

Technology Framework - Benefits

Actionable
Information – KPI's



Discrete data
Limited value

Distributed OSIsoft PI Historians
Large Population of Data

Annual Savings

Data Analysis
\$3,000,000

Raw Data Analysis

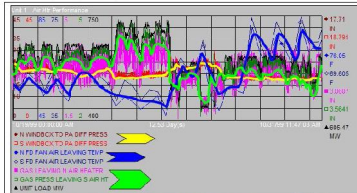
- Post trip analysis
- Process monitoring
- Optimization
- Early warning
- Alarming

UNIT 1 – COMBUSTION PROC (I.E., AIR HEATER PERFORMANCE VS COAL MILLS)

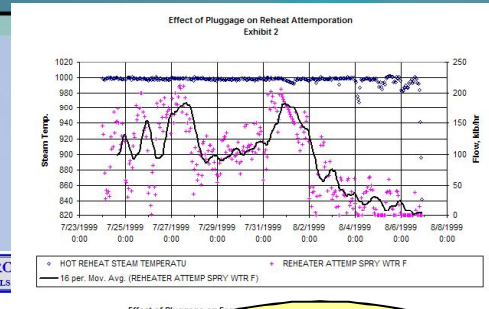
Exhibit 5

Concerns have recently arisen regarding degrading performance of Unit 1's Coal Mills over the past week. It would like to have the opportunity to discuss the problem in light of two factors: 1) Lack of good air heater radial seals, and 2) rising ambient air temperatures.

In the PI graph below of Unit 1's parameters, a review of **PAsto-Windbox** (ambient air temperatures (FD Fan Air Leaking)) and **PAsto-Window** (Hot Reheat Steam Temperature) (Key to Coal Mill performance) is compared simultaneously to past operating history has defined that when the **PAsto-Window** reaches a level of 187°F/90°C that both combustion and coal mill performance is drastically impacted. This is the level at which air heater radial seal replacement is dictated if unit load is to be maintained without restrictions.



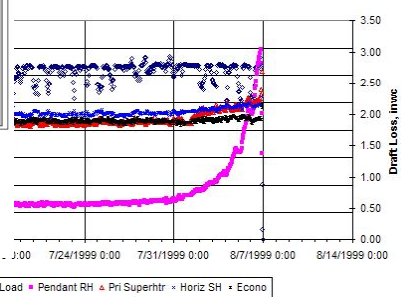
Understanding that air density changes as temperature changes and that it has an inverse effect on fan and air heater performance (i.e., as air temp. increases, efficiency of fan/air heater decrease) we can readily see in the above graph that since October 22nd the ambient air temperature changed drastically. This was the reported time that Unit 1 coal mill output problems began to arise. As a result, **PAsto-Window** was reduced and coal mills removed from service in an attempt to maintain enough I of TA (Total Air) to the **PAsto-Window** in the morning mill. In a later period, this provided a false impression that **PAsto-Window** pressure was not affected by rising ambient temperatures, yet when compared to unit load one can easily surmise the cause of this perception. It was on Oct. 27th that the true impact on **PAsto-Window** pressure can be seen in the PI graph above. Please note in the above graph that air temperature had a POSITIVE impact on **PAsto-Window** on Oct. 27th when it cooled down.



\$ 1,890,000
One Plant
1st year savings!

Water, Superheater, and Economizer Draft Loss

Exhibit 4

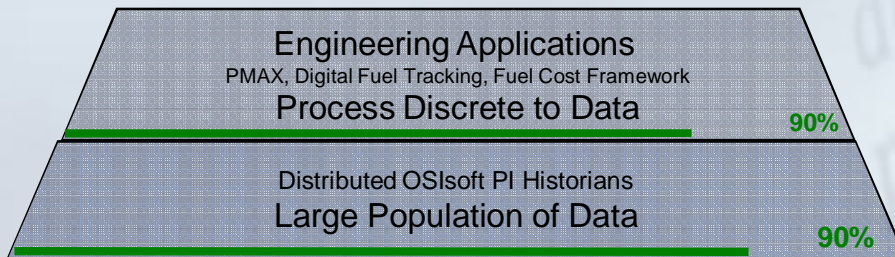


Technology Framework - Benefits

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Annual Savings

Discrete data
Limited value



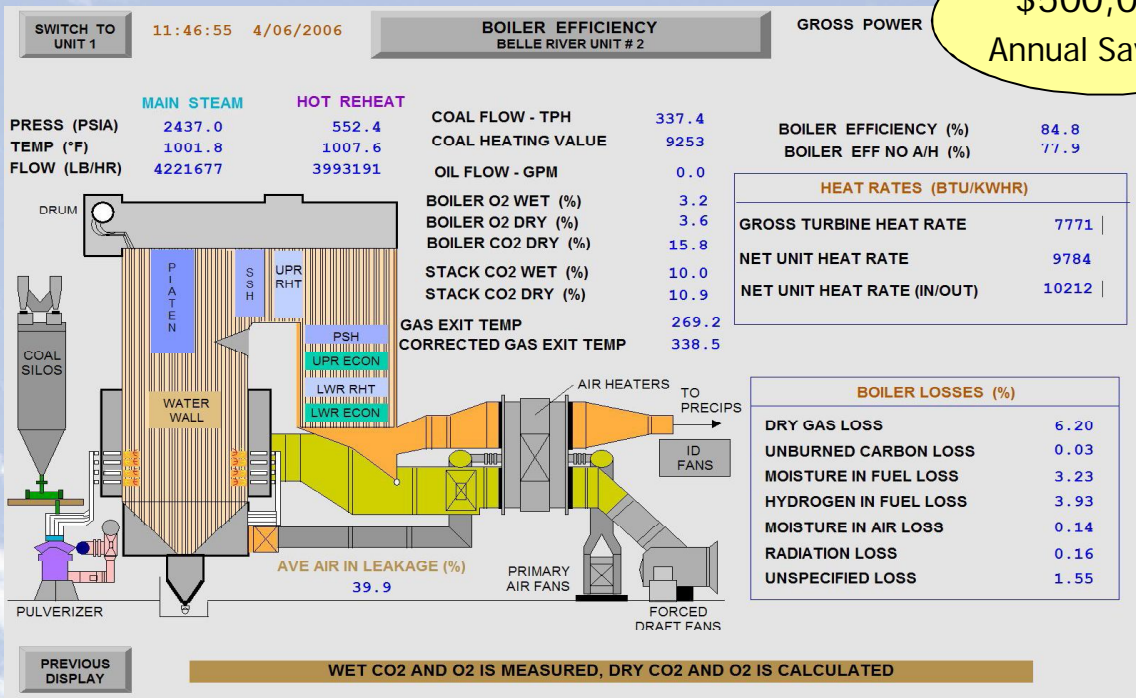
Process Analysis
\$4,500,000

\$3,000,000

Fleet Performance Analysis (PMAx)

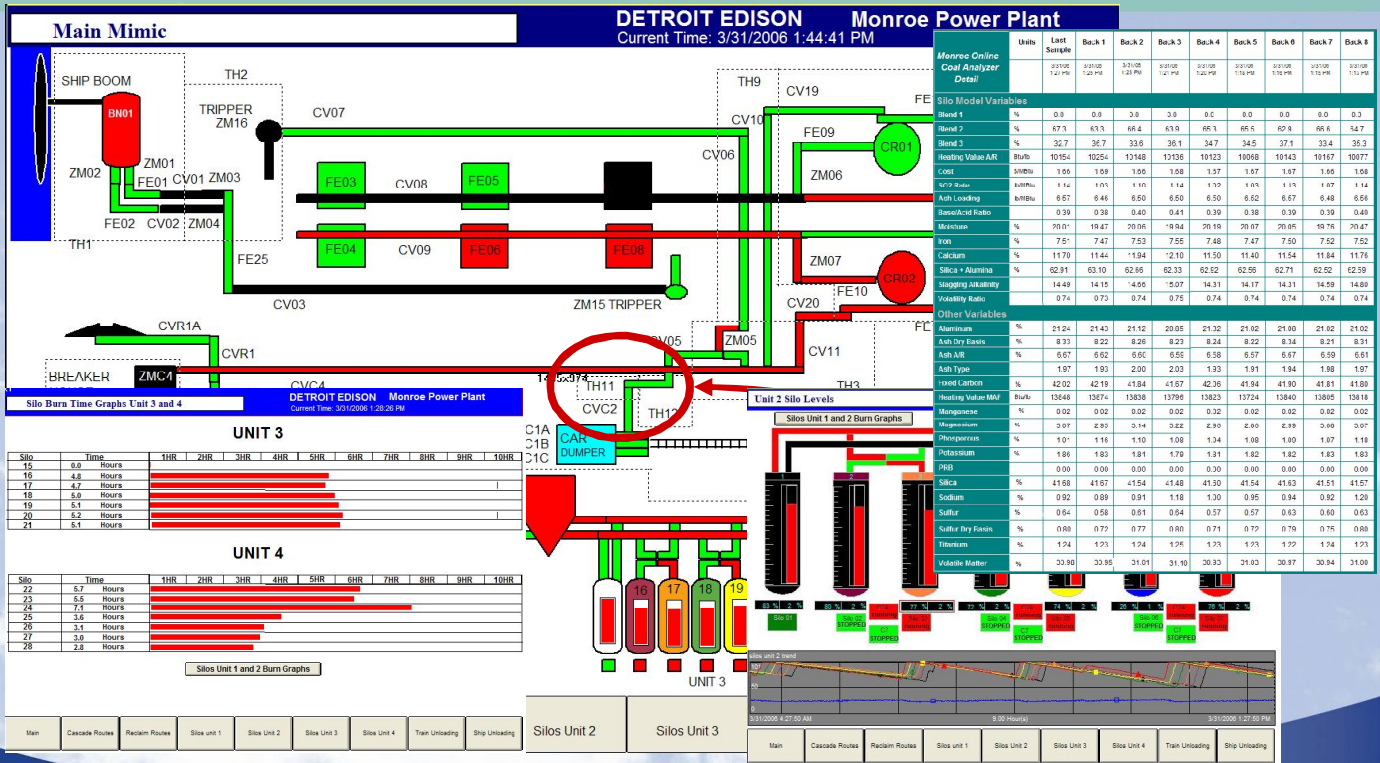
Thermal Performance Calculation Engine

**\$500,000
Annual Savings!**



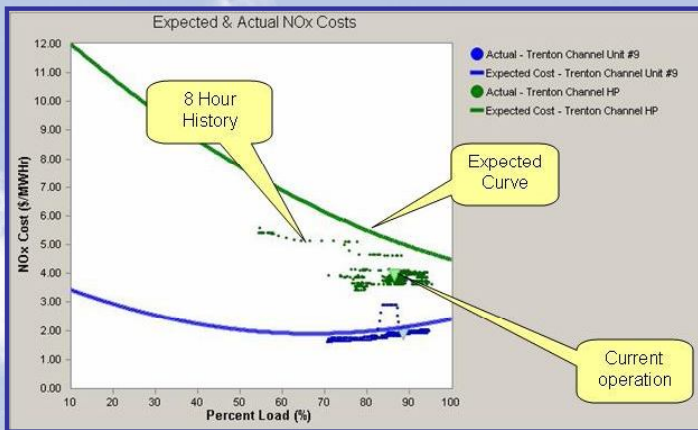
Digital Fuel Tracking System

\$1,200,000
Annual Savings!



NOx Emissions Strategy

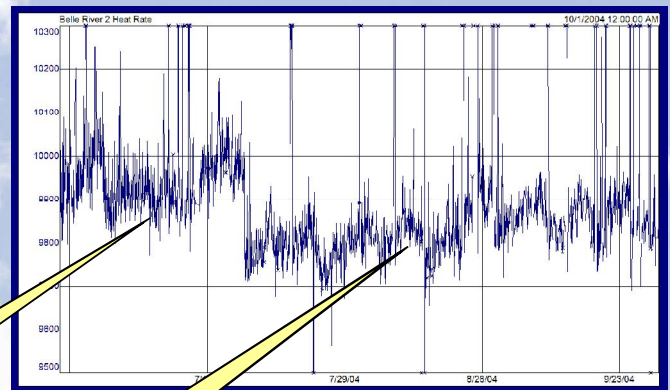
\$2,200,000
Annual Savings!



NOx Reduction with Improved Heatrate

Before Implementation

After Implementation



Primary focus is NOx reduction only

Focus on operating near NOx budget curve

OSIsoft

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VALUE NOW, VALUE OVER TIME

Energy Management System (EMS)

- The Plant Energy Management System is used to automatically control unit dispatch
- Implements data validation on all fields
- Performs several calculations based on PI data to determine validity of inputs.
- Transported to EMS Ranger via PI

Fossil Generation Unit Capacity Framework

Reports Data Entry Administration EMS Print About Quick Links

Plant Energy Management System - Monroe Unit 1

Last Refresh: 3/3/2006 2:27:23 PM Auto-Refresh Interval: 5 Minutes AGC Mode: LOCAL

Select Unit Change Data Send Now Limits & Error Checks

	Block 1	Block 2	Block 3	Block 4
Fuel Data				
Fuel Definition	Coal	Coal	Coal	#2 Oil
Max Available MW	600	0	0	0
Regulating Fuel	Yes	No	No	No
Realtime MWS	670.1719	0	0	0
Fuel Cost \$/MBTU	2.306458	2.306458	2.306458	14.04883
O + M Cost \$/MBTU	0.1099987	0.1099987	0.1099987	0.1099987
Emission Cost	0.6212921	0.6212921	0.6212921	0.1028996
Total Cost \$/MBTU	3.03772	3.03772	3.03772	14.26172
Total Cost \$/MW Hr	27.33936	27.33936	27.33936	128.3555
Other Data				
Dispatch Margin Up	9.828125	0	0	0
Dispatch Margin	Calc Failed	0	0	0
Aux Power	32.3125			
Dynamic Heat Rate	105.87			
Unit Status	DNE			
Fuel Cost	0			
Startup MBTU	0			
Fuel Price Calculator				
* Current Blend: LSS:100%				
Type of Coal / Blend % By Weight	LSS	100%		
Type of Coal / Blend % By Weight	LSW	0%		
Type of Coal / Blend % By Weight	LSW	0%		
Auto Update Fuel Prices	Calculate	Send		

Operating Limit Data

Total Capability: 680 TCAP
 Ten Minute Capability: 680 TMC
 Regulation High: 680 Reg High
 Net MW: 670.1719
 Regulation Low: 400 Reg Low
 Ramp Rate Up: 2 AGC MW/MIN
 Ramp Rate Down: 2 AGC MW/MIN
 Forbidden Zone 1 High: 0
 Forbidden Zone 1 Low: 0
 Forbidden Zone 2 High: 0
 Forbidden Zone 2 Low: 0
 Forbidden Zone 3 High: 0
 Forbidden Zone 3 Low: 0
 Forbidden Zone 4 High: 0
 Forbidden Zone 4 Low: 0

Quick Reference

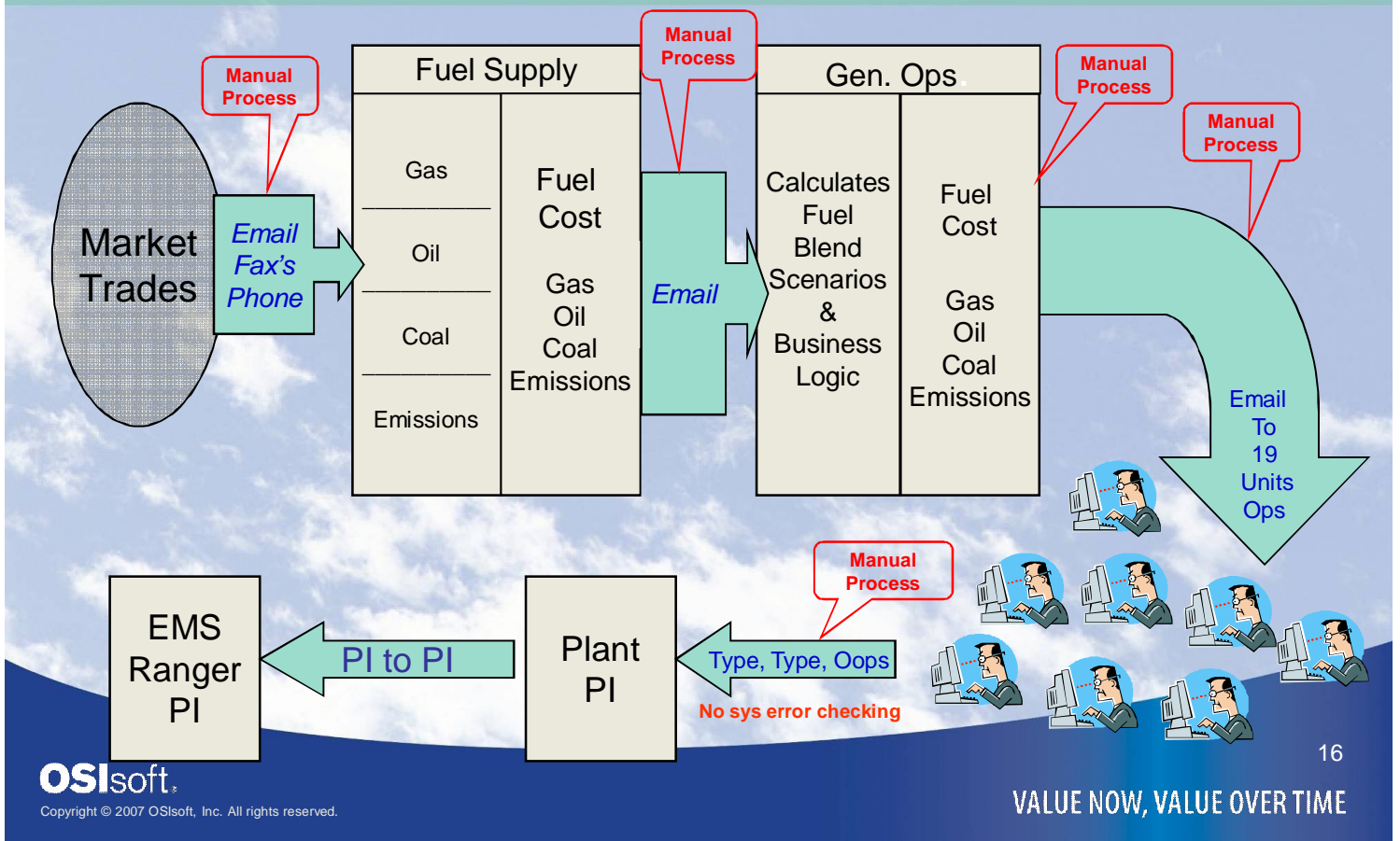
1. To edit data, click "Change Data".
2. Make necessary changes, then click "Send Now".

Select Unit Change Data Send Now Limits & Error Checks

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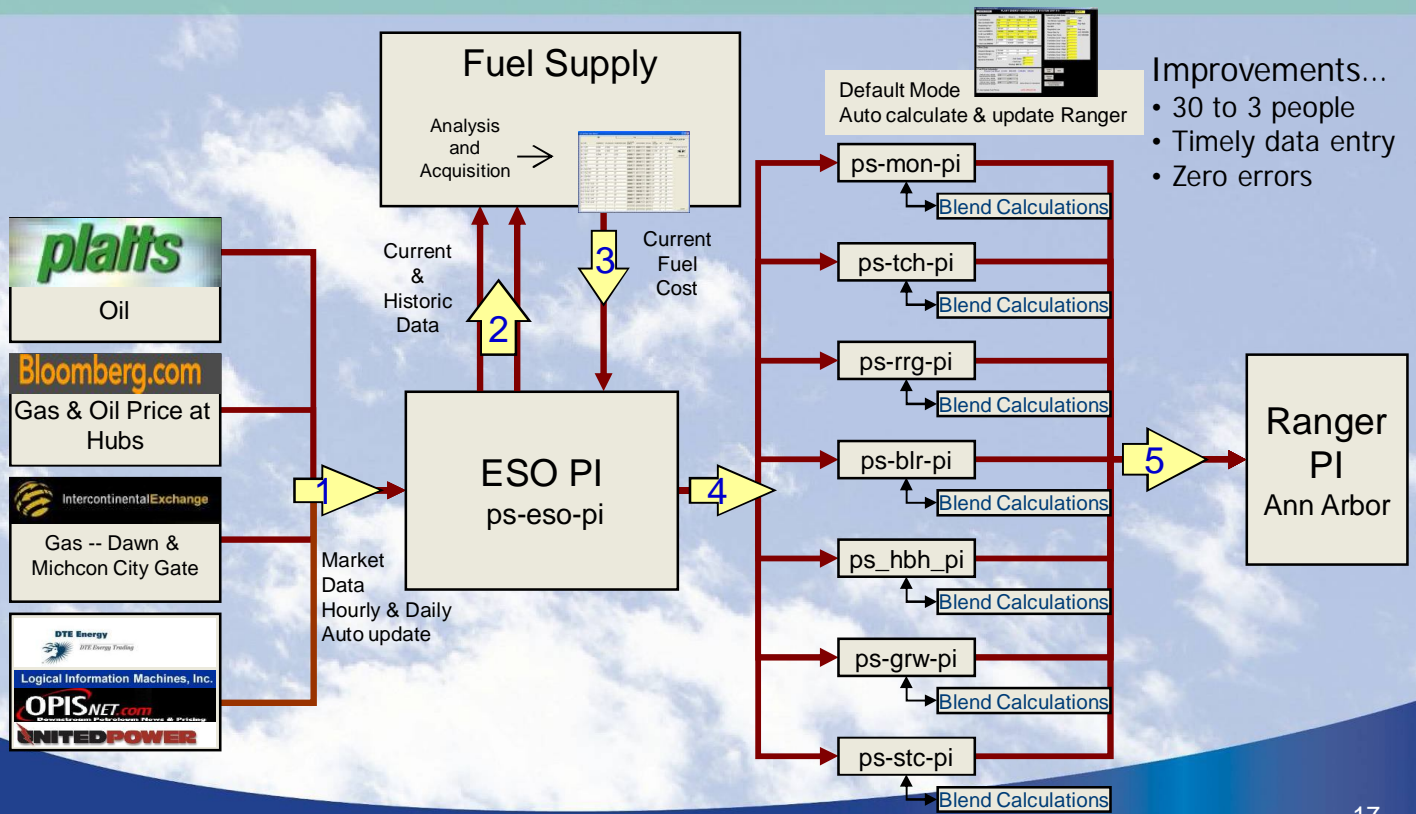
\$120,000 Savings!

Before Fuel Cost Framework



Fuel Cost Framework

\$530,000
Annual Savings!



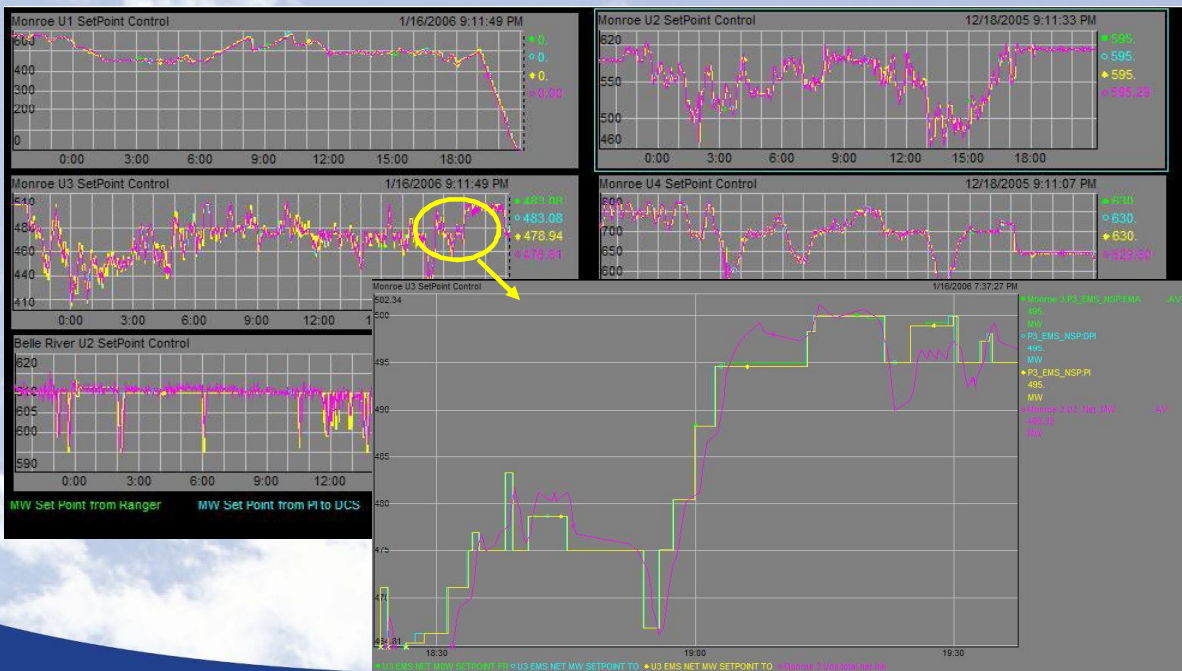
- Improvements...
- 30 to 3 people
 - Timely data entry
 - Zero errors

PI to PI (AGC)

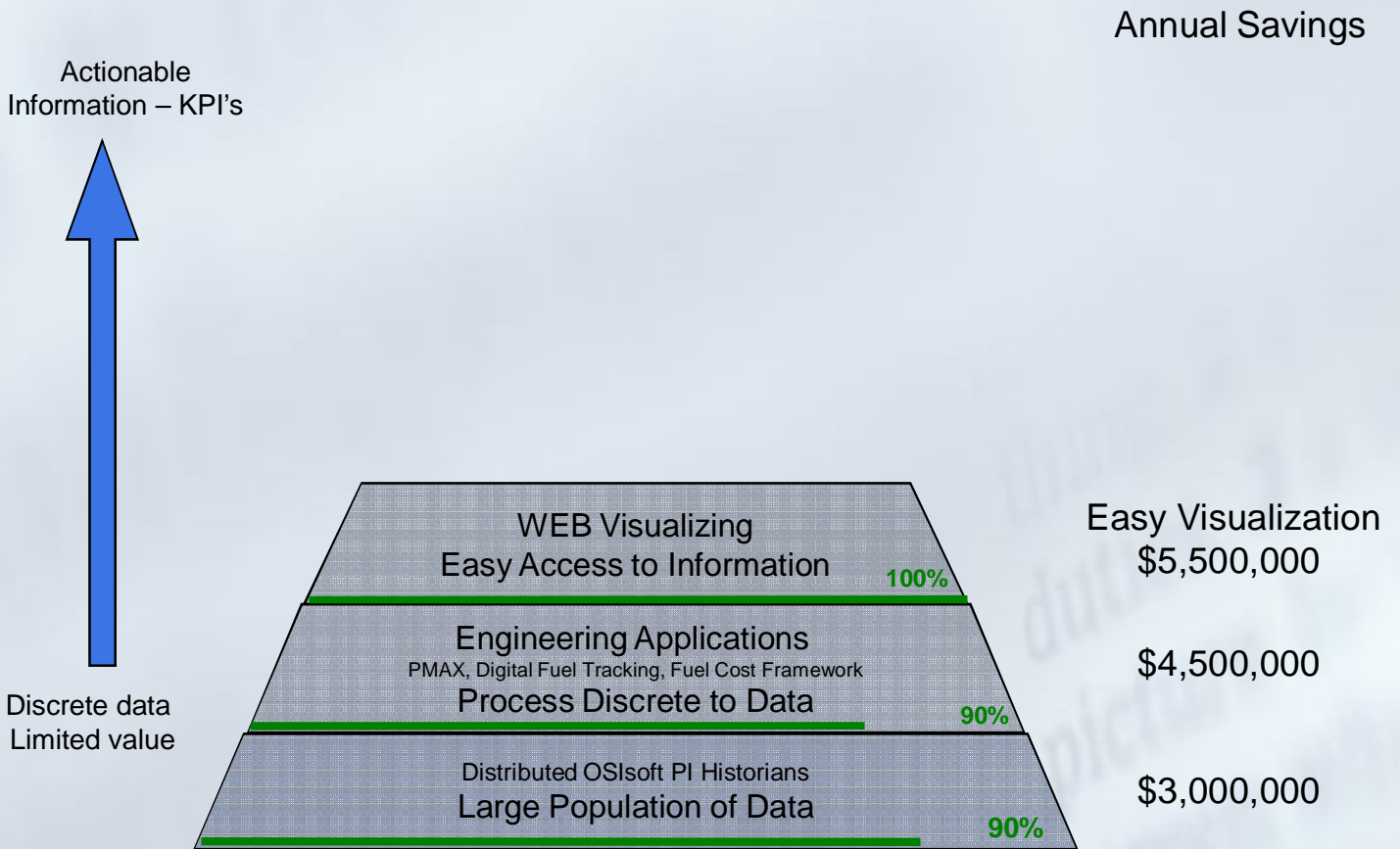
\$200,000 Savings!

AGC – Automatic Generation Control

5 largest Fossil units & Peaking Units are ramped through PI Set Point control



Technology Framework



Fleet Status – PI WEB enabled

Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Unit	Net MW	TMC	TCAP	Load Forecast		
BR 1	0	0	0	CC 15	66	95	95	HA 12-1	0	42	42	HE	Today	Tomorrow
BR 2	609	635	635	CC 16	53	125	125	HA 12-2	0	42	42	0100	6041	8250
FE 2	0	0	0					HB 11	0	4	4	0200	6015	7862
MON 1	645	730	730	BR 12-1	77	77	77	MON 11	0	14	14	0300	5691	7505
MON 2	745	755	760	BR 12-2	75	75	75	NE 11-1	0	17	17	0400	5967	7457
MON 3	753	760	760	BR 13	76	76	76	NE 11-2	0	16	16	0500	6212	7564
MON 4	753	753	753	DURY 11	0	67	67	NE 11-3	0	16	16	0600	6857	8010
RR 2	245	255	255	DURY 12	0	69	69	NE 11-4	0	16	16	0700	7250	8581
RR 3	273	275	275	GW 11-1	77	77	77	NE 12	0	21	21	0800	7893	9183
SC 1	105	105	135	GW 11-2	54	54	54	NE 13-1	0	21	21	0900	8893	10069
SC 2	112	112	156	GW 12	19	19	19	NE 13-2	0	21	21	1000	9573	10593
SC 3	125	135	150	BR 11										
SC 4	135	140	140	CC 11										
SC 6	255	255	280	CF 11										
SC 7	329	329	329	DA 11										
TC 7	94	105	105	FE 11-1										
TC 8	73	80	80	FE 11-2										
TC 9	460	500	500	FE 11-3										
GW 1	369	450	785	FE 11-4										
HB 1	84	84	84	HA 11-1										
LUD 1	0	0	0	HA 11-2										
LUD 2	0	0	0	HA 11-3										
LUD 3	0	0	0	HA 11-4										
LUD 4	-319	0	319											
LUD 5	0	0	0											
LUD 6	-322	0	322											

Plant Generation	6281
Ludington Generation	0
Peaker Generation	378
Misc. Generation	85
Total Generation	6745
Total Load	7978
Steel Load	289

Ludington DE EE 7293
Transactions
Firm Purchase
Non-Firm Purchase
Firm Sale
Non-Firm Sale
Service Area Load
Retail Schedule

		COAL MILLS							FD	PA	FANS			ID	Cond	HE	FW PUMPS			BF	Circ	VP	HDP	GB											
M	1	1	2	3	4	5	6	7	N	S	N	S	SW	NW	NE	SE	N	C	S	N	S	N	S	N	S										
O	2	1	2	3	4	5	6	7	N	S	N	S	N	S	N	S	N	C	S	N	S	N	S	N	S										
N	3	1	2	3	4	5	6	7	N	S	N	S	SW	NW	NE	SE	N	C	S	N	S	N	S	N	S										
	4	1	2	3	4	5	6	7	N	S	N	S	SW	NW	NE	SE	N	C	S	N	S	N	S	N	S										
B	1	BF	PA	RE	WH	GR	BL	DR	E	W	E	W	1	2	3	3	E	C	W	E	W	E	W	N	C	S	NE	SE	NW	SW	E	C	W		
R	2	BF	PA	RE	WH	GR	BL	DR	E	W	E	W	1	2	3	3	E	C	W	E	W	E	W	N	C	S	NE	SE	NW	SW	E	C	W		
S	1	1	2	3	4	5																													
	2	1	2	3	4	5																													
T	4	1	2	3	4	5																													
C	6	1	2	3	4	5	6	7	8	N	S	N	S	N	S	N	S	N	C	S	N	S	N	S	N	S	N	C	S	N	S	N	S	N	S
R	7	A	B	C	D	E	F																												
R	2	1	2	3	4	5	6	7	8	E	W	E	W	E	W	E	W	E	C	W	E	C	W	E	C	W	E	C	W	E	C	W	E	C	W
R	3	1	2	3	4	5	6																												
OW																																			
T	16	A	B	C																															
C	17	A	B	C																															
H	18	A	B	C																															
	19	A	B	C	D	E	F																												
	9	A	B	C	D	E	F																												

Real-Time DCS Operator Displays

6000 real time dynamic actively linked WEB DCS graphics

MTG OVERVIEW

MWV STM PR	BLR	3625	TUR	3520	IND	3471	#	DISP				
1ST STAGE PR		2772	PSIG				#1	TR SH RACK LVL	△	0 IN	MW GROSS	796
N MAIN STEAM		996						SCREEN LVL	△	-0 IN	MW NET	763
S MAIN STEAM		996					#2	TR SH RACK LVL	△	1 IN	MW DEMAND %	94
HOT REHEAT PR		694	PSIG					SCREEN LVL	△	4 IN	MW GEN %	94
N HOT REHEAT		1012	F				#4	TR SH RACK LVL	△	-6 IN	MVAR S	208
S HOT REHEAT		1013	F					SCREEN LVL	△	-3 IN	GEN VOLT	121.7
COLD REHEAT PR		734	PSIG							BUS VOLT	121.6	
N COLD REHEAT		596	F							H2 PR	68	
S COLD REHEAT		594	F									

3D Schematic: GMW 796, RPM 3597

BEARING OIL PR	15	#		SEAL STEAM PR	5.5		STATOR CLG FLOW	352.7
BRG OIL CLR IN	152	F		S/S EXHAUST VAC	14.1		E STR CLG PMP	
BRG OIL CLR OUT	118	F		N S/S EXHAUSTER		N PWR	W STR CLG PMP	
OIL CLR CTRL VLV	40	%	AUTO	S S/S EXHAUSTER		N PWR	GEN BUS CLG FAN N	
TG OIL PMP			AUTO	CONDENSER VAC	27.22	INHG	GEN BUS CLG FAN S	
EMRG OIL PMP			AUTO	N MAIN UNIT VAC PMP		N PWR	1 TRAVELNG SCREEN	
SEAL OIL P	13.07			S S/S EXHAUSTER		N PWR	2 TRAVELNG SCREEN	
AR SIDE TEMP	110	F		N MAIN UNIT VAC PMP		N PWR	3 TRAVELNG SCREEN	
H2 SIDE TEMP	110	F		S MAIN UNIT VAC PMP		N PWR	4 TRAVELNG SCREEN	
H2 S/O PMP			N PWR	INLET WTR BOX TEMP		EAST WEST	HYD FLUID PR	
S/O BKUP PMP			N PWR	OUTLET WTR BOX TEMP		75 75	N DEH PMP	
AR SIDE S/O PMP			N PWR	MTG HOTWELL TEMP		95 96	S DEH PMP	
N BRG SEAL VAP EXT			N PWR	N MAIN UNIT CIRC PMP		N PWR		
S BRG SEAL VAP EXT			N PWR	C MAIN UNIT CIRC PMP		N PWR		
			N PWR	S MAIN UNIT CIRC PMP		N PWR		

Trend Graph: Shows multiple data series over time, with a red circle highlighting a peak in the data.

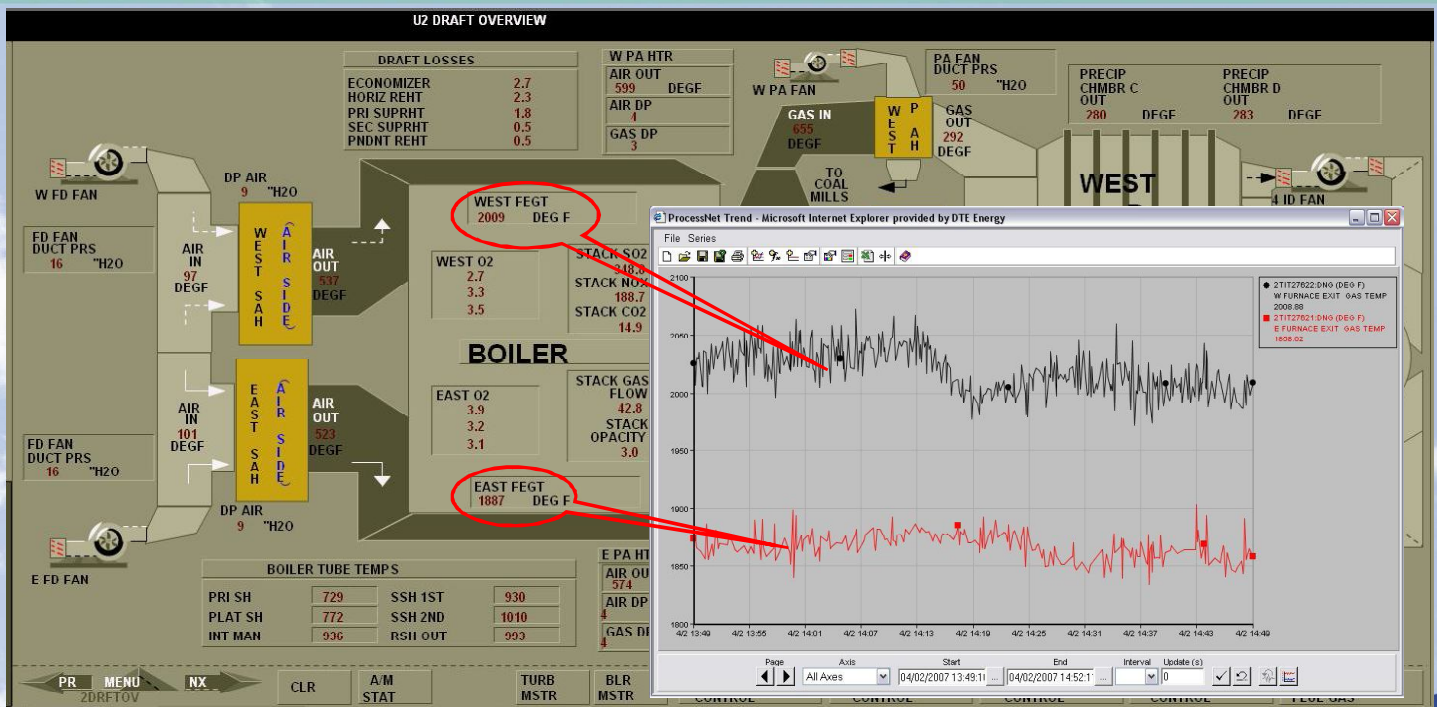
Buttons: ESC, A/M STATUS, MTGOIL CTRL, EHC-H2 CTRL, MTGDNR CTRL, MTG CTRL, MTG SU CTRL, MTG TEST

Footer: Next Page, Detroit Edison, UNIT 2



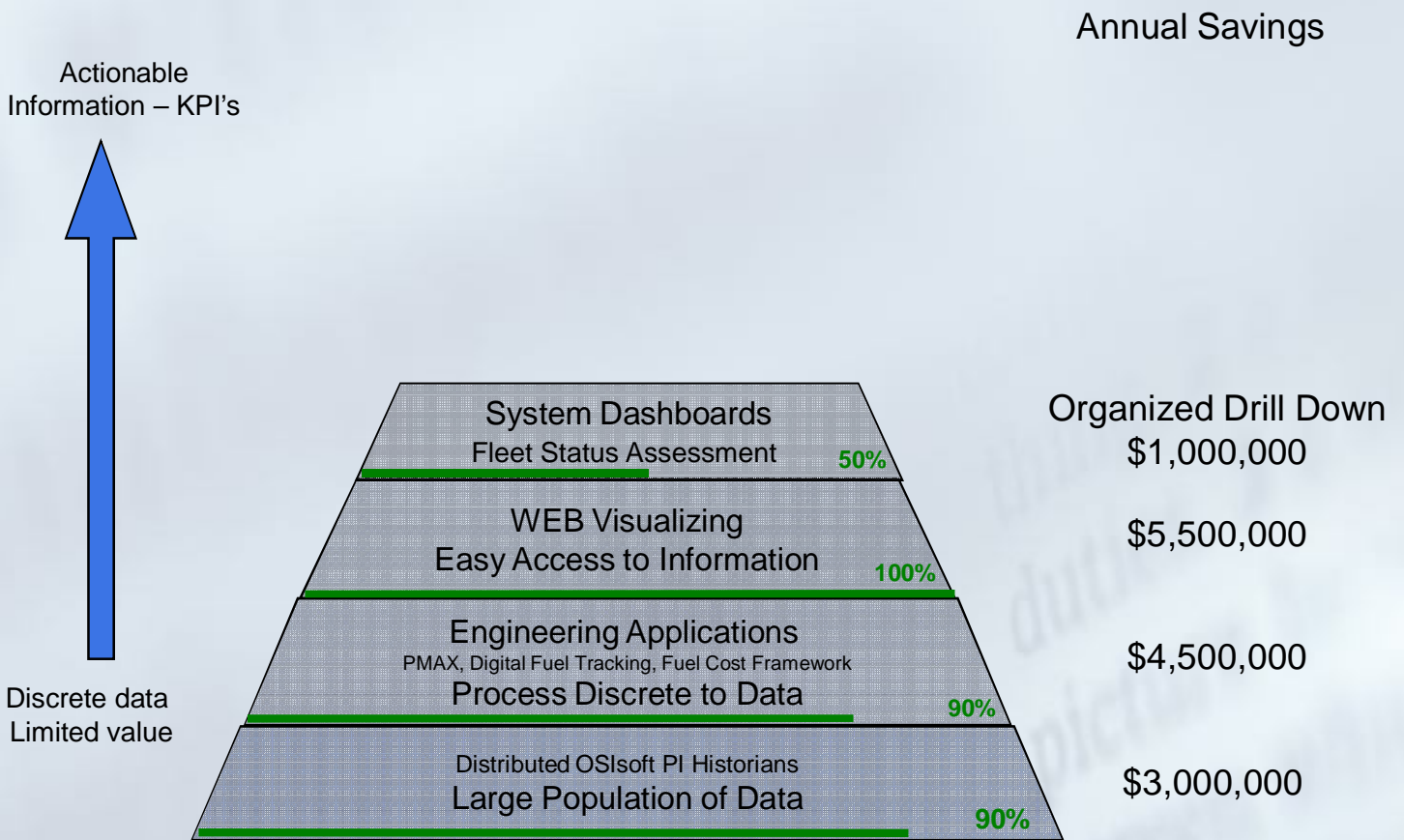
Click & Trend

PI enabled - Event Re-play



Re-play events using historical PI data

Technology Framework



System Dashboards – PI Enabled

2000 real time dynamic actively linked WEB System graphics

Coal Mill Status
Click & Drill

Monroe

Units	Coal Mills						
Monroe Unit 1	1	2	3	4	5	6	7
Monroe Unit 2	1	2	3	4	5	6	7

Belle River

Units	Coal Mills							
Belle River Unit 1	PK	PL	YE	RE	WH	GR	BL	OR
Belle River Unit 2	PK	PL	YE	RE	WH	GR	BL	OR

St. Clair

Units	Coal Mills							
St. Clair Unit 1	1	2	3	4	5			
St. Clair Unit 2	1	2	3	4	5			
St. Clair Unit 3	1	2	3	4	5			
St. Clair Unit 4	1	2	3	4	5			
St. Clair Unit 6	1	2	3	4	5	6	7	8
St. Clair Unit 7	A	B	C	D	E	F		

ST. CLAIR UNIT 1: COAL MILL 1

ST. CLAIR UNIT 1	
MILL 1	
Mill Vibration	5.85 MLS
PA Fan Vibration	0.50 MILS
PA Fan Temperature	137.6 DEGF
PA Fan Motor Amps	38.2 AMPS
Coal Mill Feeder Speed	1043.1 RPM
Coal Mill Primary Air Differential	2.44 IN H2O
Coal Mill Primary Air Damper Position	41.9 %
Coal Mill Hot Air Damper Position	60.6 %
Coal Mill Differential Pressure	12.54 IN H2O
Coal Mill Outlet Temperature	140.2 DEGF
Coal Mill PA Inlet Temperature	516.3 DEGF
Coal Mill Oil Temperature	24.9 PSIG
Coal Mill Oil Pressure	100.6 DEGF
Coal Mill Primary Air Flow Percent	86.0 %
Coal Mill Lead	13.7 TN/HR
Coal Mill Running Time	44.41 HRS
Unit Lead Not MW	69.82 MW

Harbor Beach

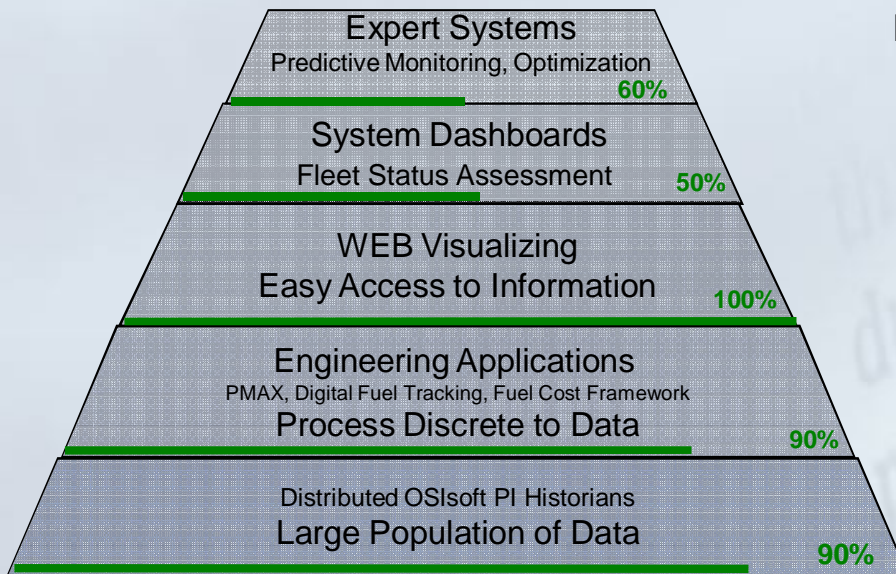
Units	Coal Mills	
Harbor Beach	1	2

Technology Framework

Actionable
Information – KPI's



Discrete data
Limited value



Annual Savings

Predictive – Optimize
\$8,000,000

\$1,000,000

\$5,500,000

\$4,500,000

\$3,000,000

Expert Systems

- Equipment & Process Monitoring

- ▶ Fleet wide implementation 2006
- ▶ A Primary Performance Center Application

\$7,769,680
Annual Savings!

- Combustion Optimization – NeuCo

- ▶ Startup on St Clair Unit 7
- ▶ Installation in progress on Belle River 2
- ▶ Planned for Monroe Units 1-4

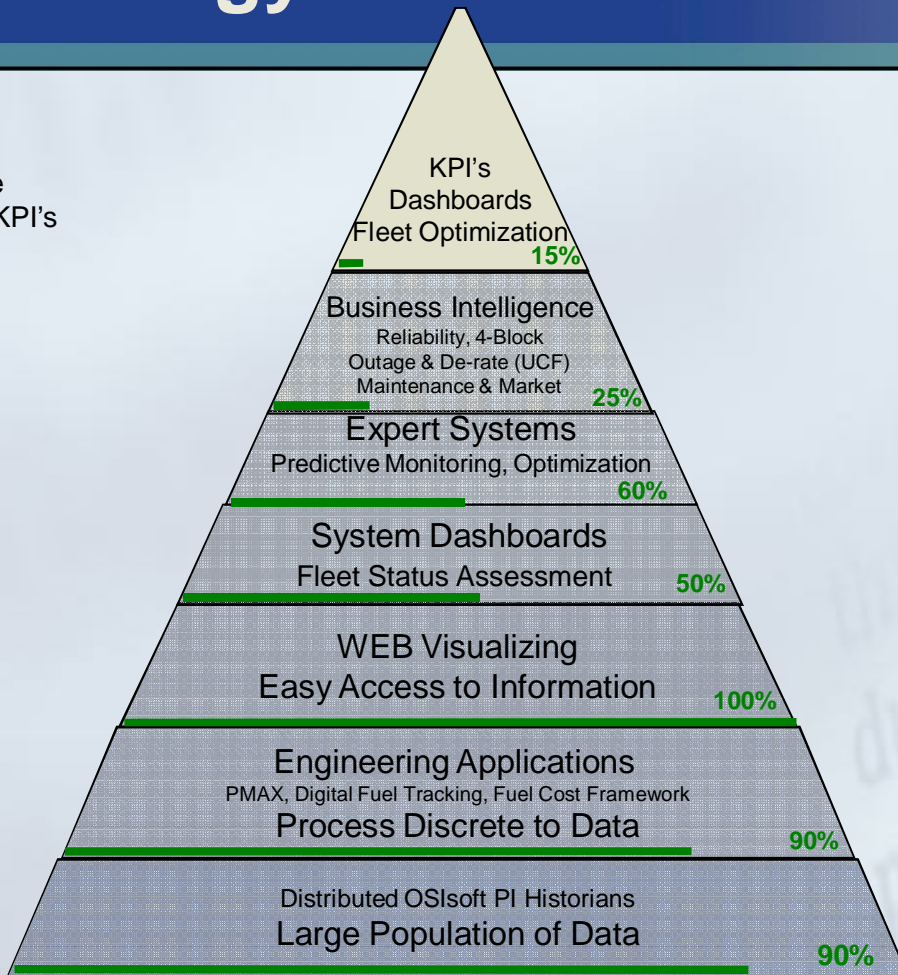
\$330,000/unit
Annual Savings!

Technology Framework

Actionable
Information – KPI's



Discrete data
Limited value



Annual Savings

Fleet Optimization
\$20,000,000
(Projected Savings)

\$11,000,000

\$1,000,000

\$5,500,000

\$4,500,000

\$3,000,000

Unit Capacity Framework (UCF)

Process Flow

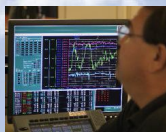
Day Ahead

Real Time

Power Plants



Performance Center



Merchant Center

Market



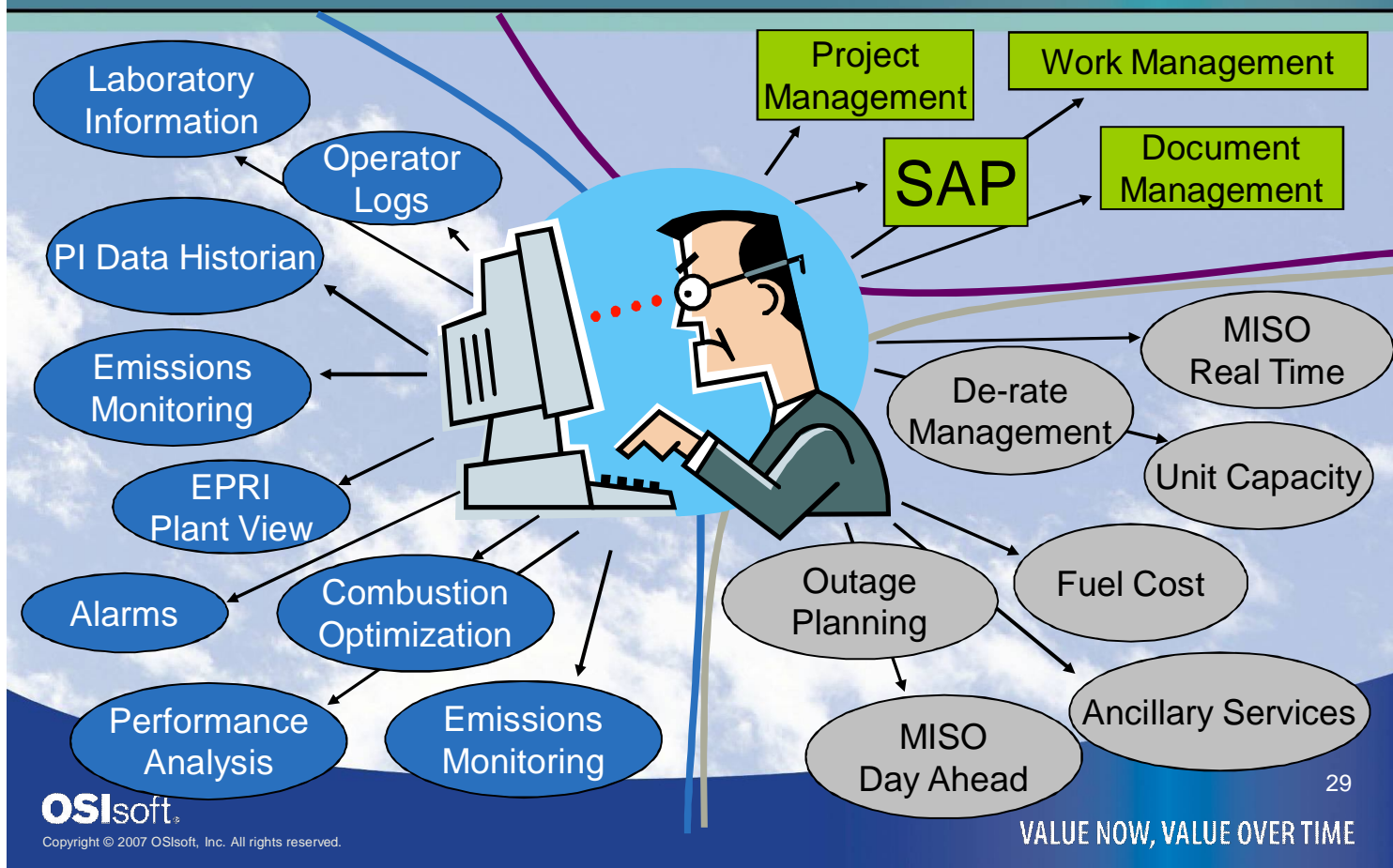
Market Strategy

Market Feedback

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No Shortage of Information!

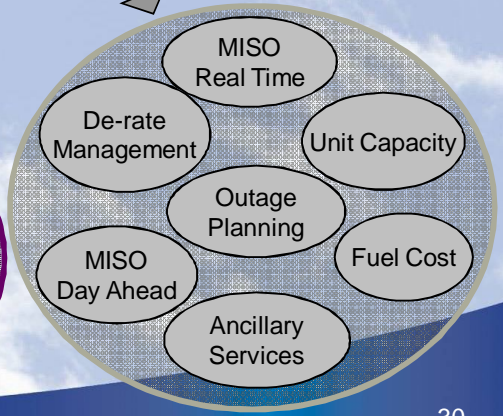
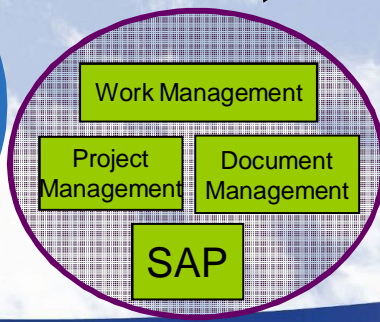
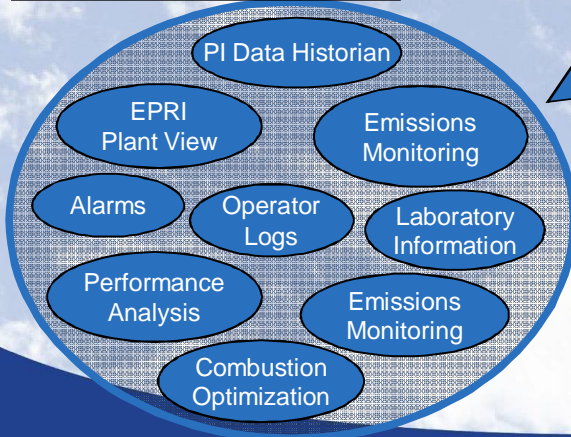


Analysis Framework



Standard GUI
Single Method

Analysis Framework:
Integrated applications environment:
Consistent framework for data,
analysis, reporting and consistent
user graphical interface.



Process Cost Drill Down

MONROE

MONROE UNIT 4

ALL PLANTS

MONROE POWER PLANT

MONROE	UNIT 4	Coal Mill	MIL1	MIL2	MIL3	MIL4	MIL5	MIL6	MIL7
EAF		Status	●	●	●	●	●	●	●
Year To Date	80.14	Year To Date	100.00	100.00	99.93	99.79	100.00	100.00	100.00
Previous Week	100.00	Previous Week	100.00	100.00	100.00	100.00	100.00	100.00	100.00
PROD COST (Inst) \$/MWh		Milling Cost \$/TON							
Current Date	21.21	Year To Date	1.87	1.82	1.75	1.343			
Fuel Cost	18.16	Power Cons Cost	0.21	0.22	0.22	0.20			
Emission Cost	3.05	Operation Cost	0.10	0.12	0.13	0.14			
Previous Week	22.22	Maintenance Cost	1.55	1.48	1.40	13.09			
Fuel Cost	18.92	Previous Week	0.78	0.30	0.29	0.26			
Emission Cost	3.30	Power Cons Cost	0.21	0.22	0.22	0.20			
PROD COST \$/MWh		Operation Cost	0.07	0.07	0.07	0.07			
Year To Date	19.85	Maintenance Cost	0.00	0.00	0.00	0.00			
Fuel Cost	17.73	SS Count							
Operation Cost	1.45	Year To Date	0	3	0	0			
Maintenance Cost	0.68	Previous Week	0	0	0	0			
MILLING COST \$/TON		PG Count							
Year To Date	4.87	Year To Date	6	2	0	6			
Power Cons Cost	0.11	Previous Week	0	0	0	0			
Operation Cost	3.28	HEAT RATE BTU/100KWh							
Maintenance Cost	1.48	Current Date	10732	10687	10614	10669	10732		
Previous Week		Previous Week	10732	10687	10614	10669	10732		
HEAT RATE BTU/100KWh		<div style="display: flex; justify-content: space-around; align-items: center;"> ● = RUNNING ● = NOT RUNNING ● = NOT INSTRUMENTED </div>							

Unit Summary

MONROE	UNIT 1	UNIT 2	UNIT 3	UNIT 4
Year To Date	96.77	76.76	0.00	80.14
Previous Week	98.96	40.46	0.00	100.00

ProcessGuard Alarms (Last 10)

dt_start	dt_end	plant	unit	signature	description	groups	primary display
1/29/2007 10:38:51 AM	Open	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR FRONT BEARING TEMP	14	AMBCTL
1/29/2007 10:37:59 AM	01/29/2007 10:38:01	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR FRONT BEARING TEMP	14	AMBCTL
1/29/2007 10:37:53 AM	01/29/2007 10:37:58	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR FRONT BEARING TEMP	14	AMBCTL
1/29/2007 10:37:46 AM	01/29/2007 10:37:46	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR FRONT BEARING TEMP	14	AMBCTL
1/29/2007 10:37:36 AM	01/29/2007 10:37:36	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR FRONT BEARING TEMP	14	AMBCTL
1/29/2007 10:37:34 AM	01/29/2007 10:37:34	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR FRONT BEARING TEMP	14	AMBCTL
1/29/2007 10:37:31 AM	01/29/2007 10:37:31	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR FRONT BEARING TEMP	14	AMBCTL
1/29/2007 10:29:41 AM	01/29/2007 10:29:41	BOHPP	HL_DCS	CM-INTFRFG-TC	CM 6 MOTOR REAR BEARING TEMP	14	AMBCTL

SmartSignal Watch Items (Last 10)

Signal	Alert	Unit	Time	P ID	Unit	
MIL2 - MOTOR 8 FPG TEMP & CURRENT	BOHPP 4 PULVERIZER	UCM-INTFRFG-TC	CM 2 MOTOR REAR BEARING TLOW	17.0	3/23/2007 1:42:31 PM	4/5/2007 1:23:18 PM
MIL1 - MOTOR 8 FPG TEMP & CURRENT	BOHPP 4 PULVERIZER	UCM-INTFRFG-TC	CM 1 PULV MOTOR AMP HIGH	6	4/5/2007 9:53:17 AM	4/5/2007 11:03:16 AM
MIL7 - MOTOR 8 FPG TEMP & CURRENT	BOHPP 4 PULVERIZER	UCM-INTFRFG-TC	CM 7 MOTOR BOX THRUSET FPG TLOW	16	4/5/2007 1:03:16 AM	4/5/2007 4:53:14 AM
MIL2 - MOTOR 8 FPG TEMP & CURRENT	BOHPP 4 PULVERIZER	UCM-INTFRFG-TC	CM 2 MOTOR WINDING TEMP HIGH	4	4/5/2007 11:03:38 PM	4/4/2007 12:43:37 AM
MIL2 - MOTOR 8 FPG TEMP & CURRENT	BOHPP 4 PULVERIZER	UCM-INTFRFG-TC	CM 2 MOTOR WINDING TEMP HIGH	4	4/5/2007 11:03:38 PM	4/4/2007 12:43:37 AM

Expanded System Dashboard

MONROE UNIT 4

MONROE Unit 4: COAL MILL 5

Net Megawatts
721.1

Monroe Unit 4

Mill 5	
Coal Mill Running Hours	176964.50 HRS
Coal Mill Outlet Temperature	144.23
Coal Mill P A Differential Pressure	-1.14
Motor Front BRG Temperature	157.1
Motor Rear BRG Temperature	134.2
Motor Winding Temperature	149.3
Coal Mill Pulverizer Motor	92.9
HA Damper Position	-255.0
TA Damper Position	0.30
PA Damper Position	51.94
P A Flow	84.51
Over Box Thrust BRG Temperature	121.1
Coal Mill Fuel Flow	1010.91
Coal Mill Feeder Speed	1010.91
North P A Fan Inlet Damper Position	-255.0
South P A Fan Inlet Damper Position	100.7

MOISTURE 18.39
COAL BLENDS 6.66
LOW SULPHUR SOUTHERN 57.73
LOW SULPHUR WESTERN 42.27
FUEL FLOW 101.09
FDR BIAS -40
FDR SPD 1010.91
FDR SEAL AIR VALVE OPEN
HA DMPR POS -255.0
N HOT PA DUCT TEMP 544.7
S HOT PA DUCT TEMP 549.3
N WINDBOX TO PA DIFF PRESS 35.33
S WINDBOX TO PA DIFF PRESS 35.17
DIFF PRESS -1.14
PABIAS 6.0
P A DAMPR POS 51.94
AUTO
P A FLOW 84.51
PA DMPR POS 51.94
MTR WINDING TEMP H1 149.3
MTR WINDING TEMP H2 148.5
MTR FRONT BRG TEMP 134.2
MTR REAR BRG TEMP 134.2
OBX THRUST BRG TEMP 121.1
INERTING STM PRESSURE 97.9
INERTING STM TEMPERATURE 281.9

EAF

Year To Date	
Year To Date	100.00
Previous Week	100.00

Milling Cost \$/TON

Year To Date	
Year To Date	1.14
Power Cons Cost	0.25
Operation Cost	0.42
Maintenance Cost	0.78

Previous Week

Power Cons Cost	0.25
Operation Cost	0.16
Maintenance Cost	0.80

SS Count

SS Count	
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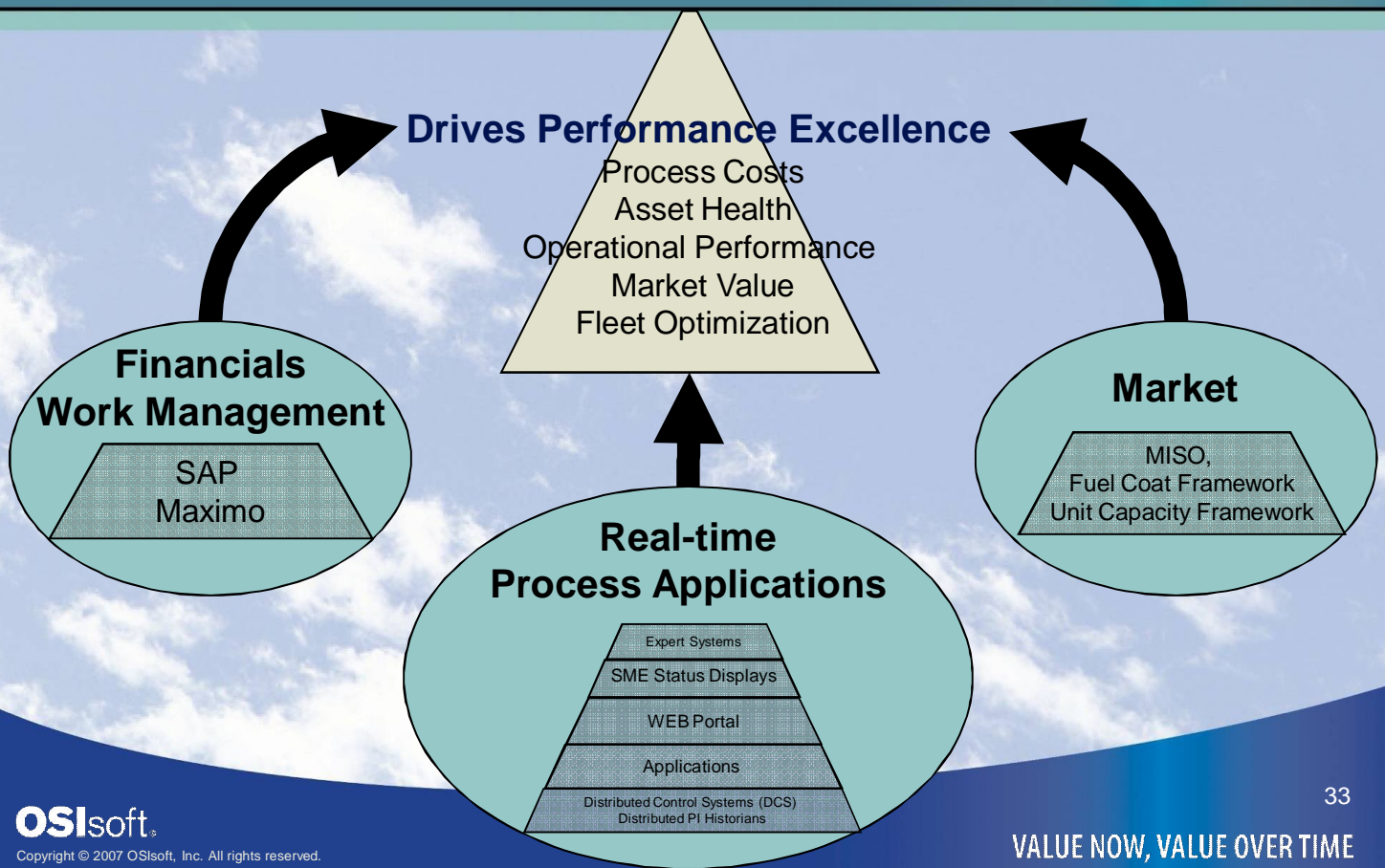
SmartSignal Watch Items (Last 10)

Group	Asset	Rule	Total	Reset	Last
No records					

ProcessGuard Alarms (Last 10)

Alarm	Start	End	Plant	Unit	Tagname	Description	GroupID	Priority/Status
1/18/2007 8:20:50 AM	Open		MONPP	u4_DCS	CM5 FIBER TRIP	CM5 FIBER TRIPPED	13	4CM5CTL
1/18/2007 8:20:23 AM	Open		MONPP	u4_DCS	CM5 FIBER TRIP	CM5 FIBER TRIPPED	13	4CM5CTL
1/18/2006 11:03:40 PM	Open		MONPP	u4_DCS	CM5 FIBER TRIP	CM5 FIBER TRIPPED	13	4CM5CTL
1/18/2006 11:03:40 PM	Open		MONPP	u4_DCS	CM5 FIBER TRIP	CM5 FIBER TRIPPED	13	4CM5CTL
1/20/2006 9:48:50 PM	Open		MONPP	u4_DCS	CM5 MTR WINDING TEMP	CM5 MOTOR WINDING TEMP	13	4CM1-70V
1/20/2006 9:48:36 PM	Open		MONPP	u4_DCS	CM5 MTR WINDING TEMP	CM5 MOTOR WINDING TEMP	13	4CM1-70V

Total Fleet Management





The Value of Real time

Pertamina Downstream

Assets

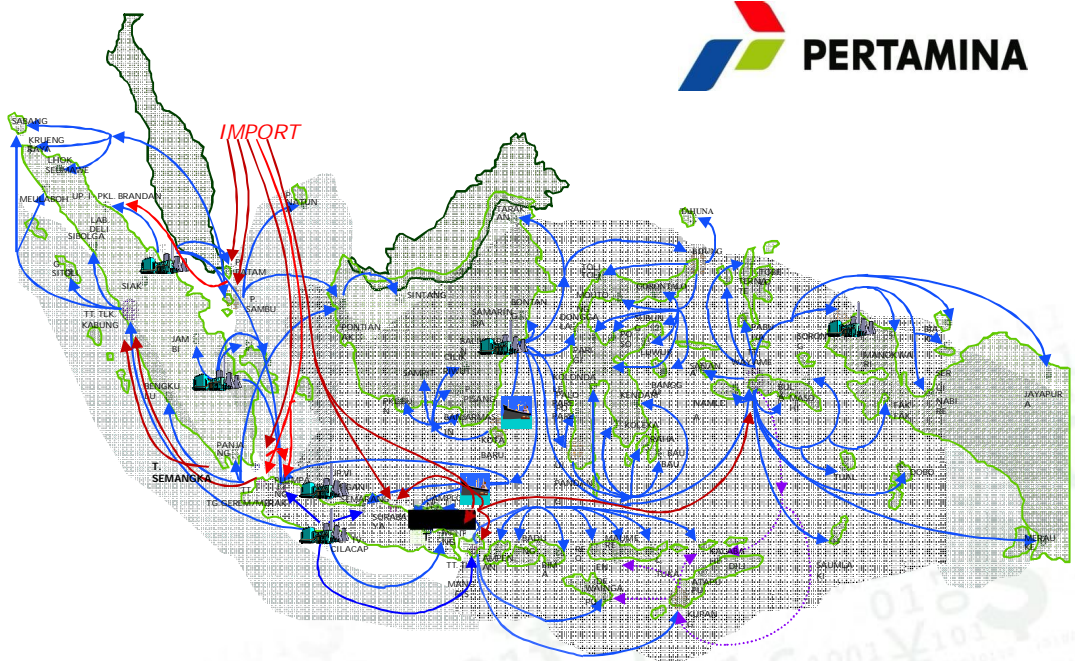
6 Refineries :
1,034 Million bbl/day

120 + Depots

98 Vessels

3,400 Fuel Stations

Sales Volume :
1,200 Million bbl/day
(92 % Market Share)



One of the most complex Downstream Supply Chains in the world

CHALLENGE / PROBLEM DETAILS (early 2007)

Process, People, Structure

- Business process based on functional units, planning based on functional target, no one is accountable for downstream margin.
- “Legacy” structure, rigid interfaces between Refining & Marketing, creating silos within the organization.
- No single point of coordination for Supply operations.

Systems

- Lack of integrated system for planning optimization and scheduling
- No coherent single view of downstream timely operational data
- Unable to track Plan vs Actual

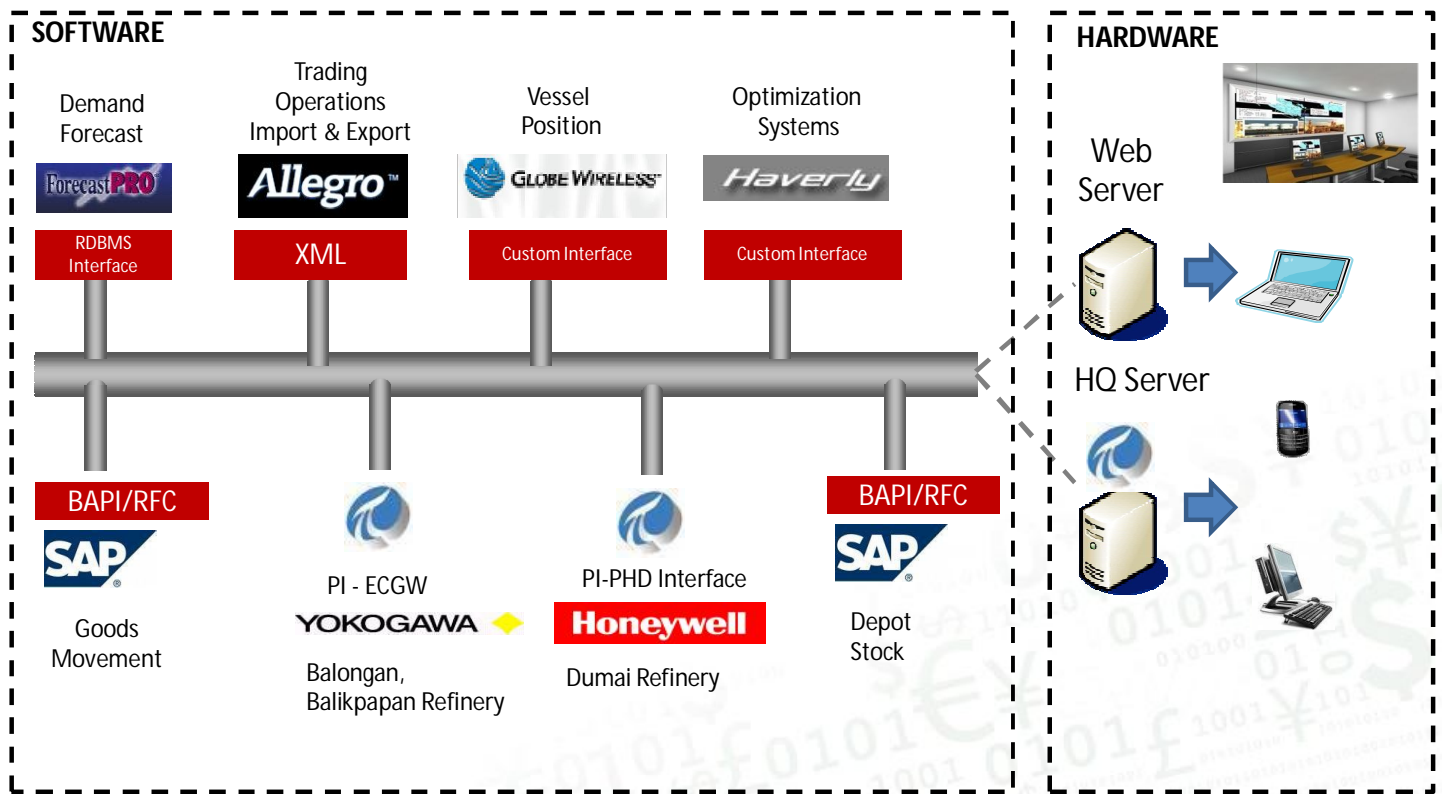


Integrated Downstream Dashboard

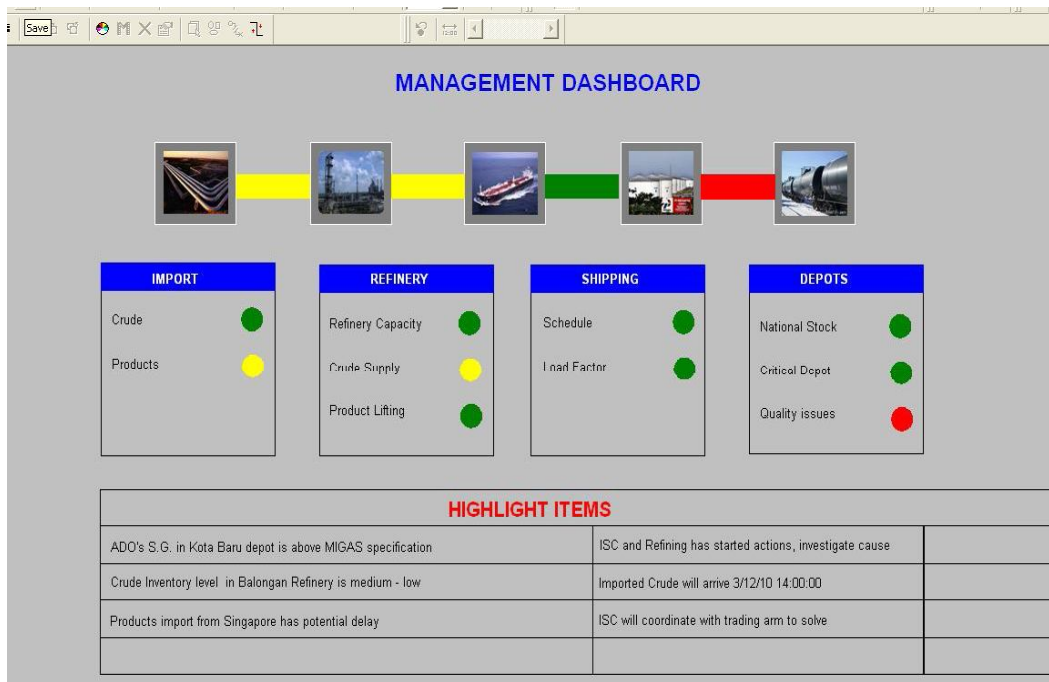
Objectives :

- Consistent single view of entire downstream supply chain
- Integrated real time data from Crude Purchases to Secondary Distribution
- Decision making support (normal operations, supply chain disruptions)

Integration Architecture



Main Dashboard Display



Objective

- Management view of Entire Supply Chain

Features

- Easy to understand "traffic lights"
- Highlighted items
- Drill down capabilities

Crude and Product Imports

PI ProcessBook - [ImportMonitoring]

File Edit View Insert Tools Draw Arrange Window Help

100%

IMPORT SCHEDULE MONITORING

CRUDE IMPORT				PLAN		ACTUAL		DESTINATION	STOCK LEVEL
STATUS	VESSEL NAME	VOLUME (MBBLS)	GRADE	ALD	ADD	ALD	ADD		
Green	VALIANT1	600,000	LIGHT	10/3	12/3	10/3		CILACAP	Green
Yellow	VALIANT2	1,200,000	MEDIUM	11/3	13/3	12/3		BALIKPAPAN	Yellow
Green								BALONGAN	Green
Green									Green

PRODUCT IMPORT				PLAN		ACTUAL		DESTINATION	STOCK LEVEL
STATUS	VESSEL NAME	VOLUME (MBBLS)	GRADE	ALD	ADD	ALD	ADD		
Red	SUNFLOWER	200,000	MOGAS	10/3	12/3	10/3	14/3	MEDAN	Yellow
Green	VIAYANTI	185,000	MOGAS	11/3	13/3	12/3	13/3	JAKARTA	Green
Green	GANDARI	300,000	ADO	10/3	12/3	10/3		KOTA BARU	Green
Yellow	PROVIDENCE	200,000	MOGAS	11/3	13/3	12/3		T.UBAN	Yellow

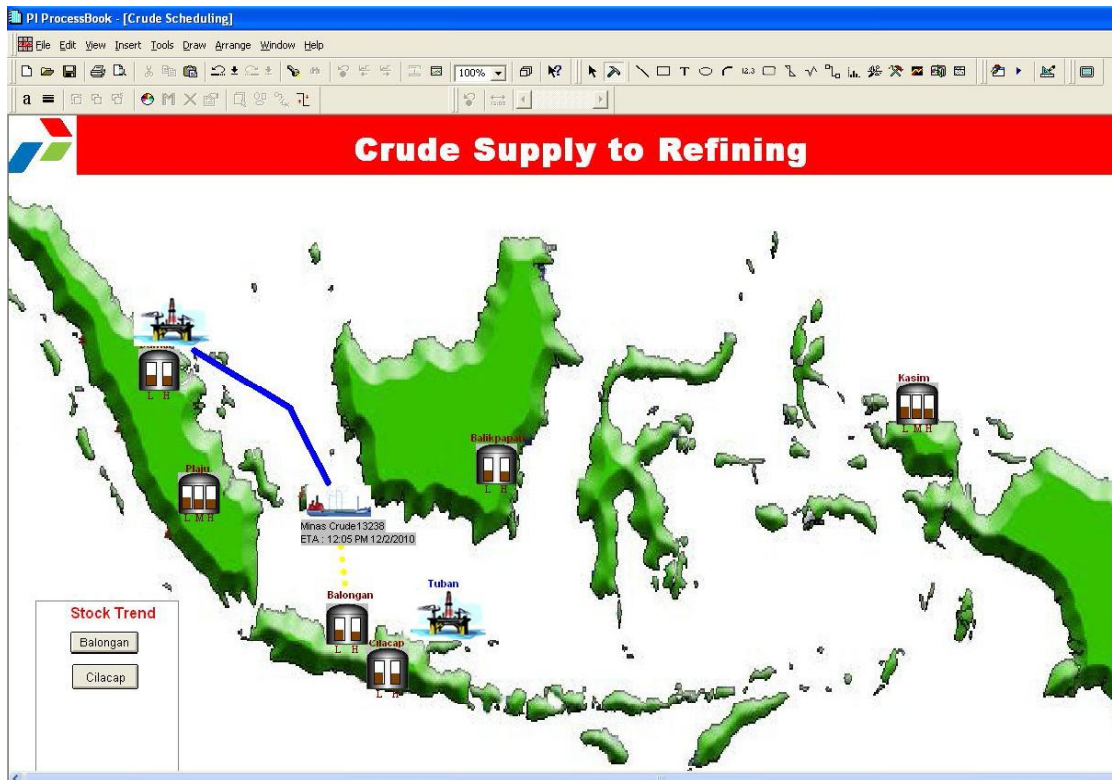
Objective

- Track Crude & Products Imports Schedule

Features

- Tracks ETA of incoming shipments
- Tankage and Jetty Availability
- Summary of committed and pending cargoes

Crude Supply to Refinery



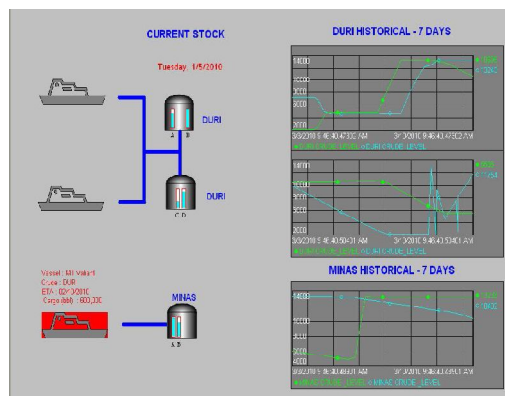
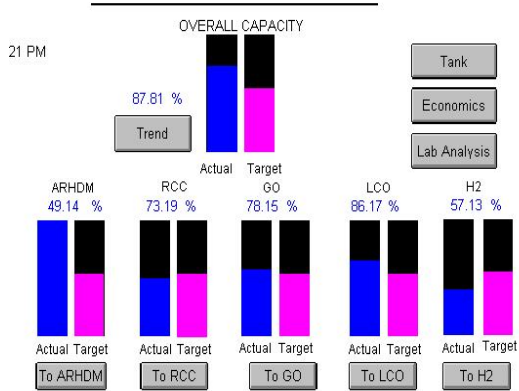
Objective

- Track shipments
- Maintain Crude stock levels

Features

- Plan vs Actual
- Refinery upsets notification
- Vessel alarms

Refinery Operations

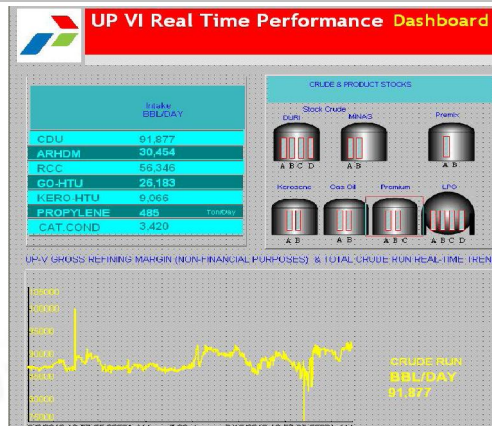
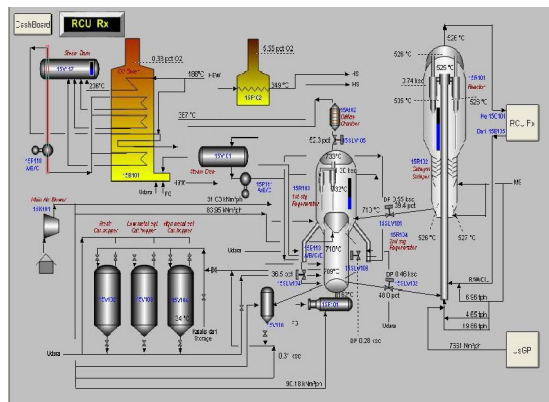


Objective

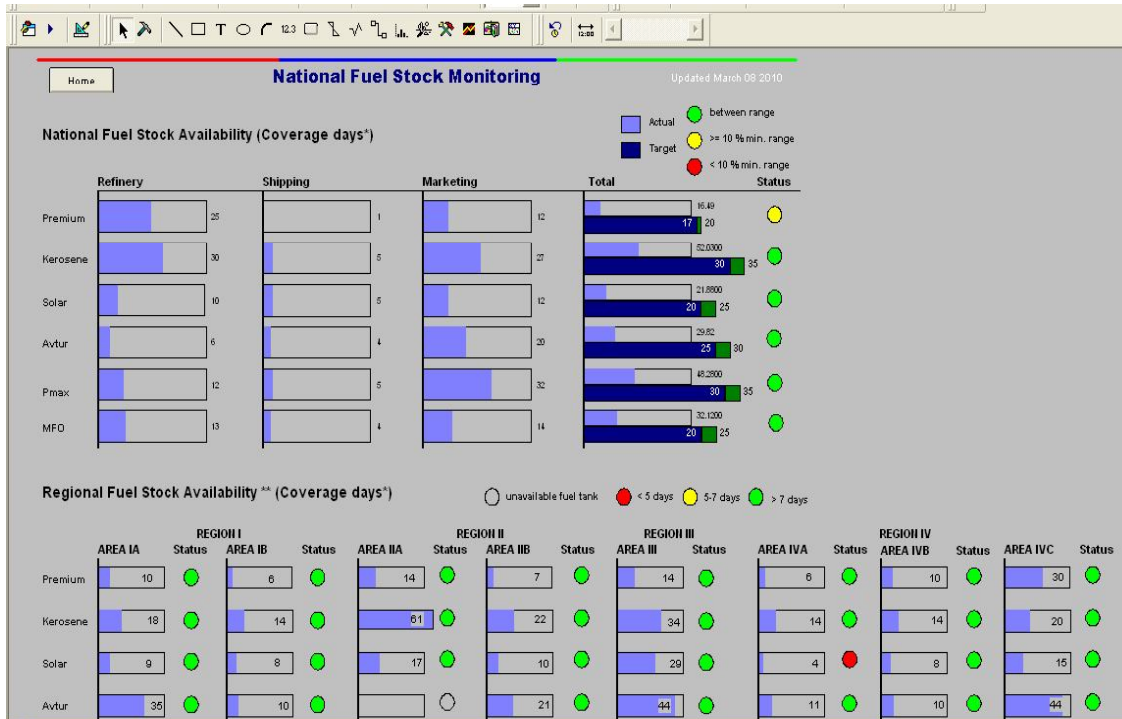
- Real time monitoring refinery operations

Features

- Plan vs Actual Production
- Stock levels of crude and finished products
- Detail DCS level view
- Refinery Problem EWS



National Stock



Objective

- Maintain National fuel stock levels
- Management View

Features

- Identify potential critical depots
- Actions taken
- Deviation highlights

PI ProcessBook - [Potency of Critical Depot]

File Edit View Insert Tools Draw Arrange Window Help

100%

Home

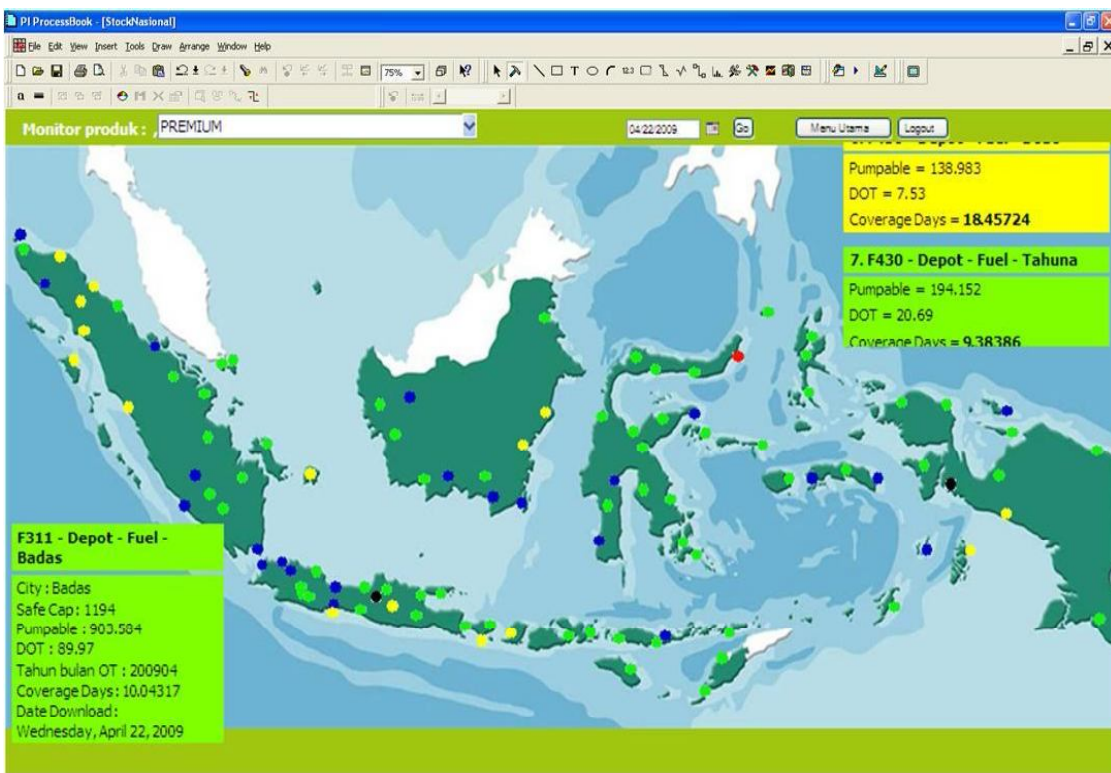
Potential Critical Depot & Next Action

Updated March 08 2010

- On Track
- Slight Delays
- Major Delays

Product	Depot	Area	CD/DOT	Next Action	Status
PREMIUM	Semarang	II A	5,7 / 2.200 KL	MT. Gandaria ex Sin, ETA 03.03, cargo 19.080 KL, Stock tgl 03.03 menjadi 12,4 hari	On Track
	Teluk Kabung	I B	6,3 / 3.022 KL	MT. Griya Asmat ex Bal, ETA 05.03, cargo 7.000 KL, stock tgl 05.03 menjadi 4,5 hari MT. Falcon Star ex Sin, ETA 07.03, cargo 32.000 KL, stock tgl 07.03 menjadi 13,1 hari	On Track
SOLAR	Makassar	IV B	4,0 / 1.800 KL	MT. Golden Pearl ex Bpp, ETA 03.03, cargo 7.000 KL, Stock tgl 03.03 menjadi 6,0 hari MT. Pegaden ex TT Tuban, ETA 04.03, cargo 10.000 KL, Stock tgl 04.03 menjadi 10,5 hari MT. Paluh Tabuhan ex Kalbut, ETA 05.03, cargo 20.000 KL, Stock tgl 03.03 menjadi 20,6 hari	On Track

Supply To Marketing



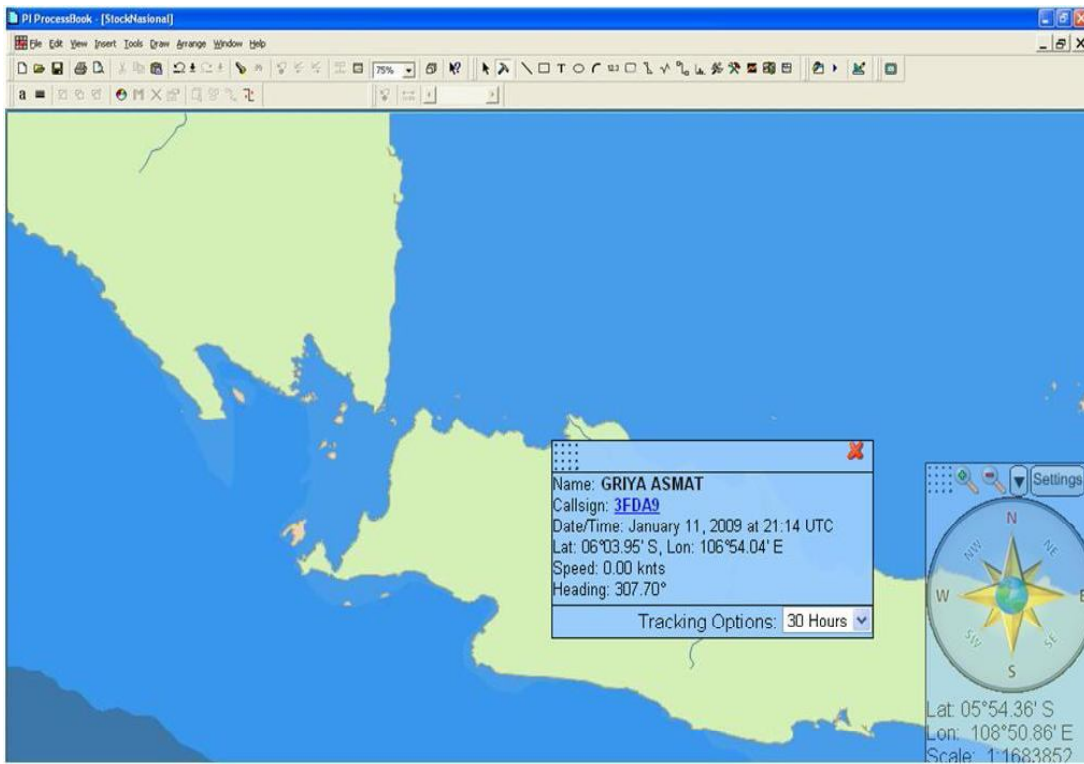
Objective

- Maintain National fuel stock levels

Features

- Identify potential critical depots
- Top 10 critical depots
- Single click to access detail depot data

Vessel Tracking



Objective

- Real time vessel position monitoring

Features

- Track Shipments
- Real time updates of ETA
- Vessel deviation highlights

Does real time data matter ?

Case Examples :

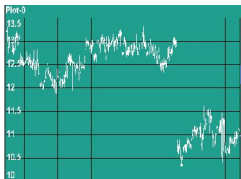
Unscheduled
Refinery shutdown

Confirm w Refinery
Total Loss Production

Check
Current Stock

Trading Arm
Confirms cargo
availability

Import
Arrived



Result

- Stock maintained, critical depots avoided
- "Prompt " cargo avoided -> **US\$ 1 -2/barrel difference**

00:00

00:05

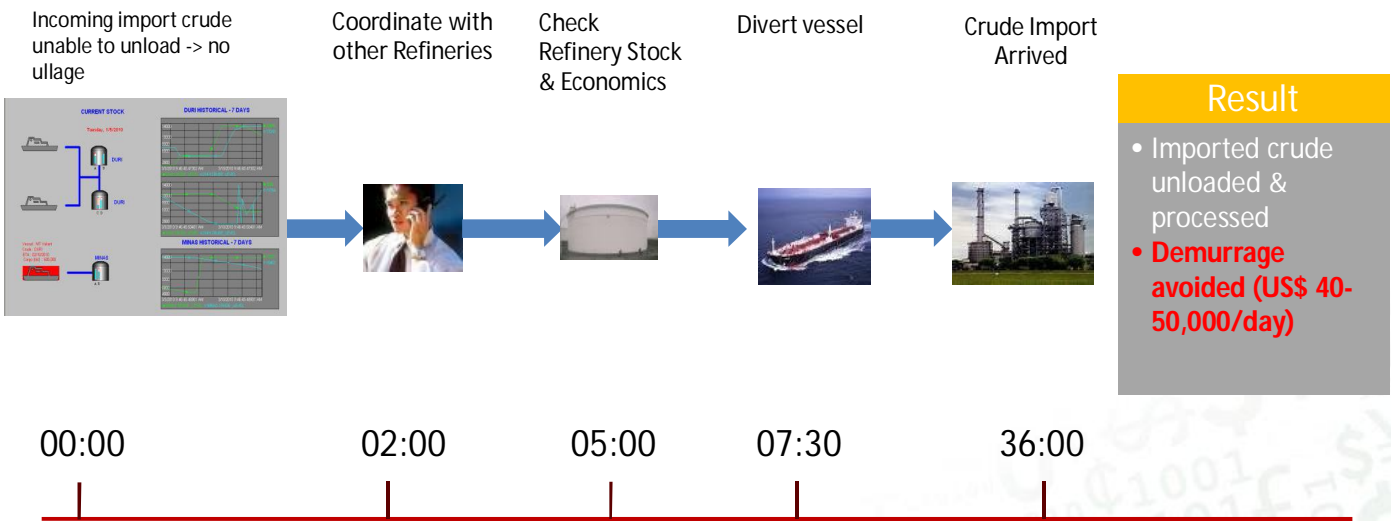
02:00

06:00

48:00

Does real time data matter ?

Case Examples :



SUMMARY – Integrated Downstream Dashboard

	BEFORE - 2007	AFTER - 2009
Working Environment	4 Operating Group, Separate floors	Single floor, in Control Room
Planning process	Functional Silos	Integrated planning and operations from end to end
Data Timeliness	Outdated, not synchronized data	Real time and near real time data
Data Visibility	Limited view of supply chain data	Single coherent view
Monitoring tools	Manual monitoring - Excel	Track plan vs actual through Processbook, Web

BENEFITS

Tangible Benefits

- National stocks maintained at optimal level
- Reduced Critical Depots (stock outs) by 65 %
- Reduced Demurrage by 40 %
- Better loss monitoring & control

US\$ 25 – 30
Million/Year

Intangible Benefits

- Better Team Work & Coordination
- Better Decision Making
- Faster response to supply chain problems
- Integrated end to end downstream visibility

“Downstream First”
Mindset

Conclusions:

- Fleet Management requires a robust real-time data infrastructure as a pre-requisite
- *The Data Infrastructure should be*
 - Highly Available
 - Scalable
 - Extensible
 - Flexible
 - Portable
 - Secure
 - Usable