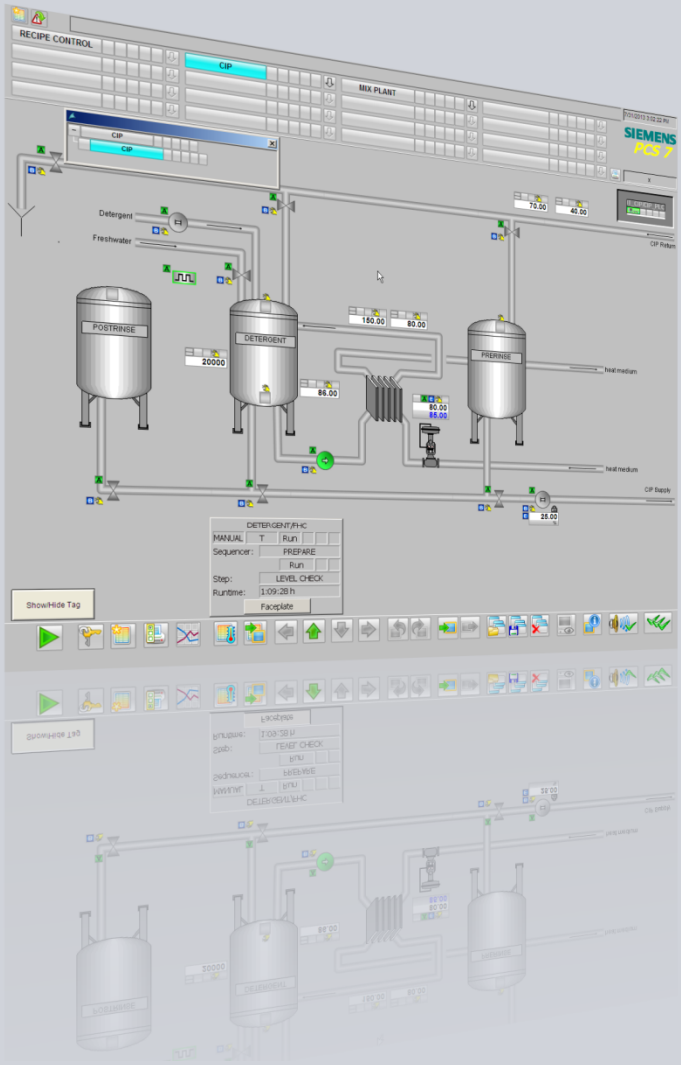
PCS 7 Unit Template "CIP - Cleaning in Place"

SIMATIC PCS 7

Application Description•October 2013



Applications & Tools

Answers for industry.

SIEMENS

Warranty and Liability

Note

The Application Examples are not binding and do not claim to be complete with regard to configuration, equipment or any contingencies. The application examples do not represent customer-specific solutions; they are only intended to provide support for typical applications. You are solely responsible for the correct operation of the described products. These Application Examples do not relieve you of your responsibility to use safe practices in application, installation, operation and maintenance. By using these Application Examples, you acknowledge that we will not be liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these Application Examples at any time and without prior notice. If there are any deviations between the recommendations provided in this Application Example and other Siemens publications – e.g. Catalogs – the contents of the other documents shall 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 compensation for damages due to a breach of a fundamental contractual obligation is, 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 in the burden of proof to your detriment.

Any form of duplication or distribution of these Application Examples or excerpts hereof is prohibited without the express consent of Siemens Industry Sector.

Copyright © Siemens AG 2013 All rights reserved

Siemens Industry Online Support

This entry is from the Siemens Industry Online Support. The following link will take you directly to the download page of this document:

http://support.automation.siemens.com/WW/view/en/78463886

Table of Contents

Warranty and Liability **2**

1 Automation Task **4**

2 Solution **5**

2.1 Solution overview 5
2.2 Description of the core functionality 7
2.2.1 Description of the individual functions 8
2.2.2 P&I diagram 10
2.3 Required hardware and software components 11

3 Basics **12**

3.1 Process engineering 12
3.2 Automation technology 12

4 Function mechanism **14**

4.1 Project structure 14
4.1.1 Naming convention of the CFC Charts 14
4.1.2 Plant View 15
4.2 Functionality and process tags 17
4.2.1 Supply modules (CIP SUPPLY) 17
4.2.2 CIP RETURN 26
4.2.3 Detergent tank 33
4.2.4 Fresh water tank (postrinse tank) 40
4.2.5 Prerinse tank 41
4.2.6 Mixer 43
4.2.7 Mixer supply (TANK_IN) 44
4.2.8 Mixer drainage (TANK_OUT) 48
4.3 Step sequences (SFC-type instances) 51
4.3.1 CIP RETURN 51
4.3.2 CIP SUPPLY 57
4.3.3 FILL_HEAT_CONC 63
4.3.4 TANK_IN 70
4.3.5 TANK_OUT 73
4.4 SIMATIC BATCH 79
4.4.1 Cleaning recipes 79
4.4.2 Cleaning batches 81

5 Starting the application example **82**

5.1 Preparation 82
5.2 Working with the Multiproject 85
5.3 Startup of the Application 90

6 Operation of the Application **93**

6.1 Overview 93
6.2 Scenario A 93
6.3 Scenario B 99
6.4 Scenario C 101

7 Related Literature **103**

7.1 Bibliography 103
7.2 Internet Links 103

8 History **103**

Copyright © Siemens AG 2013 All rights reserved

1 Automation Task

Introduction

Taking a closer look at a food or pharmaceutical producing facility and its engineering processes, we will find that certain process steps, procedures, and devices will repeat in the same or similar form.

An important process in this regard is automated cleaning of equipment and machine parts.

This process gains more importance with increasing facility size, since manual cleaning is no longer possible. One efficient procedure is the "Cleaning in Place" procedure, briefly CIP procedure.

The CIP procedure facilitates on-site cleaning of equipment and machine parts. Disassembly is not required. This type of automated cleaning also saves valuable working time.

Overview of the automation task

The CIP facility is used for cleaning the other facility parts and valves. The individual valves are controlled through the automation program.

Description of the automation task

The liquids required for cleaning are prepared and stored inside the CIP facility. The different liquids for the different cleaning phases must always be available in sufficient quantities. This requires continuous monitoring of the filling levels inside the supply tank. If the levels are too low, liquid must be fed into the tanks.

Apart from the filling level, the quality of the liquid is also important. To achieve a high quality, the liquids inside the tanks are controlled to maintain a defined temperature and concentration of detergent, which is why temperature and concentration will continuously be monitored and adjusted, if required.

Another task is to re-use the cleaning liquid after use in the best possible way. This requires checking the quality once more in the return flow. If the quality does not comply with the specifications, the liquid will automatically be fed back into the tanks, as long as these are not full. In case the quality is not sufficient or the tanks are full, the liquid will be disposed of.

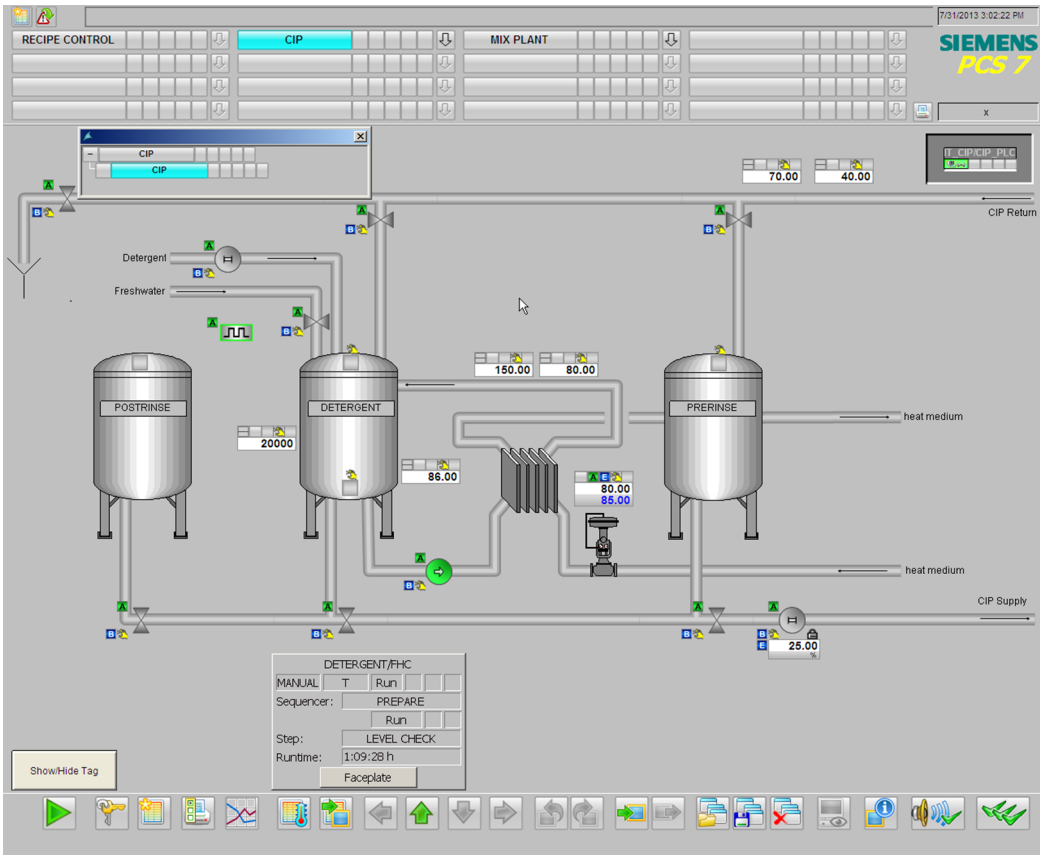
Copyright © Siemens AG 2013 All rights reserved

2 Solution

2.1 Solution overview

The following diagram gives a schematic overview of the solution:

Figure 2-1



The "CIP" application example was realized as a SIMATIC PCS 7 multi-project in accordance with ISA S88.01.

The multi-project includes an AS project (user program), an OS project (visualization with process images), and a SIMATIC BATCH facility (production and cleaning recipes).

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

Copyright © Siemens AG 2013 All rights reserved

Advantages

This application offers the following advantages:

- Realization of a CIP facility in accordance with ISA S88.01
- Description of the most important automation functions for a CIP facility

Delimitation

The following special cases are not covered by the "CIP" application example:

- Simultaneous cleaning of the production system parts
- Simulation of the engineering process

Required knowledge

Basic knowledge of the following technical fields is assumed:

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

Copyright © Siemens AG 2013 All rights reserved

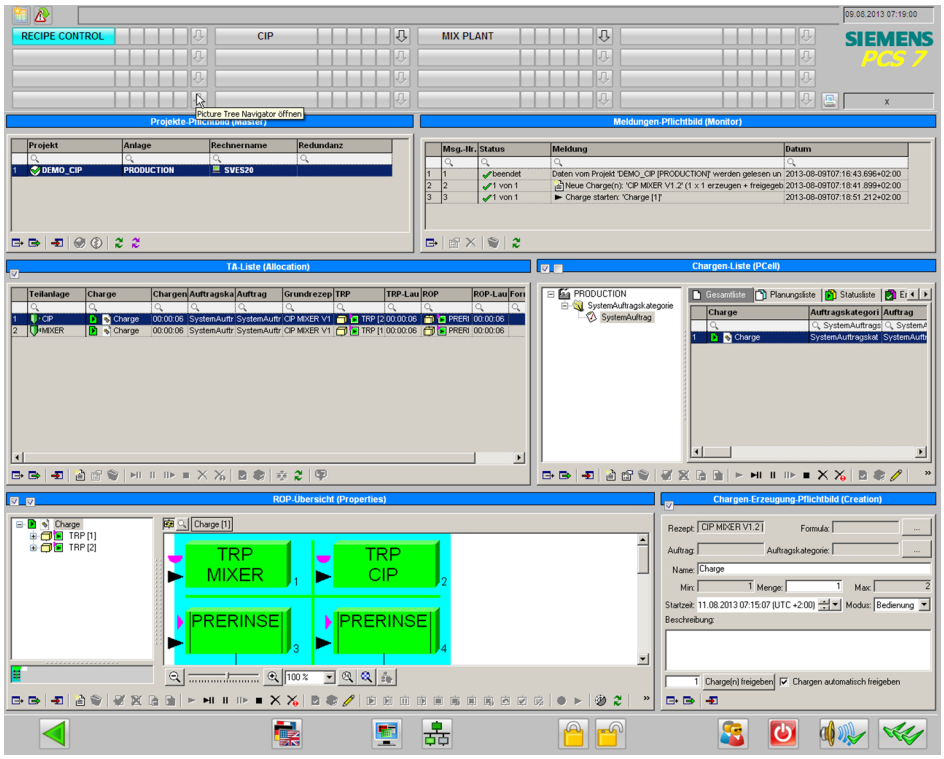
2.2 Description of the core functionality

The "CIP" application example includes the user program with typical process tags of a CIP facility.

The plant hierarchy (TH) is set up in accordance with ISA S88.01. The technical equipment required for the CIP facility is defined. An overview screen of the facility and an overview screen with BATCH OCXn are included for operation.

The following figure shows the BATCH OCX overview screen:

Figure 2-2



A SIMATIC BATCH Backup with an example recipe for creating cleaning batches is included.

The application example does not include any simulation. The changes in process values must therefore be carried out manually, so that changes will occur in the program sequence. The setpoint values in the recipes have been freely selected and can vary with each facility. The technical equipment and process tags are used as an exemplary model and can be applied to a real production system with facility-specific adjustments.

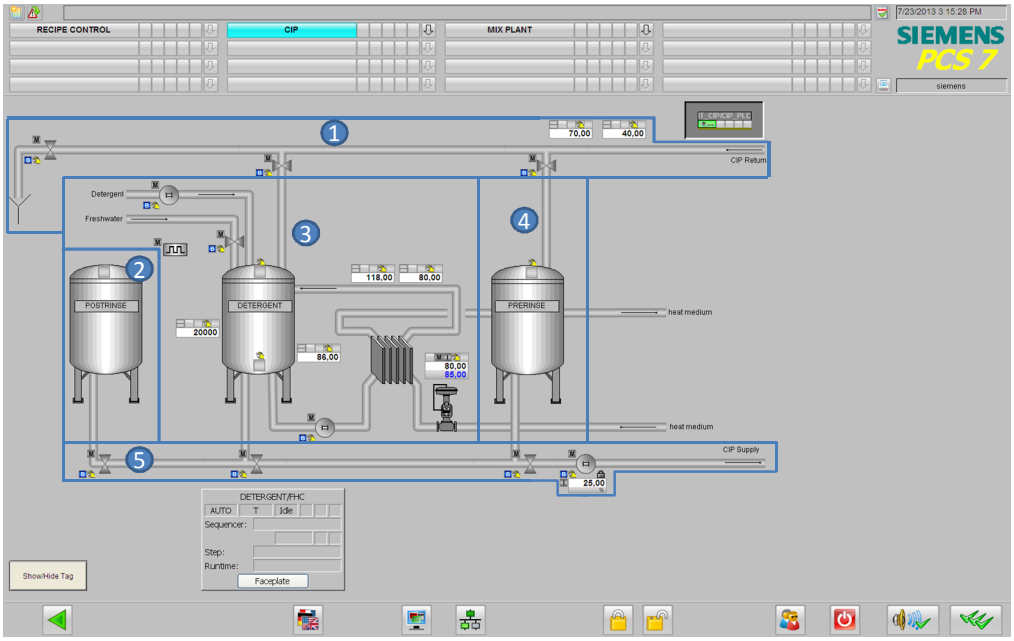
The cleaning recipes must be created for the facility parts depending on setup and product. The example recipe only describes the basic setting.

Copyright © Siemens AG 2013 All rights reserved

2.2.1 Description of the individual functions

The following chapter describes the individual components of a CIP facility. The starting point is the process diagram of the visualization screen.

Figure 2-3



The process diagram of the CIP facility includes the following main components:

1. CIP return modules
2. Postrinse tank
3. Detergent tank
4. Prerinse tank
5. CIP supply modules

1. CIP Return

The return line is used for recovery of the CIP liquids used. Depending on the filling levels of the tanks, the quality (temperature and detergent concentration) and the current cleaning phase, the liquid will be fed into the corresponding tanks or the drainage. This process is controlled by the sensors and valves.

2. Postrinse tank

The cleaning liquid (e.g. water) is stored in the postrinse tank for the final cleaning phase. The liquid can only be withdrawn if it is above the minimum filling level.

Copyright © Siemens AG 2013 All rights reserved

3. Detergent tank

The detergent tank contains the cleaning liquid for the second cleaning phase. Inside the tank, the liquid is heated up to the specified temperature and the required detergent concentration is created. The liquid is continuously pumped through a heating cycle to keep it at the specified temperature at all times. The detergent concentration is measured as a function of the temperature (through the conductance value). If it is too low, detergent will be replenished.

The detergent tank can also be filled with fresh water. This can be done if no CIP phase is active, since the concentration and the temperature must be readjusted again.

Note The detergent tank is exemplary for an acid or alkaline solution tank.

4. Prerinse tank

The prerinse tank contains the cleaning liquid for the first cleaning phase. The liquid will remove contaminations and product residues from the pipes and valves.

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

The tank can be filled until the maximum level is reached.

If, for procedural reasons, a certain temperature and/or detergent concentration is required for the liquid, the liquid can be prepared in accordance with the detegent tank description.

5. Supply modules

The CIP liquids will be fed from the CIP tanks into the production system parts to be cleaned via the supply modules. The feed-in from the tanks into the supply modules is controlled by valves. Depending on which cleaning phase is active, the corresponding valve will be opened. The flow rate is controlled via a pump.

Prior to any withdrawal of liquid a check will be carried through to determine whether the liquid complies with the quality requirements and/or whether sufficient liquid is available.

Other functions

Apart from the "CIP" facility, the example project also includes the "MIX PLANT" part, which is used for visualizing the cleaning process with a CIP facility. This part consists of the mixer to be cleaned and the technical equipment "TANK_IN" (tank supply) and "TANK_OUT" (tank drainage).

Advantages of this solution

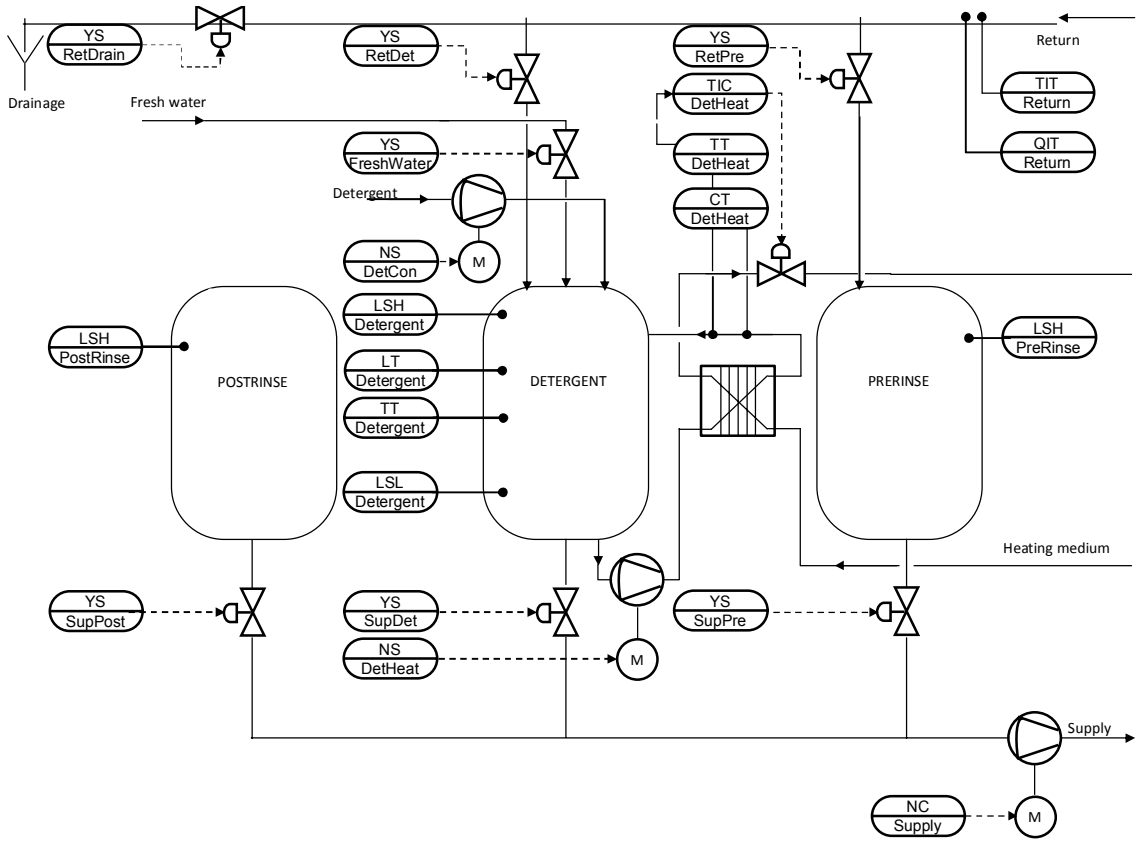
- Reduction of required know-how for developing the application
- Reduction of time and effort required for configuration
- Flexible setup and adjustment through technical functionalities
- Standardized structures

Copyright © Siemens AG 2013 All rights reserved

2.2.2 P&I diagram

The following figure shows the P&I diagram of the CIP facility, including the process tags used in the project.

Figure 2-4



Copyright © Siemens AG 2013 All rights reserved

2.3 Required hardware and software components

The application example was set up with the following components:

Hardware components

Table 2-1

Component	Note
SIMATIC PCS 7 ES/OS IPC547D W7	For the PCS 7 V8.0 SP1 example project

Note For other hardware please observe the minimum requirements for installing the software components. For the minimum requirements please refer to the PCS 7 readme file.

Standard software components

Table 2-2

Component	Note
SIMATIC PCS 7 V8.0 SP1	Part of SIMATIC PCS 7 ES/OS IPC547D W7
S7-PLCSIM	Not a part of SIMATIC PCS 7, appropriate licenses are required.
APL Library V8.0 SP1	Part of SIMATIC PCS 7 V8.0 SP1
SIMATIC BATCH V8.0 SP1	Not a part of SIMATIC PCS 7, appropriate licenses are required.
BRAUMAT Library V7.1	Not a part of SIMATIC PCS 7, appropriate licenses are required.

Copyright © Siemens AG 2013 All rights reserved

Sample files and projects

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

Table 2-3

Component	Note
78463886_CIP_PCS7V801.zip	PCS 7 V8.0 SP1 sample project
78463886_CIP_en.pdf	This document

3 Basics

3.1 Process engineering

Cleaning in Place (CIP)

The term "Cleaning in Place", or CIP, describes a procedure that is used by the process industry for cleaning the facility parts. This procedure offers the advantage that cleaning is done directly on-site, without the facility part having to be disassembled.

A separate facility part is integrated into the facility for the CIP procedure. There the cleaning liquid is prepared and stored. The design of the facility parts to be cleaned allows for their connection to the CIP facility part. The CIP facility part is positioned in a way that the distances to the facility parts to be cleaned are as short as possible.

3.2 Automation technology

The unit concept

In this application example, the "CIP" facility part can be considered a unit.

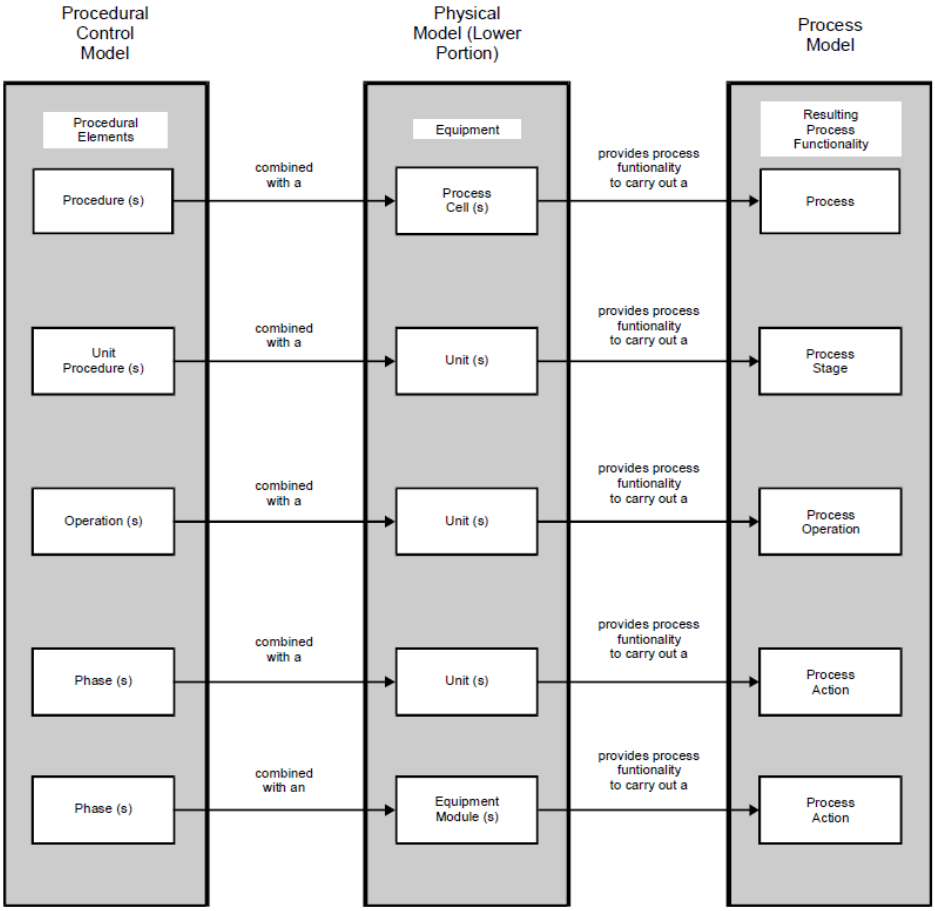
The term "unit" stands for a unit in a process plant (facility part, device, machine) including sensors, actuators, and the corresponding automation software frequently required in this component configuration. The unit as a "type" is used as a template for creating many, differently configurable instances.

Copyright © Siemens AG 2013 All rights reserved

ISA-88

The application example has been configured according to ISA-S88 standard. The standard describes a process with regard to the available equipment (physical model), the defined procedural process (process model), and the equipment used for producing a batch (procedural control model). The following diagram describes the setup of the ISA-S88 standard.

Figure 3-1



Note For detailed information on ISA-S88.01 please refer to manual "Process Control System PCS 7 SIMATIC BATCH V8.0 SP1, chapter "Technological Basics according to ISA-88.01". Follow the link to find this manual: http://support.automation.siemens.com/WW/view/en/68154748

Copyright © Siemens AG 2013 All rights reserved

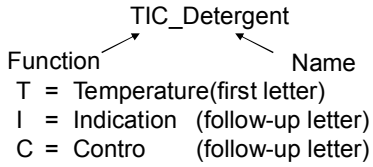
4 Function mechanism

4.1 Project structure

4.1.1 Naming convention of the CFC Charts

The designation of process tags follows a uniform naming convention, the function is named in compliance with the European standard EN 62424. The following figure shows the composition of a process tag designation.

Figure 4-1



The following table shows the letters used in the application and their meaning:

Copyright © Siemens AG 2013 All rights reserved

Table 4-1

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

Table 4-2

Follow-up letter	Meaning
C	Open and closed-loop control ("Control")
F	Fraction
I	Indication
S	Binary control function or switching function (not safety-relevant) ("Switching")
T	Transmitter, analog value processing (monitoring)
H	High
L	Low

4.1.2 Plant View

The plant hierarchy of the "CIP" application example has been configured in accordance with ISA S88.01.

AS Project

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

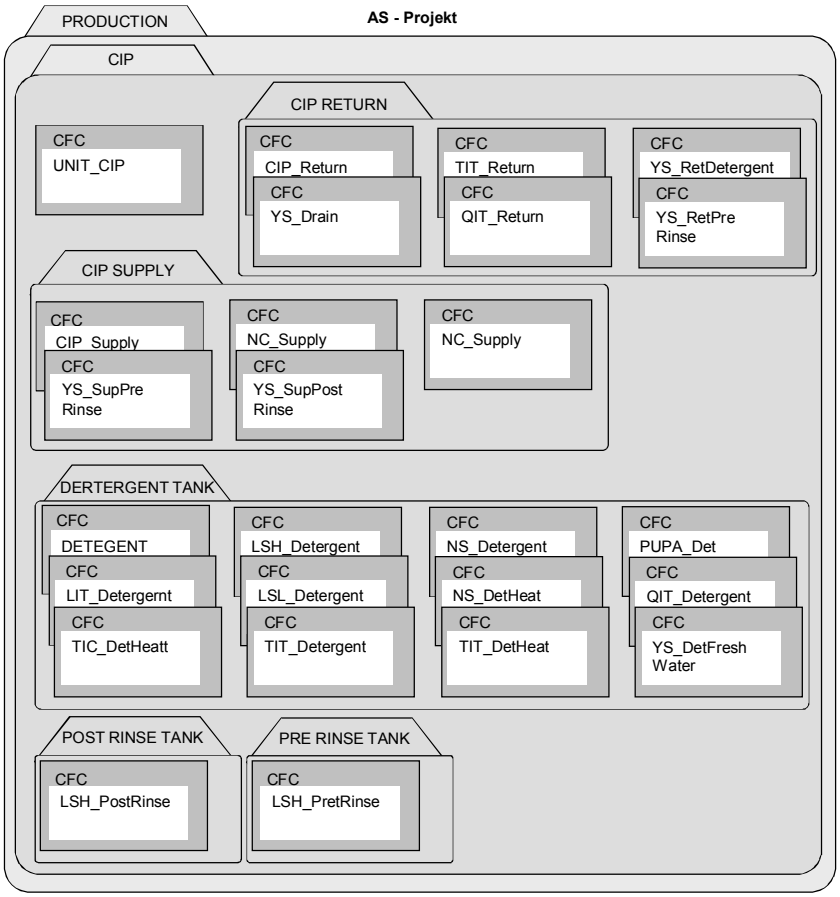
- "CIP" includes the hierarchy folder "CIP" defined as a unit
- "MIXER PLANT" includes the hierarchy folder "MIXER" defined as a unit
- "RECIPE CONTROL" includes no further objects

The "CIP" unit includes the CFC chart "UNIT_CIP" with the "UNIT_PLC" block, the hierarchy folder for the technical equipment "CIP_SUPPLY" and "CIP_RETURN" and the neutral hierarchy folders for the CIP facility tanks. These folders include the required process tags.

The "MIXER" unit includes the "UNIT_MIXER" CFC chart with the "UNIT_PLC" block "UNIT_MIXER" and the hierarchy folder for the technical equipment "TANK_IN" and "TANK_OUT". These folders include the required process tags.

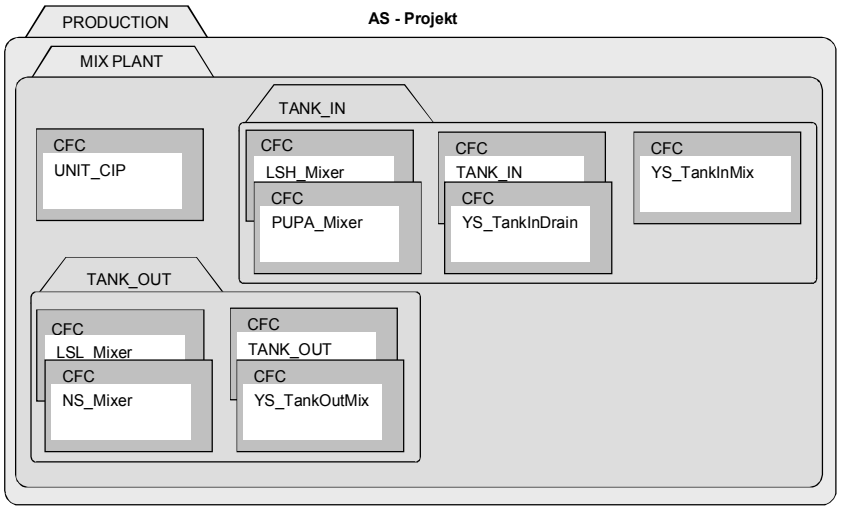
The following diagrams describe the setup of the AS project:

Figure 4-2



Copyright © Siemens AG 2013 All rights reserved

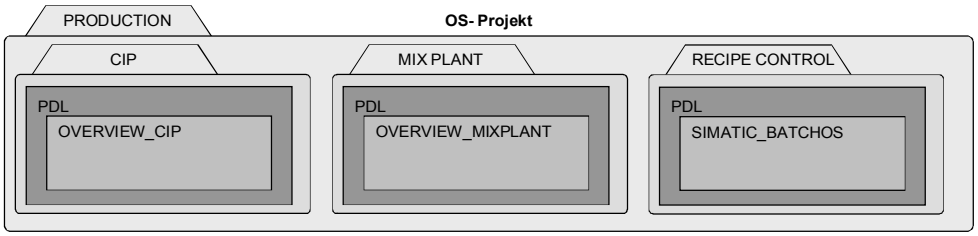
Figure 4-3



OS Project

The plant hierarchy in the OS project is derived from the plant hierarchy of the AS project. The neutral hierarchy folders "CIP", "MIX PLANT" and "RECIPE CONTROL" include the overview screens "OVERVIEW_CIP.pdl", "OVERVIEW_MIXPLANT.pdl" and "SIMATIC_BATCHOS.pdl". The hierarchy folders "CIP" and "MIX PLANT" defined as units include the screens "CIP.pdl" and "MIXER.pdl".

Figure 4-4



Copyright © Siemens AG 2013 All rights reserved

4.2 Functionality and process tags

The CIP application example comprises different technical functionalities and process tags. In the PCS 7 project, all process tags (including the process tags of the technical functions) are based on process tag tpyes of the master data library. The process tag types used in the project originate from the APL library. SFC types, that are also included in the master data library, are used for describing the technical functions.

The following chapters will give you information on the structure of the individual technical functionalities, as well as the description of the SFCs used.

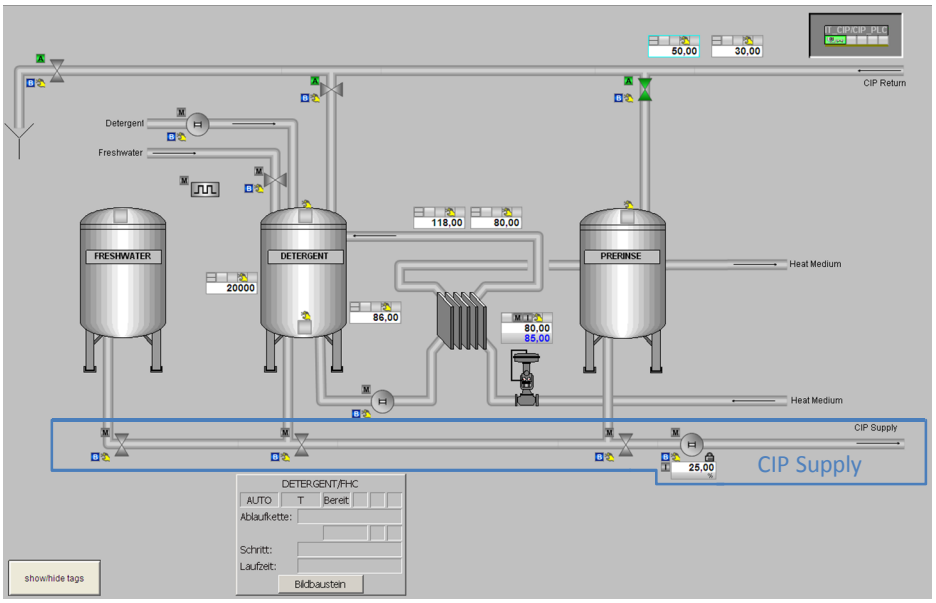
4.2.1 Supply modules (CIP SUPPLY)

The detergent will be fed from the tanks to the individual units of the facility. The decision about which detergent will be withdrawn is realized through an SFC-type instance. Depending on the control strategy selected, the liquid will be withdrawn from the corresponding tank. The amounts withdrawn will be defined via cleaning recipes in SIMATIC BATCH. Cleaning is performed by means of cleaning batches and will therefore also be logged.

Setup

The following diagram shows the setup of the supply modules:

Figure 4-5



Copyright © Siemens AG 2013 All rights reserved

The supply valves of the tanks are opened and closed via an SFC-type instance "CIP SUPPLY".

The table below provides an overview of all components and the process tag types used.

Table 4-3

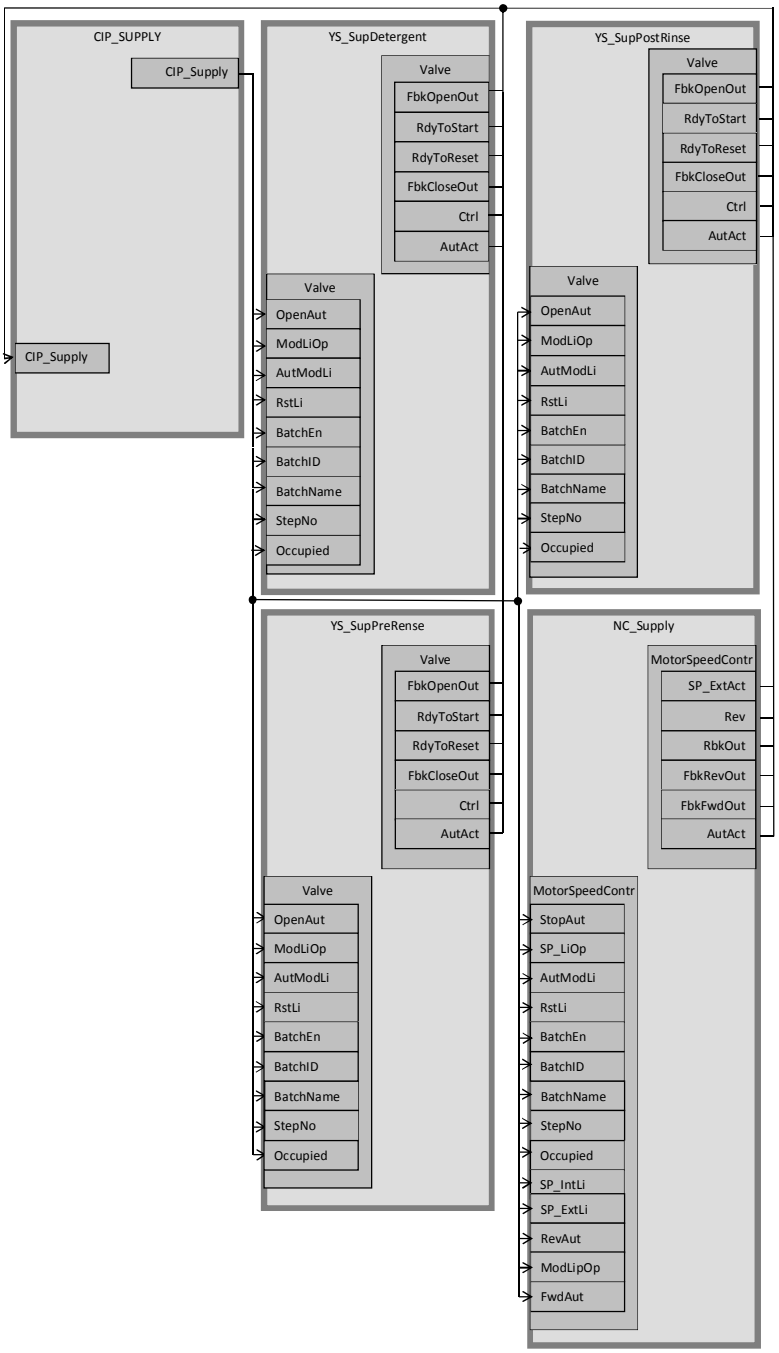
Name	Process tag type	Description
CIP_Supply	SCF-TYPE "CIP SUPPLY"	- Opening and closing the valves depending on the specified control strategy - Starting and stopping the pump
NC_Supply	MotorSpeedControlled	Motor for driving the pump
YS_SupDetergent	ValveLean	Process tag "Detergent tank valve"
YS_SupPostRinse	ValveLean	Process tag "Fresh water tank valve"
YS_SupPreRinse	ValveLean	Process tag "Prerinse tank valve"

Copyright © Siemens AG 2013 All rights reserved

Process tag interconnection

The following figure shows a simplified illustration of the supply modules, including any interconnections or SFC accesses across different CFC charts.

Figure 4-6



Copyright © Siemens AG 2013 All rights reserved

Parameter setting

The configuration of the individual process tags is described below. For a detailed description of the SFC type please refer to chapter "4.3. Step sequences".

NC_Supply

The flow rate of the cleaning liquid is controlled in the "NC_Supply" process tag. The setpoint value is specified via the SFC-type instance "CIP SUPPLY". The "NC_Supply" process tag is an instance of the process tag type "MotorSpeedControlled".

The table below shows the configuration of the instance of "MotorSpeedControlled".

Table 4-4

Block	Connection	Value	Typical Use
FbkFwd	SimPV_In	1	Simulated process value
RbkSpeed	PV_InUnit	1342	Unit of measure of the input signal, percent %
RbkSpeed	SimOn	1	Simulation switched on
RbkSpeed	SimPV_In	28.0	Simulated process value
Interlock			Removed
Intlk04			Inserted as IntlkMot
IntlkMot	In01		Interconnection with YS_SupPostRinse\Valce.FbkOpenOut
IntlkMot	In02		Interconnecting YS_SupDetergent\Valve.FbkOpenOut
IntlkMot	In03		Interconnection with YS_SupPreRinse\Valve.FbkOpenOut
IntlkMot	Out		Result of the logic interconnected with NC_Supply\ MotorSpeedContr.Intlock
Protect	In01	1	Interconnection removed, value "1"
OR_OOS	In7		Visible interconnection with NC_Supply\2.OosAct
MotorSpeedContr	FwdAut		Switching on forward in automatic mode (CIP_Supply\CIP SUPPLY.M1_FwdAut)
MotorSpeedContr	StopAut		Stopping the motor in automatic mode (CIP_Supply\CIP SUPPLY.M1_StopAut)
MotorSpeedContr	RevAut		Switching on backward in automatic mode (CIP_Supply\CIP SUPPLY.M1_StopAut)
MotorSpeedContr	ModLiOp		Switching the operation (operator or interconnection/SFC (CIP_Supply\CIP SUPPLY.M1_ModLiOp)
MotorSpeedContr	SP_ext		External setpoint value (CIP_Supply\CIP SUPPLY.M1_SP_Ext)
MotorSpeedContr	SP_HiLim	60.0	Upper limit of the setpoint value

Copyright © Siemens AG 2013 All rights reserved

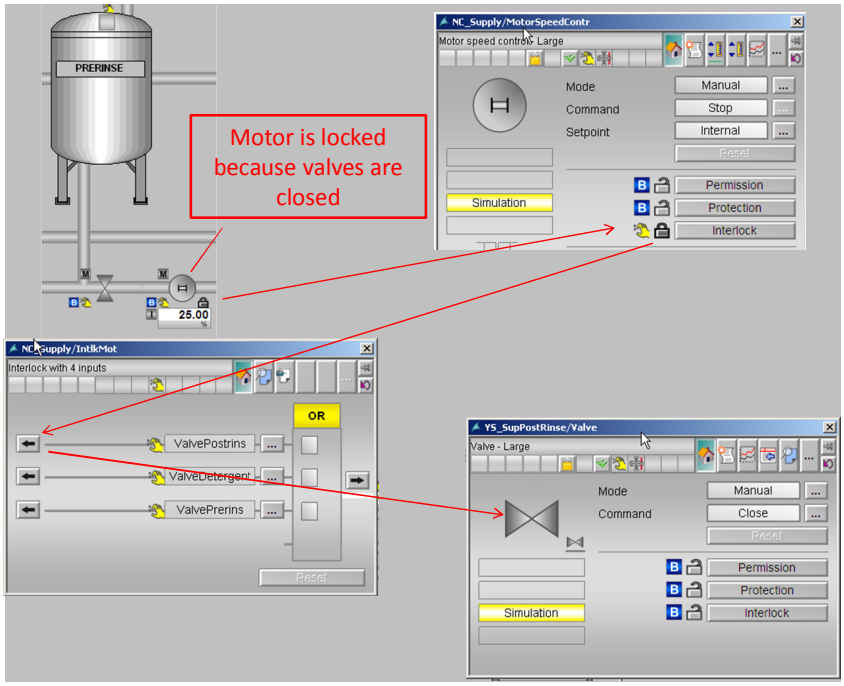
Block	Connection	Value	Typical Use
MotorSpeedContr	SP_LiOp		Internal/external setpoint source (CIP_Supply\CIP SUPPLY.M1_SP_LiOp)
MotorSpeedContr	SP_ExtLi		External setpoint via interconnection CIP_Supply\CIP SUPPLY.M1_SP_ExtLi
MotorSpeedContr	SP_IntLi		Internal setpoint via interconnection CIP_Supply\CIP SUPPLY.M1_SP_IntLi
MotorSpeedContr	Monitor	0	Feedback monitoring disabled
MotorSpeedContr	RstLi		Reset via interconnection CIP_Supply\CIP SUPPLY.M1_RstLi
MotorSpeedContr	Interlock		Interlocking without Reset (CIP_Supply\IntlkMot.out)
MotorSpeedContr	BatchEN		Occupation enabled (CIP_Supply\CIP SUPPLY.QBA_EN)
MotorSpeedContr	BatchID		Batch number (CIP_Supply\CIP SUPPLY.QBA_ID)
MotorSpeedContr	BatchName		Batch name (CIP_Supply\CIP SUPPLY.QBA_NA)
MotorSpeedContr	StepNo		Batch step number (CIP_Supply\CIP SUPPLY.QSTEP_NO)
MotorSpeedContr	Occupied		Occupied by batch (CIP_Supply\CIP SUPPLY.QOCCUPIED)
MotorSpeedContr	AV		Additional analog value (NC_Supply\FLOW.AV_Tech)
MotorSpeedContr	GrpErr		Group error (CIP_Supply\CIP SUPPLY.M1_GrpErr)
MotorSpeedContr	RdyToStart		Ready to start (CIP_Supply\CIP SUPPLY.M1_RdyToStart)
MotorSpeedContr	RdyToReset		Ready to reset (CIP_Supply\CIP SUPPLY.M1_RdyToReset)
MotorSpeedContr	Fwd		Control forward (CIP_Supply\CIP SUPPLY.M1_Fwd)
MotorSpeedContr	Rev		Control backward (CIP_Supply\CIP SUPPLY.M1_Rev)
MotorSpeedContr	AutAct		Automatic mode (CIP_Supply\CIP SUPPLY.M1_AutAct)
MotorSpeedContr	FbkFwdOut		Feedback "forward mode" (CIP_Supply\CIP SUPPLY.M1_FbkFwdOut)
MotorSpeedContr	FbkRevOut		Feedback "backward mode" (CIP_Supply\CIP SUPPLY.M1_FbkRevOut)
MotorSpeedContr	SP_ExtAct		External setpoint active (CIP_Supply\CIP SUPPLY.M1_SP_ExtAct)
MotorSpeedContr	RbkOut		Output "Readback value" (CIP_Supply\CIP SUPPLY.M1_RbkOut)
Error	In8		(NC_Supply\ ScalePV.Bad)
Pcs7AnIn			Inserted as "ScalePV"

Copyright © Siemens AG 2013 All rights reserved

Block	Connection	Value	Typical Use
ScalePV	Scale	70	Scaling of the process value
ScalePV	PV_InUnit	1349	Unit of measurement for the process value in cubic metres per hour m³/h
ScalePV	SimOn	1	Simulation on
ScalePV	SimPV_In	26	Simulated process value
ScalePV	Mode	16#00	Value status and type of measurement
ScalePV	MS_Release		Release for maintenance (NC_Supply\FLOW.MS_Release)
AV			Inserted as FLOW for additional analog value
FLOW	AV		Additional analog value (NC_Supply\ ScalePV.PV_Out)
FLOW	AV_Unit		Unit of measurement for an additional analog value (NC_Supply\ ScalePV.PV_OutUnit)
FLOW	AV_OpScale		Limit for the bar display scale (NC_Supply. ScalePV \ScaleOut)
FLOW	SV_Out		Output for the analog value (CIP_Supply\CIP SUPPLY.RINSE_FLOW_AI)

The IntlkMot block is used for locking the motor. This is to ensure that the motor runs only if one of the valves is open. The following diagram describes the locking and how to cancel it.

Figure 4-7



Copyright © Siemens AG 2013 All rights reserved

YS_SupDetergent

The valve process tag "YS_SupDetergent" controls the drainage of the detergent tank into to the supply system. The valve block receives the opening or closing command from the SFC-type instance "CIP SUPPLY". The "YS_SupDetergent" process tag is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance of "ValveLean".

Table 4-5

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening or closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed
Valve	OpenAut		Open valve in automatic mode, (CIP_Supply\CIP SUPPLY.V2_OpenAut)
Valve	ModLiOp		Switch-over between operating mode operator/interconnection (CIP_Supply\CIP SUPPLY.V2_ModLiOp)
Valve	RstLi		Reset via interconnection (CIP_Supply\CIP SUPPLY.V2_RstLi)
Valve	BatchEn		Occupation enabled (CIP_Supply\CIP SUPPLY.QBA_EN)
Valve	BatchID		Batch number (CIP_Supply\CIP SUPPLY.QBA_ID)
Valve	BatchName		Batch name (CIP_Supply\CIP SUPPLY.QBA_NA)
Valve	StepNo		Batch step number (CIP_Supply\CIP SUPPLY.QSTEP_NO)
Valve	Occupied		Occupied by batch (CIP_Supply\CIP SUPPLY.QOCCUPIED)
Valve	RdyToStart		Ready to start (CIP_Supply\CIP SUPPLY.V2_RdyToStart)
Valve	RdyToReset		Ready to reset (CIP_Supply\CIP SUPPLY.V2_RdyToReset)
Valve	Ctrl		Control output (CIP_Supply\CIP SUPPLY.V2_Ctrl)
Valve	AutAct		Automatic mode active (CIP_Supply\CIP SUPPLY.V2_AutAct)
Valve	FbkOpenOut		Valve open (CIP_Supply\CIP SUPPLY.V2_FbkOpenOut)
Valve	FbkClosedOut		Valve closed (CIP_Supply\CIP SUPPLY.V2_FbkCloseOut)

Copyright © Siemens AG 2013 All rights reserved

YS_SupPostRinse

The valve process tag "YS_SupPostRinse" controls the drainage of the fresh water tank into to the supply system. The valve block receives the opening or closing command from the SFC-type instance "CIP SUPPLY". The "YS_SupPostRinse" process tag is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance of "ValveLean".

Table 4-6

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening / closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed
Valve	OpenAut		Open valve in automatic mode (CIP_Supply\CIP SUPPLY.V3_OpenAut)
Valve	ModLiOp		Switch-over between operating mode operator/interconnection (CIP_Supply\CIP SUPPLY.V3_ModLiOp)
Valve	RstLi		Reset via interconnection (CIP_Supply\CIP SUPPLY.V3_RstLi)
Valve	BatchEn		Occupation enabled (CIP_Supply\CIP SUPPLY.QBA_EN)
Valve	BatchID		Batch number (CIP_Supply\CIP SUPPLY.QBA_ID)
Valve	BatchName		Batch name (CIP_Supply\CIP SUPPLY.QBA_NA)
Valve	StepNo		Batch step number (CIP_Supply\CIP SUPPLY.QSTEP_NO)
Valve	Occupied		Occupied by batch (CIP_Supply\CIP SUPPLY.QOCCUPIED)
Valve	RdyToStart		Ready to start (CIP_Supply\CIP SUPPLY.V3_RdyToStart)
Valve	RdyToReset		Ready to reset (CIP_Supply\CIP SUPPLY.V3_RdyToReset)
Valve	Ctrl		Control output (CIP_Supply\CIP SUPPLY.V3_Ctrl)
Valve	AutAct		Automatic mode active (CIP_Supply\CIP SUPPLY.V3_AutAct)
Valve	FbkOpenOut		Valve open (CIP_Supply\CIP SUPPLY.V3_FbkOpenOut)
Valve	FbkClosedOut		Valve closed (CIP_Supply\CIP SUPPLY.V3_FbkCloseOut)

Copyright © Siemens AG 2013 All rights reserved

YS_SupPreRinse

The valve process tag "YS_SupPreRinse" controls the drainage of the fresh water tank into to the supply system. The valve block receives the opening or closing command from the SFC-type instance "CIP SUPPLY". The "YS_SupPreRinse" process tag is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance of "ValveLean".

Table 4-7

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening / closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed
Valve	OpenAut		Open valve in automatic mode (CIP_Supply\CIP SUPPLY.V1_OpenAut)
Valve	ModLiOp		Switch-over between operating mode operator/interconnection (CIP_Supply\CIP SUPPLY.V1_ModLiOp)
Valve	RstLi		Reset via interconnection (CIP_Supply\CIP SUPPLY.V1_RstLi)
Valve	BatchEn		Occupation enabled (CIP_Supply\CIP SUPPLY.QBA_EN)
Valve	BatchID		Batch number (CIP_Supply\CIP SUPPLY.QBA_ID)
Valve	BatchName		Batch name (CIP_Supply\CIP SUPPLY.QBA_NA)
Valve	StepNo		Batch step number (CIP_Supply\CIP SUPPLY.QSTEP_NO)
Valve	Occupied		Occupied by batch (CIP_Supply\CIP SUPPLY.QOCCUPIED)
Valve	RdyToStart		Ready to start (CIP_Supply\CIP SUPPLY.V1_RdyToStart)
Valve	RdyToReset		Ready to reset (CIP_Supply\CIP SUPPLY.V1_RdyToReset)
Valve	Ctrl		Control output (CIP_Supply\CIP SUPPLY.V1_Ctrl)
Valve	AutAct		Automatic mode active (CIP_Supply\CIP SUPPLY.V1_AutAct)
Valve	FbkOpenOut		Valve open (CIP_Supply\CIP SUPPLY.V1_FbkOpenOut)
Valve	FbkClosedOut		Valve closed (CIP_Supply\CIP SUPPLY.V1_FbkCloseOut)

Copyright © Siemens AG 2013 All rights reserved

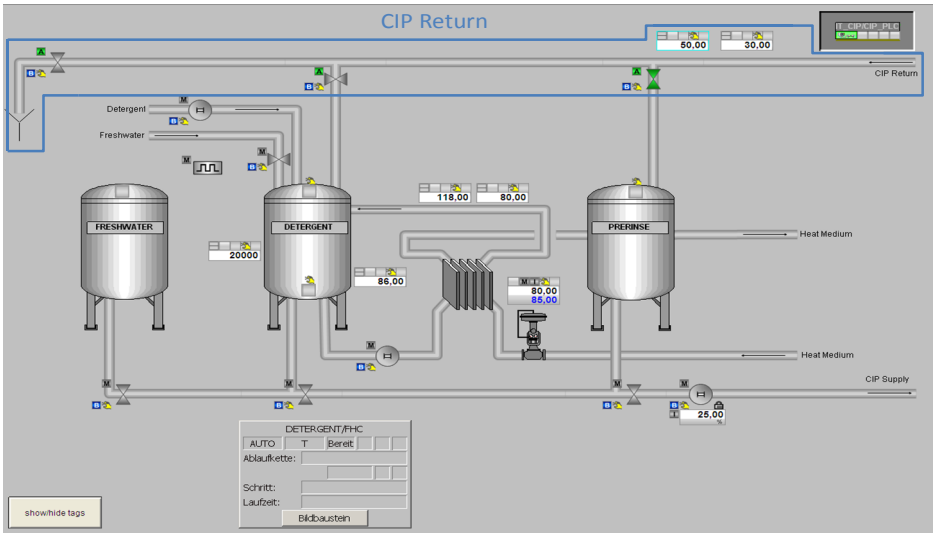
4.2.2 CIP RETURN

Temperature and concentration of the liquid will be determined in the return flow. Depending on the values measured, the liquid will be fed back into the CIP tanks. Depending on whether the quality of the liquid is sufficient, the valves to the tank will be opened. The liquid from the prerinse phase will be fed directly into the drainage. In case the quality is not sufficient or the tanks are full, the liquid will also be fed into the drainage.

Setup

The following diagram shows the setup of the return modules:

Figure 4-8



The supply valves of the tanks are controlled via an SFC-type instance "CIP RETURN".

The table below provides an overview of all components and the process tag types used.

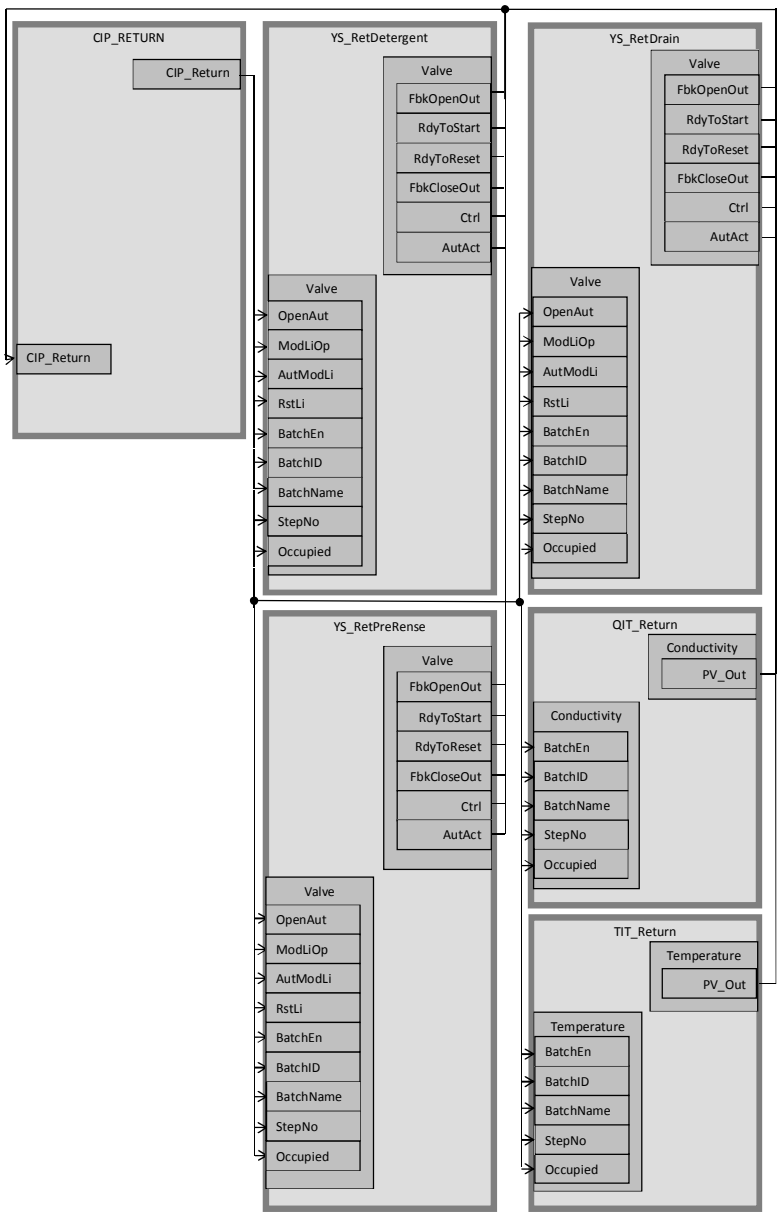
Table 4-8

Name	Process tag type	Description
QIT_Return	"AnalogMonitoring"	Detecting the concentration of the alkaline solution
TIT_Return	"AnalogMonitoring"	Detecting the temperature of the liquid
YS_RetDetergent	"ValveLean"	Valve for the CIP Return in the detergent tank
YS_RetDrain	"ValveLean"	Valve for the CIP Return in the drainage
YS_RetPreRinse	"ValveLean"	Valve for the CIP Return in the prerinse tank
CIP_Return	SFC-type instance	- Opening und closing the valves - Interface for connection to SIMATIC BATCH

Copyright © Siemens AG 2013 All rights reserved

The following figure shows a simplified illustration of the return modules, including any interconnections or SFC accesses across different CFC charts.

Figure 4-9



Copyright © Siemens AG 2013 All rights reserved

Parameter setting

The configuration of the individual process tags is described below. For a detailed description of the SFC type please refer to chapter "4.3. Step sequences".

QIT_Return

The detergent concentration of the liquid in the return flow is detected in the "QIT_Return" process tag. This value is transmitted to the SFC-type instance "CIP RETURN". The measured value determines into which tank the liquid will be fed. The "QIT_Return" process tag is an instance of the process tag type "AnalogMonitoring".

The following table shows the configuration of the instance of "AnalogMonitoring".

Table 4-9

Block	Connection	Value	Typical Use
Input1	PV_InUnit	1289	Unit of measurement, millisiemens mS
Conductivity	PV_Hyst	3.0	Hysteresis for PV alarm
Conductivity	MsgLock	1	Suppress process messages
Conductivity	BatchEn		Occupation enabled (CIP_Return\CIP RETURN.QBA_EN)
Conductivity	BatchID		Batch number (CIP_Return\CIP RETURN.QBA_ID)
Conductivity	BatchName		Batch name (CIP_Return\CIP RETURN.QBA_NA)
Conductivity	StepNo		Batch step number (CIP_Return\CIP RETURN.QSTEP_NO)
Conductivity	Occupied		Occupied by batch (CIP_Return\CIP RETURN.QOCCUPIED)

Copyright © Siemens AG 2013 All rights reserved

TIT_Return

The temperature of the liquid in the return flow is detected in the "TIT_Return" process tag. This value is transmitted to the SFC-type instance "CIP RETURN". The measured value determines into which tank the liquid will be fed. The "TIT_Return" process tag is an instance of the process tag type "AnalogMonitoring".

The following table shows the configuration of the instance of "AnalogMonitoring":

Table 4-10

Block	Connection	Value	Typical Use
Input1	PV_InUnit	1001	Unit of measurement, degrees Celsius °C
Temperature	BatchEn		Occupation enabled (CIP_Return\CIP RETURN.QBA_EN)
Temperature	BatchID		Batch number (CIP_Return\CIP RETURN.QBA_ID)
Temperature	BatchName		Batch name (CIP_Return\CIP RETURN.QBA_NA)
Temperature	StepNo		Batch step number (CIP_Return\CIP RETURN.QSTEP_NO)
Temperature	Occupied		Occupied by batch (CIP_Return\CIP RETURN.QOCCUPIED)

YS_RetDetergent

The valve process tag "Ys_retdetergent" controls the CIP Return to the detergent tank. The process tag receives the command to open or close the valve from the SFC-type instance "CIP RETURN". The valve process tag "Ys_retdetergent" is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance of "ValveLean".

Table 4-11

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening or closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed
Valve	OpenAut		Open valve in automatic mode, (CIP_Return\CIP RETURN.V2_OpenAut)
Valve	ModLiOp		Switching the operation mode between operator / interconnection (CIP_Return\CIP RETURN.V2_ModLiOp)

Copyright © Siemens AG 2013 All rights reserved

Block	Connection	Value	Typical Use
Valve	RstLi		Reset via interconnection CIP_Return\CIP RETURN.V2_RstLi
Valve	BatchEn		Occupation enabled (CIP_Return\CIP RETURN.QBA_EN)
Valve	BatchID		Batch number (CIP_Return\CIP RETURN.QBA_ID)
Valve	BatchName		Batch name (CIP_Return\CIP RETURN.QBA_NA)
Valve	StepNo		Batch step number (CIP_Return\CIP RETURN.QSTEP_NO)
Valve	Occupied		Occupied by batch (CIP_Return\CIP RETURN.QOCCUPIED)
Valve	RdyToStart		Ready to start (CIP_Return\CIP RETURN.V2_RdyToStart)
Valve	RdyToReset		Ready to reset (CIP_Return\CIP RETURN.V2_RdyToReset)
Valve	Ctrl		Control output (CIP_Return\CIP RETURN.V2_Ctrl)
Valve	AutAct		Automatic mode active (CIP_Return\CIP RETURN.V2_AutAct)
Valve	FbkOpenOut		Valve open (CIP_Supply\CIP SUPPLY.V2_FbkOpenOut)
Valve	FbkClosedOut		Valve closed (CIP_Return\CIP RETURN.V2_FbkCloseOut)

Copyright © Siemens AG 2013 All rights reserved

YS_RetDrain

The valve process tag "Ys_retDrain" controls the CIP Return to the drainage. The process tag receives the command to open or close the valve from the SFC-type instance "CIP RETURN". The valve process tag "Ys_retDrain" is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance of "ValveLean".

Table 4-12

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening / closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed
Valve	OpenAut		Open valve in automatic mode, (CIP_Return\CIP RETURN.V3_OpenAut)

Block	Connection	Value	Typical Use
Valve	ModLiOp		Mode switching between operator / interconnection (CIP_Return\CIP RETURN.V3_ModLiOp)
Valve	RstLi		Reset via interconnection (CIP_Return\CIP RETURN.V3_RstLi)
Valve	BatchEn		Occupation enabled (CIP_Return\CIP RETURN.QBA_EN)
Valve	BatchID		Batch number (CIP_Return\CIP RETURN.QBA_ID)
Valve	BatchName		Batch name (CIP_Return\CIP RETURN.QBA_NA)
Valve	StepNo		Batch step number (CIP_Return\CIP RETURN.QSTEP_NO)
Valve	Occupied		Occupied by batch (CIP_Return\CIP RETURN.QOCCUPIED)
Valve	RdyToStart		Ready to start (CIP_Return\CIP RETURN.V3_RdyToStart)
Valve	RdyToReset		Ready to reset (CIP_Return\CIP RETURN.V3_RdyToReset)
Valve	Ctrl		Control output (CIP_Return\CIP RETURN.V3_Ctrl)
Valve	AutAct		Automatic mode active (CIP_Return\CIP RETURN.V3_AutAct)
Valve	FbkOpenOut		Valve open (CIP_Supply\CIP SUPPLY.V3_FbkOpenOut)
Valve	FbkClosedOut		Valve closed (CIP_Return\CIP RETURN.V3_FbkCloseOut)

Copyright © Siemens AG 2013 All rights reserved

YS_RetPreRinse

The valve process tag "YS_RetPreRinse" controls the CIP Return to the prerinse tank. The process tag receives the command to open or close the valve from the SFC-type instance "CIP RETURN". The valve process tag "YS_RetPreRinse" is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance of "ValveLean".

Table 4-13

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening or closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed

Block	Connection	Value	Typical Use
Valve	OpenAut		Open valve in automatic mode, (CIP_Return\CIP RETURN.V1_OpenAut)
Valve	ModLiOp		Mode switch between operator / interconnection (CIP_Return\CIP RETURN.V1_ModLiOp)
Valve	RstLi		Reset via interconnection CIP_Return\CIP RETURN.V1_RstLi
Valve	BatchEn		Occupation enabled (CIP_Return\CIP RETURN.QBA_EN)
Valve	BatchID		Batch number (CIP_Return\CIP RETURN.QBA_ID)
Valve	BatchName		Batch name (CIP_Return\CIP RETURN.QBA_NA)
Valve	StepNo		Batch step number (CIP_Return\CIP RETURN.QSTEP_NO)
Valve	Occupied		Occupied by batch (CIP_Return\CIP RETURN.QOCCUPIED)
Valve	RdyToStart		Ready to start (CIP_Return\CIP RETURN.V1_RdyToStart)
Valve	RdyToReset		Ready to reset (CIP_Return\CIP RETURN.V1_RdyToReset)
Valve	Ctrl		Control output (CIP_Return\CIP RETURN.V1_Ctrl)
Valve	AutAct		Automatic mode active (CIP_Return\CIP RETURN.V1_AutAct)
Valve	FbkOpenOut		Valve open (CIP_RETURN\CIP RETURN.V1_FbkOpenOut)
Valve	FbkClosedOut		Valve closed (CIP_Return\CIP RETURN.V1_FbkCloseOut)

Copyright © Siemens AG 2013 All rights reserved

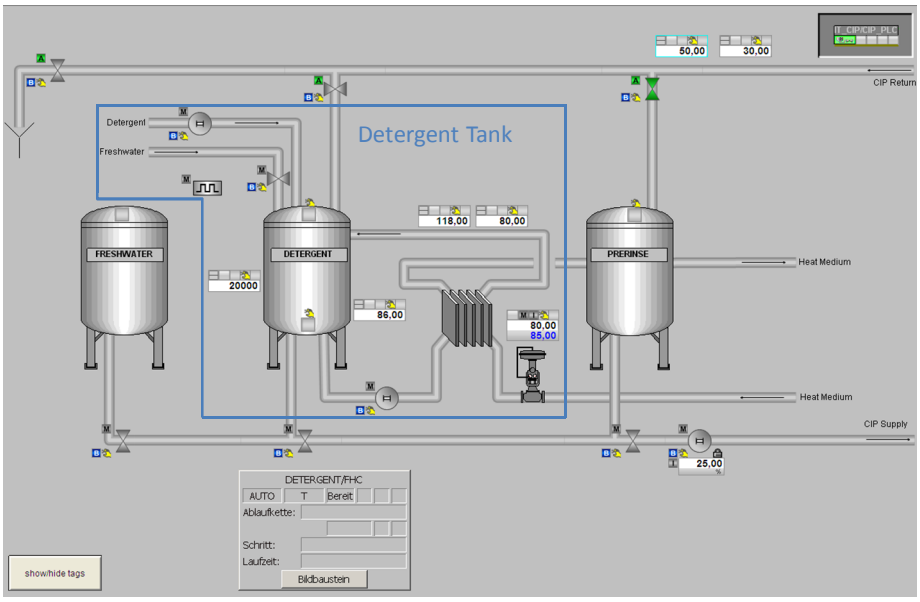
4.2.3 Detergent tank

The detergent tank contains the detergent for cleaning. The detergent will be heated up to the required temperature inside the tank. In addition, the required detergent concentration is set. The detergent tank is continously filled, either through the return during the cleaning phases or through the feed-in of fresh water and alkaline solution. The temperature of the liquid inside the tank is continously controlled to maintain a specified value.

Setup

The following diagram shows the setup of the detergent tank:

Figure 4-10



The tank has two level sensors that are used to detect the maximum and the minimum filling level. The liquid is pumped through a heat exchanger via pipes in order to control the temperature. Inside the pipes, the concentration of the alkaline solution is measured, as well. Circulation of the liquid is controlled through an SFC-type instance DETERGENT, through which the concentration is also controlled and the setpoint values for the PID controller are transmitted to the temperature control.

The table below provides an overview of all components and the process tag types used.

Table 4-14

Name	Process tag type	Description
QIT_Detergent	"AnalogMonitoring"	Process tag for the alkaline solution concentration
LIT_Detergent	"AnalogMonitoring"	Process tag for the filling level
TIT_DetHeat	"AnalogMonitoring"	Process tag for the temperature of the liquid in the cycle
TIT_Detergent	"AnalogMonitoring"	Process tag for the temperature of the liquid inside the tank
LSH_Detergent	"DigitalMonitoring"	Process tag for max. filling level reached
LSL_Detergent	"DigitalMonitoring"	Process tag for min. filling level reached

Copyright © Siemens AG 2013 All rights reserved

Name	Process tag type	Description
NS_DetCon	"MotorLean"	Process tag for controlling the pump for detergent feed-in
NS_DetHeat	"MotorLean"	Process tag for controlling the pump for heating cycle
YS_DetFreshWater	"ValveLean"	Process tag for controlling the valve for fresh water feed-in
TIC_DetHeat	"PIDControlLean"	Process tag for controlling the liquid temperature
PUPA_Det		Process tag for dosing the detergent
DETERGENT		SFC-type instance "DETERGENT"

Parameter setting

The configuration of the individual process tags is described below. For a detailed description of the SFC type please refer to chapter "4.3. Step sequences".

QIT_Detergent

The detergent concentration of the liquid in the heating cycle is detected in the "QIT_Detergent" process tag. This value is transmitted to the SFC-type instance "FILL_HEAT_CONC". The measured value is used to control the infeed of detergent into the tank. The "QIT_Detergent" process tag is an instance of the process tag type "AnalogMonitoring".

The following table shows the configuration of the instance of "AnalogMonitoring".

Table 4-15

Block	Connection	Value	Typical Use
Input1	Scale	200	Scaling of the process value
Input1	PV_InUnit	1289	Unit of measure, millisiemens mS
Conductivity	PV_Out		Output for the process value (DETERGENT\FHC.CONC_AI)

Copyright © Siemens AG 2013 All rights reserved

LIT_Detergent

The current level of the detergent tank is measured in the "LIT_Detergent" process tag. This value is transmitted to the SFC-type instance "FILL_HEAT_CONC". This value is used to adjust the filling level of the detergent tank. The "LIT_Detergent" process tag is an instance of the process tag type "AnalogMonitoring".

The following table shows the configuration of the instance of "AnalogMonitoring".

Table 4-16

Block	Connection	Value	Typical Use
Input1	Scale	25000	Scaling of the process value
Input1	PV_InUnit	1038	Unit of measure for process value, liter L
Level			MonAnL replaced by MonAnS
Level	PV_Out		Output process value (DETERGENT\FHC.LEVEL_AI, DETERGENT\FHC.L_HYS_AI)

TIT_DetHeat

The current temperature of the liquid in the heating cycle of the detergent tank is measured in the "TIT_DetHeat" process tag. This value is transmitted to the SFC-type instance "FILL_HEAT_CONC". This value is used to control the temperature of the liquid inside the detergent tank. The "TIT_DetHeat" process tag is an instance of the process tag type "AnalogMonitoring".

The following table shows the configuration of the instance of "AnalogMonitoring".

Table 4-17

Block	Connection	Value	Typical Use
Temperature	PV_Out		Output process value (TIC_DetHeat\PV.SimPV_IN)

TIT_Detergent

The current temperature of the liquid inside the detergent tank is measured in the "TIT_Detergent" process tag. This value is transmitted to the SFC-type instance "FILL_HEAT_CONC". This value is used to control the temperature of the liquid inside the detergent tank. The "TIT_Detergent" process tag is an instance of the process tag type "AnalogMonitoring".

The following table shows the configuration of the instance of "AnalogMonitoring".

Table 4-18

Block	Connection	Value	Typical Use
Temperature	PV_Out		Output process value (DETERGENT\FHC.TEMP_AI)

LSH_Detergent

The upper filling level of the detergent tank is monitored in the "LIT_Detergent" process tag. This value is transmitted to the SFC-type instance "FILL_HEAT_CONC". It is used for controlling the filling level inside the detergent tank. The "LSH_Detergent" process tag is an instance of the process tag type "DigitalMonitoring".

The following table shows the configuration of the instance of "DigitalMonitoring".

Table 4-19

Block	Connection	Value	Typical Use
MonDigital	In		Digital input value (DETERGENT\FHC.LS1_In)
MonDigital	Out		Digital output value (YS_DetFreshWater\Permit.In02)

Copyright © Siemens AG 2013 All rights reserved

LSL_Detergent

The lower filling level of the detergent tank is monitored in the "LSL_Detergent" process tag. The value is transmitted to the SFC-type instance "FILL_HEAT_CONC". It is used for controlling the filling level inside the detergent tank. The "LSL_Detergent" process tag is an instance of the process tag type "DigitalMonitoring".

The following table shows the configuration of the instance of "DigitalMonitoring".

Table 4-20

Block	Connection	Value	Typical Use
MonDigital	In		Digital input value (DETERGENT\FHC.LS2_In)
MonDigital	Out		Digital output value (NS_DetHeat\Protect.In01)

YS_DetFreshWater

The valve process tag "YS_DetFreshWater" controls the infeed of fresh water into the detergent tank. The process tag receives the command to open or close the valve from the SFC-type instance "FILL_HEAT_CONC". The "YS_DetFreshWater" process tag is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance "ValveLean".

Table 4-21

Block	Connection	Value	Typical Use
Valve	OpenAut		Valve open in automatic mode (DETERGENT\FHC.V1_OpenAut)
Valve	CloseAut		Valve closed in automatic mode (DETERGENT\FHC.V1_CloseOut)
Valve	ModLiOp		Switching between operator / interconnection (DETERGENT\FHC.V1_ModLiOP)
Valve	AutModLi		Automatic mode via interconnection (DETERGENT\FHC.V1AutModLi)
Valve	ManModLi		Manual mode via interconnection, inverted (DETERGENT\FHC.V1_AutModLi)
Valve	Ctrl		Control output (DETERGENT\FHC.V1_Ctrl)
Valve	AutAct		Automatic mode is active (DETERGENT\FHC.V1_AutAct)
Valve	FbkOpenOut		Feedback "Valve open" (DETERGENT\FHC.V1_FbkOpenOut)
Valve	FbkCloseOut		Feedback "Valve closed" (DETERGENT\FHC.V1_FbkCloseOut)

Copyright © Siemens AG 2013 All rights reserved

NS_DetCon

The motor process tag "NS_DetCon" is used for dosing the detergent feed-in. The motor is controlled by the "PUPA_Det" process tag in pulsed mode. The "NS_DetCon" process tag is an instance of the process tag type "MotorLean".

The following table shows the configuration of the instance "MotorLean".

Table 4-22

Block	Connection	Value	Typical Use
Motor	StartAut		Starting the motor in automatic mode (NS_DetCon\2.Out)
Motor	StopAut		Stopping the motor in automatic mode (NS_DetCon\3.Out)
Motor	ModLiOP		Switching between operator / interconnection (DETERGENT\FHC.M2_ModLiOP)
Motor	Start		Controlling the motor, "Start" (DETERGENT\FHC.M2_Start)
Motor	FbkRunOut		Feedback for "Start" (DETERGENT\FHC.M2_FbkRunOut")
Or04			Added as "2" for starting the motor
2	In01		Starting the motor in pulsed mode (PUPA_Det\STRENGT.ActGrp01)
2	In02		Starting the motor (DETERGENT\FHC.M2_StartAut)
Or04			Added as "3" for stopping the motor
3	In01		Starting the motor in pulsed mode, inverted (PUPA_Det\STRENGT.ActGrp01)
3	In02		(DETERGENT\FHC.M2_StopAut)

Copyright © Siemens AG 2013 All rights reserved

NS_DetHeat

The motor process tag "NS_DetHeat" is used for controlling the pump for the heating cycle. The process tag receives the command to start or stop the motor from the SFC-type instance "FILL_HEAT_CONC". The motor process tag is an instance of the process tag type "MotorLean".

The following table shows the configuration of the instance of "MotorLean".

Table 4-23

Block	Connection	Value	Typical Use
Motor	StartAut		Starting the motor in automatic mode (DETERGENT\FHC.M1_StartAut)
Motor	AutModLi		Automatic mode via interconnection (DETERGENT\FHC.M1_AutModLi)
Motor	ManModLi		Manual mode via interconnection, inverted (DETERGENT\FHC.M1_AutModLi)

Block	Connection	Value	Typical Use
Motor	ModLiOP		Switching between operator / interconnection (DETERGENT\FHC.M1_ModLiOP)
Motor	Start		Controlling the motor, "Start" (DETERGENT\FHC.M1_Start)
Motor	FbkRunOut		Feedback for "Start" (DETERGENT\FHC.M1_FbkRunOut)
Protect	In01		Inverted
Protect	In02	1	

TIC_DetHeat

The temperature of the liquid is detected in the "TIC_DetHeat" process tag. The setpoint value is specified via the SFC-type instance "FILL_HEAT_CONC". The process tag transfers the manipulated value to the valve process tag "YC_DetHeat". The process tag is an instance of the process tag type "PIDControlLean".

The following table shows the configuration of the instance of "PIDControlLean".

Table 4-24

Block	Connection	Value	Typical Use
PID	SP_LiOp		Setpoint value source internal/external (DETERGENT\FHC.PID1_SP_LiOP)
PID	ModLiOp		Mode switch operator/automatic mode (DETERGENT\FHC.PID1_ModLiOp)
PID	AutAct		Automatic mode "active (DETERGENT\PID1_AutAct)
PID	LoopClosed		Control loop closed (DETERGENT\FHC.PID1_LoopClosed)
PID	PV_Out		Process value output (DETERGENT\FHC.PID1_PV_Out)
PV	SimOn	1	Simulation switched on
PV	SimPV_In		Simulated process value (TIT_DetHeat\Temperature.PV_Out)

Copyright © Siemens AG 2013 All rights reserved

PUPA_Det

The process tag "PUPA_Det" is used for pulse-shaped control. The process tag receives the starting command for control from the SFC-type instance "FILL_HEAT_CONC". The "PUPA_Det" process tag transfers the pulse-shaped control command to the motor process tag "NS_DetCon".

The following table shows the configuration of the instance:

Table 4-25

Block	Connection	Value	Typical Use
BlPuPa			Inserted as "STRENGTH" for pulse pause function.
STRENGTH	ModLiOp		Mode switch operator/automatic mode (DETERGENT\FHC.PUPA1_ModLiOp)
STRENGTH	AutModLi		Automatic mode via interconnection DETERGENT\FHC.PUPA1_AutModLi
STRENGTH	ManModLi		Manual mode via interconnection DETERGENT\FHC.PUPA1_ManModLi
STRENGTH	StartAut		Start signal in automatic mode (DETERGENT\FHC.PUPA1_StartAut)
STRENGTH	IntLock	1	Valve locked (1 = no)
STRENGTH	GroupCnt	1	Number of activated groups
STRENGTH	LoopCnt	8	Repetitions of activated groups
STRENGTH	Pulse01	5.0	Pulse duration group 1
STRENGTH	AutAct		Automatic mode "active" (DETERGENT\FHC.PUPA1_AutAct)
STRENGTH	ManAct		Manual mode "active" (DETERGENT\FHC.PUPA1_ManAct)
STRENGTH	StartOut		Signal status (DETERGENT\FHC.PUPA1_StartOut)
STRENGTH	ActiveOut		Repetition status (DETERGENT\FHC.PUPA1_ActiveOut)
STRENGTH	ActGrp01		activated device group (DETERGENT\FHC.PUPA1_ActGrp01, NS_DetCon\2.In1, NS_DetCon\3.In1)
STRENGTH	CurLpCnt		current repetition (DETERGENT\FHC.PUPA1_CurLpCnt)
STRENGTH	AllLpDone		all repetitions done (DETERGENT\FHC.PUPA1_AllLpDone, DETERGENT\FHC.SIG_2)

Copyright © Siemens AG 2013 All rights reserved

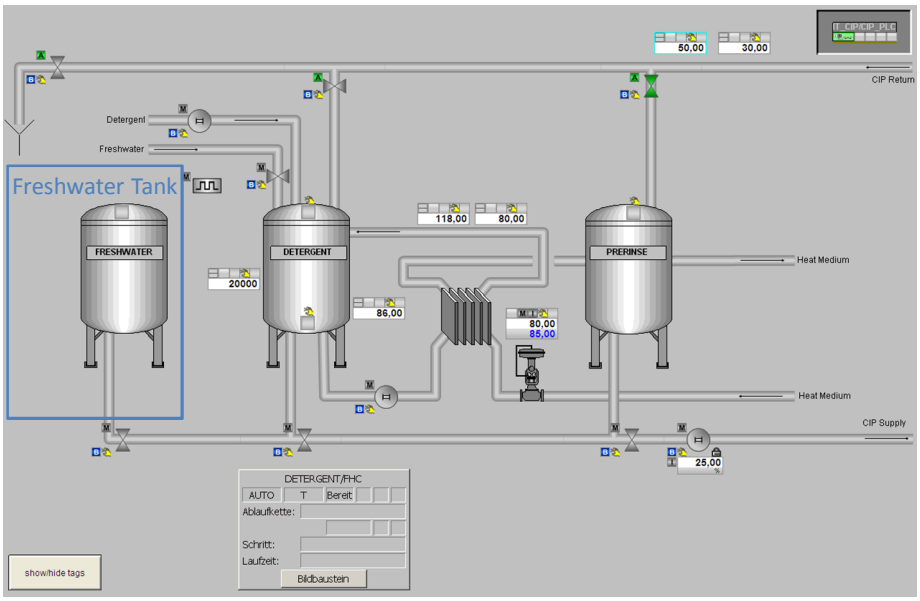
4.2.4 Fresh water tank (postrinse tank)

The postrinse tank contains fresh water for postrinsing. The fresh water is withdrawn during the postrinse phase. Water is not being fed back into this tank via the return line. The water is not being prepared and can be used at the ambient temperature. Liquid can be withdrawn from the fresh water tank at any time, as long as the minimum filling level is still maintained.

Setup

The following diagram shows the setup of the postrinse tank:

Figure 4-11



The "CIP" application example contains only some of the process tags for the postrinse tank. The process tags included are without any function and are used for illustration.

The setup strongly depends on the requirements of the cleaning process. The detergent tank (process tags and SFC-type "FILL_HEAT_CONC") can be used as a template for configuration. Elements not required can be removed. The process tag "LSH_PostRinse" only is included in the application example. The "LSH_PostRinse" process tag is an instance of the process tag type "DigitalMonitoring".

Copyright © Siemens AG 2013 All rights reserved

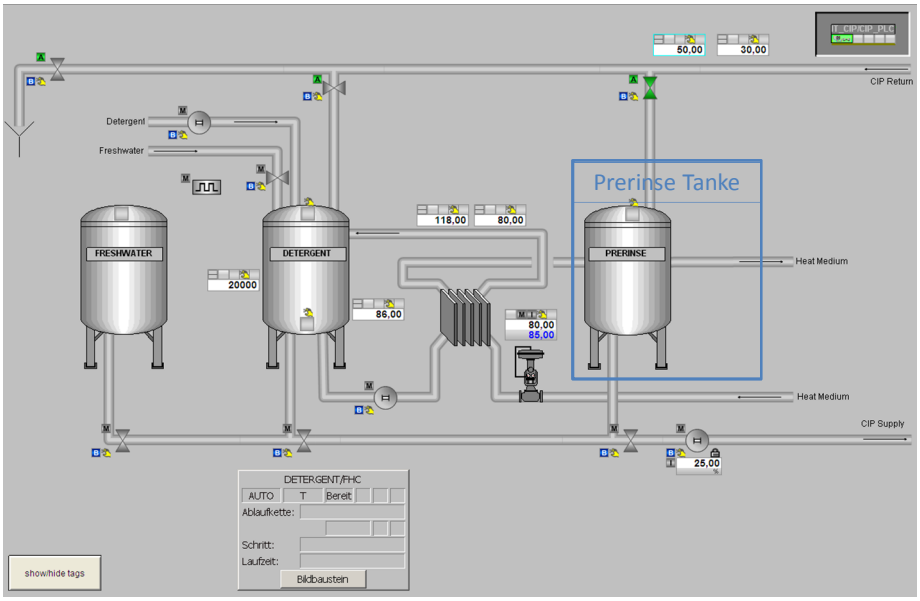
4.2.5 Prerinse tank

In the prerinse tank the liquid for prerinsing is stored and prepared. It is withdrawn during the prerinse phase. The liquid can be fed back into the tank via the return line. Fresh water can also be supplied.

Setup

The following diagram shows the setup of the prerinse tank:

Figure 4-12



The "CIP" application example contains only some of the process tags for the prerinse tank. The preparation of the liquid (e.g. temperature) is not taken into account.

The setup of the prerinse tank strongly depends on the requirements of the cleaning process. The detergent tank (process tags and SFC-type "FILL_HEAT_CONC") can be used as a template for configuration. Elements not required can be removed. The process tag "LSH_PreRinse" is included in the application example. The "LSH_PreRinse" process tag is an instance of the process tag type "DigitalMonitoring".

Copyright © Siemens AG 2013 All rights reserved

Parameter setting

The configuration of the individual process tags is described below.

LSH_PreRinse

The maximum filling level of the prerinse tank is monitored in the "LSH_PreRinse" process tag. The value is transmitted to the SFC-type instance "CIP RETURN". It is used for controlling the filling level inside the prerinse tank. The "LSH_PreRinse" process tag is an instance of the process tag type "DigitalMonitoring".

The following table shows the configuration of the instance "DigitalMonitoring".

Table 4-26

Block	Connection	Value	Typical Use
LSH03	In		Digital input value (CIP_Return\CIP RETURN.LS2_In)
LSH03	Out		Digital output value (CIP_Return\CIP RETURN.LS2_Out)

Copyright © Siemens AG 2013 All rights reserved

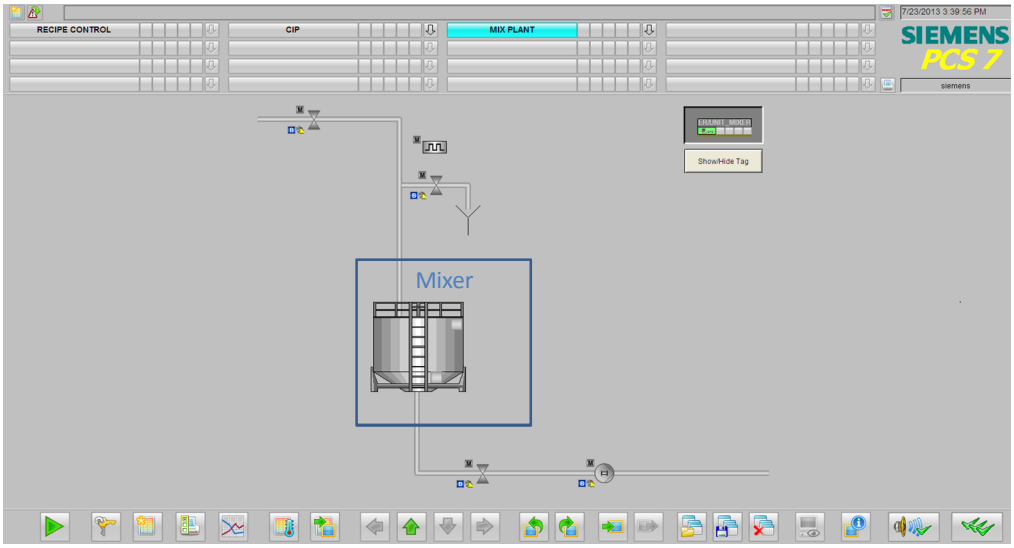
4.2.6 Mixer

The mixer is the part of the facility to be cleaned in the "CIP" application example and is used for illustrating the process. In the application example, no process tags are configured for the mixer.

Setup

The following diagram shows the setup of the mixer:

Figure 4-13



Copyright © Siemens AG 2013 All rights reserved

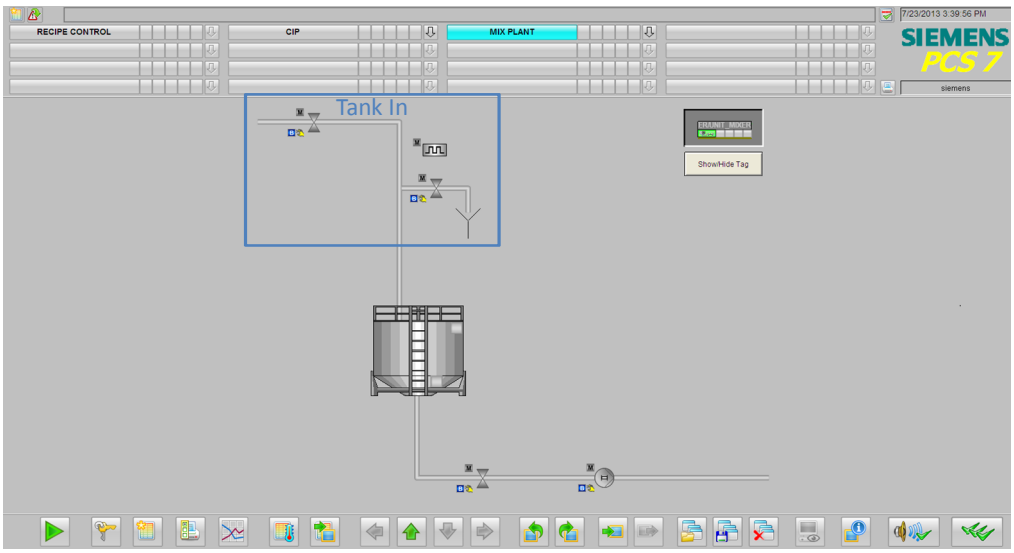
4.2.7 Mixer supply (TANK_IN)

The cleaning liquid is fed from the CIP facility into the mixer via the supply line. In addition, a further valve is cleaned. The additional valve is controlled through an instance of the BIPuPA block.

Setup

The following diagram shows the setup of the mixer supply:

Figure 4-14



The valves are controlled via an SFC-type instance "TANK_IN".

The table below provides an overview of all components and the process tag types used.

Table 4-27

Name	Process tag type	Description
TANK_IN	SFC-type instance "TANK_IN"	Control of the valves in the mixer supply line.
PUPA_Mixer	BIPuPa Function Block Instance	The additional valve is controlled in a pulsed way.
YS_TankInMix	"ValveLean"	Valve for the mixer supply
YS_TankInDrain	"ValveLean"	Additional valve
LSH_Mixer	"DigitalMonitoring"	Process tag for maximum filling level reached

Parameter setting

The configuration of the individual process tags is described below. For a detailed description of the SFC type please refer to chapter "4.3. Step sequences".

Copyright © Siemens AG 2013 All rights reserved

PuPa_Mixer

The process tag "PUPA_Mixer" is used for pulse-shaped control. The process tag receives the starting command for control from the SFC-type instance "TANK_IN". The "PUPA_Mixer" process tag transfers the pulse-shaped control command to the valve process tag "YS_TankInMix".

The following table shows the configuration of the instance:

Table 4-28

Block	Connection	Value	Typical Use
BlPuPa			Inserted as "BlPuPa" for pulse pause function
BlPuPa	ModLiOp		Mode switch operator/automatic mode (TANK_IN\MX_TANK_IN.PUPA_ModLiOp)
BlPuPa	AutModLi		Automatic mode via interconnection TANK_IN\MX_TANK_IN.PUPA_AutModLi
BlPuPa	ManModLi		Manual mode via interconnection TANK_IN\MX_TANK_IN.PUPA_ManModLi
BlPuPa	StartAut		Start signal in automatic mode (TANK_IN\MX_TANK_IN.PUPA_StartAut)
BlPuPa	IntLock	1	Valve locked (1 = no)
BlPuPa	GroupCnt	1	Number of activated groups
BlPuPa	LoopCnt	8	Repetitions of activated groups (TANK_IN\MX_TANK_IN.PUPA_LoopCnt)
BlPuPa	Pulse01	5.0	Pulse duration group 1
BlPuPa	AutAct		Automatic mode "active" (TANK_IN\MX_TANK_IN.PUPA_AutAct)
BlPuPa	ManAct		Manual mode "active" (TANK_IN\MX_TANK_IN.PUPA_ManAct)
BlPuPa	StartOut		Signal status (TANK_IN\MX_TANK_IN.PUPA_StartOut)
BlPuPa	ActiveOut		Repetition status (TANK_IN\MX_TANK_IN.PUPA_ActiveOut)
BlPuPa	ActGrp01		Activated device group (TANK_IN\MX_TANK_IN.PUPA__ActGrp01, YS_TankInDrain\1.In1)
BlPuPa	CurLpCnt		Current repetition (TANK_IN\MX_TANK_IN.PUPA_CurLpCnt)
BlPuPa	AllLpDone		All repetitions done (TANK_IN\MX_TANK_IN.PUPA_AllLpDone,)
BlPuPa	OvwBatchInfo	1	CMData overwritable with BATCH data
BlPuPa	BatchEnLi		Occupation enabled TANK_IN\MX_TANK_IN.PUPA_QBA_EN
BlPuPa	BatchOccLi		Occupied by batch TANK_IN\MX_TANK_IN.PUPA_QOCCUPIED
BlPuPa	BatchIdLi		Batch number TANK_IN\MX_TANK_IN.PUPA_QBA_ID
BlPuPa	BatchNameLi		Batch designation TANK_IN\MX_TANK_IN.PUPA_QBA_NA
BlPuPa	StepNoLi		Batch step number TANK_IN\MX_TANK_IN.PUPA_QSTEP_NO

Copyright © Siemens AG 2013 All rights reserved

LSH_Mixer

The maximum filling level of the mixer is monitored in the "LSH_Mixer" process tag. The "LSH_Mixer" process tag is an instance of the process tag type "DigitalMonitoring". In the "CIP" application example, the process tag is used for illustrating the process and has no function. The process tag type was not changed.

YS_TankInMix

The process tag "YS_ TankInMix" controls the supply from the CIP to the mixer. The process tag receives the command to open or close the valve from the SFC-type instance "TANK_IN". The "YS_ TankInMix" process tag is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance "ValveLean".

Table 4-29

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening or closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed
Valve	OpenAut		Open valve in automatic mode, (TANK_IN\MX_TANK_IN.V1_OpenAut)
Valve	ModLiOp		Switch mode between operator / interconnection (TANK_IN\MX_TANK_IN.V1_ModLiOp)
Valve	RstLi		Reset via interconnection TANK_IN\MX_TANK_IN.V1_RstLi
Valve	BatchEn		Occupation enabled (TANK_IN\MX_TANK_IN.QBA_EN)
Valve	BatchID		Batch number (TANK_IN\MX_TANK_IN.QBA_ID)
Valve	BatchName		Batch name (TANK_IN\MX_TANK_IN.QBA_NA)
Valve	StepNo		Batch step number (TANK_IN\MX_TANK_IN.QSTEP_NO)
Valve	Occupied		Occupied by batch (TANK_IN\MX_TANK_IN.QOCCUPIED)
Valve	RdyToStart		Ready to start (TANK_IN\MX_TANK_IN.V1_RdyToStart)
Valve	RdyToReset		Ready to reset (TANK_IN\MX_TANK_IN.V1_RdyToReset)
Valve	Ctrl		Control output (TANK_IN\MX_TANK_IN.V1_Ctrl)
Valve	AutAct		Automatic mode active (TANK_IN\MX_TANK_IN.V1_AutAct)

Copyright © Siemens AG 2013 All rights reserved

Block	Connection	Value	Typical Use
Valve	FbkOpenOut		Valve "open" (TANK_IN\MX_TANK_IN.V1_FbkOpenOut)
Valve	FbkClosedOut		Valve "closed" (TANK_IN\MX_TANK_IN.V1_FbkCloseOut)

YS_TankInDrain

The process tag "YS_ TankInDrain" controls a further valve to the drainage in the supply line from the CIP to the mixer. The process tag receives the command to open or close the valve from the SFC-type instance "TANK_IN" and the "PuPa_Mixer" process tag. The "YS_TankInDrain" process tag is an instance of the process tag type "ValveLean".

The following table shows the configuration of the instance of "ValveLean".

Table 4-30

Block	Connection	Value	Typical Use
FbkOpen	PV_In	0	Feedback "Valve open", interconnection removed
FbkClose	PV_In	0	Feedback "Valve closed", interconnection removed
Permit	In01	0	Release for opening or closing from the rest position, interconnection removed
Interlock	In01	0	Locking, interconnection removed
Protect	In01	0	Protective locking, interconnection removed
Or04			Inserted as "1" for opening the valve via the SFC or the PuPa
1	In1		Opening through the PuPa (PuPa_Mixer\BIPuPa.ActGrp01)
1	In2		Opening through the SFC (TANK_IN\MX_TANK_IN.2_OpenAut)
1	Out		(TANK_IN\YS_TankInDrain\Valve.OpenAut)
Valve	AutModLi		Automatic mode via interconnection TANK_IN\MX_TANK_IN.V2_AutModLi
Valve	ModLiOp		Switch mode between operator / interconnection (TANK_IN\MX_TANK_IN.V2_ModLiOp)
Valve	RstLi		Reset via interconnection TANK_IN\MX_TANK_IN.V2_RstLi
Valve	BatchEn		Occupation enabled (TANK_IN\MX_TANK_IN.QBA_EN)
Valve	BatchID		Batch number (TANK_IN\MX_TANK_IN.QBA_ID)
Valve	BatchName		Batch name (TANK_IN\MX_TANK_IN.QBA_NA)
Valve	StepNo		Batch step number (TANK_IN\MX_TANK_IN.QSTEP_NO)
Valve	Occupied		Occupied by batch (TANK_IN\MX_TANK_IN.QOCCUPIED)
Valve	RdyToStart		Ready to start (TANK_IN\MX_TANK_IN.V2_RdyToStart)

Copyright © Siemens AG 2013 All rights reserved

Block	Connection	Value	Typical Use
Valve	RdyToReset		Ready to reset (TANK_IN\MX_TANK_IN.V2_RdyToReset)
Valve	Ctrl		Control output (TANK_IN\MX_TANK_IN.V2_Ctrl)
Valve	AutAct		Automatic mode active (TANK_IN\MX_TANK_IN.V2_AutAct)
Valve	FbkOpenOut		Valve "open" (TANK_IN\MX_TANK_IN.V2_FbkOpenOut)
Valve	FbkClosedOut		Valve "closed" (TANK_IN\MX_TANK_IN.V2_FbkCloseOut)

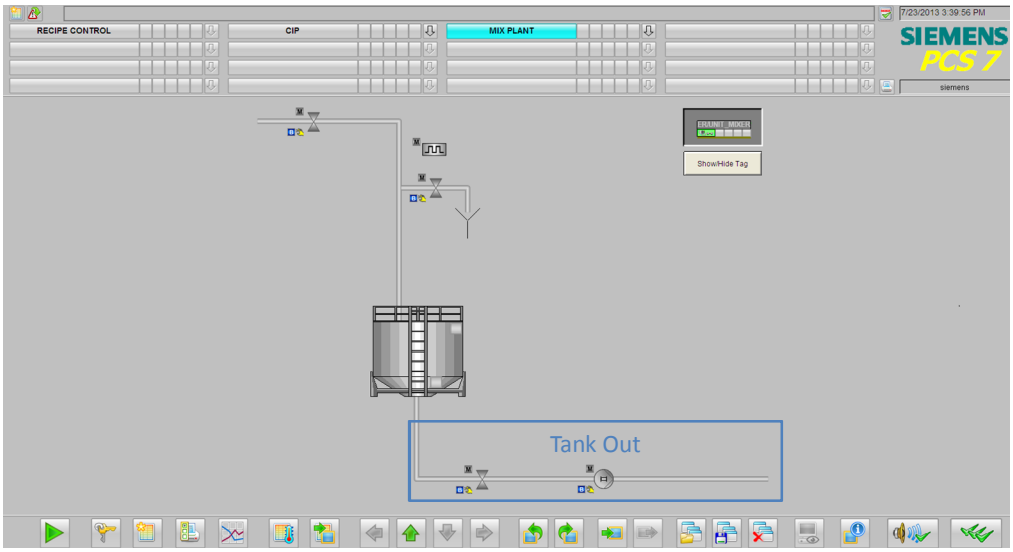
4.2.8 Mixer drainage (TANK_OUT)

The cleaning liquid is fed from the mixer back to the CIP facility via the drainage.

Setup

The following diagram shows the setup of the mixer drainage:

Figure 4-15



The valve and the pump are controlled via an SFC-type instance "TANK_OUT".

The table below provides an overview of all components and the process tag types used.

Table 4-31

Name	Process tag type	Description
TANK_Out	SFC-type instance "TANK_IN"	Control of the valve and the pump in the mixer drainage.
LSL_Mixer	"DigitalMonitoring"	Process tag for min. filling level reached
YS_TankOutMix	"ValveLean"	Valve for the mixer drainage
NS_Mixer	"MotorLean"	Pump for the mixer drainage

Copyright © Siemens AG 2013 All rights reserved

Parameter setting

The configuration of the individual process tags is described below. For a detailed description of the SFC type please refer to chapter "4.3. Step sequences".

LSL_Mixer

In the "LSL_Mixer" process tag, the filling level of the mixer is monitored for reaching the minimum value. The "LSL_Mixer" process tag is an instance of the process tag type "DigitalMonitoring". In the "CIP" application example, the process tag is used for illustrating the process and has no function. The process tag type was not changed.

NS_Mixer

The motor process tag NS_Mixer is used for emptying the mixer. The motor is controlled by the SFC-type instance "TANK_Out". The motor process tag "NS_Mixer" is an instance of the process tag type "MotorLean".

The table below shows the configuration of the instance of "MotorLean".

Table 4-32

Block	Connection	Value	Typical Use
Permit	In01		Interconnection removed
Interlock	In01		Interconnection removed
Protect	In01		Interconnection removed
Motor	StartAut		Starting the motor in automatic mode (TANK_OUT\MX_TANK_OUT.M1_StartAut)
Motor	ModLiOp		Switch mode between operator and interconnection (TANK_OUT\MX_TANK_OUT.M1_ModLiOp)
Motor	AutModLi		Automatic mode via interconnection TANK_OUT\MX_TANK_OUT.M1_AutModLi
Motor	BatchEn		Occupation enabled (TANK_OUT\MX_TANK_OUT.QBA_EN)
Motor	BatchId		Batch number (TANK_OUT\MX_TANK_OUT.QBA_ID)
Motor	BatchName		Batch name (TANK_OUT\MX_TANK_OUT.QBA_NA)
Motor	StepNo		Batch step number (TANK_OUT\MX_TANK_OUT.QSTEP_NO)
Motor	Occupied		Occupied by batch (TANK_OUT\MX_TANK_OUT.QOCCUPIED)
Motor	Start		Control "start" motor (TANK_OUT\MX_TANK_OUT.M1_Start)
Motor	FbkRunOut		Feedback for "Start" (TANK_OUT\MX_TANK_OUT.M1_FbkRunOut)

Copyright © Siemens AG 2013 All rights reserved

YS_TankOutMix

The valve process tag YS_TankOutMix controls the outflow of the cleaning liquid from the mixer back into the CIP facility. The process tag receives the command to open or close the valve from the SFC-type instance "TANK_OUT". The "YS_TankOutMix" valve process tag is an instance of the process tag type "ValveLean".

The table below shows the configuration of the instance of "ValveLean".

Table 4-33

Block	Connection	Value	Typical Use
Valve	OpenAut		"Valve open" in automatic mode (TAN_OUT\MX_TANK_OUT.V1_OpenAut)
Valve	CloseAut		"Valve closed" in automatic mode (TAN_OUT\MX_TANK_OUT.V1_CloseOut)
Valve	ModLiOp		Switch mode between operator and interconnection (TAN_OUT\MX_TANK_OUT.V1_ModLiOP)
Valve	AutModLi		Automatic mode via interconnection TAN_OUT\MX_TANK_OUT.V1AutModLi
Valve	Ctrl		Control output (TAN_OUT\MX_TANK_OUT.V1_Ctrl)
Valve	FbkOpenOut		Feedback "Valve open" (TAN_OUT\MX_TANK_OUT.V1_FbkOpenOut)
Valve	FbkCloseOut		Feedback "Valve closed" (TAN_OUT\MX_TANK_OUT.V1_FbkCloseOut)
Valve	GrpErr		Group error is "active" (TAN_OUT\MX_TANK_OUT.V1_GrpErr)
Valve	BatchEn		Occupation enabled (TAN_OUT\MX_TANK_OUT.QBA_EN)
Valve	BatchId		Batch number (TAN_OUT\MX_TANK_OUT.QBA_ID)
Valve	BatchName		Batch name (TAN_OUT\MX_TANK_OUT.QBA_NA)
Valve	StepNo		Batch step number (TAN_OUT\MX_TANK_OUT.QSTEP_NO)
Valve	Occupied		Occupied by batch (TAN_OUT\MX_TANK_OUT.QOCCUPIED)

Copyright © Siemens AG 2013 All rights reserved

4.3 Step sequences (SFC-type instances)

The CIP facility is designed for batch mode. There are different SFC-type instances with different tasks within the facility. According to ISA 88, the SFC-type instance describes the technical installations. These will be described in the following.

The following table summarizes the SFC types of the "CIP" example application:

Table 4-34

SFC Type Name	Comment
CIP RETURN	The return of the CIP facility
CIP SUPPLY	The supply of the CIP facility
FILL_HEAT_CONC	The preparation of the liquid (no SIMATIC BATCH functionality)

4.3.1 CIP RETURN

The SFC-type instance is started by SIMATIC BATCH in the cleaning recipes and opens or closes the valves to the tanks and the drainage in the return line of the CIP facility. This is done in dependence of the control strategy (defined in the recipe) and the quality of the liquid.

Copyright © Siemens AG 2013 All rights reserved

Control Strategies

The table below summarizes the control strategies of the SFC type "CIP RETURN".

Table 4-35

Control Strategy Name	Comment
PRE RINSE	Control strategy for prerinse phase
DETERGENT	Control strategy for rinse phase
POST RINSE	Control strategy for postrinse phase

Setpoints

The following table summarizes the setpoint values of the SFC type "CIP RETURN".

Table 4-36

Setpoint name	Data type	Connection name	Unit	Comment
TEMP_RINSE	REAL	PRE_TEP	°C	Temperature prerinse liquid
TEMP_DETERGENT	REAL	DET_TEMP	°C	Temperature detergent
HYSTERESIS_TEMP	REAL	T_HYS	°C	Temperature hysteresis
PRE_CONC	REAL	PRE_CONC	mS	Detergent concentration prerinse liquid

Setpoint name	Data type	Connection name	Unit	Comment
DET_CONC	REAL	DET_CONC	mS	Detergent concentration detergent
HYSTERESIS	REAL	C_HYS	mS	Concentration hysteresis

Process values

The following table summarizes the process values of the SFC type "CIP RETURN":

Table 4-37

Process value name	Data type	Connection name	Comment
TEMP_PRE_SUB	REAL	TEMP_PRE_SUB	Temperature prerinse liquid
TEMP_DET_SUB	REAL	TEMP_DET_SUB	Temperature detergent
CONC_PRE_SUB	REAL	CONC_PRE_SUB	Detergent concentration prerinse liquid
CONC_DET_SUB	REAL	CONC_DET_SUB	Detergent concentration detergent

Copyright © Siemens AG 2013 All rights reserved

Block contacts

The following table summarizes the block contacts of the SFC type "CIP RETURN":

Table 4-38

Name	Block	Connection name	Comment
V1	VlvL	V1	Valve to prerinse tank
V2	VlvL	V2	Valve to detergent tank
V3	VlvL	V3	Valve to drainage
LS1	MonDiL	LS1	Filling level monitoring prerinse tank
LS2	MonDiL	LS2	Filling level monitoring detergent tank

Step sequences

The following step sequences are configured in the SFC type "CIP RETURN":

- PRE RINSE Switches all valves to automatic mode, closes the valves to the tanks, opens valve to the drainage
- DETERGENT: Switches all valves to automatic mode, opens valves to the corresponding tanks and closes the valve to the drainage if the tanks are full or the liquid not OK.
- POST RINSE: see DETERGENT
- COMPLETING_ABORT: Closes all valves and enables them for manual mode again.

COMPLETING_ABORT

The "COMPLETING_ABORT" sequence closes all valves and enables them for manual operation and sets the SFC to the "IDLE" state.

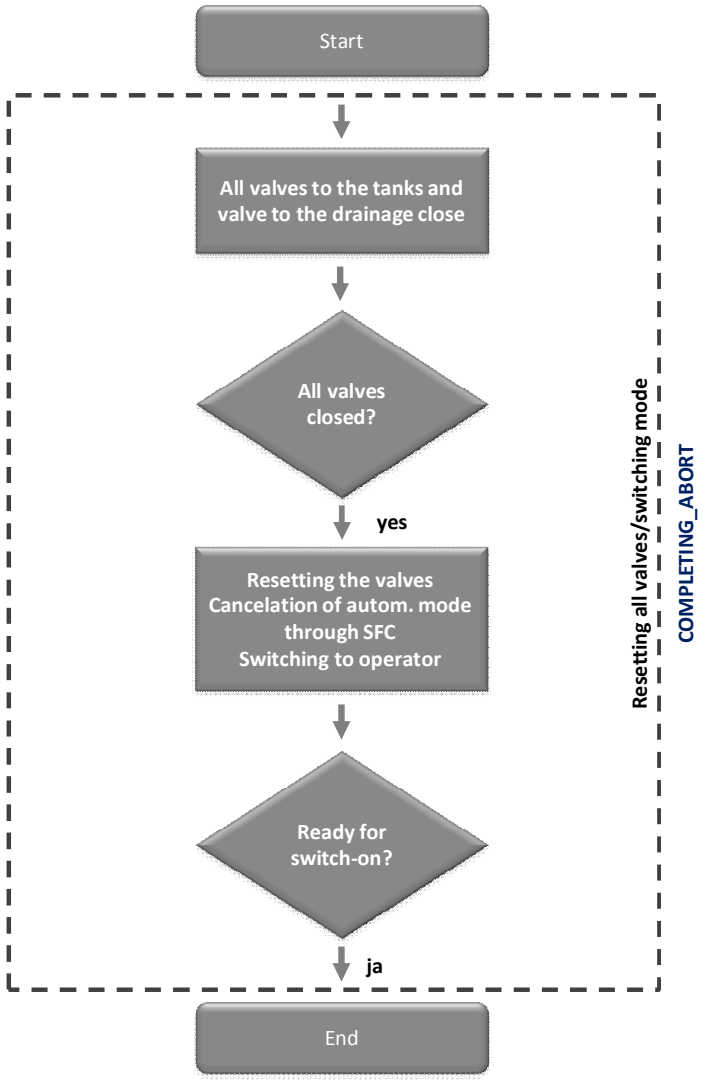
The following table summarizes the start conditions of the "COMPLETING_ABORT" sequence:

Table 4-39

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

The following diagram summarizes the setup of the "COMPLETING_ABORT" sequence.

Figure 4-16



Copyright © Siemens AG 2013 All rights reserved

PRERINSE

The "PRERINSE" sequence performs the following actions during the prerinse phase:

- Sets the valves in the return line into automatic mode
- Closes all valves to the tanks
- Opens the valve to drainage
- Sets the SFC into the "Ready to Complete" status at the end of processing

The following table summarizes the start conditions of the "PRERINSE" sequence:

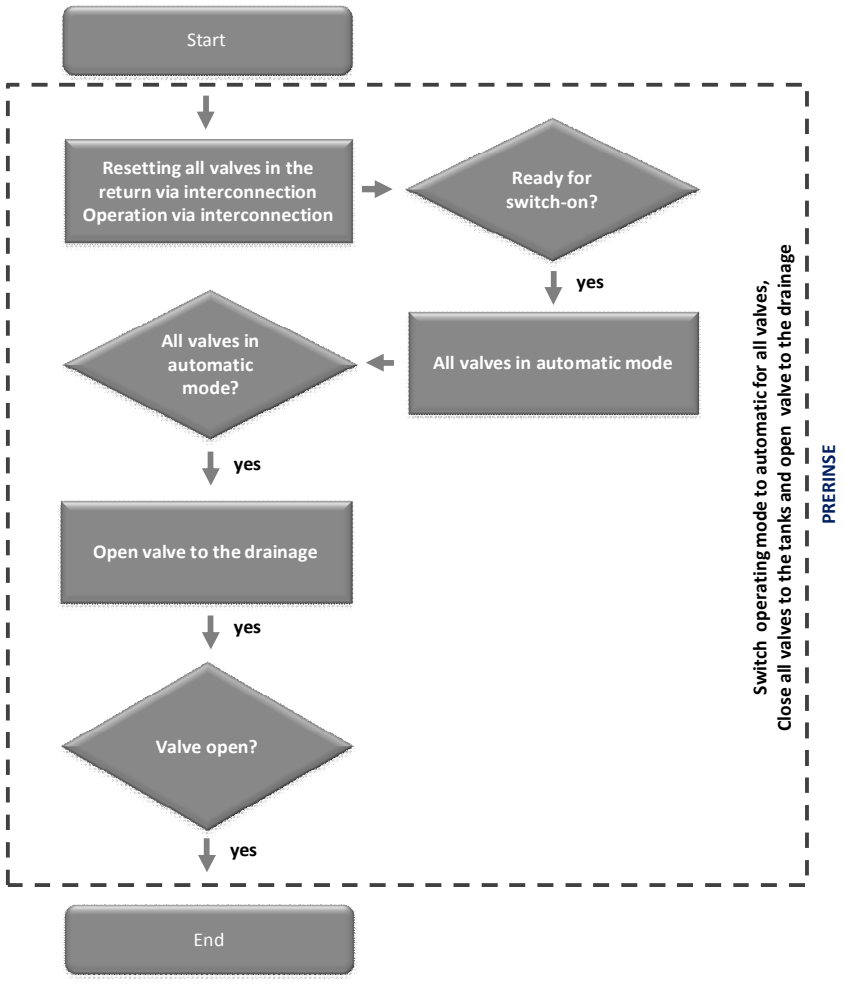
Table 4-40

SFC Status	=	Value	Logic
Run	=	Run	AND
QCS	=	1	
READY_TC	=	0	

The sequence will stay active until it is completed by the superimposed control (SIMATIC BATCH).

The following diagram summarizes the setup of the "PRERINSE" sequence.

Figure 4-17



Copyright © Siemens AG 2013 All rights reserved

DETERGENT

The "DETERGENT" sequence performs the following actions during the rinse phase:

- Sets the valves in the return line into automatic mode
- Opens or closes the valves depending on tank levels and quality of the liquid
- Sets the SFC into the "Ready to Complete" status (in every "valve step")

There is a separate step for each valve that is opened or closed ("valve step"). In that step the corresponding valve will be opened and all other valves will be closed. In the subsequent transition, conditions will be checked for any changes. If conditions have changed, a different valve step will be jumped to accordingly.

The following table summarizes the start conditions of the "DETERGENT" sequence:

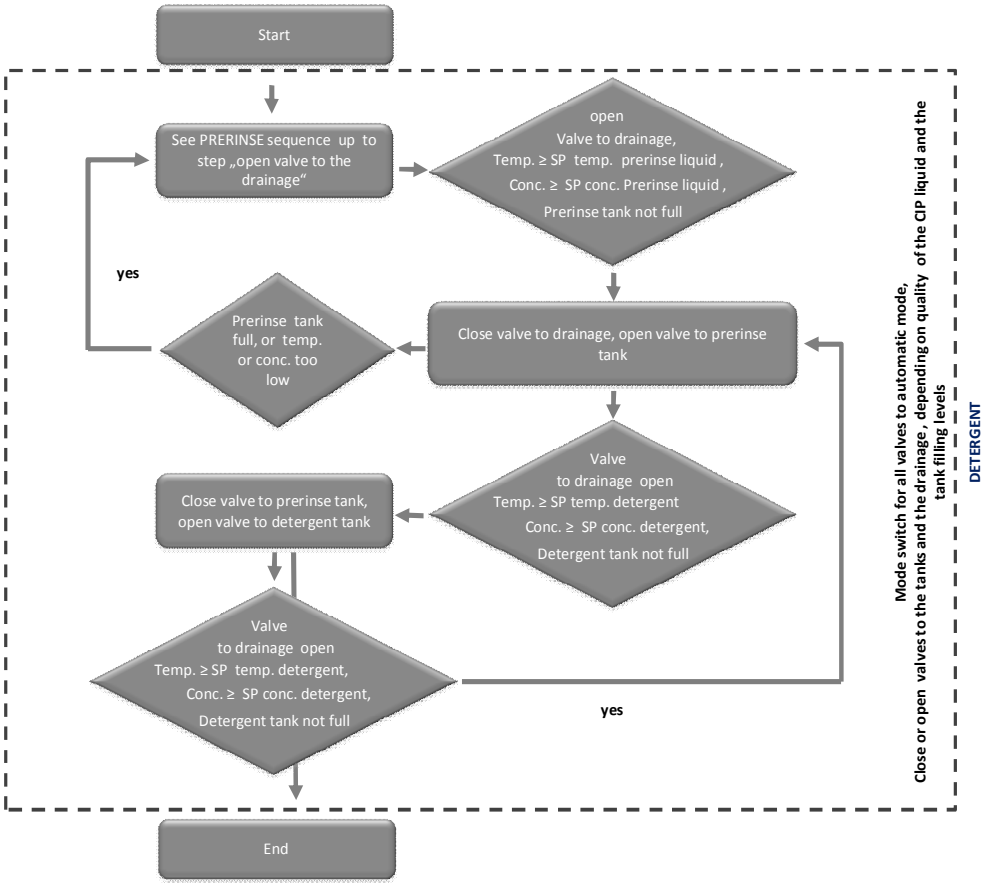
Table 4-41

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

The sequence will stay active until completed by the superimposed control (SIMATIC BATCH).

The following diagram summarizes the setup of the "DETERGENT" sequence.

Figure 4-18



Copyright © Siemens AG 2013 All rights reserved

POSTRINSE

The "POSTRINSE" sequence performs the following actions during the postrinse phase:

- Sets the valves in the return line into automatic mode
- Opens or closes the valves depending on tank levels and quality of the liquid
- Sets the SFC into the "Ready to Complete" status (in every "valve step")

There is a separate step for each valve that is opened or closed ("valve step"). In that step the corresponding valve will be opened and all other valves will be closed. In the subsequent transition, conditions will be checked for any changes. If conditions have changed, a different valve step will be jumped to accordingly.

The following table summarizes the start conditions of the "POSTRINSE" sequence:

Table 4-42

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

The sequence will stay active until completed by the superimposed control (SIMATIC BATCH).

The setup of the "POSTRINSE" sequence is identical with the "DETERGENT" sequence.

Copyright © Siemens AG 2013 All rights reserved

4.3.2 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 facility to the supply line. This is done in dependence of the control strategy (defined in the recipe). In addition, a pump is started that pumps the liquid from the tanks into the units to be cleaned. Before liquid is withdrawn from the tanks, the compliance with the corresponding requirements is checked.

Control Strategies

The following table summarizes the control strategies of the SFC type "CIP SUPPLY".

Table 4-43

Control Strategy Name	Comment
PRERINSE	Control strategy for prerinse phase
DETERGENT	Control strategy for rinse phase
POSTRINSE	Control strategy for postrinse phase

Copyright © Siemens AG 2013 All rights reserved

Setpoints

The following table summarizes the control strategies of the SFC type "CIP SUPPLY".

Table 4-44

Setpoint name	Data type	Connection name	Unit	Comment
RINSE_TIME	REAL	RINSE_TIME	s	Rinsing time of the phase
RINSE_FLOW	REAL	RINSE_FLOW	m³/h	Flow rate

Process values

The following table summarizes the process values of the SFC type "CIP SUPPLY".

Table 4-45

Process value name	Data type	Connection name	Comment
PRERINSE_READY	BOOL	PRERINSE_READY	Prerinse liquid OK
DETERGENT_READY	BOOL	DETERGENT_READY	Detergent OK
POSTRINSE_READY	BOOL	POSTRINSE_READY	Postrinse liquid OK

Block contacts

The following table summarizes the block contacts of the SFC type "CIP RETURN":

Table 4-46

Name	Block	Connection name	Comment
V1	VlvL	V1	Valve to prerinse tank
V2	VlvL	V2	Valve to detergent tank
V3	VlvL	V3	Valve to postrinse tank
M1	MotSpdCL	M1	Pump supply modules
TIMER1	BlTimer	TIMER1	Timer supply modules

Step sequences

The following step sequences are configured in the SFC type "CIP SUPPLY ":

- PRERINSE: Sets all valves and the pump to automatic mode, opens the drainage valve of the prerinse tank, closes drainage valves of detergent tank and postrinse tank, starts the pump
- DETERGENT: Sets all valves and the pump to automatic mode, opens the drainage valve of the detergent tank, closes drainage valves of prerinse tank and postrinse tank, starts the pump
- POSTRINSE: Sets all valves and the pump to automatic mode, opens the drainage valve of the prerinse tank, closes drainage valves of detergent tank and postrinse tank, starts the pump
- Resuming: Starts the pump after one of the "run sequences" was stopped
- Holding: Stops the pump if one of the "rinse sequences" is stopped
- Completing_Abort: Closes all valves and stops the pump and enables them for manual mode

The instance of the SFC type "CIP SUPPLY" is interconnected with the "RINSETIMER" block. This is to ensure that the specified dwell time of the cleaning fluid in the unit to be cleaned is maintained. The "RINSETIMER" block is an instance of function block "BlTimer" from the BRAUMAT library.

Copyright © Siemens AG 2013 All rights reserved

PRERINSE

The "PRERINSE" sequence performs the following actions during the prerinse phase:

- Sets the valves in the supply line and the pump to automatic mode
- Checks whether the prerinse liquid complies with the quality requirements and is available in sufficient amounts.
- Closes the valves of detergent and postrinse tank
- Opens the valve of the prerinse tank
- Starts the timer

The following table summarizes the start conditions of the "PRERINSE" sequence:

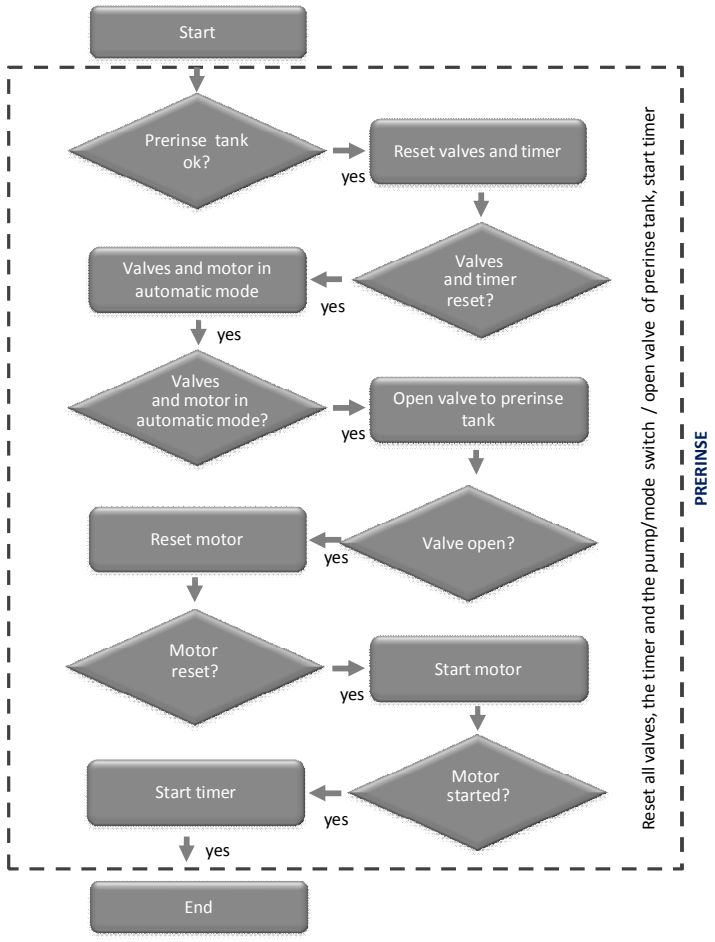
Table 4-47

SFC Status	=	Value	Logic
RUN	=	Run	AND
QCS		1	

The "PRERINSE" sequence stays active until the time set at the timer has elapsed.

The following diagram summarizes the setup of the "PRERINSE" sequence.

Figure 4-19



Copyright © Siemens AG 2013 All rights reserved

DETERGENT

The "DETERGENT" sequence performs the following actions during the rinse phase:

- Sets the valves in the supply line and the pump to automatic mode.
- Checks whether the detergent complies with the quality requirements and is available in sufficient amounts.
- Closes the valves of prerinse and postrinse tank.
- Opens the valve of the detergent tank.
- Starts the timer.

The following table summarizes the start conditions of the "DETERGENT" sequence:

Table 4-48

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

The "DETERGENT" sequence stays active until the time set at the timer has elapsed.

The setup of the "DETERGENT" sequence corresponds to the "PRERINSE" sequence with the following differences:

- The valve to the postrinse tank is opened instead of the valve to the prerinse tank.
- Different setpoint values for the timer

POSTRINSE

The "POSTRINSE" sequence performs the following actions during the postrinse phase:

- Sets the valves in the supply line and the pump to automatic mode.
- Checks whether the postrinse liquid complies with the quality requirements and is available in sufficient amounts.
- Closes the valves of prerinse and detergent tank.
- Opens the valve of the postrinse tank.
- Starts the timer

The following table summarizes the start conditions of the "PRERINSE" sequence:

Table 4-49

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

The "POSTRINSE" sequence stays active until the time set at the timer has elapsed.

The setup of the "POSTRINSE" sequence corresponds to the "PRERINSE" sequence with the following differences:

- The valve to the postrinse tank is opened instead of the valve to the prerinse tank.
- Different setpoint values for the timer

Copyright © Siemens AG 2013 All rights reserved

Completing_Abort

The "COMPLETING_ABORT" sequence closes all valves and enables them for manual operation and sets the SFC to the "IDLE" state.

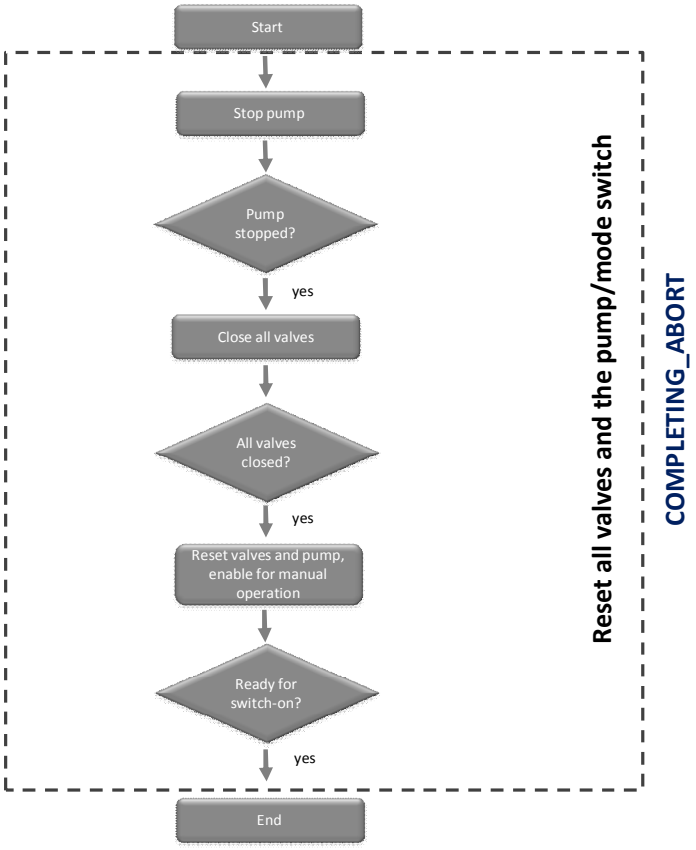
The following table summarizes the start conditions of the "COMPLETING_ABORT" sequence:

Table 4-50

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

The following diagram summarizes the setup of the "COMPLETING_ABORT" sequence:

Figure 4-20



Copyright © Siemens AG 2013 All rights reserved

Holding

The "Holding" sequence stops the pump in the supply line and if one of the run sequences is stopped. The pump is stopped so that no further liquid is withdrawn. The timer is stopped.

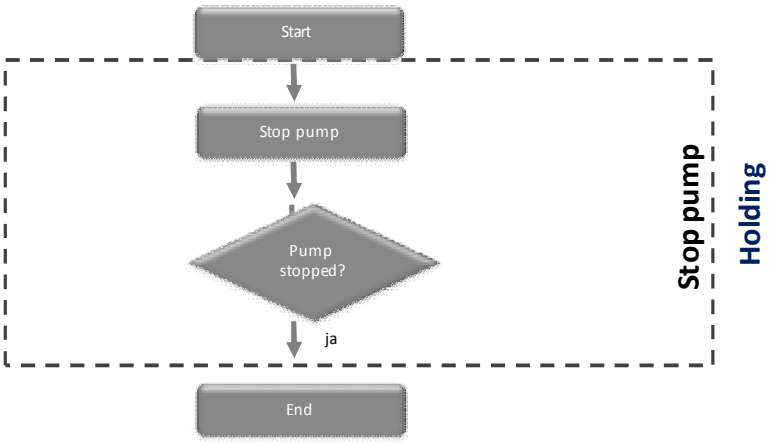
The following table summarizes the start conditions of the "Holding" sequence:

Table 4-51

SFC Status	=	Value	Logic
HOLDING	=	Holding	OR

The following diagram summarizes the setup of the "Holding" sequence:

Figure 4-21



Resuming

The "Resuming" sequence starts the pump in the supply line and if one of the run sequences is to be re-started. The timer is continued.

The following table summarizes the start conditions of the "Resuming" sequence:

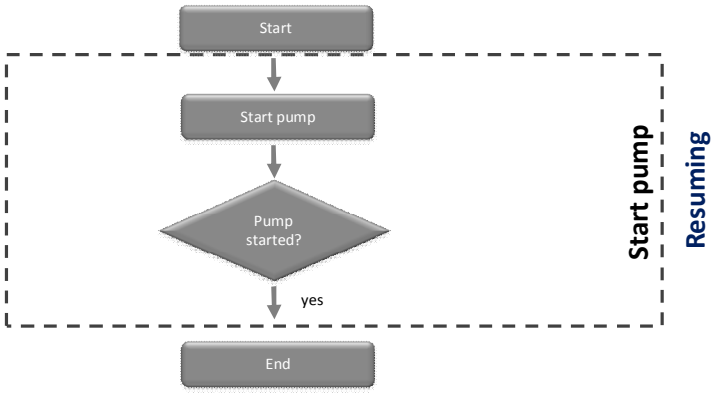
Table 4-52

SFC Status	=	Value	Logic
RESUMING	=	Resuming	OR

The following diagram summarizes the setup of the "Resuming" sequence:

Copyright © Siemens AG 2013 All rights reserved

Figure 4-22



4.3.3 FILL_HEAT_CONC

The SFC-type instance "FHC" is started by the operator. It must be permanently active to ensure that the detergent is available in sufficient amounts and the specified quality at any time.

The filling level, the temperature and the detergent concentration of the liquid are detected and, if required, adjusted via the SFC-type instance "FHC" of the SFC type "FILL_HEAT_CONC".

In the "CIP" application example, the liquids of the pre- and postrinste tank are not being prepared. These liquids can be prepared with the SFC type "FILL_HEAT_CONC".

Control Strategies

The following table summarizes the control strategies of the SFC type "FILL_HEAT_CONC":

Table 4-53

Control Strategy Name	Comment
PREPARE	Preparation of the liquid

Setpoints

The following table summarizes the setpoint values of the SFC type "FILL_HEAT_CONC":

Table 4-54

Setpoint name	Data type	Connection name	Unit	Comment
LEVEL	REAL	LEVEL	L	Tank level
HYSTERESIS_LEVEL	REAL	L_HYS	L	Hysteresis, tank level
TEMPERATURE	REAL	TEMP	°C	Temperature of the liquid
HYSTERESIS_Temp	REAL	T_HYS	°C	Temperature of the hysteresis
CONCENTRATION	REAL	CONC	mS	Detergent concentration
HYSTERESIS_Conc	REAL	C_HYS	mS	Hysteresis detergent

Copyright © Siemens AG 2013 All rights reserved

Parameters

The following table summarizes the parameters of the SFC type "FILL_HEAT_CONC":

Table 4-55

Parameter name	Data type	Connection name	Comment
LEVEL_SP_HYS	REAL	LEVEL_SP_HYS	
TEMP_SP_HYS	REAL	TEMP_SP_HYS	
CONC_SP_HYS	REAL	CONC_SP_HYS	
LEVEL_CECK	BOOL	LEVEL_CECK	

Note texts

The following table summarizes the note texts of the SFC type "FILL_HEAT_CONC":

Table 4-56

Name	Number	Display text
CIP_Ready	1	CIP ready?

Copyright © Siemens AG 2013 All rights reserved

Block contacts

The following table summarizes the block contacts of the SFC type "FILL_HEAT_CONC":

Table 4-57

Name	Block	Connection name	Comment
V!	VlvL	V1	Valve fresh water
V2	VlvL	V2	
M1	MotL	M1	Motor circulation pump
M2	MotL	M2	Motor metering pump
LS1	MonDiL	LS1	Filling level monitoring high
LS2	MonDiL	LS2	Filling level monitoring low
PID1	PIDConL	PID1	Temperature controller
PUPA1	BlPuPa	PUPA1	Pulse pause for metering
ANA1	MonAnL	ANA1	

Step sequences

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

- PREPARE: Sets filling level, temperature and detergent concentration
- ABORTING: Closes the valves and stops the pumps

PREPARE

The "PREPARE" sequence is the run sequence of the SFC-type instance and is permanently active.

The "PREPARE" sequence performs the following actions:

- Sets the valves and the pumps to automatic mode
- Measures the filling level and refills the liquid
- Measures the temperature of the liquid and controls it
- Measures the concentration of the detergent and controls it

The sequence is started by the operator.

The following table summarizes the start conditions of the "PREPARE" sequence:

Table 4-58

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

The sequence stays active until stopped by the operator. Within the sequence, the first point to be checked is whether the filling level is sufficient and whether it might have to be readjusted. If the filling level is sufficient, the next point to be checked is whether the temperature is high enough and whether it might have to be readjusted. Once the level and the temperature are set, the concentration of the detergent will be checked and readjusted, if required.

Copyright © Siemens AG 2013 All rights reserved

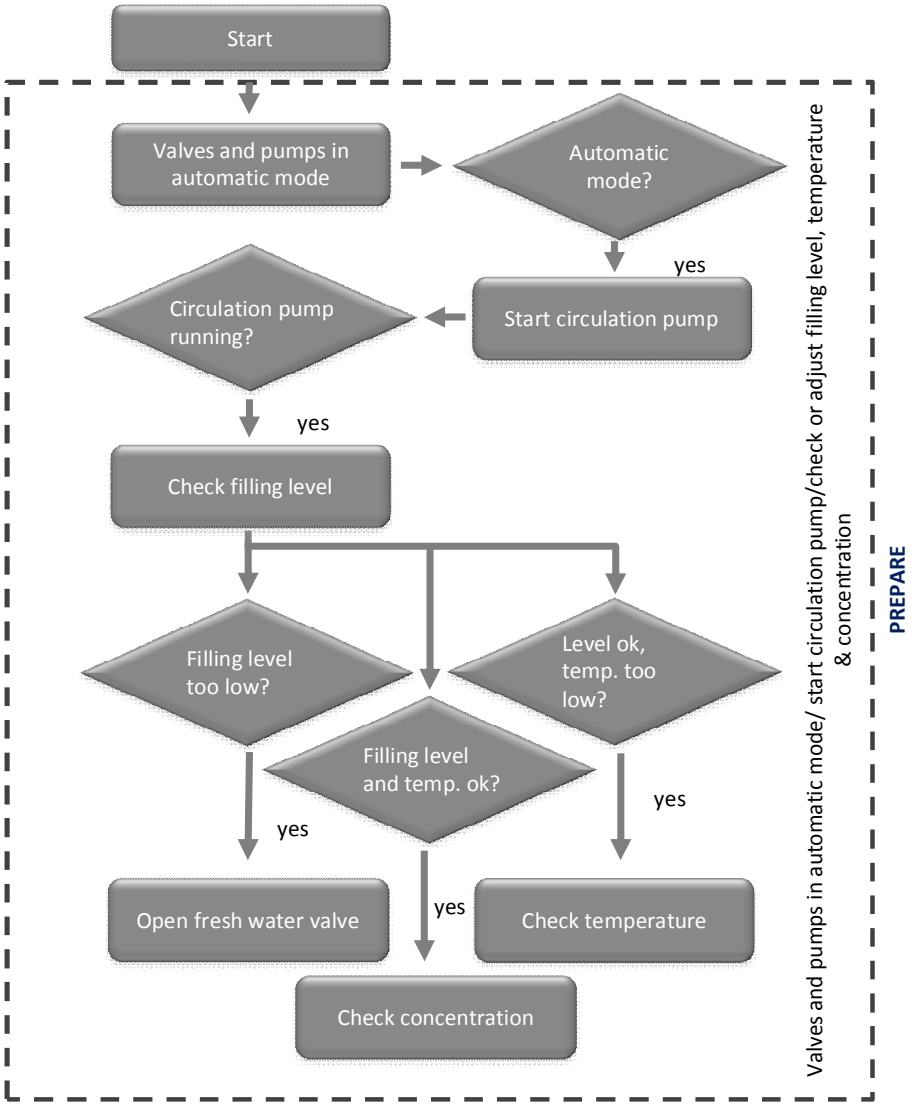
The detergent was dosed through the BlPuPa block (BRAUMAT library) interconnected with the SFC-type instance. Via this block the metering pump is controlled in a pulse-shaped mode through a defined cycle.

The setup of the "PREPARE" sequence is described in the following four diagrams.

Figure 4-23 shows the sequence of the following actions:

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

Figure 4-23

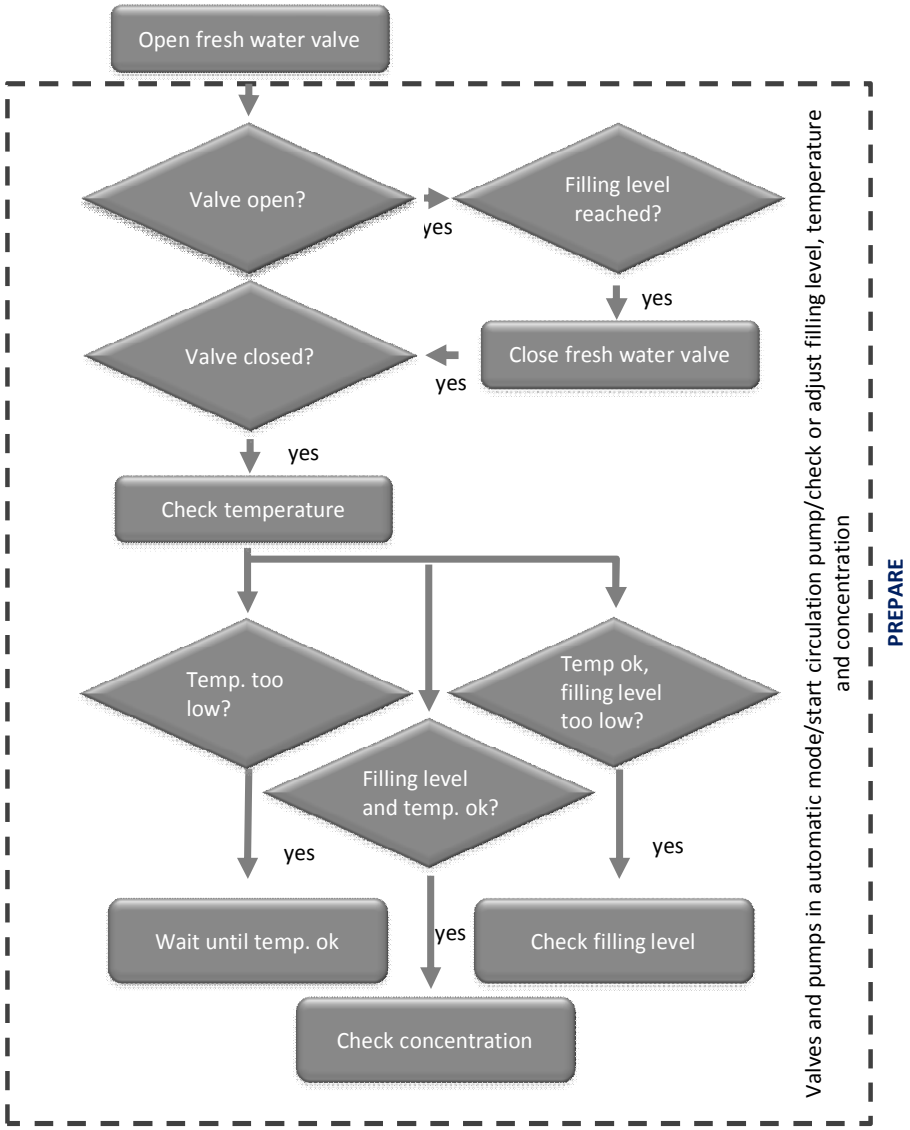


Copyright © Siemens AG 2013 All rights reserved

Figure 4-24 shows the sequence of the following actions:

- Adjust the filling level (open/close fresh water valve)
- Check the temperature
- Adjust the temperature or jump to the steps for filling level and/or concentration checking

Figure 4-24

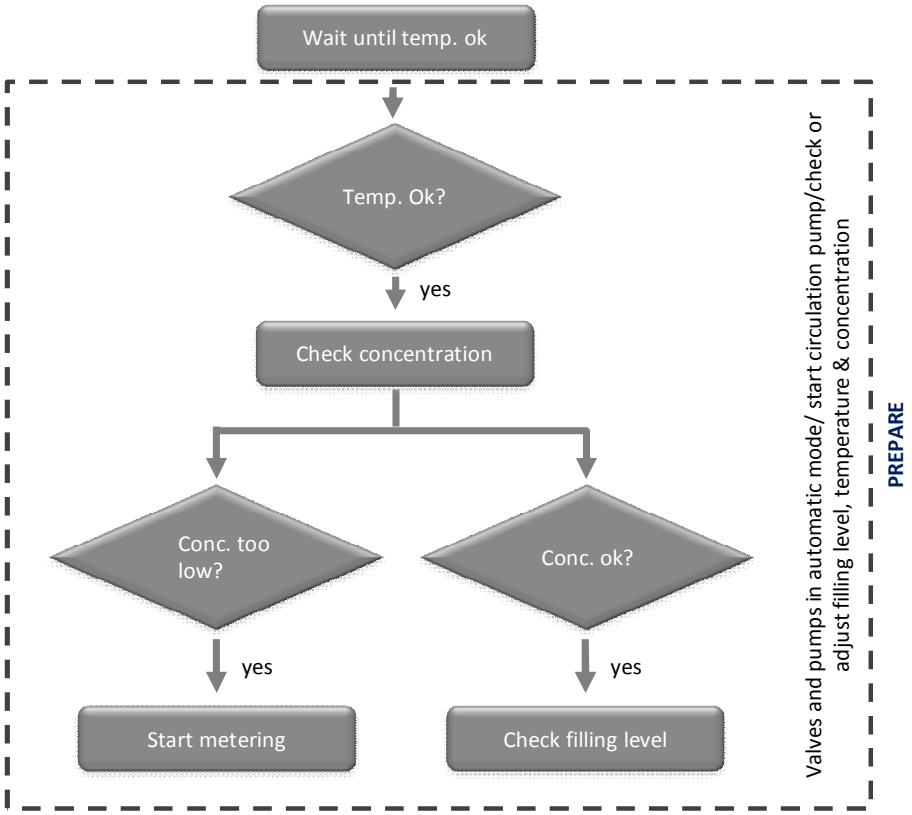


Copyright © Siemens AG 2013 All rights reserved

Figure 4-25 shows the sequence of the following actions:

- Adjust the temperature (let liquid circulate)
- Check the concentration
- Adjust the concentration or jump to the steps for filling level checking

Figure 4-25

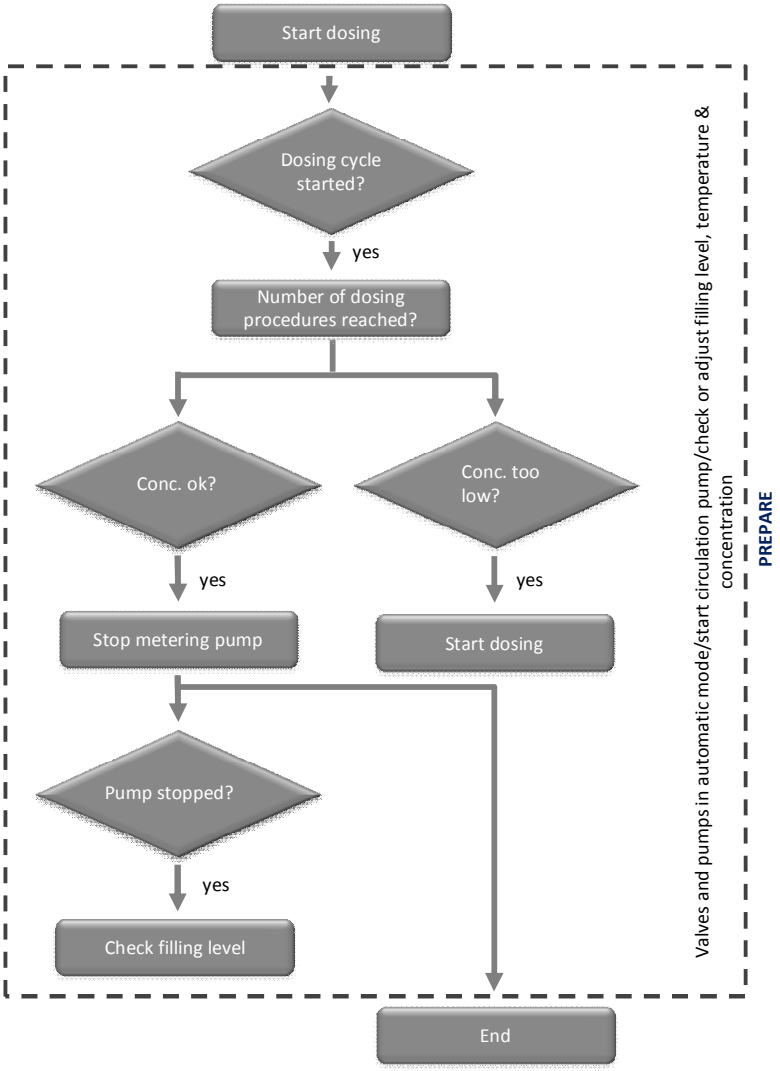


Copyright © Siemens AG 2013 All rights reserved

Figure 4-26 shows the sequence of the following actions:

- Adjust the concentration (start pulse pause control of the metering pump)
- Check the concentration
- Restart dosing or jump to step for filling level checking

Figure 4-26



Copyright © Siemens AG 2013 All rights reserved

ABORTING

The "ABORTING" sequence is performed if the "PREPARE" run sequence is aborted.

The "ABORTING" sequence performs the following actions:

- Closes all valves
- Stops all pumps

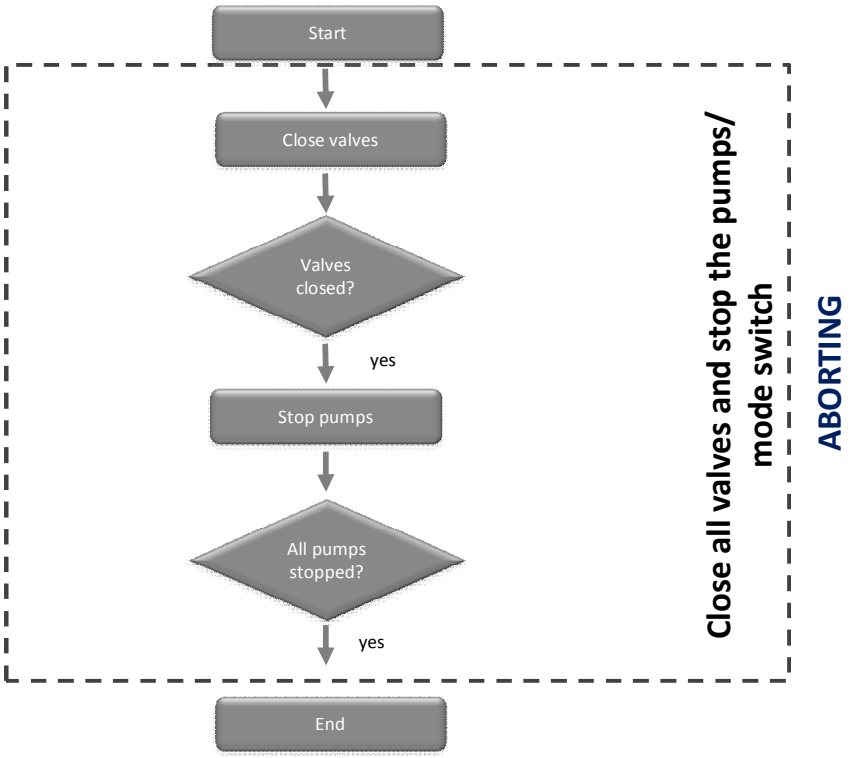
The following table summarizes the start conditions of the "ABORTING" sequence:

Table 4-59

SFC Status	=	Value	Logic
ABORTING	=	Aborting	OR

The following diagram summarizes the setup of the "ABORTING" sequence:

Figure 4-27



4.3.4 TANK_IN

The SFC-type instance is started by SIMATIC BATCH in the cleaning recipes and opens or closes the valve to the mixer and controls the BlPuPa block for the valve to the drainage.

Control Strategies

The following table summarizes the control strategies of the SFC type "TANK_IN":

Table 4-60

Control Strategy Name	Comment
PRODUCTION	for production phase
CIP	for cleaning the mixer

Block contacts

The following table summarizes the block contacts of the SFC type "TANK_IN":

Table 4-61

Name	Block	Connection name	Comment
V1	VlvL	V1	Valve mixer
V2	VlvL	V2	Valve drainage
PUPA	BlPuPa	PUPA	Connection for pulse pause block

Copyright © Siemens AG 2013 All rights reserved

Step sequences

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

- PRODUCTION: Opens and closes the valves
- CIP: Opens and closes the valves, starts the pulse pause block
- COMPLETING_ABORT: closes the valvese, resets the pulse pause block

PRODUCTION

The "PRODUCTION" sequence performs the following actions during production:

- Resets the valves
- Sets the valves to automatic mode
- Opens the valves

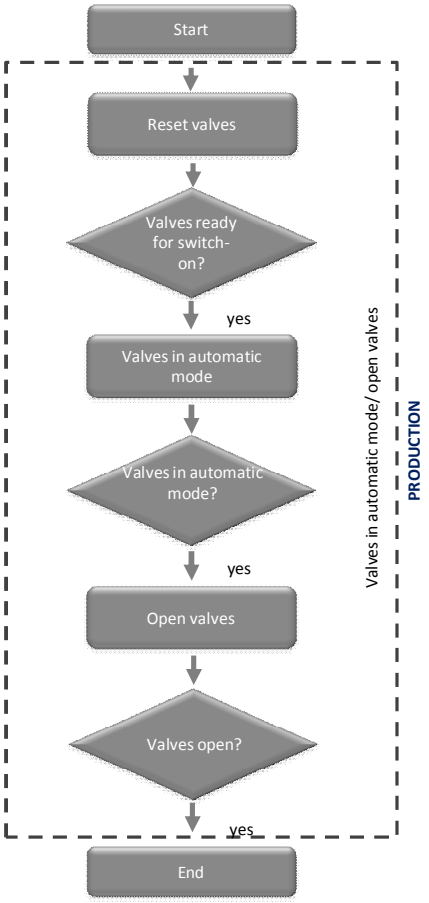
The following table summarizes the start conditions of the "PRODUCTION" sequence:

Table 4-62

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

The following diagram summarizes the setup of the "PRODUCTION" sequence.

Figure 4-28



Copyright © Siemens AG 2013 All rights reserved

CIP

The "CIP" sequence performs the following actions during the cleaning phase:

- Resets the valves and the pulse pause block
- Sets the valves and the pulse pause block to automatic mode
- Opens the valve to the mixer and starts the pulse pause block

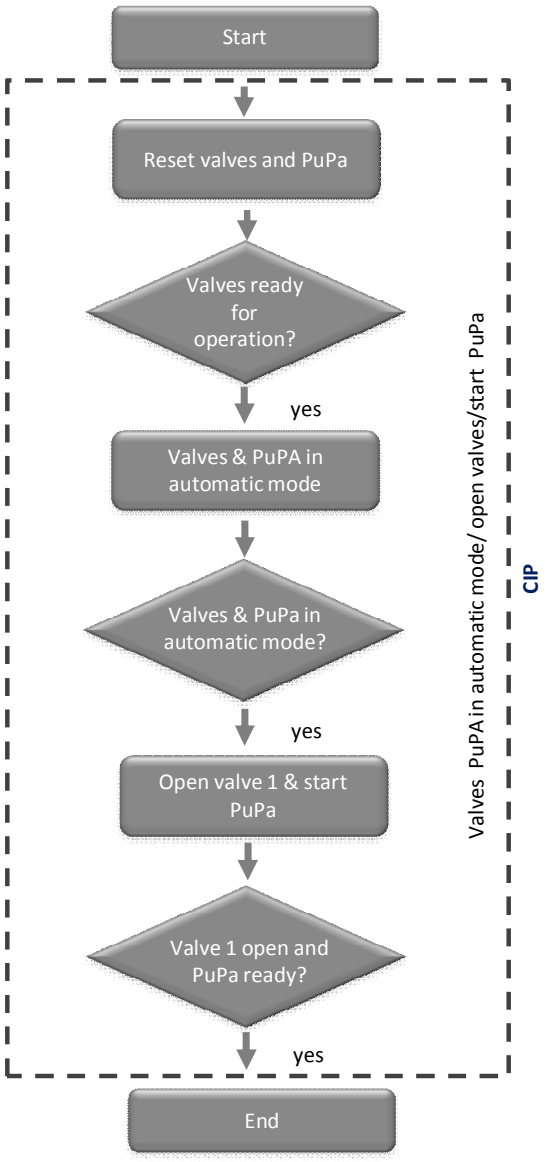
The following table summarizes the start conditions of the "CIP" sequence:

Table 4-63

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

The following diagram summarizes the setup of the "CIP" sequence.

Figure 4-29



Copyright © Siemens AG 2013 All rights reserved

COMPLETING_ABORT

The "COMPLETING_ABORT" sequence is executed if a run sequence was completed or aborted. The "COMPLETING_ABORT" sequence performs the following actions:

- Closes all valves and enables them for manual mode
- Resets the PuPa and enables it for manual mode
- Sets the SFC into the "IDLE" state

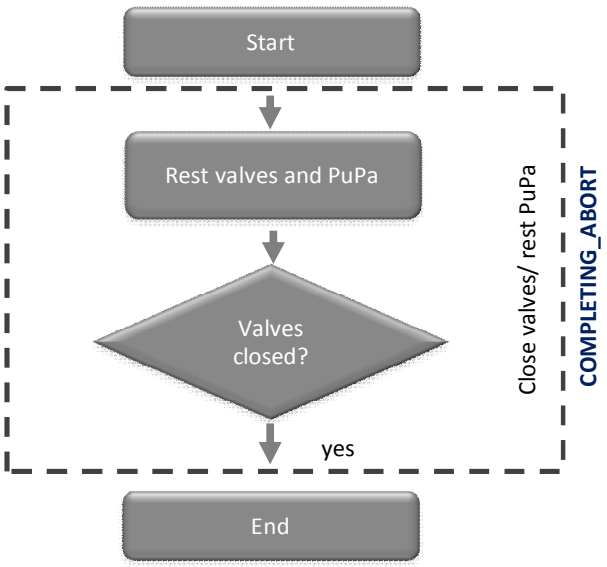
The following table summarizes the start conditions of the "COMPLETING_ABORT" sequence:

Table 4-64

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

The following diagram summarizes the setup of the "CIP" sequence.

Figure 4-30



Copyright © Siemens AG 2013 All rights reserved

4.3.5 TANK_OUT

The SFC-type instance is started by SIMATIC BATCH in the cleaning recipes and opens or closes the drain valve to the mixer and starts or stops the pumps for pumping out the mixer.

Control Strategies

The following table summarizes the control strategies of the SFC type "TANK_OUT":

Table 4-65

Control Strategy Name	Comment
PRODUCTION	for production phase
CIP	for cleaning the mixer

Block contacts

The following table summarizes the block contacts of the SFC type "TANK_OUT":

Table 4-66

Name	Block	Connection name	Comment
V1	VlvL	V1	Valve mixer
V2	VlvL	V2	Valve freely available
M1	MotL	M1	Motor for pump

Step sequences

The following step sequences are configured in the SFC:

- PRODUCTION: Opens and closes the valve, starts and stops the motor
- CIP: Opens and closes the valve, starts and stops the motor
- COMPLETING_ABORT: Closes the valve and resets it, stops the motor and resets it
- RESUMING: Starts the motor
- HOLDING: Stops the motor

Copyright © Siemens AG 2013 All rights reserved

PRODUCTION

The "PRODUCTION" sequence performs the following actions during production:

- Resets the valve and the motor
- Sets the valve and the motor to automatic mode
- Opens the valve
- Starts the motor

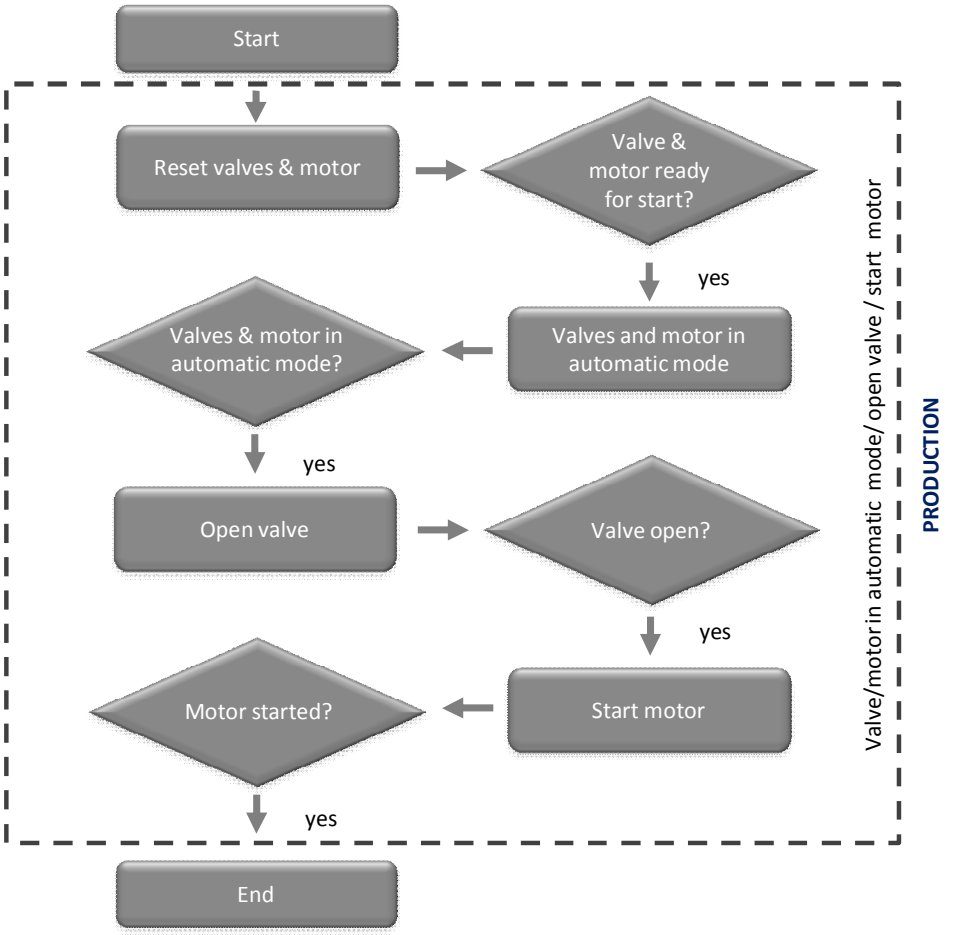
The following table summarizes the start conditions of the "PRODUCTION" sequence:

Table 4-67

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

The following diagram summarizes the setup of the "CIP" sequence.

Figure 4-31



Copyright © Siemens AG 2013 All rights reserved

CIP

The "CIP" sequence performs the following actions during the cleaning phase:

- Resets the valve and the motor
- Sets the valve and the motor to automatic mode
- Opens the valve
- Starts the motor

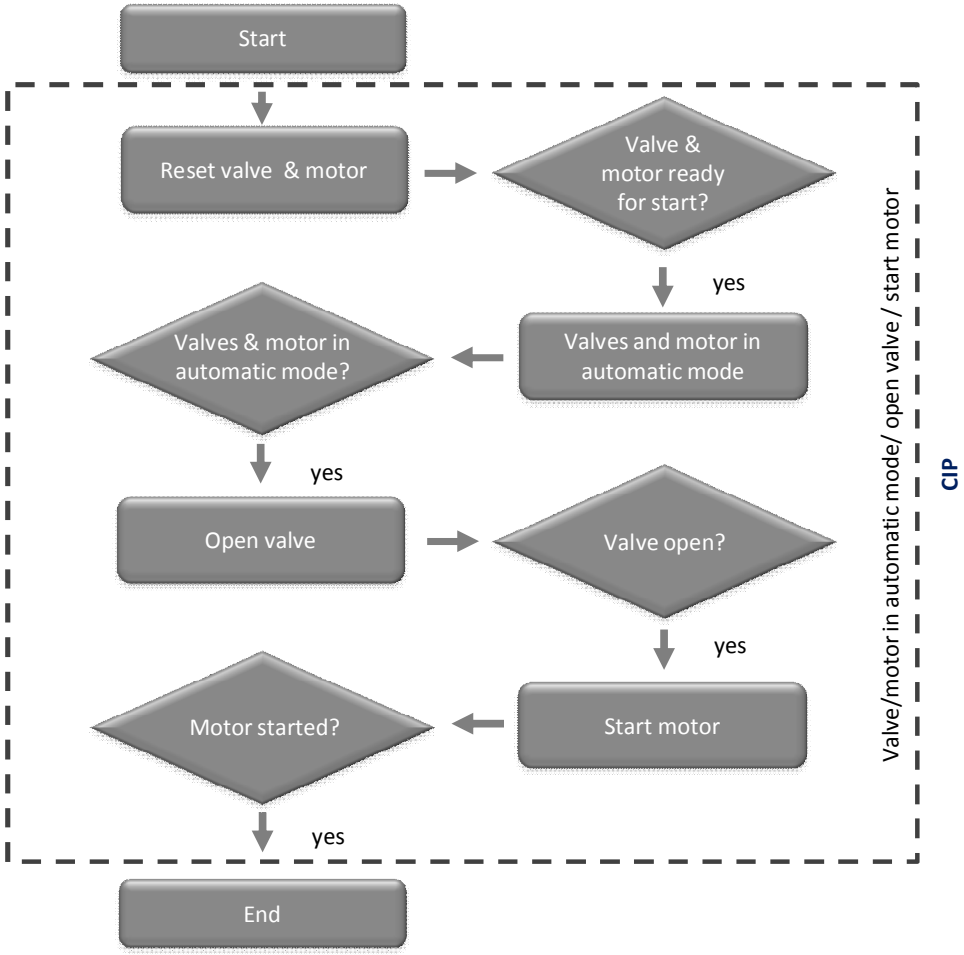
The following table summarizes the start conditions of the "CIP" sequence:

Table 4-68

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

The following diagram summarizes the setup of the "CIP" sequence.

Figure 4-32



Copyright © Siemens AG 2013 All rights reserved

COMPLETING_ABORT

The "COMPLETING_ABORT" sequence is executed if a run sequence was completed or aborted. The "COMPLETING_ABORT" sequence performs the following actions:

- Stops the motor and enables it for manual mode
- Closes the valve and enables it for manual mode
- Resets the valve and the motor
- Sets the SFC into the "IDLE" state

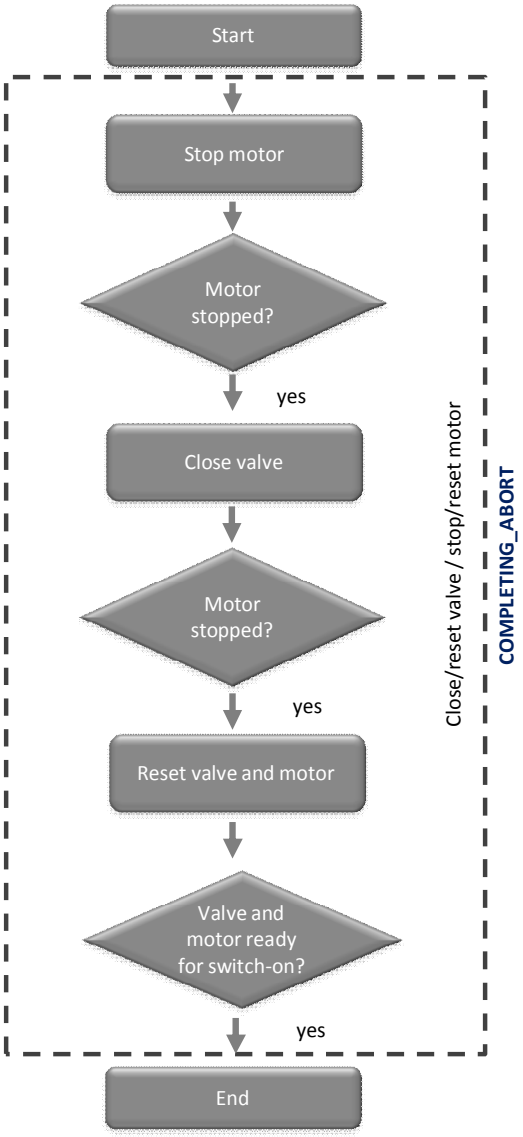
The following table summarizes the start conditions of the "COMPLETING_ABORT" sequence:

Table 4-69

SFC Status	=	Value	Logic
ABORTING	=	Aborting	OR
COMPLETING	=	Completi	

The following diagram summarizes the setup of the "COMPLETING_ABORT" sequence:

Figure 4-33



Copyright © Siemens AG 2013 All rights reserved

HOLDING

The "HOLDING" sequence is executed if a run sequence was stopped. The "HOLDING" sequence performs the following actions:

- Stops the motor

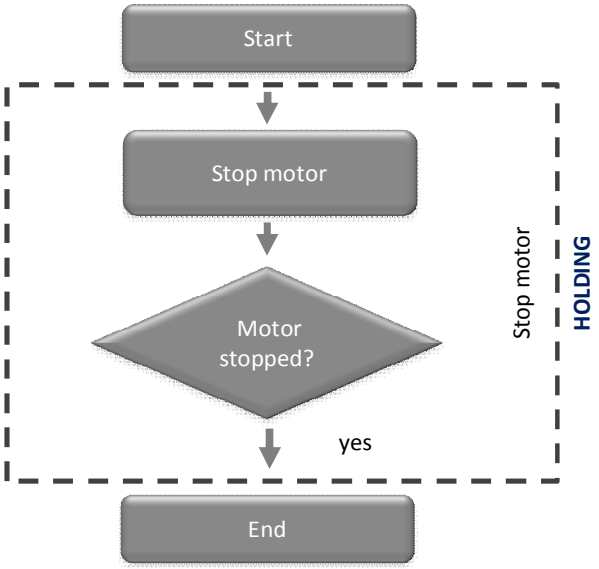
The following table summarizes the start conditions of the "HOLDING" sequence:

Table 4-70

SFC Status	=	Value	Logic
HOLDING	=	Holding	

The following diagram summarizes the setup of the "HOLDING" sequence:

Figure 4-34



RESUMING

The "RESUMING" sequence is executed if a stopped run sequence is restarted.
The "RESUMING" sequence performs the following actions:

- Starts the motor

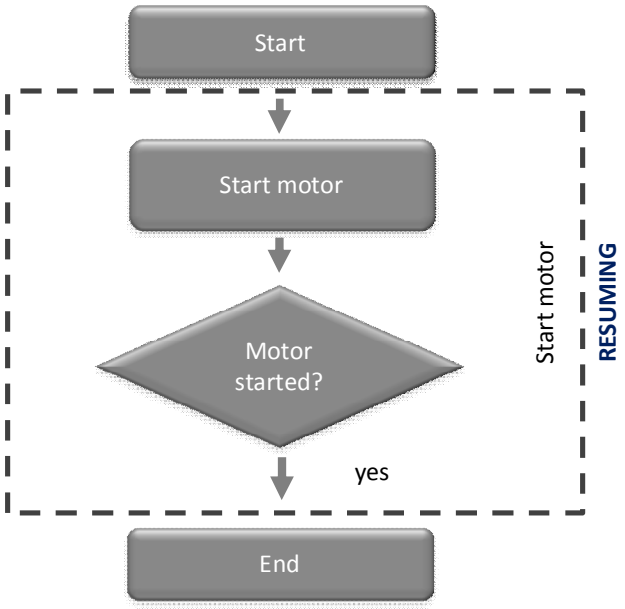
The following table summarizes the start conditions of the "RESUMING" sequence:

Table 4-71

SFC Status	=	Value	Logic
RESUMING	=	Resuming	

The following diagram summarizes the setup of the "RESUMING" sequence:

Figure 4-35



Copyright © Siemens AG 2013 All rights reserved

4.4 SIMATIC BATCH

SIMATIC BATCH is used for discontinuous production. Through the use of SIMATIC BATCH, different products can be produced on one production system. Production is effected by means of recipes. The recipes include the know-how required for production. Recipes can be changed by the operators. The entire recipe process with messages and measured values, as well as operator interventions, will be logged.

Apart from recipes for making a product there are also recipes for cleaning the facility parts.

4.4.1 Cleaning recipes

Cleaning recipes are used for cleaning the facility parts required for production.

Information included in the recipe

The cleaning recipe may include the following information:

- Facility part to be cleaned
- Duration of cleaning (setpoint values for the dwell time of the liquid inside the facility part)
- Temperature of the cleaning liquid
- Detergent concentration of the cleaning liquid
- Amount of cleaning liquid (flow rate)

Different cleaning recipes can be set up for one facility part. They differ in the points mentioned above. The differences depend, for example, on the degree of soiling of the facility or product that was on the facility before.

Copyright © Siemens AG 2013 All rights reserved

Example recipe setup

The "CIP MIXER" example recipe in the "CIP" application example is used for cleaning the facility part "mixer". It consists of the recipe unit procedures (TRPs) "TRP MIXER" and "TRP CIP".

The following table summarizes the recipe unit procedures (TRP) and the units.

Table 4-72

TRP	Occupied unit
TRP MIXERr	MIXER
TRP CIP	CIP

There are three recipe operations (ROP) for each TRP: "PRERINSE", "DETERGENT", and "POSTRINSE". The names of the recipe operations correspond to the current cleaning phase. The recipe functions (RF) are called within the ROPs. Two RFs running parellel are included in each ROP.

The following table summarizes the RFs:

Table 4-73

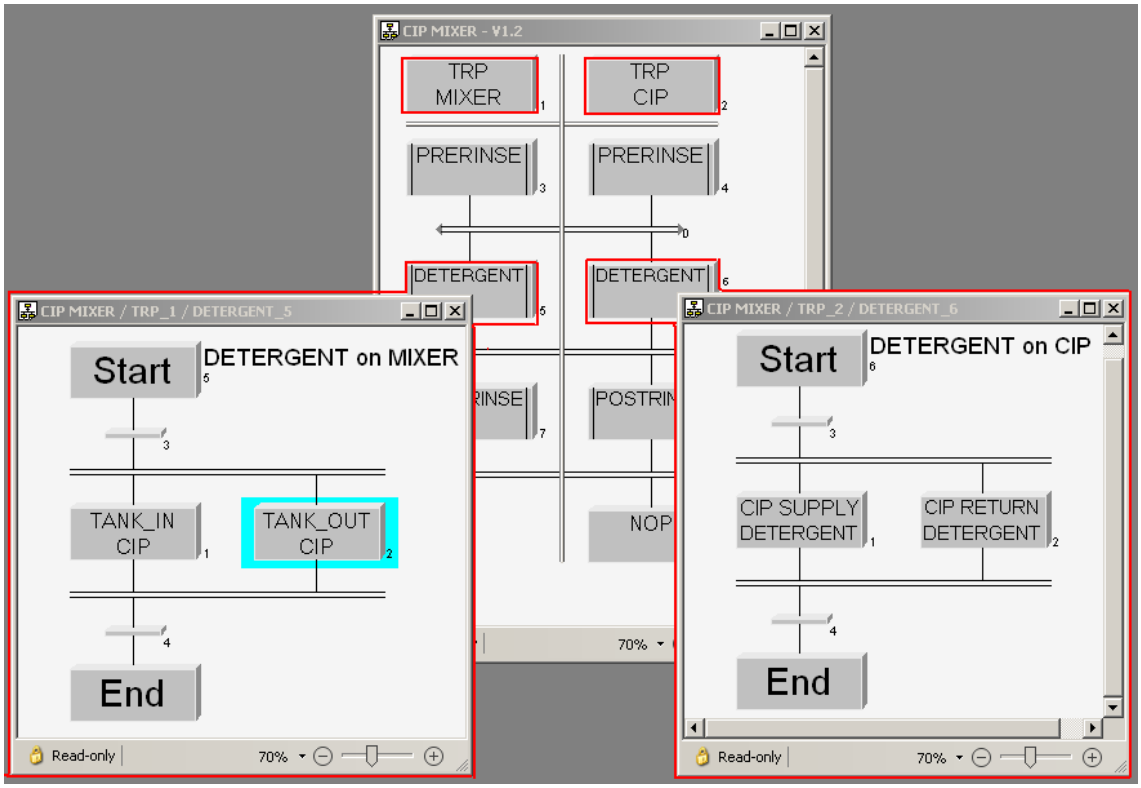
TRP	ROP	RF	Control Strategy
MIXER	PRERINSE	TANK_IN	CIP
		TANK_OUT	CIP
	DETERGENT	TANK_IN	CIP
		TANK_OUT	CIP
	POSTRINSE	TANK_IN	CIP
		TANK_OUT	CIP
CIP	PRERINSE	CIP_SUPPLY	PRERINSE
		CIP_RETURN	PRERINSE
	DETERGENT	CIP_SUPPLY	DETERGENT
		CIP_RETURN	DETERGENT
	POSTRINSE	CIP_SUPPLY	POSTRINSE
		CIP_RETURN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

Between the ROPs there are synchronization lines to ensure that the process in the TRPs is synchronized. At the end of the recipe there is an NOP step, which is required to ensure that also the last two ROPs are in synchronization with each other.

Copyright © Siemens AG 2013 All rights reserved

The following figure 4-36 describes the setup of the cleaning recipe included in the setup of the "CIP" application example.

Figure 4-36



4.4.2 Cleaning batches

The cleaning batches are created as an order in SIMATIC BATCH. The recipe for cleaning is defined during batch creation.

The cleaning batch can automatically be started directly after the end of a production batch, which ensures that, after producing a product, the facility is clean again and can be used for further production.

Copyright © Siemens AG 2013 All rights reserved

5 Starting the application example

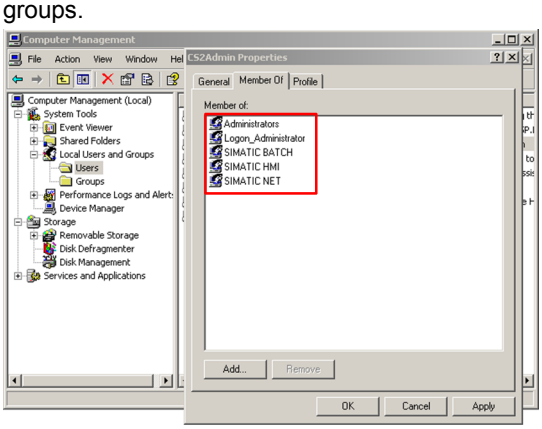
5.1 Preparation

The commissioning of the application example, which simulates the control with the "S7-PLCSIM" program, will be described in the following. If a real control is used, the hardware components used must be configured in the HW-Config.

Preparation in Windows

The following instruction describes the steps to be performed in Windows.

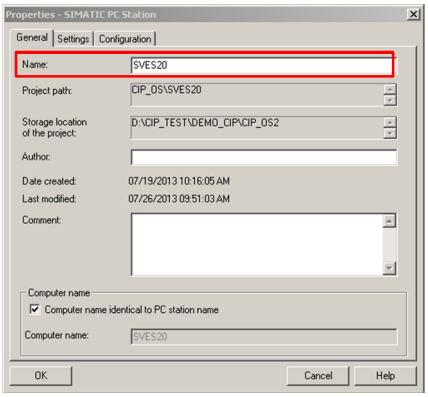
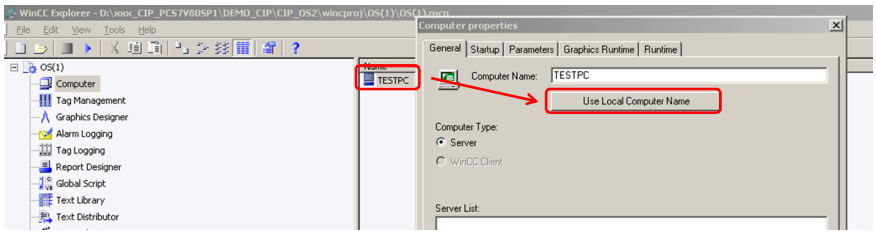
Table 5-1

No.	Action
1.	Click "Start".
2.	Right-click on "Computer" and open the "Manage" menu item. The Computer Management opens.
3.	On the left side of the window, right-click on the menu item "Local Users and Groups > Groups". Select the menu item "New Group". This will open the "New Group" window.
4.	Enter the "CIPDemoUser" in the Name field.
5.	Add the user name, under which you are currently logged on to Windows, to this group.
6.	Click "Create".
7.	On the left side of the window, select the menu item "Local Users and Groups > Users". On the right side, right-click the user name under which you are currently logged on. Select the menu item "Properties". The "Properties" window will open.
8.	Select the "Member Of" tab card and check whether the user is a member of the following groups.  If the user is not included in all groups, add it to the ones that are missing.

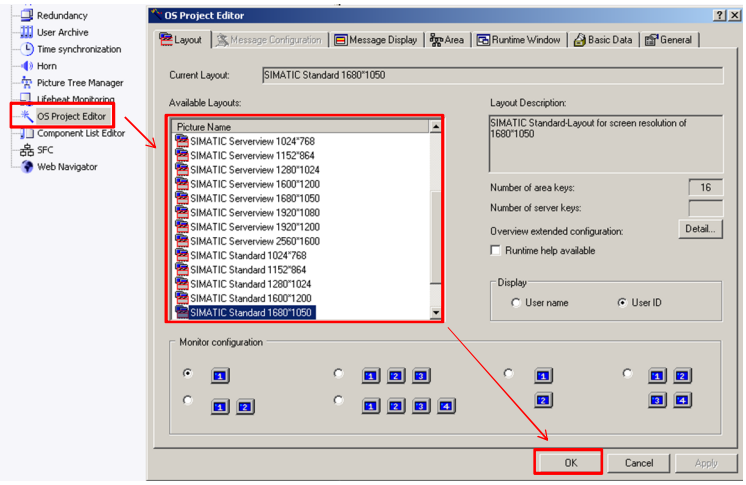
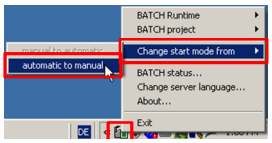
Copyright © Siemens AG 2013 All rights reserved

Preparation of the project

Table 5-2

No.	Action
1.	Copy the "78463886_CIP_PCS7V801.zip" and "78463886_CIP_PCS7V80SP1_BATCH_BACKUP.sbb" files to any folder on the configuration computer and then open the SIMATIC Manager.
2.	Click "File > Dearchive" on the menu bar and select file "78463886_CIP_PCS7V801.zip". Then confirm with "Open".
3.	Select the folder in which the project will be stored and confirm with the "OK" button. The project will be extracted.
4.	In the "Dearchiving" dialog, click on the "OK" button and then click "yes" in the dialog to open the project.
5.	Right-click on "CIP_OS > SVES20" and click on the menu item "Object properties".
6.	In the "Name" field, enter the name of your PC and click "OK". 
7.	Right-click on "CIP_OS > Name of your PC > WinCC Appl > OS(14)" and select the menu item "Open object".
8.	Confirm the dialog "Configured server not available" with "OK".
9.	In WinCC Explorer, open the properties of your PC and click on the "Use local computer name" button in the open properties dialog. Confirm the message "Change computer name" with "OK". 
10.	In WinCC Explorer, click "File > Exit" and select "Exit WinCC Explorer and close project" in the following dialog with "OK".
11.	Open WinCC Explorer again, as described in Step 15.
12.	Double-click the "Tag Management" to open it. In the "WinCC Configuration Studio", right-click on "Tag Management > SIMATIC S7 Protocol Suite > Industrial Ethernet" and select menu item "System Parameters".
13.	Double-click the "OS Project Editor" to open it.

Copyright © Siemens AG 2013 All rights reserved

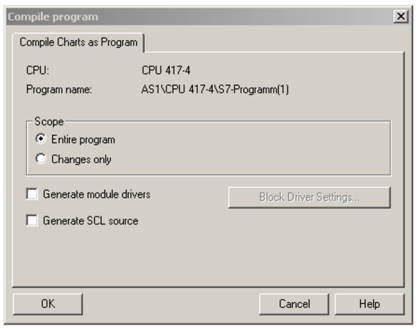
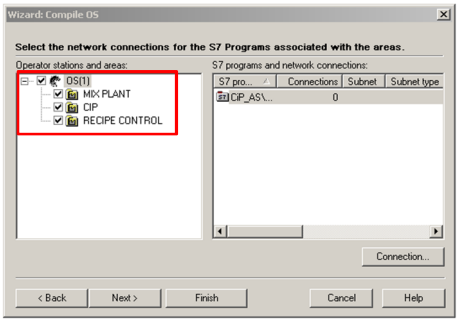
No.	Action
14.	On the "Layout" tab, in the "Available Layouts" field, select the "SIMATIC Standard" image according to your screen resolution.  Click "OK" to accept the settings and to close the "OS Project Editor".
15.	Check the defined "Logic Device Name" on the "Unit" tab. If the "S7-PLCSIM" program is used, the device name PLCSIM(ISO) (with 64 bit operating systems "PLCSIM.ISO") will be selected. Changing the device name might require restarting the program. Open WinCC Explorer again, as described in step 15.
16.	Close WinCC Explorer, as described in step 18.
17.	Right-click the icon of the SIMATIC BATCH Launch Coordinator on the Windows task bar and select the menu item "Change start mode from > automatic to manual".  **Note** Administrator rights are required to change the start mode. **Note** The SIMATIC BATCH Launch Coordinator will start automatically with the start of the PC. In case the SIMATIC BATCH did not start, proceed as follows: Click "Start > All Programs > SIMATIC > BATCH > BATCH Launch Coordinator" (with 64 bit operating system "Start > All Programs > Siemens Automation > SIMATIC > BATCH Launch Coordinator").

Copyright © Siemens AG 2013 All rights reserved

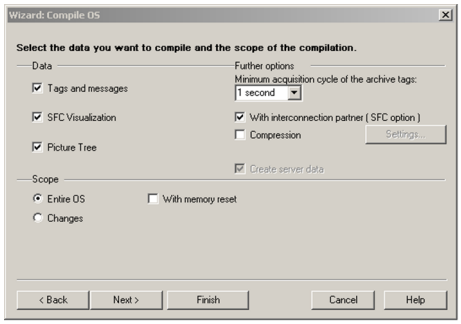
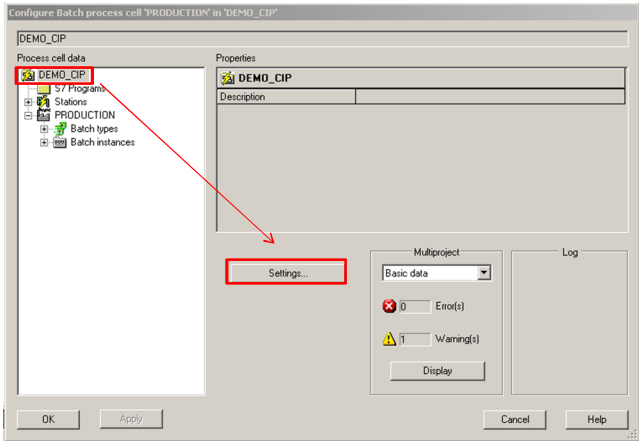
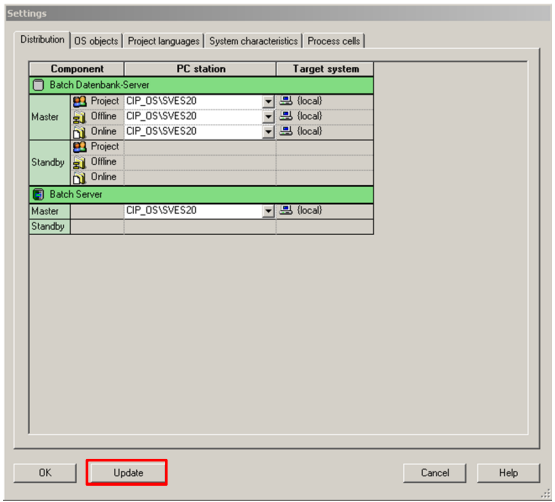
5.2 Working with the Multiproject

The following instruction describes the steps to be performed in the Multiproject. It is assumed that the SIMATIC Manager has already been opened and the project has been selected in the component view.

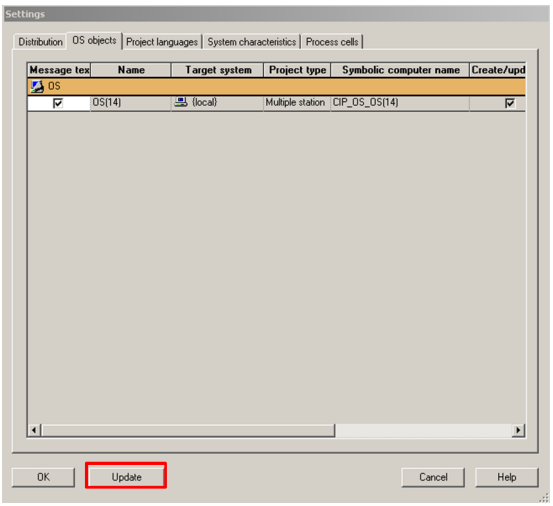
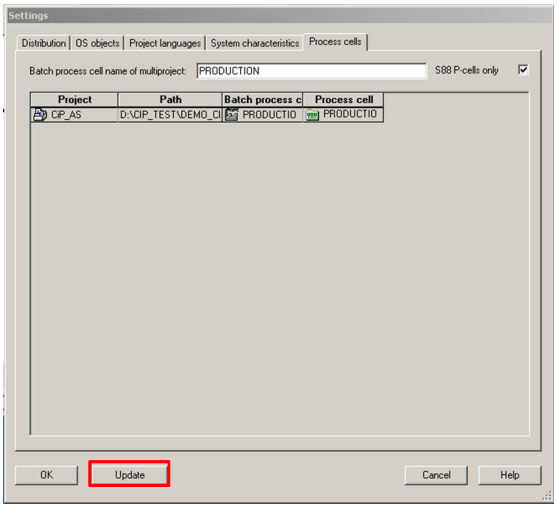
Table 5-3

No.	Action
1.	Right-click on CIP_AS > AS1 > CPU 417-4 > S7 Program(1) > Charts and select the menu item "Compile".
2.	In the "Compile Program" dialog, select the option "Entire program" and deactivate the option "Generating module drivers", then confirm with "OK". 
3.	Close the compiling protocol.
4.	Right-click on "CIP_OS > SVES20 > WinCC Appl. > OS(14)" and select the menu item "Compile". The compiling dialog will open.
5.	Press "Next".
6.	Press "Next".
7.	Make sure that all areas have been selected and press "Next". 

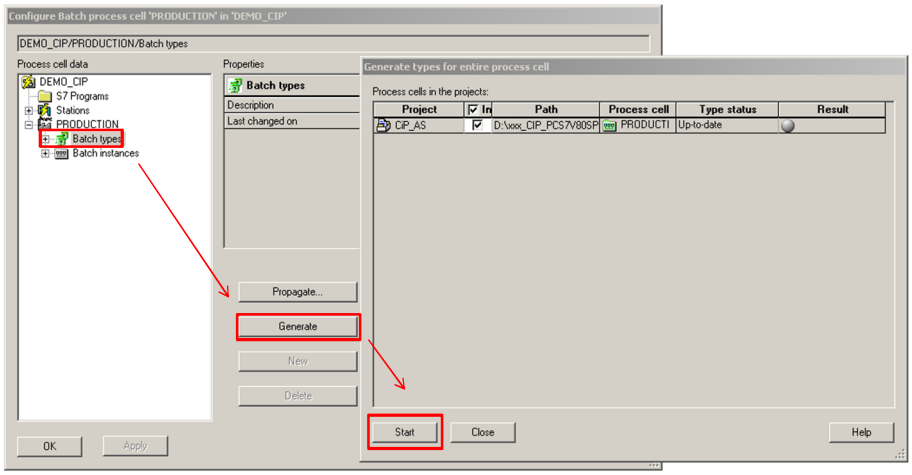
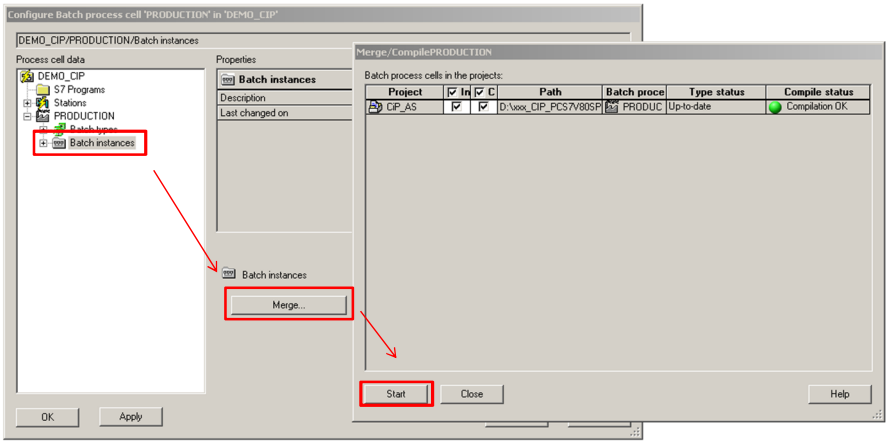
Copyright © Siemens AG 2013 All rights reserved

No.	Action
8.	Select the following settings and press "Next". 
9.	Then click on "Compile".
10.	Confirm the "Compile OS" dialog with "OK".
11.	In the SIMATIC Manager, right-click on the "DEMO_CIP > SIMATIC BATCH" multiproject and select the menu item "Open Configuration Dialog". The SIMATIC BATCH configuration dialog will open.
12.	Select the "DEMO_CIP" multiproject in the BATCH dialog and then click on "Settings".  The "Settings" window will open.
13.	On the "Distribution" tab, click on "Update". 

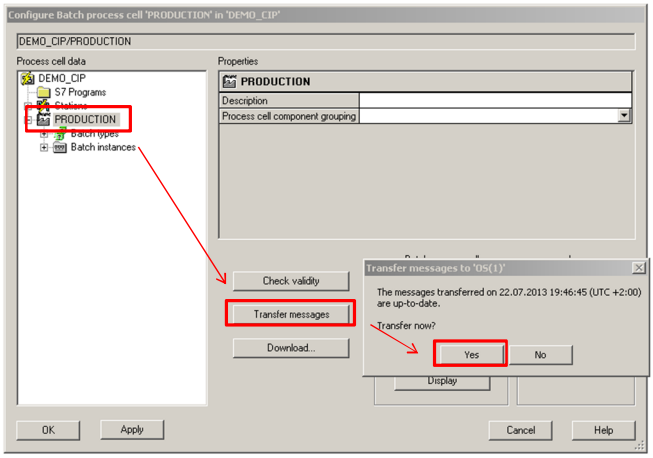
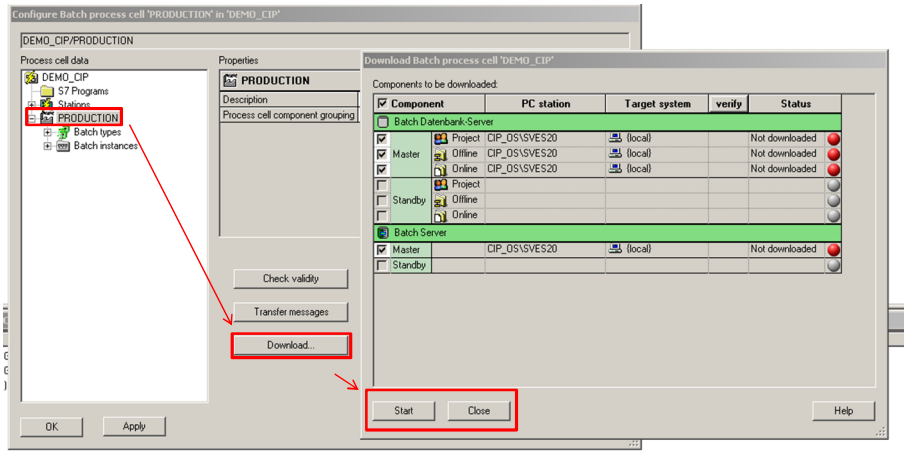
Copyright © Siemens AG 2013 All rights reserved

No.	Action
14.	On the "OS objects" tab, click on "Update". 
15.	On the "Process cells" tab, click on "Update". 
16.	Click "OK" to exit the "Settings" window.

Copyright © Siemens AG 2013 All rights reserved

No.	Action
17.	Select the menu item "BATCH types" and click on "Generate" and then on "Start".  After that click on "Close".
18.	Select the menu item "BATCH types" and click on "Propagate" and then on "Start". After that click on "Close".
19.	Select the menu item "BATCH instances" and click on "Merge" and then on "Start".  After that click on "Close".

Copyright © Siemens AG 2013 All rights reserved

No.	Action
20.	Select the menu item "PRODUCTION" and click on "Transfer messages". Confirm the "Transfer messages to OS (14)" dialog with "Yes". 
21.	Select the menu item "PRODUCTION" and click on "Download".  After that click on "Close".
22.	Click "OK" to close the SIMATIC BATCH configuration dialog.

Copyright © Siemens AG 2013 All rights reserved

5.3 Startup of the Application

The following instruction describes how to set the "CIP" application example to initializing state.

For startup, it is assumed that the SIMATIC Manager has already been opened and the project has been selected in the component view.

Starting the (S7 PLCSIM) simulation

Proceed as follows to start the simulation:

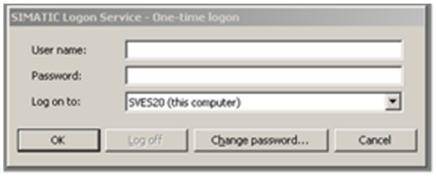
Table 5-4

No.	Action
1.	Select "Options > Simulate Module" in the menu. The "S7-PLCSIM" dialog window will open.
2.	Select "Execute > Position Key Switch > Run-P" in the menu.
3.	Switch to the Component View of the SIMATIC Manager and select "CiP_AS > AS1 > CPU 417-4 > S7 Program > Charts.
4.	In the menu bar, click on "Target system > load" and confirm the dialog with "Yes". Confirm the "Stop target module" dialog with "OK" and then the "Load" dialog with "Yes".

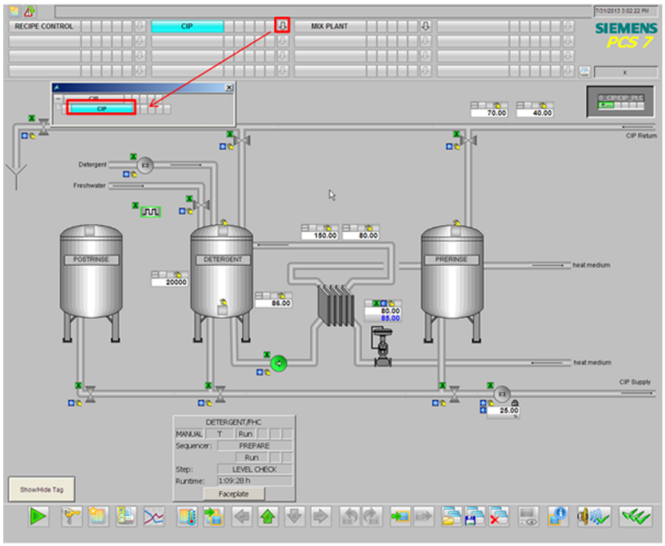
Enable OS (WinCC Runtime)

Proceed as follows to activate the OS:

Table 5-5

No.	Action
1.	Right-click on "CIP_OS > SVES20 > WinCC Appl. > OS(14)" and select the menu item "Open object".
2.	For enabling the OS (WinCC Runtime), select "File > enable" in the WinCC Explorer menu.
3.	Log on to the SIMATIC Logon Dialog with your Windows user. 

Copyright © Siemens AG 2013 All rights reserved

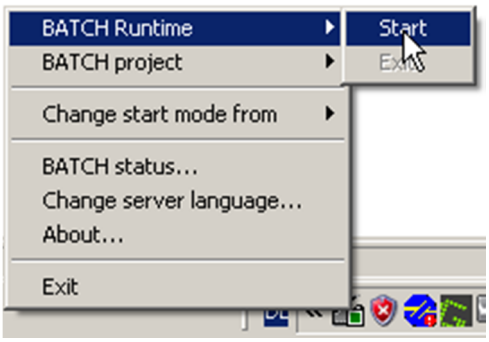
No.	Action
4.	Select "CIP" on the screen. 

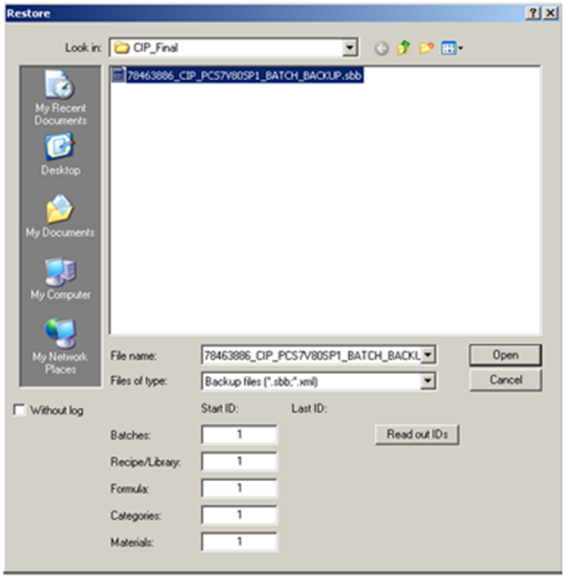
Copyright © Siemens AG 2013 All rights reserved

Enable SIMATIC BATCH

Proceed as follows to activate SIMATIC BATCH:

Table 5-6

No.	Action
1.	Click on the "Windows logo key" on your keyboard to display the Windows taskbar.
2.	The icon of the SIMATIC BATCH Launch Coordinator shows a green "stop icon" . The currently loaded project "DEMO_CIP" is displayed as a tool tip.
3.	Right-click the icon of the SIMATIC BATCH Launch Coordinator and select the menu item "BATCH Runtime > Start" to start the SIMATIC BATCH Runtime.  The icon of the SIMATIC BATCH Launch Coordinator shows an "hourglass" , which symbolizes that the SIMATIC BATCH server is being started. The "hourglass" changes into a "play icon" . The SIMATIC BATCH server is now in "Run" state.
4.	Click "Start > All Programs > SIMATIC > BATCH > BATCH Control Center" (with 64 bit operating systems "Start > All Programs > Siemens Automation > SIMATIC > BATCH Control Center"). The BATCH Control Center will open.

No.	Action
5.	Click on the "Options" menu item and select "Restore". The Restore dialog will open. 
6.	Navigate to the storage location of file "78463886_CIP_PCS7V80SP1_BATCH_BACKUP" and select it. Click "Open".
7.	In the left window, click on the system icon "PRODUCTION" and select the menu command "Update system".
8.	Confirm the "Update system" dialog with "OK".
9.	Click on the "Options" menu item and select "Role Management". The "SIMATIC Logon Role Management" will open.
10.	In the "Configured roles and assignment types" window, click on "Roles > Superuser > Groups and users". Select the menu item "Edit". The window "Edit groups and users" will open.
11.	Click on the "List" button. All available groups and users will be listed.
12.	Add the "CIP_DemoUser" group to "Configured groups and users".
13.	Click "OK" to exit the the "Edit groups and users" window.
14.	In the "SIMATIC Logon Role Management" window, click on "File > save"
15.	In the "SIMATIC Logon Role Management" window, click on "File > exit"

Copyright © Siemens AG 2013 All rights reserved

6 Operation of the Application

6.1 Overview

The following chapter explains how to operate the application example. Three different scenarios will be described.

- Manual operation of individual functions in the WinCC overview screen
- 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

This scenario describes running the facility in "manual" mode. Here you can operate the individual components of the CIP facility, and to adapt the detergent concentration in the detergent tank, for example.

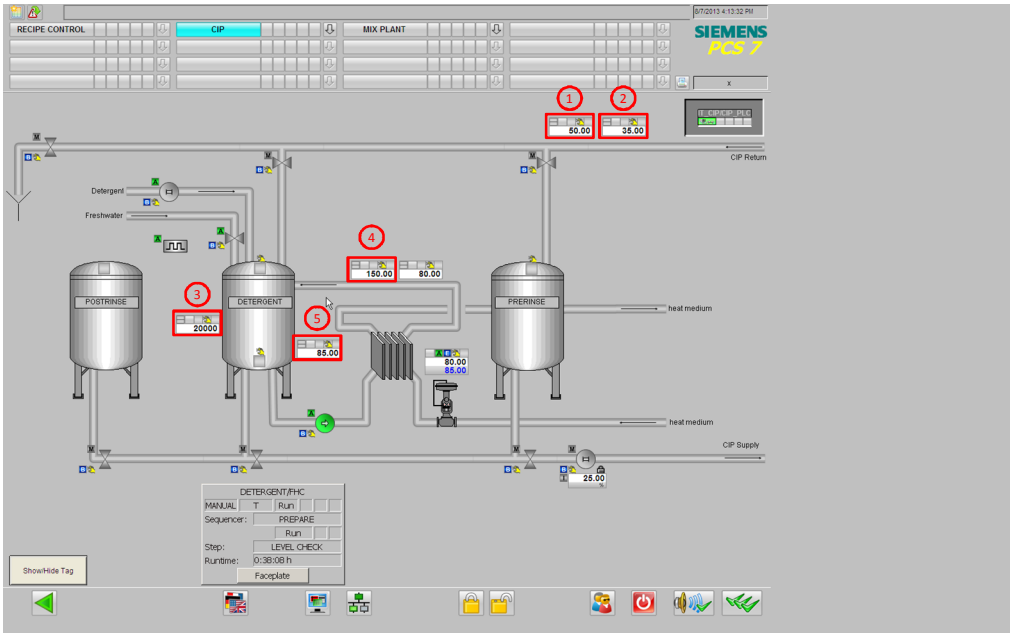
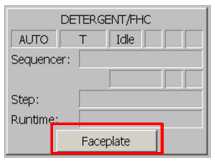
The following instruction describes how to start the preparation of the cleaning liquid in the detergent tank. It is assumed that:

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

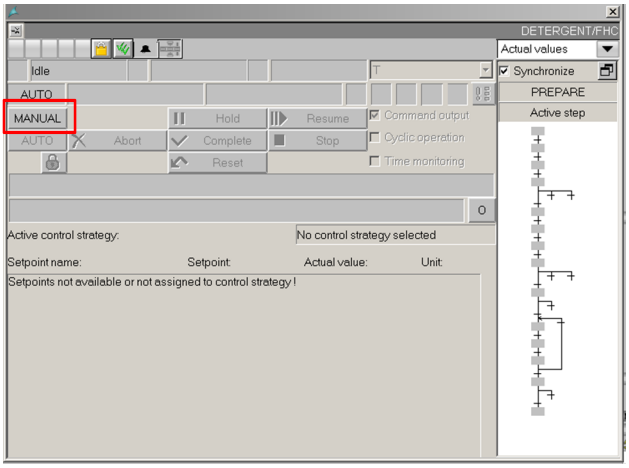
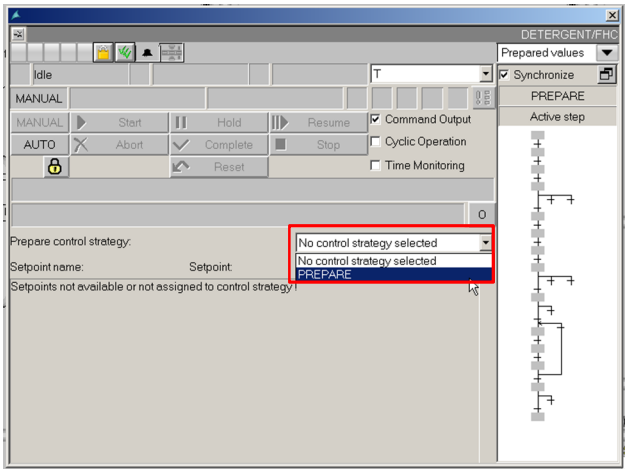
Copyright © Siemens AG 2013 All rights reserved

6.2 Scenario A

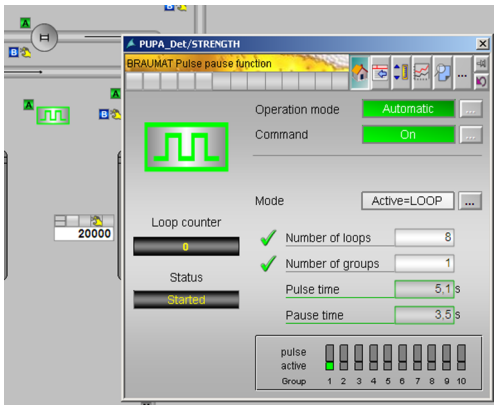
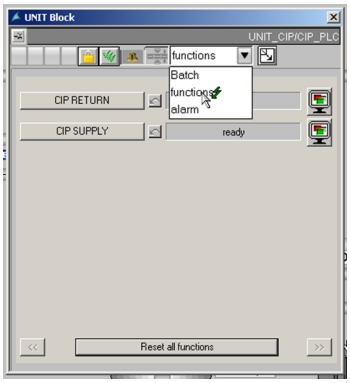
Table 6-1

No.	Action
1.	Open the overview screen of the CIP facility.
2.	Set the following values for the marked process tags:  1. Concentration in the return flow to 50 mS 2. Temperature in the return flow to 35°C 3. Tank content to 20000 l 4. Concentration in the heating cycle to 150 mS 5. Temperature in the tank to 85°C
3.	In the SFC Control "DETERGENT/FHC", click on the "Faceplate" button.  The faceplate of the "DETERGENT/FHC" SFC will open.

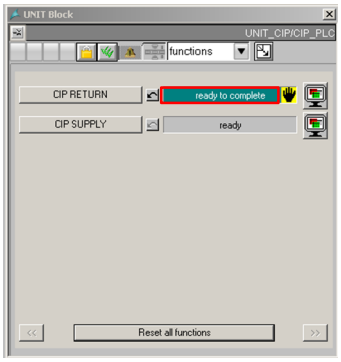
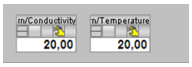
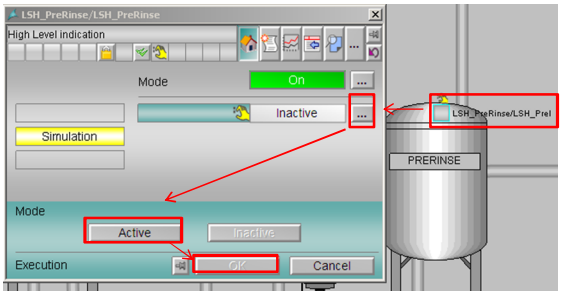
Copyright © Siemens AG 2013 All rights reserved

No.	Action
4.	Click on "MANUAL" in order to switch the SFC from automatic mode to manual mode.  Confirm the "SFC operation" dialog with "OK".
5.	Select die Control Strategy "PREPARE" and start the SFC.  Confirm the "SFC operation" dialog with "OK". You will get a list of the setpoint and actual values.
6.	Start the SFC by clicking the "Start" button in the faceplate of the SFC DETERGENT/FHC. Confirm the "SFC operation" dialog with "OK". The SFC will start and stay in the "LEVEL CHECK" step.
7.	Change the process value for the current temperature in the tank to 75°C (see item 5 in step 2). SFC will change to the "CHECK TEMP" step.
8.	Change the temperature to 85 °C again. THE SFC will jump to the "LEVEL CHECK" step.
9.	Change the value for the filling level to less than 17500 l (see item 3 in step 2). THE SFC will jump to the "LEVEL REACHED?" step and the fresh water valve will be opened.
10.	Change the value for the filling level to 20000 l again. THE SFC will jump to the "LEVEL CHECK" step again.
11.	Change the value for the concentration in the heat cycle to 115 mS (see item 4 in step 4). THE SFC will jump to the "CHECK PUPA" step. The BlPuPa block will be started. It will control the metering pump in pulsed mode.

Copyright © Siemens AG 2013 All rights reserved

No.	Action
12.	Click on the PUPA block icon to open the corresponding faceplate. You can see the puls and pause times in the faceplate.  If, after a specified number of loops, the concentration value is still not sufficient, a message will be issued.
13.	Set the values for temperature, concentration, and filling level such that the "LEVEL CHECK" step is active.
14.	Click on the block icon of the UNIT_PLC block "UNIT_CIP" in order to open the UNIT_PLC faceplate.
15.	Go to the "Functions" view. 
16.	Click on the "CIP RETURN" button to open the faceplate of the "CIP RETURN" SFC.
17.	Click on the "MANUAL" button in order to switch the SFC from automatic mode to manual mode. Confirm the "SFC operation" dialog with "OK".
18.	Select die Control Strategy "PRERINSE" and start the SFC. Confirm the "SFC operation" dialog with "OK".
19.	Click on the "Start" button to start the SFC. Confirm the "SFC operation" dialog with "OK". The valve to the drainage will open.

Copyright © Siemens AG 2013 All rights reserved

No.	Action
20.	The SFC is not self-completing and is in the "ready to complete" state. 
21.	Click on the "Exit" button to exit the SFC. Confirm the "SFC operation" dialog with "OK".
22.	Click on the "Reset" button to set the SFC to the "IDLE" state. Confirm the "SFC operation" dialog with "OK".
23.	Change to the control strategy "DETERGENT". Confirm the "SFC operation" dialog with "OK". Start the SFC. Confirm the "SFC operation" dialog with "OK".
24.	Change the process values of the concentration and the temperature in the CIP Return,
25.	Clicking on the block icons of the analog monitor will block "QIT_Return" and "TIT_Return" (see items 1 and 2 in step 2). 
26.	Change the values and observe the valves in the return line. Depending on the values, the valves will be opened to the tanks or the drainage.
27.	Activate the level monitoring of the prerinse or detergent tank.  Now no liquid will be fed into the tank with active level monitoring.
28.	Click on the "Exit" button to exit the "CIP_Return" SFC. Confirm the "SFC operation" dialog with "OK".
29.	Click on the "Reset" button to set the SFC to the "IDLE" state. Confirm the "SFC operation" dialog with "OK". Note The "POSTRINSE" control strategy behaves in the same way as the "DETERGENT" control strategy.
30.	Click on the "AUTO" button to switch the "CIP_Return" SFC from manual mode to automatic mode. Confirm the "SFC operation" dialog with "OK".
31.	Click on the block icon of the UNIT_PLC block "UNIT_CIP" in order to open the UNIT_PLC faceplate.
32.	Go to the "Functions" view.

Copyright © Siemens AG 2013 All rights reserved

No.	Action
33.	Click on the "CIP SUPPLY" button to open the faceplate of the "SUPPLY" SFC.
34.	Click on the "MANUAL" button in order to switch the SFC from automatic mode to manual mode. Confirm the "SFC operation" dialog with "OK".
35.	Select the "PRERINSE" control strategy. Confirm the "SFC operation" dialog with "OK".
36.	Click on the "Start" button to start the SFC. Confirm the "SFC operation" dialog with "OK". The valve from the prerinse tank will open and the supply pump will be started. The sequence stays active until the time set at the timer block has elapsed. If the sequence is stopped via the "Hold" button, the time will also be stopped. If the sequence is continued via the "Continue" button, the time will also continue. Note: The control strategies "DETERGENT" and "POSTRINSE" have the same behavior.
37.	All three control strategies will be started once the "CHECK LEVEL" step is active in the "DETERGENT" SFC.
38.	After the sequences have run through, the SFC is in the "Completed" state. Click on the "Reset" button to set the SFC to the "IDLE" state. Confirm the "SFC operation" dialog with "OK".
39.	Click on the "AUTO" button to switch the SFC from manual mode to automatic mode. Confirm the "SFC operation" dialog with "OK".

Copyright © Siemens AG 2013 All rights reserved

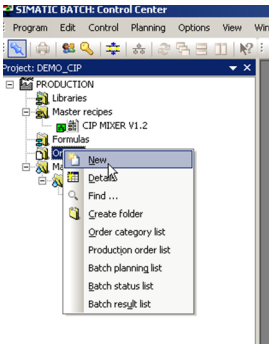
6.3 Scenario B

In scenario A you learned about the individual functions of the CIP facility in manual mode. In scenario B you will learn how to use these functions with SIMATIC BATCH, the CIP facility being operated from the SIMATIC BATCH Control Center.

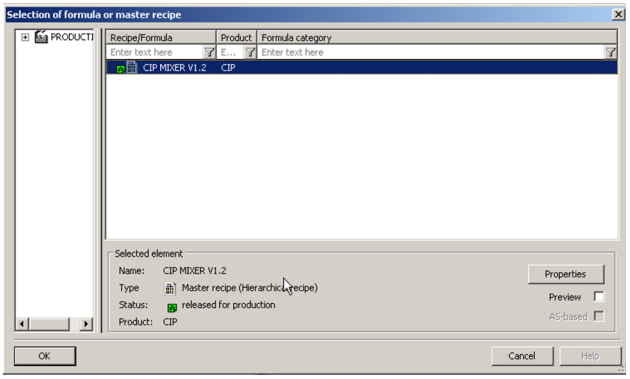
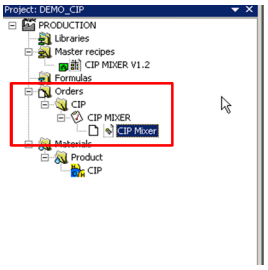
It is assumed that:

- WinCC Runtime is active
- The S7 program in "S7-PLCSIM" is loaded and the key switch set to Run(-P)
- The SIMATIC BATCH server is in "Run" state
- The "DETERGENT" SFC is in "Run" state (active step "CHECK LEVEL")
- The supplied backup was installed
- The role management is completed

Table 6-2

No.	Action
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 will open.
3.	Right-click on the "Commands" menu item and select "New".  The "Create order category" window will open.
4.	In the "Name" field, enter an appropriate name (e.g. CIP) and click "OK".
5.	Right-click on the "CIP" menu item and select "New". The "Create order" window will open.
6.	On the "General" tab in the "Name" field, enter an appropriate name (e.g. CIP MIXER).
7.	Go to the "Batches" tab.
8.	Click on the "New" button. The "Selection of formula or master recipe" window will open.

Copyright © Siemens AG 2013 All rights reserved

No.	Action
9.	Select the master recipe "CIP MIXER V1.2" and then click "OK". 
10.	Assign an appropriate name to the batch in the "Create order" window. In the "Create order" window, click the "OK" button. Now you created a new order with a batch. 
11.	Right-click on the batch and select "Release". Confirm the opening dialog window with "Yes".
12.	Double-click on the batch. The control recipe will be displayed.
13.	Right-click on the batch and select "Start". Confirm the opening dialog window with "Yes". The batch will be started. Now SIMATIC BATCH will occupy the unit and start the SFC functions. All control strategies will be gone through successively.
14.	Go to WinCC Runtime and observe how the individual valves and pumps are controlled.
15.	Change the values for temperature and concentration (see item 1 and 2 in scenario A) in the return line. Accordingly, the valves to the tanks and to the drainage will be opened or closed.
16.	Change to the "Mixer" process diagram. Here, too, the valves and the pump are controlled at the mixer.
17.	The batch will close automatically. The SFCs started will be closed by SIMATIC BATCH and reset to the "IDLE" state.

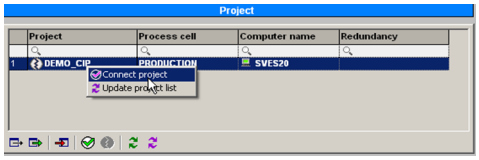
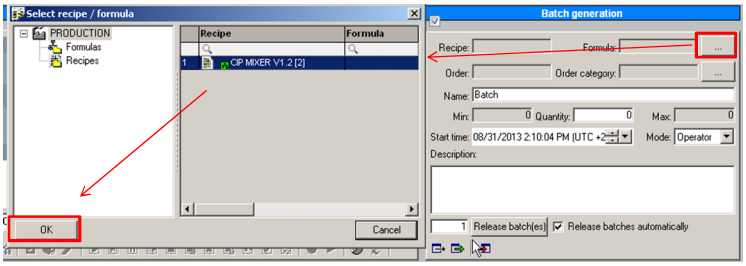
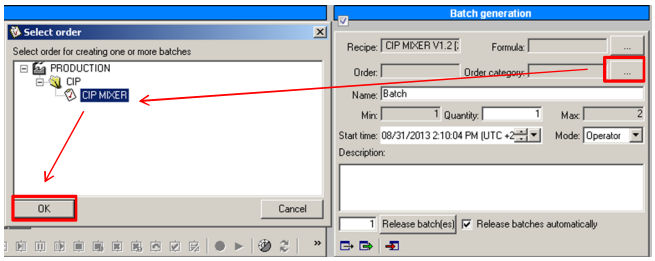
Copyright © Siemens AG 2013 All rights reserved

6.4 Scenario C

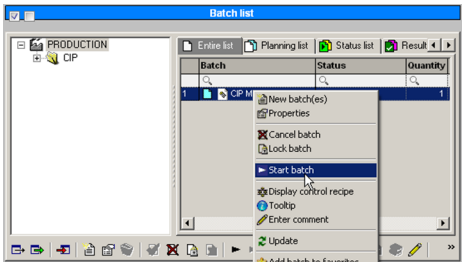
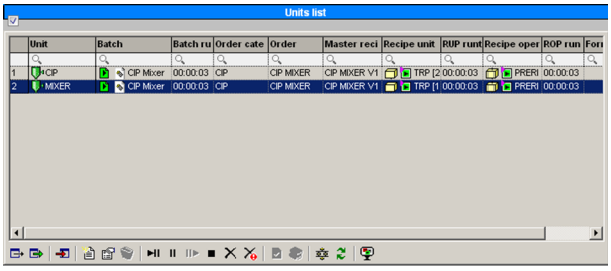
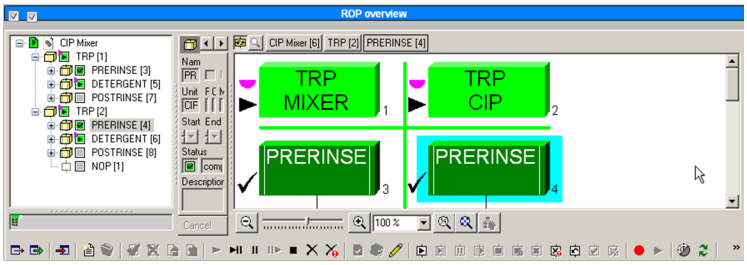
In scenario A you learned about the individual functions of the CIP facility in manual mode. In scenario B you will learn how to use these functions with SIMATIC BATCH, the CIP facility being operated in WinCC Runtime via the SIMATIC BATCH OS controls (BATCH OCXs.). It is assumed that:

- WinCC Runtime is active
- The S7 program in "S7-PLCSIM" is loaded and the key switch set to Run(-P)
- The SIMATIC BATCH server is in "Run" state
- The "DETERGENT" SFC is in "Run" state (active step "CHECK LEVEL")
- The supplied backup was installed
- The role management is completed
- The order was created in SIMATIC BATCH Control Center

Table 6-3

No.	Action
1.	In WinCC Runtime, open the "RECIPE CONTROL" screen.
2.	In the "Projects" BATCH OCX, right-click on the "DEMO_CIP" project and select the "Connect project". 
3.	In the "Batch generation" BATCH OCX, click on the button next to "Formula"
4.	Select the "CIP MIXER V1.2" recipe in the "Select recipe / formula" window. Click "OK". 
5.	In the "Batch generation" BATCH OCX, click on the button next to "Order category".
6.	Select the "CIP MIXER" order in the "Select order" window (must be created in the BATCH Control Center beforehand). Click "OK". 
7.	In the "Batch generation" BATCH OCX, enter an appropriate name.
8.	Adapt the start time in the "Batch generation" BATCH OCX.

Copyright © Siemens AG 2013 All rights reserved

No.	Action
9.	In the "Batch generation" BATCH OCX, click on the "Release batch(es)" button.
10.	Click "Yes" in the "Confirmation" dialog. The batch will be created and started.
11.	In the "Batch list" BATCH OCX, right-click on the batch that you created before and select "Start batch". 
12.	Click "Yes" in the "Confirmation" dialog.
13.	You will see the units occupied by the batch in the "Units list" BATCH OCX. 
14.	Double-click on the occupied units. You will see the control recipe in the "ROP overview" BATCH OCX. 

Copyright © Siemens AG 2013 All rights reserved

7 Related Literature

7.1 Bibliography

This list is not complete and only represents a selection of relevant literature.

Table 7-1

	Subject	Title
/1/	Praxisbuch für Regelungen mit SIMATIC S7 und SIMATIC PCS7 für die Prozessautomatisierung	Regeln mit SIMATIC Müller, Jürgen / Pfeiffer, Bernd-Markus / Wieser, Roland Publicis Kommunikationsag ISBN 978-3895783401
/2/	Process engineering	TECHNOLOGIE Brauer & Mälzer Kunze, Wolfgang / Manger, Hans-Jürgen Publicis Kommunikationsag ISBN 978-3-921690-56-7

7.2 Internet Links

The following list is not complete and only represents a selection of relevant information.

Table 7-2

	Subject	Title
\1\	SIMATIC PCS 7 in Industry Online Support - Overview Page	www.siemens.com/industry/onlinesupport/pcs7
\2\	SIMATIC Process Control System PCS 7 Compendium Part C - Technical Functions with SFC Types	http://support.automation.siemens.com/WW/view/en/63187297
\3\	SIMATIC PCS 7 overview (link collection on FAQ, manuals, compendium, forum, application examples, and multimedia)	http://support.automation.siemens.com/WW/view/en/63481413
\4\	SIMATIC Process Control System PCS 7 SIMATIC BATCH V8.0 SP1"	http://support.automation.siemens.com/WW/view/en/68154748
\5\	PCS 7 V8.0 SP1 Manual Collection	http://support.automation.siemens.com/WW/view/en/59538371
\6\	SIMATIC Process Control System PCS 7 PCS 7 BRAUMAT Library V7.1	http://support.automation.siemens.com/WW/view/en/60307664

Copyright © Siemens AG 2013 All rights reserved

8 History

Table 8-1

Version	Date	Modifications
V1.0	10/2013	First version