits

This application offers you the following benefits:

- Implementation of a CIP system conforming to ISA S88.01
- Description of the most important automation functions for a CIP system

Delimitation

These “CIP” application examples do not cover the special case of a simultaneous cleaning of parts of the system.

Required knowledge

Basic knowledge of the following specialist fields is a prerequisite:

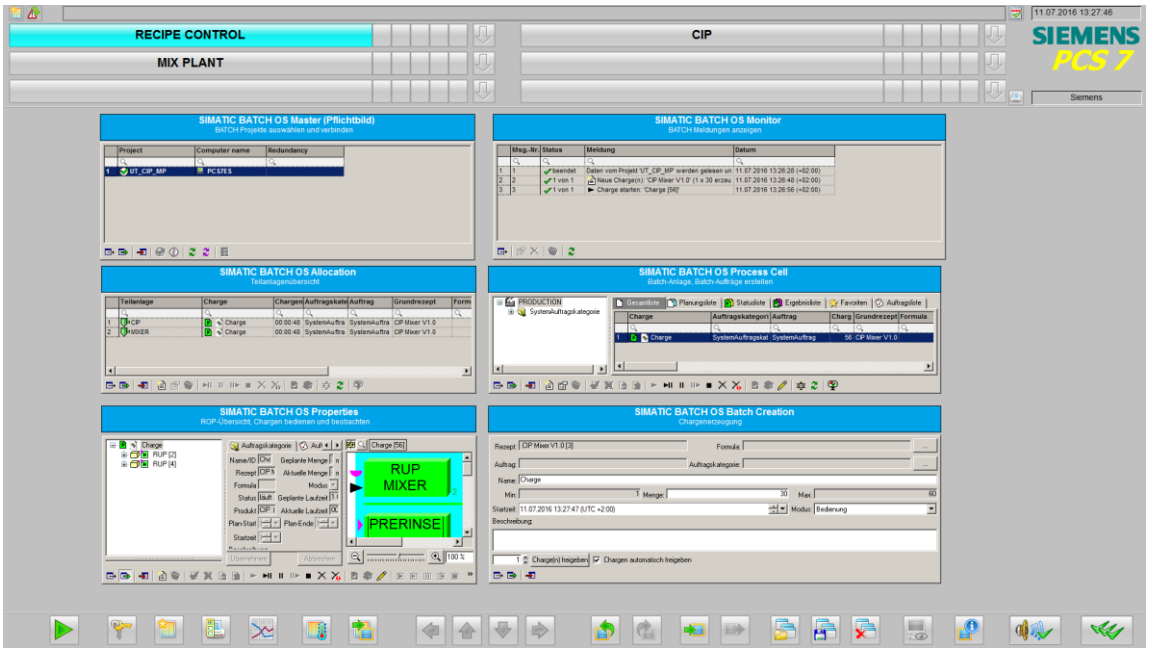
- Configuring with SIMATIC PCS 7, SIMATIC BATCH and the APL library
- Knowledge of control technology
- Basic knowledge of process technology

2.2 Core functionality

The "CIP" application example includes the user program with typical process tag types for a CIP system.

The plant hierarchy (PH) is constructed according to ISA S88.01. The equipment modules necessary for the CIP system are defined. A plant overview picture and an overview picture with BATCH OCXn are included for operation.

The figure below shows the BATCH OCX overview picture:



A SIMATIC BATCH backup with a sample recipe is included for creating cleaning batches.

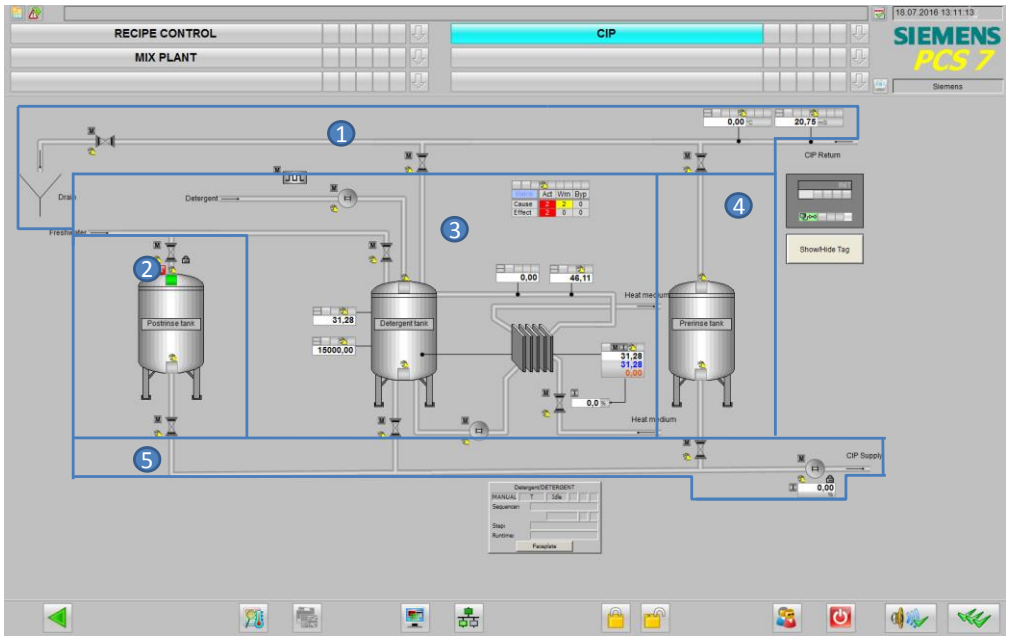
Das Application example contains a simple simulation based on CFCs. The setpoints in the recipes are freely selected and may differ from one plant to another. The equipment modules and process tag types are used as an exemplary template and with plant-specific adaptations can be applied to a real production plant.

The cleaning recipes must be created for the plant sections to be cleaned depending on construction and product. The example recipe merely describes the basic construction.

Note The technical process in the CIP system is not simulated.

2.2.1 Description of the individual functions

The individual parts of a CIP system are described in the following. The entry point is the process picture of the visualization screen.



The process picture of the CIP system consists of the following main parts:

1. CIP return modules
2. Post-rinse tank
3. Detergent tank
4. Pre-rinse tank
5. CIP supply modules

1. Return

The return is used to recover the used CIP fluids. Depending on the fill level in the tanks, the quality (temperature and detergent concentration) and also the current cleaning phase, the fluid is fed into the appropriate tanks or into the drain. This is done with the aid of sensors and valves.

2. Post-rinse tank

The cleaning fluid (e.g., water) for the final cleaning phase is stored in the post-rinse tank. Fluid can be drawn off provided the level does not fall below the minimum fill level.

3. Detergent tank

The detergent tank contains the cleaning fluid for the second cleaning phase. In this tank the fluid is heated up to the prescribed temperature and the necessary detergent concentration is established. The fluid is permanently pumped through a heating circuit so that it will always be at the specified temperature. Depending on the temperature, the detergent concentration is measured (based on its conductance). If the detergent concentration is too low, detergent is added.

The detergent tank can also be filled with fresh water. This is possible when there is no CIP phase active, as the temperature and the concentration have to be adjusted to the correct values again.

Note The detergent tank is used as an example of an acid or alkali tank.

4. Pre-rinse tank

The pre-rinse tank contains the cleaning fluid for the first cleaning phase. The fluid removes contamination and product residues from the pipes and apparatus.

The tank is filled with fresh water or CIP fluid from the other cleaning phases.

The tank can be filled provided the maximum fill level has not been reached.

If a particular temperature and / or detergent concentration for the fluid is necessary for process-related reasons, the fluid can be prepared in the same way as described for the detergent tank.

5. Preprocessing

The CIP fluids are fed from the CIP tanks through the CIP supply line into the parts of the plant that are to be cleaned. The inflow from the tanks into the supply line is regulated via valves. The appropriate valve is opened depending on which cleaning phase is active. The flow rate is controlled by a pump.

Before the fluid is drawn off, it is checked to confirm that it meets the quality requirements / that sufficient fluid is available.

Other functions

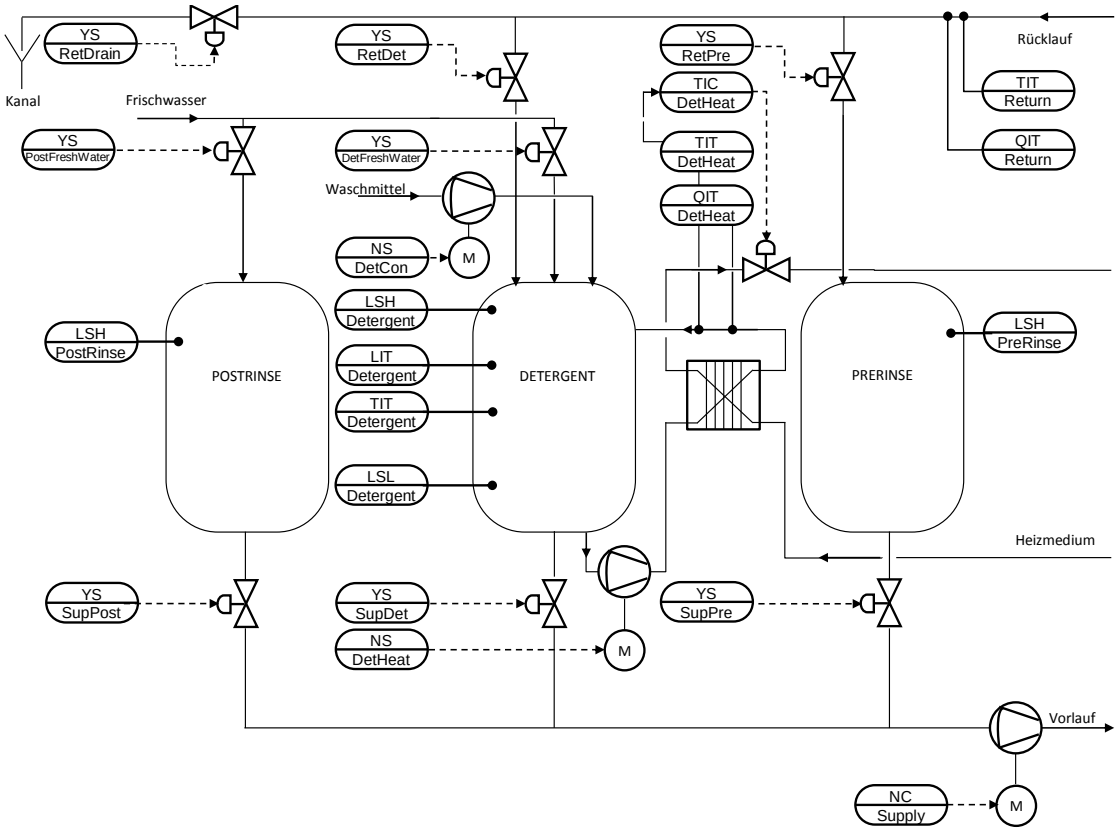
In addition to the "CIP" CIP system, the example project also contains the "MIX PLANT" plant section. This is used to demonstrate cleaning with a CIP system. The plant section consists of the mixer to be cleaned as well as the "TANK_IN" (tank inlet) and "TANK_OUT" (tank outlet) equipment modules.

Advantages of this solution

- A reduction of the knowledge necessary to develop applications
- A reduction in the configuration effort
- More flexible setup and adaptation due to technical functions
- Standardized structures

2.2.2 PI process screen

The figure below shows the PI flow diagram of the CIP system. The process tag types that are contained in the project have been entered.



2.3 Hardware and software components used

The example project has been created with the following components:

Hardware components

Component	Note
SIMATIC PCS 7 ES/OS IPC847D W7	For the PCS 7 V8.2 example project

Note In case of different hardware, please observe the minimum requirements for installing the software components. The minimum requirements can be found in the Read Me file of the PCS 7.

Standard software components

Component	Note
SIMATIC PCS 7 V8.2	Part of SIMATIC PCS 7 ES/OS IPC847D W7
S7 PLCSIM	Not part of SIMATIC PCS 7; appropriate licenses are required.
APL Library V8.2	Part of SIMATIC PCS 7 V8.2
SIMATIC BATCH V8.2	Not part of PCS 7; appropriate licenses are required.
BRAUMAT Library V7.1 Upd2	Not part of PCS 7; appropriate licenses are required.
PCS 7 Logic Matrix ES package • PCS 7 Logic Matrix Editor • PCS 7 Logic Matrix Library	Not part of SIMATIC PCS 7 V8.2
PCS 7 Logic Matrix OS package • PCS 7 Logic Matrix Viewer	Not part of SIMATIC PCS 7 V8.2

Example files and projects

The following list contains all the files and projects used in this example.

Component	Note
78463886_PROJ_CIP_PCS7_V82.zip	PCS 7 V8.2 example project and SIMATIC BATCH Backup
78463886_DOCU_CIP_de.pdf	This document

3 Basics

3.1 Process engineering

Cleaning in Place (CIP)

The term "Cleaning in Place", or CIP for short, designates a process which is used in the process industry for cleaning plant parts. The advantage of the process is that the cleaning takes place directly on the plant part in situ, without it having to be dismantled.

A separate plant section is added to the plant for the CIP process. The cleaning fluid is prepared and stored here. The plant sections to be cleaned are designed so that they can be connected to the CIP plant section. The CIP plant section is positioned so that the paths to the plant sections to be cleaned are as short as possible.

3.2 Automation technology

The "unit" concept

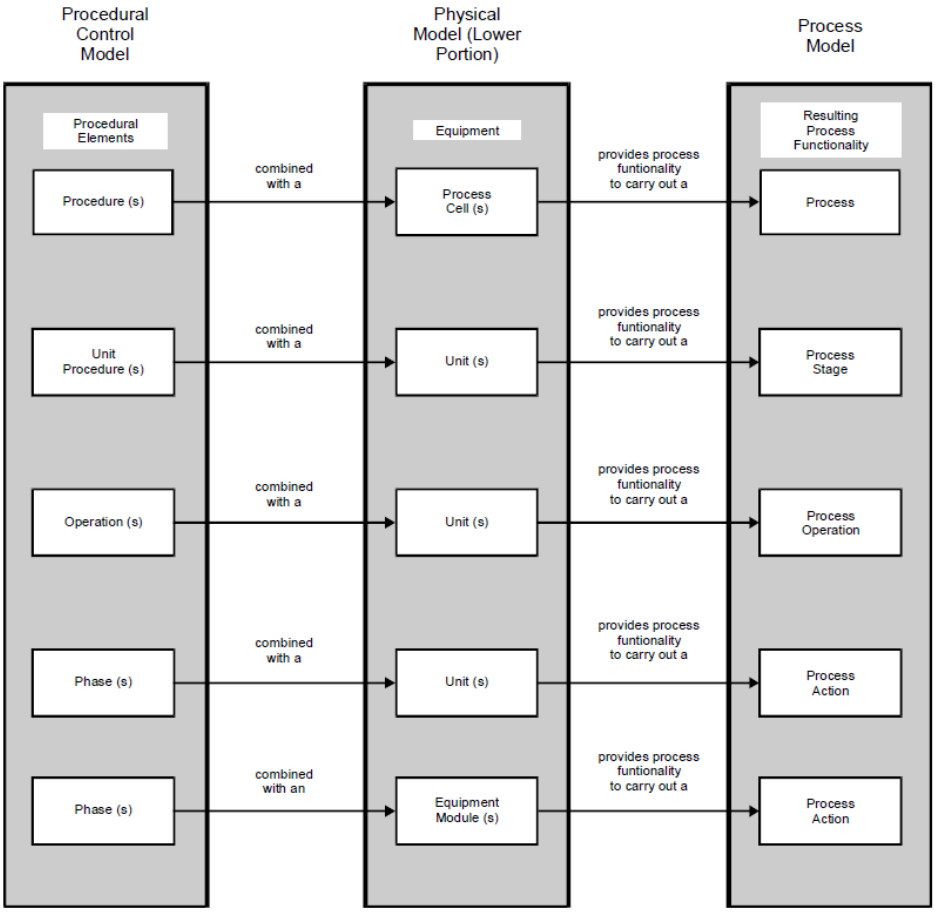
In this application example, the "CIP" plant section can be regarded as a unit.

The term "unit" means a unit in process-related plants (plant section, apparatus, machines) including the sensors, actuators and the assigned automation software that is frequently required in this configuration of components. The unit as a "Type" is used as a template for generating many different programmable instances.

ISA-88

The application example is configured in accordance with the ISA-S88 standard. The standard describes a process with reference to the equipment available (physical model), the defined technical process (process model) and the equipment that is used to produce a batch (procedural control model).

The figure below describes the structure of the ISA-S88 standard.



Note You will find detailed information on ISA-S88.01 in the manual entitled "PCS 7 SIMATIC BATCH V8.2 Process Control System", in the chapter entitled "Technological basics complying with ISA-88.01". You will find this manual at the following link: https://support.industry.siemens.com/cs/de/en/view/109485956

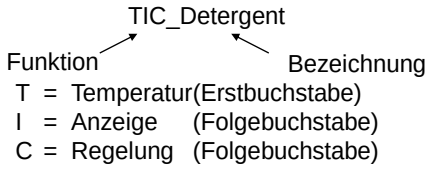
4 Structure and Principle of Operation

4.1 Project structure

4.1.1 CFC chart naming convention

A uniform naming convention has been used for identifying the process tag types - the function is named according to the European standard EN 62424.
The following figure shows the composition of a process tag name:

Fig. 4-1



The following table contains the letters used in the application and their meanings:

First letter	Meaning
F	Flow
L	Level
N	Motor
P	Pressure
Q	Master value
S	Speed (velocity, rotational speed, frequency)
T	Temperature
X	Freely selectable first letter
Y	Control valve

Subsequent letter	Meaning
C	Control
F	Fraction
I	Indication
S	Switching (binary control function or switching function non-safety-related)
T	Monitoring (transmitter, analog value processing)
H	High (top)
L	Low (bottom)

4.1.2 Technological view

The plant hierarchy of the Application Example “CIP" is configured in accordance with ISA S88.01.

AS Project

In the AS project, "CIP_AS", the first plant hierarchy level, "PRODUCTION", is defined as the plant and contains the neutral hierarchy folders.

- "CIP" contains the "CIP" hierarchy folder, defined as a plant section
- "MIXER PLANT" contains the "MIXER" hierarchy folder, defined as a plant section
- "RECIPE CONTROL" contains no other objects
- “Simulation” contains the simulation plans for our application example

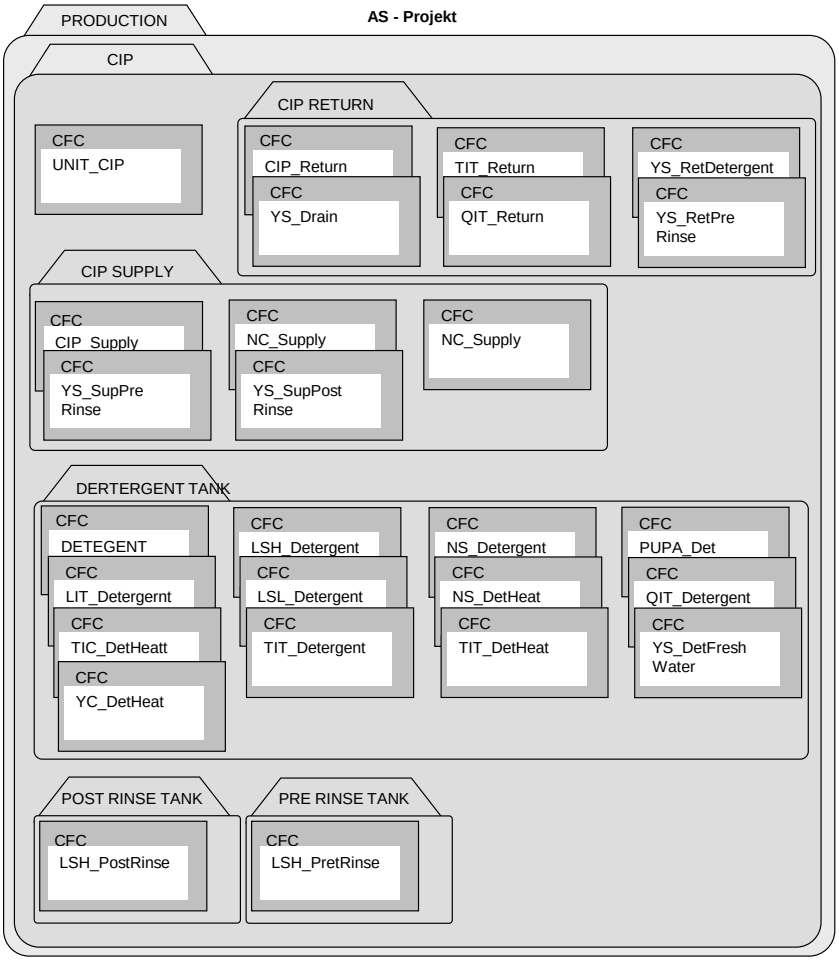
The "CIP" plant section contains the "UNIT_CIP" CFC diagram with the "UNIT_PLC" block, the hierarchy folders for the "CIP_SUPPLY" and "CIP_RETURN" equipment modules and the neutral hierarchy folders for the tanks in the CIP system. The necessary process tags are located in these folders.

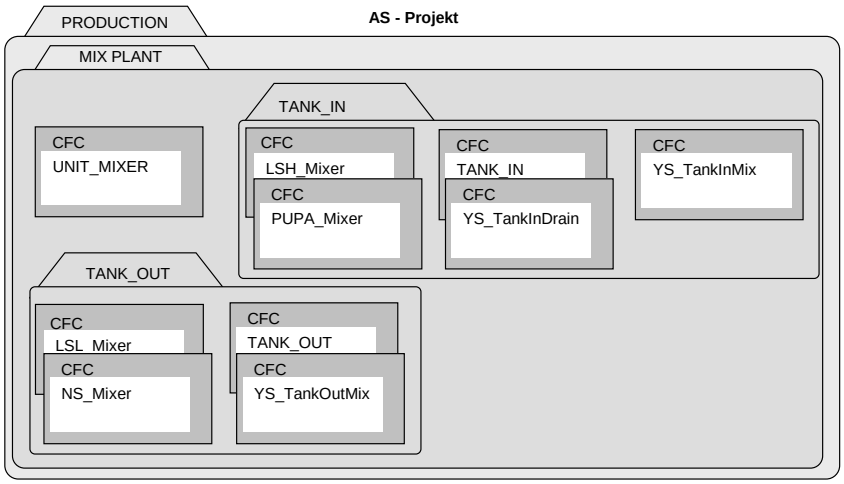
The "MIXER" plant section contains the "UNIT_MIXER" CFC diagram with the "UNIT_MIXER" "UNIT_PLC" block and the hierarchy folders for the "TANK_IN" and "TANK_OUT" equipment modules. The necessary process tags are located in these folders.

Note The simulation plans are intended to illustrate the application example and are not further explained.

4.1 Project structure

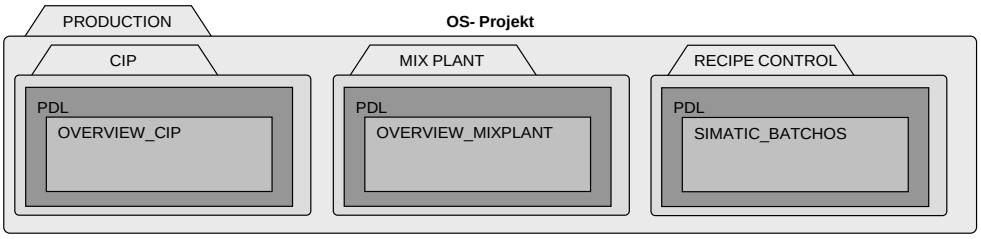
The following figures show the structure of the AS project:





OS project

The plant hierarchy in the OS project is derived from the technological hierarchy of the AS project. The “CIP", "MIX PLANT" and "RECIPE CONTROL" neutral hierarchy folders contain the "OVERVIEW_CIP.pdl", "OVERVIEW_MIXPLANT.pdl" and "SIMATIC_BATCHOS.pdl" overview images. The sub-folders contain no other objects.



4.2 Technical functions and process tags

The "CIP" application example is composed of various technical functions and process tags. In a PCS 7 project, all the process tags, including the CMT, are based on the master data library. SFC types, which are also included in the master data library, are used to describe the technical functions.

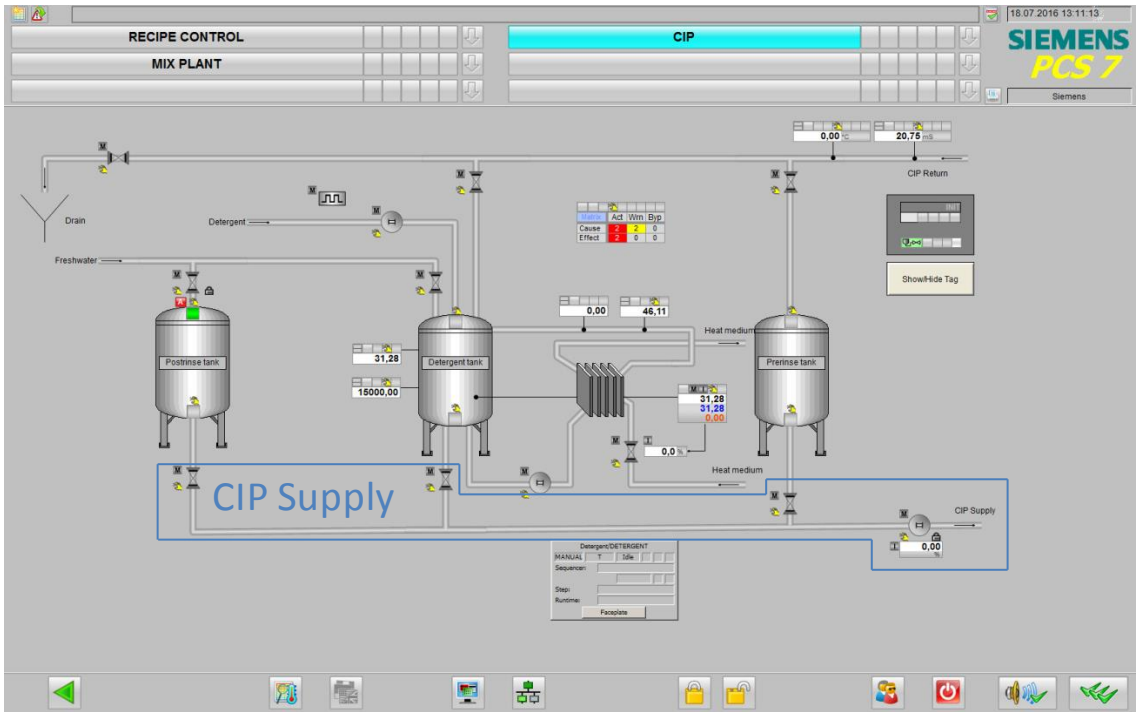
In the following chapters you will find information on the structure of the individual technical functions. You will also find a description of the SFCs used.

4.2.1 CIP SUPPLY

The detergent is fed from the tanks to the individual sections of the plant via the CIP supply. Which detergent is used is implemented by means of an SFC type instance. The fluid is taken from the appropriate tank, depending on which control strategy is selected. The quantities taken are defined by cleaning recipes in SIMATIC BATCH. The cleaning is carried out using cleaning batches and thus is also logged.

Setup

The figure below shows the design of the supply apparatus:



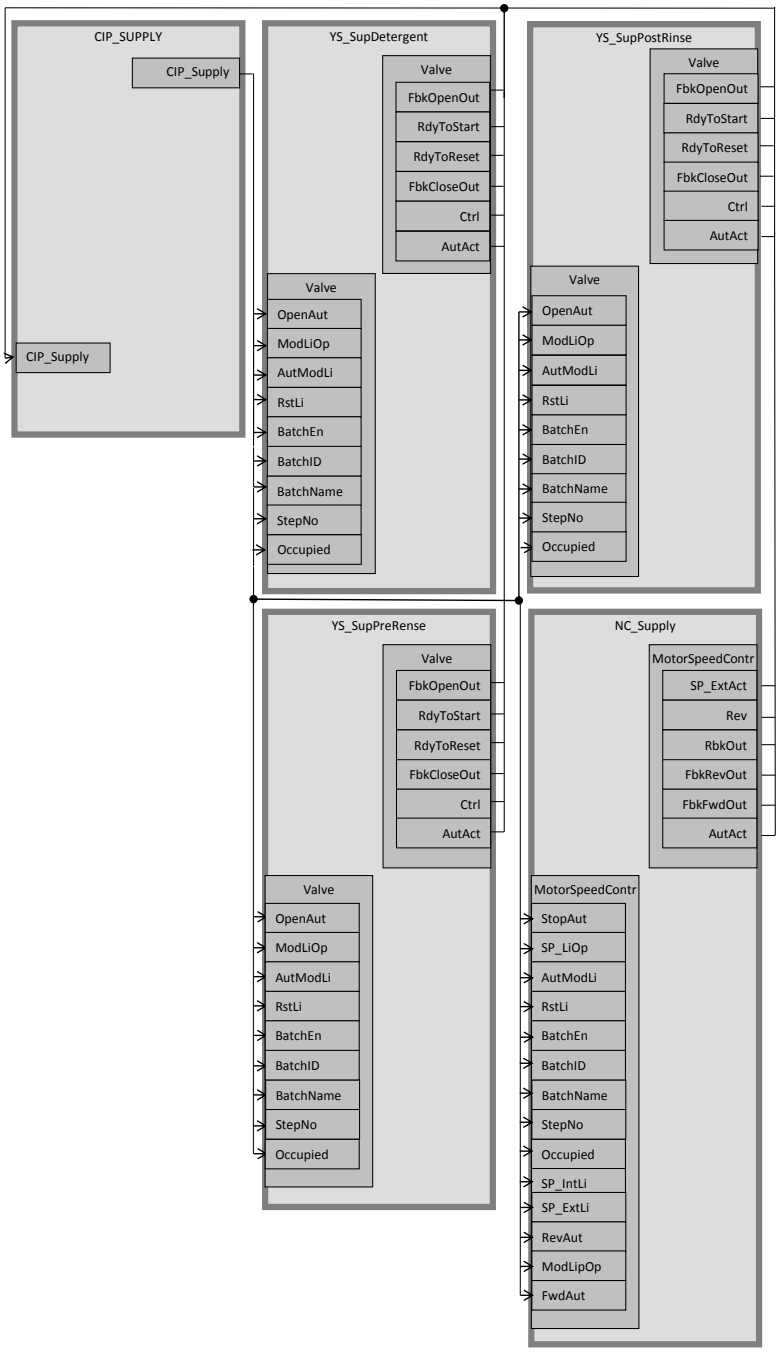
The valves in the supply are opened and closed and the pump is started by an instance of the “CIP_SUPPLY" SFC type.

The following table provides an overview of the elements and control module types used.

Designation	Technical function/ CMT	Description
CIP_Supply	“CIP_SUPPLY” SFC type	• Opening and closing the valves according to the specified control strategy • Starting and stopping the pump
NC_Supply	“MotVsd”	Process tag for pump drive
YS_SupDetergent	“Val”	Process tag, detergent tank valve
YS_SupPostRinse	“Val”	Process tag, pre-rinse tank valve
YS_SupPreRinse	“Val”	Process tag, post-rinse tank valve

Process tag interconnection

The following figure shows schematically the supply apparatus including the connections or SFC accesses that span the CFC diagram.



Parameter assignment

The parameter assignment for the individual process tags is described in the following. A detailed description of the SFC type can be found in Chapter 4.4, "Sequences".

NC_Supply

The pump that is activated by the "NC_Supply" process tag regulates the cleaning fluid flow rate. In the Application Example, the control of the process tag is via the “CIP_Supply” SFC type instance. Process tag "NC_Supply" is an instance of the “MotVsd” control module type with the following selected variants:

- Intlock
- Permit
- Rbk
- SP_Out

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkFwd	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimNC_Supply\SimFbkFwd.Out)
Rbk	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimNC_Supply\SimSpeed.Out)
Fwd	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (NC_Supply\U.Fwd)
SP_Out	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (NC_Supply\U.SP_Out)
Calc_SP_Ext	In1	1	Setpoint in [m³/h] (interconnection to the SFC)
	In2	1.666667	Conversion factor
	Out		Interconnection to the SP_Ext (NC_Supply\U.SP_Ext)

Block	Connection	Value	Use
U	FwdAut		Activation order for forward operation in automatic mode (CIP_Supply\CIP_SUPPLY.M1_FwdAut)
	Occupied		Occupied by batch (CIP_Supply\CIP_SUPPLY.QOCCUPIE)
	StepNo		Batch step number (CIP_Supply\CIP_SUPPLY.QSTEP_NO)
	BatchName		Batch name (CIP_Supply\CIP_SUPPLY.QBA_NA)
	BatchID		Batch Identification (CIP_Supply\CIP_SUPPLY.QBA_ID)
	BatchEn		Batch occupancy release (CIP_Supply\CIP_SUPPLY.QBA_EN)
Intlock	In01		Interlocking of motor (Interconnection for Interlock logic LM_CIP\E004.Out)

Note When “U.FwdAut” and “CIP_SUPPLY.M1_FwdAut” are interconnected, all other interconnections between the motor module and the SFC type instances are also created. These are not listed in the above table.

The “Intlock” block is used to interlock the motor. This ensures that the motor only runs if one of the valves is open as well. The interlocking logic is generated with the PCS 7 Logic Matrix. See Chapter 4.3 “Interlocks" for a detailed description of the interlock logics.

YS_SupDetergent

The valve that is activated by the “YS_SupDetergent” process tag controls the discharge from the detergent tank to the supply. In the Application Example, the control of the process tag is via the “CIP_Supply” SFC type instance. Process tag "YS_SupDetergent" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupDetergent\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupDetergent\SimFbkOpen.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupDetergent\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (CIP_Supply\CIP_SUPPLY.V2_OpenAut)
	Occupied		Occupied by batch (CIP_Supply\CIP_SUPPLY.QOCCUPIE)
	StepNo		Batch step number (CIP_Supply\CIP_SUPPLY.QSTEP_NO)
	BatchName		Batch name (CIP_Supply\CIP_SUPPLY.QBA_NA)
	BatchID		Batch Identification (CIP_Supply\CIP_SUPPLY.QBA_ID)
	BatchEn		Batch occupancy release (CIP_Supply\CIP_SUPPLY.QBA_EN)

Note When “V.OpenAut” and “CIP_SUPPLY.V2_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created. These are not listed in the above table.

YS_SupPostRinse

The valve that is activated by the “YS_SupPostRinse” process tag controls the discharge from the post-rinse tank to the supply. In the Application Example, the control of the process tag is via the “CIP_Supply” SFC type instance. Process tag "YS_SupPostRinse" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupPostRinse\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupPostRinse\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupPostRinse\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (CIP_Supply\CIP_SUPPLY.V3_OpenAut)
	Occupied		Occupied by batch (CIP_Supply\CIP_SUPPLY.QOCCUPIE)
	StepNo		Batch step number (CIP_Supply\CIP_SUPPLY.QSTEP_NO)
	BatchName		Batch name (CIP_Supply\CIP_SUPPLY.QBA_NA)
	BatchID		Batch Identification (CIP_Supply\CIP_SUPPLY.QBA_ID)
	BatchEn		Batch occupancy release (CIP_Supply\CIP_SUPPLY.QBA_EN)

Note When “V.OpenAut” and “CIP_SUPPLY.V3_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

YS_SupPreRinse

The valve that is activated by the “YS_SupPreRinse” process tag controls the discharge from the pre-rinse tank to the supply. In the Application Example, the control of the process tag is via the “CIP_Supply” SFC type instance. Process tag “YS_SupPreRinse" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupPreRinse\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_SupPreRinse\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_SupPreRinse\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (CIP_Supply\CIP_SUPPLY.V3_OpenAut)
	Occupied		Occupied by batch (CIP_Supply\CIP_SUPPLY.QOCCUPIE)
	StepNo		Batch step number (CIP_Supply\CIP_SUPPLY.QSTEP_NO)
	BatchName		Batch name (CIP_Supply\CIP_SUPPLY.QBA_NA)
	BatchID		Batch Identification (CIP_Supply\CIP_SUPPLY.QBA_ID)
	BatchEn		Batch occupancy release (CIP_Supply\CIP_SUPPLY.QBA_EN)

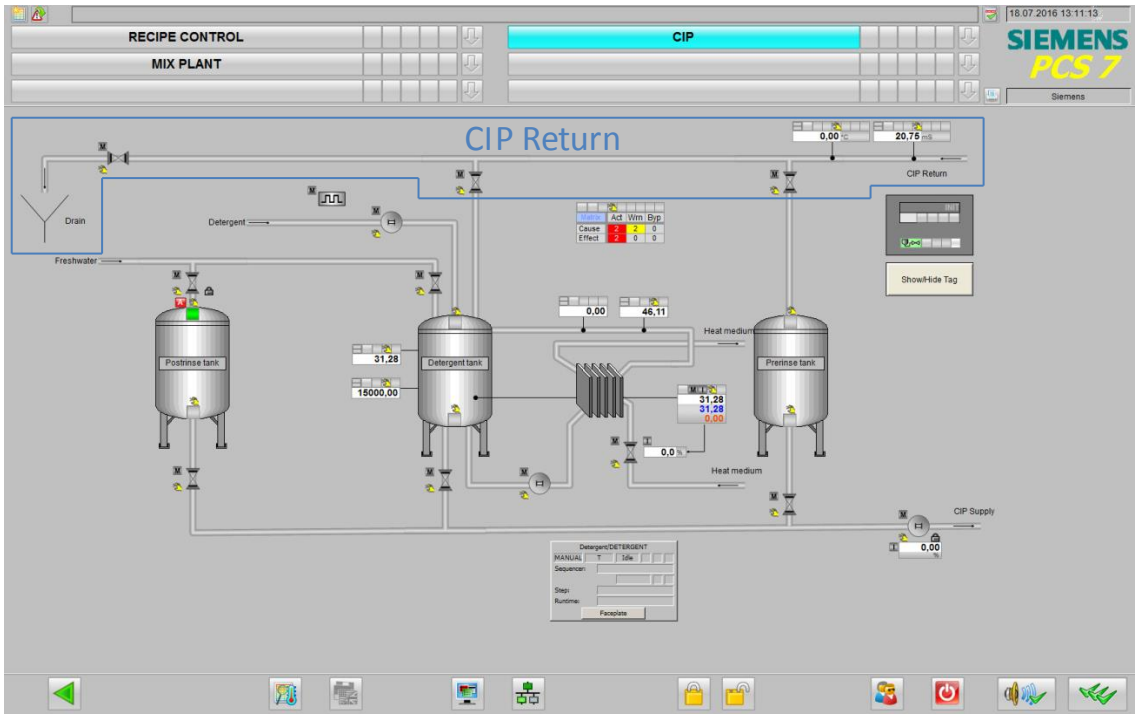
Note When “V.OpenAut” and “CIP_SUPPLY.V1_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

4.2.2 CIP RETURN

The temperature and concentration of the fluid are determined in the return line and, depending on the measured values, it is fed back into the CIP tanks. The valves to the tanks are opened depending on the quality of the fluid. The fluid from the pre-rinse phase is fed directly into the drain. If the tanks are full or if the quality is not adequate, the fluid is also discharged into the drain.

Setup

The figure below shows the design of the supply apparatus:



The valves in the return are opened and closed by an instance of the "CIP_RETURN" SFC type.

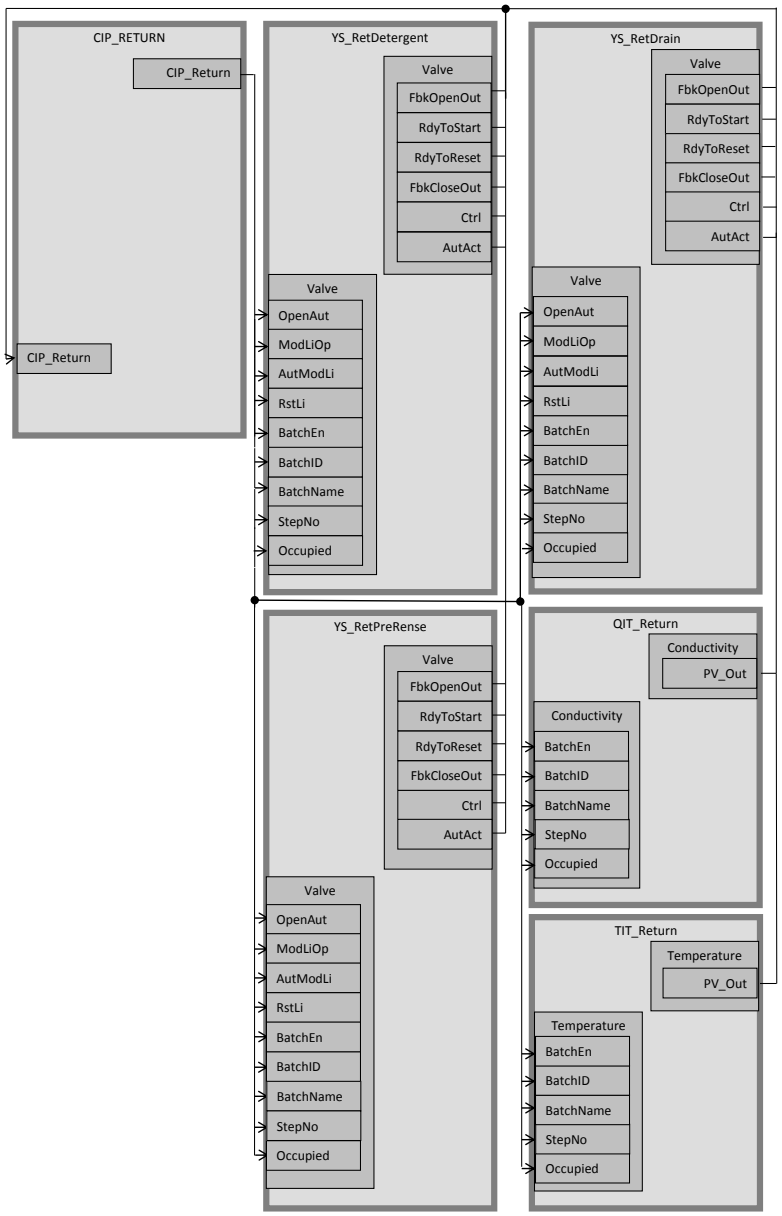
4.2 Technical functions and process tags

The following table provides an overview of the elements and control module types used.

Designation	Technical function/ CMT	Description
CIP_Return	SFC type “CIP_RETURN”	• Opening and closing the valves according to the specified control strategy • Interface for connecting to SIMATIC BATCH
YS_RetDetergent	“Val”	Process tag Valve, detergent tank return line
YS_RetDrain	“Val”	Process tag return valve drain
YS_RetPreRinse	“Val”	Process tag valve post-rinse tank return
QIT_Return	AMon	Acquisition of detergent concentration in the CIP return line
TIT_Return	AMon	Determining the fluid temperature in the return line

Process tag interconnection

The following figure shows schematically the supply apparatus including the connections or SFC accesses that span the CFC diagram.



Parameter assignment

The parameter assignment for the individual process tags is described in the following. A detailed description of the SFC type can be found in Chapter 4.4, "Sequences".

YS_RetDetergent

The valve that is activated by the “YS_RetDetergent” process tag controls the supply to the detergent tank in the return line. In the Application Example, the control of the process tag is via the “CIP_Return” SFC type instance. Process tag “YS_RetDetergent" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl
- Intlock

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_RetDetergent\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_RetDetergent\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_RetDetergent\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (CIP_Return\CIP_RETURN.V2_OpenAut)
	Occupied		Occupied by batch (CIP_Return\CIP_RETURN.QOCCUPIE)
	StepNo		Batch step number (CIP_Return\CIP_RETURN.QSTEP_NO)
	BatchName		Batch name (CIP_Return\CIP_RETURN.QBA_NA)
	BatchID		Batch Identification (CIP_Return\CIP_RETURN.QBA_ID)
	BatchEn		Batch occupancy release (CIP_Supply\CIP_SUPPLY.QBA_EN)
Intlock	In01		Interlocking of valve (Interconnection for Interlock logic LM_CIP\E001.Out)

Note When “V.OpenAut” and “CIP_SUPPLY.V2_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

The “Intlock” block is used to interlock the valve. This ensures that it is only opened if the detergent tank is not full. The interlocking logic is generated with the PCS 7 Logic Matrix. See Chapter 4.3 “Interlocks" for a detailed description of the interlock logics.

YS_RetDrain

The valve that is activated by the “YS_RetDrain” process tag controls the supply to the drain in the return line. In the Application Example, the control of the process tag is via the “CIP_Return” SFC type instance. Process tag "YS_RetDrain" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_RetDrain\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_RetDrain\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_RetDrain\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (CIP_Return\CIP_RETURN.V3_OpenAut)
	Occupied		Occupied by batch (CIP_Return\CIP_RETURN.QOCCUPIE)
	StepNo		Batch step number (CIP_Return\CIP_RETURN.QSTEP_NO)
	BatchName		Batch name (CIP_Return\CIP_RETURN.QBA_NA)
	BatchID		Batch Identification (CIP_Return\CIP_RETURN.QBA_ID)
	BatchEn		Batch occupancy release (CIP_Supply\CIP_SUPPLY.QBA_EN)

Note When “V.OpenAut” and “CIP_RETURN.V3_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

YS_RetPreRinse

The valve that is activated by the “YS_RetPreRinse” process tag controls the supply to the detergent tank in the return line. In the Application Example, the control of the process tag is via the “CIP_Return” SFC type instance. Process tag "YS_RetPreRinse" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl
- Intlock

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_RetPreRinse\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_RetPreRinse\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_RetPreRinse\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (CIP_Return\CIP_RETURN.V1_OpenAut)
	Occupied		Occupied by batch (CIP_Return\CIP_RETURN.QOCCUPIE)
	StepNo		Batch step number (CIP_Return\CIP_RETURN.QSTEP_NO)
	BatchName		Batch name (CIP_Return\CIP_RETURN.QBA_NA)
	BatchID		Batch Identification (CIP_Return\CIP_RETURN.QBA_ID)
	BatchEn		Batch occupancy release (CIP_Supply\CIP_SUPPLY.QBA_EN)
Intlock	In01		Interlocking of valve (Interconnection for Interlock logic LM_CIP\E002.Out)

Note When “V.OpenAut” and “CIP_RETURN.V1_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

The “Intlock” block is used to interlock the valve. This ensures that it is only opened if the detergent tank is not full. The interlocking logic is generated with the PCS 7 Logic Matrix. See Chapter 4.3 “Interlocks" for a detailed description of the interlock logics.

QIT_Return

The display process tag "QIT_Return" is used for detecting and displaying the detergent concentration. Process tag "QIT_Return" is an instance of the “AMon” control module type with the following selected variants:

- Opt_PV_Scale
- PV_In

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
PV_Scale	HiScale	150	Scaling of the process value
PV_Unit	IN	1289	Process value unit (mS)
PV_In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (conductance\ConducReturn.Out)
I	Occupied		Occupied by batch (CIP_Return\CIP_RETURN.QOCCUPIE)
	StepNo		Batch step number (CIP_Return\CIP_RETURN.QSTEP_NO)
	BatchName		Batch name (CIP_Return\CIP_RETURN.QBA_NA)
	BatchID		Batch Identification (CIP_Return\CIP_RETURN.QBA_ID)
	PV_Out		Process value (CIP_Return\CIP_RETURN.DET_CONC_AI; CIP_Return\CIP_RETURN.PRE_CONC_AI)

TIT_Return

The display process tag “TIT_Return" is used for detecting and displaying the fluid temperature. Process tag “TIT_Return" is an instance of the “AMon” control module type with the following selected variants:

- Opt_PV_Scale
- PV_In

The following table shows the interconnections to other process tags and parameters:

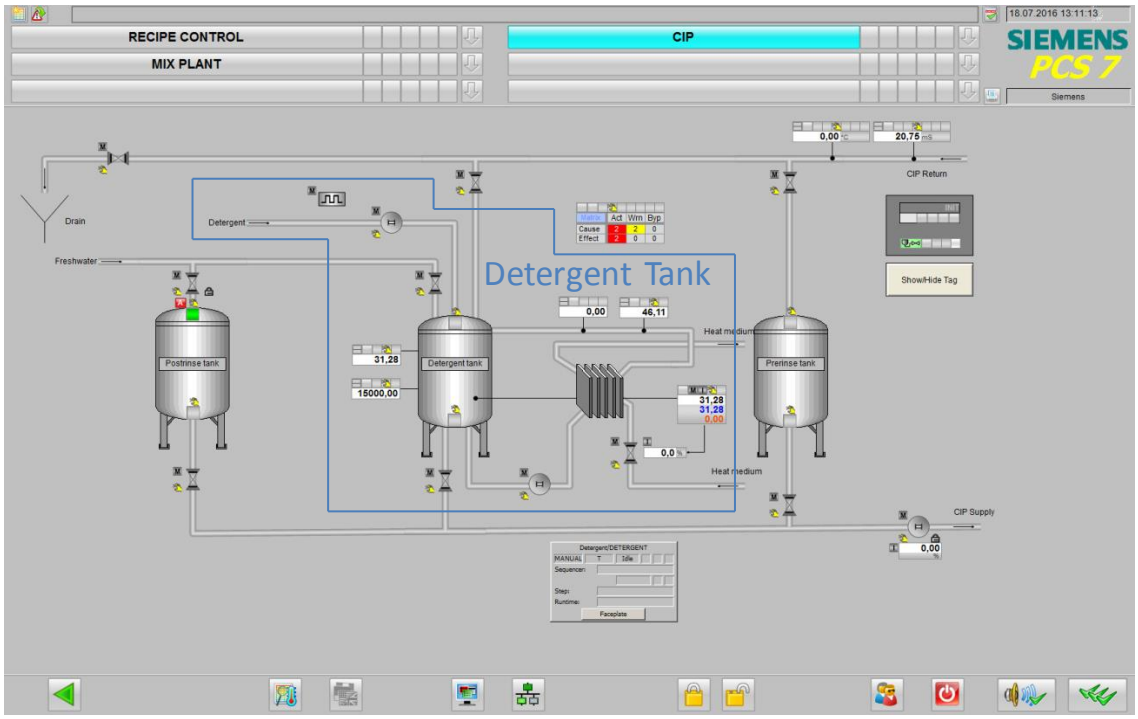
Block	Connection	Value	Use
PV_Unit	IN	1001	Process value unit (ºC)
PV_In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Temperature\TemInCRet.Out)
I	Occupied		Occupied by batch (CIP_Return\CIP_RETURN.QOCCUPIE)
	StepNo		Batch step number (CIP_Return\CIP_RETURN.QSTEP_NO)
	BatchName		Batch name (CIP_Return\CIP_RETURN.QBA_NA)
	BatchID		Batch Identification (CIP_Return\CIP_RETURN.QBA_ID)
	PV_Out		Process value (CIP_Return\CIP_RETURN.DET_TMP_AI; CIP_Return\CIP_RETURN.PRE_TMP_AI)

4.2.3 Detergent tank

The detergent tank contains the detergent used for cleaning. The detergent is heated to the required temperature in the tank. The required detergent concentration is also set. The detergent tank is continuously filled, either from the return line during the cleaning phases or by supplying fresh water and alkali. The temperature of the fluid in the tank is continuously regulated to a specified value.

Setup

The figure below shows the design of the detergent tank:



The tank contains three level sensors which detect the maximum, minimum and current fill levels, respectively. The fluid is pumped via pipes through a heat exchanger in order to control the temperature. The concentration of the alkali is also measured in the pipes. The circulation of the fluid is controlled by means of an instance of the “DETERGENT” SFC type. This is also used to control the concentration and to pass the setpoints for the PID controller for temperature control.

The following table provides you with an overview of the elements and control module types used.

Designation	Technical function/ CMT	Description
Detergent	SFC type “FILL_HEAT_CONC”	Setting of detergent characteristics depending on the setpoints of the control strategy
LIT_Detergent	AMon	Acquisition of fill level in detergent tank
LSH_Detergent	DMon	Acquisition of maximum fill level in detergent tank reached
LSL_Detergent	DMon	Acquisition of minimum fill level in detergent tank reached
NS_DetCon	Mot	Process tag for pump drive for addition of alkali
NS_DetHeat	Mot	Process tag for pump drive for heating circuit
PuPaDet		Process tag for metering the addition of alkali
QIT_Detergent	AMon	Acquisition of detergent concentration in CIP detergent tank
TIC_Heat	Ctrl	Process tag for the control of the fluid temperature in the heating circuit
TIT_Detergent	AMon	Determining the fluid temperature in detergent tank
TIT_DetHeat	AMon	Determining the fluid temperature in heating circuit
YC_DetHeat	ValAn	Process tag for control valve in heating circuit
YS_DetFreshWater	Val	Valve for fresh water supply to detergent tank process tag

Parameter assignment

The parameter assignment for the individual process tags is described in the following. A detailed description of the SFC type can be found in Chapter “4.3. Sequences".

LIT_Detergent

The display process tag "LIT_Detergent" is used for detecting and displaying the fill level in the detergent tank. Process tag “LIT_Return" is an instance of the “AMon” control module type with the following selected variants:

- Opt_PV_Scale
- PV_In

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
PV_Scale	HiScale	25000	Scaling of the process value
PV_Unit	IN	1038	Process value unit (L)
PV_In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_Level_DetergentTank\Level.Out)
I	PV_Out		Process value (Detergent\DETERGENT.LEVEL_AI; LM_CIP\C001.Ana1)

LSH_Detergent

The display process tag “LSH_Detergent" is used for detecting and displaying the maximum fill level of the detergent tank. The "LSH_Detergent" process tag is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_Level_DetergentTank\LSH.GE)
S	Out		Digital output value (CIP_Return\CIP_RETURN.LS1Out; LM_CIP\C001.Dig1)

LSL_Detergent

The display process tag "LSL_Detergent" is used for detecting and displaying the minimum fill level of the detergent tank. Process tag “LSL_Detergent" is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_Level_DetergentTank\LSL.LE)

NS_DetCon

The pump that is activated by the “NC_DetCon" process tag regulates the metering of the addition of detergent. In the Application Example, the control of the process tag is via the “DETERGENT” SFC type instance and the “PuPa_Det” process tag. Process tag "NS_DetCon" is an instance of the “Mot” control module type with the following selected variants:

- Permit
- Opt_1Fbk
- Start

The process tag has been expanded to incorporate the following functions:

- Or04 – “Start_NSDetCon”
- Or04 – “Stop_NSDetCon”

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
Fbk	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_NSDetCon\SimFbkRun.Out)
Start	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (NSDetCon\U.Start)
Start_NSDetCon	In1		Start pulse (PuPa_Det\Strengh.ActGrp01)
	In2		Start pulse (Detergent\DETERGENT.M2_AutStart)
	Out		Start pulse (NS_DetCon\U.StartAut)

Block	Connection	Value	Use
Stop_NSDetCon	In1		Stop pulse (PuPa_Det\Strengh.ActGrp01 inverted)
	In2		Start pulse (Detergent\DETERGENT.M2_AutStop)
	Out		Stop pulse (NS_DetCon\U.StopAut)
U	ModLiop		Switchover of operating mode selection manual/switchover (Detergent\DETERGENT.M2_ModLiOp)

Note When “U.ModLiOp” and “DETERGENT.M2_ModLiOP” are interconnected, all other interconnections between the motor module and the SFC type instances are also created automatically. These are not listed in the above table.

NS_DetHeat

The pump activated by the “NS_DetHeat” process tag controls the circulation of alkali through the heating circuit. In the Application Example, the control of the process tag is via the “DETERGENT” SFC type instance. Process tag "NS_DetHeat" is an instance of the “Mot” control module type with the following selected variants:

- Permit
- Opt_1Fbk
- Start

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
Fbk	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_NSDetCon\SimFbkRun.Out)
Start	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (NSDetHeat\U.Start)
U	StartAut		Activation order for starting in automatic mode (Detergent\DETERGENT.M1_StartAut)

Note When “U.ModLiOp” and “DETERGENT.M2_ModLiOP” are interconnected, all other interconnections between the motor module and the SFC type instances are also created automatically. These are not listed in the above table.

PuPaDet

The “PuPaDet” process tag serves for the pulsed activation of the metering pump for detergent concentration. In the Application Example, the control of the process tag is via the “DETERGENT” SFC type instance. The “PuPa_Det" process tag forwards the pulsed control command on to the "NS_DetCon" process tag.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
BlPuPa			Inserted as "STRENGTH" for pulse/pause function
STRENGH	ModLiOp		Switchover of operating mode selection manual/switchover (Detergent\DETERGENT.PuPa1_ModLiOp)

Note When “STRENGH.ModLiOp” and “DETERGENT.PuPa1_ModLiOp” are interconnected, all other interconnections between the pulse/pause module and the SFC type instances are also created automatically. These are not listed in the above table.

QIT_Detergent

The display process tag “QIT_Detergent" is used for detecting and displaying the detergent concentration in the detergent tank. Process tag “QIT_Detergent" is an instance of the “AMon” control module type with the following selected variants:

- Opt_PV_Scale
- PV_In

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
PV_Scale	HiScale	180	Scaling of the process value
PV_Unit	IN	1289	Process value unit (mS)
PV_In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (conductance\ConducTank.Out)
I	PV_Out		Process value (Detergent\DETERGENT.CONC_AI)

TIC_DetHeat

The temperature of the fluid in the detergent tank is determined in the "TIC_DetHeat" process tag. The current temperature of the fluid is registered in the “TIT_Detergent” display process tag and transferred to the "TIC_DetHeat” controller process tag. In the Application Example, the setpoint is specified by means of the "DETERGENT" SFC type instance. The “TIC_DetHeat” process tag passes the control variable to the "YC_DetHeat" control valve. “TIC_DetHeat” is an instance of the “Ctrl” CMT.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
AIF_SFC	SP_LiOp		Setpoint source internal/external via interconnection (Detergent\DETERGENT.PID1_SP_LiOp)
C	Gain	20.277	Controller gain
	TI	186.941	Controller adjustment time
to_Actor_Slave	Out		Interconnection for the valve (control) (YC_DetHeat\from_CTRL.In)
from_Actor_Slave	In		Interconnection for the valve (control) (YC_DetHeat\to_Ctrl.Out)

Note When “AIF_SFC.SP_LiOp” and “DETERGENT.PID1_SP_LiOp” are interconnected, all other interconnections between the SFC interface module and the SFC type instances are also created automatically. These are not listed in the above table.

TIT_Detergent

The display process tag “TIT_Detergent" is used for detecting and displaying the fluid temperature in the detergent tank. Process tag “TIT_Detergent" is an instance of the “AMon” control module type with the following selected variants:

- Opt_PV_Scale
- PV_In

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
PV_Unit	IN	1001	Process value unit (ºC)
PV_In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Temperature\TemInC.Out)
I	PV_Out		Process value (Detergent\DETERGENT. TEMP_AI; TIC_DetHeat\C.PV)

TIT_DetHeat

The display process tag “TIT_Detheat" is used for detecting and displaying the fluid temperature in the heating circuit. Process tag “TIT_Detheat" is an instance of the “AMon” control module type with the following selected variants:

- Opt_PV_Scale
- PV_In

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
PV_Unit	IN	1001	Process value unit (ºC)
PV_In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Temperature\TemTIT_DetHeat.Out)

YC_DetHeat

The valve that is activated by the “YC_DetHeat” process tag controls the flow rate of the heating medium in the heating circuit. In the Application Example, the control of the process tag is via the “DETERGENT” SFC type instance. The setpoint is specified via the "TIC_DetHeat” controller process tag. Process tag “YC_DetHeat" is an instance of the “ValAn” control module type with the following selected variants:

- Ctrl
- FbkClose
- FbkOpen
- MV_Out
- Opt_If_Ctrl
- Permit
- Rbk

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYC_Detheat\SimValveOpen.GE)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYC_Detheat\SimValveClose.GE)
Rbk	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYC_Detheat\SimRbk.Out)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_Detheat\V.Ctrl)
MV_Out	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_Detheat\V.MV)
V	OpenAut		Activation signal to open valve (Detergent\DETERGENT.V2_OpenAut
from_Ctrl	In		Interconnection to the controller (TIC_DetHeat\to_Actor_Slave.Out)
to_Ctrl	Out		Interconnection for the controller (TIC_DetHeat.from_Actor_Slave)

Note When “V.OpenAut” and “DETERGENT.V2_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

YS_DetFreshWater

The valve that is activated by the “YS_DetFreshwater” process tag controls the inlet of fresh water to the detergent tank. In the Application Example, the control of the process tag is via the “DETERGENT” SFC type instance. Process tag "YS_DetFreshWater" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl
- Intlock

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_FreshWater\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_FreshWater\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_DetFreshWater\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (Detergent\DETERGENT.V1_OpenAut)
Intlock	In01		Interlocking of valve (Interconnection for Interlock logic LM_CIP\E001.Out)

Note When “V.OpenAut” and “DETERGENT.V1_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

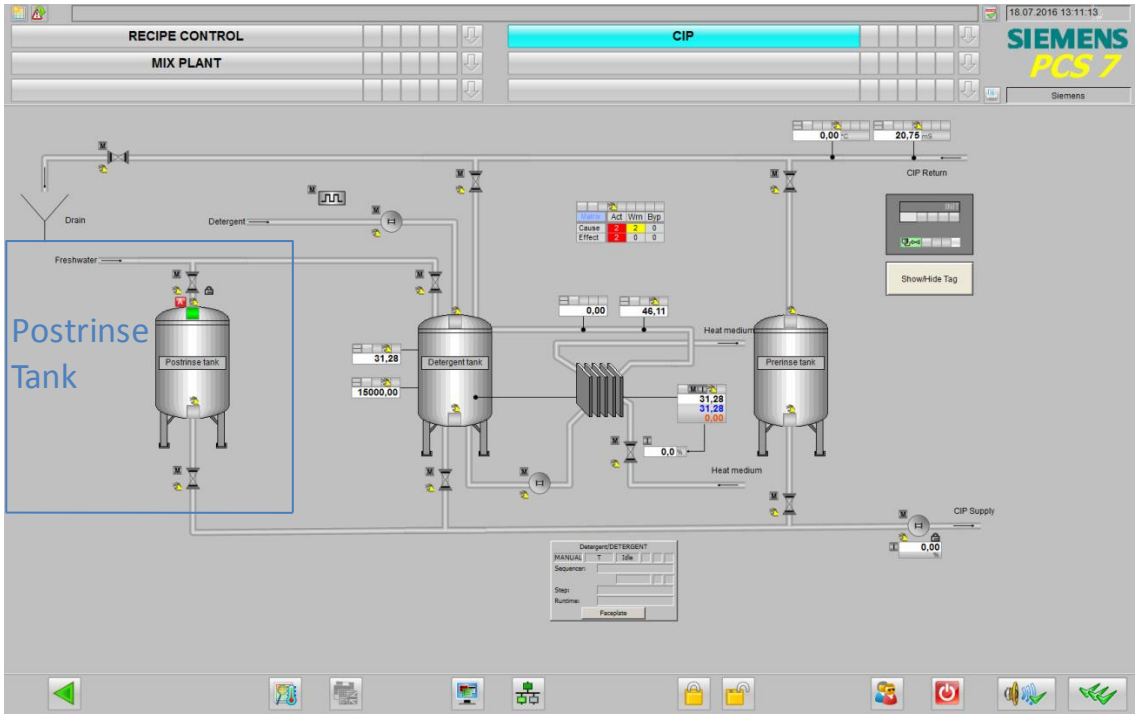
The “Intlock” block is used to interlock the valve. This ensures that it is only opened if the detergent tank is not full. The interlocking logic is generated with the PCS 7 Logic Matrix. See Chapter 4.3 “Interlocks" for a detailed description of the interlock logics.

4.2.4 Post-rinse tank

Fresh water for post-rinsing is stored in the post rinse tank. It is drawn off during the post-rinse phase. No water is fed into this tank from the return line. In the application example the water is not reprocessed and can be used at ambient temperature. Fluid can be drawn from the post-rinse tank at any time, provided the level does not fall below the minimum fill level.

Setup

The figure below shows the design of the post-rinse tank:



The tank contains two level sensors which register the maximum and minimum fill levels. When the minimum fill level is reached the fresh water valve is opened. When the maximum fill level is reached the fresh water valve is closed. In the Application Example activation of the fresh water is via the PCS 7 Logic Matrix.

Note The design of the post-rinse tank depends strongly on the requirements of the cleaning process. The detergent tank (process tags and "FILL_HEAT_CONC" SFC type) can be taken as a template for configuration.

The following table shows an overview of the elements and control module types used:

Designation	Technical function/ CMT	Description
YS_FreshWaterPostrinse	"Val"	Process tag Fresh water valve of post-rinse tank
LSH_Postrinse	DMon	Acquisition of maximum fill level in fresh water tank reached
LSL_Postrinse	DMon	Acquisition of minimum fill level in fresh water tank reached

Parameter assignment

The parameter assignment for the individual process tags is described in the following. A detailed description of the fresh water valve activation can be found in Chapter 4.3, "Interlocks".

YS_FreshWaterPostrinse

The valve that is activated by the "YS_FreshwaterPostrinse" process tag controls fresh water intake into the post-rinse tank. In the Application Example, the control of the process tag is effected via the "LM_CIP" CFC generated by the PCS 7 Logic Matrix. Process tag "YS_FreshWaterPostrinse" is an instance of the "Val" control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl
- Intlock

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_FreshWaterPostR\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_FreshWaterPostR\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_FreshWaterPostrinse\V.Ctrl)
V	OpenAut		Activation order for opening in automatic mode (LM_CIP\E005.Out)
Intlock	In01		Interlocking of valve (Interconnection for Interlock logic LM_CIP\E003.Out)

The “Intlock” block is used to interlock the valve. This ensures that it is only opened if the post-rinse tank is not full. The interlocking logic is generated with the PCS 7 Logic Matrix. See Chapter 4.3 “Interlocks" for a detailed description of the interlock logics.

LSH_Postrinse

The “LSH_Postrinse" display process tag is used for detecting and displaying the maximum fill level of the post-rinse tank. Process tag “LSL_Postrinse" is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_Level_PostRTank\LSH.GE)
S	Out		Digital output value (LM_CIP\C003.Dig1)

LSL_Postrinse

The display process tag “LSL_Postrinse" is used for detecting and displaying the minimum fill level of the post-rinse tank. Process tag “LSL_Postrinse" is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

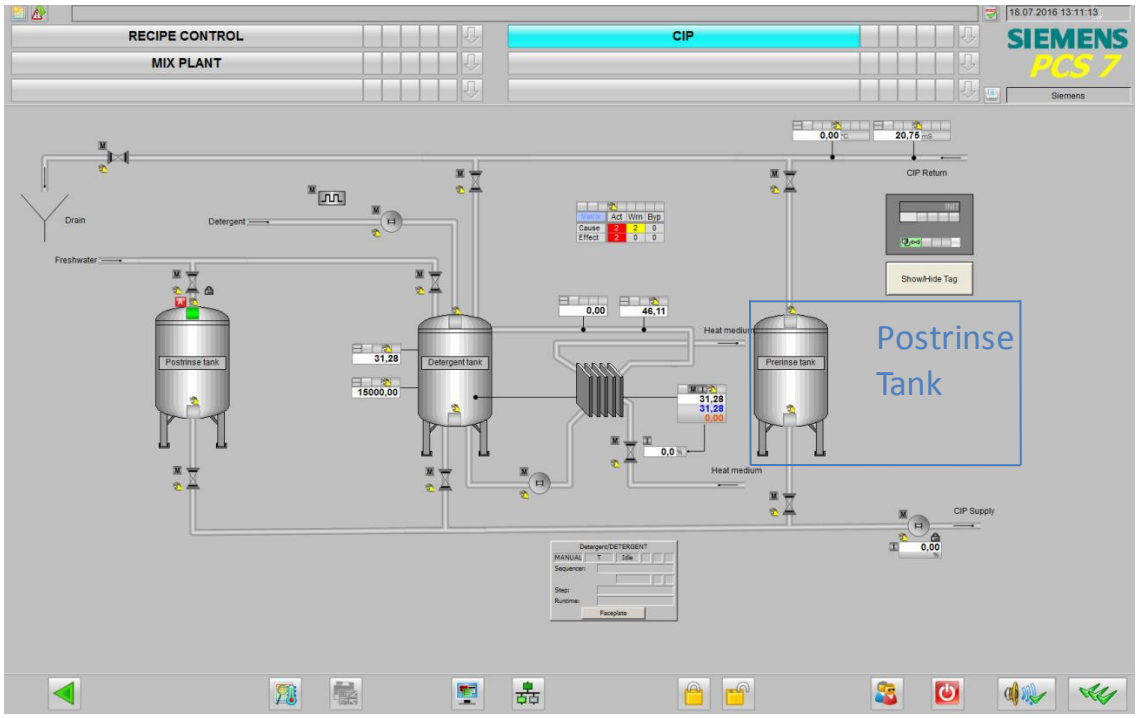
Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_Level_PostRTank\LSL.LE)
S	Out		Digital output value (LM_CIP\C005.Dig1)

4.2.5 Pre-rinse tank

The pre-rinse tank contains the detergent used for pre-rinse phase. In the application example the pre-rinse tank is filled through the return during the cleaning phase. The temperature and the detergent concentration of the liquid in the tank are not controlled in the application example.

Setup

The figure below shows the design of the pre rinse tank:



The tank contains two level sensors which register the maximum and minimum fill levels. Acquisition of the minimum fill level only serves the purpose of visualization in this application example. When the maximum fill level is reached the valve in the return line is closed and locked.

Note The design of the pre-rinse tank depends strongly on the requirements of the cleaning process. The detergent tank (process tags and "FILL_HEAT_CONC" SFC type) can be taken as a template for configuration.

The following table provides you with an overview of the elements and control module types used:

Designation	Technical function/ CMT	Description
LSH_Postrinse	DMon	Acquisition of maximum fill level in fresh water tank reached
LSL_Postrinse	DMon	Acquisition of minimum fill level in fresh water tank reached

Parameter assignment

The parameter assignment for the individual process tags is described in the following. A detailed description of the fresh water valve activation can be found in Chapter 4.3, “Interlocks”.

LSH_PreRinse

The display process tag “LSH_PreRinse" is used for detecting and displaying the maximum fill level of the pre-rinse tank. Process tag “LSH_PreRinse" is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_Level_PostRTank\LSH.GE)
S	Out		Digital output value (LM_CIP\C002.Dig1; CIP_Return\CIP_RETURN.LS2_Out)

LSL_PreRinse

The display process tag “LSL_PreRinse" is used for detecting and displaying the minimum fill level of the pre-rinse tank. Process tag “LSL_PreRinse" is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

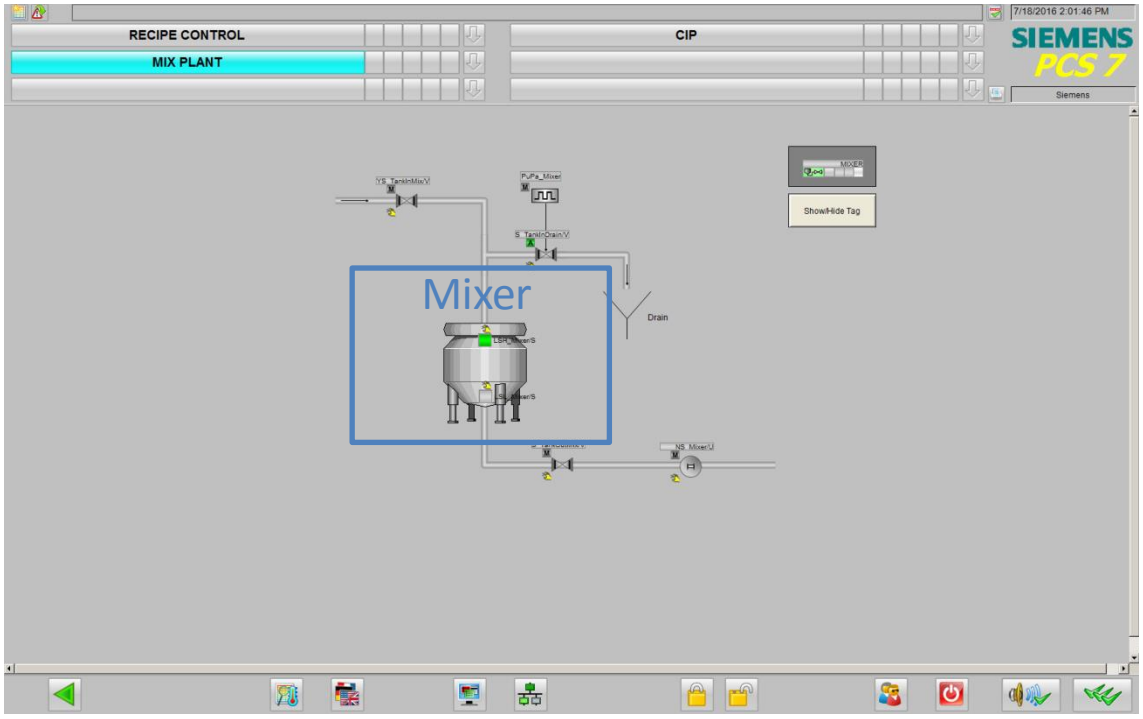
Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (Sim_Level_PreRTank\LSL.LE)

4.2.6 Mixer

The mixer is the part of the plant to be cleaned in the application example and is used to demonstrate the process. There are no process tags configured for the mixer in the application example.

Setup

The figure below shows the design of the mixer:

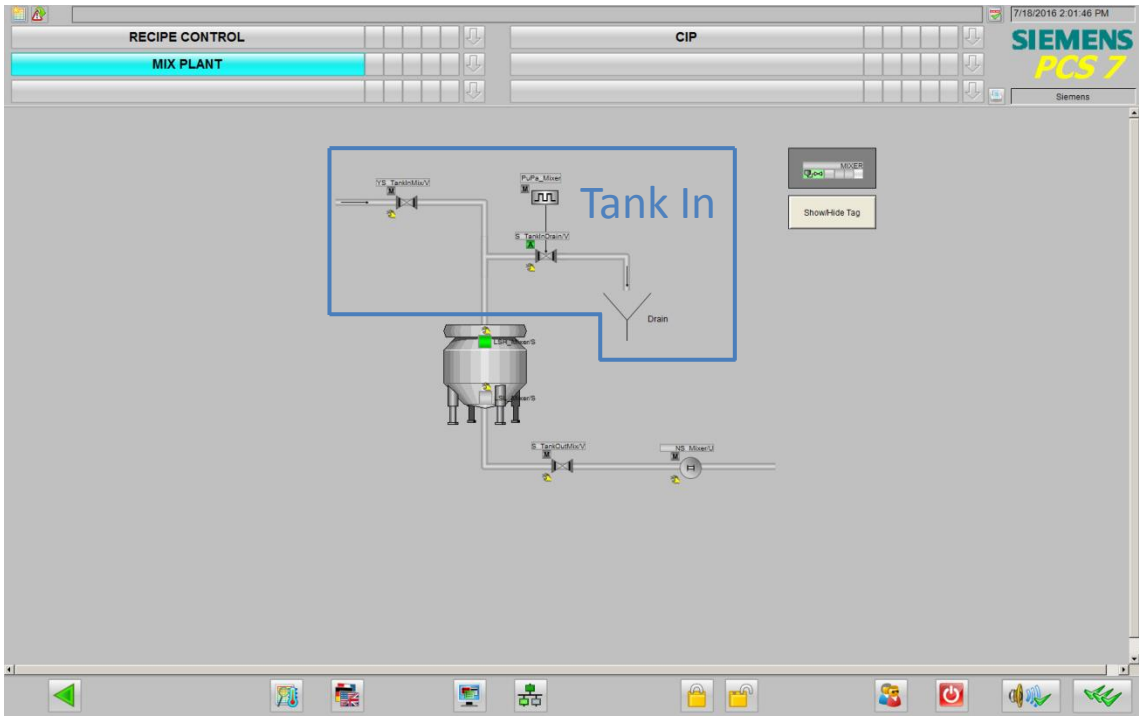


4.2.7 Mixer supply (TANK_IN)

The detergent is fed from the CIP system into the mixer via the supply line. The type of detergent used is implemented by means of an SFC-type instance. The appropriate fluid is added to the mixer, depending on which control strategy is selected. The quantities added are defined by cleaning recipes in SIMATIC BATCH. The cleaning is carried out using cleaning batches and thus is also logged.

Setup

The figure below shows the design of the mixer supply:



The valves in the supply are opened and closed by an instance of the "TANK_IN" SFC type and the “PuPa_Mixer” process tag.

The following table provides an overview of the elements and control module types used.

Designation	Technical function/ CMT	Description
TANK_IN	"TANK_IN" SFC type	Opening and closing the valves according to the specified control strategy
LSH_Mixer	“DMon”	Acquisition of maximum fill level in mixer reached
PuPa_Mixer		Process tag for pulsed activation of Drain valve
YS_TankInDrain	“Val”	Valve drain Process tag
YS_TankInMix	“Val”	Valve Inlet Mixer Process tag

Parameter assignment

The parameter assignment for the individual process tags is described in the following. A detailed description of the SFC type can be found in Chapter 4.4.4, "Sequences".

LSH_Mixer

The “LSH_Mixer" display process tag is used for detecting and displaying the maximum fill level of the mixer. Process tag “LSH_Mixer" is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimLevel_Mixer\LSH_Mixer.GE)

PuPa_Mixer

The “PuPa_Mixer" process tag is used for pulsed activation of the valve leading to the drain. In the Application Example, the control of the process tag is via the “TANK_IN” SFC type instance. The “PuPa_Mixer" process tag forwards the pulsed control command to the “YS_TankInDrain" process tag.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
BlPuPa			Inserted as "PuPa_Mixer" for pulse/pause function
STRENGH	ModLiOp		Switchover of operating mode selection manual/switchover (Tank In\TANK_IN.PuPa_ModLiOp)

Note When “PuPa_Mixer.ModLiOp” and “TANK_IN.PuPa1_ModLiOp” are interconnected, all other interconnections between the pulse/pause module and the SFC type instances are also created automatically. These are not listed in the above table.

YS_TankInDrain

The valve that is activated by the “YS_TankInDrain” process tag controls the discharge of detergent to the drain. In the Application Example, the control of the process tag is via the “TANK_IN” SFC type instance and the “PuPa_Mixer” process tag. Process tag "YS_TankInDrain" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl

The process tag has been expanded to incorporate the following functions:

- Or04 – “OpenYS_TankInDrain”
- Or04 – “OpenYS_TankInDrain”

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_TankIndrain\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_TankIndrain\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_TankInDrain\V.Ctrl)
OpenYS_Drain	In1		“Open” pulse (TANK IN\TANK_IN.V2_OpenAut)
	In2		“Open” pulse (PUPA_Mixer\PuPa_Mixer.ActGrp01)
	Out		“Open” pulse (YS_TankInDrain\V.OpenAut)
CloseYS_Drain	In1		“Close” pulse (TANK IN\TANK_IN.V2_OpenAut)
	In2		“Close” pulse (PUPA_Mixer\PuPa_Mixer.ActGrp01 inverted)
	Out		“Close” pulse (YS_TankInDrain\V.CloseAut)

Block	Connection	Value	Use
V	ModLiop		Switchover of operating mode selection manual/switchover (TANK IN\TANK_IN.V2_ModLiOp)
	Occupied		Occupied by batch (TANK IN\TANK_IN.QOCCUPIE)
	StepNo		Batch step number (TANK IN\TANK_IN.QSTEP_NO)
	BatchName		Batch name (TANK IN\TANK_IN.QBA_NA)
	BatchID		Batch Identification (TANK IN\TANK_IN.QBA_ID)
	BatchEn		Batch occupancy release (TANK IN\TANK_IN.QBA_EN)

Note When “V.ModLiOp” and “TANK_IN.V2_ModLiOP” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

YS_TankInMix

The valve that is activated by the “YS_TankInMix” process tag controls the supply of detergent to the mixer. In the Application Example, the control of the process tag is via the “TANK_IN” SFC type instance. Process tag “YS_TankInMix" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_TankInMix\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYS_TankInMix\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_TankInMix\V.Ctrl)

Block	Connection	Value	Use
V	OpenAut		Activation order for opening in automatic mode (TANK IN\TANK_IN.V1_OpenAut)
	Occupied		Occupied by batch (TANK IN\TANK_IN.QOCCUPIE)
	StepNo		Batch step number (TANK IN\TANK_IN.QSTEP_NO)
	BatchName		Batch name (TANK IN\TANK_IN.QBA_NA)
	BatchID		Batch Identification (TANK IN\TANK_IN.QBA_ID)
	BatchEn		Batch occupancy release (TANK IN\TANK_IN.QBA_EN)

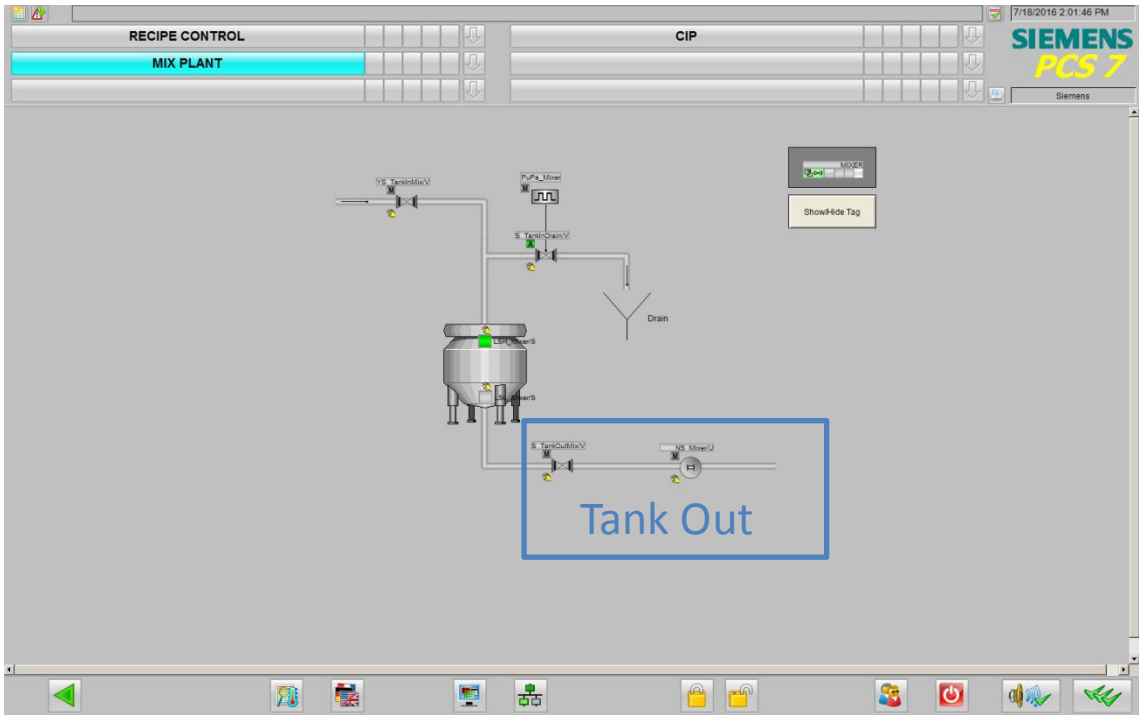
Note When “V.OpenAut” and “TANK_IN.V1_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

4.2.8 Mixer sequence

The detergent is conducted back into the CIP system via the discharge from the mixer.

Setup

The figure below shows the design of the mixer outlet:



The valves in the outlet are opened and closed and the pump is started and stopped by an instance of the “TANK_OUT" SFC type.

The following table provides an overview of the elements and control module types used.

Designation	Technical function/ CMT	Description
TANK_OUT	“TANK_OUT" SFC type	• Opening and closing valve • Starting and stopping the pump
LSL_Mixer	“DMon”	Acquisition of minimum fill level in mixer reached
YS_TankOutMix	“Val”	Valve Mixer outlet Process tag
NS_Mixer	Mot	Process tag for pump drive in mixer outlet

Parameter assignment

The parameter assignment for the individual process tags is described in the following. A detailed description of the SFC type can be found in Chapter 4.4, "Sequences".

LSL_Mixer

The “LSL_Mixer" display process tag is used for detecting and displaying the minimum fill level of the mixer. Process tag “LSL_Mixer" is an instance of the "DMon" CMT with “In” variant selected.

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
In	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimLevel_Mixer\LSL_Mixer.LE)

NS_Mixer

The pump that is activated by the “NS_Mixer" process tag pumps fluid from the mixer. In the Application Example, the control of the process tag is via the “TANK_OUT” SFC type instance. Process tag "NS_Mixer" is an instance of the “Mot” control module type with the following selected variants:

- Permit
- Opt_1Fbk
- Start

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
Fbk	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimNS_Mixer\SimFbkRun.Out)
Start	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (NS_Mixer\U.Start)
U	StartAut		Starting order in automatic mode (TANK OUT\TANK_OUT.M1_StartAut)
	Occupied		Occupied by batch (TANK OUT\TANK_OUT.QOCCUPIE)
	StepNo		Batch step number (TANK OUT\TANK_OUT.QSTEP_NO)
	BatchName		Batch name (TANK OUT\TANK_OUT.QBA_NA)
	BatchID		Batch Identification (TANK OUT\TANK_OUT.QBA_ID)
	BatchEn		Batch occupancy release (TANK OUT\TANK_OUT.QBA_EN)

Note When “U.StartAut” and “TANK_OUT.M1_StartAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

YS_TankOutMix

The valve that is activated by the “YS_TankOutMix” process tag controls the discharge of detergent from the mixer. In the Application Example, the control of the process tag is via the “TANK_OUT” SFC type instance. Process tag “YS_TankOutMix" is an instance of the “Val” control module type with the following selected variants:

- FbkClose
- FbkOpen
- Permit
- Opt_1Ctrl

The following table shows the interconnections to other process tags and parameters:

Block	Connection	Value	Use
FbkOpen	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYSTankOutMix\SimFbkOpen.Out)
FbkClose	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (SimYSTankOutMix\SimFbkClose.InvOut)
Ctrl	SimOn	1	Simulated process value active
	SimPV_In		Interconnection to simulated process value (YS_TankOutMix\V.Ctrl)
V	OpenAut		Opening order in automatic mode (TANK OUT\TANK_OUT.V1_OpenAut)
	Occupied		Occupied by batch (TANK OUT\TANK_OUT.QOCCUPIE)
	StepNo		Batch step number (TANK OUT\TANK_OUT.QSTEP_NO)
	BatchName		Batch name (TANK OUT\TANK_OUT.QBA_NA)
	BatchID		Batch Identification (TANK OUT\TANK_OUT.QBA_ID)
	BatchEn		Batch occupancy release (TANK OUT\TANK_OUT.QBA_EN)

Note When “V.OpenAut” and “TANK_Out.V1_OpenAut” are interconnected, all other interconnections between the valve module and the SFC type instances are also created automatically. These are not listed in the above table.

4.3 Interlocks

The interlocking functions in the application example are generated with the PCS 7 Logic Matrix. The following Interlocks are contained in the Application example:

- Interlocking of valves to the tanks in return if the tanks are full
- Interlocking of pump in supply if all of the valves are closed
- Interlocking of fresh water valve to post-rinse tank if it is full

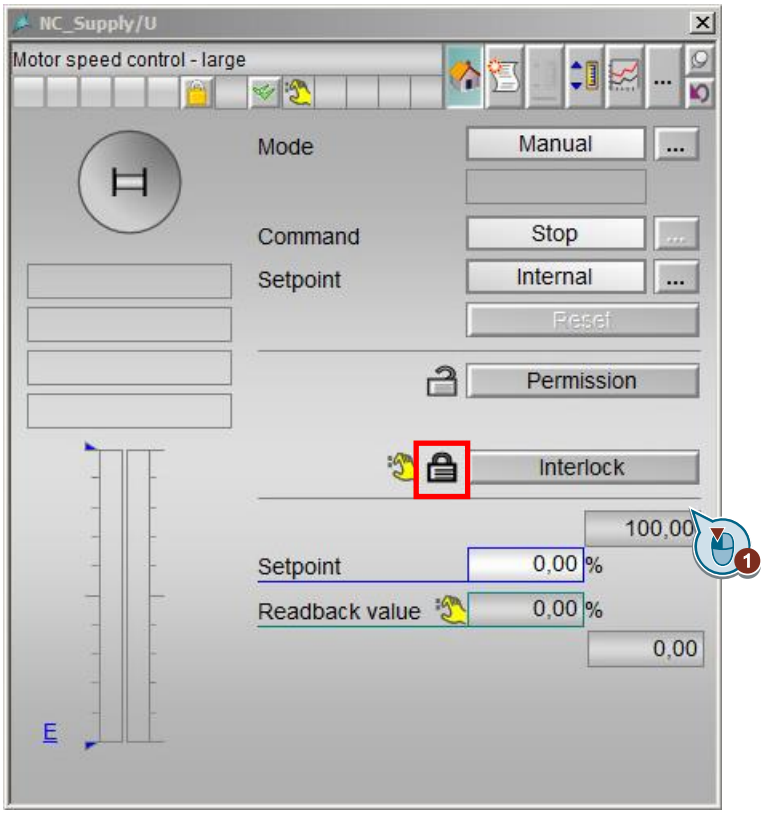
Note Not all the interlocks that must be present in a real system are configured in the application example. The interlocks configured are solely for the purpose of illustrating the PCS 7 functions used.

Motor interlock, supply

For its protection, the motor is interlocked in supply if all the valves are closed. As soon as a valve is opened, the interlocking is stopped. With the jump keys it is possible to navigate from the motor measuring point display block to the process tag causing the interlock.

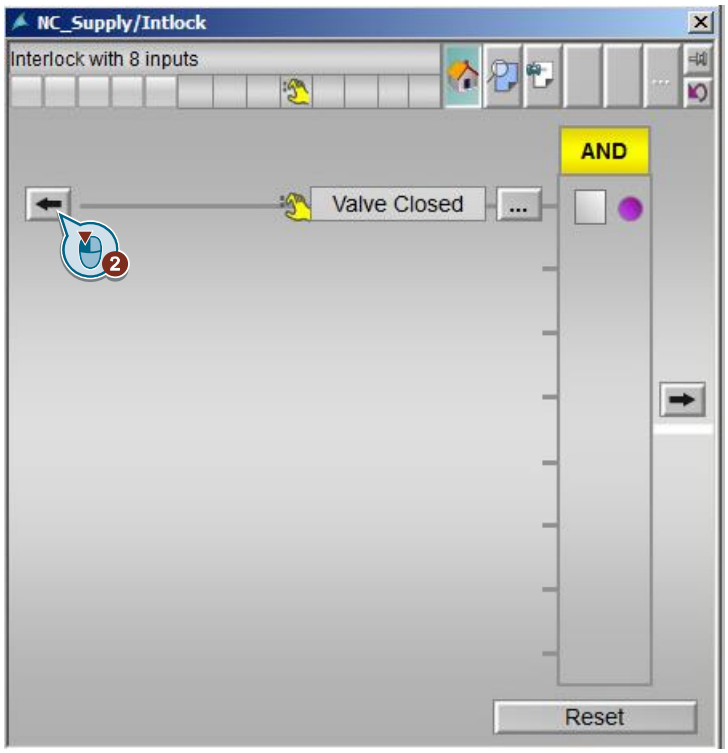
The following figures show the interlock and the navigation to the cause of the interlocking:

1. Initially the motor is interlocked.

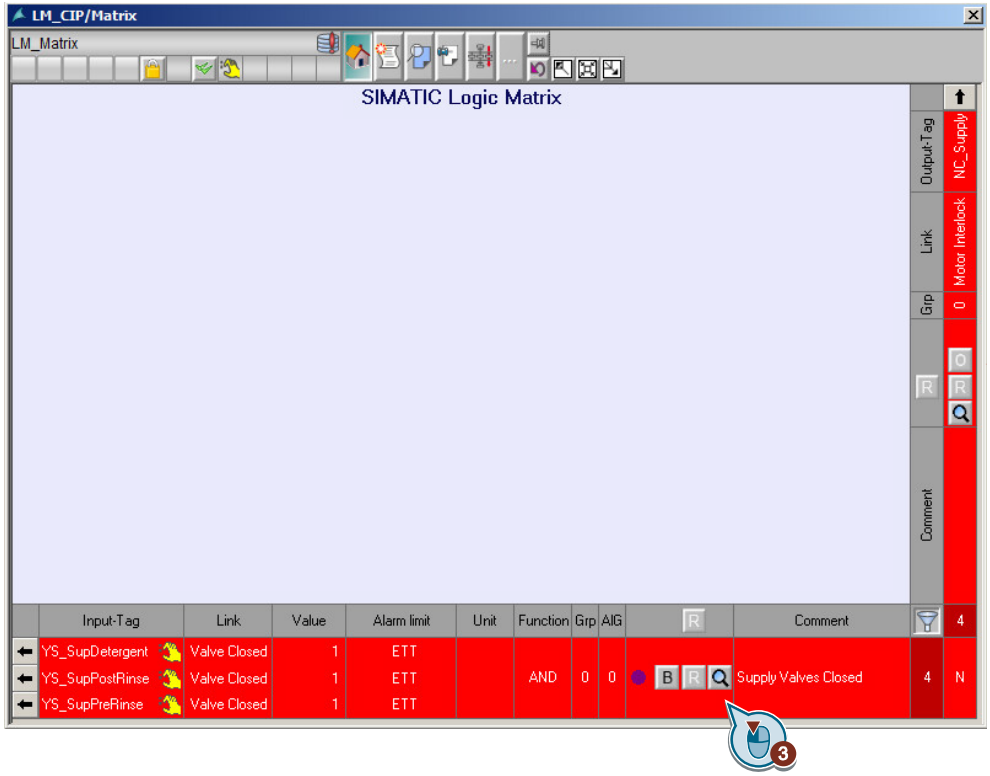


2. Clicking on the “Interlock" button the display block of the corresponding interlock block opens.

3. The interlock block displays the interlocks.
4. Using the jump keys it is possible to navigate to the cause.

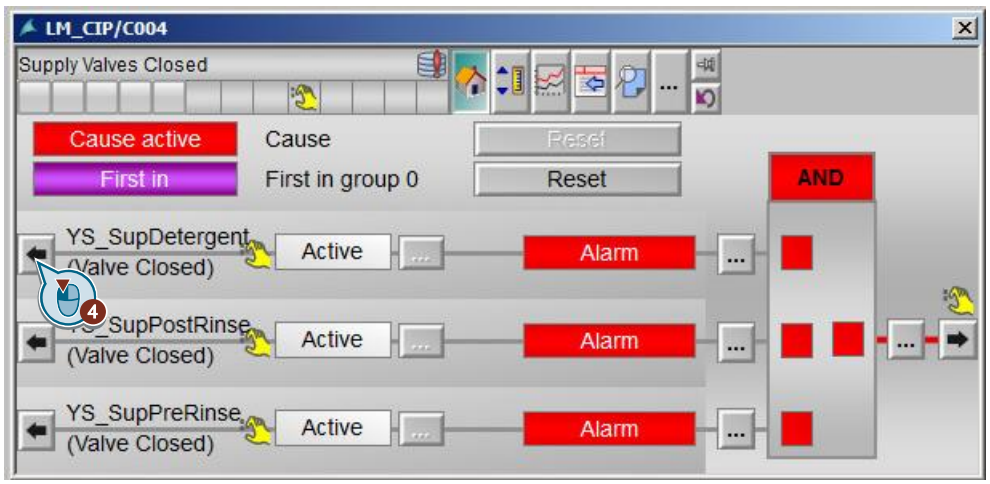


5. The PCS 7 Logic Matrix opens with the filter preset for the activated effect.

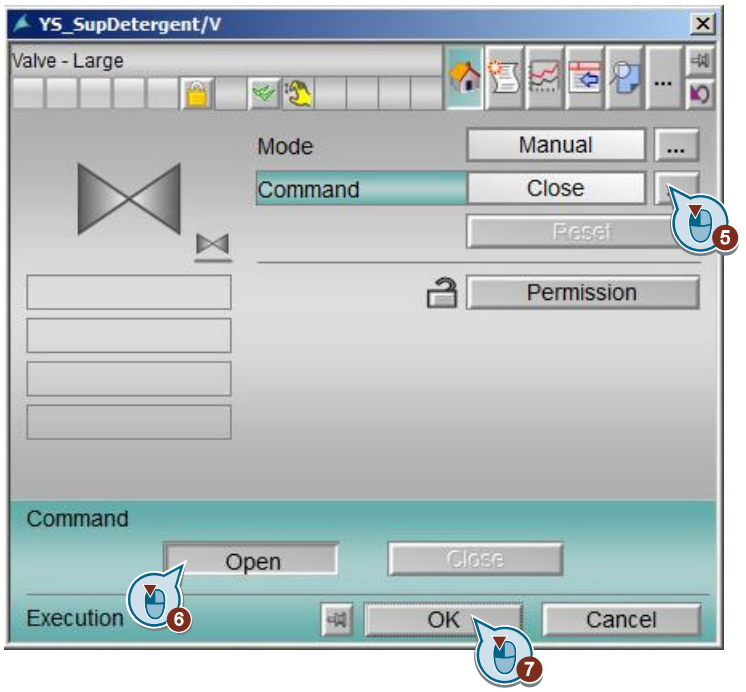


6. Left-clicking on the “magnifying glass” opens the Cause display block.

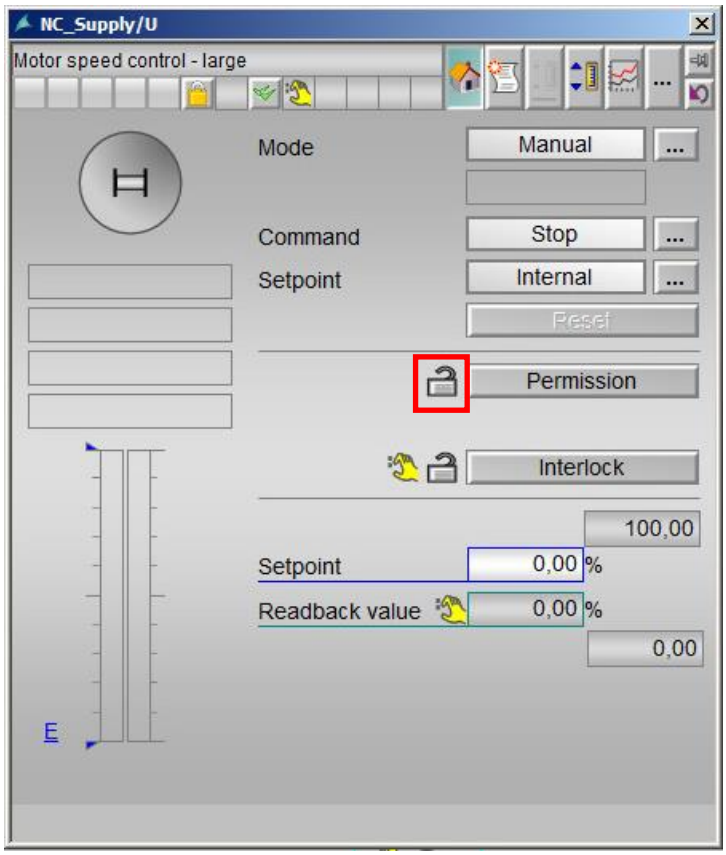
7. Via the Cause display block you can jump to the process tag that has caused the interlocking.



8. In the Faceplate of the process tag causing the interlocking you can rectify the cause (in the Application example by opening the valve).



9. After the cause of the interlocking has been rectified the interlock is removed.



With the settings of the PCS 7 Logic Matrix it is possible to determine whether the interlock is removed automatically or must be removed manually.

Note

You can find detailed information about the PCS 7 Logic Matrix in the "SIMATIC Process Control System PCS 7 Logic Matrix" manual (https://support.industry.siemens.com/cs/ww/en/view/109737083) and in the Application example "Efficient Configuration of Interlock Logics with PCS 7 Logic Matrix" (https://support.industry.siemens.com/cs/ww/en/view/109482621)

4.4 Sequences (SFC type instances)

The CIP system is designed for batch operation. Within the system there are various SFC-type instances with diverse tasks. According to ISA 88, the SFC-type instance describes the equipment module. These will be described in the following sections.

The following table provides you with an overview of the SFC types present in the application example.

SFC type	Comment
CIP_RETURN	Control of CIP system return
CIP_SUPPLY	Control of CIP system supply
FILL_HEAT_CONC	Control of fluid reprocessing in detergent tank (no BATCH functionality)
TANK_IN	Control for the supply to the mixer
TANK_OUT	Control for the mixer discharge

4.4.1 CIP_RETURN

The SFC type instance is started by SIMATIC BATCH in the cleaning recipes and opens or closes the valves in the return line of the CIP system which lead to the tanks and the drain. This takes place according to the selected control strategy (defined in the recipe) and the quality of the fluid.

Control Strategies

The control strategies for the "CIP_RETURN" SFC type are listed in the following table:

Control strategy	Comment
PRERINSE	Control strategy for pre-rinse phase
DETERGENT	Control strategy for wash phase
POSTRINSE	Control strategy for post-rinse phase

Set points

The setpoints for the "CIP_RETURN" SFC type are listed in the following table:

Setpoint name	Data type	Connection name	Unit	Comment
TEMP_PRERINSE	REAL	PRE_TMP	°C	Temperature of pre-rinse fluid
TEMP_DETERGENT	REAL	DET_TMP	°C	Temperature of washing fluid
HYSTERESIS_TEMP	REAL	T_HYS	°C	Temperature hysteresis

Setpoint name	Data type	Connection name	Unit	Comment
PRE_CON	REAL	PRE_CONC	mS	Detergent concentration in pre-rinse fluid
DET_CONC	REAL	DET_CONC	mS	Detergent concentration in washing fluid
HYSTERESIS_CONC	REAL	C_HYS	mS	Concentration hysteresis

Control values

The control values for the "CIP_RETURN" SFC type are listed in the following table:

Control value name	Data type	Connection name	Start value	Comment
SetTempRet	BOOL	SetTempRet	FALSE	Reset command for simulation values

Note In the Application example the “SetTempRet” Control value serves the purpose of resetting the simulated process values “Temperature” and “Conductivity” of the liquid in the CIP return to a defined Start value.

Block contacts

The block contacts for the "CIP_RETURN" SFC type are listed in the following table:

Name	Block	Connection name	Comment
V1	VlvL	V1	Valve to pre-rinse tank
V2	VlvL	V2	Valve to detergent tank
V3	VlvL	V3	Valve to the drain
LS1	MonDiL	LS1	Level monitoring in pre-rinse tank
LS2	MonDiL	LS2	Level monitoring in detergent tank

Sequences

The following sequences are configured in the “CIP_RETURN” SFC type:

- PRERINSE
- DETERGENT
- POSTRINSE
- COMPLETING_ABORT

COMPLETING_ABORT

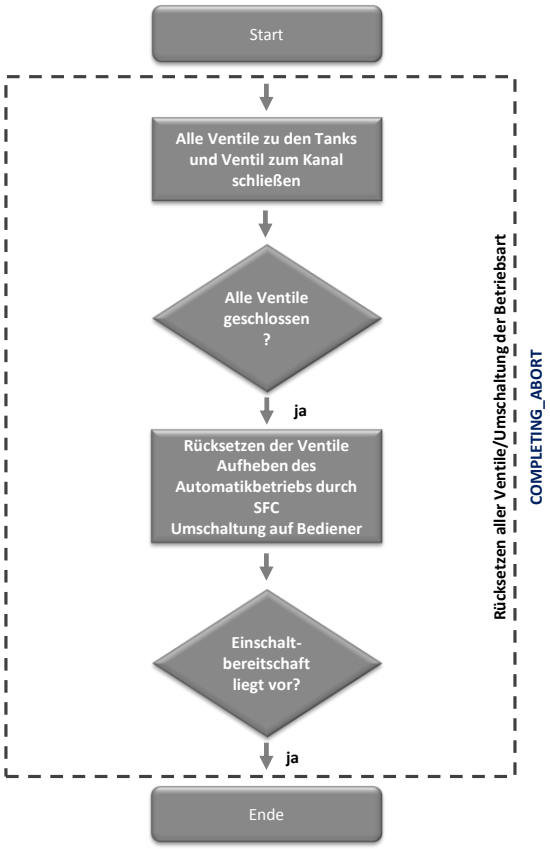
The "COMPLETING_ABORT" sequence performs the following actions:

- Closes all valves in the return line and enables their manual operation
- Sets the SFC-type to “IDLE”

The start conditions for the "COMPLETING_ABORT" sequence are listed in the following table:

SFC status	=	Value	Logic
ABORTING	=	Aborting	OR
COMPLETING	=	Completing	

The figure below shows the design of the “COMPLETING_ABORT” sequence:



PRERINSE

The "PRERINSE" sequence performs the following actions in the pre-rinse phase:

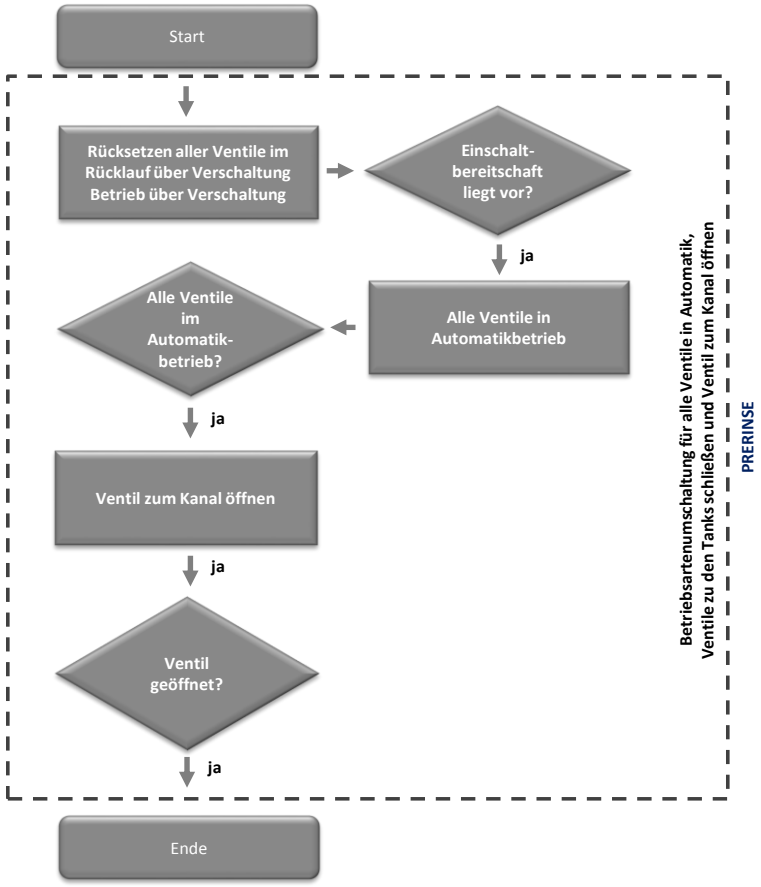
- Resets valves in the return line
- Sets Mode selection of valves to “via interconnection”
- Switches valves in the return line to automatic mode
- Closes all the valves to the tanks
- Opens the valve to the drain
- Sets the SFC type to the "Ready to Complete" state at the end of processing

The start conditions for the "PRERINSE" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	1	
READY_TC	=	0	

The “PRERINSE” sequence remains active until it is terminated by the higher level controller (SIMATIC BATCH).

The figure below shows the design of the “PRERINSE” sequence:



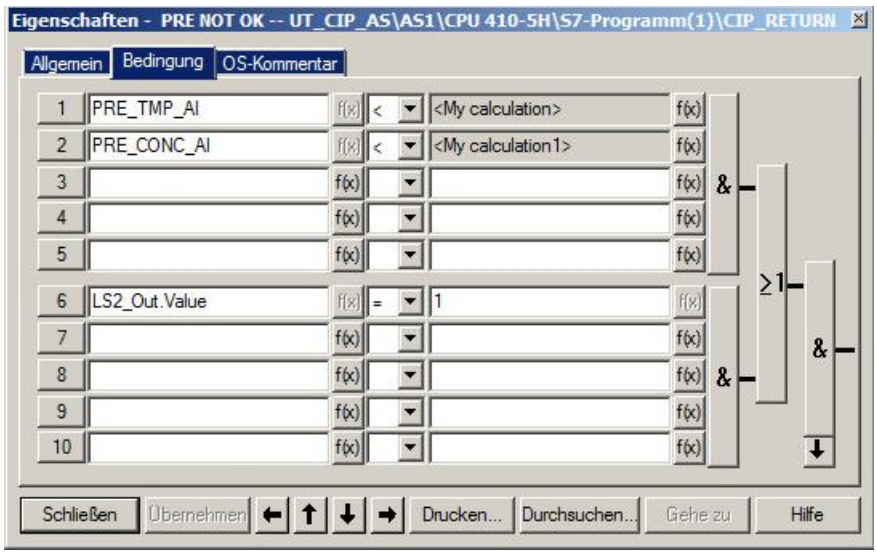
DETERGENT

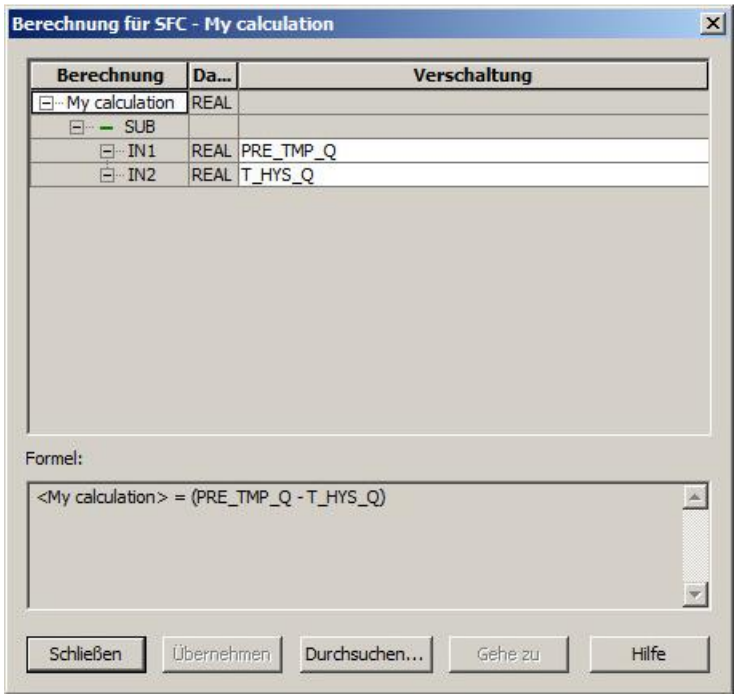
The "DETERGENT" sequence performs the following actions in the wash phase:

- Resets valves in the return line
- Sets Mode selection of valves to “via interconnection”
- Switches valves in the return line to automatic mode
- Opens or closes the valves depending on the fill levels in the tanks and the quality of the fluid
- Sets the SFC type to the "Ready to Complete" state (in each "valve step")

There is a separate step ("valve step") for each valve that is opened or closed. In this step, the corresponding valve is opened and all other valves are closed. In the subsequent transition, a check is made to see whether the conditions have changed. If the conditions have changed, the sequence jumps accordingly to another valve step.

The calculation of the conditions is carried out in the SFC-type directly, as shown in the following figures.





Note

The calculations of all other conditions in this and other SFC types are carried out according to the same principle and are not described in the application example.

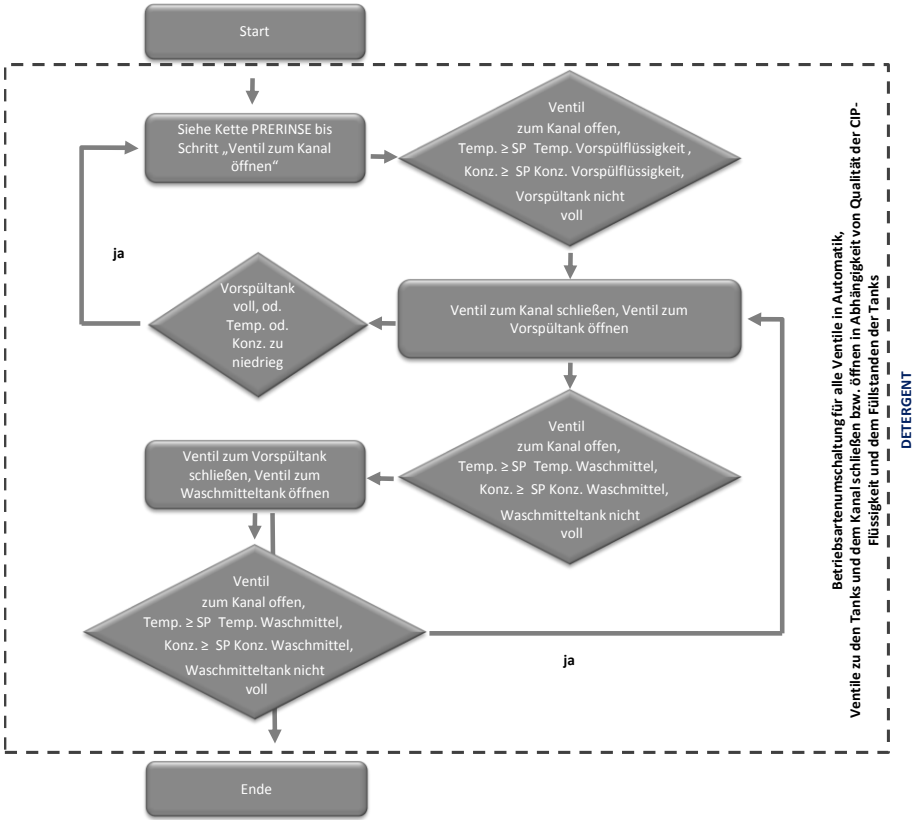
You can find detailed information on calculations in the SFC in the manual "SIMATIC Process Control System PCS 7 – SFC for SIMATIC S7 (V8.2), Chapter 12.4.5 “Calculations in steps and transitions of SFC”.
https://support.industry.siemens.com/cs/ww/en/view/109736726

The start conditions for the "DETERGENT" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	2	
READY_TC	=	0	

The “DETERGENT” sequence remains active until it is terminated by the higher level controller (SIMATIC BATCH).

The figure below shows the design of the “DETERGENT” sequence:



POSTRINSE

The "POSTRINSE" sequence performs the following actions in the wash phase:

- Resets valves in the return line
- Sets Mode selection of valves to “via interconnection”
- Switches valves in the return line to automatic mode
- Opens or closes the valves depending on the fill levels in the tanks and the quality of the fluid
- Sets the SFC type to the "Ready to Complete" state (in each "valve step")

There is a separate step ("valve step") for each valve that is opened or closed. In this step, the corresponding valve is opened and all other valves are closed. In the subsequent transition, a check is made to see whether the conditions have changed. If the conditions have changed, the sequence jumps accordingly to another valve step.

The start conditions for the "POSTRINSE" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	3	
READY_TC	=	0	

The “POSTRINSE” sequence remains active until it is terminated by the higher level controller (SIMATIC BATCH).

The design of the "POSTRINSE" sequence is identical to that of the "DETERGENT" sequence.

4.4.2 CIP_SUPPLY

The SFC type instance is started by SIMATIC BATCH in the cleaning recipes and opens or closes the valves from the tanks of the CIP system which lead to the supply line. This takes place according to the selected control strategy defined in the recipe. Additionally the pump is started in supply. The setpoint of the flow rate is defined in the recipe. Before the fluid is drawn from the tanks, a check is made to ensure that the relevant conditions are satisfied.

Control Strategies

The control strategies for the "CIP_SUPPLY" SFC type are listed in the following table:

Control strategy	Comment
PRERINSE	Control strategy for pre-rinse phase
DETERGENT	Control strategy for wash phase
POSTRINSE	Control strategy for post-rinse phase

Set points

The setpoints for the "CIP_SUPPLY" SFC type are listed in the following table:

Setpoint name	Data type	Connection name	Unit	Comment
RINSE_TIME	REAL	RINSE_TIME	S	Duration of the phase
RINSE_FLOW	REAL	RINSE_FLOW	m³/h	Flow rate of fluid

Process values

The process values for the "CIP_SUPPLY" SFC type are listed in the following table:

Name	Data type	Connection name	Comment
FCH_Level_Check	BOOL	FCH_Level	Sufficient fluid present
FCH_RUN	BOOL	FCH_RUN	Fluid reprocessing is active
FCH_HOLD	BOOL	RCH_HOLD	Fluid reprocessing is halted

Control values

The control values for the "CIP_SUPPLY" SFC type are listed in the following table:

Name	Data type	Connection name	Comment
Hold_LHC	BOOL	Hold_LHC	Fluid reprocessing is halted
Resume_LHC	BOOL	Resume_LHC	Fluid flow resume

Information texts

The information texts for the "CIP_SUPPLY" SFC type are listed in the following table:

Name	Number	Displayed text	Comment
Tanks	1	CIP Tanks ready?	Information to the effect that fluid is not reprocessed / reprocessing has not started yet.

Block contacts

The block contacts for the "CIP_SUPPLY" SFC type are listed in the following table:

Name	Block	Connection name	Comment
V1	VlvL	V1	Valve to pre-rinse tank
V2	VlvL	V2	Valve to detergent tank
V3	VlvL	V3	Valve to post-rinse tank
M1	MotL	M1	Supply pump
TIMER1	BlTimer	TIMER1	Supply timer

Sequences

The following sequences are configured in the SFC type „CIP_SUPPLY“:

- PRERINSE
- DETERGENT
- POSTRINSE
- COMPLETING_ABORT
- Holding
- Resuming

The instance of the "CIP SUPPLY" SFC type is connected to the “RinseTimer" block. This ensures that the specified exposure time for the cleaning fluid in the plant section to be cleaned is maintained. The “RinseTimer" block is an instance of the "BlTimer" function block from the BRAUMAT library.

PRERINSE

The "PRERINSE" sequence performs the following actions in the pre-rinse phase:

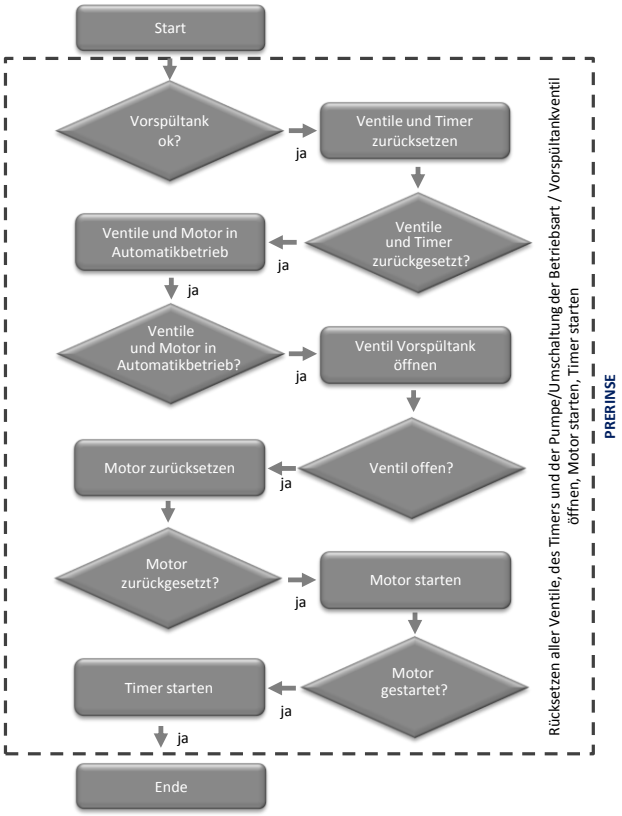
- Checks that the pre-rinse fluid meets the quality requirements and is available in sufficient quantity.
- Stops fluid reprocessing
- Switches all the valves and the pumps to automatic mode
- Closes the valves from the detergent and post-rinse tanks
- Opens valve of pre-rinse tank
- Starts pump at set speed

The start conditions for the "PRERINSE" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	1	

The sequence remains active until the time specified on the timer has elapsed.

The figure below shows the design of the “PRERINSE” sequence:



DETERGENT

The "DETERGENT" sequence performs the following actions in the wash phase:

- Checks that the detergent fluid meets the quality requirements and is available in sufficient quantity.
- Stops fluid reprocessing
- Switches all the valves and the pumps to automatic mode
- Closes valves of pre-rinse and post-rinse tank
- Opens valve of detergent tank
- Starts pump at set speed
- Starts the timer

The start conditions for the "DETERGENT" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	2	

The sequence remains active until the time specified on the timer has elapsed.

The design of the "DETERGENT" sequence is like that of the "PRERINSE" sequence, with the following differences:

- The valve to the pre-rinse tank closes
- Valve to the detergent tank opens

POSTRINSE

The “POSTRINSE” sequence carries out the following actions in the post-rinse phase:

- Checks that the post-rinse fluid meets the quality requirements and is available in sufficient quantity
- Stops fluid reprocessing
- Switches all the valves and the pumps to automatic mode
- Closes the valves from the pre-rinse and detergent tank
- Opens valve of post-rinse tank
- Starts pump at set speed

The start conditions for the "POSTRINSE" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	3	

The sequence remains active until the time specified on the timer has elapsed.

The design of the "POSTRINSE" sequence is like that of the "PRERINSE" sequence, with the following difference:

- The valve to the pre-rinse tank closes
- Valve to the detergent tank opens

Completing_Abort

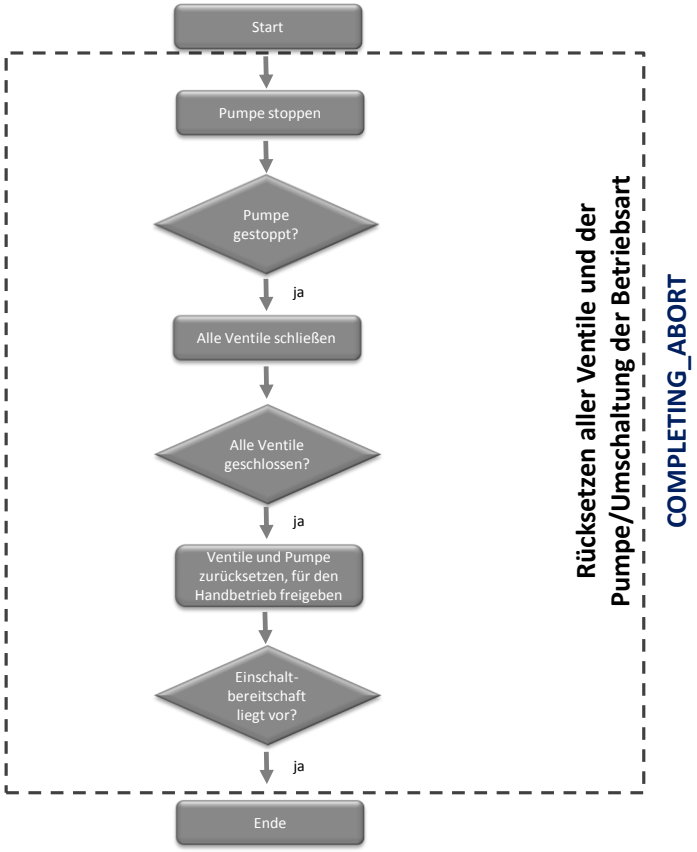
The "Completing_Abort" sequence performs the following actions:

- Stops pump in supply
- Resumes fluid reprocessing
- Closes all the valves in supply
- Resets the Timer
- Enables manual operation of valve and pump

The start conditions for the "Completing_Abort" sequence are listed in the following table:

SFC status	=	Value	Logic
ABORTING	=	Aborting	OR
COMPLETING	=	Compliti	

The figure below shows the design of the “Completing_Aborting” sequence:



Holding

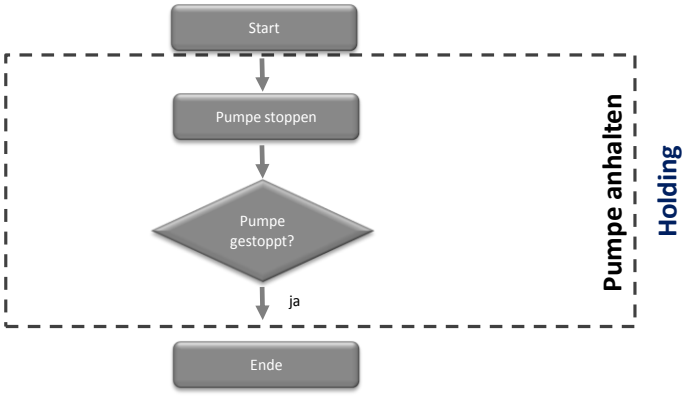
The “Holding" sequence performs the following actions:

- Stops the pump in supply
- Stops the Timer (indirectly through status “HELD = Held”)

The following table lists the starting conditions of the “Holding” sequence:

SFC status	=	Value	Logic
HOLDING	=	Holding	AND

The figure below shows the design of the “Holding” sequence:



Resuming

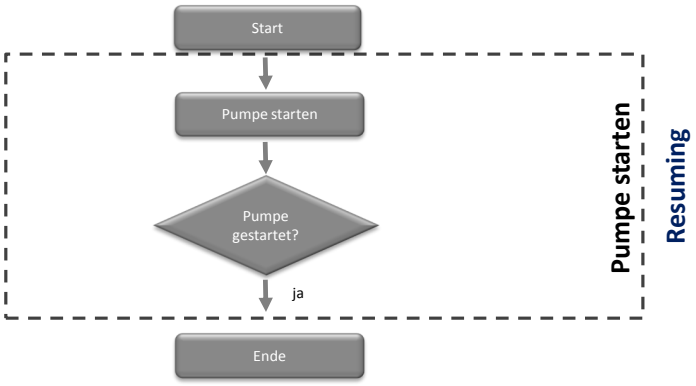
The “Resuming" sequence performs the following actions:

- Starts the pump in supply
- Starts Timer (indirectly through status “HELD = 0”)

The start conditions for the "Resuming" sequence are listed in the following table:

SFC status	=	Value	Logic
RESUMING	=	Resuming	AND

The figure below shows the design of the “Resuming” sequence:



4.4.3 FILL_HEAT_CONC

The SFC-type instance is started by the operator. It must be permanently active so that the cleaning fluid is always available in sufficient quantities of the prescribed quality.

By means of the "FHC" SFC-type instance from the "FILL_HEAT_CONC" SFC-type, the fill level, the temperature and the detergent concentration of the fluid are determined and adjusted as required.

The fluids in the pre- and post-rinse tanks are not reprocessed in the "CIP" application example. These fluids can be reprocessed with the "FILL_HEAT_CONC" SFC type.

Control Strategies

The control strategies for the "FILL_HEAT_CONC" SFC type are summarized in the following table:

Control strategy	Comment
PREPARE	Reprocessing of the fluid

Set points

The control strategies for the "FILL_HEAT_CONC" SFC type are summarized in the following table:

Setpoint name	Data type	Connection name	Unit	Comment
LEVEL	REAL	LEVEL	L	Tank fill level
HYSTERESIS_Level	REAL	L_HYS	L	Fill level hysteresis
TEMPERATURE	REAL	TEMP	°C	Temperature of fluid
HYSTERESIS_Temp	REAL	T_HYS	°C	Temperature hysteresis
CONCENTRATION	REAL	CONC	mS	Detergent concentration
HYSTERESIS_Conc	REAL	C_HYS	mS	Concentration hysteresis

Control values

The control values for the "FILL_HEAT_CONC" SFC type are listed in the following table:

Name	Data type	Connection name	Comment
LEVEL_CHECK_1	BOOL	L_CHECK	Fill level OK

Block contacts

The block contacts for the "FILL_HEAT_CONC" SFC type are listed in the following table:

Name	Block	Connection name	Comment
V1	VlvL	V1	Fresh water valve
V2	VlvAnL	V2	Temperature regulation valve
M1	MotL	M1	Circulation pump motor
M2	MotL	M2	Metering pump motor
LS1	MonDiL	LS1	Level monitoring high
LS2	MonDiL	LS2	Level monitoring low
PID1	PIDConL	PID1	Temperature controllers
PuPa1	BlPuPa	PuPa1	Pulse/pause for metering

Sequences

The following sequences are configured in the "FILL_HEAT_CONC" SFC type:

- PREPARE
- Aborting

PREPARE

The "PREPARE" sequence performs the following actions:

- Sets the valves and pumps to automatic mode.
- Checks the fill level and tops up the fluid.
- Measures the temperature of the fluid and controls it
- Measures the concentration of the detergent and controls it

The sequence is started by the operator.

The start conditions for the "PREPARE" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	1	

The procedure of the sequence remains active until it is stopped by the operator. At the start of a wash phase the sequence is halted, and at the end of the wash phase it is resumed.

In the sequence, a check is first made as to whether the fill level is adequate or if it needs to be readjusted. If the fill level is adequate, a check is made as to whether the temperature is high enough or if it needs to be readjusted If the fill level and the temperature are set, the concentration of the detergent is checked and readjusted as necessary.

The detergent is metered with the aid of the BlPuPa block (BRAUMAT library) which is connected to the SFC type instance. This is used to pulse-drive the metering pump over a predefined cycle.

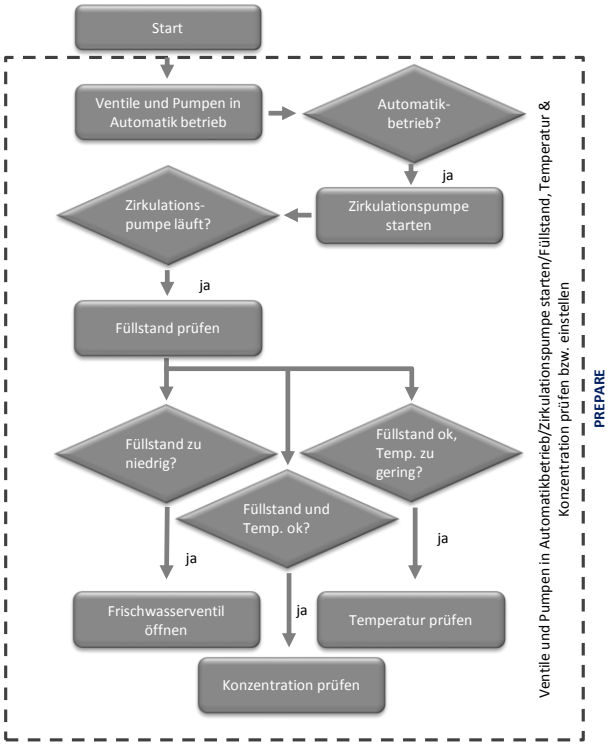
The following four figures show the structure of the “PREPARE” sequence:

4.4 Sequences (SFC type instances)

Sequence of the actions:

- Set the valves and pumps to automatic mode
- Start the circulation pump
- Check the fill level
- Adjust the fill level or jump to the step for checking the temperature or the concentration

is illustrated in the following diagram:

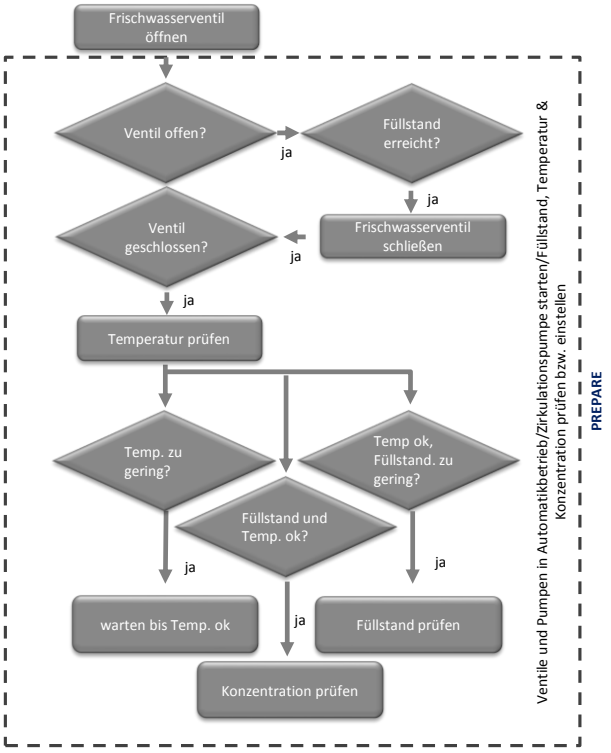


4.4 Sequences (SFC type instances)

Sequence of the actions:

- Set the fill level (open /close the fresh water valve)
- Check the temperature
- Adjust the temperature or jump to the step for checking the fill level or the concentration

is illustrated in the following diagram:

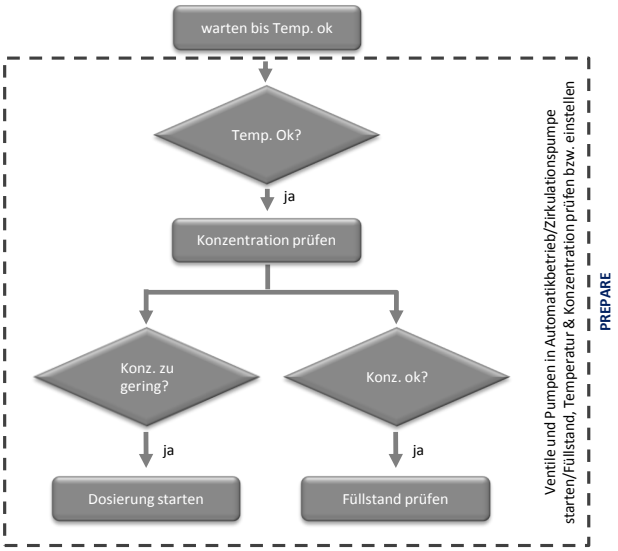


4.4 Sequences (SFC type instances)

Sequence of the actions:

- Set the temperature (make the fluid circulate)
- Check the concentration
- Adjust the concentration or jump to the step for checking the fill level

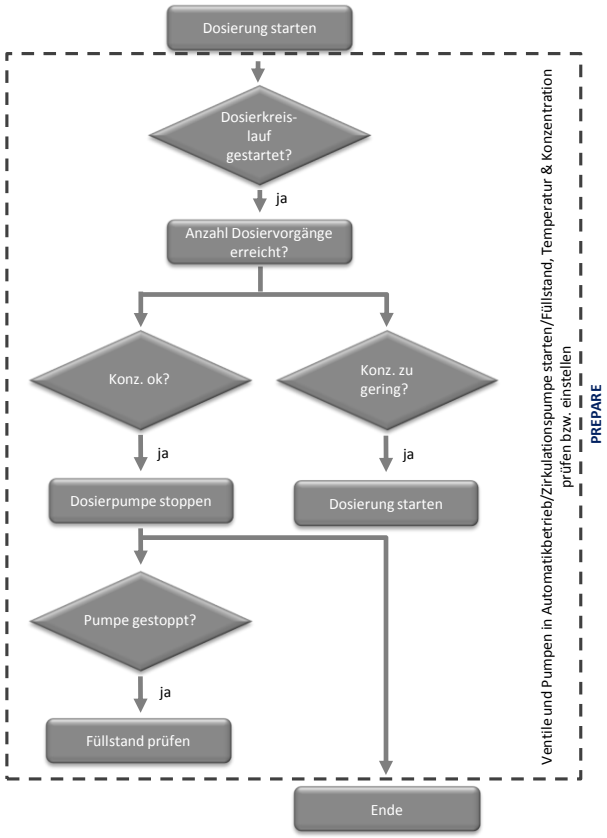
is illustrated in the following diagram:



Sequence of the actions:

- Set the concentration (start pulse/pause control of the metering pump)
- Check the concentration
- Start metering again or jump to the step for checking the fill level

is illustrated in the following diagram:



Aborting

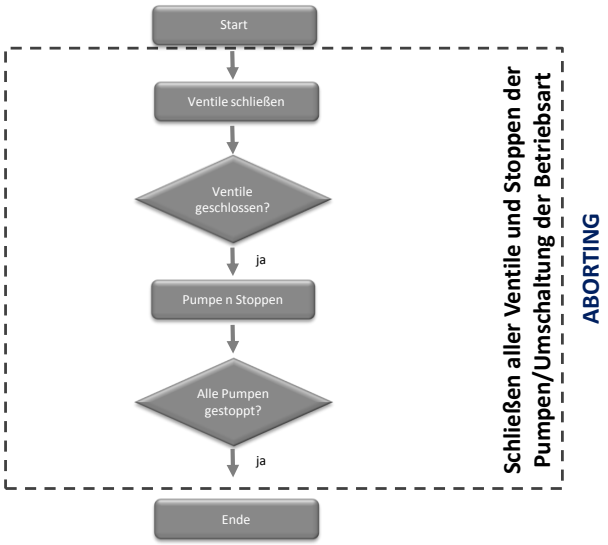
The “Aborting" sequence performs the following actions:

- Closes all the valves
- Stops all the pumps
- Enables manual operation of all process tags controlled

The start conditions for the "Aborting" sequence are listed in the following table:

SFC status	=	Value	Logic
ABORTING	=	Aborting	AND

The figure below shows the design of the “Aborting” sequence:



4.4.4 TANK_IN

The SFC-type instance is started by SIMATIC BATCH in the cleaning recipes and opens or closes the valve to the mixer. In addition the “BlPuPa” for opening and closing the valve to the drain is activated. The setting of the pulse times and number is defined in the recipe.

Control strategy

The control strategies for the "TANK_IN" SFC type are listed in the following table:

Control strategy	Comment
PRODUCTION	Control strategy for production
CIP	Control strategy for cleaning the mixer

Set points

The setpoints for the "TANK_IN" SFC type are listed in the following table:

Setpoint name	Data type	Connection name	Unit	Comment
Loops	DINT	Loop		Number of loops
Loop_Time	REAL	Loop_Time	S	Duration of a loop

Block contacts

The block contacts for the "TANK_IN" SFC type are listed in the following table:

Name	Block	Connection name	Comment
V1	VlvL	V1	Mixer valve
V2	VlvL	V2	Drain valve
PUPA	BlPuPa	PUPA	Connection for pulse/pause block

Sequences

The following sequences are configured in the "TANK_IN" SFC type:

- PRODUCTION
- CIP
- COMPLETING_ABORT

PRODUCTION

The "PRODUCTION" sequence performs the following actions:

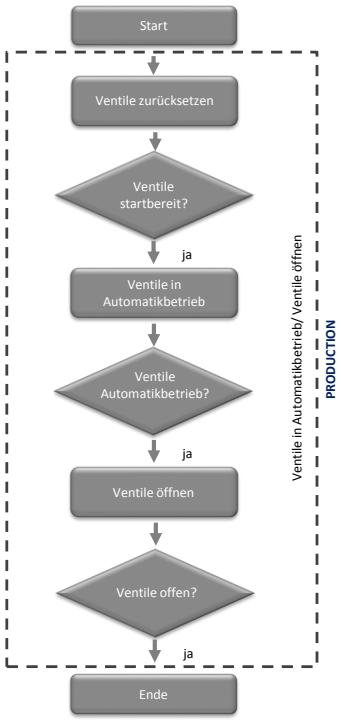
- Sets Mode selection of valves to “via interconnection”
- Switches valves to automatic mode
- Opens the valve to the mixer

The start conditions for the "PRODUCTION" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	1	

The “PRODUCTION” sequence remains active until it is terminated by the higher level controller (SIMATIC BATCH).

The figure below shows the design of the “PRODUCTION” sequence:



CIP

The "CIP" sequence performs the following actions:

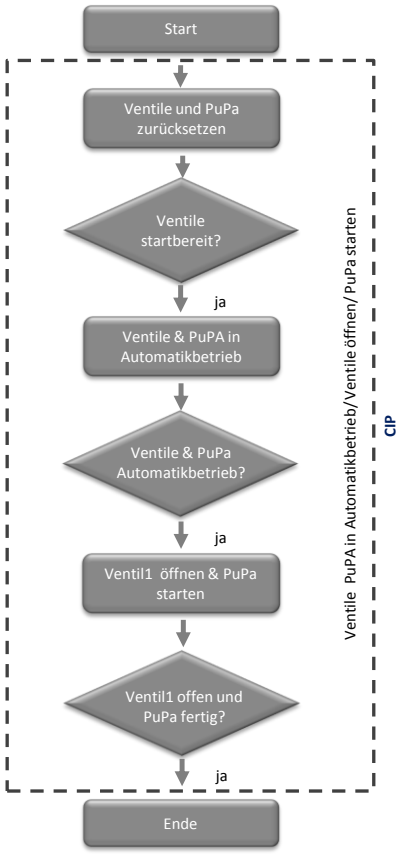
- Sets Mode selection of valves and pulse/pause block to “via interconnection”
- Sets the valves and the pulse-pause block to automatic mode
- Opens the valve to the mixer
- Starts the pulse/pause block

The start conditions for the "CIP" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	2	

The “CIP” sequence remains active until it is terminated by the higher level controller (SIMATIC BATCH).

The figure below shows the design of the “CIP” sequence:



COMPLETING_ABORT

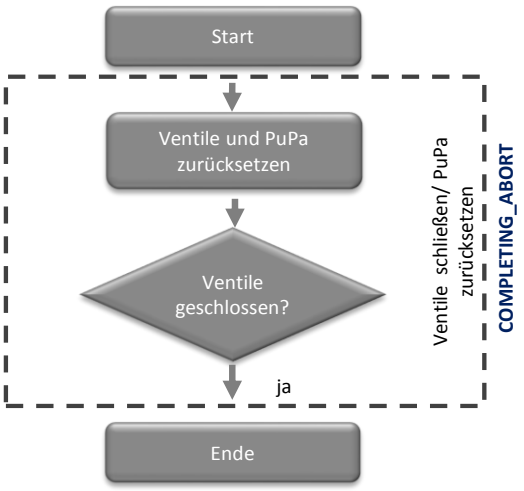
The "COMPLETING_ABORTING" sequence performs the following actions:

- Closes all the valves
- Enables manual operation of valve and Pulse-Pause block

The start conditions for the "COMPLETING_ABORTING" sequence are listed in the following table:

SFC status	=	Value	Logic
ABORTING	=	Aborting	OR
COMPLETING	=	Compliti	

The figure below shows the design of the “COMPLETING_ABORTING” sequence:



4.4.5 Tank_OUT

The SFC type instance is started by SIMATIC BATCH in the cleaning recipes and opens or closes the discharge valve from the mixer and starts or stops the pump for pumping out the mixer.

Control strategy

The control strategies for the "TANK_OUT" SFC type are listed in the following table:

Control strategy	Comment
PRODUCTION	Control strategy for production
CIP	Control strategy for cleaning the mixer

Block contacts

The block contacts for the "TANK_OUT" SFC type are listed in the following table:

Name	Block	Connection name	Comment
V1	VlvL	V1	Mixer valve
V2	VlvL	V2	Drain valve
M1	MotL	M1	Motor for pump

Sequences

The following sequences are configured in the “TANK_OUT" SFC type:

- PRODUCTION
- CIP
- COMPLETING_ABORT
- HOLDING
- RESUMING

PRODUCTION

The "PRODUCTION" sequence performs the following actions in the pre-rinse phase:

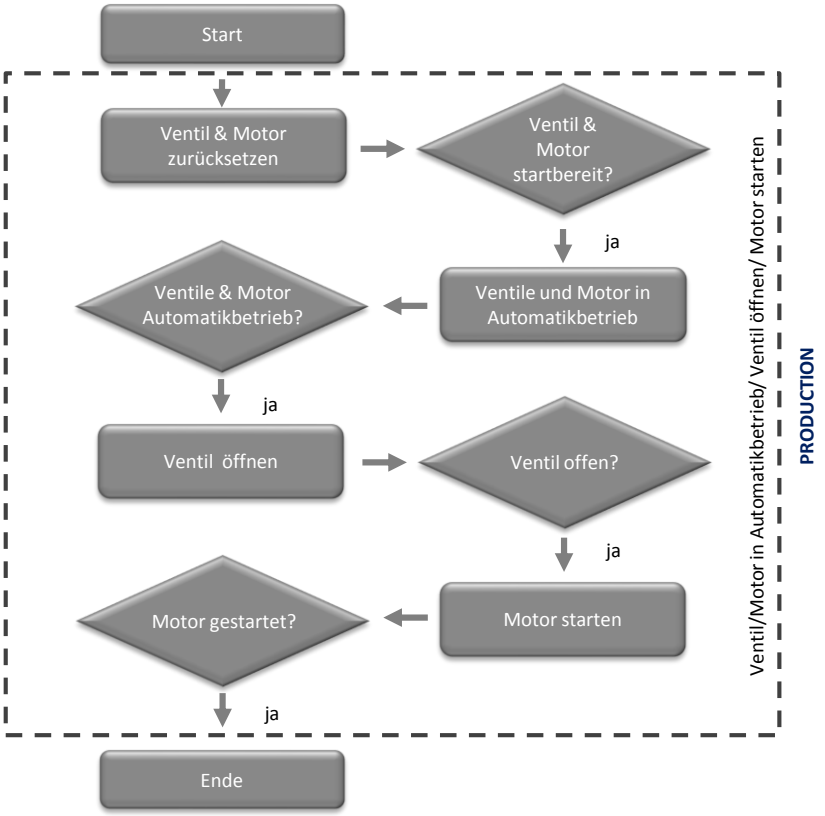
- Sets Mode selection of valve and motor to “via interconnection”
- Sets the valve and the motor to automatic mode
- Opens valve and starts motor

The start conditions for the "PRODUCTION" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	1	

The “PRODUCTION” sequence remains active until it is terminated by the higher level controller (SIMATIC BATCH).

The figure below shows the design of the “PRODUCTION” sequence:



CIP

The "CIP" sequence performs the following actions:

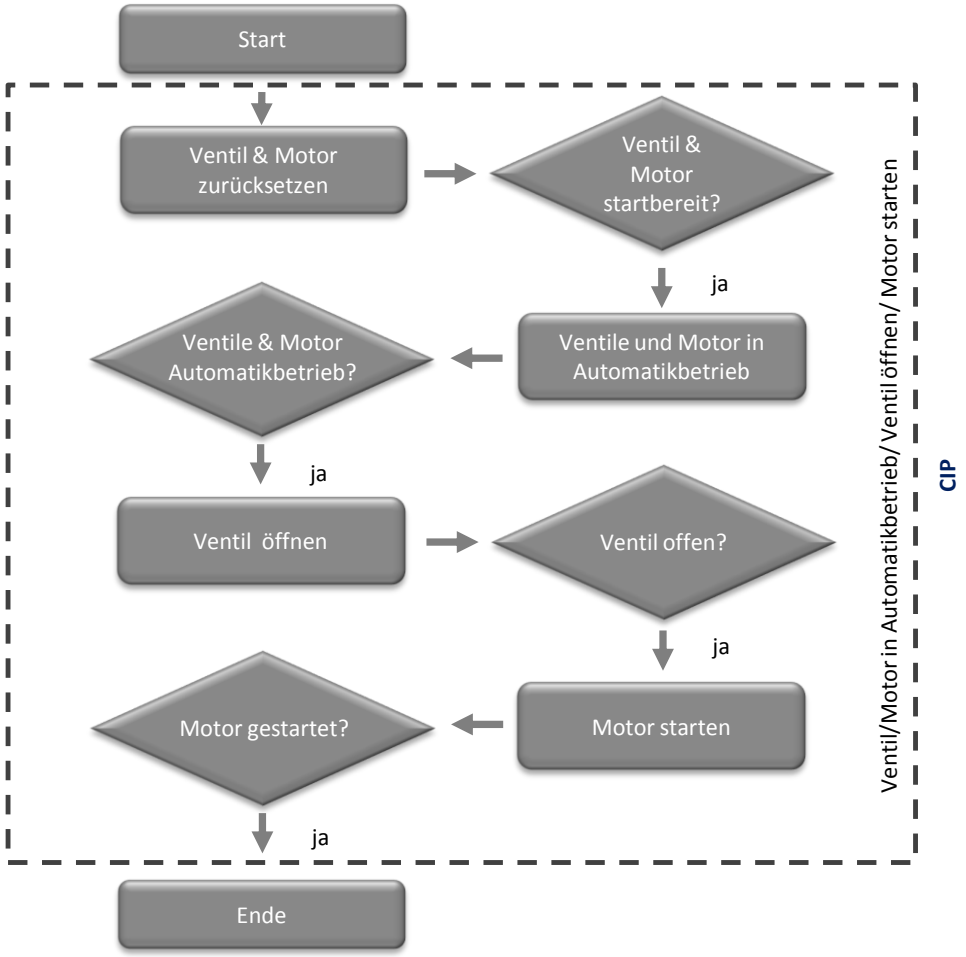
- Sets Mode selection of valve and motor to “via interconnection”
- Sets the valve and the motor to automatic mode
- Opens valve and starts motor

The start conditions for the "CIP" sequence are listed in the following table:

SFC status	=	Value	Logic
RUN	=	Run	AND
QCS	=	2	

The “CIP” sequence remains active until it is terminated by the higher level controller (SIMATIC BATCH).

The figure below shows the design of the “CIP” sequence:



COMPLETING_ABORT

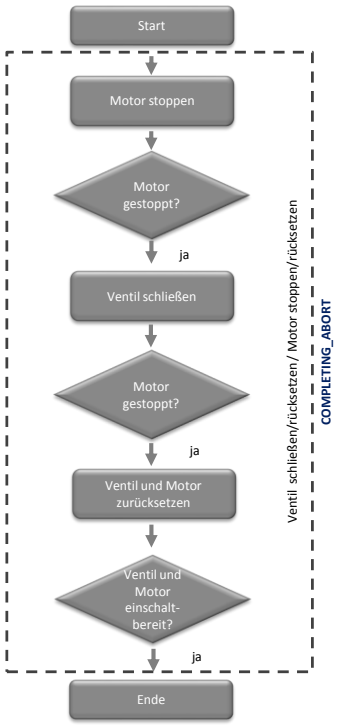
The "COMPLETING_ABORTING" sequence performs the following actions:

- Stops motor and closes the valve
- Enables manual operation of valve and motor

The start conditions for the "COMPLETING_ABORTING" sequence are listed in the following table:

SFC status	=	Value	Logic
ABORTING	=	Aborting	OR
COMPLETING	=	Compliti	

The figure below shows the design of the “COMPLETING_ABORTING” sequence:



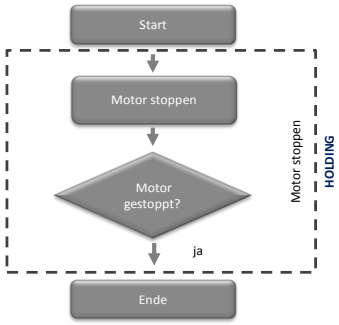
HOLDING

The “HOLDING” sequence stops the motor.

The start conditions for the "HOLDING" sequence are listed in the following table:

SFC status	=	Value	Logic
HOLDING	=	Holding	AND

The figure below shows the design of the “HOLDING” sequence:



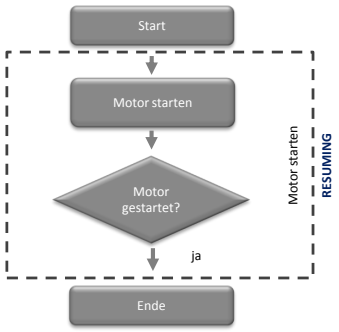
RESUMING

Die Sequence “RESUMING” starts the motor.

The start conditions for the "Resuming" sequence are listed in the following table:

SFC status	=	Value	Logic
RESUMING	=	Resuming	AND

The figure below shows the design of the “RESUMING” sequence:



4.5 SIMATIC BATCH

SIMATIC BATCH is used for discontinuous production. With the aid of SIMATIC BATCH, various products can be produced in one plant. Manufacture is carried out by means of recipes. The recipes contain the knowledge required for production. The recipes can be modified by the operating personnel. The complete recipe procedure with messages and measured values, as well as the operator interventions, is logged.

In addition to the recipes for manufacturing the product, there are also recipes that are used for cleaning the plant units.

4.5.1 Cleaning recipes

Cleaning recipes are used for cleaning the plant sections that are necessary for production.

Information contained in the recipe

The following information may be contained in the cleaning recipe:

- Plant section to be cleaned
- The duration of the cleaning (setpoints for the length of time the fluids remain in the plant section)
- The temperature of the cleaning fluid
- The detergent concentration in the cleaning fluid
- The quantity of cleaning fluid (flow rate)

Various cleaning recipes can be created for a plant section. These differ in the above-mentioned points. These differences depend, e.g., on the degree of soiling of the plant or on the product that was previously contained in the plant.

Structure of an example recipe

The "CIP Mixer" sample cleaning recipe in the "CIP" application example is intended for cleaning the "Mixer" plant section. It consists of the "TRP MIXER" and "TRP CIP" recipe unit procedures (TRP).

The table below lists the TRPs of the “CIP Mixer” cleaning recipe:

TRP	Occupied plant section
RUP Mixer	MIXER
RUP CIP	CIP

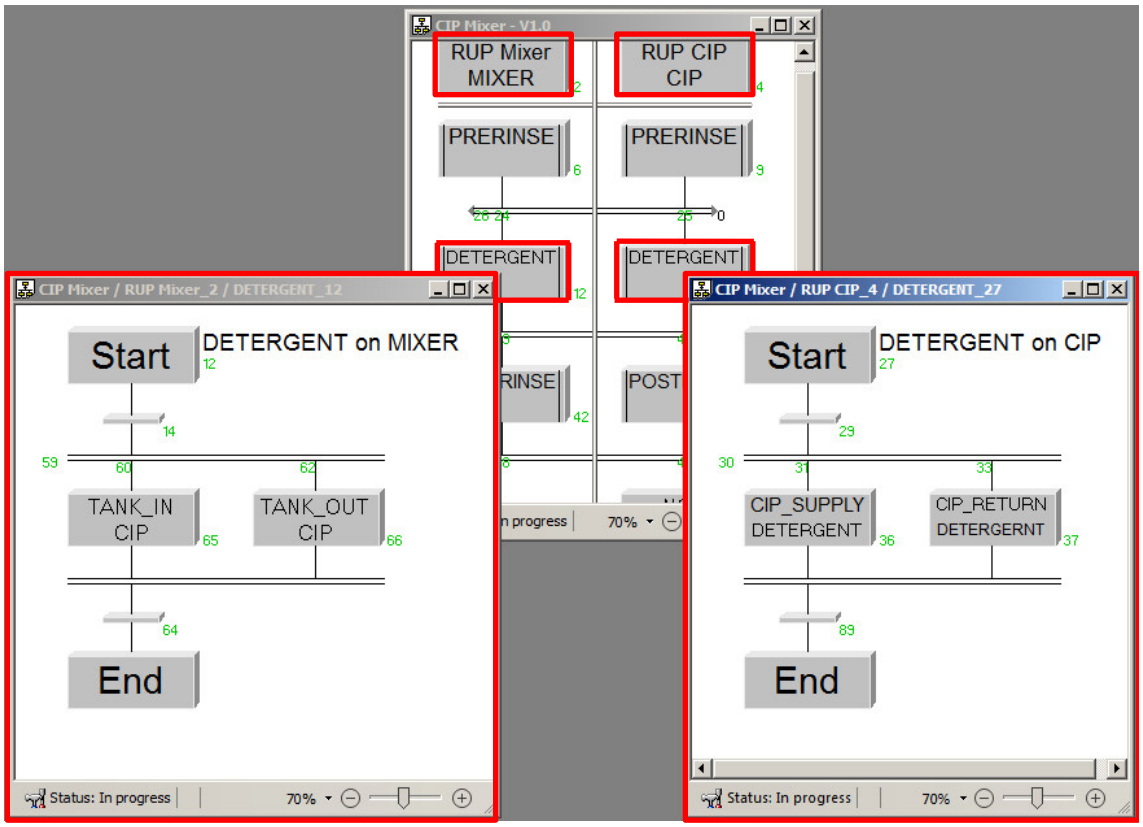
For each TRP there exist three recipe operations (ROP): "PRERINSE", "DETERGENT" and "POSTRINSE". The names of the recipe operations correspond to the current cleaning phase. The recipe phases (RFs) are called up within the ROPs. Each ROP contains two RFs, which run in parallel.

The table below lists the RFs of the “CIP Mixer” cleaning recipe:

TRP	ROP	RF	Control strategy
MIXER	PRERINSE	TANK_IN	CIP
		TANK_OUT	CIP
	DETERGENT	TANK_IN	CIP
		TANK_OUT	CIP
	POSTRINSE	TANK_IN	CIP
		TANK_OUT	CIP
CIP	PRERINSE	CIP_SUPPLY	PRERINSE
		CIP_RETURN	PRERINSE
	DETERGENT	CIP_SUPPLY	DETERGENT
		CIP_RETURN	DETERGENT
	POSTRINSE	CIP_SUPPLY	POSTRINSE
		CIP_RETURN	POSTRINSE

There are synchronization lines between the ROPs so that the process runs synchronously in the TRPs. There is a NOP step at the end of the recipe. This is necessary so that the last two ROPs will also run synchronously with one another.

The figure below describes the structure of the cleaning recipe contained in the “CIP” Application example:



4.5.2 Cleaning batches

The cleaning batches are created as requests in SIMATIC BATCH. The recipe for cleaning is defined when the batch is created.

It is possible to start the cleaning batch automatically immediately at the end of a production batch. This ensures that the plant is clean again after the production of a product and can be used for further production.

5 Starting the Application Example

5.1 Preparation

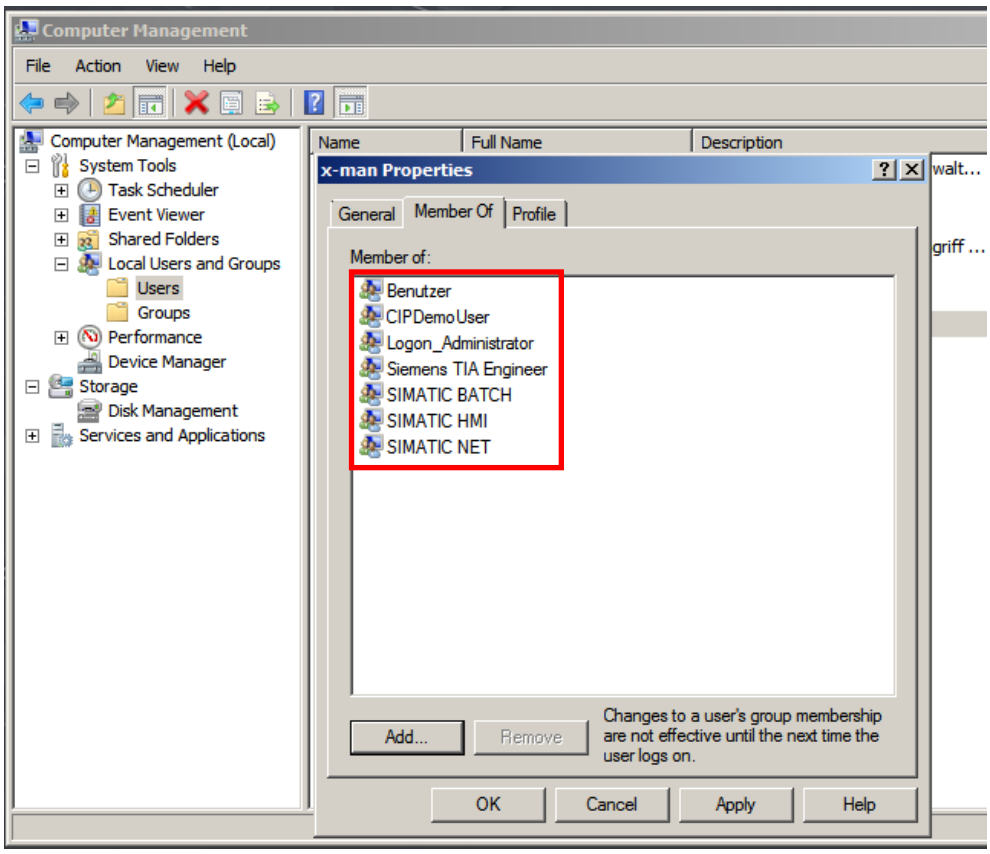
The following instructions describe how to launch the application example by emulating the controller with the "S7 PLCSIM" program. If there is a real controller, you must configure existing hardware components in HW Config.

Preparation in Windows

The following instructions describe the steps that must be performed in Windows:

1. Click on "Start".
2. Right-click on "Computer" and open the "Administrate" menu item. The Computer Management dialog opens.
3. Right-click on the left side of the window on the "Local users and groups > Groups" menu item. Select the "New group" menu command. The “New Group” window then opens.
4. Enter "CIPDemoUser" in the "Names" box.
5. Add the user name with which you are currently logged in to Windows to this group.
6. Click on "Create".
7. On the left side of the window, select the "Local users and groups" item. On the right side, right-click on the user name with which you are currently logged in. Select the "Properties" menu item. This opens the "Properties" window.

8. Switch to the "Member of" tab and check whether the user is a member of the listed groups:

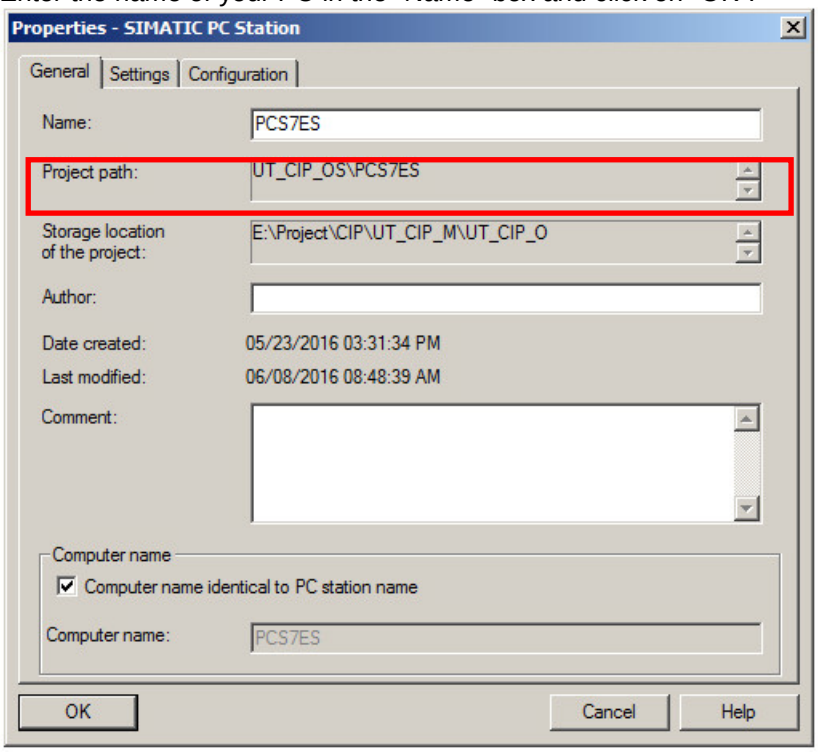


If the user is not included in all the groups, add him to the missing ones.

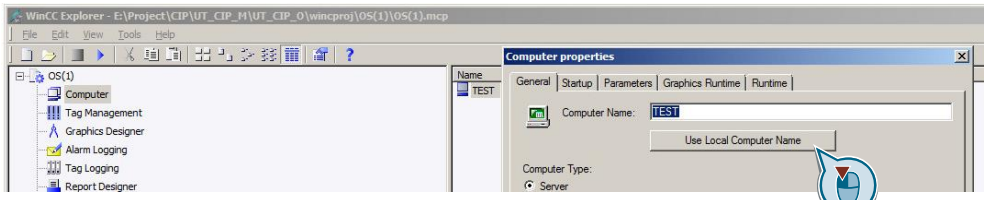
Preparing the project

1. Copy the file "78463886_PRO_CIP_PCS7_V82.zip" and “78463886_CIP_PCS7_BATCH_BACKUP.sbb” into any folder on the configuration PC and then open the SIMATIC Manager.
2. Click on "File > Retrieve" in the menu bar and select the file "78463886_PRO_CIP_PCS7_V82.zip". Then confirm with "Open".
3. Select the folder in which the project will be saved and confirm with the "OK" button.
   The project will be extracted.
4. In the "Retrieve" dialog, click on the "OK" button and then click on "Yes" in the dialog to open the project.
5. Right-click on “UT_CIP_OS > PCS7ES" and click on the "Object properties" menu item.

6. Enter the name of your PC in the "Name" box and click on "OK".

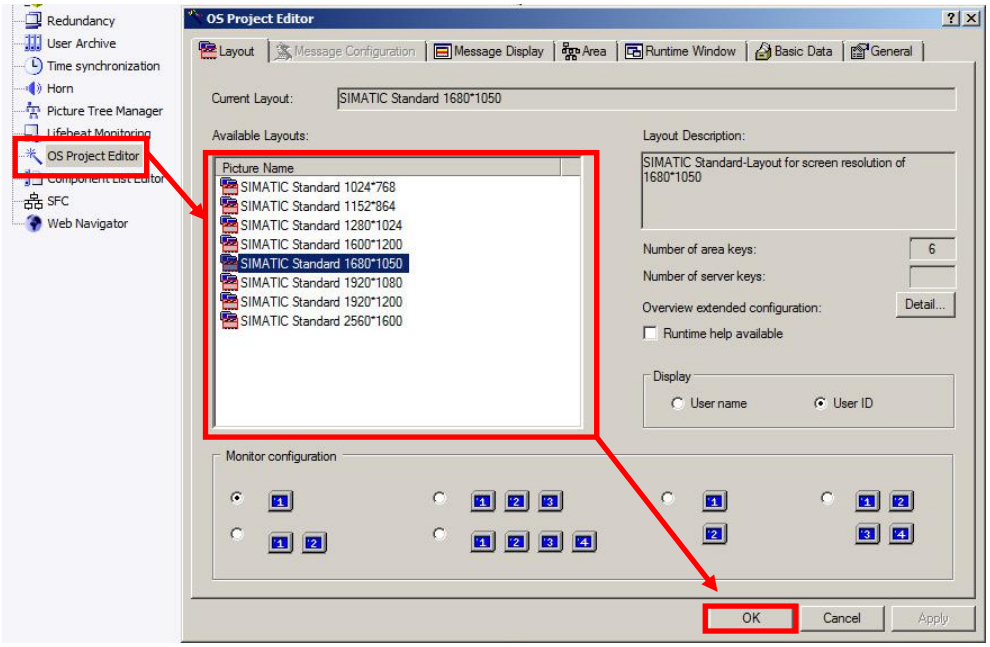


7. Right-click on “UT_CIP_OS > Name of your PC > WinCC Appl > OS (1)" and click on the "Open object" menu command.
8. Confirm the "Configured server not available" dialog with "OK".
9. In the WinCC Explorer, open the properties of your PC and, in the opened Properties dialog, click on the "Use local computer name" button. Confirm the "Change computer name" message with "OK".



10. In the WinCC Explorer, click on "File > Exit" and in the subsequent dialog select "Terminate WinCC Explorer and close project". Confirm your selection clicking on the "OK” button.
11. Reopen the WinCC Explorer as described in step 7.
12. Open by double-clicking the "OS project editor".

13. In the "Layout" tab under "Available layouts", select the "SIMATIC Standard" screen corresponding to the screen resolution that is set.



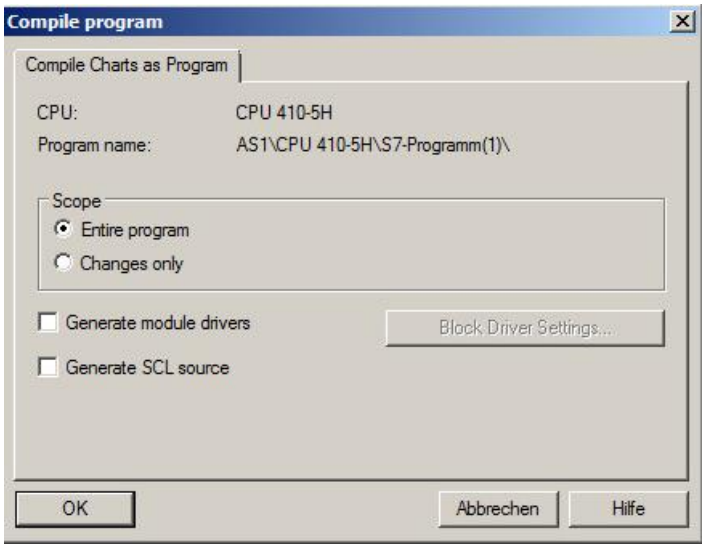
Click on "OK" to accept the settings and close the "OS project editor".

14. Exit WinCC Explorer as described in step 10.

5.2 Working on the multiproject

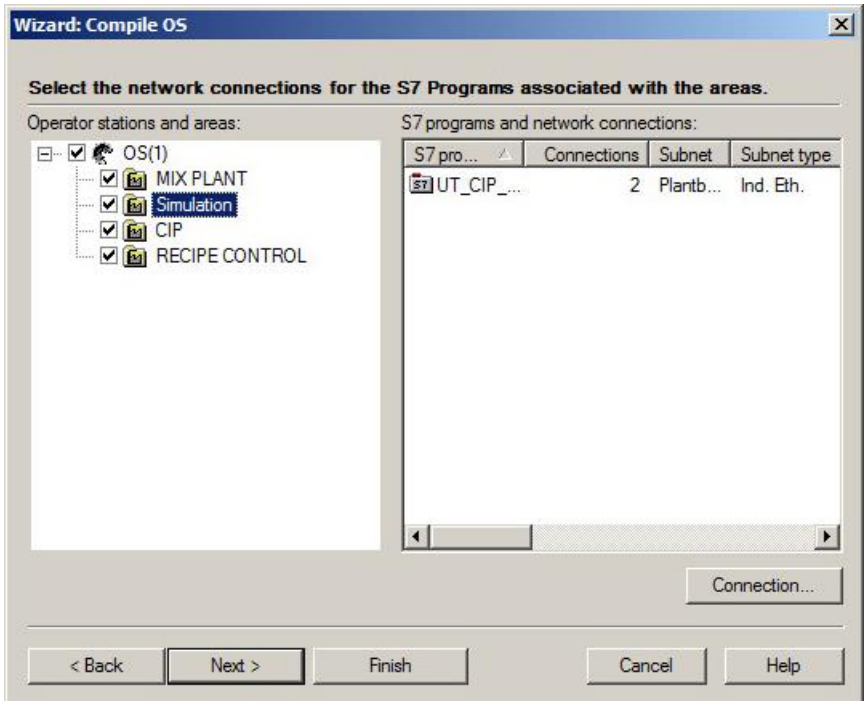
The following instructions describe the work that must be performed on the multiproject. It is necessary that SIMATIC Manager already be open and the project must have been selected in the component view.

1. Right-click on “UT_CIP_AS > AS1 > CPU 410-5H > S7-program (1) > Charts” and click the menu command "Compile".
2. In the "Compile program" dialog, select the "Entire program" item and deactivate the "Generate module drivers" option then confirm it with "OK".

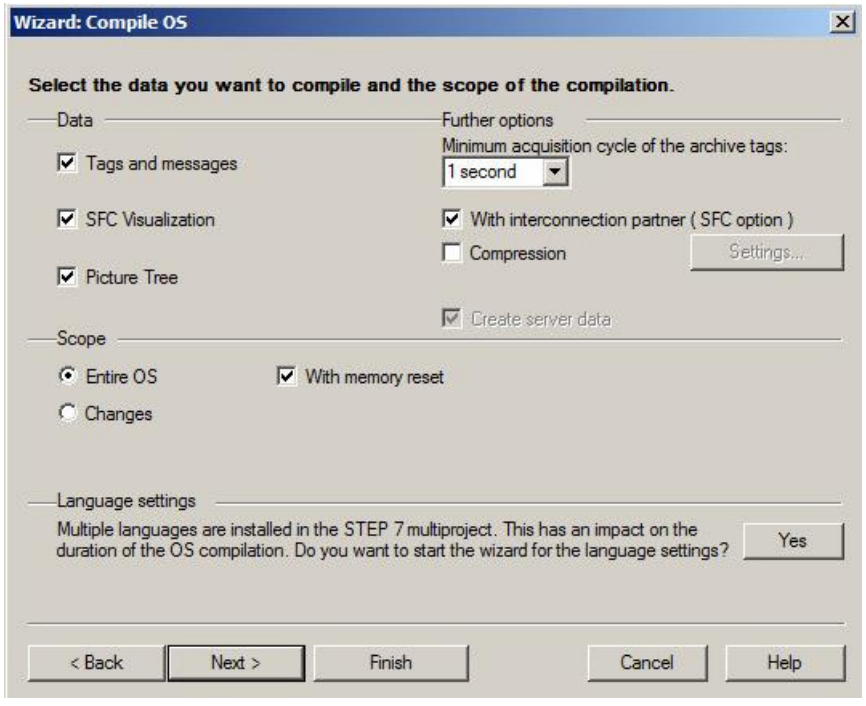


3. Close the compiler log.
4. Right-click on “UT_CIP_OS > PCS7ES (Name of PC station) > WinCC Appl > OS (1)” and click on the menu point “Compile”. The compiler dialog opens.
5. Click on "Next".
6. Click on "Next".

7. Make sure that all areas are selected and click on "Next".

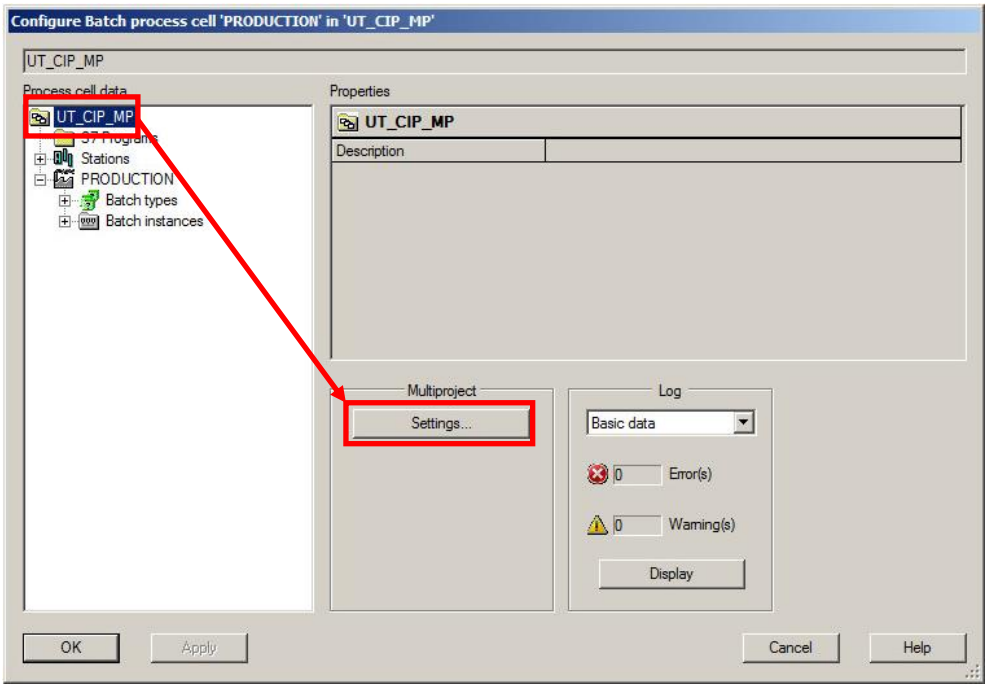


8. Select the following settings and click on “Next”.



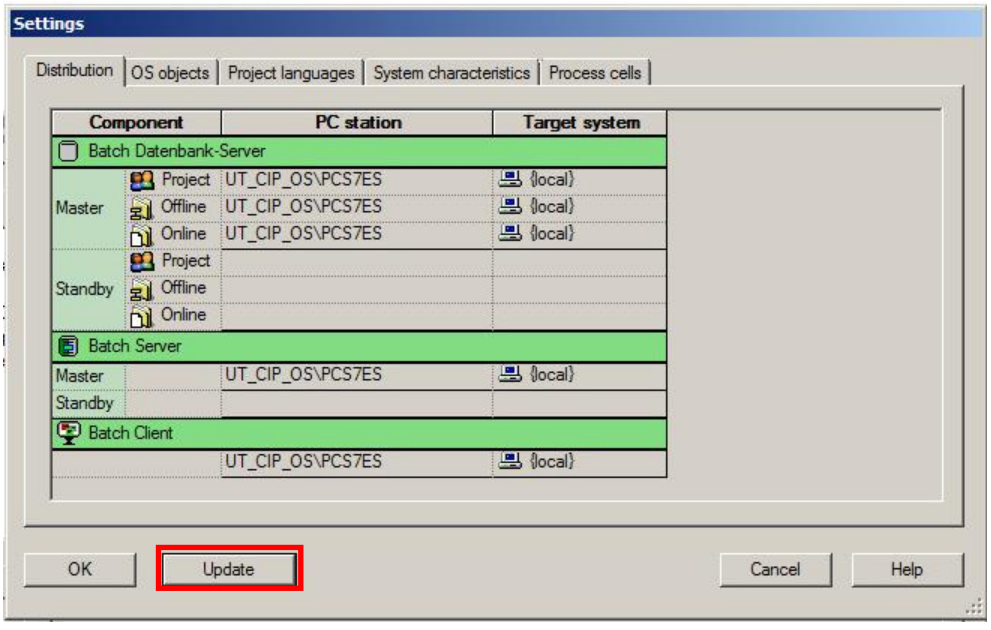
9. Click on “Compile".
10. Confirm the "Compile OS" dialog with "OK".
11. In SIMATIC Manager, right click on the "UT_CIP_MP" multiproject and select the "SIMATIC BATCH > Open configuration dialog" menu command. The SIMATIC BATCH configuration dialog opens.

12. Select the "UT_CIP_MP" multiproject and click on “Settings".

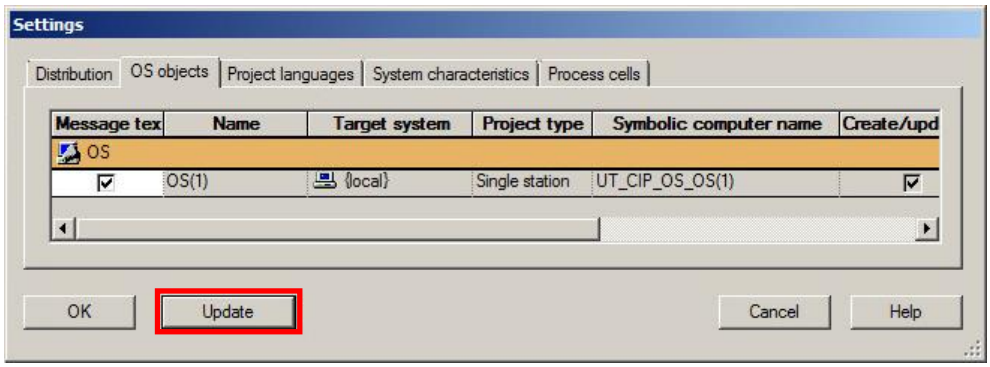


The "Settings" window opens.

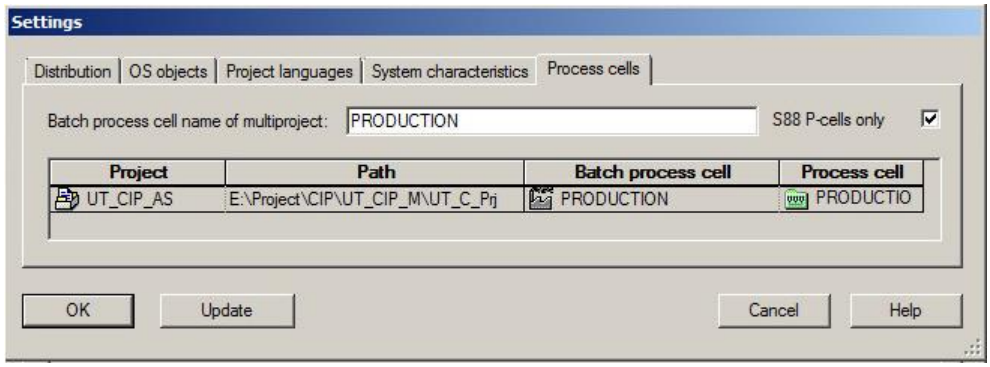
13. In the "Distribution" tab, click on "Update".



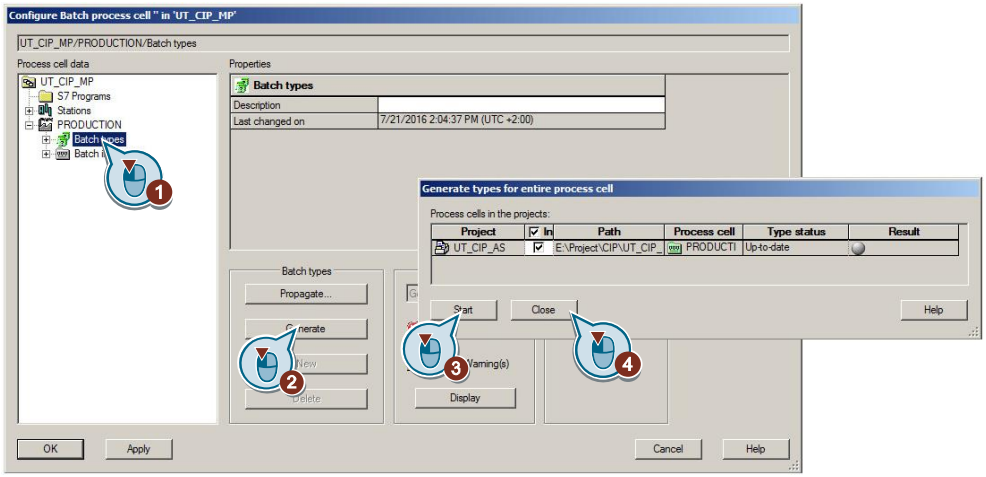
14. In the "OS objects" tab, click on "Update".



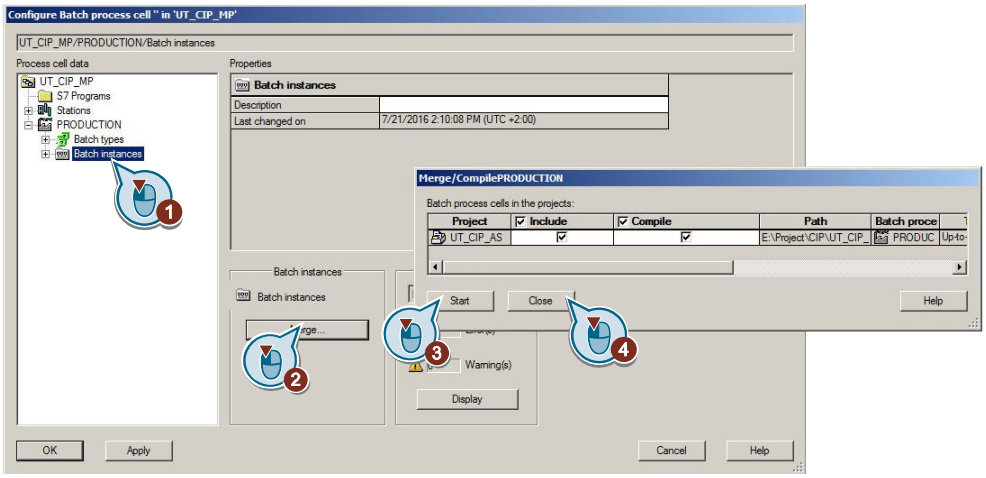
15. In the "Process cells" tab, click on "Update".



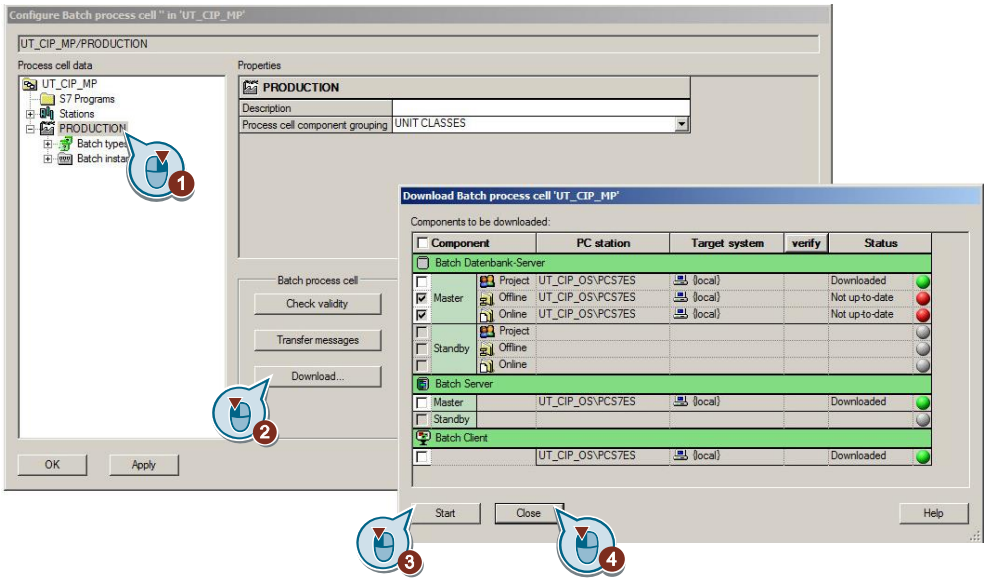
16. Click on "OK" to quit the "Settings" window.
17. Select the "BATCH types" item and click on "Generate".
18. Click on "Start".
19. Click on "Close".



20. Select the "BATCH instances" item and click on "Merge".
21. Click on "Start".
22. Click on "Close".

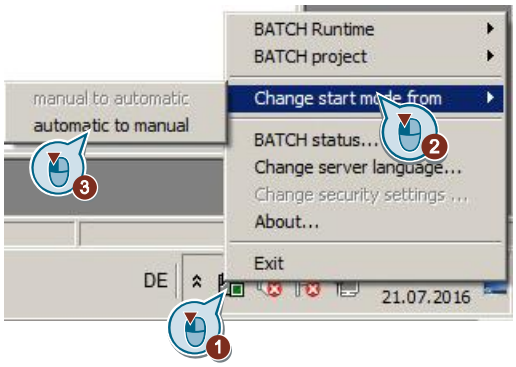


23. Select the "PRODUCTION" item and click on "Download".
24. Click on "Start".
25. Click on "Close".



26. Exit the SIMATIC BATCH configuration dialog with "OK".

27. In the windows task bar, right-click on the icon for the SIMATIC BATCH Launch Coordinator and select the "Change start mode from > Automatic to manual" menu command.



Note The SIMATIC BATCH Launch Coordinator starts automatically when the PC is started. If SIMATIC BATCH Launch Coordinator does not start, proceed as follows:

Click on "Start > All programs > Siemens Automation > SIMATIC > BATCH Launch Coordinator".

5.3 Commissioning

The following instructions describe how the "CIP" application example is initialized:

For commissioning, it is required that SIMATIC Manager is already open and that the project has been selected in the component view.

Starting the emulation (S7 PLCSIM)

To start the emulation, proceed according to the following instructions:

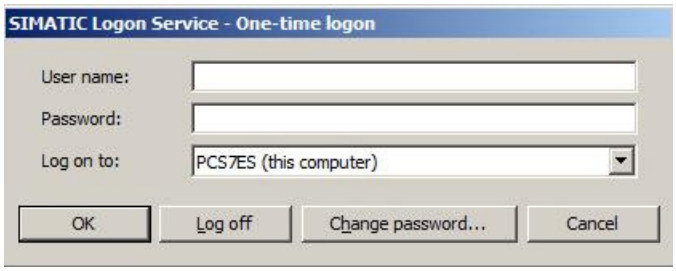
1. Select "Extras > Simulate module" from the menu.
   The "S7 PLCSIM" dialog window opens.
2. In the menu, select "Execute > Key-switch position > Run-P".
3. Switch to the component view of SIMATIC Manager and select "UT_CIP_MP > UT_CIP_AS > AS1 > CPU 410-5H > S7-program > Charts“.
4. Click on “Target system > Download” in the menu bar.
5. Confirm the "Load" dialog with "Yes".
6. Confirm the "Stop target group" dialog with "OK”.
7. Confirm the "Load" dialog with "Yes".

Activate OS (WinCC runtime)

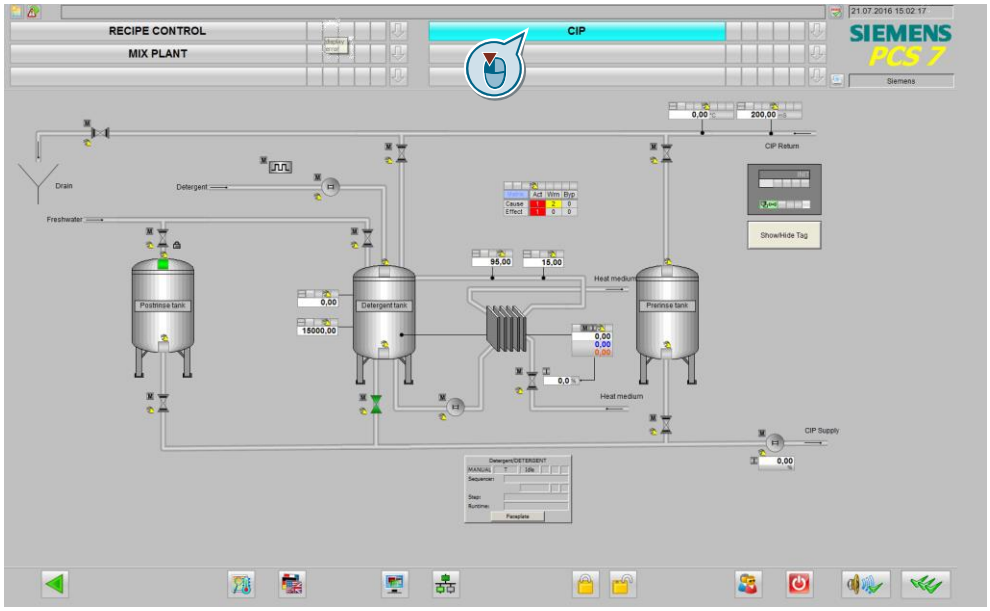
To activate the OS, proceed according to the following instructions:

1. Right-click on "UT_CIP_OS > PCS7ES > WinCC Appl. > OS" and then click on the menu command "Open object".
2. Select "File > Activate" in the WinCC Explorer menu.

3. Log into the SIMATIC Logon Dialog using your Windows user ID.



4. Select "CIP" in the icon area.

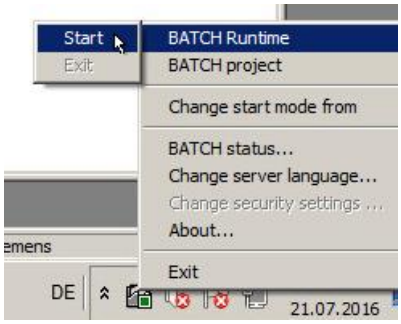


Activating SIMATIC BATCH

To activate SIMATIC BATCH, proceed according to the following instructions:

1. Click on the Windows logo key on your keyboard to bring up the Windows task bar.
2. There is a green "Stop" symbol in the icon for the SIMATIC BATCH Launch Coordinator  . The currently loaded "UT_CIP_MP" project is displayed as a tool-tip text.

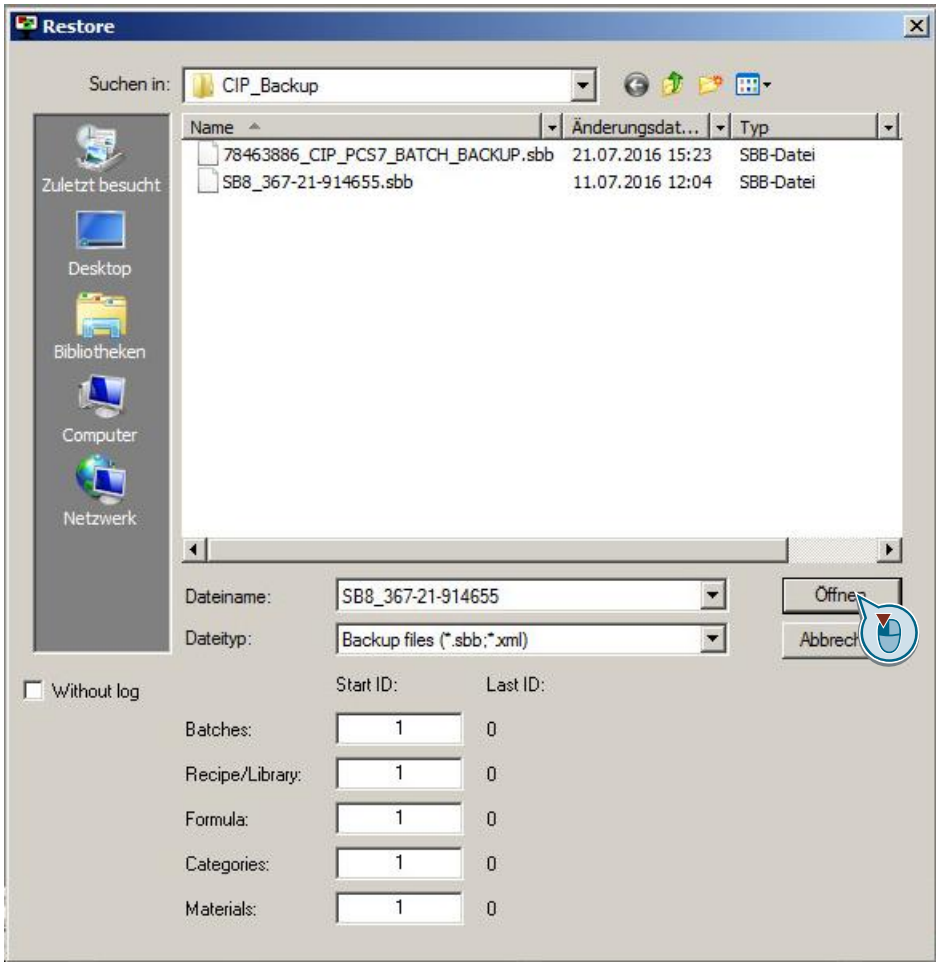
3. Right-click on the icon for the SIMATIC BATCH Launch Coordinator and select the "BATCH Runtime > Start" menu command to start SIMATIC BATCH Runtime.



There will be an "hourglass"  in the icon for the SIMATIC BATCH Launch Coordinator. This indicates that the SIMATIC BATCH server is about to be started.

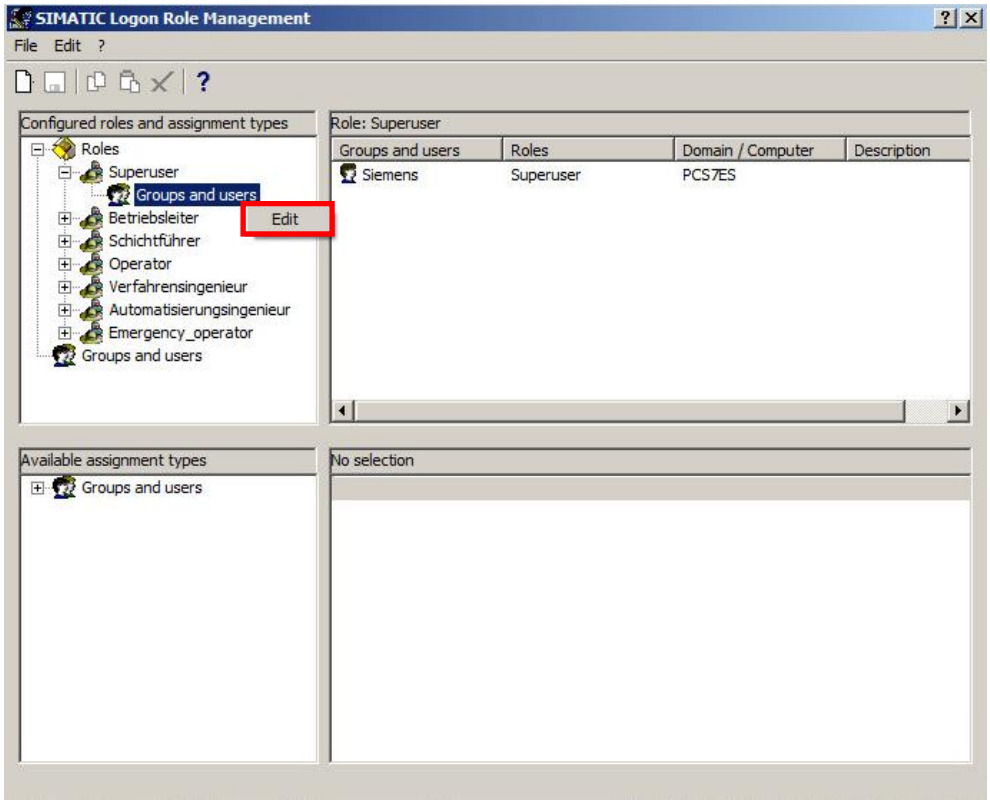
The "hourglass" turns into a "Play" symbol  . The SIMATIC BATCH server is now in the "Run" state.

4. Click on "Start > All programs > Siemens Automation > SIMATIC > BATCH Control Center".
   The BATCH Control Center opens.
5. Click on the "Extras" menu item and select the "Restore" menu command.
   The Restore dialog opens.



6. Navigate to the storage location of the "78463886_CIP_PCS7_BATCH_BACKUP" file and select it.
7. Click on "Open".
8. Click on the "PRODUCTION" process cell symbol and click on the menu command "Update the process cell".
9. Confirm the "Update the plant" dialog with "OK".
10. Click on the "Extras" menu item and select the "Role Management" menu command.
    The "SIMATIC Logon Role Management" dialog opens.

11. In the "Configured roles and assignment types" window, right-click on "Roles > Superuser > Groups and users". Select the "Edit" menu command.



The "Edit groups and users" window will open.

12. Click on the “List" button.
    All the available groups and users will be listed for you.
13. Remove the User that is present.
14. Add the group "CIPDemoUsers" to "Configured groups and users".
15. Click on the "OK" button to exit the "Edit groups and users" window.
16. In the "SIMATIC Logon Role Management" window, click on "File > Save".
17. In the "SIMATIC Logon Role Management" window, click on "File > Exit".

6 Operation and control of the Application Example

6.1 Overview

The following sections describe the operation of the application example. Three different scenarios will be described:

- Manual operation of the individual functions in the WinCC overview picture.
- Creating and starting a cleaning batch from the SIMATIC BATCH Control Center
- Creating and starting a cleaning batch with the SIMATIC BATCH controls directly from WinCC Runtime

6.2 Scenario A

Description

Handling the plant in manual mode is explained in this scenario. Here you will be able to operate the individual components of the CIP system and e.g., carry out an adjustment of the detergent concentration in the detergent tank.

The following instructions describe starting the reprocessing of the washing fluid in the detergent tank.

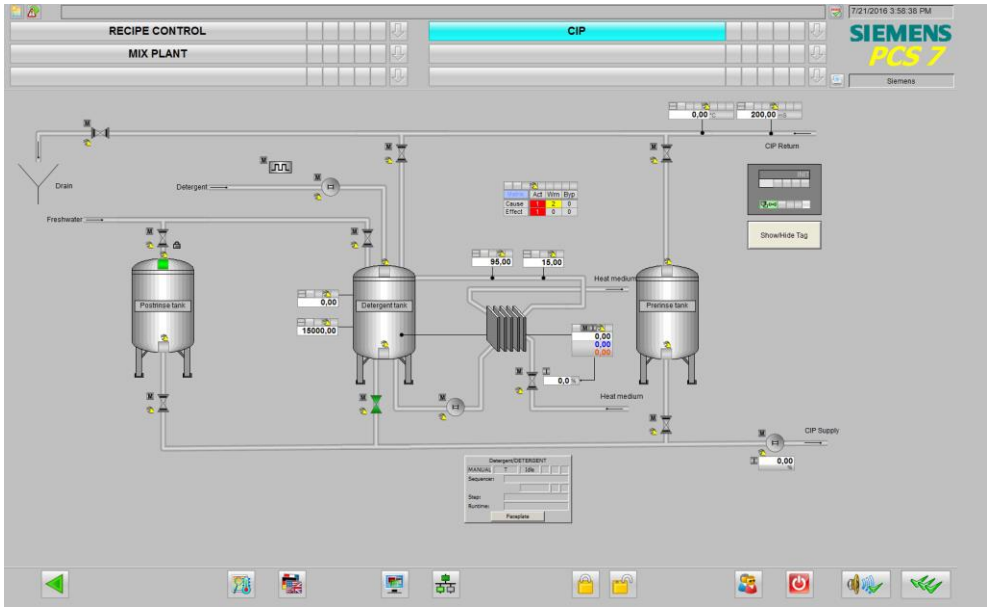
Requirement

The following points are a prerequisite:

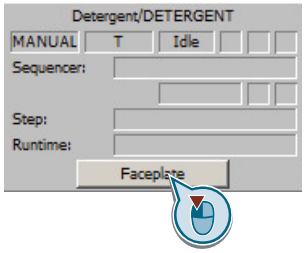
- WinCC Runtime is active
- The S7 program is loaded in "S7-PLCSIM" and the key switch is set to Run (-P)

Procedure

1. Open the plant overview picture for the CIP system.

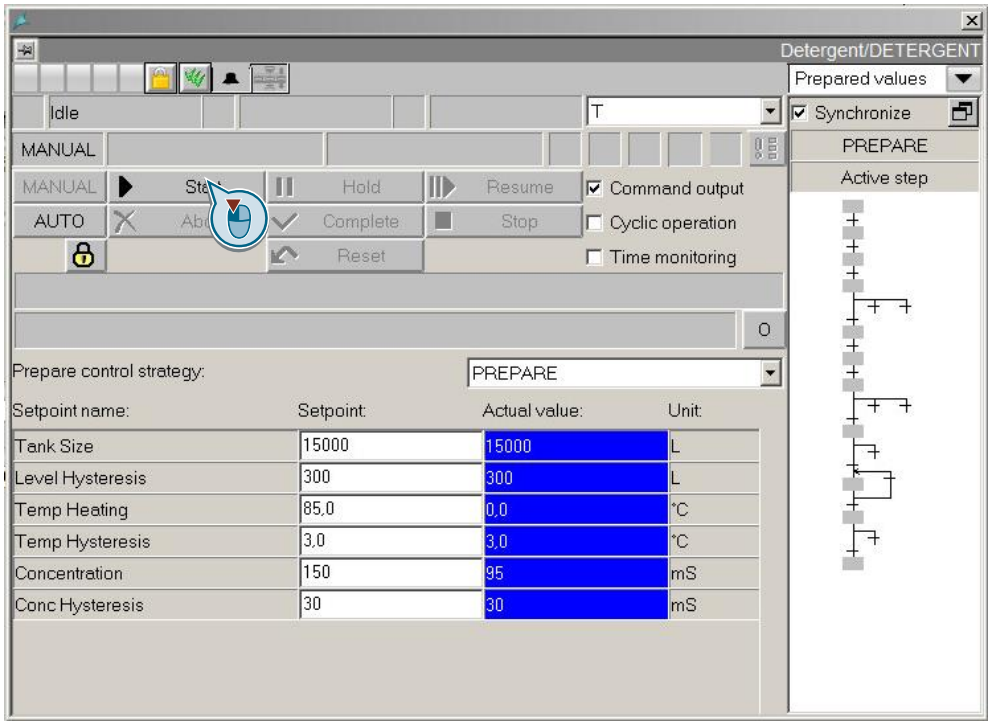


2. Click on the "Faceplate" button in the “Detergent/DETERGENT" SFC control.



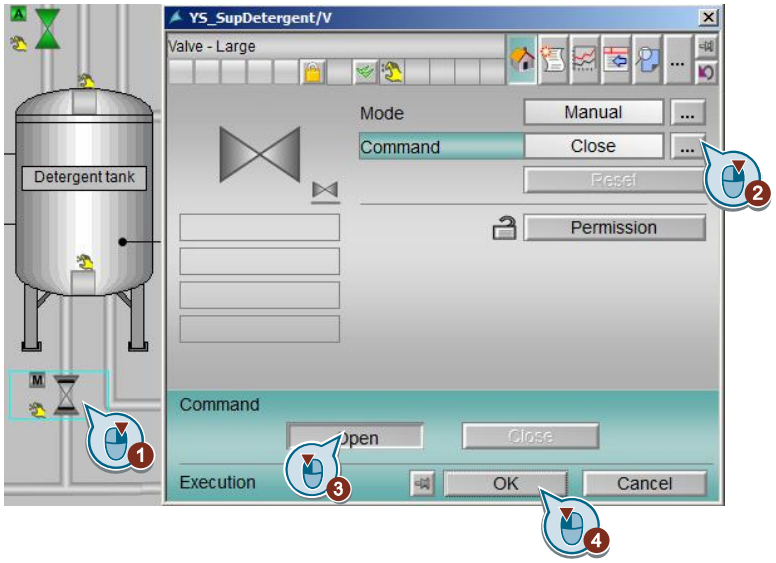
The faceplate for the “Detergent/DETERGENT" SFC opens.

3. Click on the "Start" button.



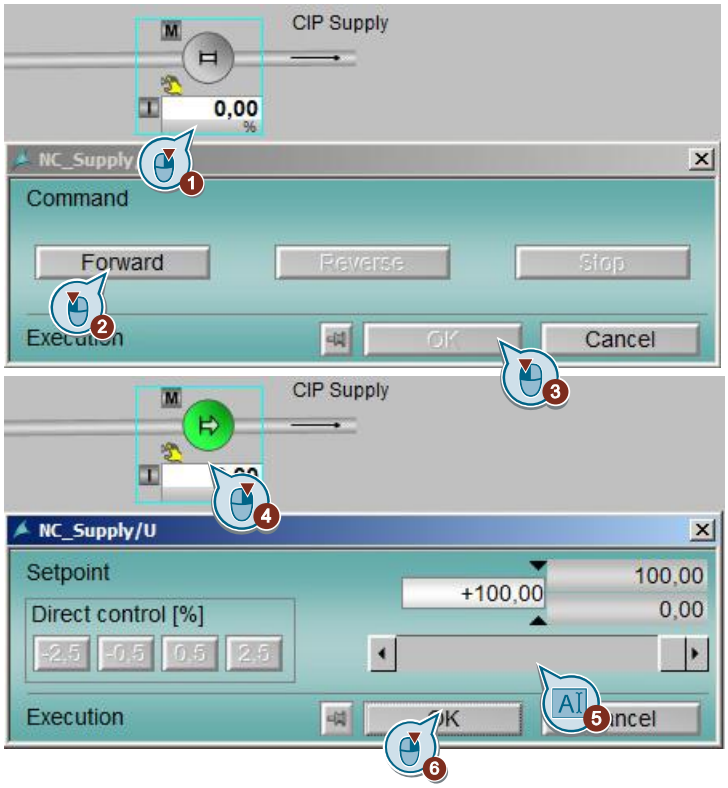
4. Confirm the "SFC operation" dialog with "OK".
   The SFC starts and adjusts to the setpoint values.

5. Open the detergent tank valve.



The valve opens.

6. Start the pump at 100% speed.



The pump runs at 100%.

7. Observe the measured values and the SFC “Detergent/DETERGENT”.

The removal of fluid causes fresh water to be added. This changes temperature and detergent concentration. The SFC “Detergent/DETERGENT” adjusts the measured values to the stated setpoints. This guarantees that fluid of the correct quality is always available.

6.3 Scenario B

In Scenario A you became acquainted with the individual functions of the CIP system in manual operation. In the following, how to use these functions with SIMATIC BATCH will be described. Here, operation is carried out from the SIMATIC BATCH Control Center.

Requirement

The following points are a prerequisite:

- WinCC Runtime is active
- The S7 program is loaded in "S7-PLCSIM" and the key switch is set to Run (-P)
- The SIMATIC BATCH server is in the "Run" state
- The "DETERGENT" SFC is in the "Run" state (active "LEVEL CHECK" step)
- The supplied backup has been imported
- Role management has already been carried out

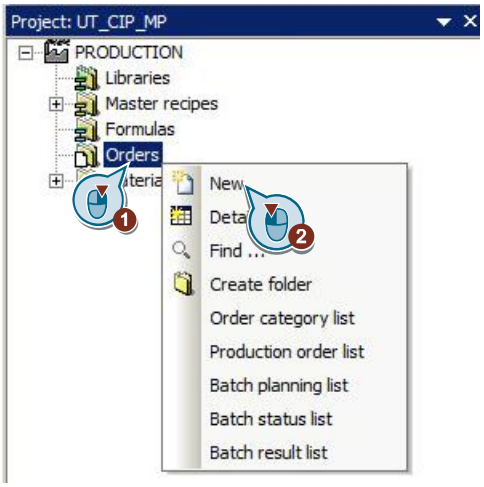
Procedure

1. In the key area, click on the "Key set change" button.

2. In the key area, click on the "BATCH Control Center" button.

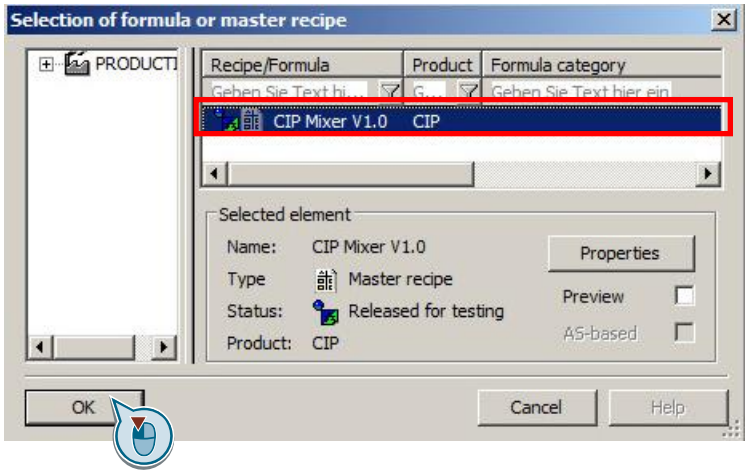
The SIMATIC BATCH Control Center opens.

Right-click on "Orders" and select the "New" menu command.



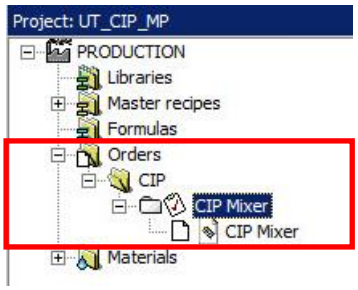
This opens the "Generate order category" window.

3. In the “Names" tab, enter a suitable name (e.g. CIP).
4. Click on the "OK" button.
5. Right-click on “CIP" and select the "New" menu command.
   The "Create job" window opens.
6. In the "General" tab, enter a suitable name (e.g. CIP MIXER) in the "Names" box.
7. Switch to the "Batches" tab.
8. Click on the “New” button.
   The "Formula or master recipe selection" window opens.
9. Select the "CIP MIXER V1.0" master recipe.
10. Click on the "OK" button.



11. Give the batch in the "Create order" window a suitable name.
12. Click on the "OK" button in the "Create job" window.

You have now created a new order with a batch.



13. Right-click on the batch and select the "Release" menu command.
14. Confirm the dialog window that opens with "Yes".
15. Double-click on the batch.
    The control recipe will be displayed for you.
16. Right-click on the batch and select the “Start" menu command.
17. Confirm the dialog window that opens with "Yes".
    The batch starts. SIMATIC BATCH now occupies the plant sections and starts the SFCs. All the control strategies are completed one after the other.
18. Switch to WinCC Runtime and observe the individual valves and pumps being actuated.

19. Switch to the “Mixer" process picture.
    Here also the valves and the pump on the mixer are actuated.

The batch is exited automatically. The SFCs that were started are terminated and reset to the "IDLE" state by SIMATIC BATCH.

6.4 Scenario C

In Scenario A you became acquainted with the individual functions of the CIP system in manual operation. In the following, how to use these functions with SIMATIC BATCH will be described. Operation takes place here in WinCC Runtime via the SIMATIC BATCH OS controls (BATCH OCXs).

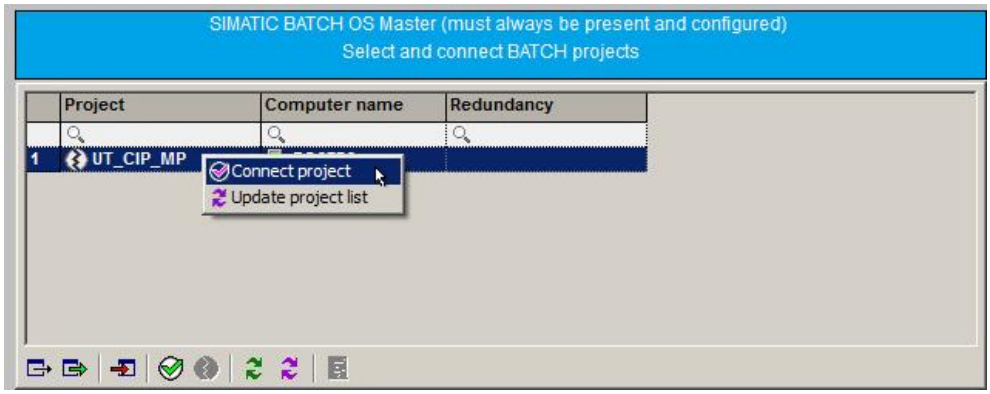
Requirement

The following points are a prerequisite:

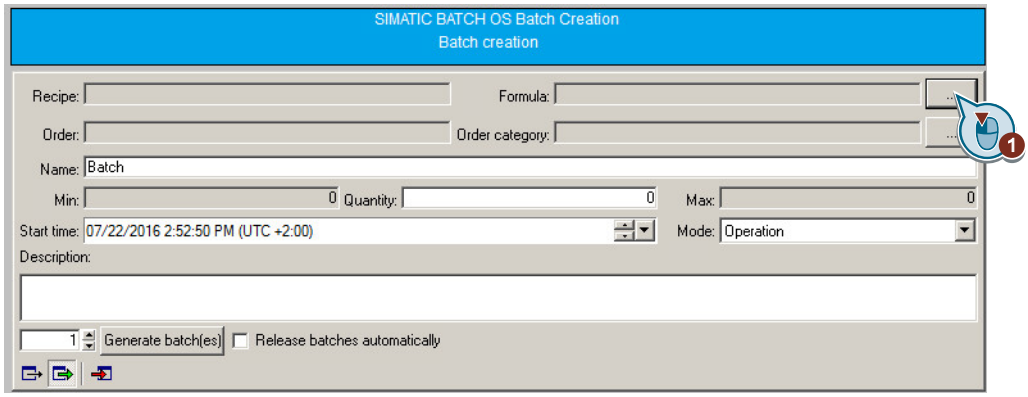
- WinCC Runtime is active
- The S7 program is loaded in "S7-PLCSIM" and the key switch is set to Run (-P)
- The SIMATIC BATCH server is in the "Run" state
- The "DETERGENT" SFC is in the "Run" state (active "LEVEL CHECK" step)
- The supplied backup has been imported
- Role management has already been carried out
- The order has been created in SIMATIC BATCH Control Center

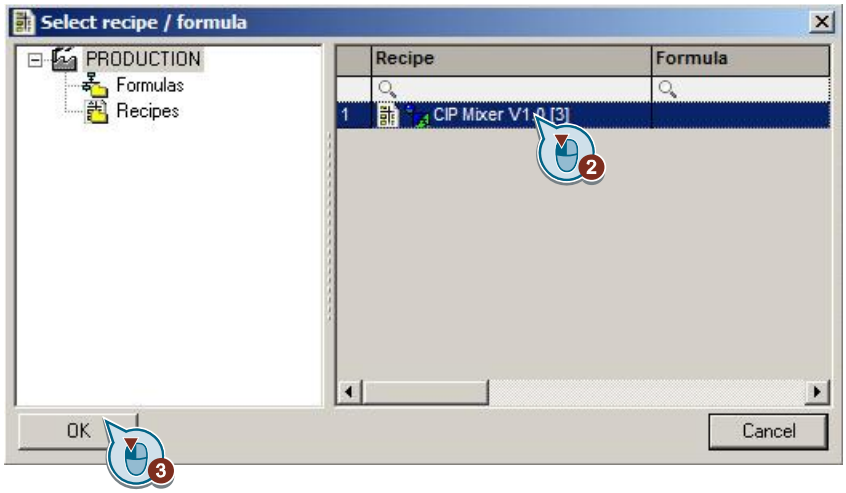
Procedure

1. Open the "RECIPE CONTROL" screen in WinCC Runtime.
2. Right-click on the "UT_CIP_MP" project in the "SIMATIC BATCH OS Master" BATCH OCX.
3. Select the "Connect project" menu command.



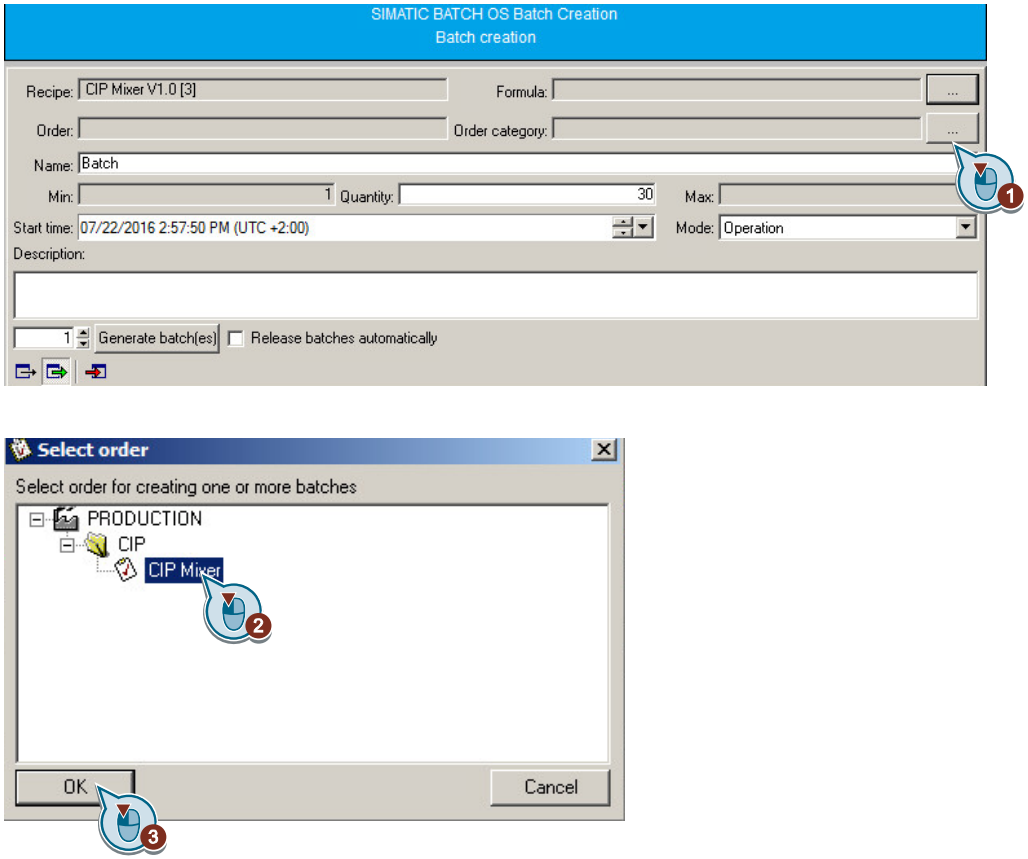
4. Right-click on the button next to “Formula” in the "SIMATIC BATCH OS Batch Creation" BATCH OCX.
5. Select the "CIP Mixer V1.0" recipe in the "Select recipe/formula" window.
6. Click on the "OK" button.





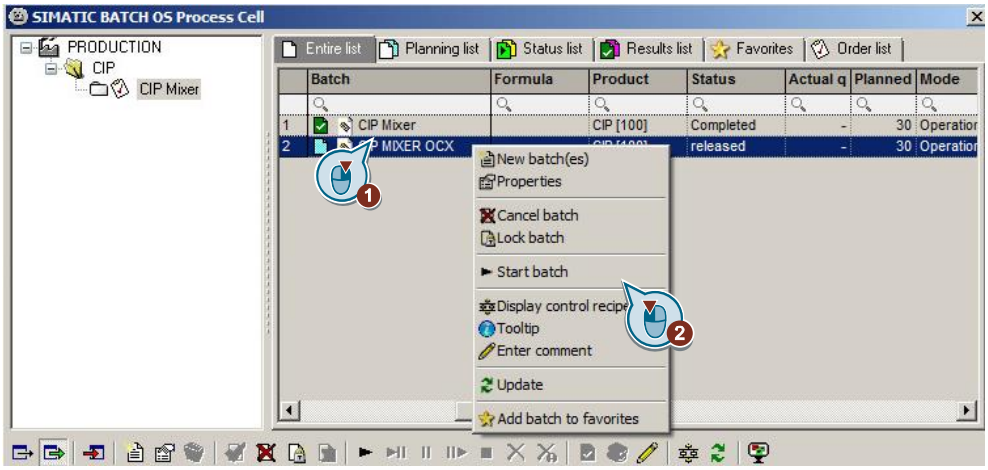
7. Right-click on the button next to “Order category” in the "SIMATIC BATCH OS Batch Creation" BATCH OCX.
8. Select the order "CIP MIXER" (needs to have been created previously in BATCH Control Center) in the "Select order" window.

Click on the "OK" button.

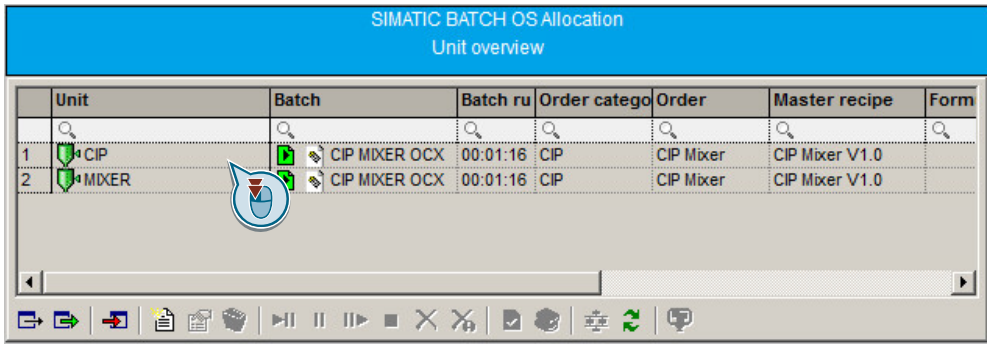


9. Enter a suitable name in the "Name" box in the "SIMATIC BATCH OS Batch Creation" BATCH OCX.
10. Adjust the start time in the "SIMATIC BATCH OS Batch Creation" BATCH OCX.
11. Right-click on the “Release batch (es)” button in the "SIMATIC BACH OS Batch Creation" BATCH OCX.
12. Click the “Yes” button in the “Confirm” dialog box.
    The batch is released.

13. Right-click on the “SIMATIC BATCH OS Process Cell” BATCH OCX on the batch that you had previously created.
14. Select the menu command “Start batch”.

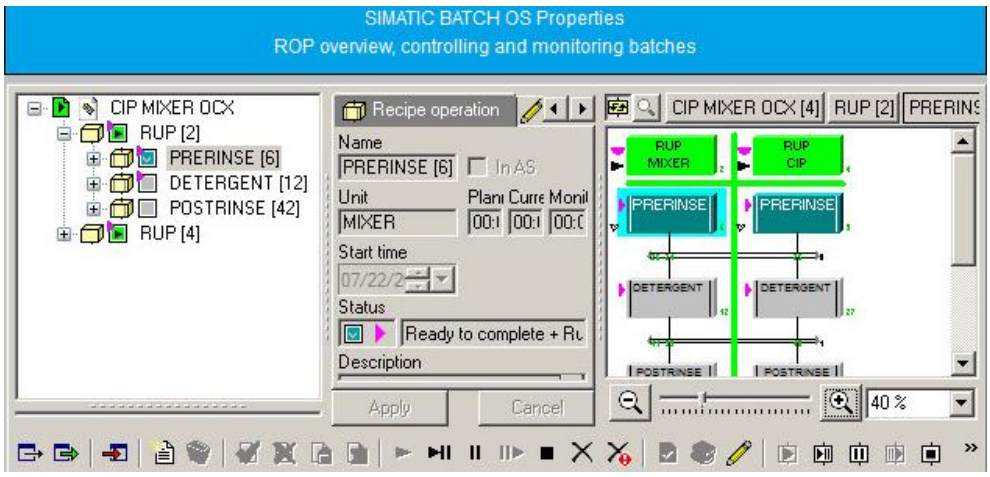


15. Click the “Yes” button in the “Confirm” dialog box.
16. You can see the plant sections occupied by the batch in the "SIMATIC BATCH OS Allocation" BATCH OCX.
17. Double-click one of the occupied plant sections.



6.4 Scenario C

In the "SIMATIC BATCH OS Properties" BATCH OCX the control recipe is displayed.



7 References

	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Download page of this entry https://support.industry.siemens.com/cs/ww/de/view/78463886
\3\	SIMATIC PCS 7 in the Industry Online Support – Overview page https://support.industry.siemens.com/cs/ww/en/view/63481413
\4\	SIMATIC Process Control System PCS 7 Compendium Part C – Technical Functions with SFC Types https://support.industry.siemens.com/cs/ww/en/view/109098121
\5\	SIMATIC Process Control System PCS 7 SIMATIC BATCH V8.2 https://support.industry.siemens.com/cs/ww/en/view/109485956
\6\	SIMATIC Process Control System PCS 7 PCS 7 BRAUMAT Library V7.1 https://support.industry.siemens.com/cs/ww/en/view/60307664
\7\	SIMATIC Process Control System PCS 7 Logic Matrix https://support.industry.siemens.com/cs/ww/en/view/109737083
\8\	Efficient Configuration of Interlock Logics with PCS 7 Logic Matrix https://support.industry.siemens.com/cs/ww/en/view/109482621

8 History

Version	Date	Modification
V1.0	10/2013	First edition
V2.0	02/15	Updating to PCS 7 V8.1
V3.0	08/2016	• Update to PCS 7 V8.2 • Implementation of PCS 7 Logic matrix • Process tags on the basis of CMTs • Simulation on the basis of CFCs • SFC calculations