



Regional Seminar Series Cleveland



CBM for Rotating Equipment

Dale Rhodes
Process Control Specialist
Millennium Inorganic Chemicals - a Cristal Global Company

October 8, 2009

Millennium: How can we improve management of rotating equipment availability by predicting equipment life based on operating time and experiences using existing systems?

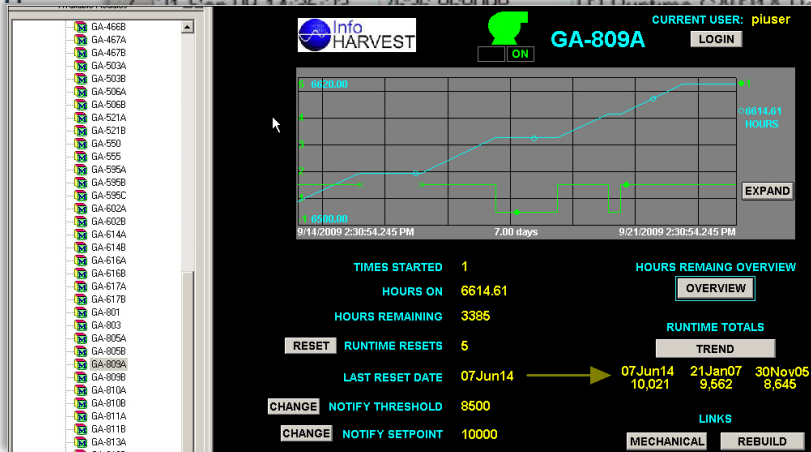
“Using the PI System, we were able to reduce our PM replacement costs resulting in an annual savings of \$700 k.”



Millennium
Inorganic Chemicals
A Cristal Company

Dale Rhodes
Process Control Specialist

		Time Remaining	Pump
3			
4	21-Sep-09 14:35:23	9956.699654	P2.Runtime.GA010A.Remai
5	21-Sep-09 14:35:23	9517.069678	P2.Runtime.GA010B.Remai
6	21-Sep-09 14:35:23	350.509888	P2.Runtime.GA014.Remai
7	21-Sep-09 14:35:23	7636.989888	P2.Runtime.GA014.Remai



Customer Business Challenge

- Improve Management of rotating equipment availability.
- Reduce PM replacement costs
- Burdensome Calculations performed in DCS

Solution

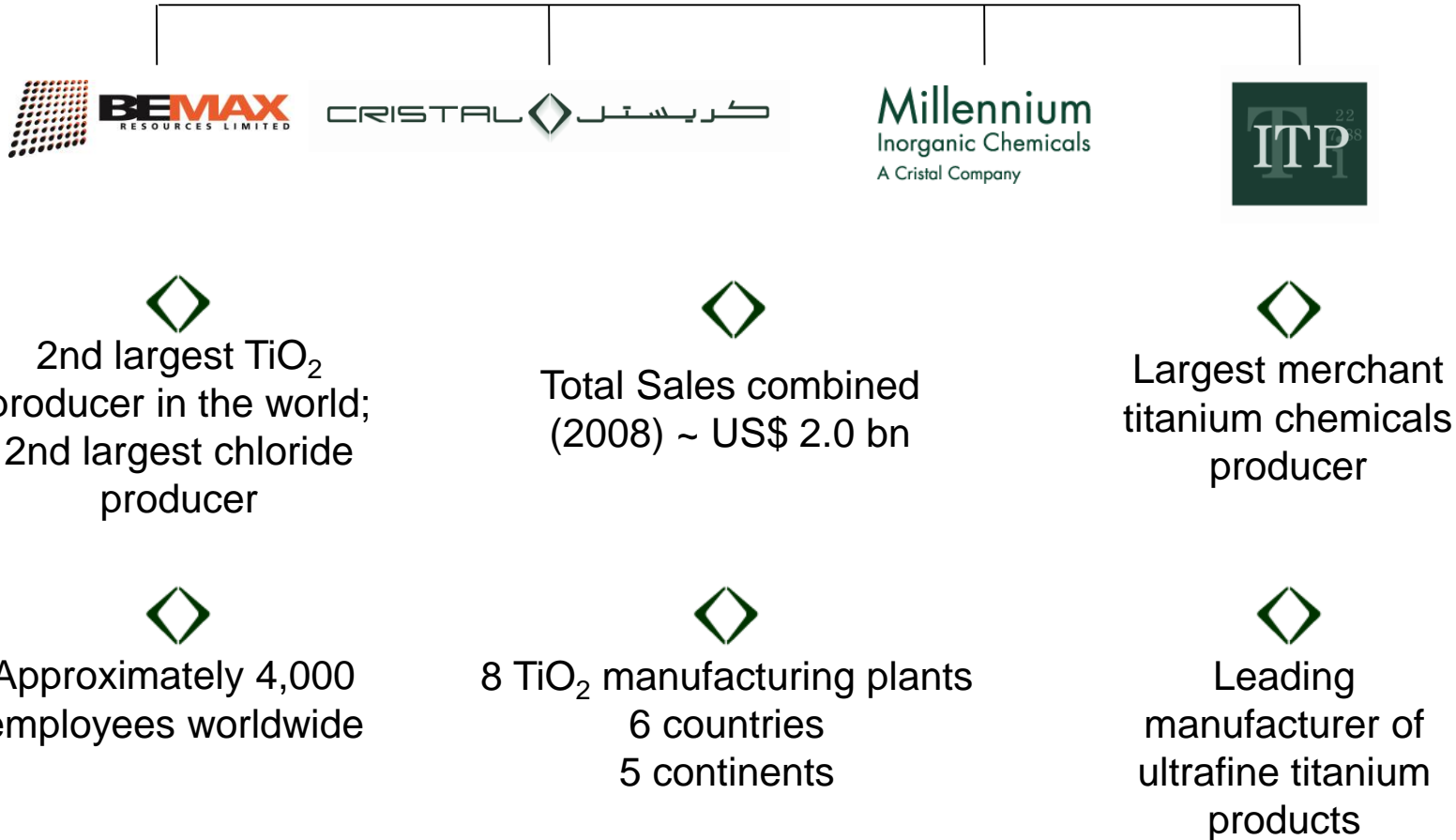
- PI Infrastructure
- PI Totalizers, ProcessBook, DataLink
- Email Notifications

Results / Benefits

- Reduced PM replacement costs by 50%
- Increased memory availability for DCS
- Managing 1 system rather than disparate systems
- Annual savings of \$700k

Cristal Global Family







TiO₂ Manufacturing Locations

Ashtabula Complex

Ashtabula 1, USA



Ashtabula 2, USA



Hawkins Point, USA



Stallingborough, UK



Bunbury, Australia



Salvador, Brazil



Yanbu, Saudi Arabia



Thann, France



- Coatings
- Plastics
- Paper Products
- Inks & Dyes
- Rubber
- Soaps
- Toothpaste
- Catalysts
- Cosmetics
- Fabrics
- Floor Coverings
- Enamels
- Pet Food
- Medicines
- Roofing Granules

CBM - Conditional Based Maintenance

Improve management of rotating equipment availability by predicting equipment life based on operating time and experiences?

- Requirements
 - Leverage existing systems
 - Make it secure
 - Generate notifications
 - Email, text messaging (future ERP integration)
 - Integrate providing mechanic with needed documents and procedures
- Solution
 - OSIsoft software
 - Module Database (future AF migration)
 - Simplified single display and spreadsheet creation
 - Data can be secured using Excel SMT add-in
 - Links to network locations
 - VBA

- PI interfaces
 - OPCDA (AB PLC)
 - OPCHDA (DeltaV)
 - RNI (RS3)
 - MODBUS (vendor PLC)
 - RDBMS (SQL - document locations)
- Module Database (aliasing and properties)
- PI Totalizers (Runtimes)
- PI Performance Equations (setpoint minus runtime)
- VBA (User logon)
- OSI DevNet EMNotify (setpoint reached)
 - Source code was altered to allow tag values in the ‘subject’ and file attachments
 - Future PI Notifications migration
- Microsoft Excel[®] SMT add-in (point security)

Available Modules

RUNTIMES

- AGITATORS
 - PLANT 1
 - PLANT 2 NORTH
 - PLANT 2 SOUTH
- BLOWERS
 - PLANT 1
 - PLANT 2 NORTH
 - PLANT 2 SOUTH
- PUMPS
 - PLANT 1
 - PLANT 2 NORTH
 - PLANT 2 SOUTH

- GA-010A
- GA-010B
- GA-014
- GA-021A
- GA-021B
- GA-042A
- GA-042B
- GA-109A
- GA-109B
- GA-128A
- GA-128B
- GA-302A
- GA-302B
- GA-306
- GA-430A
- GA-430B
- GA-430C
- GA-431A
- GA-431B
- GA-452

OFF

CURRENT USER: **pmc**

GA-010A

LOGIN

EXPAND

TIMES STARTED 27

HOURS ON 0.00

HOURS REMAINING 10000

RESET **RUNTIME RESETS** 5

LAST RESET DATE 07Jun14

CHANGE **NOTIFY THRESHOLD** 8500

CHANGE **NOTIFY SETPOINT** 10000

HOURS REMAINING OVERVIEW

OVERVIEW

RUNTIME TOTALS

TREND

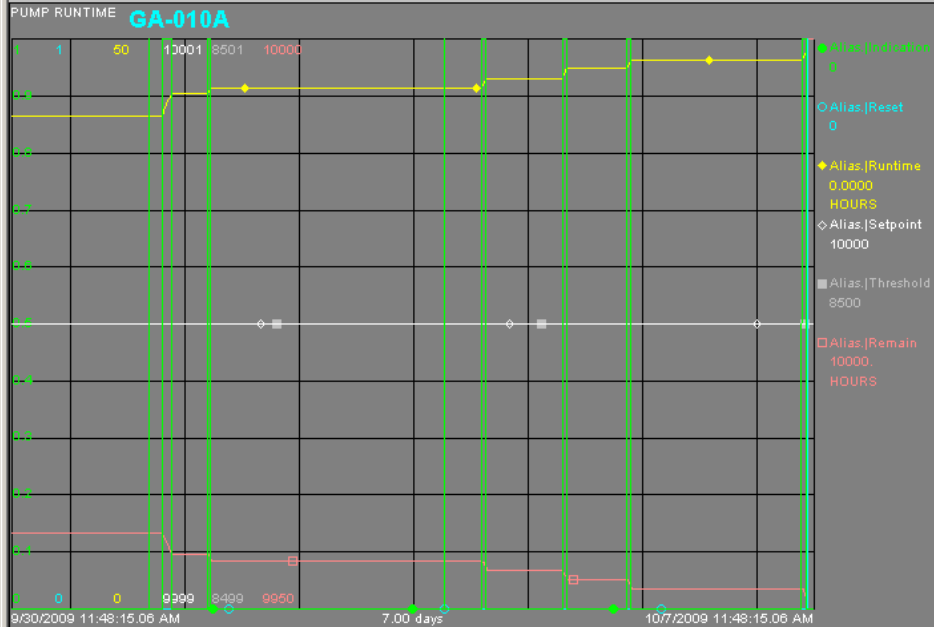
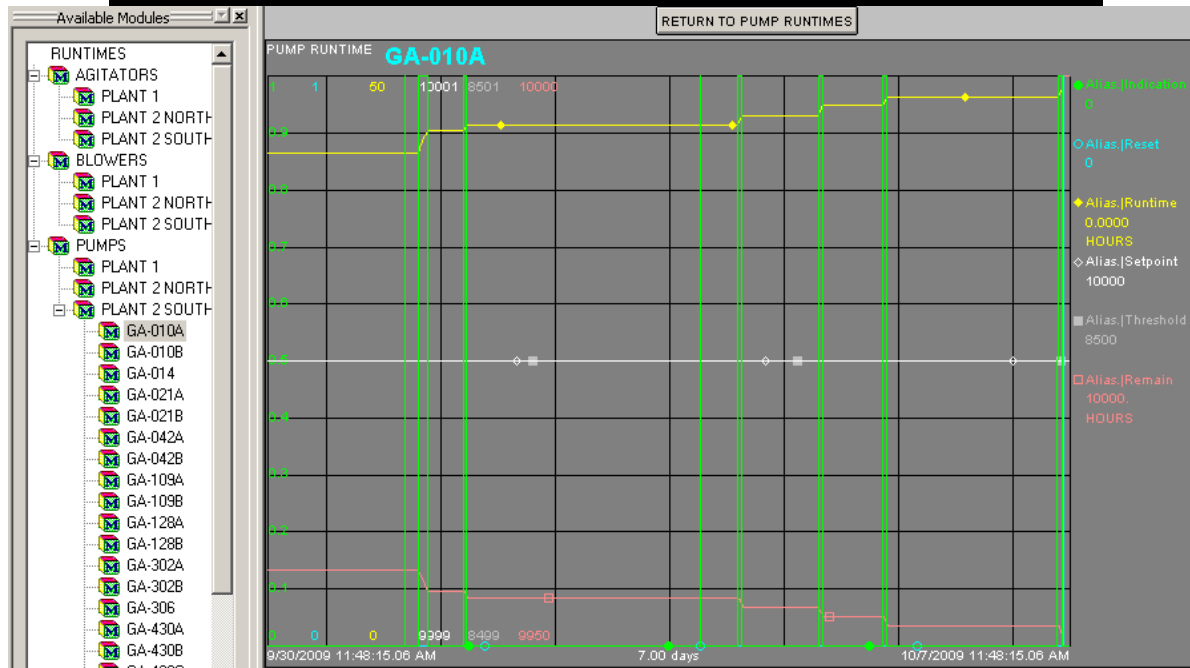
07Jun14 10,021	07Jan21 9,562	05Nov30 8,645
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LINKS

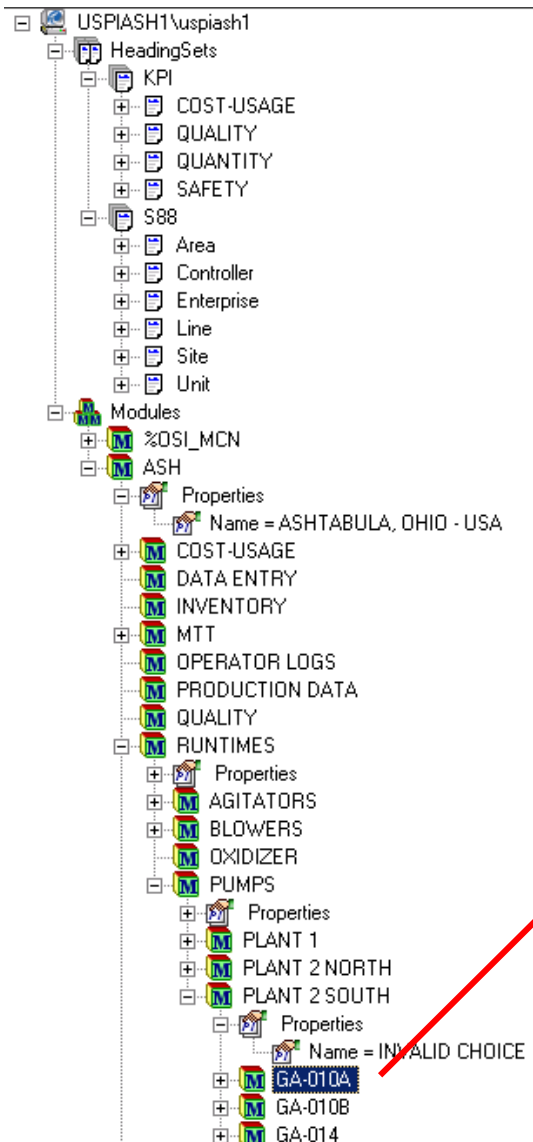
MECHANICAL **REBUILD**

RETURN TO PUMP RUNTIMES VIEW IN EXCEL

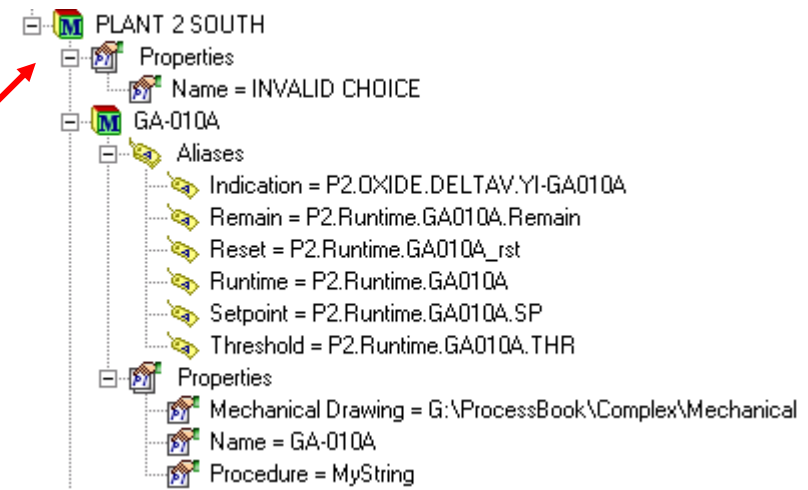
PUMP	HOURS REMAINING	PUMP	HOURS REMAINING	PUMP	HOURS REMAINING	PUMP	HOURS REMAINING	PUMP	HOURS REMAINING
GA-010A	10000	GA-430C	-27	GA-595A	7171	GA-809B	8258	GA-904B	10000
GA-010B	9504	GA-431A	6699	GA-595B	2819	GA-810A	4647	GA-917A	4324
GA-014	-30	GA-431B	3148	GA-595C	10000	GA-810B	6463	GA-917B	6915
GA-021A	7612	GA-452	379	GA-602A	10000	GA-811A	1626	GA-931A	5656
GA-021B	2213	GA-466A	2431	GA-602B	10000	GA-811B	9903	GA-931B	4336
GA-042A	3892	GA-466B	7802	GA-614A	6766	GA-813A	6750		
GA-042B	6417	GA-467A	3032	GA-614B	3941	GA-813B	4257		
GA-109a	9307	GA-467B	1172	GA-616A	8942	GA-815A	6690		
GA-109b	9018	GA-503A	7753	GA-616B	1267	GA-815B	4312		
GA-128A	97	GA-503B	2330	GA-617A	44	GA-820A	8536		
GA-128b	609	GA-506A	5677	GA-617B	10000	GA-820B	1524		
GA-302A	10000	GA-506B	7364	GA-801	1336	GA-840A	9389		
GA-302B	10000	GA-521A	10000	GA-803	85	GA-840B	2088		
GA-306	9729	GA-521B	10000	GA-805A	6505	GA-847A	-16		
GA-430A	9995	GA-950	1488	GA-805B	4701	GA-847B	10000		



3		Time Remaining	Pump	Setpoint		Time Remaining	Pump	Setpoint
4	21-Sep-09 14:35:23	9956.699654	P2.Runtime.GA010A.Remain		21-Sep-09 14:35:23	10000	P2.Runtime.GA602A.Remain	
5	21-Sep-09 14:35:23	9517.069678	P2.Runtime.GA010B.Remain		21-Sep-09 14:35:23	10000	P2.Runtime.GA602B.Remain	
6	21-Sep-09 14:35:23	350.509888	P2.Runtime.GA014.Remain		21-Sep-09 14:35:23	6954.599996	P2.Runtime.GA614A.Remain	
7	21-Sep-09 14:35:23	7636.868098	P2.Runtime.GA021A.Remain		21-Sep-09 14:35:23	4079.882456	P2.Runtime.GA614B.Remain	
8	21-Sep-09 14:35:23	2554.387718	P2.Runtime.GA021B.Remain		21-Sep-09 14:35:23	8942.366678	P2.Runtime.GA616A.Remain	
9	21-Sep-09 14:35:23	4033.444312	P2.Runtime.GA042A.Remain		21-Sep-09 14:35:23	1638.173939	P2.Runtime.GA616B.Remain	
10	21-Sep-09 14:35:23	6618.268021	P2.Runtime.GA042B.Remain		21-Sep-09 14:35:23	424.2021442	P2.Runtime.GA617A.Remain	
11	21-Sep-09 14:35:23	9307.674878	P2.Runtime.GA109A.Remain		21-Sep-09 14:35:23	9999.797707	P2.Runtime.GA617B.Remain	
12	21-Sep-09 14:35:23	9089.20813	P2.Runtime.GA109B.Remain		21-Sep-09 14:35:23	1639.583603	P2.Runtime.GA801.Remain	
13	21-Sep-09 14:35:23	435.8723765	P2.Runtime.GA128A.Remain		21-Sep-09 14:35:23	444.974741	P2.Runtime.GA803.Remain	
14	21-Sep-09 14:35:23	989.2993039	P2.Runtime.GA128B.Remain		21-Sep-09 14:35:23	6811.107545	P2.Runtime.GA805A.Remain	
15	21-Sep-09 14:35:23	10000	P2.Runtime.GA302A.Remain		21-Sep-09 14:35:23	4701.392542	P2.Runtime.GA805B.Remain	
16	21-Sep-09 14:35:23	10000	P2.Runtime.GA302B.Remain		21-Sep-09 14:35:23	3385.391667	P2.Runtime.GA809A.Remain	
17	21-Sep-09 14:35:23	9729.211167	P2.Runtime.GA306.Remain		21-Sep-09 14:35:23	8258.152732	P2.Runtime.GA809B.Remain	
18	21-Sep-09 14:35:23	9995.226976	P2.Runtime.GA430A.Remain		21-Sep-09 14:35:23	4788.940742	P2.Runtime.GA810A.Remain	
19	21-Sep-09 14:35:23	357.1171631	P2.Runtime.GA430B.Remain		21-Sep-09 14:35:23	6636.273993	P2.Runtime.GA810B.Remain	
20	21-Sep-09 14:35:23	353.071228	P2.Runtime.GA430C.Remain		21-Sep-09 14:35:23	1936.131184	P2.Runtime.GA811A.Remain	
21	21-Sep-09 14:35:23	7059.661957	P2.Runtime.GA431A.Remain		21-Sep-09 14:35:23	9903.425269	P2.Runtime.GA811B.Remain	
22	21-Sep-09 14:35:23	3147.972115	P2.Runtime.GA431B.Remain		21-Sep-09 14:35:23	6750.199835	P2.Runtime.GA813A.Remain	
23	21-Sep-09 14:35:23	721.3747019	P2.Runtime.GA452.Remain		21-Sep-09 14:35:23	4580.28192	P2.Runtime.GA813B.Remain	
24	21-Sep-09 14:35:23	2782.069934	P2.Runtime.GA466A.Remain		21-Sep-09 14:35:23	6689.941298	P2.Runtime.GA815A.Remain	
25	21-Sep-09 14:35:23	7801.609304	P2.Runtime.GA466B.Remain		21-Sep-09 14:35:23	4649.879213	P2.Runtime.GA815B.Remain	
26	21-Sep-09 14:35:23	3400.786721	P2.Runtime.GA467A.Remain		21-Sep-09 14:35:23	8535.879329	P2.Runtime.GA820A.Remain	
27	21-Sep-09 14:35:23	1514.245448	P2.Runtime.GA467B.Remain		21-Sep-09 14:35:23	1884.419381	P2.Runtime.GA820B.Remain	
28	21-Sep-09 14:35:23	7753.48675	P2.Runtime.GA503A.Remain		21-Sep-09 14:35:23	9389.121224	P2.Runtime.GA840A.Remain	
29	21-Sep-09 14:35:23	2690.207425	P2.Runtime.GA503B.Remain		21-Sep-09 14:35:23	2414.591192	P2.Runtime.GA840B.Remain	
30	21-Sep-09 14:35:23	5677.194515	P2.Runtime.GA506A.Remain		21-Sep-09 14:35:23	363.553534	P2.Runtime.GA847A.Remain	
31	21-Sep-09 14:35:23	7663.622351	P2.Runtime.GA506B.Remain		21-Sep-09 14:35:23	9999.741387	P2.Runtime.GA847B.Remain	
32	21-Sep-09 14:35:23	10000	P2.Runtime.GA521A.Remain		21-Sep-09 14:35:23	10000	P2.Runtime.GA904A.Remain	
33	21-Sep-09 14:35:23	10000	P2.Runtime.GA521B.Remain		21-Sep-09 14:35:23	10000	P2.Runtime.GA904B.Remain	
34	21-Sep-09 14:35:23	1868.233558	P2.Runtime.GA550.Remain		21-Sep-09 14:35:23	4662.833109	P2.Runtime.GA917A.Remain	
35	21-Sep-09 14:35:23	8478.717094	P2.Runtime.GA555.Remain		21-Sep-09 14:35:23	6914.693181	P2.Runtime.GA917B.Remain	
36	21-Sep-09 14:35:23	7549.267303	P2.Runtime.GA595A.Remain		21-Sep-09 14:35:23	6011.765793	P2.Runtime.GA931A.Remain	
37	21-Sep-09 14:35:23	2818.897492	P2.Runtime.GA595B.Remain		21-Sep-09 14:35:23	4335.77133	P2.Runtime.GA931B.Remain	
38	21-Sep-09 14:35:23	10000	P2.Runtime.GA595C.Remain					



- Module Database planning and build
 - Other supported efforts
 - Totalized Cost and Usage
 - Production Data
 - Quality (Manual Logger)



Totalizers configured

Totalizer Type

Summary Calculation Count Events
 All Events Events where value changes Time when TRUE

Block equal to Value: 1

Whenever a new source tag event occurs (Natural)
 Periodically

Interpolate Extrapolate
 Start schedule at: 0 Minute(s) after midnight
 Sample every: 2 Minute(s) Vary w/ DST

Write final results

After a time period elapses After a number of source events
 Based on a trigger event Continue forever (interim results ONLY)

Details

When the following expression changes When the following expression equals zero

'P2.Runtime.GA809A_rst'
 Begin at: 5 Minute(s) evaluate every: 1 Minute(s) Vary w/ DST

Write interim results

Stamped one second after start Projection based on average
 At source time (ramp) Do not write interim results
 Projection based on source value

Data and Point Security

	A	B	M	N	O	P	AJ	AL	AM
1	Select (x)	Tag	creator	dataaccess	datagroup	dataowner	ptaccess	ptgroup	ptowner
2	x	P2.Runtime.GA010A.SP	darhodes	o:rw g:r w:r	piuser	pmc	o:rw g:r w:r	piusers	pmc

energy	uspiash1	USPIASH1	energy
ENG	uspiash1	USPIASH1	ENG
ine	uspiash1	USPIASH1	ine
			SH1 lab
			SH1 mfg
			SH1 ops
			SH1 Administration
			User
piuser	uspiash1	USPIASH1	User
pmc	uspiash1	USPIASH1	Plant PMC's

Group Properties

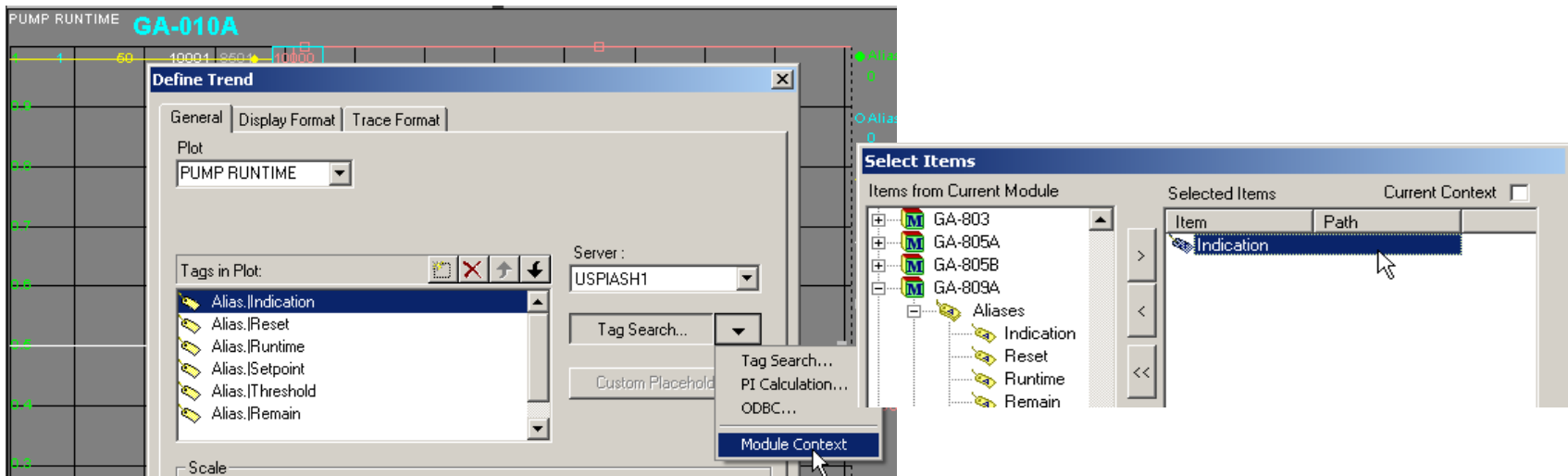
General User Membership

Username	Description
Admin	Admin
darhodes	darhodes
piadmin	PI Administration
pmc	Plant PMC

Performance equations created

Name:	P2.Runtime.GA809A.Remain		
Descriptor:	Motor/Pump Runtime Remaining		
Point class:	classic		
Point type:	Float64	Digital set:	
Eng Units:	HOURS		
Extended Descriptor:	'P2.Runtime.GA809A.SP' - 'P2.Runtime.GA809A'		

ProcessBook and DataLink aliasing



The screenshot displays two overlapping dialog boxes in a software interface. The background shows a 'PUMP RUNTIME GA-010A' plot with a value of 10004. The 'Define Trend' dialog box is open, showing a 'Tags in Plot' list with 'Alias.Indication' selected. A 'Tag Search...' menu is open, with 'Module Context' highlighted. The 'Select Items' dialog box is also open, showing a tree view of items from the current module, including 'Aliases' and 'Indication', with 'Indication' selected in the 'Selected Items' list.

- Reduced PM replacement cost
 - Annually equating to \$700k, and we're not done!
- Increased available maintenance man hours
- Enabling removal of existing runtimes from the control systems
 - More available memory and processing time
 - Disparate systems were hard to manage (Rockwell, DeltaV, RS3)
 - Control Systems not the place for maintenance activities
 - Operators need to concentrate on running the plant

Questions?

- Over 1 million Tiona® TiO₂ particles fit side by side on the head of a pin.
- Titanium is the 9th most common element in the Earth's crust.
- The surface area that could be covered with all the particles in one bag of Tiona® TiO₂ is equal to 40 football fields.
- Our Tiona® TiO₂ is in the paint used to coat the White House and the Capital dome in Washington, DC, USA.



Thank you

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