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PI Applications in Anglo American Platinum: Control Loop Monitoring and Reporting

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Real Time Information - Currency of the New Decade

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- Introduction
- Our Business
- PI and AF in Anglo American Platinum
- Problem statement
- Solution architecture
- Calculation engine for PI
- Reporting and visualisation layer for PI
- Case study: Control loop performance monitoring
 - AF and PI configuration
 - Calculations
 - Reporting
- Thanks & Questions

- Anglo American Platinum (Amplats) is rapidly rolling out PI to soon be one of the biggest PI users in Southern Africa
- Economy of scales allows for significant financial benefits of custom built solutions in Amplats
- Blue Nickel Solutions have partnered with Amplats to built process monitoring and reporting solutions for PI systems
- Blue Nickel assisted Amplats with development of a control loop monitoring solution; the subject of this presentation



- Blue Nickel Solutions is a process and systems engineering company
- We specialise in solutions for the processing industry
- Our main areas of expertise are:
 - Reporting and monitoring solutions
 - Process optimisation
 - Advanced process control

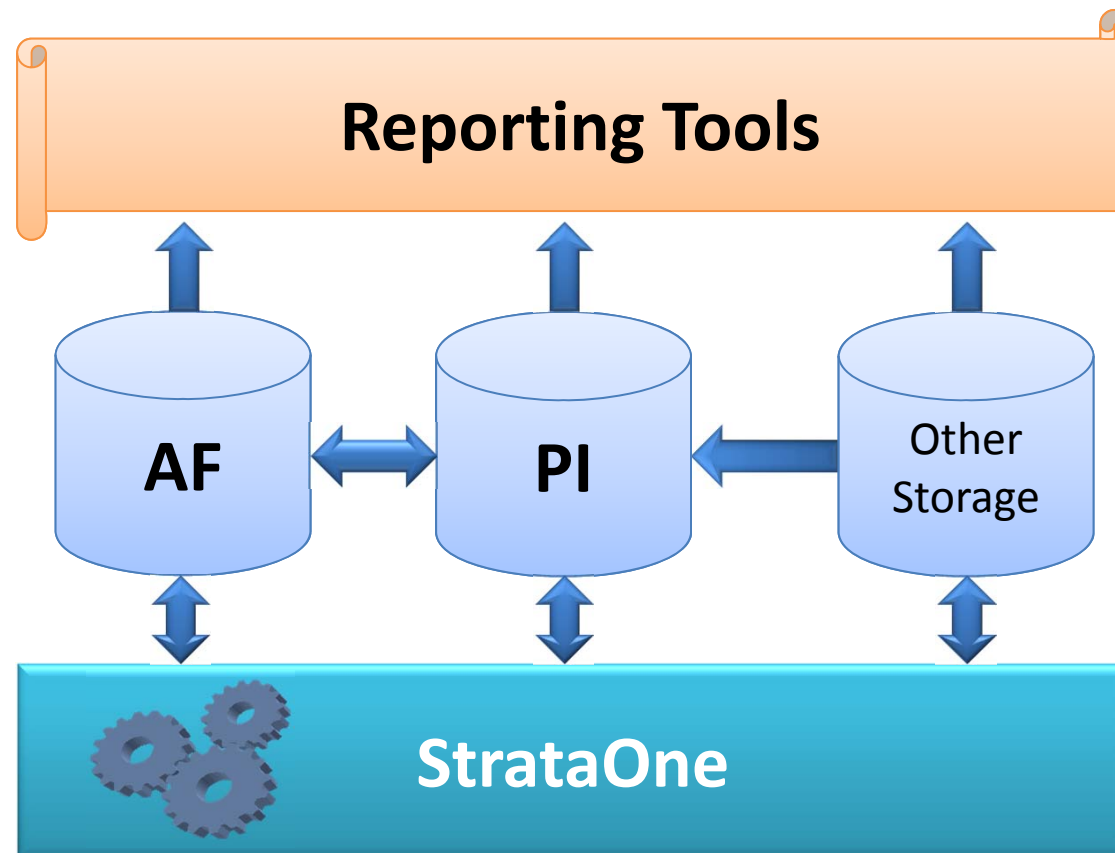
The PI system in Anglo American Platinum



- Amplats has installed the PI system on a number of their existing operations
- Currently 9 sites have PI with a complete AF process tree giving structure to data stored
- About 700 000 tags are being logged
- A central PI server have been configured to aggregate data to a central location, retrieving data from historians and relational data sources
- Amplats is an OSIsoft enterprise client

- Control loop performance monitoring (CLPM) is critical for stable operation of any processing plant
- CLPM can be done manually by the instrumentation technician or process engineer but this is very labour intensive, especially on sites that have many control loops
- Best practice is to automate CLPM for which a number of off-the-shelf packages exist
- At time of development no AF loop monitoring solutions existed and Amplats had an in-house CLPM solution

- The PI system
- Analytics
- Visualisation



- Requirements for reporting often requires processing of large amounts of data to provide meaningful insights
- There currently exists a gap in the analytics capability of AF
- Blue Nickel developed a robust, real-time calculation engine which provides strong integration with the PI system; StrataOne

StrataOne Overview



- StrataOne is a real-time execution and calculation engine
- Provides intuitive procedure to build calculations
- Most calculations can be built using predefined functions
- Unique calculation tasks can be built using .NET
- Tightly integrated communication channels for the PI system

- Technology Stack
- Benefits
 - High degree of customisation and control
 - Fluid and satisfying user experience
 - Strikes an elegant balance between robustness and ease of development
- Technology Overview
 - Microsoft .NET Framework 4 allows for quick and easy setup and access to Stored Procedures, created in SQL Server, which access the PI AF Server via a PI OLEDB Enterprise linked server
 - Telerik RAD Controls for Silverlight make UI development simple and effective



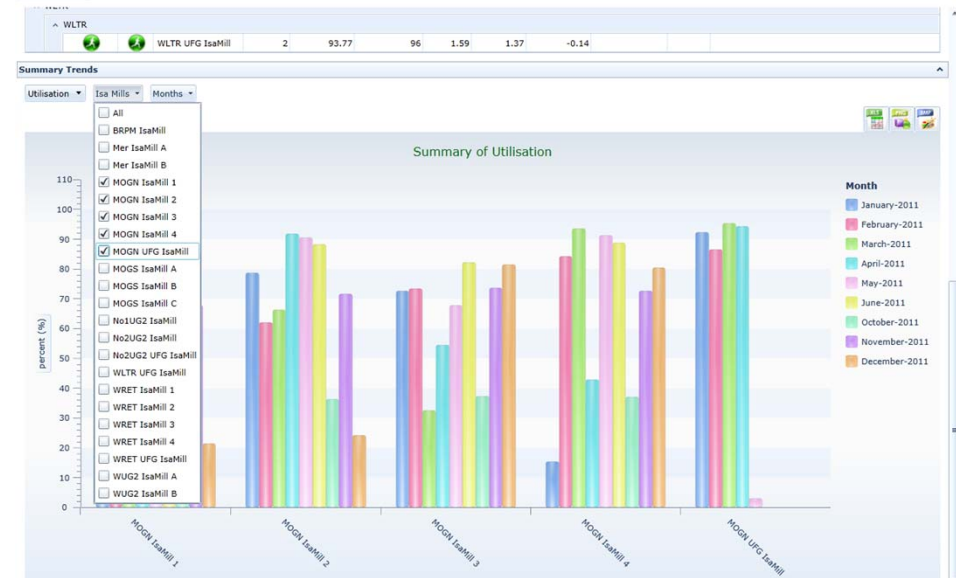
Visualisation Example



Summary

Sites	Month To Date	Current	Latest Available
Primary Mill	Isa Mill	Mill	Mill
Stops	Utilisation (%)	Availability (%)	Power (kW)
Density (t/m ³)	Feed Rate (m ² /h)	Grid -53µm (%)	Date
Amandelbult			
BRPM			
BRPM	BRPM IsaMill	0	100
		75.15	574.79
		1.16	216.67
Mogalakwena North			
Mogalakwena South			
South ASection			
MOGS	MOGS IsaMill A	2	95.08
		95.93	2100
		1.26	151.1
South BSection			
MOGS	MOGS IsaMill B	2	96.36
		94.85	2310
		1.43	301.2
South CSection			
MOGS	MOGS IsaMill C	19	19.97
		87.23	0
		2.04	31.4
Rustenburg			
Waterval Retrofit			
WRET	WRET IsaMill 1	0	0
		100	4430.23
		1.08	12.38
WRET	WRET IsaMill 2	0	100
		100	1294.61
		1.35	226.85
WRET	WRET IsaMill 3	0	100
		100	1434.4
		1.32	228.61
WRET	WRET IsaMill 4	0	0
		100	0
		1.12	26.39
WRET	WRET UFG IsaMill	0	100
		100	883.13
		1.19	269.32
Waterval UG2			
WUG2	WUG2 IsaMill A	0	93.89
		100	1808.17
		1.18	239.43
WUG2	WUG2 IsaMill B	0	93.89
		100	1708.34
		1.34	241.6
WLTR			
WLTR	WLTR UFG IsaMill	2	93.77
		96	1.59
		1.37	-0.14

Summary Trends

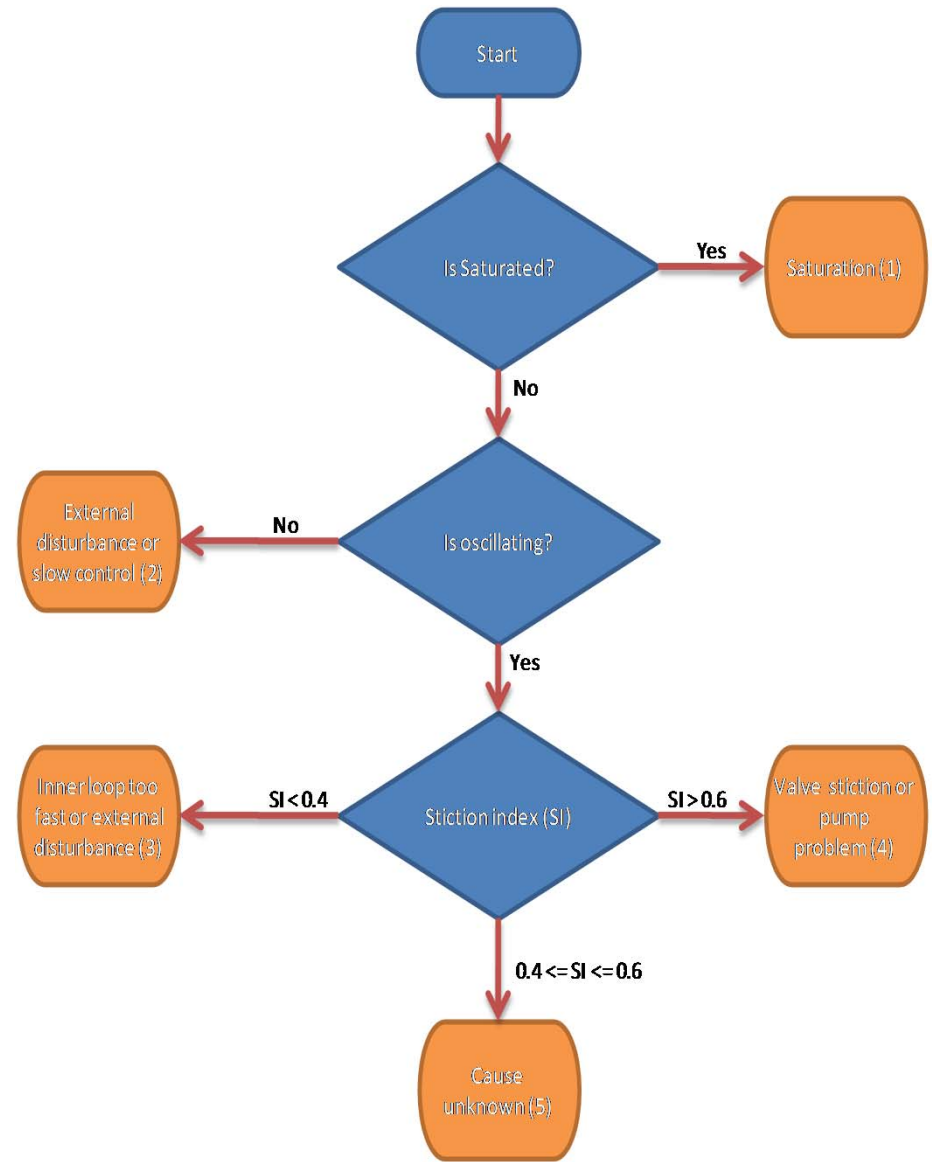
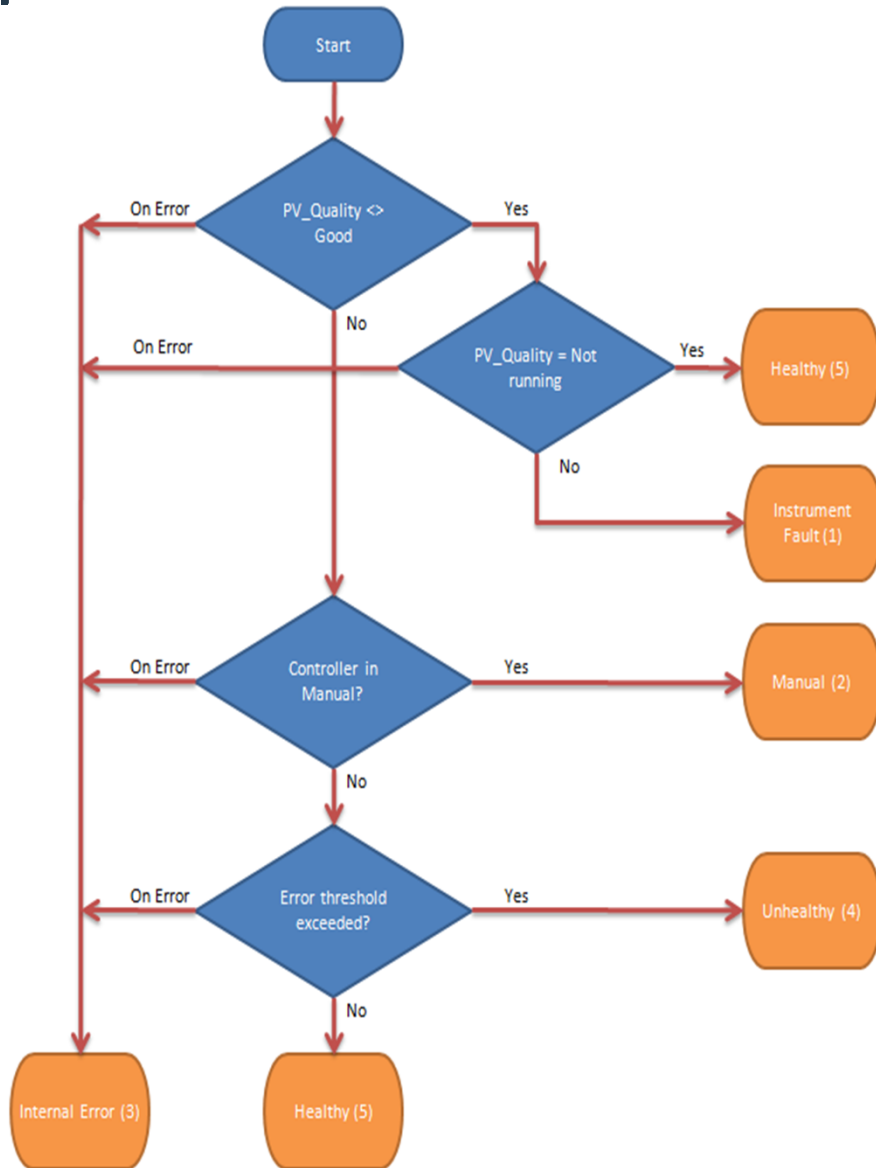


Case Study: CLPM - The Challenge



- Control loop key performance indicators are well documented in literature (and there are too many)
- Select the simplest and minimum amount of KPIs to still get the full picture
- Visualisation and KPI rollup critical for site acceptance

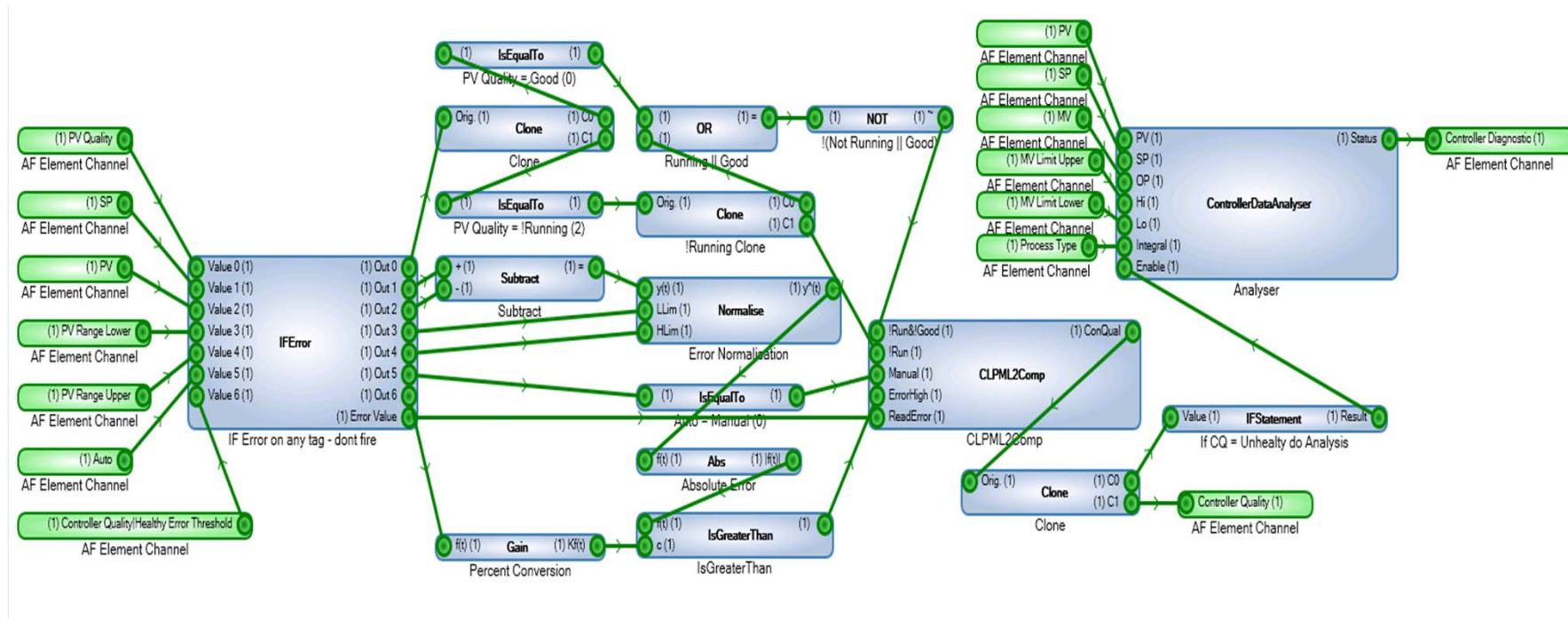
Case Study: CLPM - Theory



Case Study: CLPM – Calculations



- Building the CLPM calculations in StrataOne is easy



Case Study: CLPM - PI and AF Architecture



- StrataOne integration with AF allows for rapid deployment of CLMP calculations to all configured control loops

The screenshot shows the 'AF Execution Context Wizard' interface. On the left is a tree view of 'Amplats' elements, including 'AISP2DB06 ModuleDB', 'Amplats', and various plant sections like 'Amandelbult', 'BRPM', 'Lebowa', etc. On the right, there are checkboxes for 'Search Full Hierarchy' and 'Include elements with derived templates'. Below these is an 'Instance Preview' table with columns for 'Element Name', 'Element Description', and 'Element Path'. The table lists several PID controllers, with '404CV03' selected. Below the table are input fields for 'Name', 'Description', 'Template', and 'Category'.

Element Name	Element Description	Element Path
> 404CV03	Speed PID Controller for ConveyorTotal	\\AISP2OPM05\Amplats\Amplats\Rustenb
404WIC003	Stat PID Controller for ConveyorTotal	\\AISP2OPM05\Amplats\Amplats\Rustenb
404WIC003C	APCstat PID Controller for mStability Primary	\\AISP2OPM05\Amplats\Amplats\Rustenb
408FIC101	Flow PID Controller for ValveInletWater	\\AISP2OPM05\Amplats\Amplats\Rustenb
408FIC102	Flow PID Controller for Pump01	\\AISP2OPM05\Amplats\Amplats\Rustenb
408FIC103	Flow PID Controller for Pump02	\\AISP2OPM05\Amplats\Amplats\Rustenb
408FIC119	Flow PID Controller for ValveDilutionWater	\\AISP2OPM05\Amplats\Amplats\Rustenb
408FIC127	Flow PID Controller for Pump09	\\AISP2OPM05\Amplats\Amplats\Rustenb

Name: 404CV03
Description: Speed PID Controller for ConveyorTotal
Template: APPIDController Type: None
Category: Controller;PID Controller;

Buttons: Cancel, Previous, Finish

Case Study: CLPM - Reporting and Information Rollup



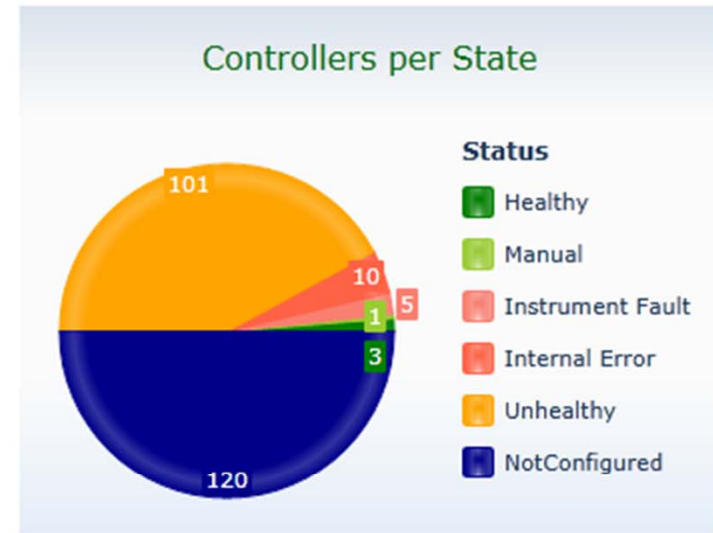
- An overall control loop performance monitoring KPI is displayed at the top of the page as a dial (the manager's number)

Home Refresh

Sites Rustenburg

From 2012/02/02 To 2012/02/03 Apply

Service SOneService Process ID 2648
 Service Started 2/3/2012 1:23:38 PM Up Time (Days) 0



Element	Instrument Fault	Healthy	Unhealthy	Internal Error	Not Configured
> Waterval Retrofit	0	0	0	0	120
Waterval UG2	5	3	101	10	0

Case Study: CLPM - Reporting and Information Rollup



- Control loop performance is grouped and sorted per process area (or process cell) according to controller states (Healthy, Unhealthy, Manual, Instrument fault or Internal error)

Home
Refresh

From 2012/02/09
To 2012/02/10
Apply

Name

Gain Integral

MV Lower Limit MV Upper Limit

Healthy Error Threshold Saturation Threshold

Status Time Percentage

No Data Series.

Controllers per State

Status

- Healthy
- Instrument Fault
- Unhealthy
- Manual
- Internal Error
- NotConfigured

Controller Performance Per Process Area

Element	Instrument Fault	Healthy	Unhealthy	Internal Error	Not Configured
> Flotation	4	1	90	2	0
PrimaryMilling	0	1	3	5	0
SecondaryMilling	4	0	6	3	0

Control Loop Time Trend Data

Controller Input

PID Controller Input

Legend

No Data Series.

Absolute Error

PID Controller Absolute Er

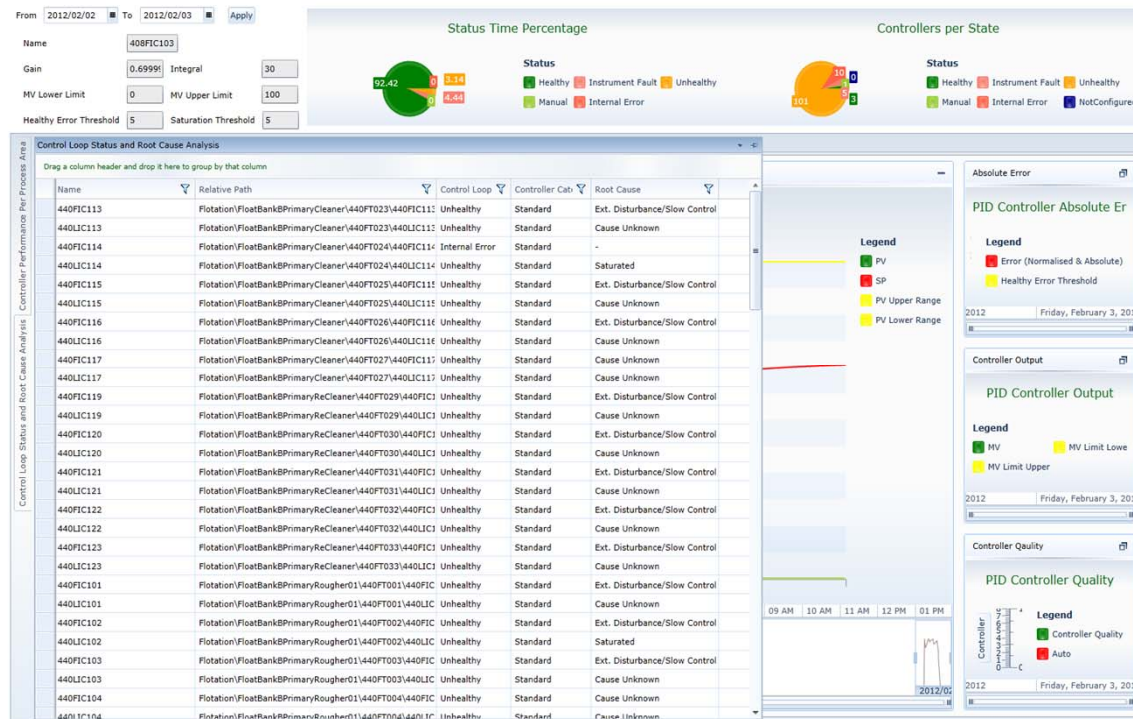
Legend

No Data Series.

Case Study: CLPM - Reporting and Information Rollup



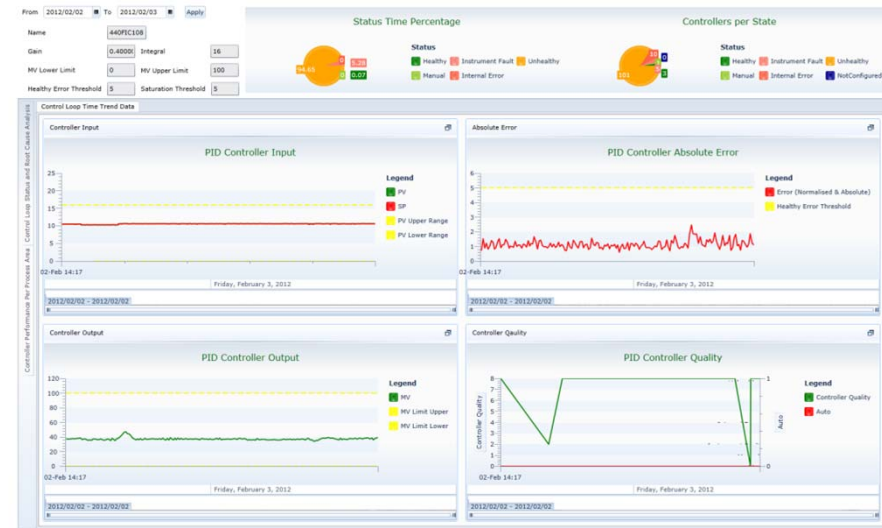
- Per process area, all loops are shown and sorted according to states
- Diagnostic information is supplied for loops that are unhealthy (Control element fault, External disturbance, Controller tuning, Saturation or Cause unknown)



Case Study: CLPM - Reporting and Information Rollup



- Individual loop performance are shown on a graph (PV, SP, OP and controller states) with zooming and scrolling capability



Questions?

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Thank you

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