

THE POWER OF PI MONTEREY CALIFORNIA



PI Application Framework Example

Applying the Application Framework

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Topics

- Description of the example (Downtime)
- Why the Application Framework
- How the example was developed using Application Framework
- Advantages of applying the Application Framework
- Demonstrate the example

Application Framework Example -Downtime

- The example requirements:
 - Monitor process events and conditions
 - Based on some rules indicate if there has been a violation
 - Assign a process event code for the violation by equipment
 - Enter comments and reason codes by equipment
 - Support the process model structure and changes made to the structure without rewriting the application

Why the Application Framework

- The Application Framework provides a structured environment for application development:
 - Provides support for reusable applications
 - Supports model structures
 - Provides the development for applications that are easily maintainable
 - Integrates with ProcessBook

Applying the Application Framework

- The following steps were applied in developing the example
 - Define the model
 - Define the element templates
 - Define the attributes for the type of element (volume for a tank)
 - Define categories for grouping and querying capability
 - Define the elements
 - Define the data references (PI tag for volume)
 - Define the analysis plug-in

Application Process



Defining Element Templates

- From the process overview the element templates were defined and created based on the equipment type
 - The element templates are used to define the equipment (tank, mixer)
 - The element templates include attributes
 - PI input tags
 - PI output tags
 - Process limit values
 - Other data sources
 - Supports categories
 - Adds structure and defines grouping

Element Templates

Name 🛆	Description	Category	Version	Туре	Type Modifier
🔒 CartonBottomSealer	Carton Bottom Sealer Element Template		12/31/1969	Node	None
🔒 CartonFiller	Cartom Filler Element Template		12/31/1969	Node	None
🔒 CartonFolder	Carton Folder Element Template		12/31/1969	Node	None
🔒 CartonTopSealer	Carton Top Sealer Element Template		12/31/1969	Node	None
🔒 ChocalatePump	Chocolate Pump Element Template		12/31/1969	Node	None
🔒 ChocolatePump	Chocolate Pump Element Template		12/31/1969	Node	None
🔒 ChocoMilkMixer	Choco Milk Mixer Element Template		12/31/1969	Node	None
🔒 ChocoSlurryMixer	Choco Slurry Mixer Element Template		12/31/1969	Node	None
诸 Flow	Flow Element Template	Tutorial	12/31/1969	Flow	None
G Hopper	Element Template for a Hopper	Downtime	12/31/1969	Node	Storage
🖓 Meter	Meter Element Template	Tutorial	12/31/1969	Measurement	None
🔒 MilkPump	Milk Pump Element Template		12/31/1969	Node	None
🔒 Mixer	Mixer Element Template	Downtime	12/31/1969	Node	None
🐾 ModelDetails	ModelElement Element Template	Tutorial	12/31/1969	Model	None
🔒 Node	Node Element Template	Tutorial	12/31/1969	Node	None
🔒 PackagingUnit	Packaging Unit Element Template	Downtime	12/31/1969	Node	None
뵌 <mark>a</mark> ReceiptTruck	Receipt Truck Element Template	Tutorial	12/31/1969	Node	Reciept Point
🕞 ShipTruck	Shipment Truck Element Template	Tutorial	12/31/1969	Node	Ship Point
🕞 Tank	Tank Element Template	Downtime	12/31/1969	Node	Storage
📲 Transfer	Transfer Element Template	Tutorial	12/31/1969	Transfer	None

Element Template

General Elen	ents Attributes
<u>N</u> ame:	Mixer
<u>D</u> escription:	Mixer Element Template
<u>P</u> arent:	Category: Downtime
Туре:	Node <u>M</u> odifier: None
Default Attrib	te:
<u>U</u> nique ID:	ecd35768-6375-4011-b318-76cb0e647278
⊻ersion:	12/31/1969 6:00:01 PM Rev 43

Element Template Attributes

General Elements Attributes

Mixer

	Name	Description	Track Revision	Category	Value Type	Default Value	UOM	Data Referen	Settings
	Speed	Current Speed of	False	DTinput	Anything	-		<none></none>	-
	Temperature	Current Temperat	False	DTinput	Double	0 degF	fahrenheit	<none></none>	_
	Volume Imba	Difference in Vol	False	Tutorial	Double	0 gal	gallon	<none></none>	-
	SpeedOp		False	DToperator	String	-		<none></none>	_
	ТетрОр		False	DToperator	String	-		<none></none>	_
	SpeedLimit	Mixer speed limit	False	DTlimit	Anything	-		<none></none>	_
	TempLimit	Temp limit	False	DTlimit	Anything	-		<none></none>	_
	Output	Event output	False	DTtrigger	String	0		<none></none>	_
	Mixer	Reason Codes fo	False	DTcodes	Anything	-		<none></none>	_
	OpComments	Operator comme	False	DTcomments	String	-		<none></none>	_
	MixerStatus	Mixer on/off	False	DTsensor	Anything	-		<none></none>	_
	SpeedTarget	Target value	False	DTtarget	Anything	-		<none></none>	_
	TempTarget	Target value	False	DTtarget	Anything	-		<none></none>	_
*			False			_			_
				-					

Defining Elements

- Elements are created from the element templates to define the process equipment (MilkTank1, MilkTank2, Mixer)
- Element includes:
 - The attribute name defined in the template
 - PI tags
 - Process limit values
 - Data reference
 - PI Point
 - Settings
 - When the data reference is a PI Point the settings is the PI tag

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Element Definition

General Attributes Models						
<u>N</u> ame:	Mixer					
Description:	Mixes White Milk & Chocolate Mix to create Chocolate Milk					
<u>T</u> emplate:	Mixer	Category: Downtime				
Туре:	Node	Modifier: None				
<u>U</u> nique ID:	0574ec39-ee88-4961-971e-575f7b40ea66					
Version:	12/31/1969 6:00:01 PM Rev 2037					

Element Attributes

General Attributes Models							
Mixer							
	Name	Value	Value Type	Data Referen	Settings		
	DTcodes						
	Mixer	Shutdown	String	PI Point	\\piserver2\MixerReasonCodes		
	DTcomments						
	OpComments	test	String	PI Point	\\piserver2\Mixer		
	DTinput						
	Speed	13.13925	Single	PI Point	\\piserver2\mixerspeed		
	Temperature	61.78561 degF	Double	PI Point	\\piserver2\tempmixer		
	DTlimit						
	SpeedLimit	15	Long	<none></none>	—		
	TempLimit	10	Long	<none></none>	—		
	DToperator						
	SpeedOp	<	String	<none></none>	_		
	TempOp	>	String	<none></none>	—		
	DTsensor						
	MixerStatus	OFF	String	PI Point	\\piserver2\MixerOnOF		
	DTtarget	DTtarget					
	SpeedTarget	20	Long	<none></none>	-		
	TempTarget	64	Long	<none></none>	—		
	DTtrigger						
	Output	Mixer Off	String	PI Point	\\piserver2\MixerDownTrigger		
	Tutorial						
	Volume Imbalance	0 gal	Double	<none></none>	—		

Analysis Plug-In

- The analysis plug-in is the code that executes the logic or rules and writes the results back to PI that can be viewed through the client applications
- The analysis plug-in developed for the Downtime application example monitors the inputs from each equipment
- Compares the inputs to the target values
- The logic and the rules determines if a violation has occurred

Analysis Plug-In

- The analysis plug-in requires the following:
 - Collect the inputs for the analysis
 - Run the analysis
 - Publish the analysis results
- A tutorial is provided with Application Framework that provides the required code
- The code that is added is specific to the application

Analysis Plug-In

- Assign a time rule to determine when the analysis is scheduled to run
- In order to apply the analysis it must be registered on the machine where it will run
- The analysis must also be applied to a model that has been defined

ProcessBook Display



Reason Codes based on Equipment



Integration with ProcessBook

Define Value	Element attributes are
Data Sets X	Data Sets
Data Sets: CHOCOSLURRYMIXER FLOW HOPPER LIMITS Delete Mew	Placeholders ProcessBook add-ins
MFTFR Edit Ine	stamp: Define value ne) Server = piserver2 Tag Search Data Sets
Columns Level Volume Volume Imbalance LevelLimit VolOp Output Help	Tag Name = HOPPER.Output Custom Placeholders Number Format: Tag name: General
OK Cancel	-10000.00
	OK Cancel Help

DataLink Report

M	Microsoft Excel - ProcessReport.xls							
Bile Edit View Insert Format Tools Data Window DI PI-SMT Help								
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		=	0	D	F	F	<u> </u>	
1	A	В	U	D		F	G	
2	2 OSIsoft Process Event Report							
3		Missen					Ini	tialize Equipment
4	Equipment							1
6	Report Start Time	*-2n						Update Report
7	Report End Thire							
8		Process Event	# of Events	Duration (Min)	Reasons	# of Events	Duration (Min)	
9		Operating	1	38	Operating Normal		0	
10		Temp High		0	Temp Sensor Bad	1	29	
11		Low Speed	5	27	High Amps on Mixer	_	0	
12		Temp High and Low Speed	3	43	Speed Sensor Failure	2	91	
13		Mixer Uff		U				
14								
16		Process Events		Reason Codes	Comments			
17	06-Mar-02 21:57:33	Low Speed	06-Mar-02 21:40:18	Temp Sensor Bad	Replaced temp sensor			
18	06-Mar-02 22:07:02	Mixer Off	06-Mar-02 22:09:32	Speed Sensor Failure	Speed sensor problem.			
19	06-Mar-02 22:09:32	Low Speed	06-Mar-02 23:15:16	Speed Sensor Failure	Tripped on high amps.			
20	06-Mar-02 22:26:13	Temp High and Low Speed						
21	06-Mar-02 22:27:03	Low Speed						
22	06-Mar-02 22:27:13	Temp High and Low Speed						
23	Ub-Mar-U2 22:28:33	Low Speed						
24	06-Mar-02 22.20.43	Low Speed						
26	06-Mar-02 22:30:04	Mixer Off						
27	06-Mar-02 22:36:54	Operating						
28	06-Mar-02 23:15:16	Mixer Off						
29								
30								
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Summary

- The structured environment of the Application Framework significantly reduces the programming requirements for the analysis plug-in
- The application supports changes to the elements without re-programming
- Applications can be distributed and applied with minimal effort
- Integrates with ProcessBook

Summary

- The Application Framework can be applied to support simple to complex applications
 - Process calculations
 - Material balances
 - Downtime monitoring
 - Scheduling activities
 - Asset and inventory management