Using PI for BSC Reporting at QNI

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Outline

- Yabulu Refinery Overview
- Business Systems Architecture
- Yabulu Refinery Performance Measures
- Other Business Benefits
- Questions

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Overview

- BHPBilliton's nickel business
- Operations in Australia and Colombia
- World's 5th largest nickel and cobalt producer
- 3.5 M tpa of imported ore produces 32 000T Ni and 2000T Co
- Employs 700 people

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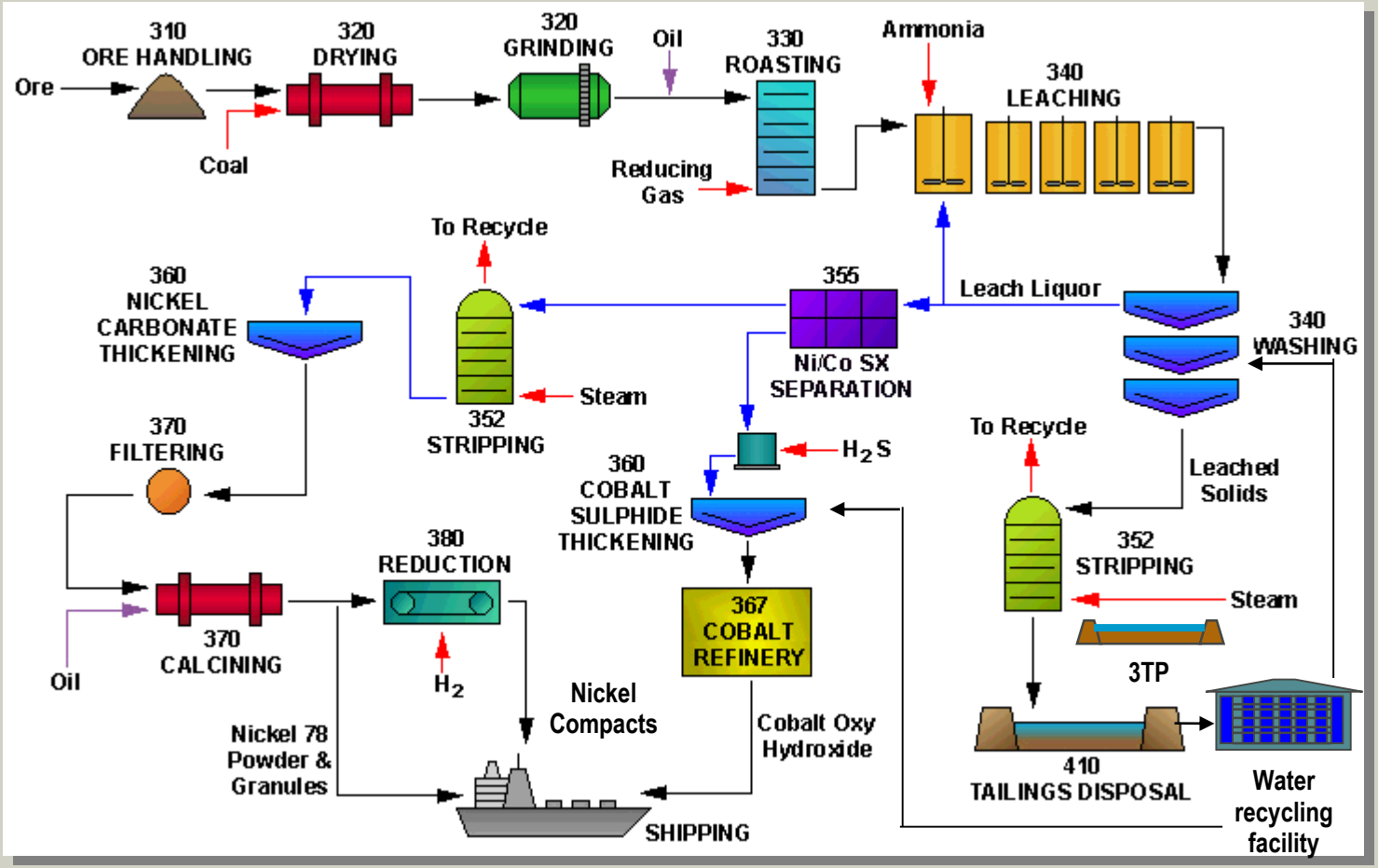
Yabulu Refinery Overview



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Yabulu Refinery Overview cont...

- 6 Control Rooms
- Mixture of Different Control Systems
- PI installed November 2000
  - •Administered by IT Department
  - •Champions in each Business Unit
- Refinery BSC Reporting Implemented FY03

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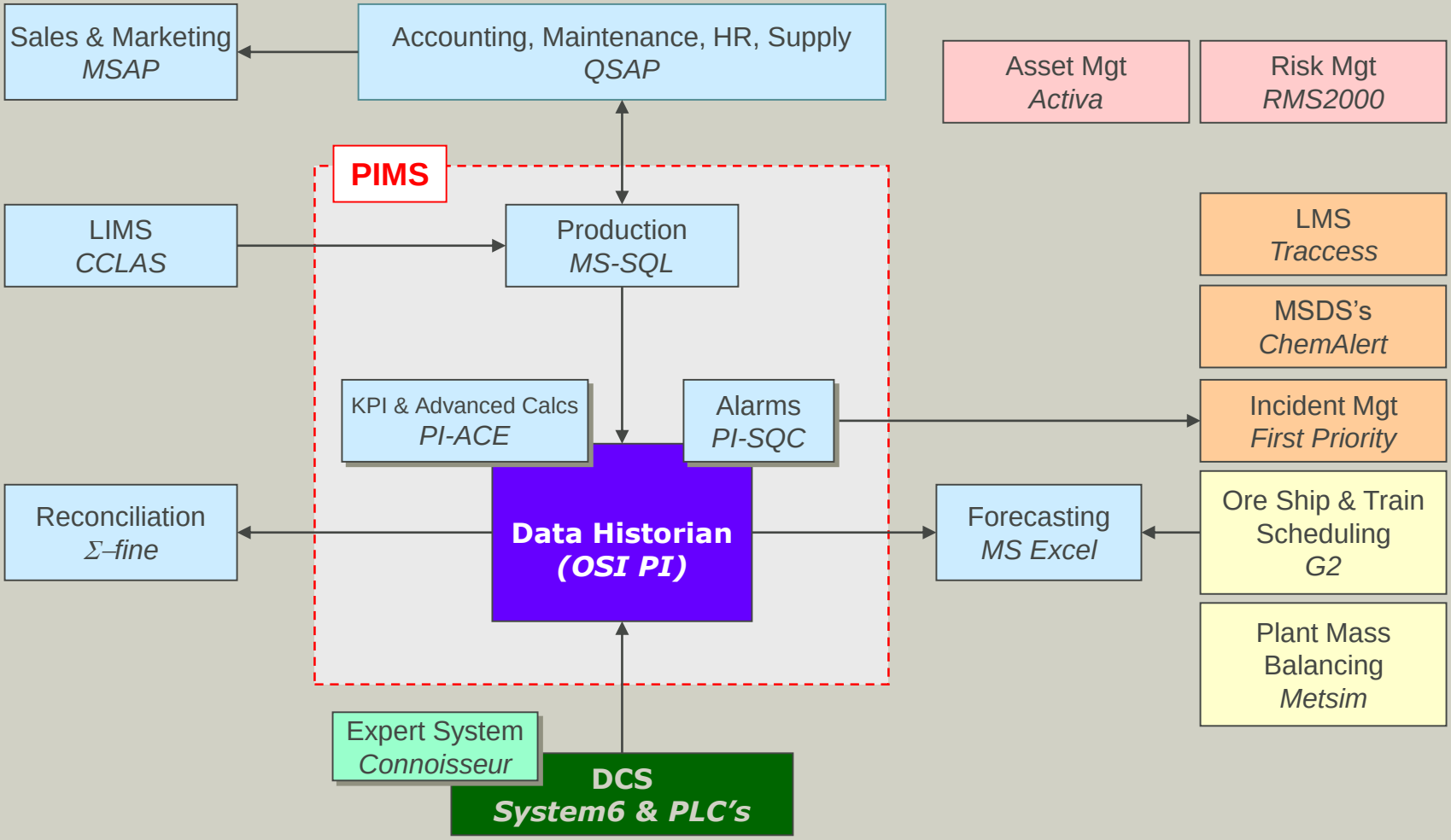
Business Systems Functional Hierarchy



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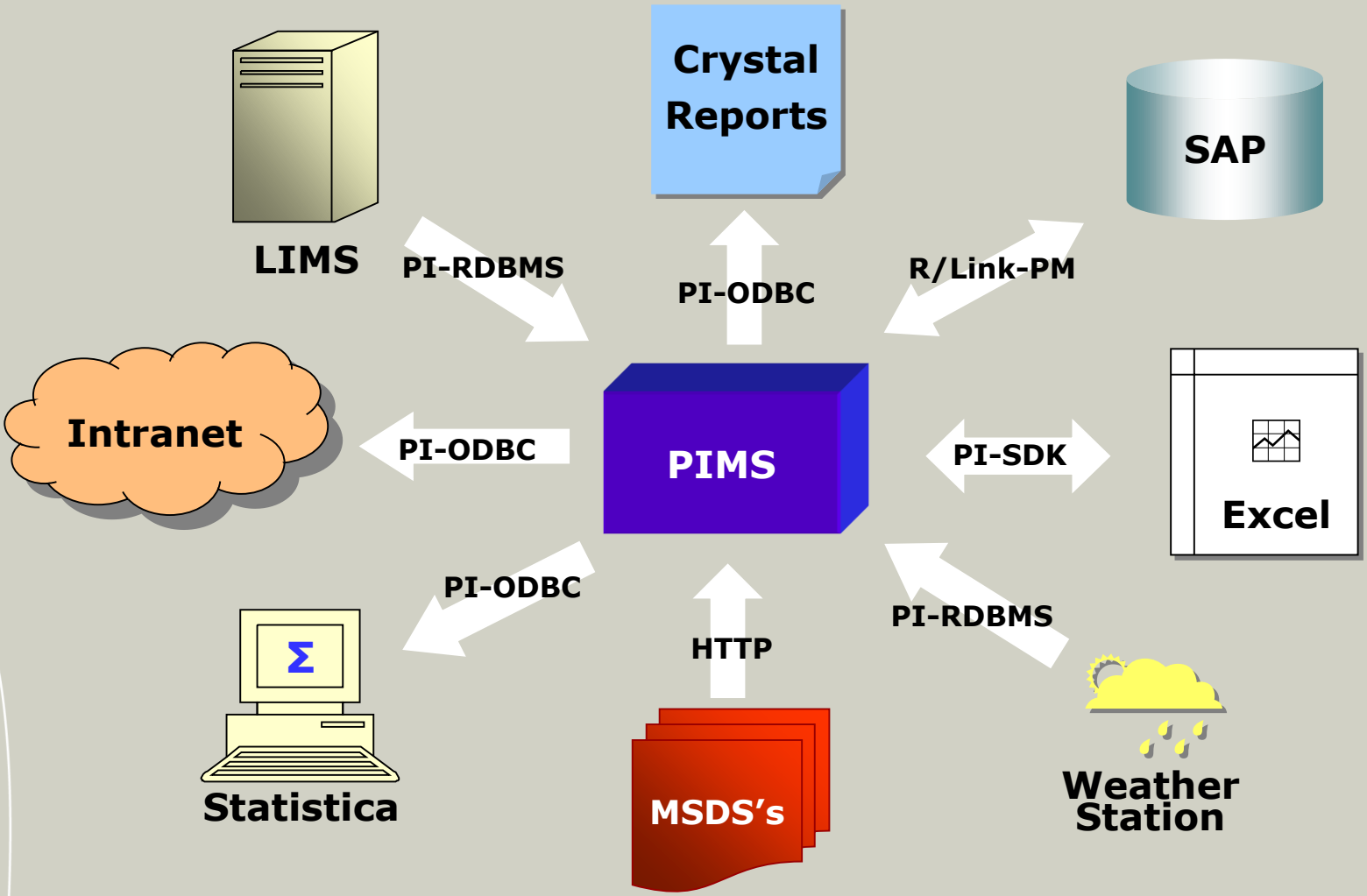
Automatic PIMS Interfaces



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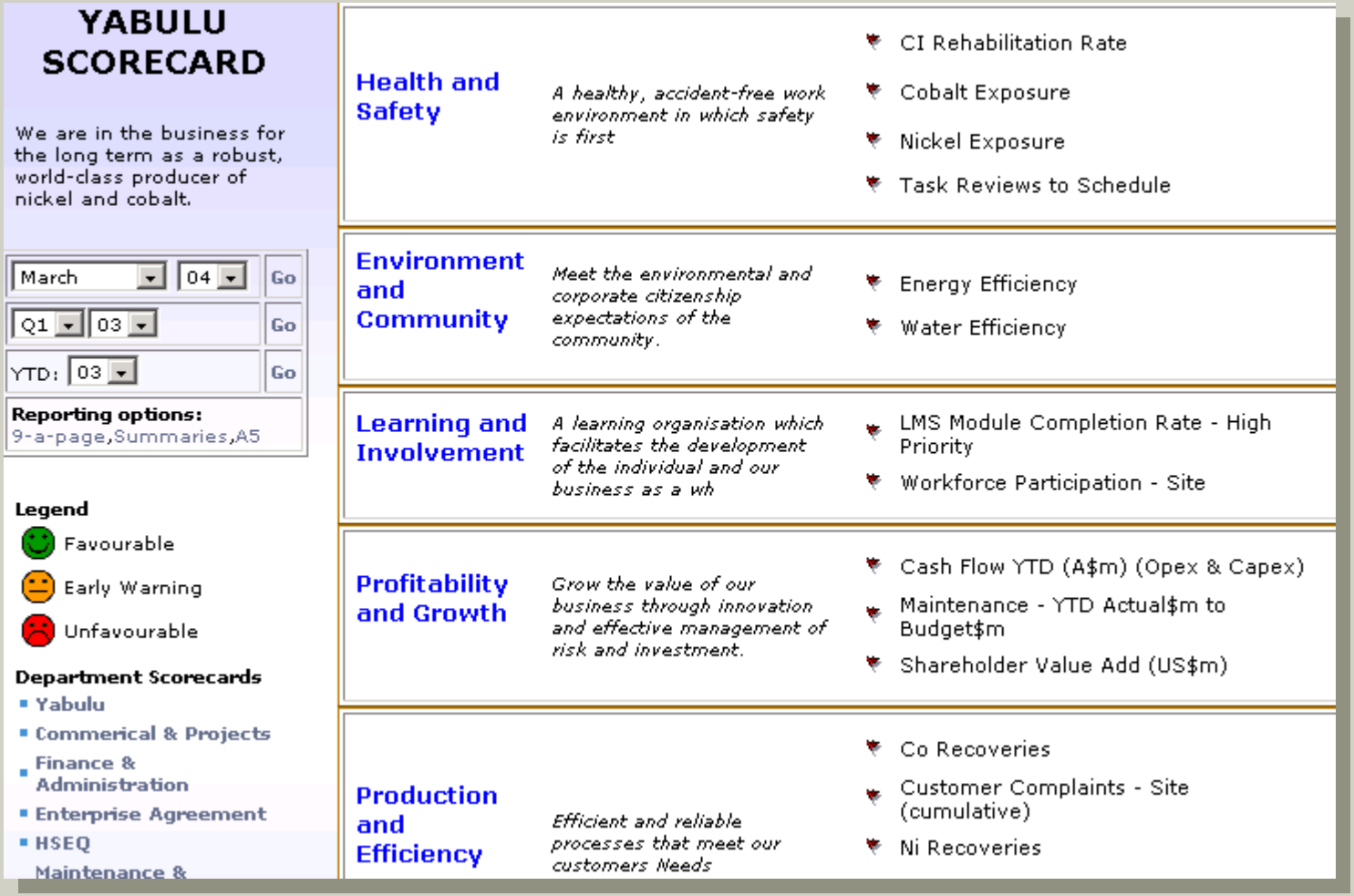
Yabulu Balanced Scorecard



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Example Business Unit Scorecard

Health and Safety	*A healthy, accident-free work environment in which safety is first*	Incident Reporting Safety Communication Task Observations	Mean Co Dust Exposure Safety Housekeeping Clearup Rate
Environment and Community	*Meet the environmental and corporate citizenship expectations of the community.*	Cobalt Emissions from stack Water Use	Steam Use
Learning and Involvement	*A learning organisation which facilitates the development of the individual and our business as a wh*	367 Level B Priority Competency Achievement	367 Level C Priority Project Participation
Profitability and Growth	*Grow the value of our business through innovation and effective management of risk and investment.*	Hydrogen Peroxide Unit cost Operating Unit Cost	Maintenance $'s per ton YTD Oxygen Unit Cost
Production and Efficiency	*Efficient and reliable processes that meet our customers Needs*	Co Recoveries Kettle Availability Non Conforming product PSD Strike Rate	Customer Complaints Larox (stage 7)Availablity Outstanding Maintenance Notifications

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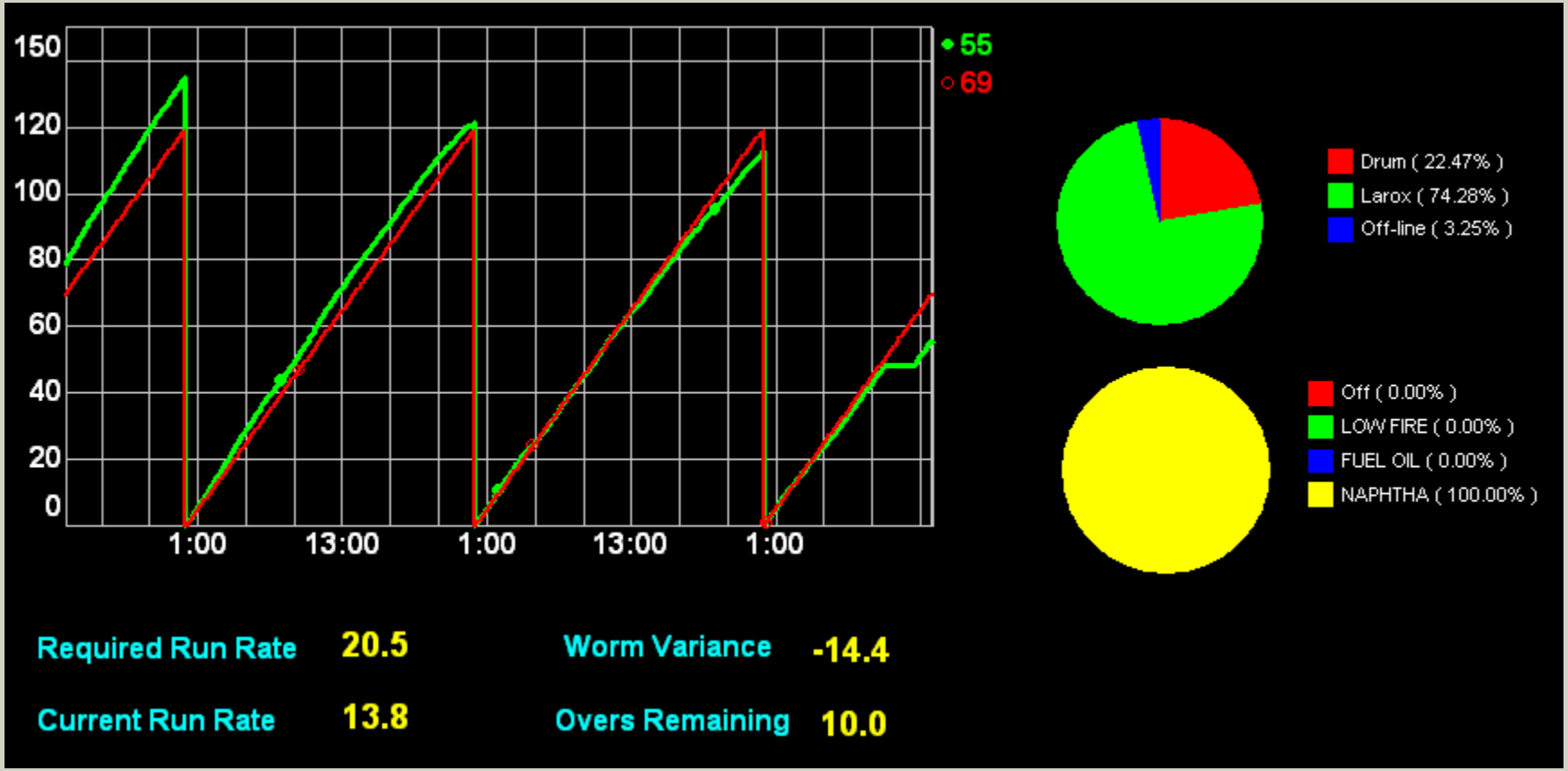
Production & Efficiency - Nickel Plant

Critical calciner KPI's monitored in real-time



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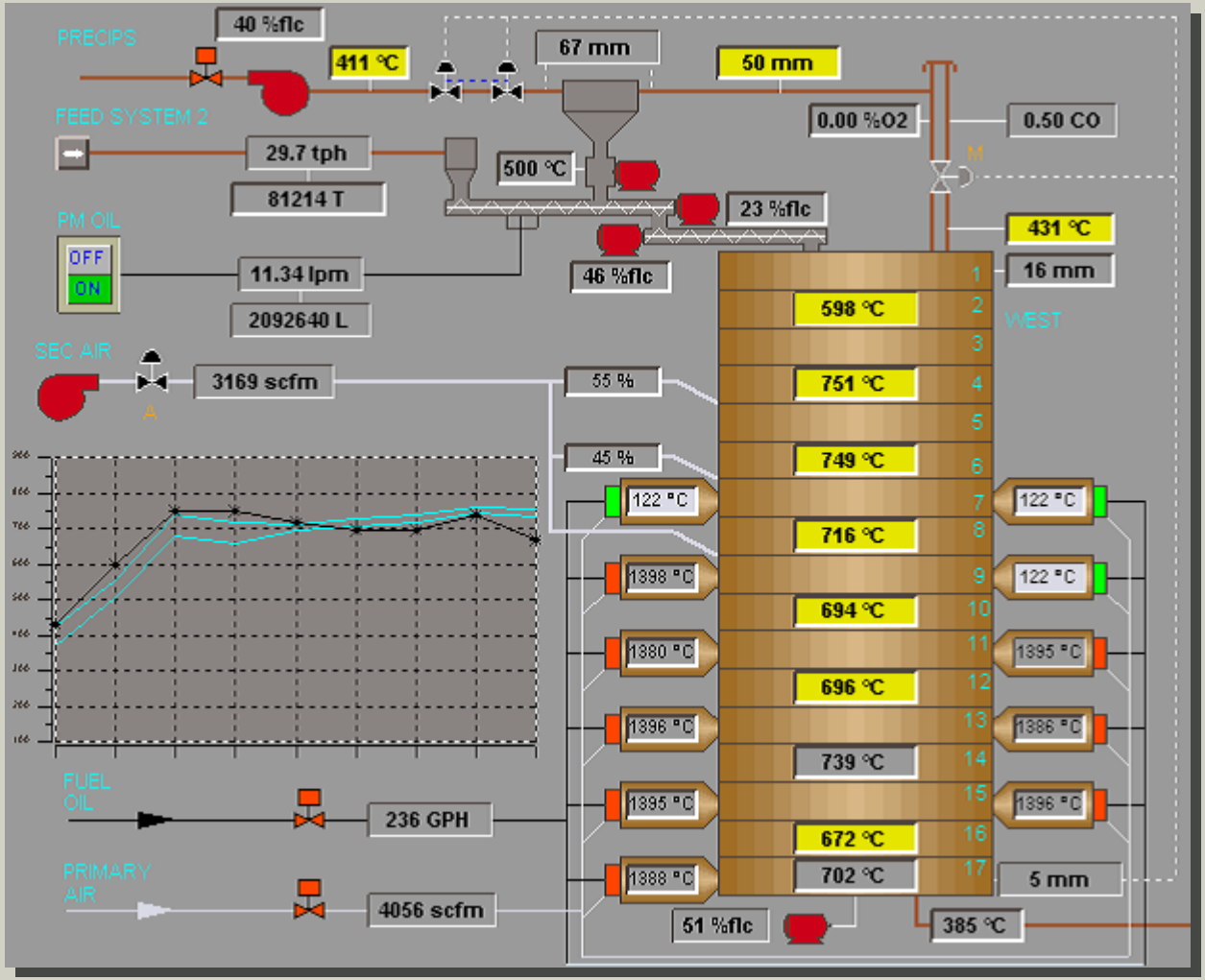
Production & Efficiency - Roasters



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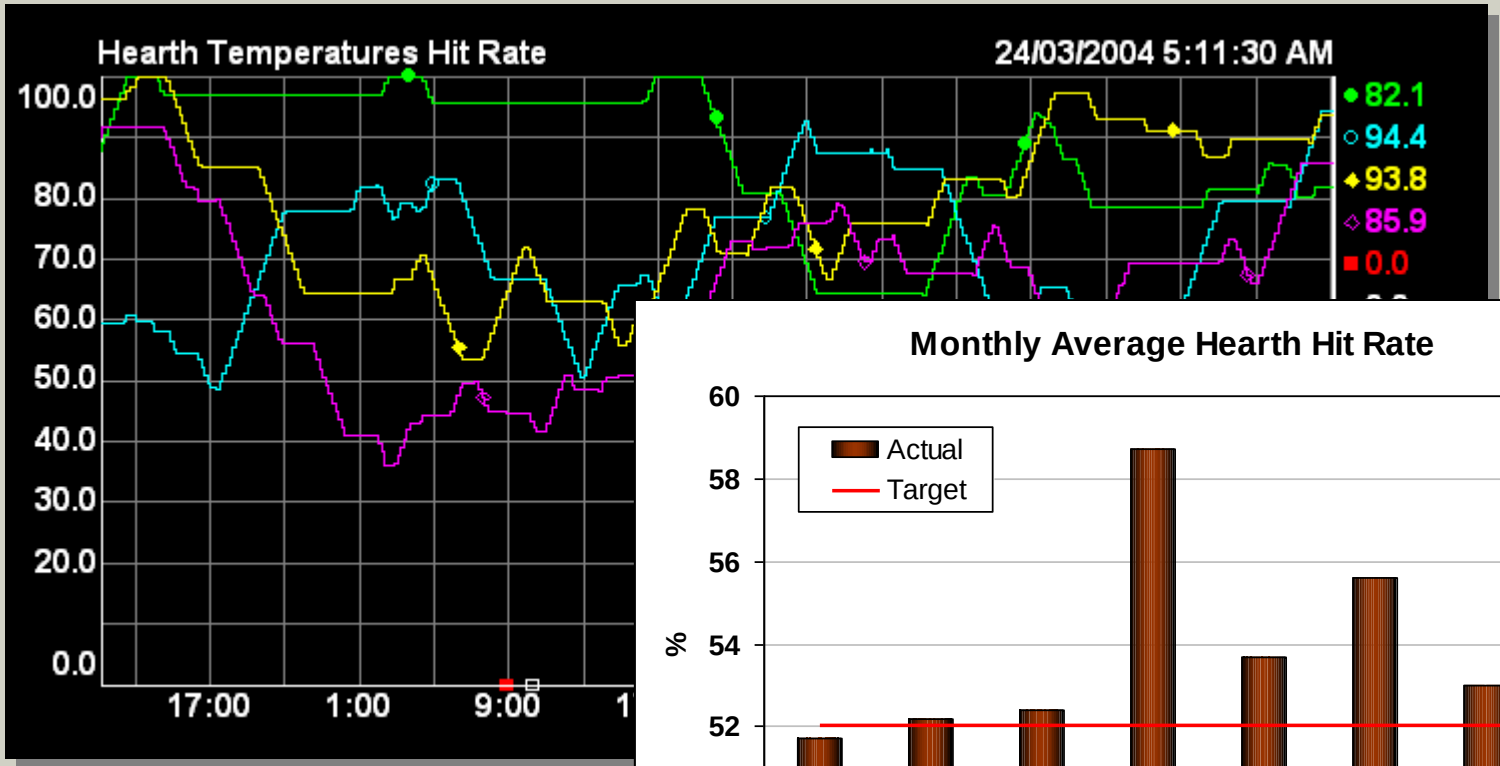
Production & Efficiency - Roasters



% of time temperature was within ±10°C of SP during the last 6 hours

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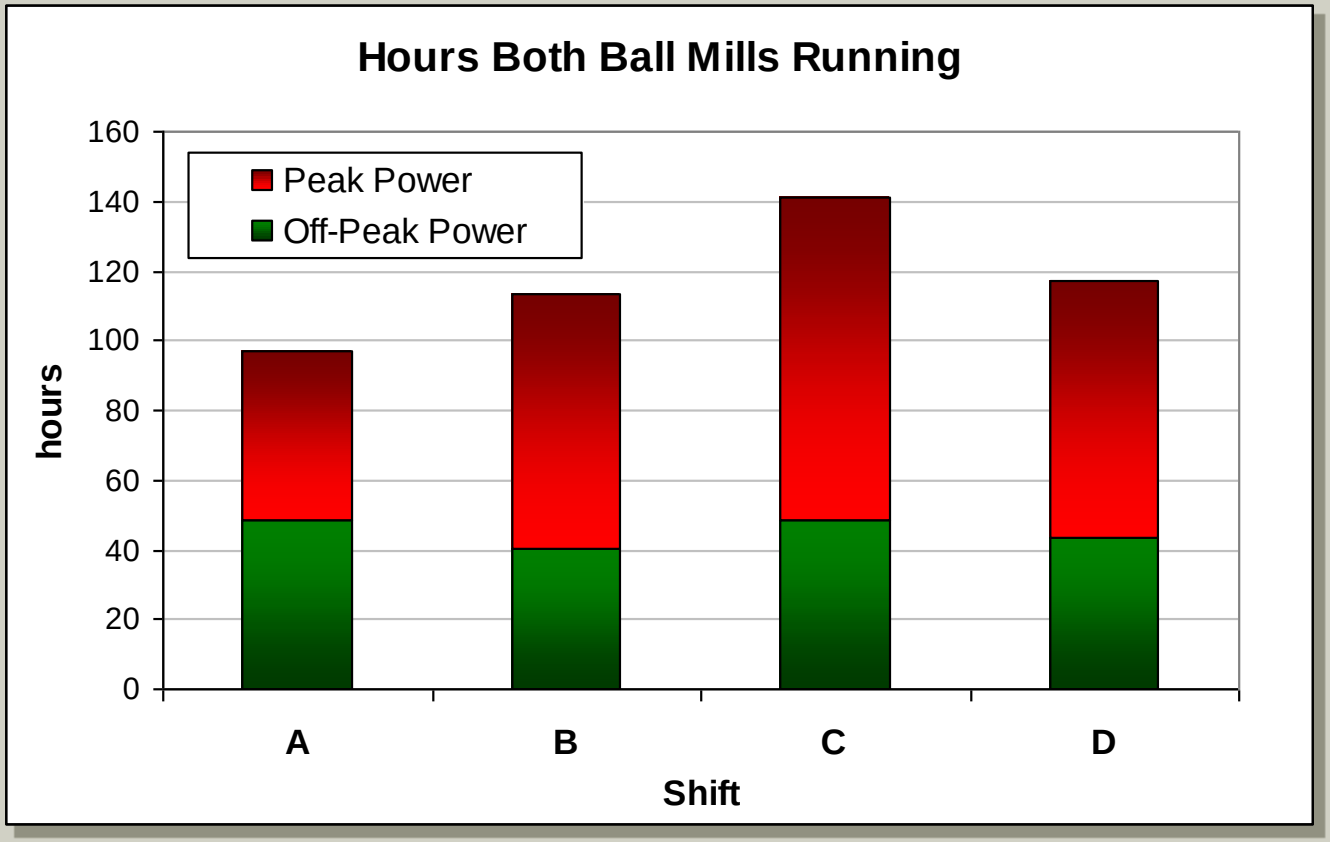
Production & Efficiency - Grinding

Compare KPI's between Shifts

Peak power is purchased at higher rate than off-peak



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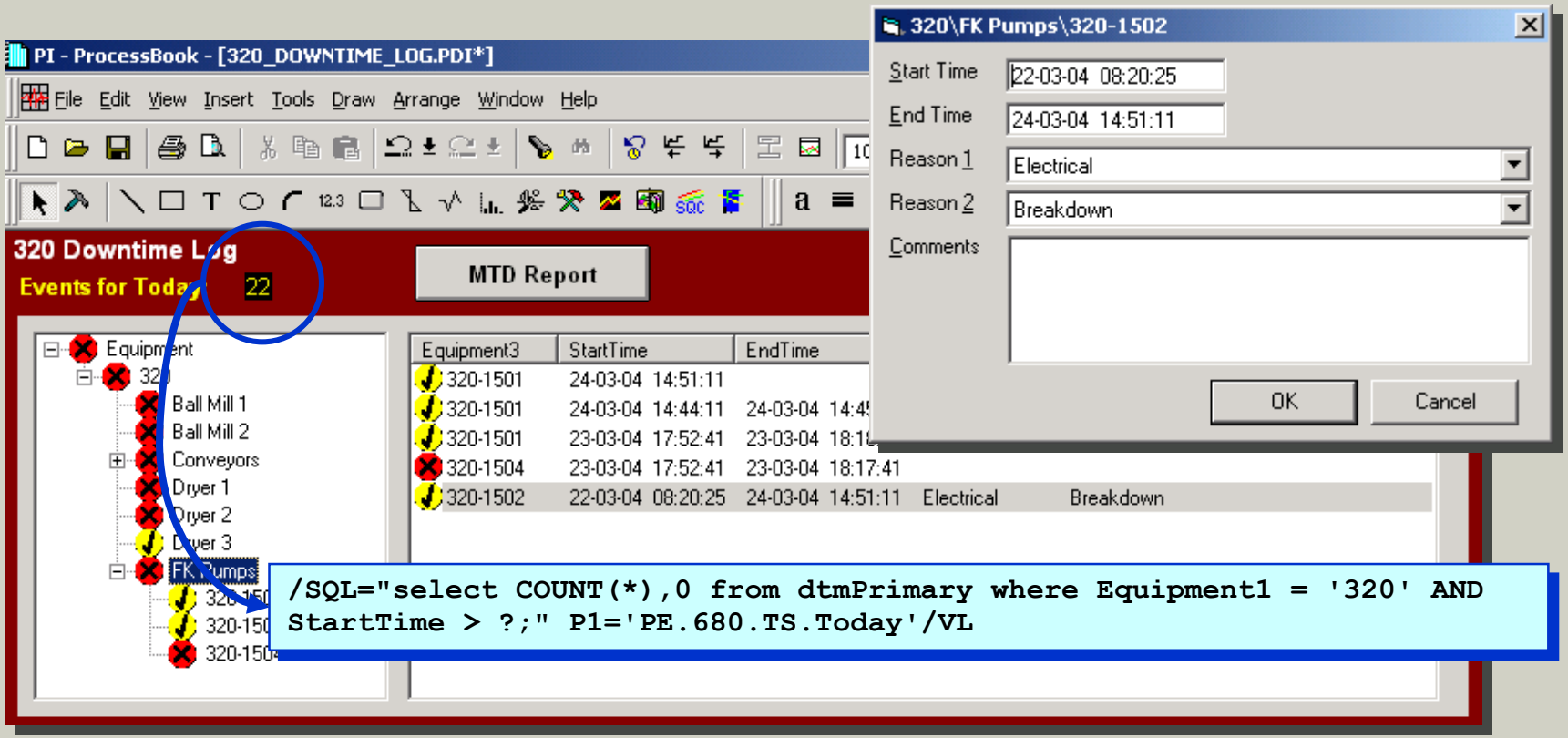
Production & Efficiency - Dryers

Operator log for entering reasons for downtime events

Uses PI Alarm tags as triggers, and events saved in SQL table



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Production & Efficiency - Dryers

Business Unit 1 Downtime Report - MTD Summary

Wednesday, 24 March, 2004

		Minutes
Ball Mill 1		5,221
Ball Mill 2		5,703
Conveyors	310-2008	3,784
		3,784
Dryer 1		4,359
Dryer 2		7,911
Dryer 3		2,257
FK Pumps	320-1501	1,181
FK Pumps	320-1502	4,159
FK Pumps	320-1504	5,281
		10,621

- Downtime summary report, using Crystal Reports
- Adhoc reports executed from Excel / MS Query for maintenance reporting

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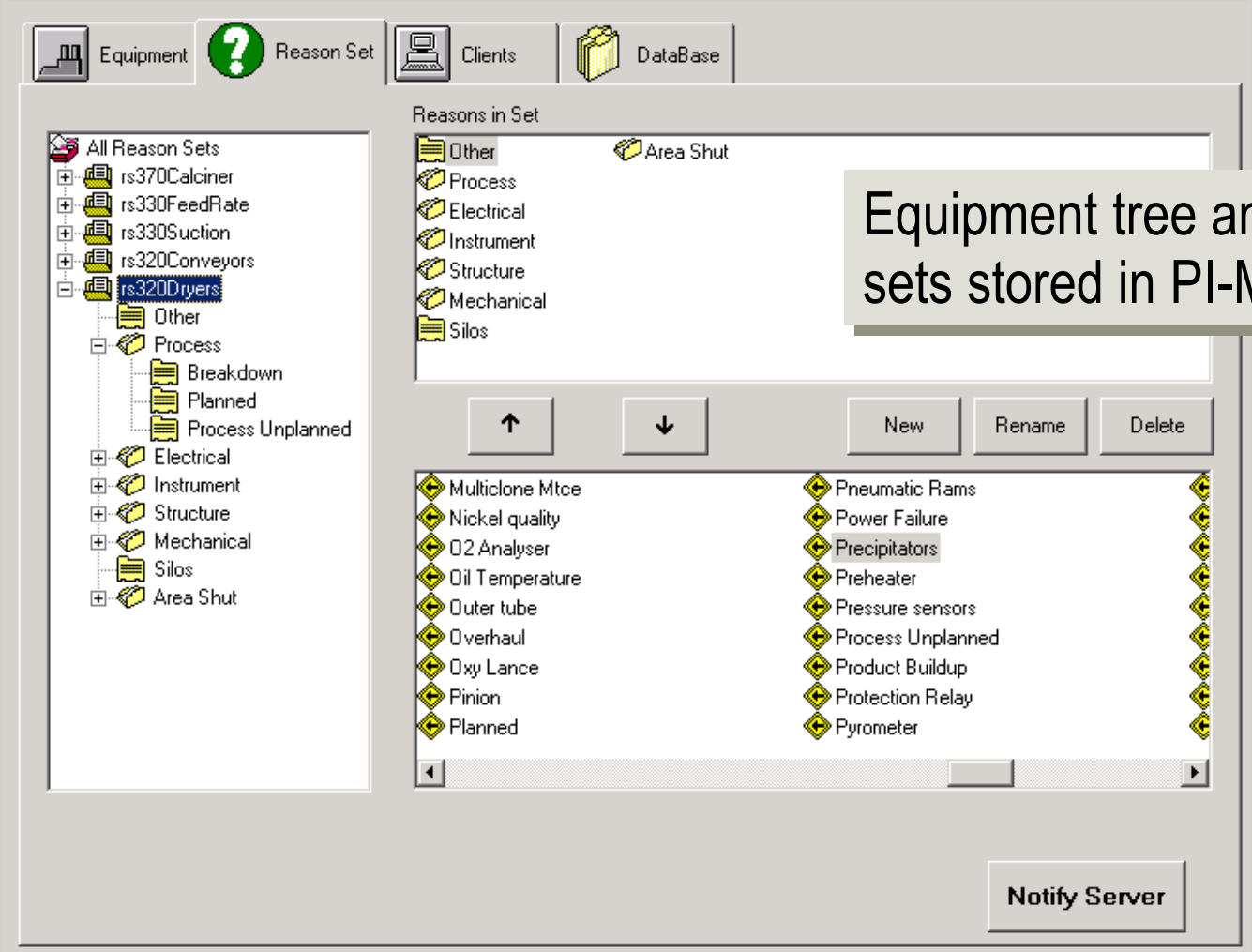
Production & Efficiency - Dryers



Equipment tree and reason sets stored in PI-MDB

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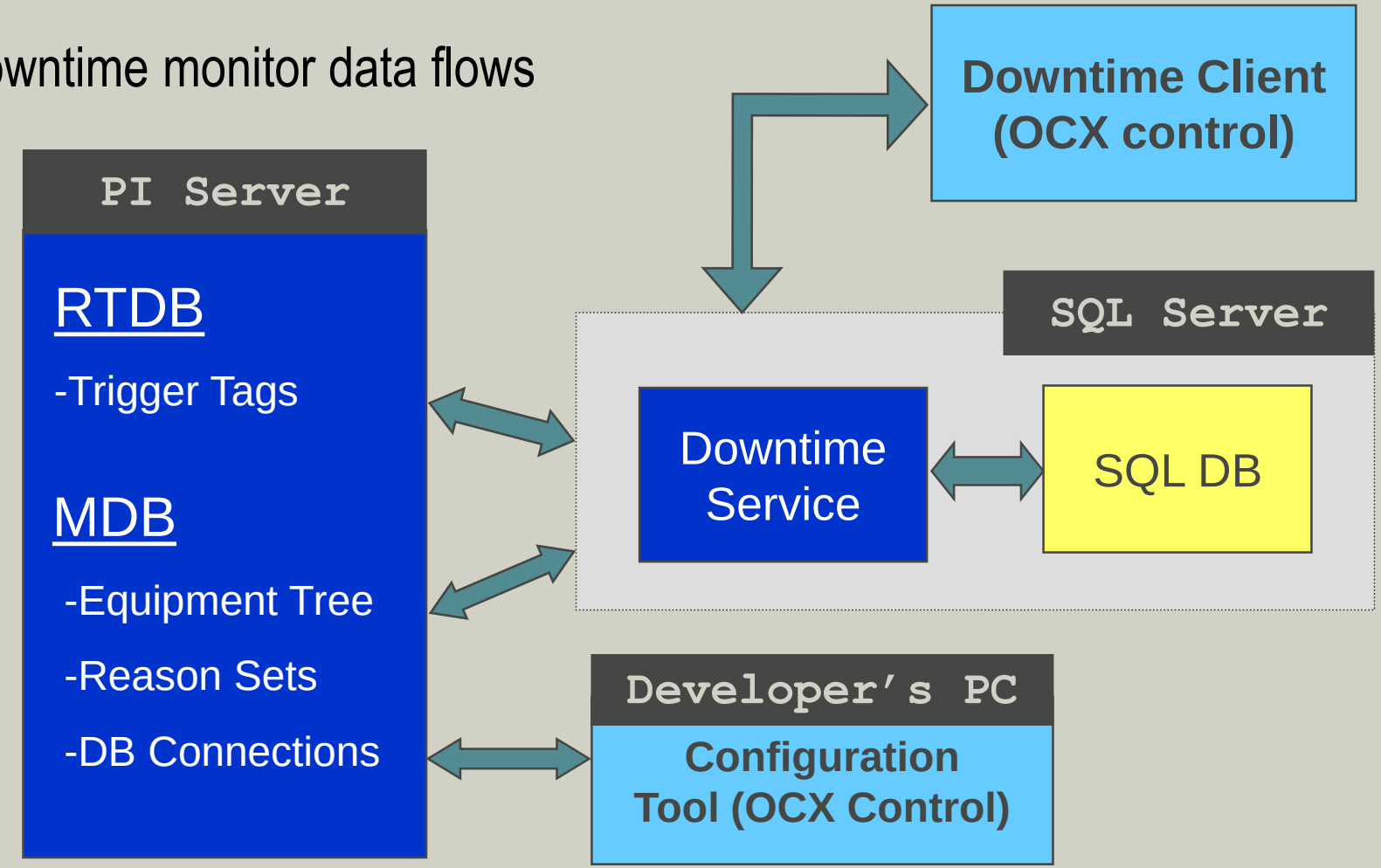
Production & Efficiency - Dryers

- Downtime monitor data flows



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Production & Efficiency - Metallurgical Accounting

- Sigmafine used to perform monthly reconciliations for nickel and cobalt
- Allows flowsheet mass balance to identify unmeasured losses
- Input data can be read from PI tags or csv file
- Has allowed monthly Metallurgical Accounting reports to be completed in 1 working day
- Report on intrinsic data quality i.e. meter & weigher accuracy

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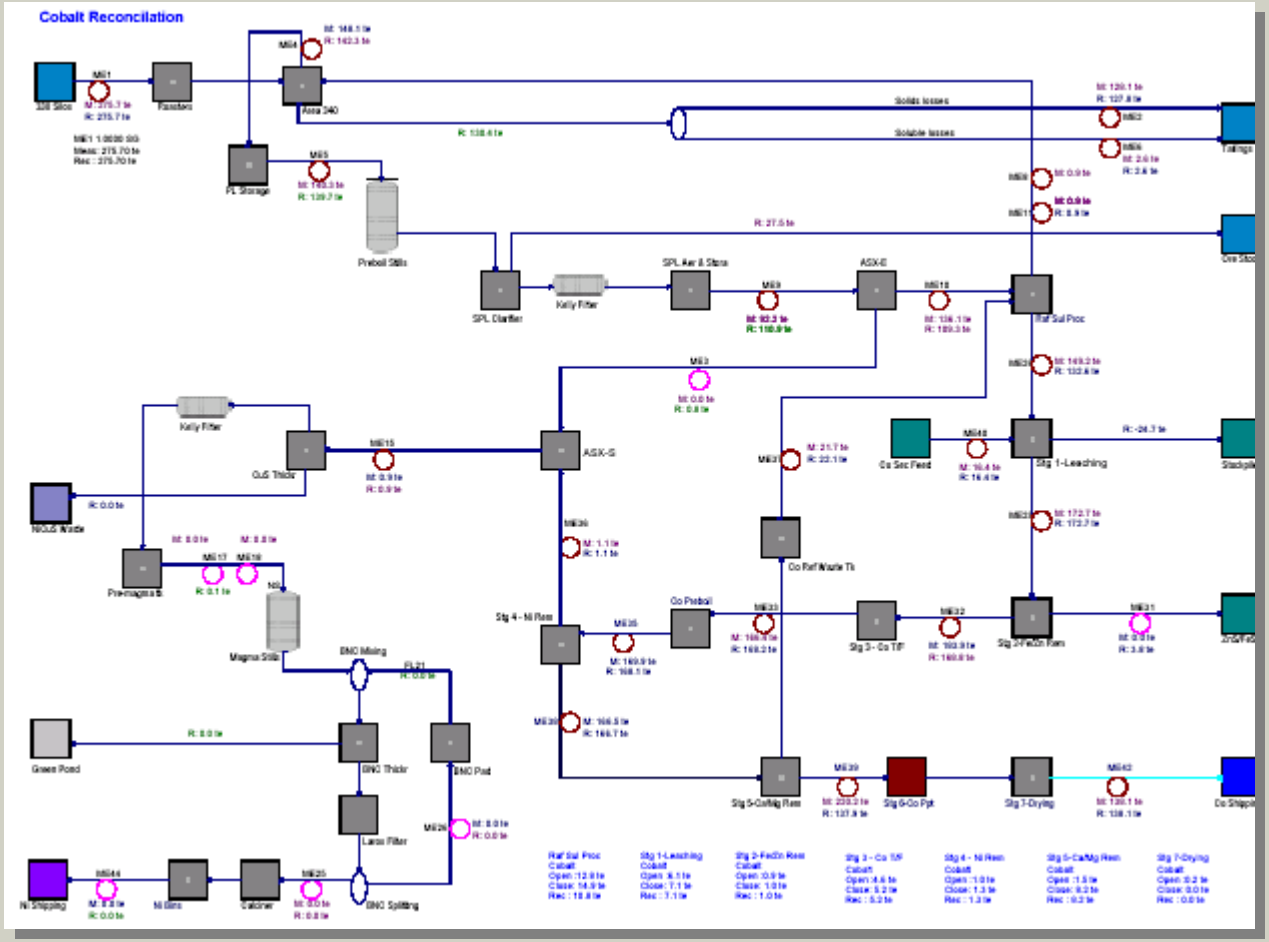
Production & Efficiency - Metallurgical Accounting



Flowsheet in Sigmafine used for monthly nickel and cobalt reconciliations

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Production & Efficiency - Metallurgical Accounting

	A	B	C	D
1	MODEL: Plant2			
2	USERID: guest		SIGMAFINE	
3	STATUS : Preliminary		METER DATA REPORT	
4	VERSION : Sigmafine 3.0.1			
5			MEASURED	RECONCILED
6			MASS	MASS
7	METER	DESC	lb	lb
8	--* LIQ METERS --*			
9	ME1		7013566	7013566
10	ME10	360FI-033	20503	20478
11	ME11		4189	4073
12	ME15	355FI-005	6185951	4902369
13	ME17	NiLSL ex 360-1902	0	0
14	ME18		5236640	5236640
15	ME2	Tails Solids Loss	1291123	1289832
16	ME25		7891667	6710907
17	ME26		0	0
18	ME28	367FI-1551	0	0
19	ME29	367FI-1511	18519	18519
20	ME3	(LO-SO) x Org Flo	5831888	4942483
21	ME31	367FI-1525	0	0
22	ME32	367FI-1521	19842	18757
23	ME33	367FI-1308	0	0
24	ME35			
25	ME36	36FI-005		
26	ME37			
27	ME38	367FI-1564		
28	ME39	Kettle Feed		
29	ME4	340FI-1059	60	
30	ME40	Co Secondary Feed		
31	ME42			
32	ME44		68	
33	ME5	340FI-3106+340FI-:	57	
34	ME6	Tails Soluble Loss		
35	ME8	340FI-1029		
36	ME9	355FI-002	4008445	4967590

	A	B	C	D
1	KBC Data Quality Indicies - Summary Report For Model Plant2			
2				
3	Period	Full Model DX0	Full Model DX1	Full Model DX2
4		Unchecked Flows %	Imbalance Ratio %	Correction Ratio %
5	----------	----------	----------	----------
6	Jan-04	18.3	14.0	13.5
7	Feb-04	51.5	18.3	12.4
8				
9	Average	34.9	16.2	13.0

- Report on measured and reconciled mass through each meter
- Report on data quality and quality of mass balance

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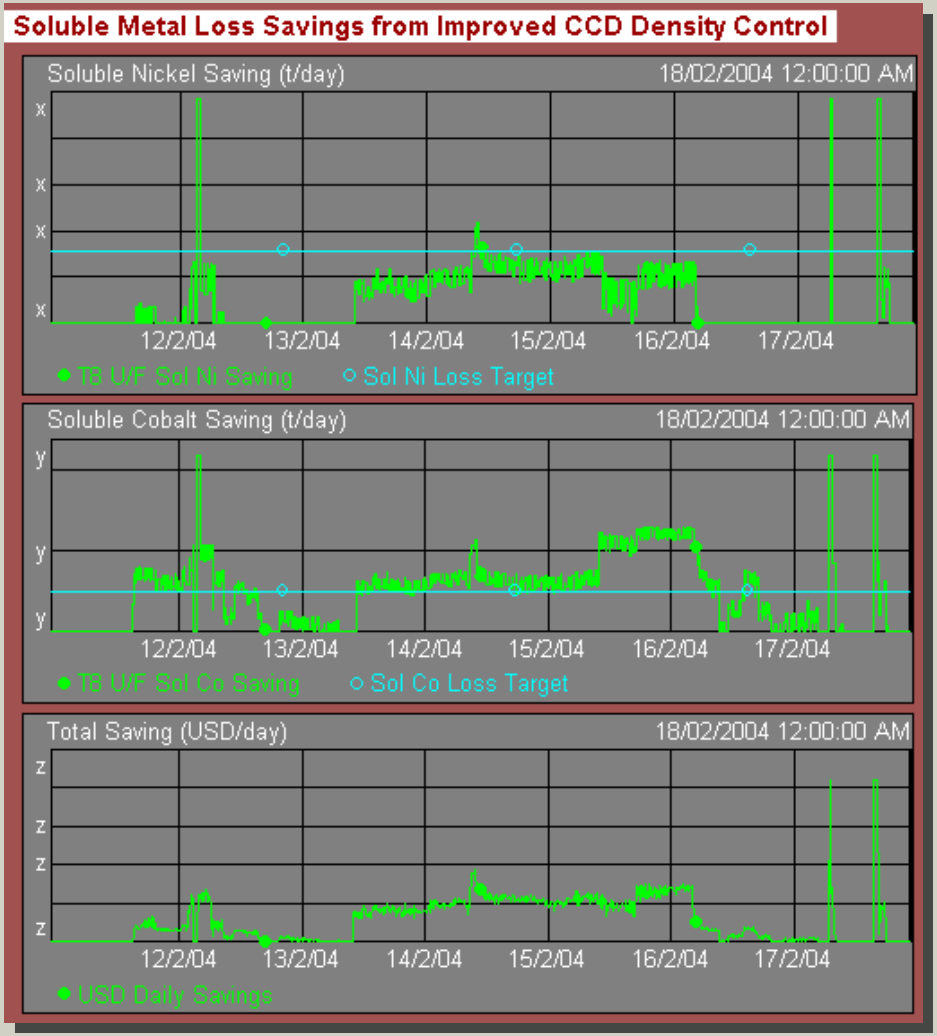
Profitability & Growth - Project ROI

Calculate payback from improvement projects by writing current nickel & cobalt prices to PI tags, and using in Data Sets



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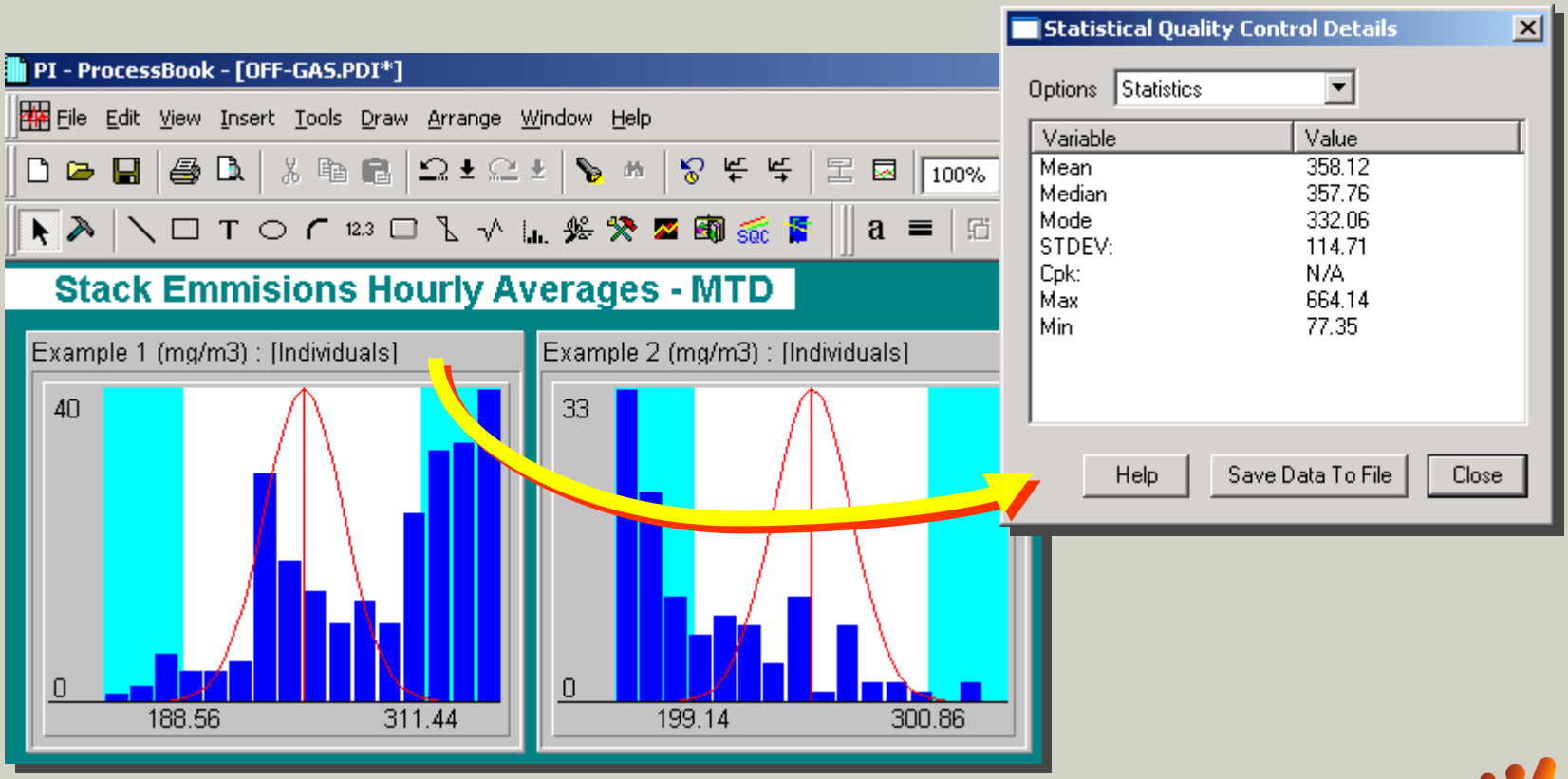
Environment & Community - Stack Discharges

Using SQC Chart Histogram for MTD KPI's

Double clicking chart title bar display statistics



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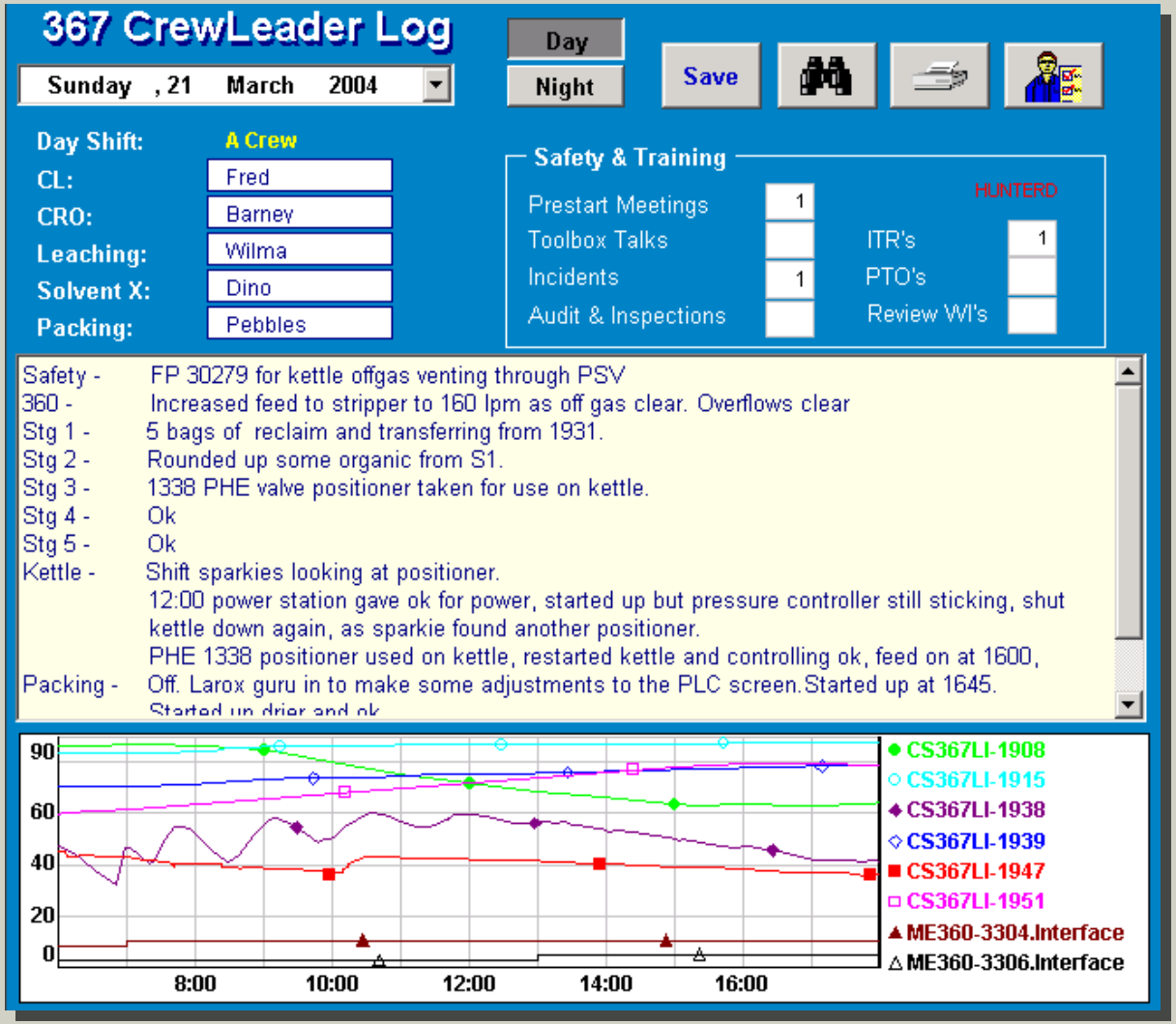
Health & Safety - CRO Logs



- Operator names recorded in PI string tags
- Safety & training stats and text saved in SQL Server
- PI Trend showing tank levels for duration of shift

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Other Business Benefits - Updating BSC Using PI-ACE

- PI-ACE used to write monthly measures to BSC database
- BSC database connection string stored as property in MDB

Sub-Modules | PI Aliases | PI Properties

PIProperty Name	Value	Datatype
test	False	Boolean
connection	Provider=SQLOLEDB; Data Source=10.61.144.3;Initial Catalog=PIM...	String
sql_update	UPDATE vwBSC SET Value = [V] WHERE MeasureID = [M]	String

- BSC Measure tags saved as aliases in MDB

Sub-Modules | PI Aliases | PI Properties

PIAlias Name	Tag Name	Server	Snapshot Value
BSC_1	PE.BSC.330.HearthHitRate	ssmqnitsv-...	59.33792
BSC_2	PE.BSC.352.Emmision.NH3	ssmqnitsv-...	748.6757
BSC_3	PE.BSC.352.LSL.Co	ssmqnitsv-...	25.52193

- MeasureID stored in “UserInt1” tag attribute

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Other Business Benefits - Updating BSC Using PI-ACE

```
Set myModule = GetPIModuleFromPath(mstrACEContext)
Set my_aliases = myModule.PIAliases
m_test = myModule.PIProperties.Item("test")
m_connection = myModule.PIProperties.Item("connection")
m_sql_string = myModule.PIProperties.Item("sql_update")
'If first day of month
If ((Day(Now()) = 1) Or m_test) Then
    Set oConnection = New ADODB.connection
    Set oRecordSet = New ADODB.Recordset
    oConnection.Mode = adModeReadWrite
    oConnection.Open m_connection
    'Do for each alias tag listed in this module
    For Each my_alias In my_aliases
       m_measureID = my_alias.DataSource.PointAttributes("userint1").Value
       m_value = my_alias.DataSource.Data.Snapshot
       'Replace placeholders with BSC MeasureID and Value
       m_sql_update = Replace(m_sql_string, "[M]", Str(m_measureID))
       m_sql_update = Replace(m_sql_update, "[V]", Str(m_value))
       'Insert into MSC Database
       oRecordSet.Open m_sql_update, oConnection, adOpenKeyset
    Next my_alias
```


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Other Business Benefits - Process Capability for ISO9001

- For a process that is normally distributed it is known that 99.73% of all values are within the ± 3 sd around the mean
- Review data which falls outside this range to determine the cause. Exclude this data if the process was unstable
- Calculate process capability based on a 95% confidence level around the process mean
- This is what we know the process is currently capable of achieving.
- Configure PI-RTSQC Alarms for when process goes outside these control limits, and raise incident in FirstPriority

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QNI PIMS Scorecard

- How up to date is the production information published on our intranet ?

- At what level of detail do we compare performance ?

- What interval is performance data tracked ?

- Who has access to this data ?

- How do we collect downtime ?

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Questions ?

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