

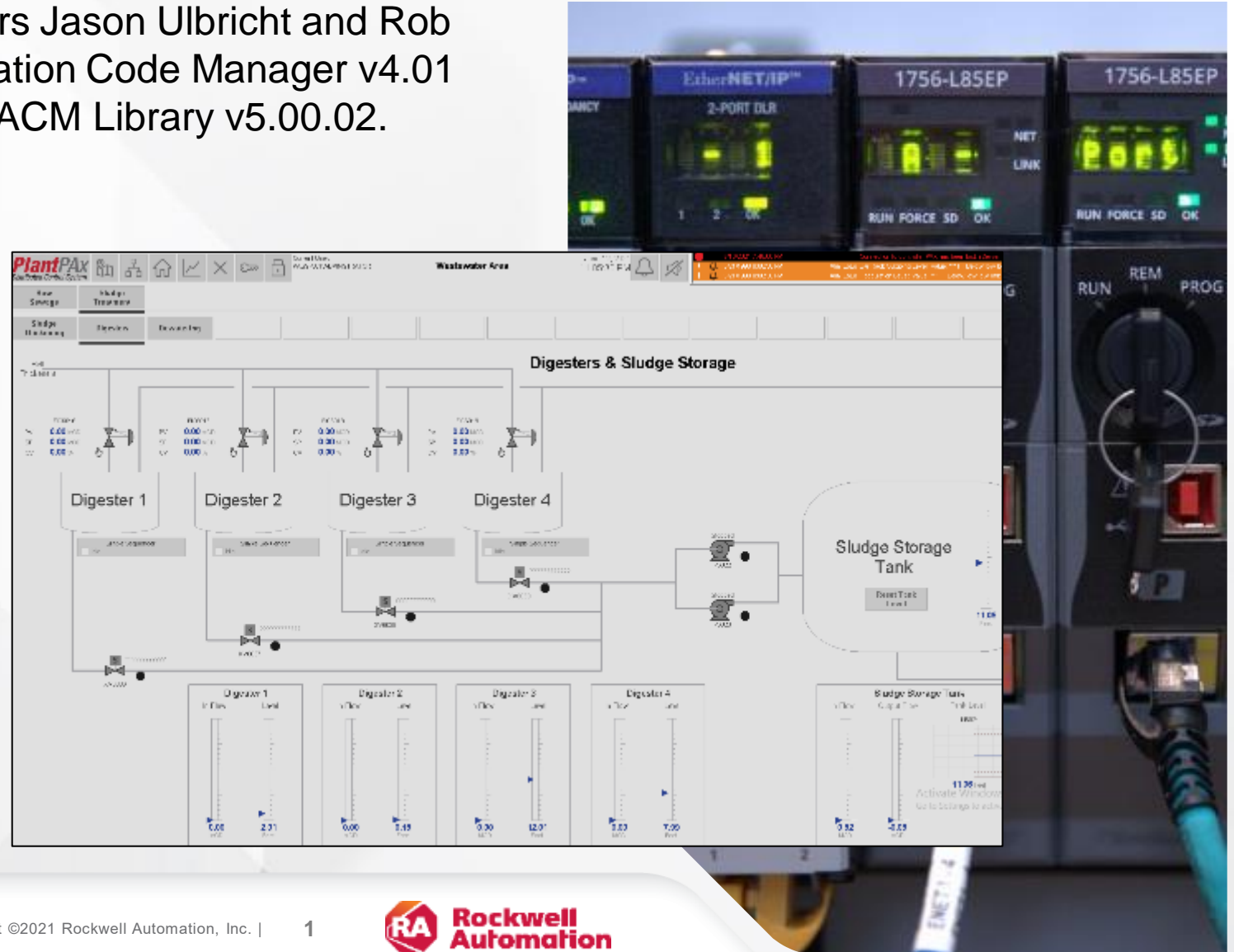
GTC Webinar

Using ACM with PlantPax 5.0 and the New 5.0 Equipment Module (EM) Object

Thank you for joining Commercial Engineers Jason Ulbricht and Rob Munk for a webinar showcasing the Application Code Manager v4.01 (ACM) software tool and the PlantPax 5.0 ACM Library v5.00.02.

Follow along as ACM is used to build WasteWater digester application code, including basic device Control Strategies, and new for PlantPax 5.0 Equipment Module (EM).

See how configuration is used by selecting library objects (process strategies, equipment modules, etc.) and providing configuration data, such as object name and descriptions, equipment set points, control interlocks, I/O mapping, etc. Once all the configuration, not programming, is complete the project is downloaded to a controller.

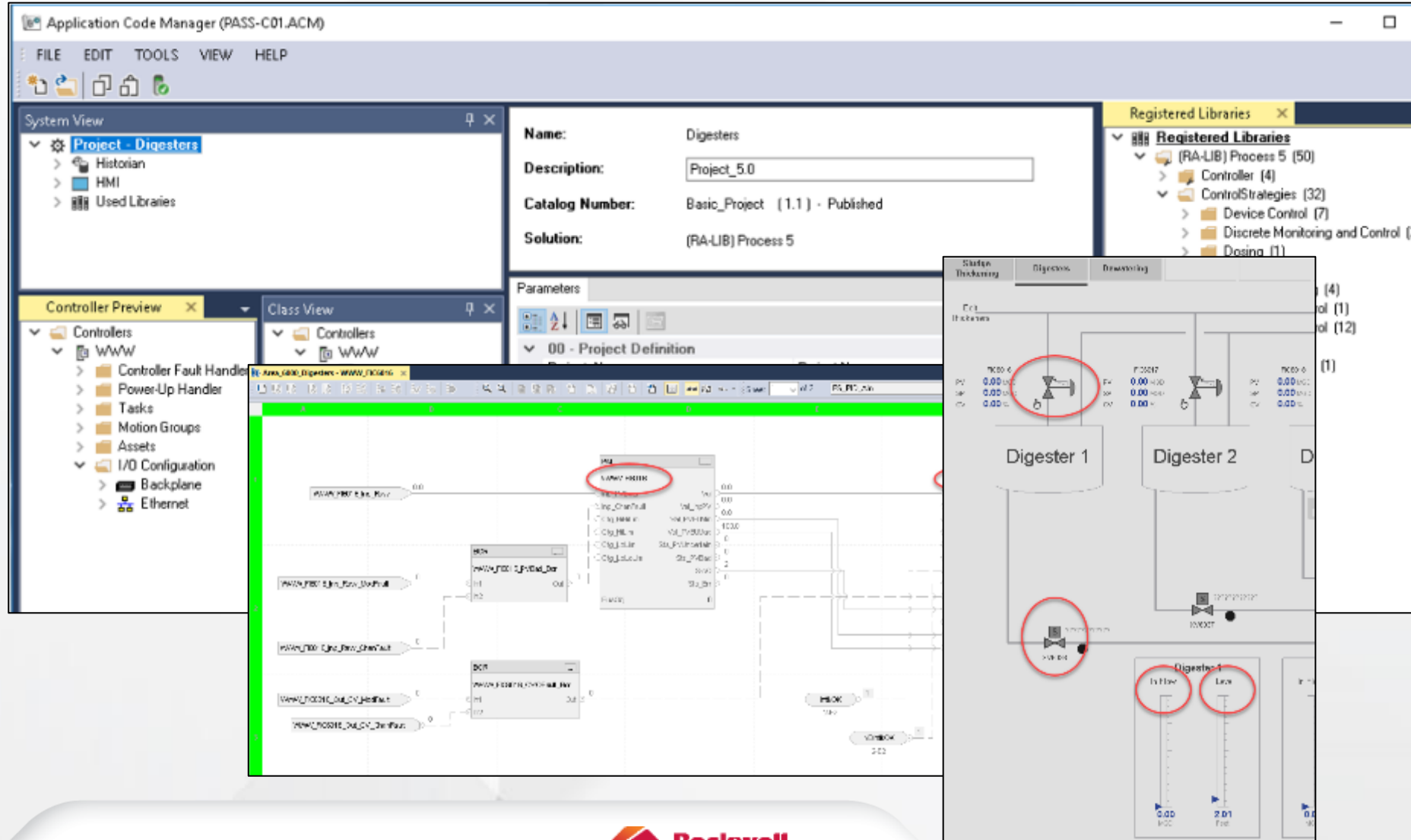


Studio5000 Application Code Manager (ACM)

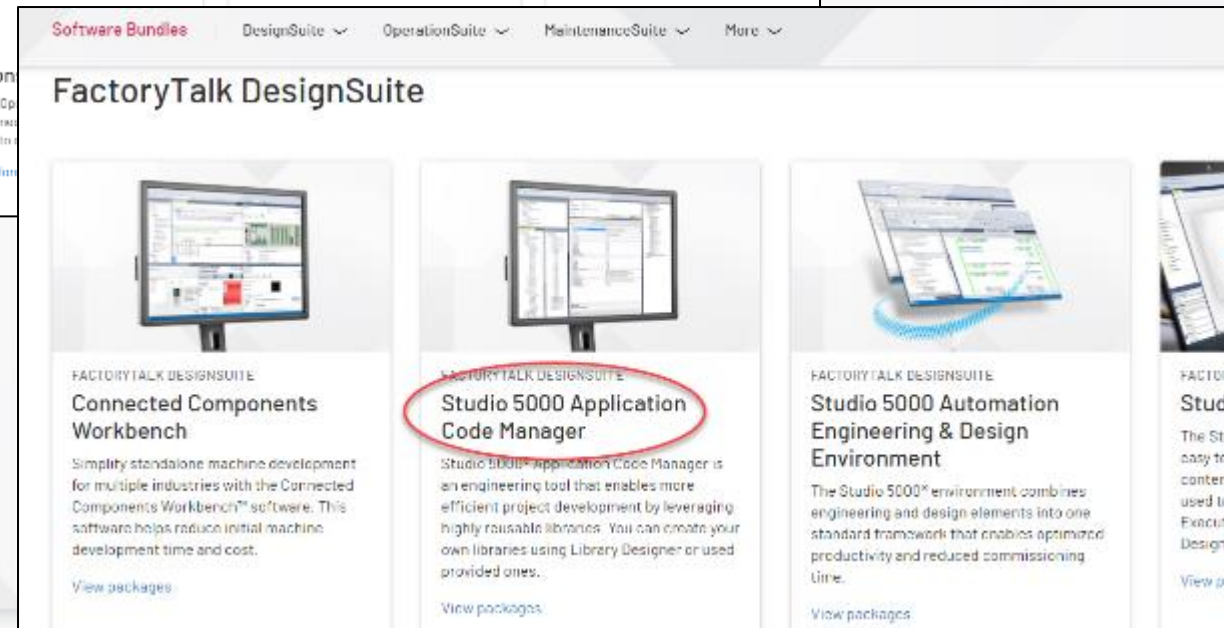
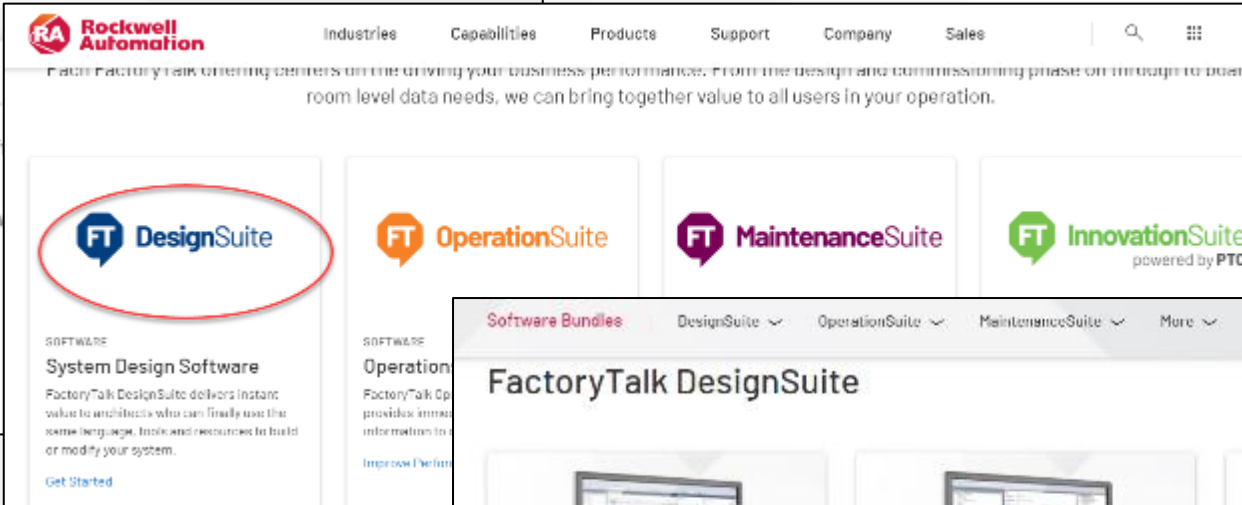
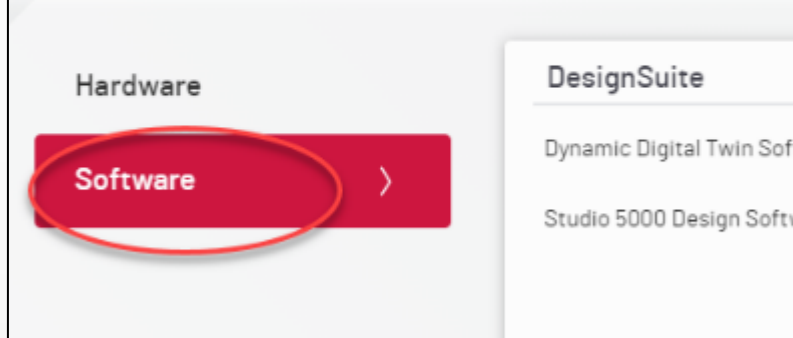
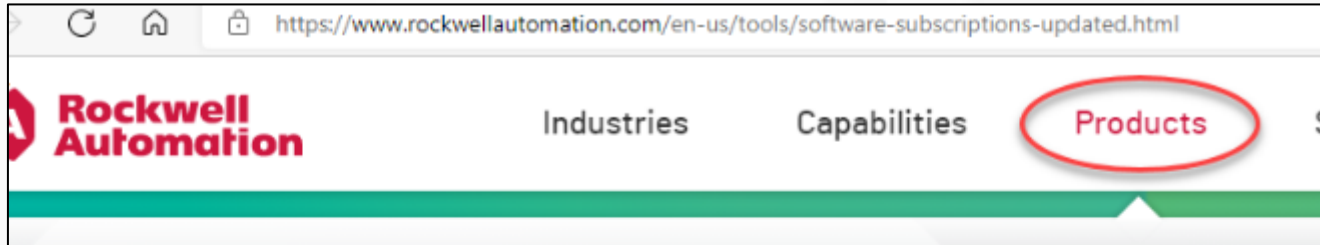
Application Code Manager is an engineering tool that enables more efficient project development by leveraging reusable libraries.

You can create your own libraries using Library Designer or use provided ones, like the PlantPax library.

Application Code Manager not only creates the Logix code but also associated FactoryTalk ViewSE/ME displays, FactoryTalk Historian tags and FactoryTalk Alarm and Events (FTAE) content.



Where to get Studio5000 Application Code Manager



ACM is available at RockwellAutomation.com, Products tab, select Software, and DesignSuite. Studio5000 Application Code Manager is a DesignSuite software bundle.

Application Focused Libraries

Rockwell has ACM libraries for process, motion, and drives applications.

Application-focused Code Libraries

Design Machines Faster with Less Investment

Our Machine Builder libraries support a wide portfolio of machine and process scenarios that include packaging, converting, print, web, and process skid. Packaging OEMs can leverage these libraries to help generate and configure ISA-TR88.00.02 (PackML) based machine logic. The Machine Builder libraries are available in Studio 5000® Application Code Manager and Studio 5000 Architect® software.

[Access the Library to Learn More](#)

Build Projects More Efficiently

Our Device Object library contains tested, documented, and lifecycle-managed objects. The device objects can be used with machine builder, process, and packaged libraries or as standalone components. Device objects are available for Studio 5000 View Designer® software and use a reworked user interface that seamlessly integrates with the products.

[Access the Library to Learn More](#)

Standardize Your Systems

Quickly assemble your applications through our predefined library of code and faceplates for end users and system integrators. With proven strategies and rich functionality, these libraries can be applied to many industries and deploy full process architectures. Save time and easily maintain your systems with our PlantPax® Process Application Code library.

[Access the Library to Learn More](#)

Rockwell has libraries of standard application content to help easily integrate automation products into systems. Our application content helps engineers create automation projects from standardized, lifecycle-managed, application-focused libraries in an efficient way. This content includes code libraries for process, motion, and drives applications.

Getting the PlantPax 5.0 Process Library for ACM

Available at RockwellAutomation.com, Support tab, select Compatibility and Download center, and search for PlantPax Process.

The screenshot shows the Rockwell Automation website with the 'Support' tab selected in the top navigation bar. A dropdown menu is open under 'Support', with 'Application Code Libraries' circled in red. Below this, a table lists various download items. The 'Process Library' is highlighted, and its 'Select Files' button is circled in black. The table includes columns for version numbers and download status.

Item	Version	Status
Downloads	33.00.02	▲
2D & 3D Drawings		
Activations		
Add-on Profiles		
Application Code Libraries		
Compatibility & Downloads		
EPLAN Macros		
Sample Code Library		
Integrated Architecture Builder		
Control Systems Configuration Tools		
Process Library	5.00.01	▲
5.00.00	5.00.00	▲
4.10.03	4.10.03	▲
4.10.02	4.10.02	▲
4.10.01	4.10.01	▲

Managed library objects and faceplates for use with Studio 5000 Application Code Manager (ACM) available in PlantPax 5.0 and 4.1 Libraries.

Getting the PlantPax Library for ACM

Tested, documented and life-cycle managed library for use with Studio 5000 Application Code Manager (**ACM**)

The screenshot displays the Rockwell Automation software interface. On the left, the 'PROCESS LIBRARY 5.00.01' page is shown with a 'Downloads 3 (max 20)' button. Under 'Accessory Files', three items are checked: 'Application Code Manager Process Library Update v5.00.01', 'Language translation files for HMI - FTView SE v5.00.01', and 'PlantPax Process Library v5.00.01'. A file explorer window is open to the 'RA' folder, showing a list of downloaded files:

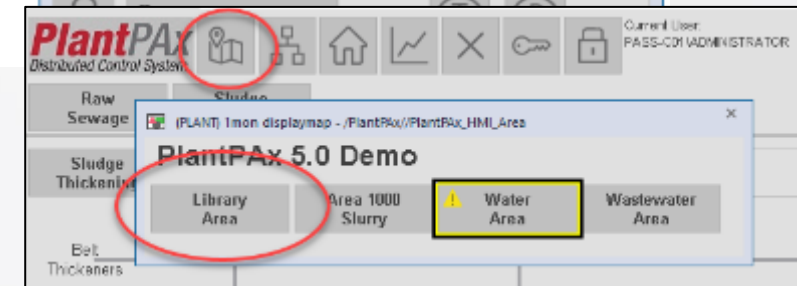
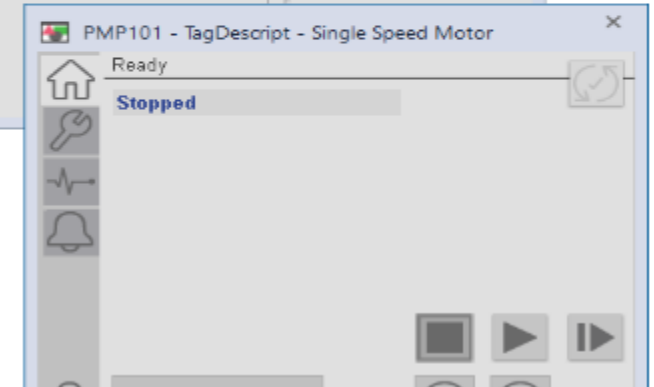
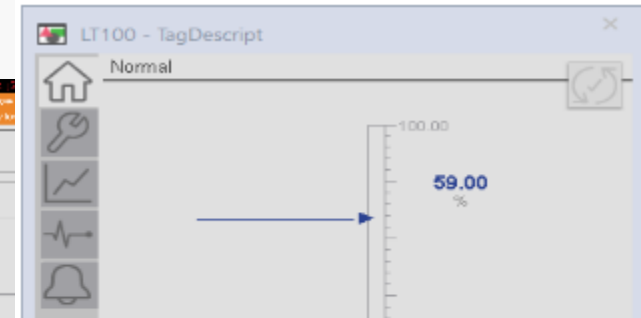
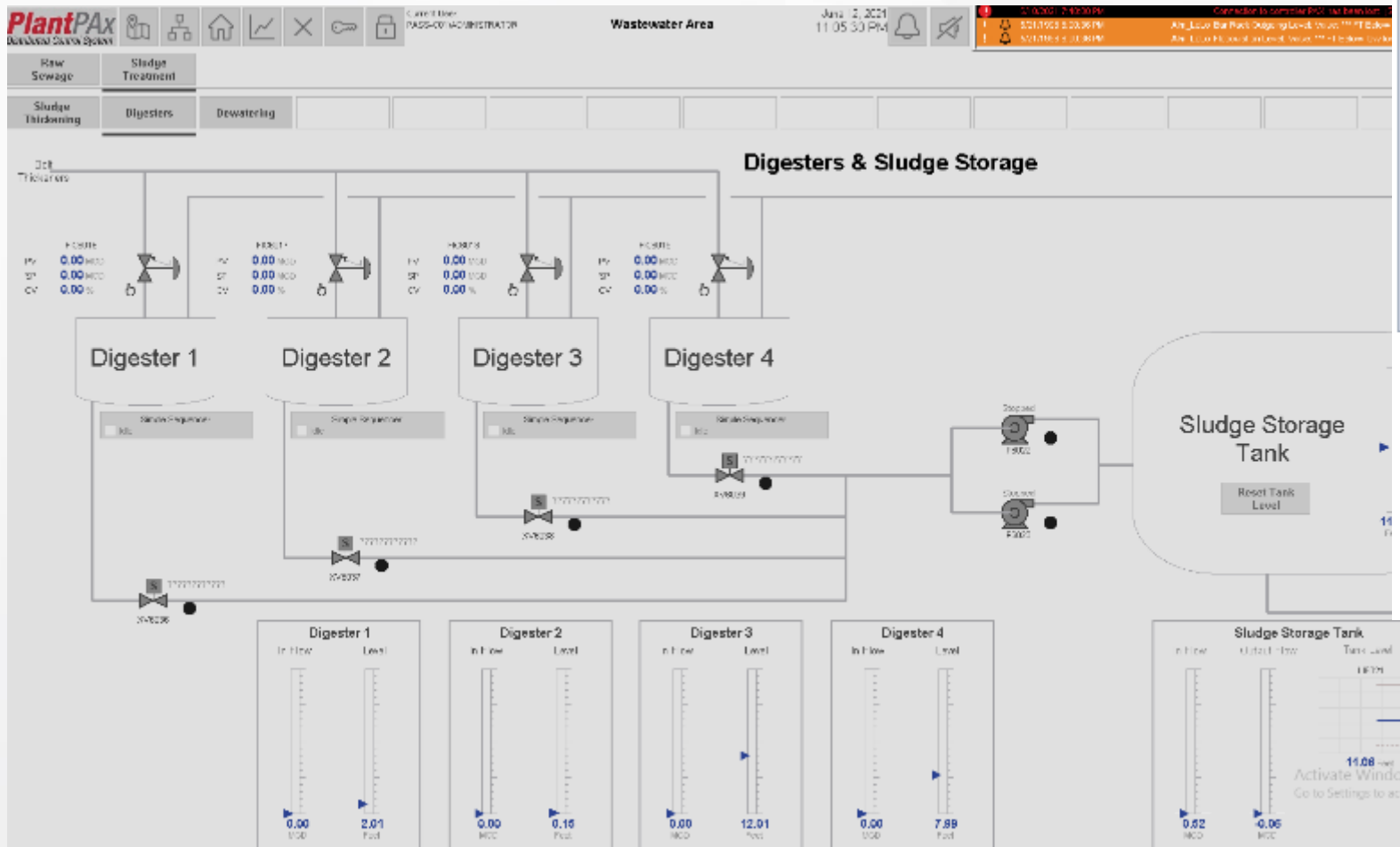
Name	Date modified	Type	Size
ACM_Update_v5.00.xx.zip	4/6/2021 2:58 PM	WinZip File	7,603 KB
Language_Files_for_5.00.01.zip	4/6/2021 2:58 PM	WinZip File	1,390 KB
PlantPax_Process_Library_v5.00.01.zip	4/6/2021 2:58 PM	WinZip File	228,149 KB
V33.051_kit1_ENHCLXRED.zip	10/25/2020 4:11 PM	WinZip File	64,238 KB

On the right, the 'Registered Libraries' pane shows a tree view with the following structure:

- Registered Libraries
 - (RA-LIB) Process 5 (50)
 - Controller (4)
 - ControlStrategies (32)
 - Device Control (7)
 - D4SD (1.1)
 - NPO (1.1)
 - PAO (1.1)
 - PDO (1.1)
 - PMTR (1.1)
 - PVLV (1.1)
 - PVSD (1.1)
 - Discrete Monitoring and Control (2)
 - Dosing (1)
 - Equipment (2)
 - Input Processing (4)
 - Process Control (4)

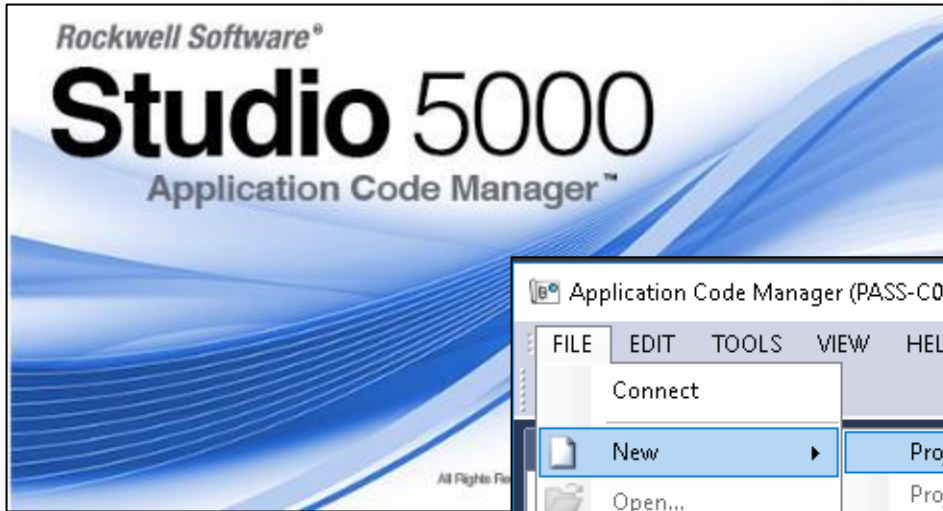
PlantPax Process Library includes Device Objects and Faceplates

The library also contains all the HMI objects for a PlantPax project.



To see the complete library, download the PlantPax 5.0 Process Demo Image.

The first step in ACM is to Create a Project



Object Configuration Wizard

Name:

Description:

Catalog Number: Basic_Project (1.1) - Published

Solution: (RA-LIB) Process 5

Note the project type is (RA-LIB)Process 5

Application Code Manager (PASS-C01.ACM)

FILE EDIT TOOLS VIEW HELP

Connect

New ▶ Project

Open...

Delete...

Recent Projects

Exit

Object Configuration Wizard

Select a library

Filter:

Show All Revisions Show All Libraries

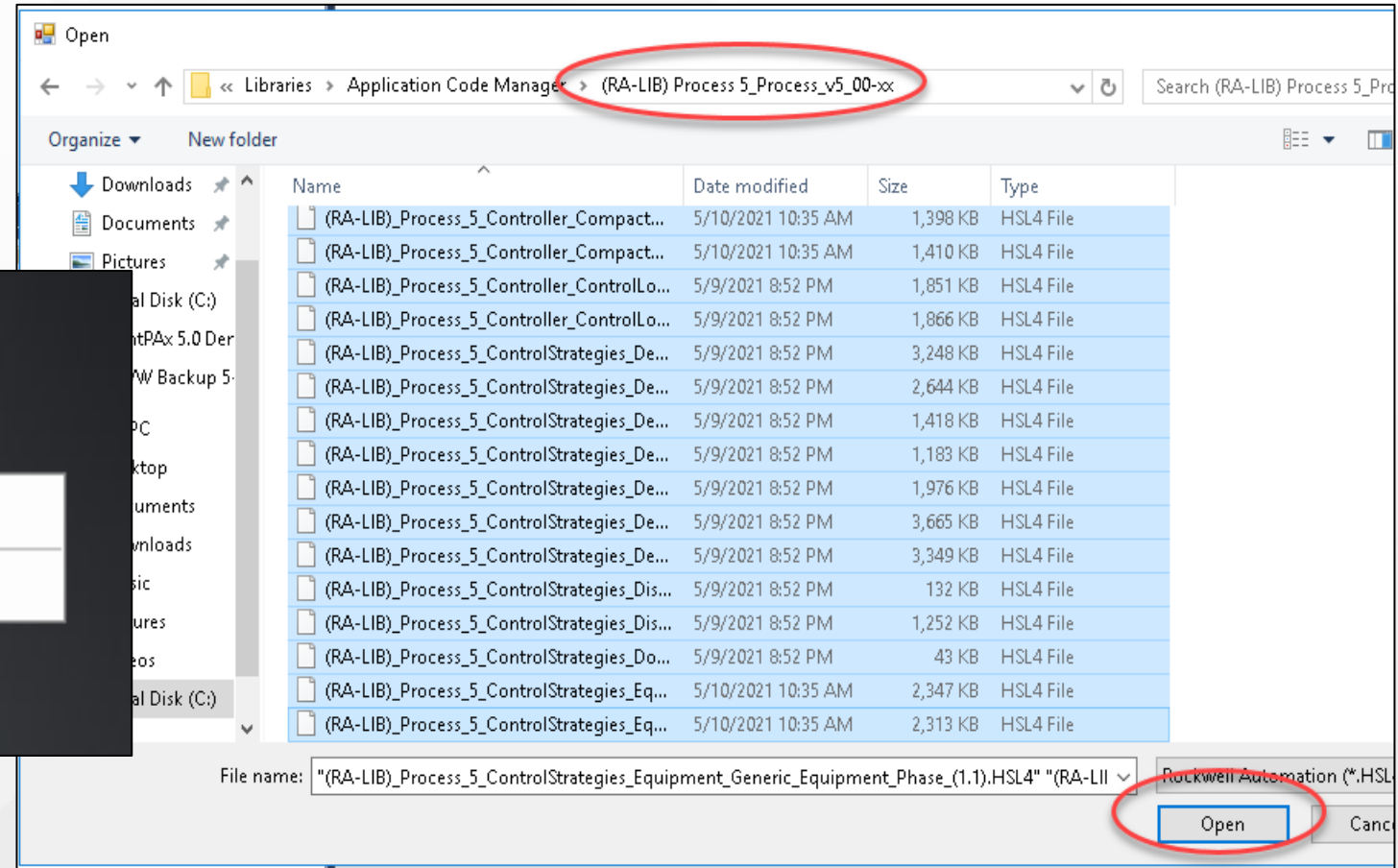
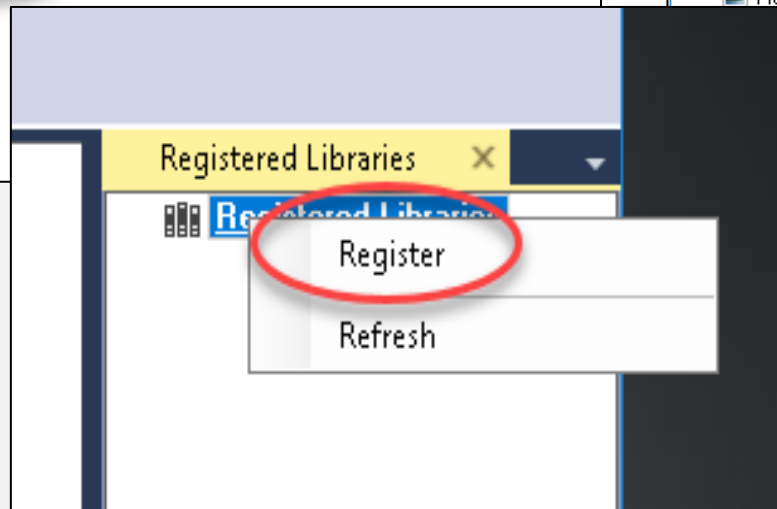
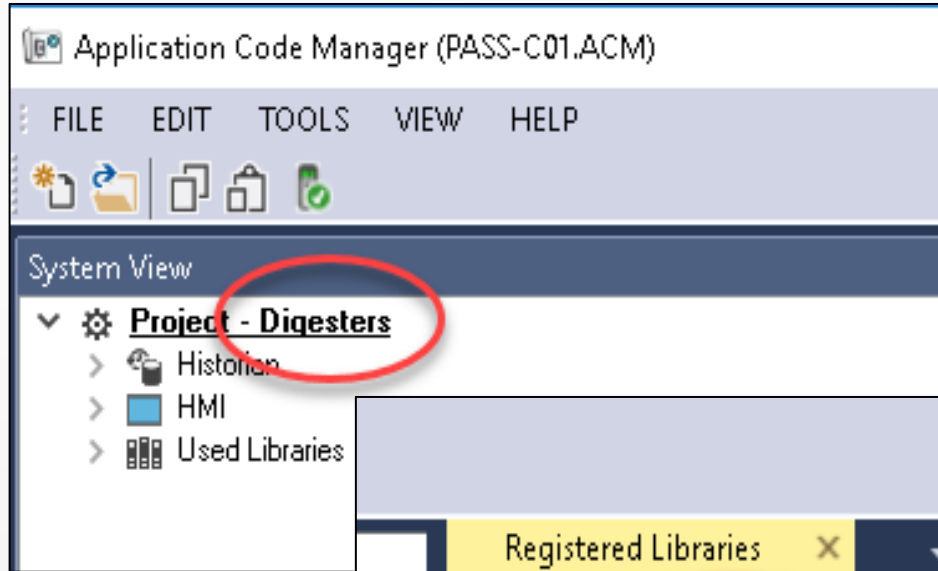
Solution	LibraryType	Category	CatalogNumber	Family	ContentType	Class	Status
Project (1 item)							
(RA-LIB) Process 5	Project	Project	Basic_Project (1.1)	Project	Task	Standard	Published

Cancel << Previous Next >> Finish

Two initial setup steps before configuring the actual application are to create the project within ACM and register the library. To create the project, we name it and select the type. In this case the type is PlantPax 5.0

Register the Library

The next step is to register the PlantPax Process library within ACM.



Process Library 5.0 Instructions and Process Strategies.

Registered Libraries	
>	Controller (4)
▼	ControlStrategies (32)
▼	Device Control (7)
	D4SD (1.1)
	NPD (1.1)
	PAO (1.1)
	PDO (1.1)
	PMTR (1.1)
	PVLV (1.1)
	PVSD (1.1)
▼	Discrete Monitoring and Control (2)
	PBL (1.1)
	PLLS (1.1)
▼	Dosing (1)
	TOT (1.1)
▼	Equipment (2)
	Generic_Equipment_Module (1.1)
	Generic_Equipment_Phase (1.1)
▼	Input Processing (4)
	PAI (1.1)
	PDI (1.1)
	PPTC (1.1)
	PTST (1.1)
▼	Procedural Control (1)
	PDOSE (1.1)
▼	Regulatory Control (12)
	IMC (1.1)
	PDBC (1.1)
	PFO (1.1)
	PHLS (1.1)
	PPID (1.1)
	PPID_Casc (1.1)
	PPID_FF (1.1)
	PPID_OVERRIDE (1.1)
	PPID_PAO (1.1)
	PPID_PVSD (1.1)
	PPID_Ratio (1.1)
	PPID_SPLITRANGE (1.1)

Library Resources		
LIBRARY OBJECT	LIBRARY OBJECT	LIBRARY OBJECT
I/O PROCESSING	PowerFlex 755 Drive (P_PF755)	CROSS FUNCTIONAL
Basic Analog Input (P_AIn)	SMC™-50 Smart Motor Controller (P_SMC50)	Condition Gate Delay (P_Gate)
Analog Input Channel (P_AInChan)	SMC™ Flex Smart Motor Controller	Interlocks with First Out and Bypass (P_Intlk)
Advanced Analog Input (P_AInA)		Hand-operated Valve (P_ValveHO)
Dual Sensor Analog Input (P_AInD)	REGULATORY CONTROL	Motor-operated Valve (P_ValveMO)
Multiple Analog Input (P_AInMu)	Proportional + Integral + Derivative Enhanced (P_PIDE)	Mix-proof Valve (P_ValveMP)
Discrete Input Object (P_DIn)	Analog Fanout (P_Fanout)	Solenoid-operated Valve (P_ValveSO)
Discrete Input Object Advanced	High or Low Selector (P_HiLoSel)	2-state Valve Statistics (P_ValveStats)
Discrete Output (P_DOut)	Deadband Controller (P_DBC)	n-Position Device (P_nPos)
Analog Output (P_AOut)	PROCEDURAL CONTROL	STEAM TABLE
Pressure/Temperature Compensation (P_PTComp)	Sequencer Object (P_Seq)	Saturated Steam Pressure (P_PSat)
Tank Strapping Table (P_StrapTbl)	Dosing (Weight Scale or Flowmeter) (P_Dose)	Saturated Steam Temperature (P_TSat)
HART Analog Input (P_AInHART)	Lead/Lag/Standby Motor Group (P_LLS)	General Steam Table (P_Steam)
HART Analog Output (P_AOutHART)	MOTORS	Entropy (P_Steam_hs)
REGULATORY CONTROL	Single-speed Motor (P_Motor)	Steam Properties Given Pressure and Enthalpy (P_Steam_ph)
Proportional + Integral + Derivative Enhanced (P_PIDE)	Two-speed Motor (P_Motor2Spd)	Steam Properties Given Pressure and Entropy (P_Steam_ps)
Analog Fanout (P_Fanout)	Reversing Motor (P_MotorRev)	Hand-operated Motor (P_MotorHO)
High or Low Selector (P_HiLoSel)	Hand-operated Motor (P_MotorHO)	Modular Multivariable Control (MMC)
Deadband Controller (P_DBC)	Discrete 2-, 3-, or 4-state Device (P_D4SD) (also used for valves)	Proportional + Integral + Derivative Enhanced (PIDE)
	PowerFlex® 523/525 VF Drives (P_PF52x)	Ramp Soak (RMPS)
	PowerFlex 753 Drive (P_PF753)	Totalizer (TOT)
		Logix Change Detector (L_ChangeDet)
		Logix Controller CPU Utilization (L_CPU)
		Logix Redundant Controller Monitor (L_Redun)
		Logix Task Monitor (L_TaskMon)
		Logix Module Status (L_ModuleSts)
		DISPLAY ELEMENTS AND FACEPLATES FOR BUILT-IN INSTRUCTIONS
		Built-in Autotuner
		Coordinated Control (CC)
		Internal Model Control (IMC)
		Modular Multivariable Control (MMC)
		Ramp Soak (RMPS)
		Totalizer (TOT)
		P_DInAdv (speed switch)
		P_IntlkAdv (interlocks)

Add a Controller to the Project

Note no controllers exist in the project yet. Add a Process Controller 1756- L85EP for PlantPAx 5.0.

The screenshot illustrates the steps to add a controller to a project. The **System View** shows the project structure with folders for Historian, HMI, and Used Libraries. The **Controller Preview** window shows the 'Controllers' folder. The **Class View** shows the 'Controllers' folder with a context menu open, highlighting 'Add New...'. The **Object Configuration Wizard** is open, showing a table of available controllers. The 'Process_Controller (1.1)' is highlighted in the table.

Solution	LibraryType	Category	CatalogNumber	Family	ContentType
CompactLogix (2 items)					
(A-LIB) Process 5	Controller	CompactLogix	Basic_CmptController (1.0)	Logix	Task
(A-LIB) Process 5	Controller	CompactLogix	Process_CmptController (1.0)	Logix	Task
ControlLogix (2 items)					
(A-LIB) Process 5	Controller	ControlLogix	Basic_Controller (1.1)	Logix	Task
(RA-LIB) Process 5	Controller	ControlLogix	Process_Controller (1.1)	Logix	Task

Controller Preview shows what content will be generated in the final ACD from the configured Class View library objects.

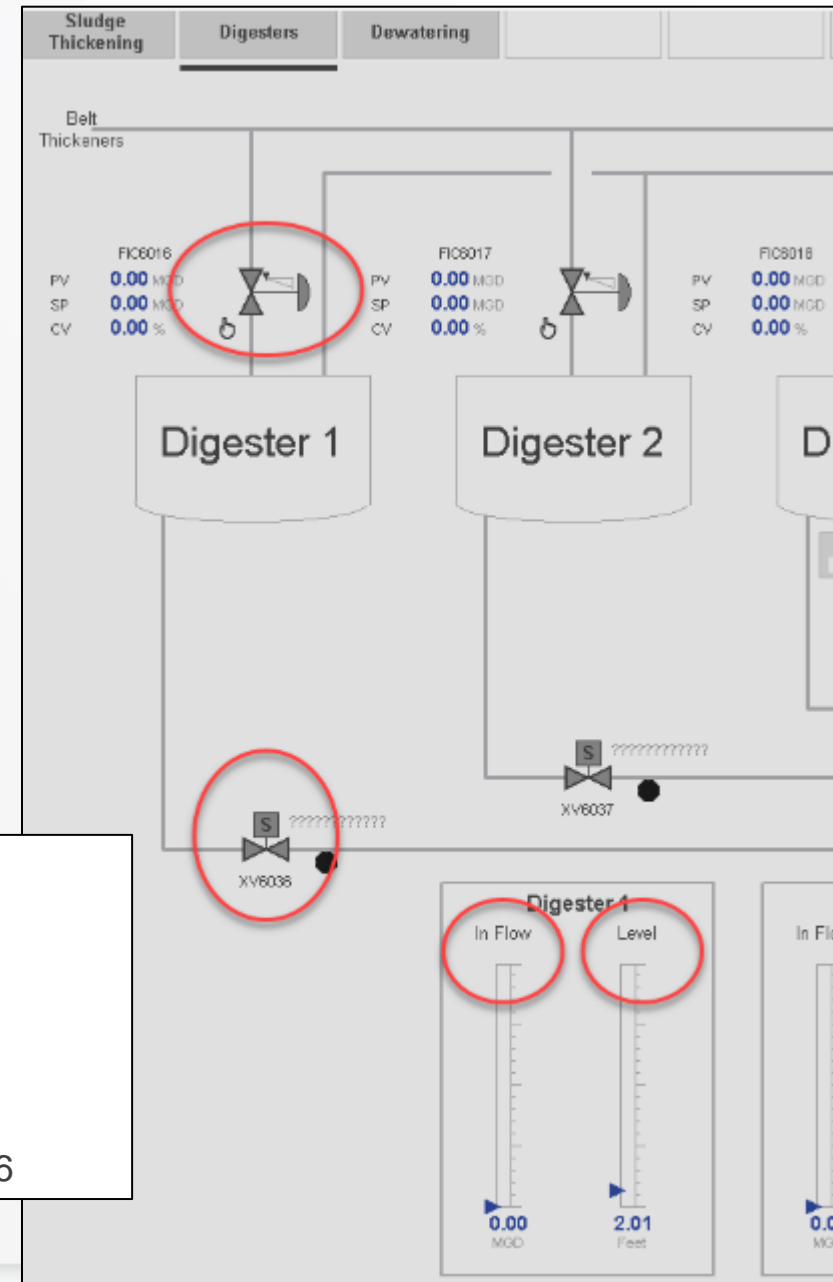
Class View shows all the configured library objects as well as all the instances.

PlantPax Task Model

The PlantPax Task Model includes Slow, Normal and fast tasks.

The WasteWater Digester application – inlet flow, level and outlet valve is added to the normal task running at 250ms.

The screenshot displays two windows from the Rockwell Automation software. The 'Controller Preview' window on the left shows a tree view of controllers under 'WWW'. The 'WWW' controller is circled in red. Under 'WWW', there are three folders: 'Controller Fault Handler', 'Power-Up Handler', and 'Tasks'. The 'Tasks' folder is expanded, showing 'Fast', 'Normal', 'Slow', and 'System' tasks. The 'Normal' task is selected, and its 'MainRoutine' is highlighted with a blue box. The 'Class View' window on the right shows the class structure for the 'WWW' controller. Under 'Program (1.0)', the 'Communications' class is highlighted with a blue box. Other classes listed include 'FastProgram', 'GlobalFunctions', 'HardwareTree', 'NormalProgram', 'OrgTree', 'raC_LgxFault', 'raC_LgxPowerUp', 'SlowProgram', and 'SystemProgram'.



Digester 1 Devices:

In Flow – Analog input PAI - WWW_FI6016

Inlet Valve – Control valve PPID - WWW_FIC6016

Level - Analog input PAI - WWW_LI6011

Outlet Valve – Solenoid valve PVLV - WWW_XV6036

Configuring the Normal Task – adding a Program

Add new program to the Normal Task.

The image consists of three screenshots from the Rockwell Automation software interface, illustrating the steps to add a new program to a Normal task.

- Top Left Screenshot:** Shows the 'Controller Preview' window with a tree view of tasks. The 'Normal' task is selected and circled in red. The 'Class View' window shows the 'Program (1.0)' folder expanded, listing various program components like 'Communications', 'FastProgram', 'GlobalFunctions', 'HardwareTree', 'NormalProgram', 'OrgTree', 'raC_LgxFault', and 'raC_LoxPowerUp'.
- Top Right Screenshot:** A text box above the screenshot reads 'Added program named Area_6000_Digesters'. The 'Controller Preview' window shows the 'Normal' task expanded, with a new program named 'Area_6000_Digesters' added and circled in red. The 'MainRoutine' sub-item is also circled in red.
- Bottom Screenshot:** Shows the 'Controller Preview' window with the 'Normal' task selected. A context menu is open over the 'Normal' task, with the 'Add New Program' option circled in red. The menu also includes 'Add New...', 'Contributing Instances', and a list of program components.

Add Process Strategies to the Controller

Add flow indicating control strategy (PAI) named WWW_FI6016 to the digester program.

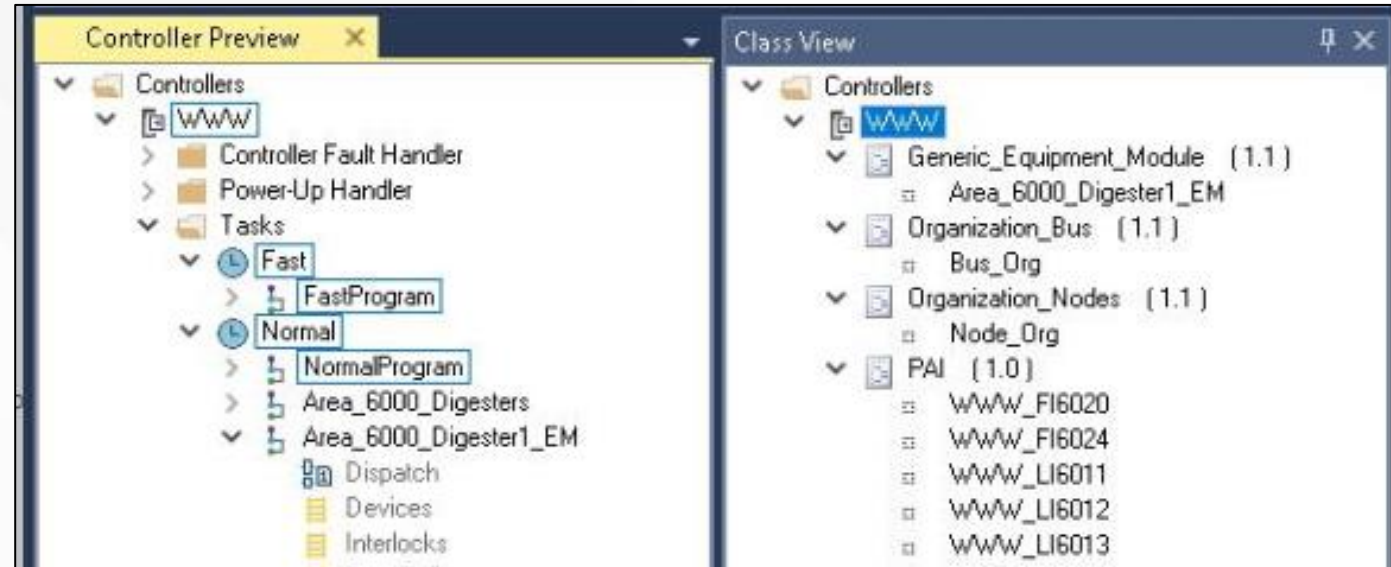
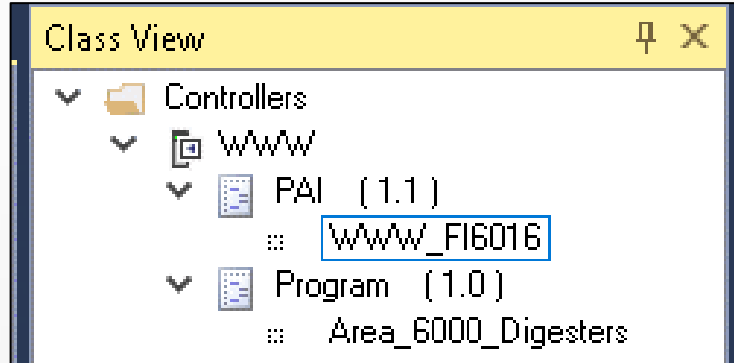
The image shows a multi-step process in the Rockwell Automation software:

- Class View:** A tree view showing the project structure. The 'WWW' controller is selected, and the 'Add New...' option is highlighted in a red circle.
- Object Configuration Wizard (Library Selection):** A dialog box showing a list of libraries. The 'Input Processing' category is expanded, and the 'Input Processing PAI (1.1)' item is selected, highlighted with a red circle.
- Object Configuration Wizard (Configuration):** A dialog box for configuring the selected object. The 'Name' field is set to 'WWW_FI6016' (circled in red). The 'Use_OOAP' parameter is set to 'True' (circled in red).
- Object Configuration Wizard (Parameters):** A dialog box showing the parameters for the object. The 'ACM_UsedIn' parameter is set to 'PPID' (indicated by a large grey arrow).

Note the flow indicator is part of the flow controller PPID.

Add More Process Strategies to the Controller

Add the rest of the Process Strategies to the Digester program. Flow control valve PPID, Level, and valve.

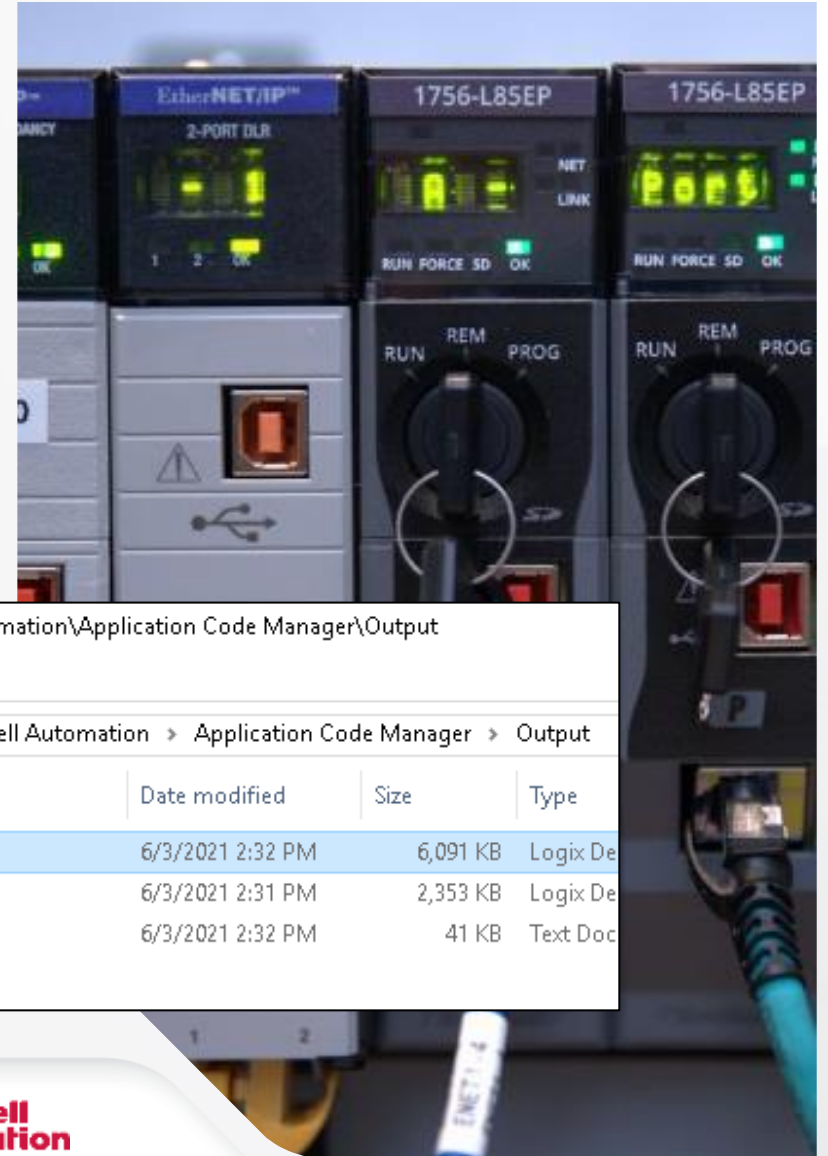
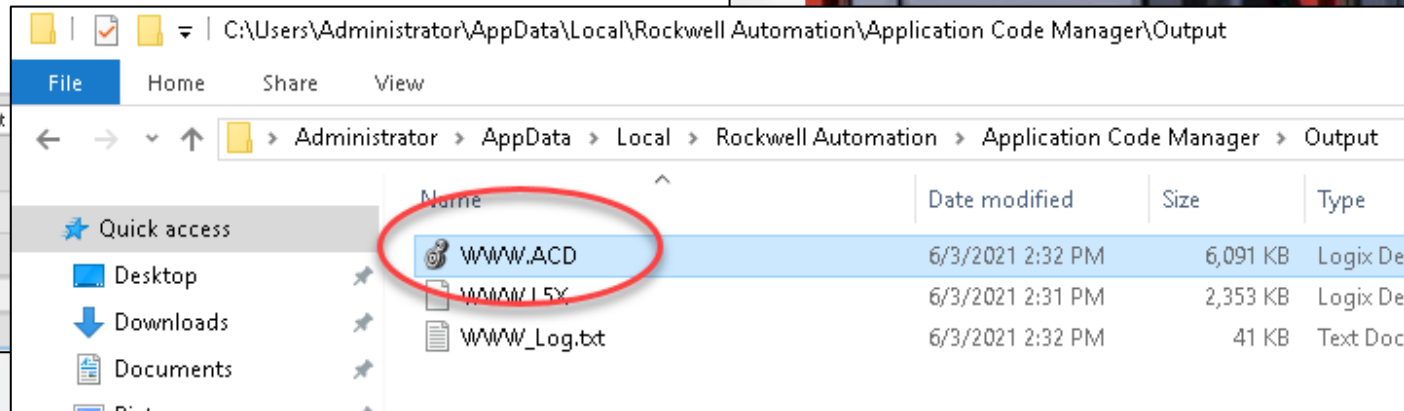
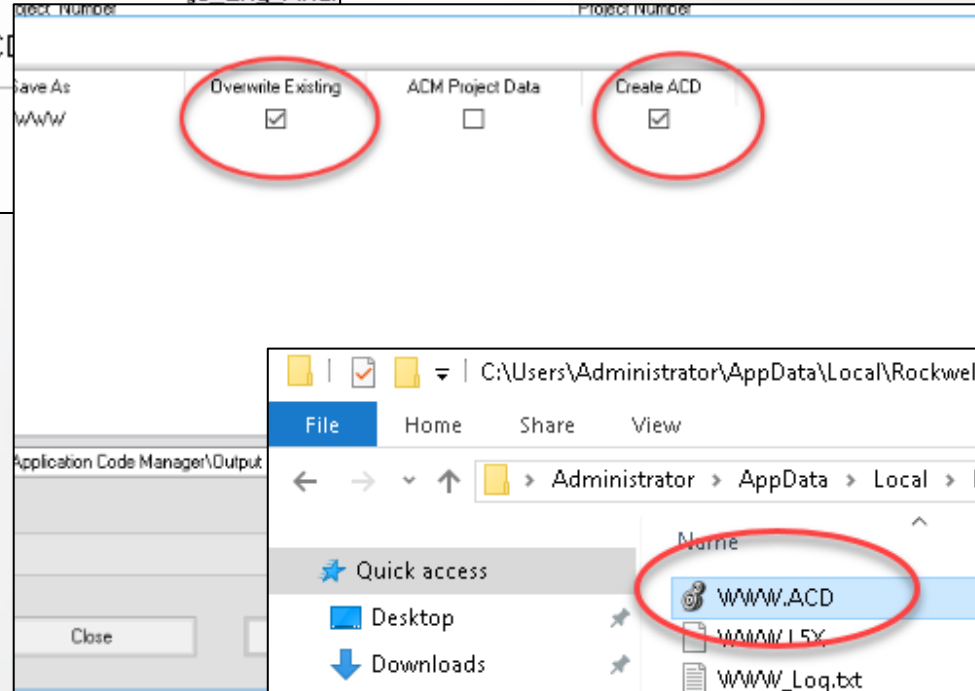
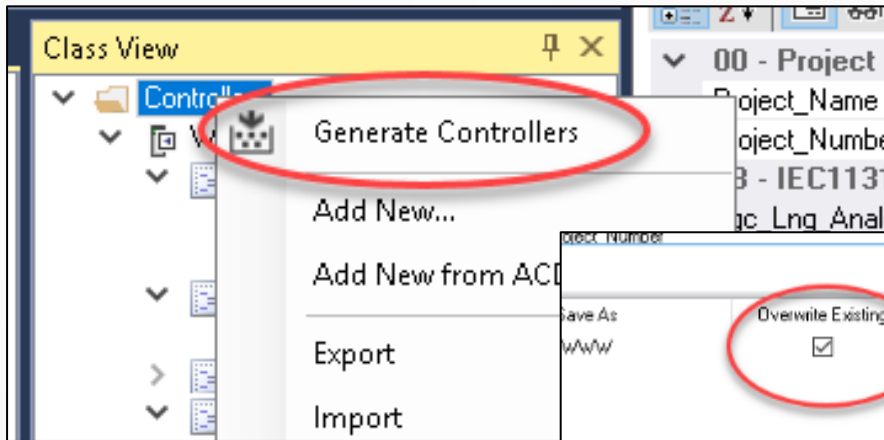


Bus (3 items)									
Device Control (7 items)									
(RA-LIB) Process 5	ControlStrategies	Device Control	D4SD (1.1)	Logix	Task	Standard	Published	2.0.0	
(RA-LIB) Process 5	ControlStrategies	Device Control	NPO (1.1)	Logix	Task	Standard	Published	2.0.0	
(RA-LIB) Process 5	ControlStrategies	Device Control	PAO (1.1)	Logix	Task	Standard	Published	2.0.0	
(RA-LIB) Process 5	ControlStrategies	Device Control	PDO (1.1)	Logix	Task	Standard	Published	2.0.0	
(RA-LIB) Process 5	ControlStrategies	Device Control	PMTB (1.1)	Logix	Task	Standard	Published	2.0.0	
(RA-LIB) Process 5	ControlStrategies	Device Control	PVLV (1.1)	Logix	Task	Standard	Published	2.0.0	
(RA-LIB) Process 5	ControlStrategies	Device Control	PVSD (1.1)	Logix	Task	Standard	Published	2.0.0	

Export to Excel for bulk configuration

Generate the Controller Code

Once all the Control Strategies are added we can generate the controller ACD file.



Controller Code

All the strategies are in the code.

Logix Designer - WWW [1756-L85EP 33.11]

File Edit View Search Logic Communications Tools Window Help

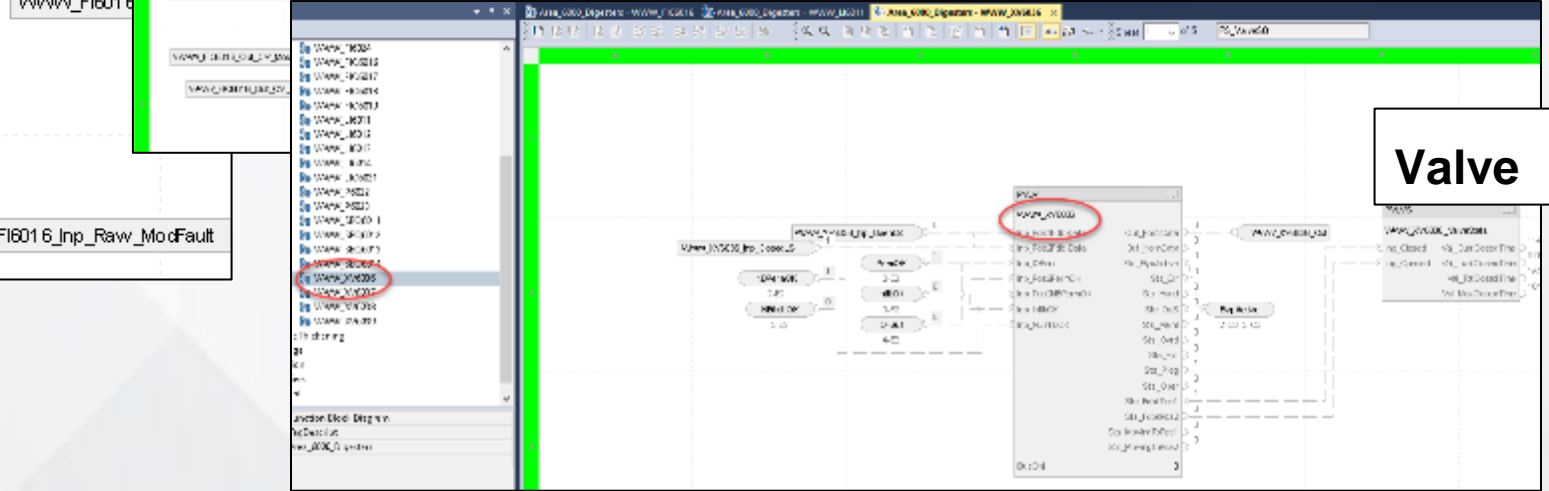
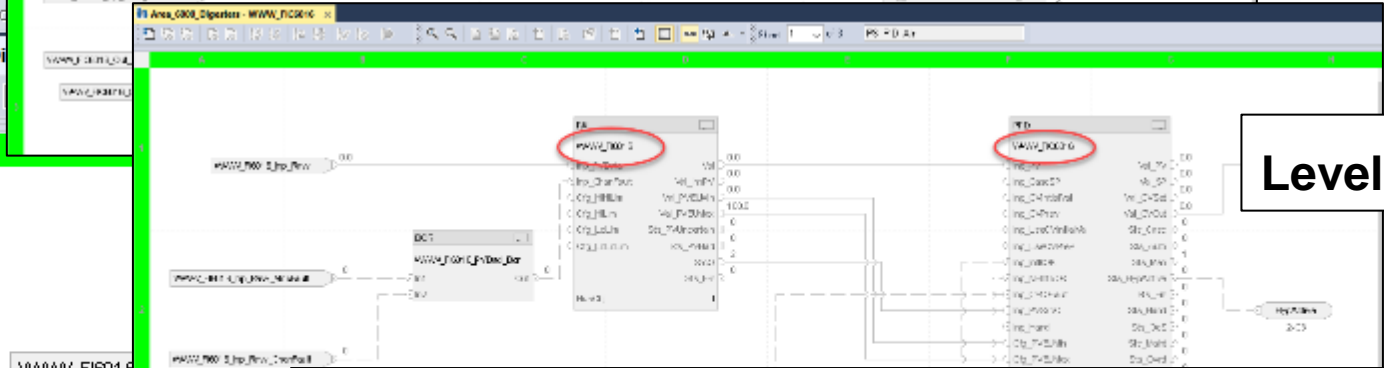
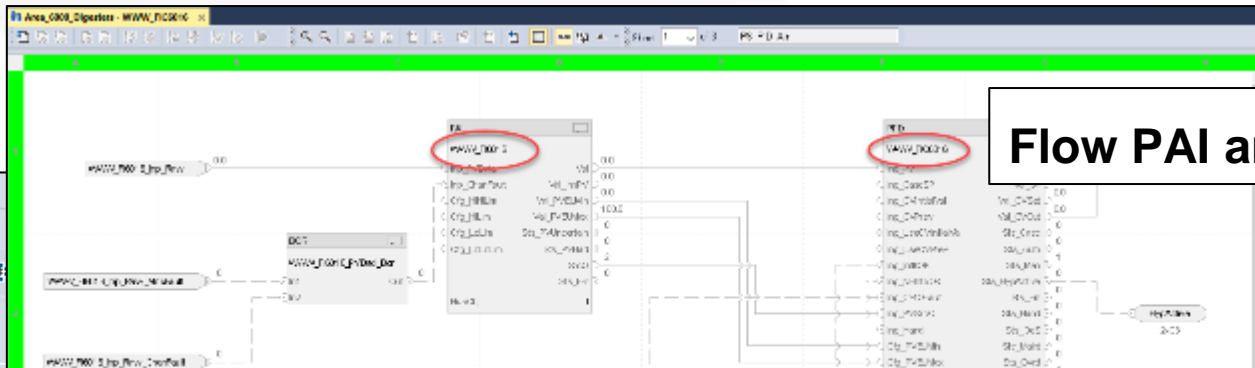
Run Mode
Controller OK
Energy Storage OK
I/O Not Present

Rem Run No Forces No Edits

Path: AB_ETHIP-1\192.168.1.101*

Logical Organizer

- System
 - Wastewater
 - SludgeTreatment
 - Dewatering
 - Digesters
 - Area_6000_Digesters
 - Logic and Tags
 - Parameters and Local Tags
 - MainRoutine
 - WWW_FI6020
 - WWW_FI6021
 - WWW_FIC6016
 - WWW_FIC6017
 - WWW_FIC6018
 - WWW_FIC6019
 - WWW_LI6011
 - WWW_LI6012



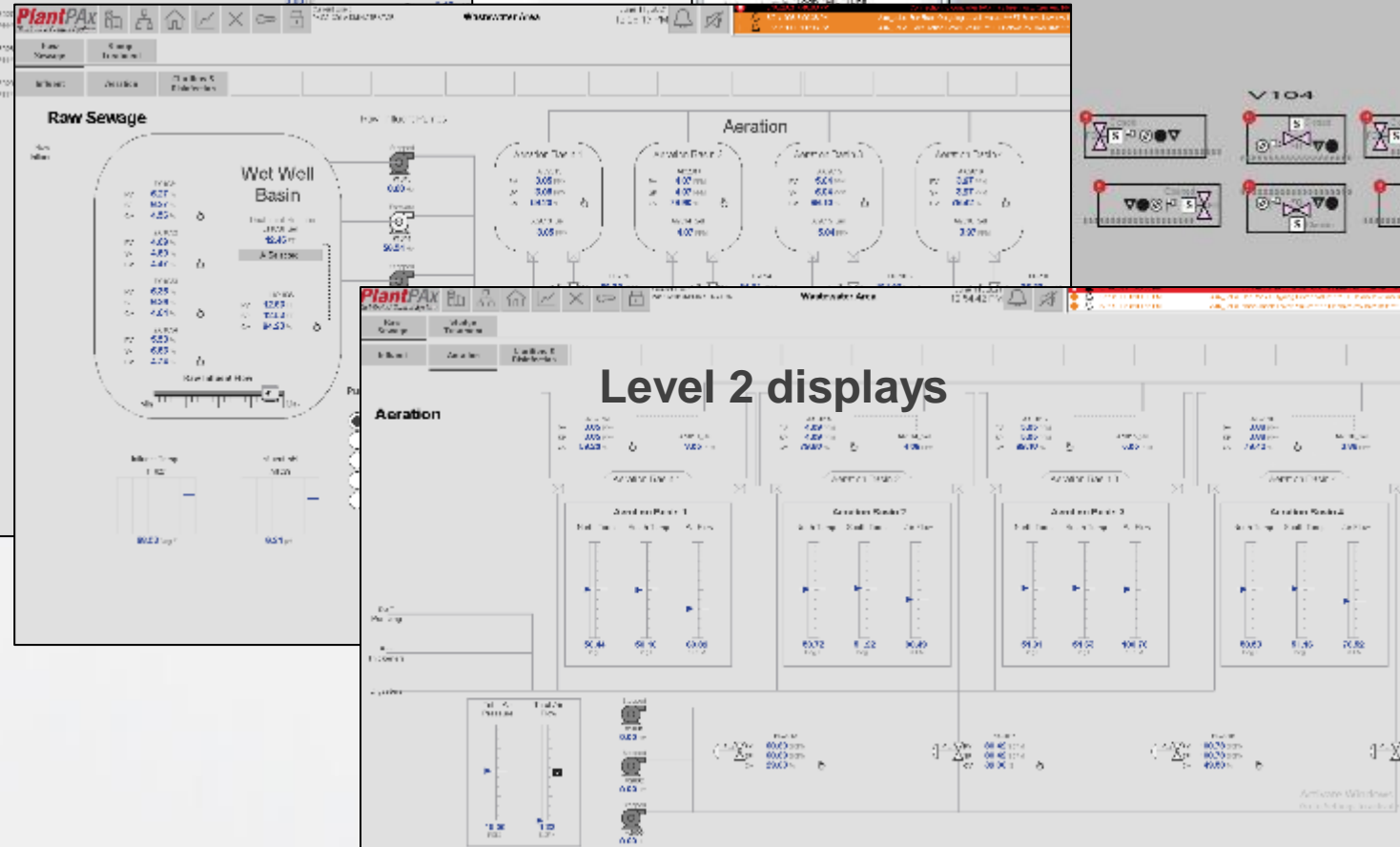
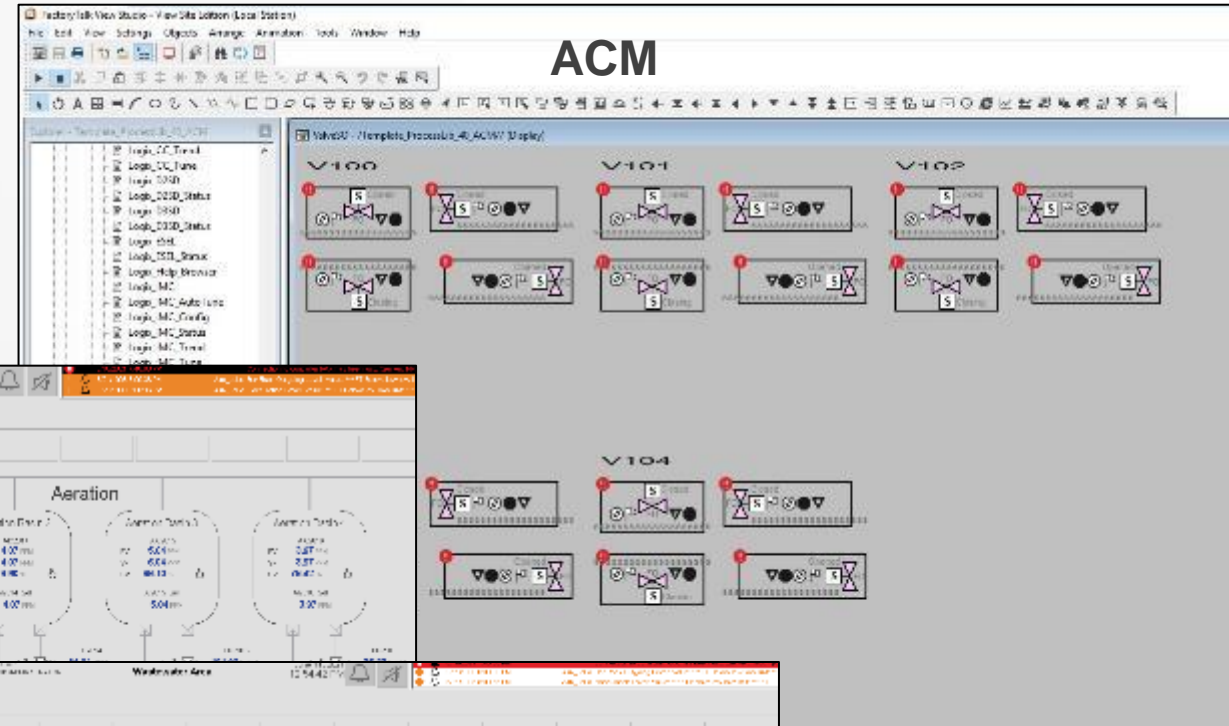
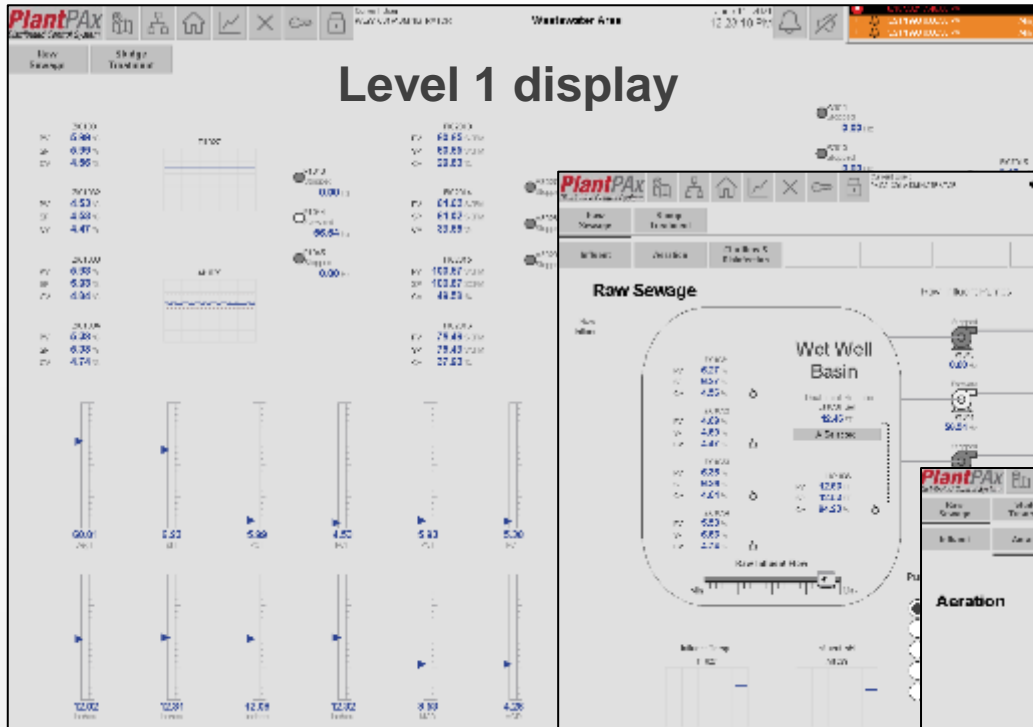
ACM can also create the HMI objects

ACM and the Library of Process Objects can also be used to quickly configure the HMI FactoryTalk View Studio application that comprise a PlantPAX System. This can help reduce the engineering time to assemble a new integrated architecture process HMI application.

The image displays two software interfaces. The left interface is the Application Code Manager (ACM) for Project_5.0, showing a 'Registered Libraries' pane with categories like Controller, ControlErase, Device, Discrete, Dosing, Equipment, Input Processing, Procedural Control, Regulatory Control, and Speciality. A 'Library Repositories' pane is also visible. The right interface is the FactoryTalk View Studio HMI design environment, showing a process flow diagram with HMI objects (e.g., HMI_1000, HMI_1001) and a 'Library Repositories' pane. Arrows indicate the flow of HMI objects from the ACM libraries to the HMI design environment.

Use ACM to Help Build the HMI

ACM can populate the displays with device objects.



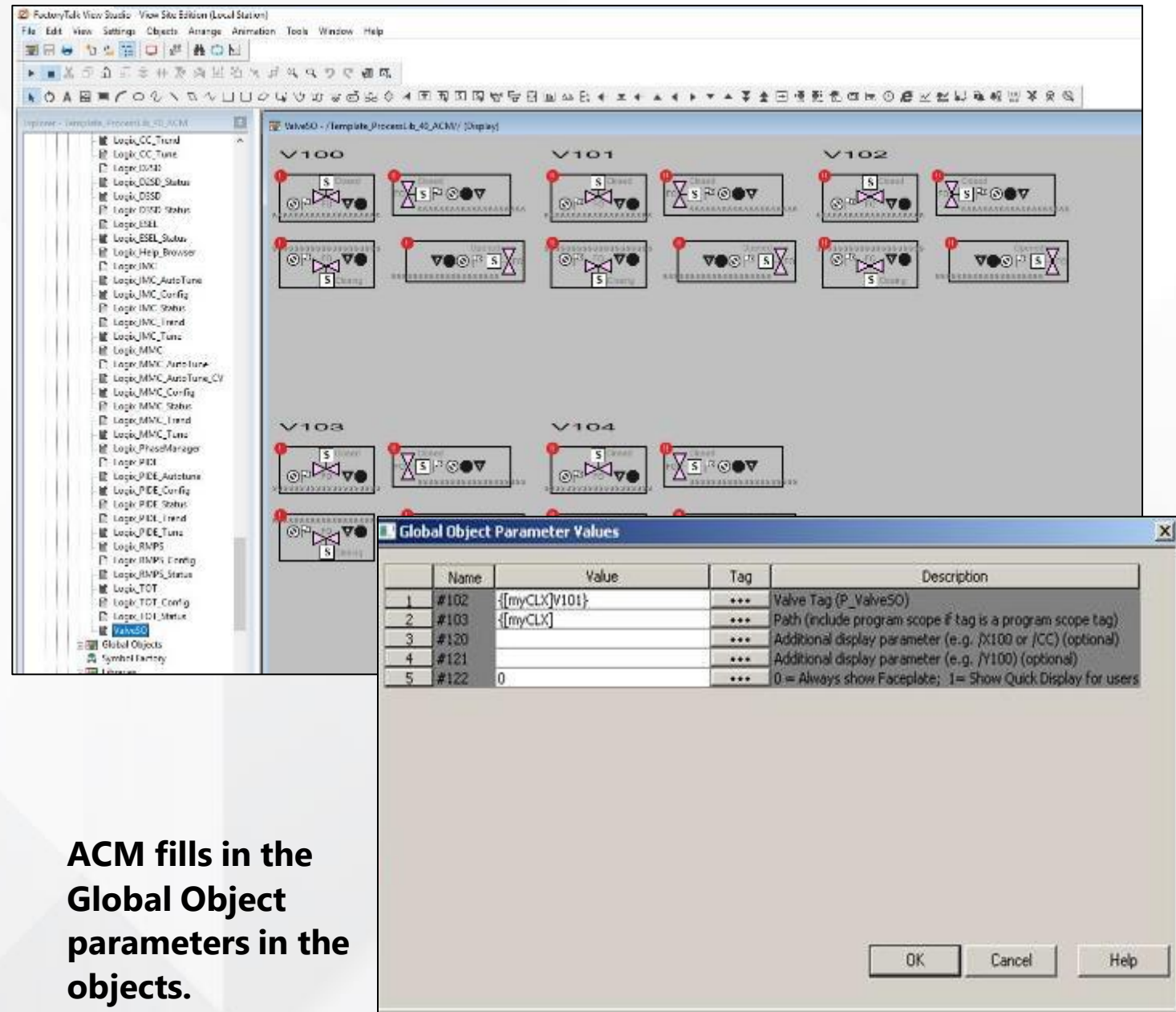
ACM HMI

ACM creates PlantPax Library based graphics with the Global Object Parameter Values already correct.

To configure ACM using the PlantPax HMI Library, you use View Studio to see which orientation of the global object you want, and ACM creates PlantPax Library based graphics with the Global Object Parameter Values already correct.

Also:

ACM also generates FactoryTalk Alarms and Events Content for 4.x libraries (AOI based) and Historian tags.



The screenshot shows the FactoryTalk View Studio interface. On the left is a project tree with various logic objects. The main workspace displays a HMI display for 'Valve50' with several valve symbols labeled V100 through V104. A dialog box titled 'Global Object Parameter Values' is open in the foreground, containing a table with the following data:

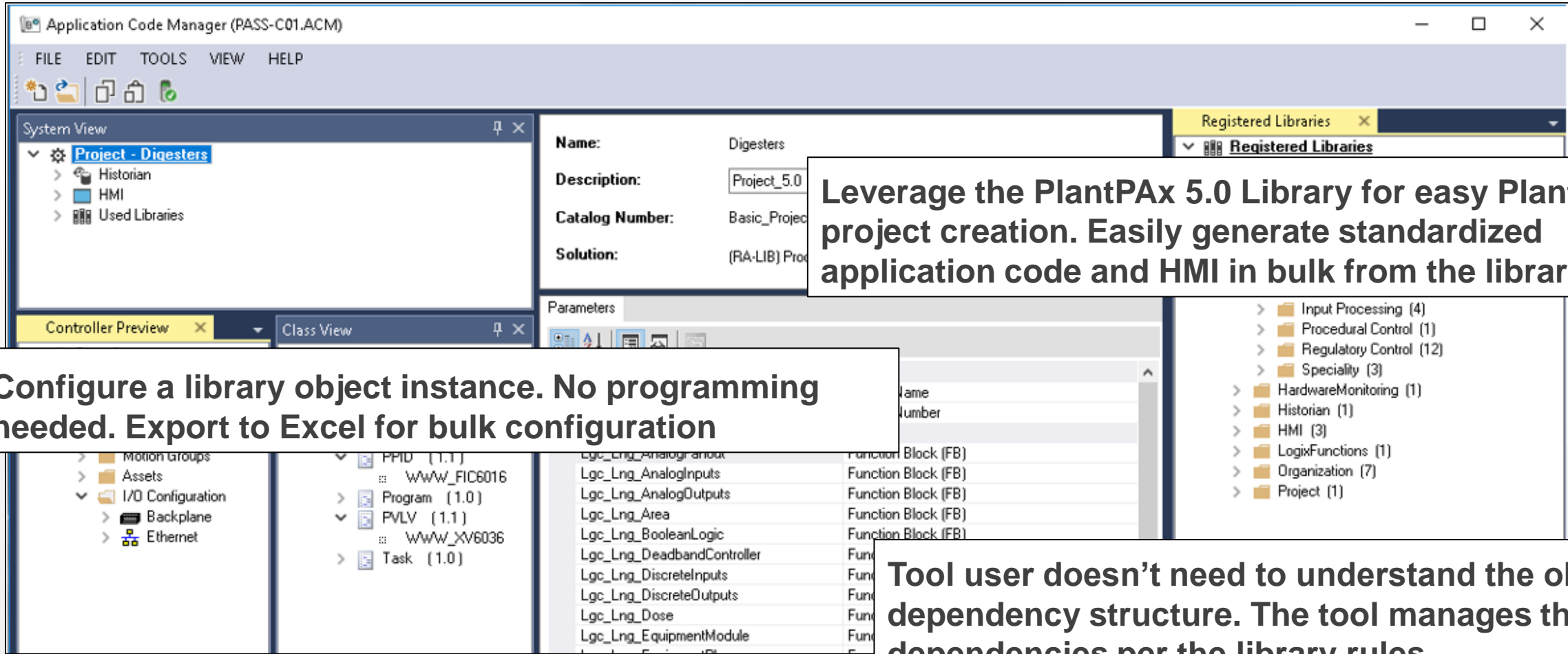
	Name	Value	Tag	Description
1	#102	{[myCLX]V101}	...	Valve Tag (P_Valve50)
2	#103	{[myCLX]}	...	Path (include program scope if tag is a program scope tag)
3	#120		...	Additional display parameter (e.g. /X100 or /CC) (optional)
4	#121		...	Additional display parameter (e.g. /Y100) (optional)
5	#122	0	...	0 = Always show Faceplate; 1 = Show Quick Display for users

At the bottom of the dialog box are 'OK', 'Cancel', and 'Help' buttons.

ACM fills in the Global Object parameters in the objects.

Summary

ACM has a free and paid version. The free version of Application Code Manager can only connect to a local database instance and only support a single controller per project. Projects with multiple controllers will need a license. The PlantPax Process Library is free.



Leverage the PlantPax 5.0 Library for easy PlantPax project creation. Easily generate standardized application code and HMI in bulk from the libraries.

Configure a library object instance. No programming needed. Export to Excel for bulk configuration

Tool user doesn't need to understand the object dependency structure. The tool manages the dependencies per the library rules.



Thank you,

Now Jason will present an overview on the new Equipment Module (EM) and use ACM to add an EM to the process strategies created above. He will then give an overview of the Organization Bus and review the final state logic in the controller file (ACD) that ACM generated.



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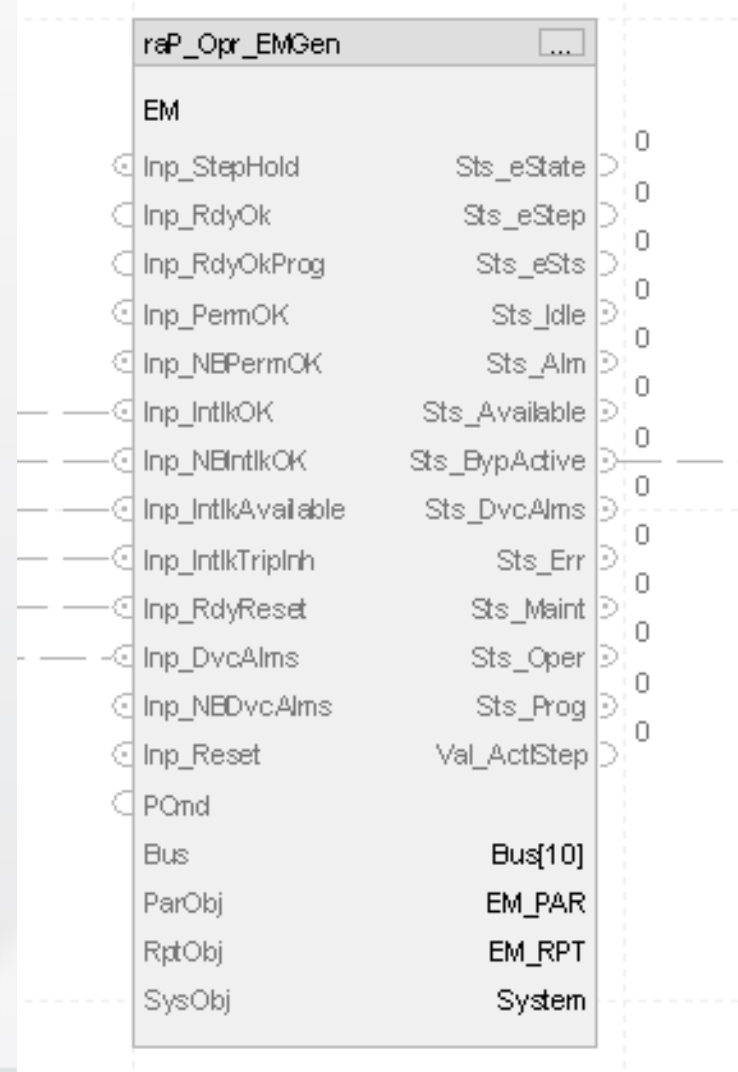


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PlantPax 5.0 Equipment Module (EM)

Using ACM to create and configure the PlantPax Equipment Module

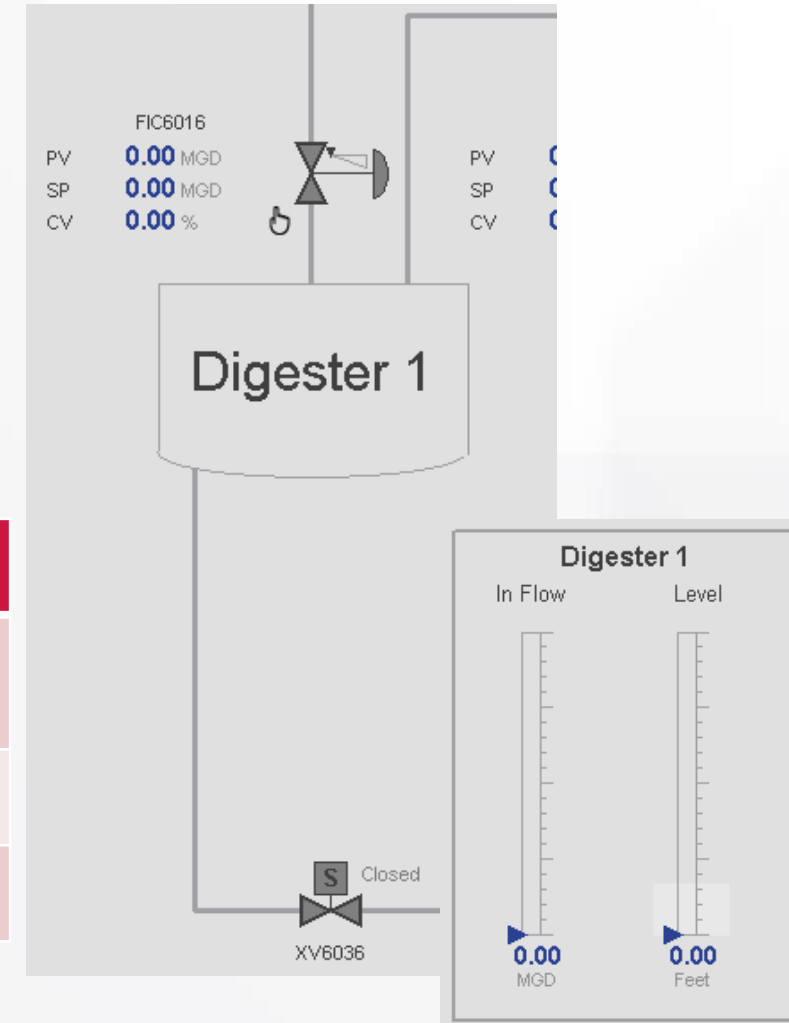
- The raP_Opr_EMGen (Generic Equipment Module) object controls an Equipment Module in a variety of command sources and monitors for fault conditions. The PlantPax EM allows users to configure up to 32 equipment states.
- An equipment module can be configured to operate independently, or one or several EMs can be moved to specific states by an Equipment Phase according to a product recipe.
- For this webinar we will be focusing on configuring and using a single equipment module to control the states of a Wastewater Digester.



Wastewater Digester

This section of the presentation will build upon the Control Strategies that we just created.

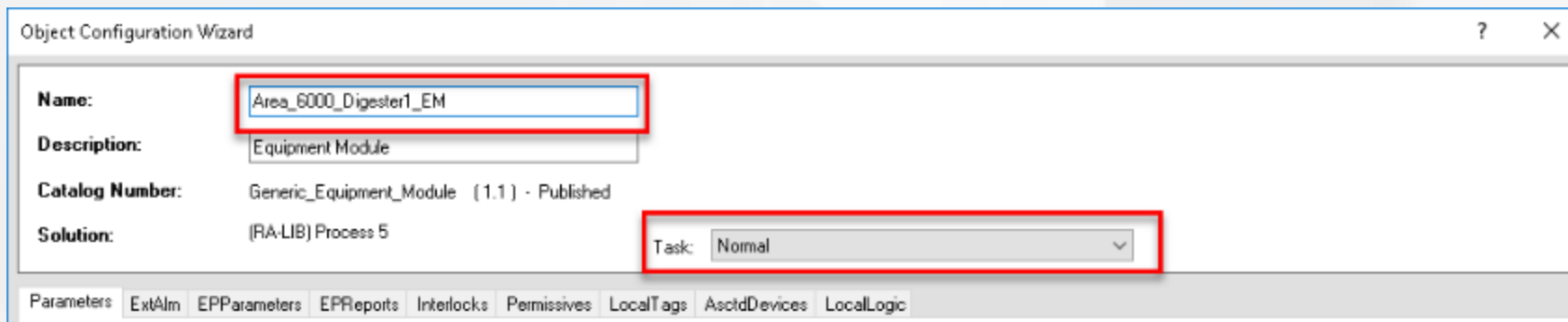
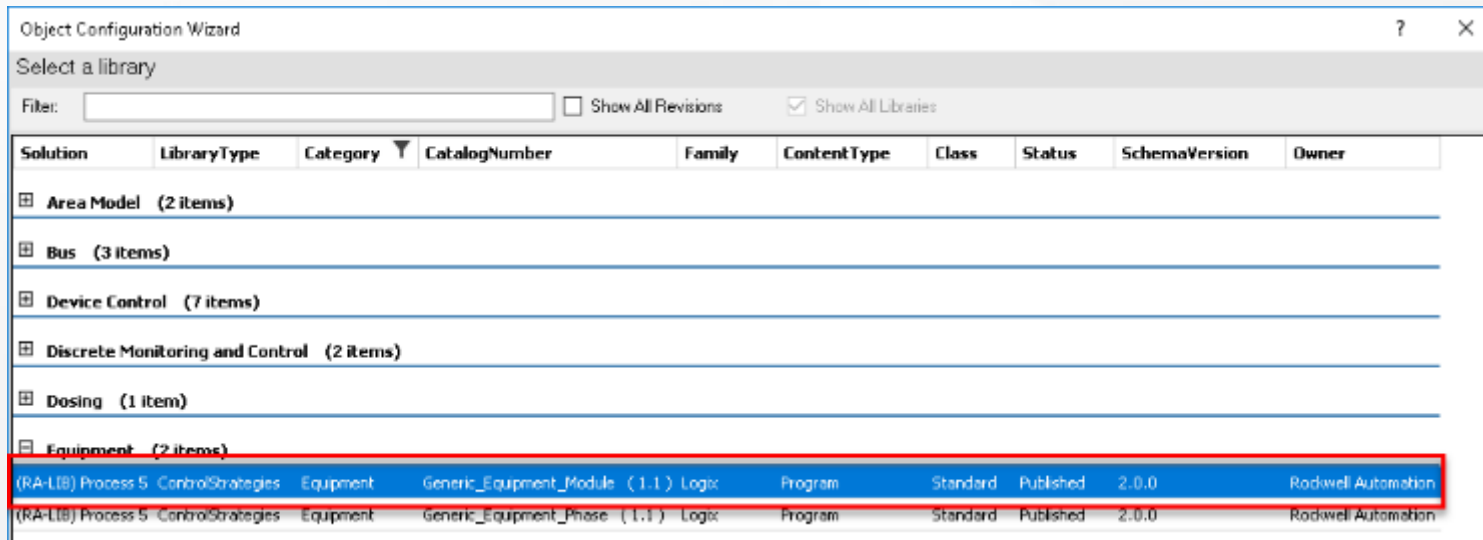
- The Digester EM will manipulate the PPID Control Valve FIC6016 and Discharge Valve XV6036 to either Drain or Fill the digester tank.
- The user will enter two parameters – Tank Level Setpoint and Flow Rate of the liquid entering the tank.



	Off	Drain	Fill
FIC6016	Off	Off	PV following SP from Parameter
XV6036	Closed	Opened	Closed
LI6011	At Setpoint	Draining to SP	Filling to SP

Using ACM to create the EM Program

- ACM can be used to easily create and configure an Equipment Module. It gives the user the ability to associate devices, create EM state routines, and configure parameters, interlocks, permissives, and alarms.
- Begin by right clicking the controller in ACM and selecting Add New, then select the Generic_Equipment_Module Control Strategy. Name the EM and select the Task.



Using ACM to create the EM Program

- Set the number of states in Cfg_NumStates. This EM will have 3 states – Off, Drain, and Fill.

Property	Value
02 - Device Configuration	
Cfg_NumStates	3
Cfg_PermAllowCmd	0
Cfg_HasParCmds	False
Cfg_HasRptCmds	False
Cfg_WaitRptData	False
Cfg_AllowShelve	True
Cfg_AllowDisable	True
Cfg_HasMoreObj	False
Cfg_ShedOnExtddAlms	True
Cfg_ShedOnIntlk	
Cfg_IdleState	0

- Configure the Routine Name and Routine Type for each state.

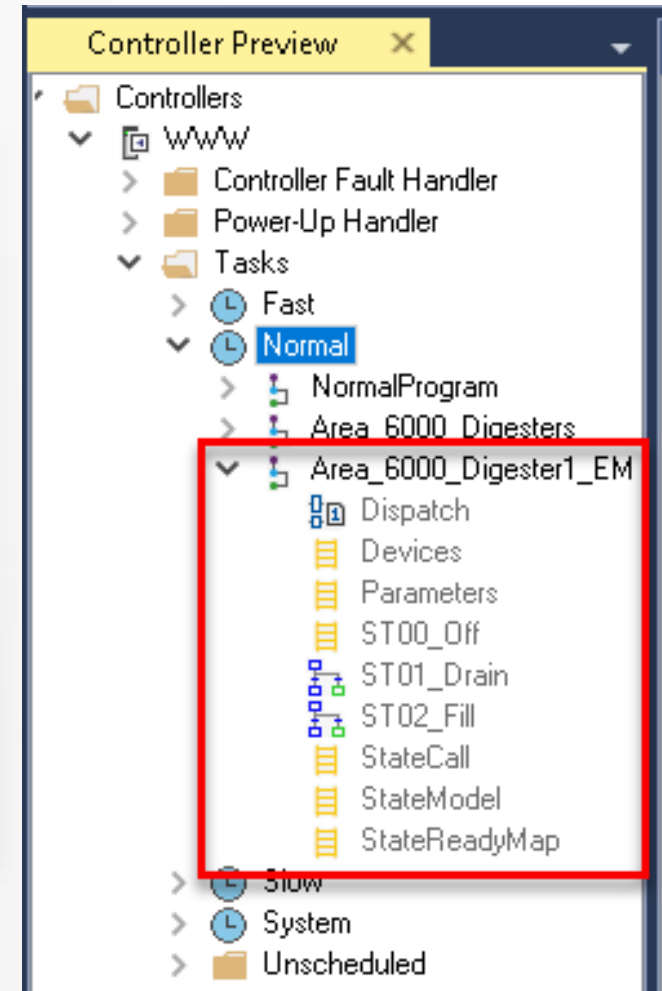
Property	Value
03.00 - State Configuration	
State_0RoutineName	Off
State_0RoutineType	RLL
03.01 - State Configuration	
State_1RoutineName	Drain
State_1RoutineType	SFC
03.02 - State Configuration	
State_2RoutineName	Fill
State_2RoutineType	SFC

- Configure the HMI State Button Text.

Property	Value
06 - HMI Configuration	
HMI_State0_Command_Text	Off
HMI_State1_Command_Text	Drain
HMI_State2_Command_Text	Fill

Using ACM to create the EM Program

- Click Finish to create the EM Program. The Digester EM should now be created under the Normal task with the Off, Drain, and Fill routines.
- If you intend on using Interlocks or Permissives, be sure to set Cfg_HasIntlkObj and Cfg_HasPermObj parameters in the 01 – Programming and Execution section to true.



Configure Associated Devices

- Once we have the EM Program created, we can assign things like associated devices, parameters, alarms, interlocks, and permissives.



- To configure the associated devices, navigate to the AsctdDevices tab in the EM configuration. Right click in the blank area and select Add New. The DeviceName field is the name of the Alias Tag that will be created, while the ReferencedTag field is where we will select the Control Strategies we created earlier in this presentation. Select the appropriate Device Type in the drop-down menu for each device.

Name	Index	DeviceName	DeviceType	DeviceDesc	ReferencedTag	Description	SubObject Description
Dvc00	00	Outlet_Vlv1	PVLV	Description	WWW_XV6036	Digester #1 Valve	
Dvc01	01	Inlet_Ctrl_Vlv1	PPID	Description			

- The four Associated Devices for this Digester EM are configured as follows:

Name	Index	DeviceName	DeviceType	DeviceDesc	ReferencedTag	Description	SubObject Description
Dvc00	00	Outlet_Vlv1	PVLV	Description	WWW_XV6036	Digester #1 Valve	
Dvc01	01	Inlet_Ctrl_Vlv1	PPID	Description	WWW_FIC6016	PID Control Loop	
Dvc02	02	Inlet_Flow1	PAI	Description	WWW_FI6016	Flow In Digester #1	
Dvc03	03	Tank_Level1	PAI	Description	WWW_LI6011	Digester #1 Level	

Configure Parameters

- The last step necessary to configure the Digester EM is to configure the Level Setpoint and Flow parameters. These can be created in the EPPParameters tab.



- Right click in the parameter area and click Add New. Select the Parameter Type, Give the Parameter a name, and set the appropriate EU.

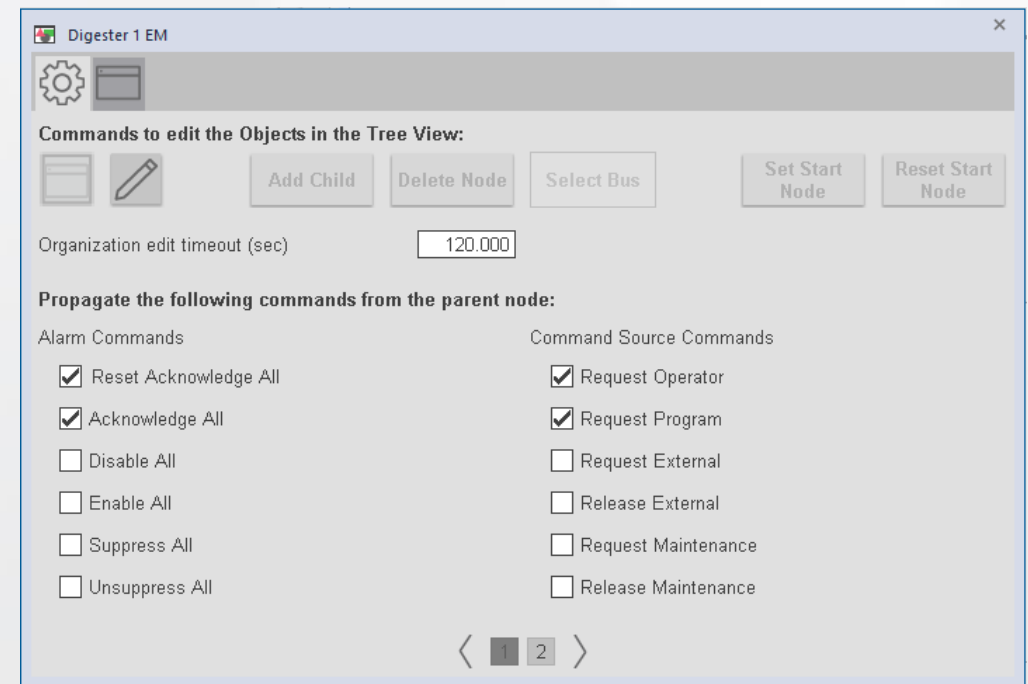
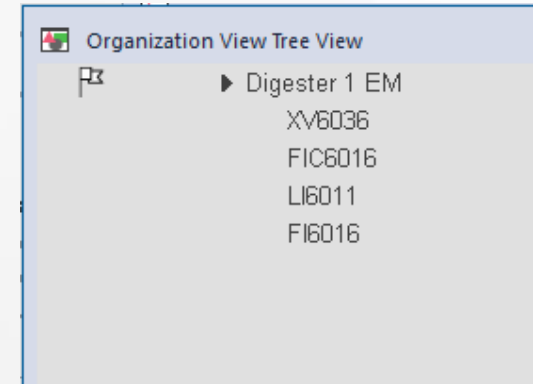


- The completed parameters for the Digester EM are shown below:

	ParamType	Param_Name	Param_DvcDscrpt	Param_Public	Param_DcmlPlcs	Param_EU	Param_Default	ParamR_Cfg_Default	ParamS_Cfg_Default	Param_ReadWrite
	Real	Level_SP	Tank Level SP	<input type="checkbox"/>	0	FT	0	1.0	Null	<input checked="" type="checkbox"/>
	Real	InFlow_SP	Flow SPfor Inlet Control Valve	<input type="checkbox"/>	0	MGD	0	1.0	Null	<input checked="" type="checkbox"/>

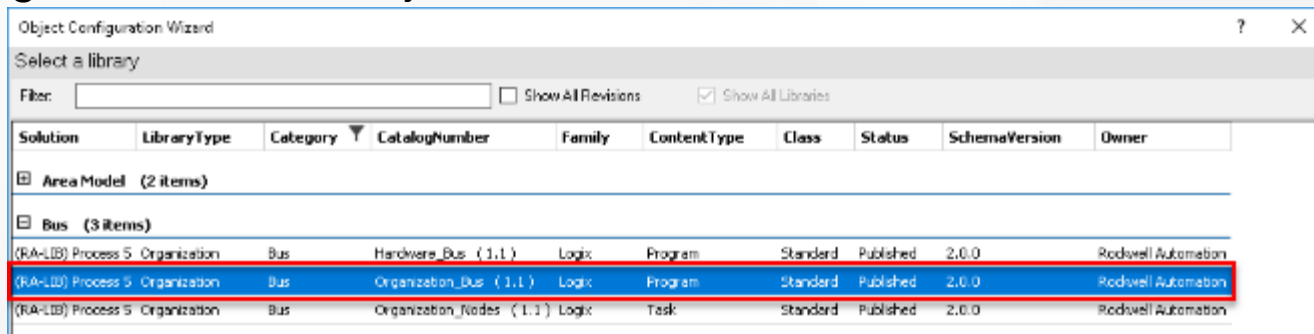
PlantPAx 5.0 Organization Bus

- Organization is a method by which parent / child relationships can be created and modified among control objects. Organization provides a method to propagate a selected subset of commands from the parent down to its children or propagate the aggregate of a selected subset of status (related to command source, alarms, etc.) from the children up to the parent(s).
- Organizational views can be many nodes deep and wide, and numerous organizational views can reference the same devices to suit the needs of the user. The structure and view of these organizational trees can be modified online from the HMI. This provides the ability to coordinate commands of related equipment and view their related status (equipment modules or phase modules), or alternatively to monitor specific equipment or equipment types as a maintenance function.

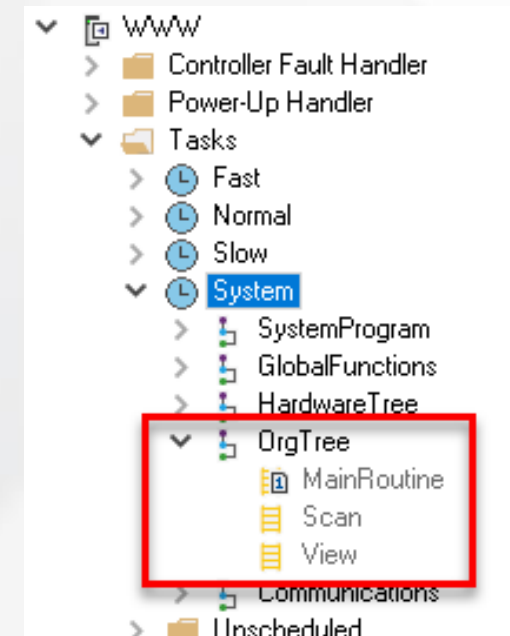
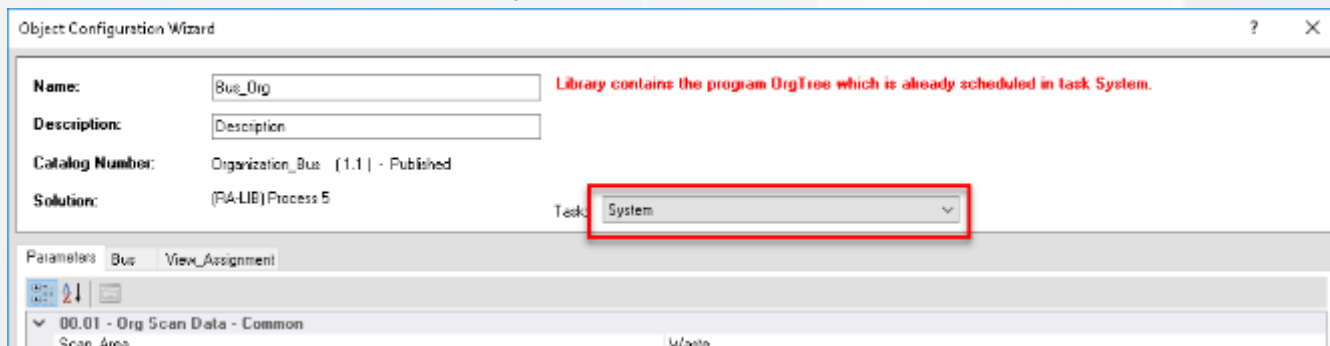


Using ACM to create the Organization Bus

- ACM can be used to easily create and configure the Organization Bus object and add devices as Bus Nodes.
- In ACM, right click the controller and select Add New. Select the Organization_Bus object.

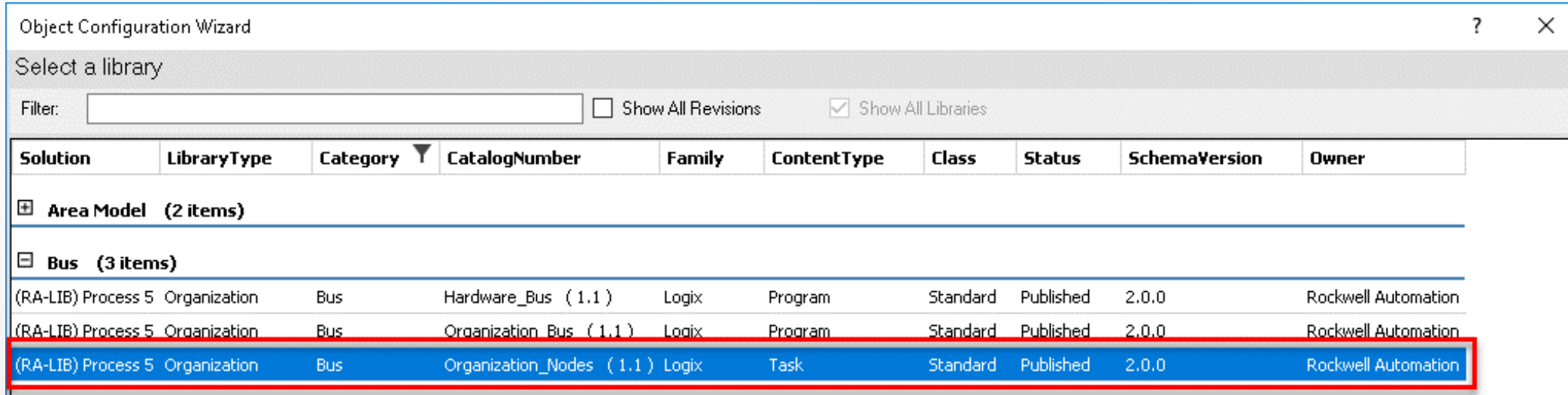


- Select the System task and click Finish. The OrgTree program will now be populated in the System task.



Using ACM to create the Organization Bus

- Next, an Organization Node object needs to be added to the project. This creates an array of nodes where devices can be assigned and organized.



Object Configuration Wizard

Select a library

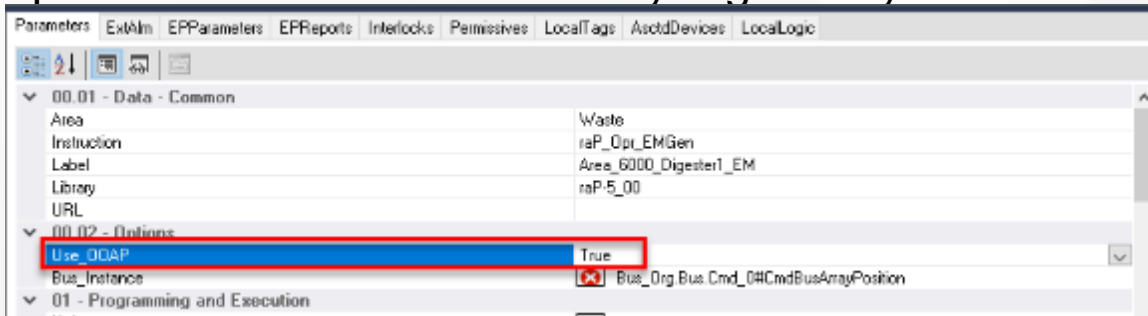
Filter: Show All Revisions Show All Libraries

Solution	LibraryType	Category	CatalogNumber	Family	ContentType	Class	Status	SchemaVersion	Owner
+ Area Model (2 items)									
- Bus (3 items)									
(RA-LIB) Process 5	Organization	Bus	Hardware_Bus (1.1)	Logix	Program	Standard	Published	2.0.0	Rockwell Automation
(RA-LIB) Process 5	Organization	Bus	Organization_Bus (1.1)	Logix	Program	Standard	Published	2.0.0	Rockwell Automation
(RA-LIB) Process 5	Organization	Bus	Organization_Nodes (1.1)	Logix	Task	Standard	Published	2.0.0	Rockwell Automation

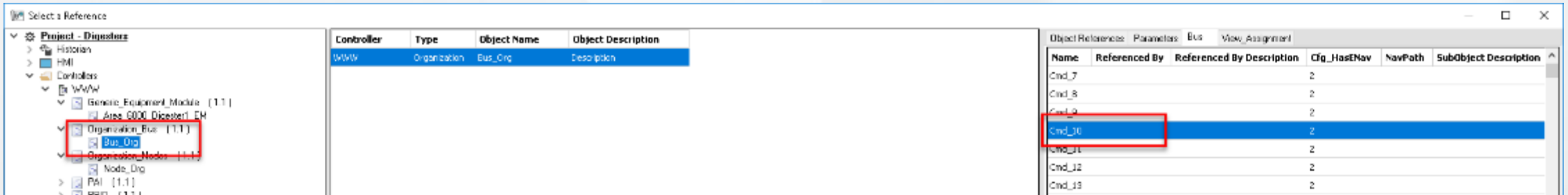
- Click Next and select the number of nodes (length of the array) that you would like to create. For this example, the default of 500 was used.

Assigning Devices to the Organization Bus

- Now that the Organization Bus and Organization Node have been created, we can assign each of the device objects we've created to a bus node.
- For each device, we need to set the parameter Use_OOAP to True, then click the ellipsis in the Bus_Instance Field to select the correct Node for the device. It's helpful to use a spreadsheet or table to visually organize your devices prior to this step.



- Select the Bus Node instance that you would like to be associated with each device. The EM has been assigned to Node 10.



Assigning Devices to the Organization Bus

- The Discharge Valve is assigned to Bus Node 11.

Name: www_XV6036
Description:
Catalog Number: PVLV (1.1) - Published
Solution: (RA-LIB) Process 5

Task: Program:

Parameters | Interlocks | Permissive_1 | Permissive_2

00 - Selection	
Use_OOAP	True
Use_ArbitrationQ	False
00.01 - Data - Common	
Area	Waste
Instruction	PVLV
Label	XV6036
Library	raP-5_00
URL	
Has_More_URL	
00.02 - Data - General	
XCmd_Pos2_Label	Open
Sts_CmdToPos2_Label	Command to open
Sts_Pos2_Label	Opened
Sts_MovingToPos2_Label	Opening
XCmd_Pos1_Label	Close
Sts_CmdToPos1_Label	Command to close
Sts_Pos1_Label	Closed
Sts_MovingToPos1_Label	Closing
XCmd_Pos2Pulse_Label	Pulse open
XCmd_Pos1Pulse_Label	Pulse close
XCmd_ContPulse_Label	Pulse
Sts_Pulsing_Label	Pulsing
01 - Options	
ACM_Type	Solenoid operated Valve (P_ValveS0)
Bus_Instance	Bus_Org.Bus.Cmd_11

Assigning Devices to the Organization Bus

- The Control Valve PPID and associated PAI are assigned to Bus Node 12 and 13 respectively.
- You do not need to change any configuration to the PAI strategy for the associated FI6016 Analog Input. This configuration is done within the PPID CS configuration parameters.

Name:

Description:

Catalog Number: PPID (1.1) - Published

Solution: (RA-LIB) Process 5

Task: Program:

Parameters | Interlocks

PAI_RefTag	<input type="text" value="www_FIC6016"/>
Ref_PAI_DM	www_FIC6016#PAI_RefTag
Use_OOAP	<input type="text" value="True"/>
00.01 - Data - Common	
Area	Waste
Instruction	PPID
Label	FIC6016
Library	raP-5_00
URL	
URL_PVHart	
Has_More_URL	
00.02 - Data - General	
Inp_PV_EU	MGD
Val_CVOut_EU	%
Inp_CascSP_Navigation	
Inp_PV_Navigation	
Val_CVOut_Navigation	
01 - Options	
Cfg_HasHART	False
Cfg_HasIntlkObj	True
Bus_Instance	<input type="text" value="Bus_Org.Bus.Cmd_12"/>
Bus_InstancePV	<input type="text" value="Bus_Org.Bus.Cmd_13"/>
01.00 - Options - Interlock Rank 0	

Assigning Devices to the Organization Bus

- The Tank Level PAI is assigned to Bus Node 14.

Name: www_LI6011

Description: Digester #1 Level

Catalog Number: PAI (1.1) - Published

Solution: (RA-LIB) Process 5

Task: Normal Program: Area_6000_Digesters

Parameters

- 00 - Selection
 - ACM_Type: PAI(Single_channel)
 - ACM_UsedIn: None
 - Use_OOAP: True
- 00.01 - Data - Common
 - Inp_PV: []
 - Inp_PV_Address: []
 - Cfg_HasHART: False
 - Bus_Instance: Bus_Org.Bus.Cmd_14
- 04 - Alarm Configuration

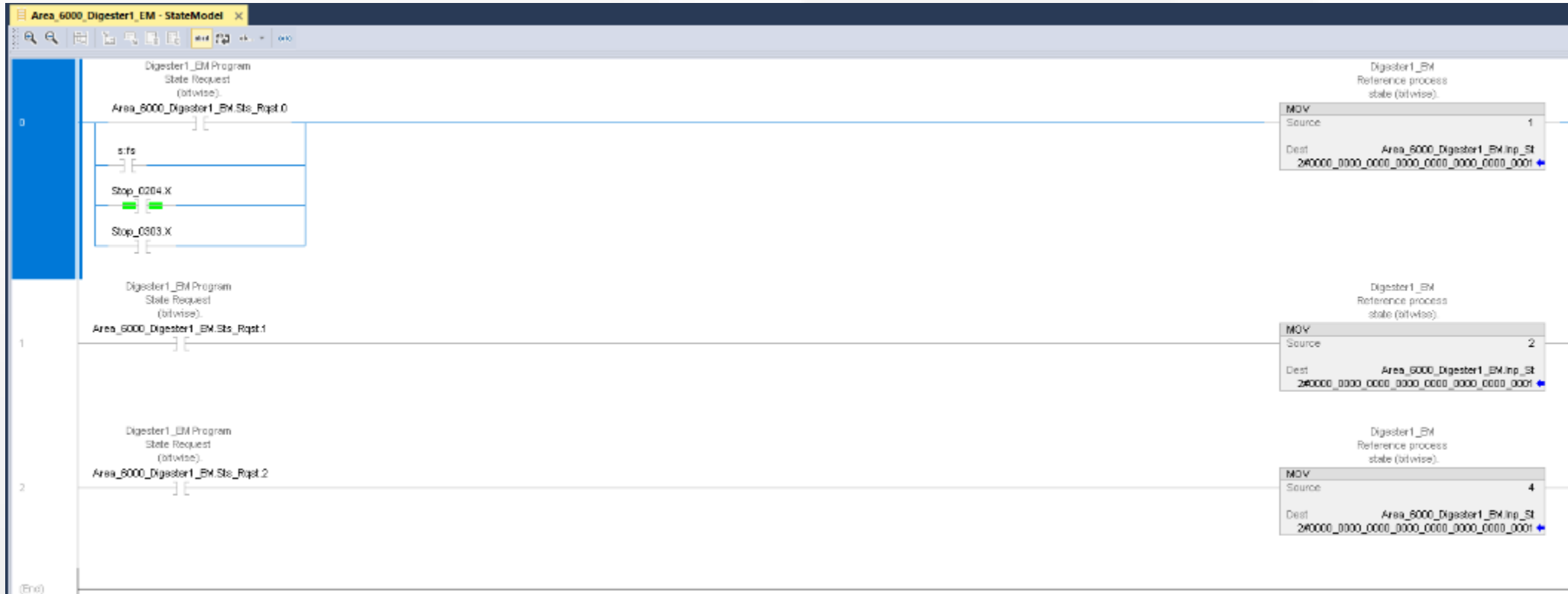
- Once the Bus Nodes have been assigned, we can generate the controller and begin to create the state logic.

Finalizing the Logic for the Equipment Module

- Once the ACD file is generated, we need to complete the logic for the EM.
 - The **Dispatch** routine contains the EM that was created as well as JSRs to each of the other routines. This routine does not need to be modified.
 - **Devices** contains device alarm logic. Some basic alarms have been created, but additional alarm conditions can be added if desired.
 - **Interlocks** is an empty routine since we did not configure any interlocks in the ACM project.
 - **Parameters** contains the EM_PAR objects for the two parameters that we created.
 - **St00_Off**, **ST01_Drain**, and **ST02_Fill** contain the logic for each of the three EM states.
 - **StateCall** is used to call the correct EM state when an operator clicks the related HMI button.
 - **StateModel** contains your state model (if state model is implemented external to raP_Opr_EMGen).
 - **StateReadyMap** contains the logic that controls visibility on the different state buttons.

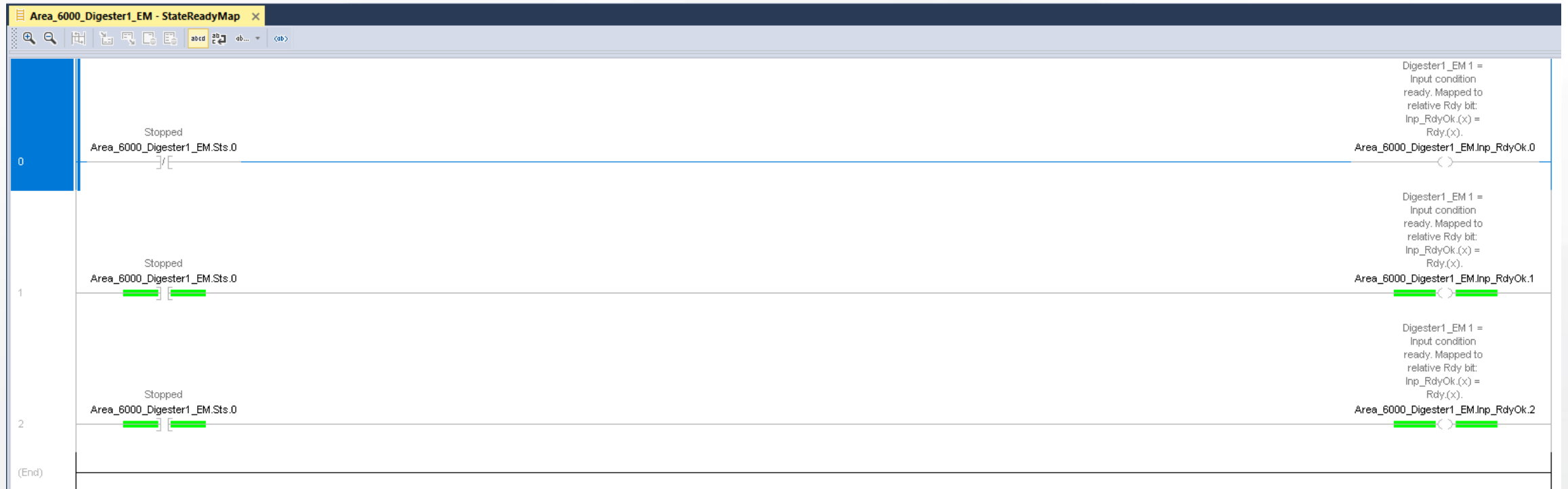
State Model Routine

- The State Model routine can be modified to implement logic to handle the EM state logic.
- For the Digester EM, we've just added two rungs to return the EM to the Off state upon completion of the Drain or Fill sequences.



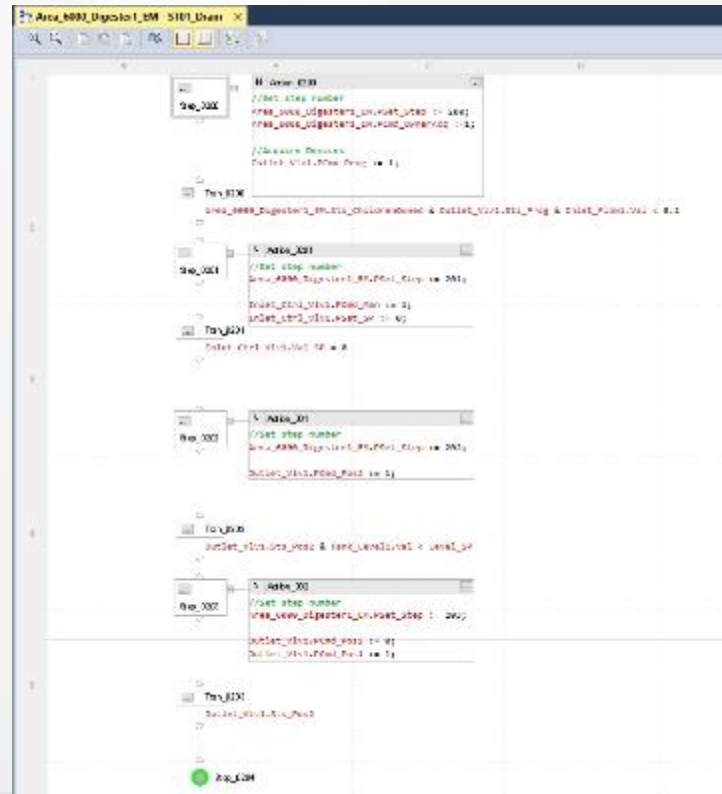
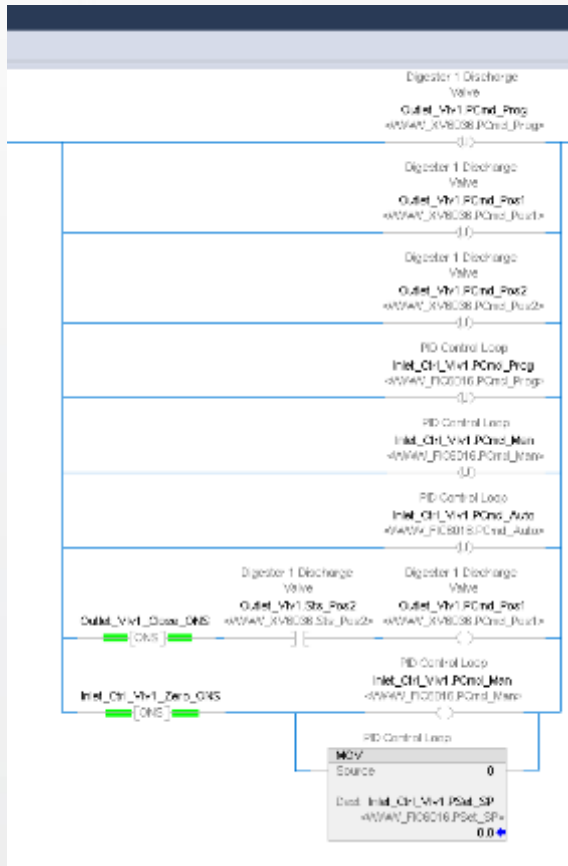
State Ready Map

- The State Ready Map was modified for the Digester EM so that the Drain and Fill buttons were only available when the Digester is in the Off state.



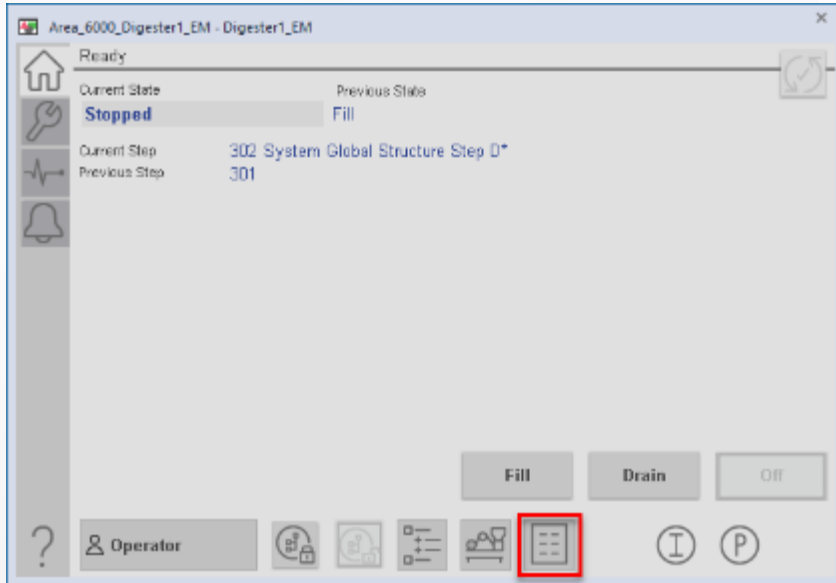
State Logic

- The ST00_Off, ST01_Drain, and ST02_Fill routines need to have logic added. For this EM, the Off routine will return the devices to their normal state and relinquish control, Drain will open the discharge valve until the tank drains to the entered level setpoint, and Fill will close the discharge valve, then manipulate the PPID Control Valve to fill the tank using the level setpoint and flow parameters.

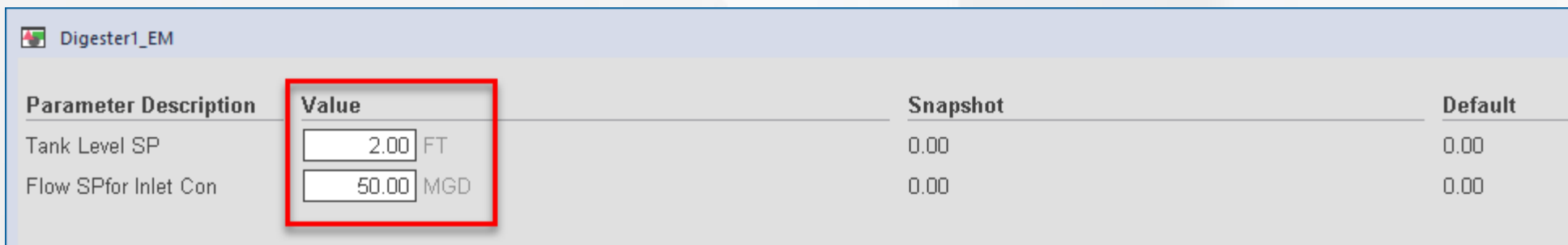


Running the EM

- With the Digester in the Off state, click to launch the Parameters faceplate.



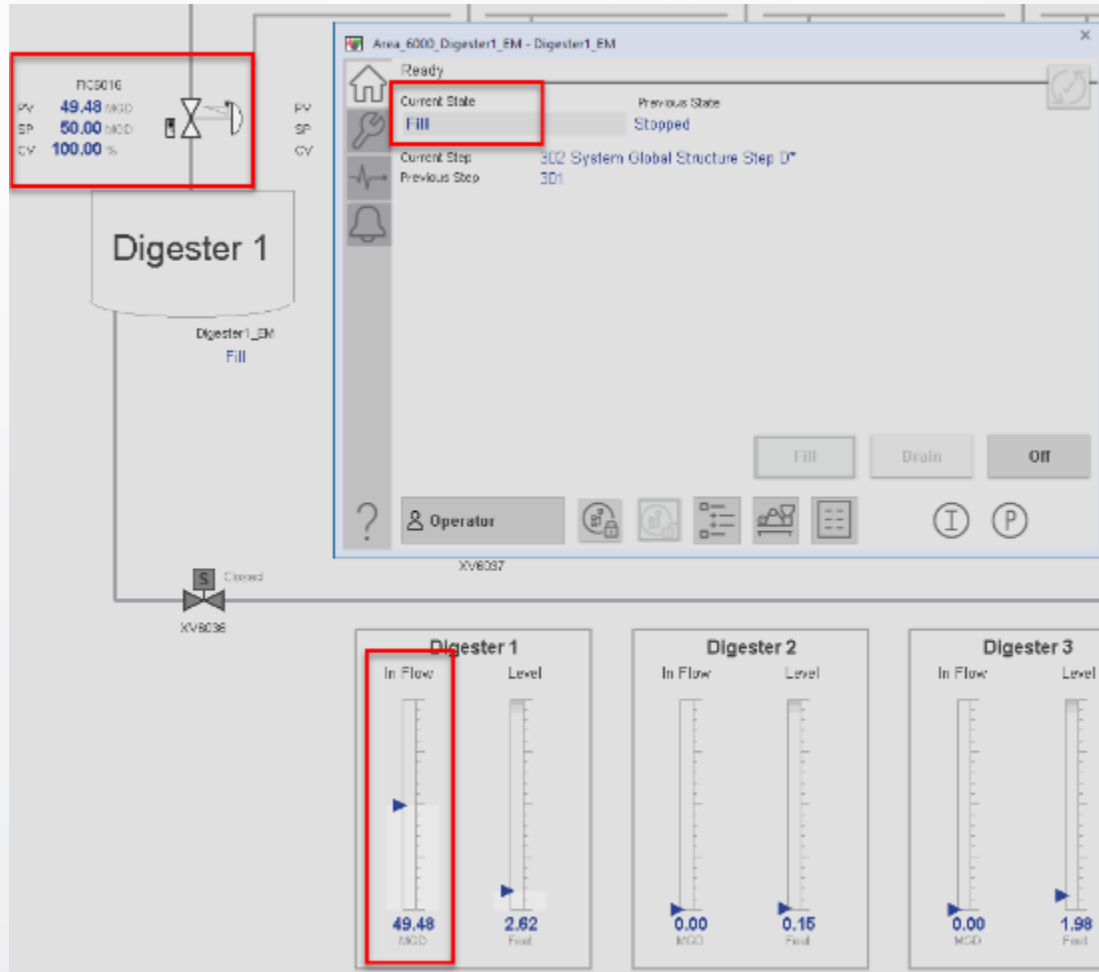
- Enter values for each parameter. Only the Tank Level SP parameter will be used for the Drain state.



Parameter Description	Value	Snapshot	Default
Tank Level SP	2.00 FT	0.00	0.00
Flow SPfor Inlet Con	50.00 MGD	0.00	0.00

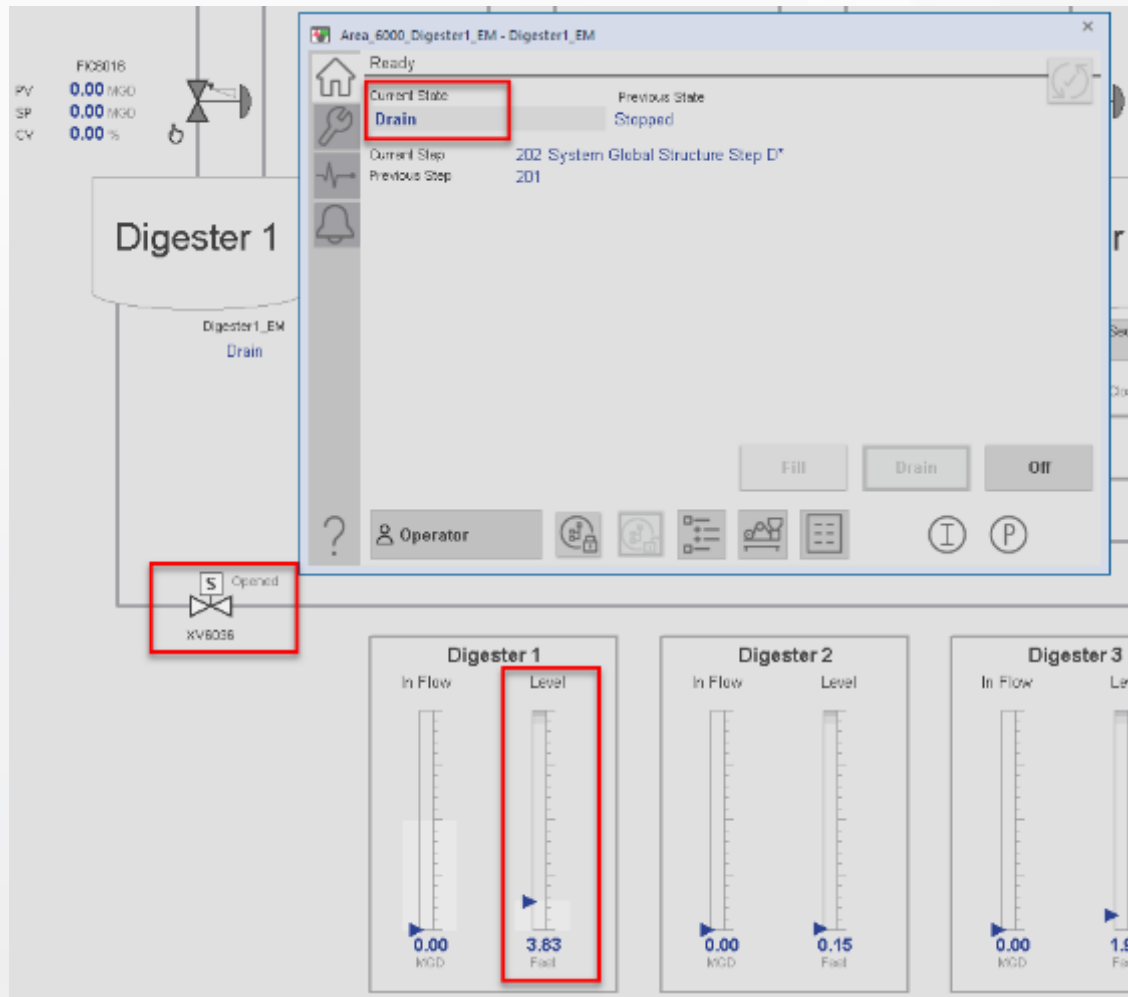
Fill State

- In the Fill state, the PPID SP is set to the EM parameter, and the tank is filled until the Digester Level PAI reaches the Tank Level SP parameter.



Drain State

- In the Drain state, the outlet valve is opened and the tank is drained until the Digester Level PAI reaches the setpoint entered into the parameters.



Thank You



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