



Implementing an RtPM-based Product Tank Transfer Using Analysis Framework

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Bayer MaterialScience

PURemotion

Global Manufacturing Systems (GMS)

Reliability Systems Development & Support

Which OSIsoft Products Do We Use?

Bayer Material Science has globally rolled out PI-RtPM as our standard platform for process related information

- PI Enterprise Server with Advanced Server Application
- ProcessBook and DataLink Clients
- Various Interfaces

In addition, on a site by site basis the following products are being used

ACE - Advance Computing Engine, AF – Analysis Framework

Batch products and BatchView

PI Server Framework Add in and PI Professional Server

RLINK, RtWebParts, Sigmafine and SQC





How we use PI and RtPM ?

Typical Applications Prior to Using Analysis Framework - AF

- To calculate OEE – Overall Equipment Efficiency $OEE = A \times R \times Q$
- To provide Process Modeling for Manufacturing/Technology Departments.
- Solve Complex Calculations – Fouling for Heat Exchangers
- Present Information about Production to Upper Management

First Project Application for Analysis Framework – AF

- Tank Transfers Project





Business Drivers for a Tank Farm Transfer Project

- Reduce Product Contamination
- Environmental Concerns
- Personnel Safety
- Decision Support Management
- Tracking Product Flow and Location
- Provide Web Based Visibility of Inventory
- Reduced Use of Paper
- Increased Product Throughput
- Increase Equipment Utilization
- Reduce Nuisance Alarms
- Excel Based Inventory Reporting



OEE Conti-Process



Baytown			
Asset Tree	Date Selected	Refresh Page	
Show	4/22/2006	Today	Refresh Page

[Show](#) Daily Summary

[Hide](#) Monitor Screen - Saturday, April 22, 2006

PI TimeStamp	Copy LossCode	Delete LossCode	Availability Actual (BDP: 100.00)	Availability LossCode	Rate Actual (BDP: 48,488.00)	Rate LossCode	Quality Actual (BDP: 100.00)	Quality LossCode
1:00 PM			Waiting For Value From Pi ...		Waiting For Value From Pi ...		Waiting For Value From Pi ...	
12:00 PM			Waiting For Value From Pi ...		Waiting For Value From Pi ...		Waiting For Value From Pi ...	
11:00 AM			100.00		21,532.66	Assign LC	100.00	
10:00 AM			100.00		21,520.66	Assign LC	100.00	
9:00 AM			100.00		Raw Material / Utilities Raw Material Chlorine B Shift, Baytown 4/22/2006 11:00:05 AM		100.00	
8:00 AM			100.00				100.00	
7:00 AM			100.00		21,523.31	Raw Material / Utilities	100.00	
6:00 AM			100.00		21,532.11	Raw Material / Utilities	100.00	
5:00 AM			100.00		21,532.46	Raw Material / Utilities	100.00	
4:00 AM			100.00		21,525.93	Raw Material / Utilities	100.00	
3:00 AM			100.00		21,516.94	Raw Material / Utilities	100.00	
2:00 AM			100.00		21,516.04	Raw Material / Utilities	100.00	
1:00 AM			100.00		21,523.90	Raw Material / Utilities	100.00	



OEE Conti-Process

MonitorScreenMainPage - Microsoft Internet Explorer

Address: http://by-gotd.bayer-ag.com/OEE_TDI_2/Monitor/MonitorScreenMainPage.aspx

OEE Overall Equipment Effectiveness System

Home Überwachung Berichte Verwaltung Abmelden Contact Us SiteMap Help

Conti Prozess

Asset Tree

Bayer Links

- Intranet
 - BayNet
 - BayerNews Channel
 - Corporate Design
 - Rubber
 - Plastics
 - Coatings & Colorants
 - Polyurethanes
- Internet
 - Bayer Global
 - BayNews International
 - Rubber
 - Plastics
 - Coatings & Colorants
 - Polyurethanes

Brunsbittel

Asset Tree ausgewähltes Datum: 11.01.2005 Heute

Andere Anlagen zur Ursachenvergabe: Anlage auswählen um Ursachen zuzuweisen

Refresh Refresh Page

Anzeigen Tägliche Zusammenfassung -

Hide Überwachung - Dienstag, 11. Januar 2005

PI Zeitstempel	Kopiere Ursache	Lösche Ursache	Verfügbarkeit Aktuell (BDP: 100,00)	Verfügbarkeit Ursache	Produktion Aktuell (BDP: 20,21)	Produktion Ursache	Qualität Aktuell (BDP: 100,00)	Qualität Ursache
20:00			100,00		19,58		100,00	
19:00			100,00		19,73		100,00	
18:00			100,00		19,36		100,00	
17:00			100,00		19,72		100,00	
16:00			100,00		19,49		100,00	
15:00			100,00		19,70		100,00	
14:00			100,00		19,69		100,00	
13:00			100,00		19,50		100,00	
12:00			100,00		19,83		100,00	
11:00			100,00		19,56		100,00	
10:00			100,00		19,69		100,00	
09:00			100,00		18,32	Rohmaterial / Hilfsstoffe	100,00	
08:00			100,00		16,83	Rohmaterial / Hilfsstoffe	100,00	
07:00			100,00		16,65	Rohmaterial / Hilfsstoffe	100,00	
06:00			100,00		16,92	Rohmaterial / Hilfsstoffe	100,00	
05:00			100,00		16,07	Rohmaterial / Hilfsstoffe	100,00	
04:00			100,00		14,03	Rohmaterial / Hilfsstoffe	100,00	
03:00			100,00		14,22	Rohmaterial / Hilfsstoffe	100,00	
02:00			100,00		14,07	Rohmaterial / Hilfsstoffe	100,00	
01:00			100,00		14,29	Rohmaterial / Hilfsstoffe	100,00	

Done

Start | John Vergas - ... | Microsoft Fron... | Documents an... | C:\ | Microsoft Pow... | MonitorScre... | Local intranet | 2:09 PM



OEE Batch-Process



Microsoft Internet Explorer window titled "OEE Monitor Page - Microsoft Internet Explorer". The address bar shows "http://10.39.6.12/OEEPet_zh/Monitor/Batch/MonitorMain.aspx".

The page header includes the "OEE Overall Equipment Effectiveness System" logo, a navigation bar with "Home", "Monitoring", "Reports", "Administration", and "LogOff", and the "Bayer Polymers" logo with "Contact Us" and "SiteMap" links.

The main content area displays "Reactor R402" and "Workup V452A (L1)" and "Workup V452C (L1)". A "Summary" button is visible.

The "AssetTree" on the left shows a tree structure:

- LinYuan
 - PET代 C
 - PET
 - Line 1
 - Line 2
 - LP REACTOR
 - Line 3
 - Line 4

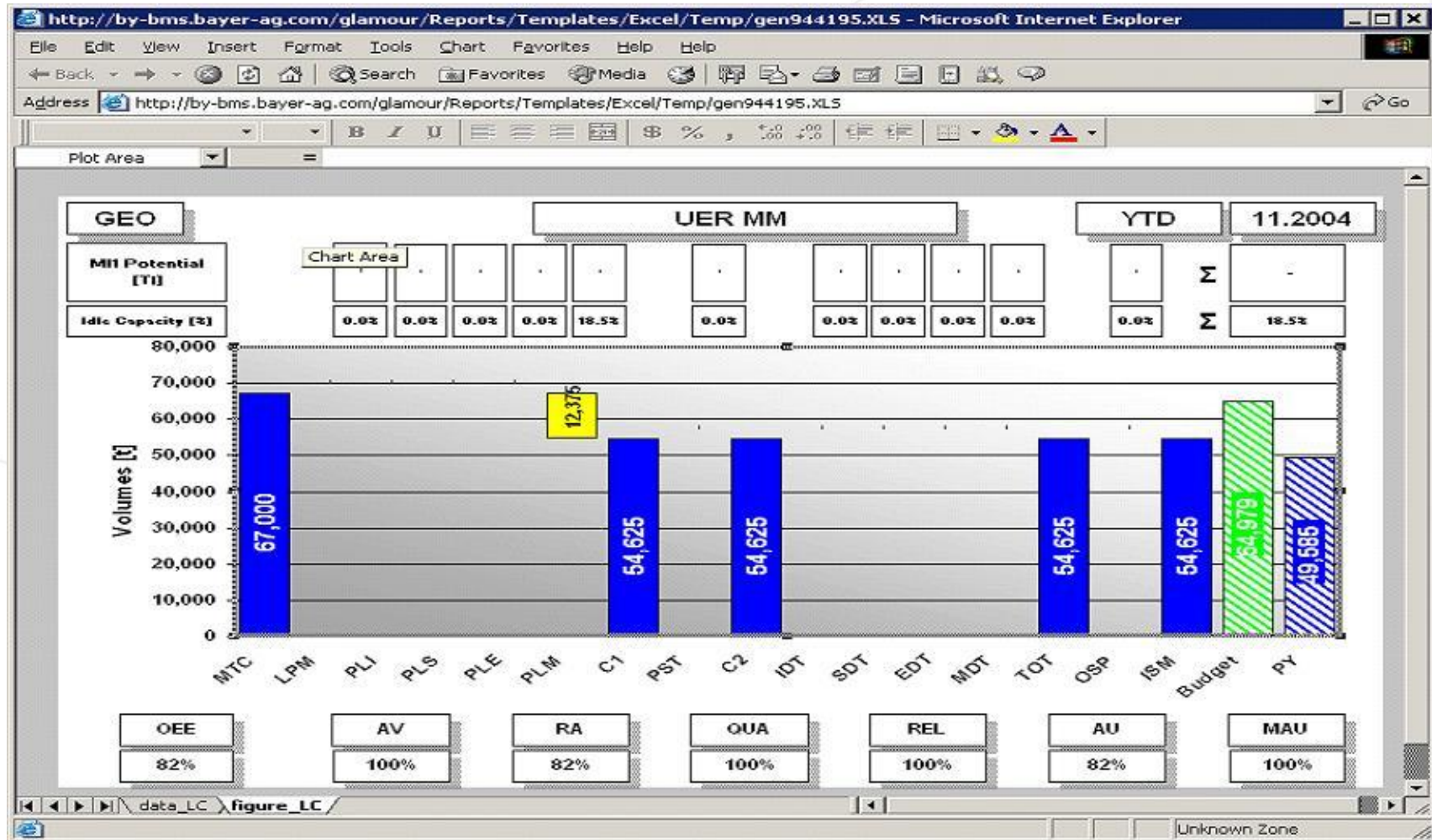
The main table displays process data for "HP3553/HP3553" and "HP3553_8".

#	Description	開始時間 (Start Time)	結束時間 (End Time)	實際的 (Actual)	目標 (Target)	偏差 (Difference)	Weight	用 (Avail)	Rate
1	加 LP/Base	2005/1/11 下午 05:10:10	2005/1/11 下午 05:56:20	46.166670	50	-4	0		
2	加熱/抽真空	2005/1/11 下午 05:56:20	2005/1/11 下午 06:04:50	8.50	20	-12	0		
3	PO加料	2005/1/11 下午 06:04:50	2005/1/12 上午 01:28:40	443.833330	450	-6	0		
4	PO內壓反應	2005/1/12 上午 01:28:40		0	160	-160	0		
5	EO加料				100				
6	EO內壓反應				35				
7	待移液				60				
8	反應槽移液				30				
	Workup			498.5	905	-182	0		

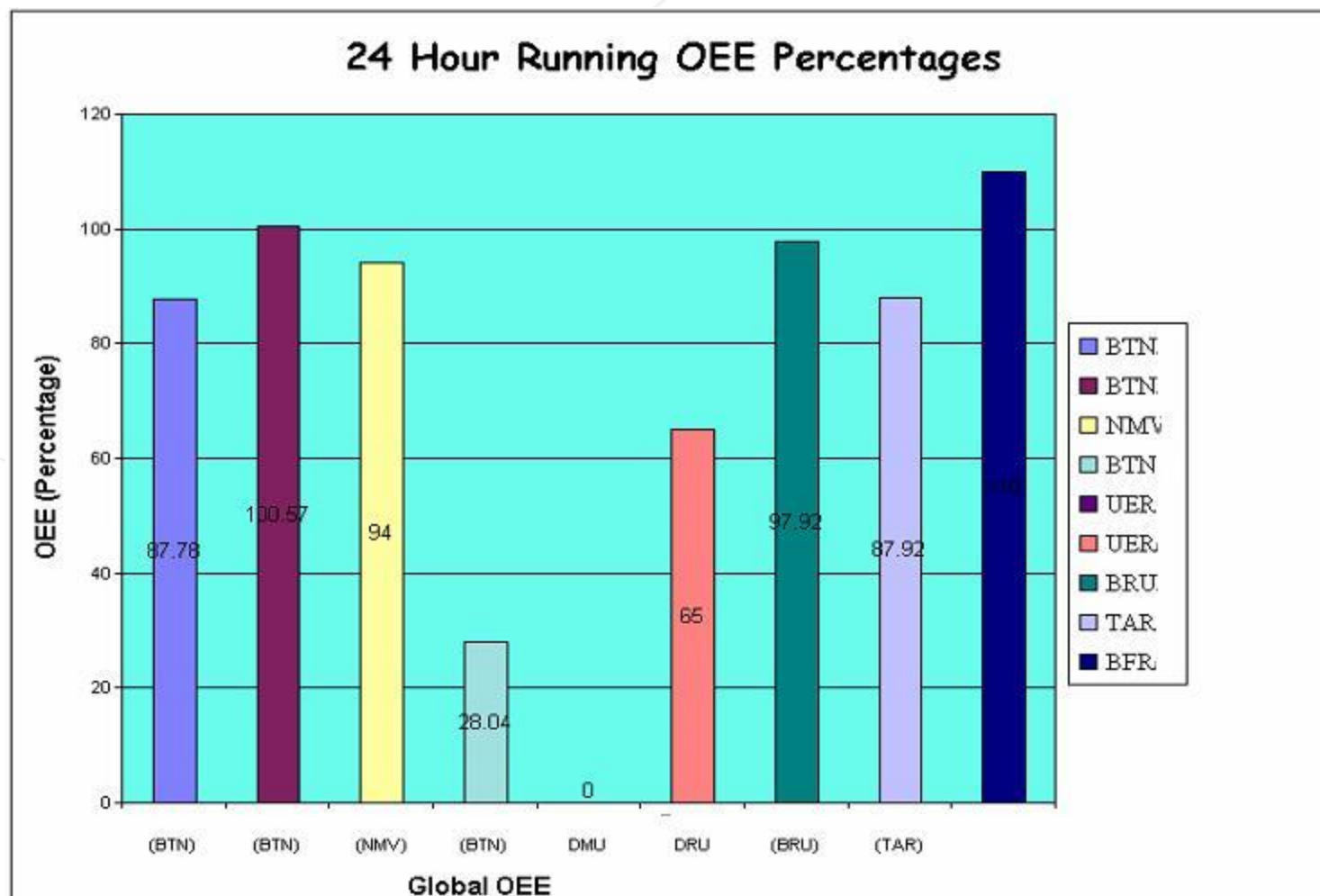
The status bar at the bottom indicates "Done" and "Local intranet".



OEE - KPI Reporting



OEE - Reporting



PROCESS COST MODELS

VTPlan im Web - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print

Address <http://bygotd.bayer-ag.com:2007/download.asp?folder=Home&style=nolist> Go

Global

Home

Calculation
Defaults
Results
Monitor
WWW Quick Telefon
© 2003 BTS

Variable Costs | [Steam](#) | [Material Balance](#) | [Preconcentration](#) | [Equipment Performance](#)

Variable costs

Yield: 99.0

	Consumption [lb/h]	Specific consumption [lb%lb]	Monthly material costs [M\$/month]	Specific costs [\$ % lb]	Percentage [%]
Raw material					
RM1	1111	1111	1111	10.9	50.4
RM2	2222	2222	2222	2.0	9.3
RM3	3333	3333	3333	6.0	27.6
RM4	4444	4444	4444	0.0	0.0
RM5	5555	5555	5555	0.0	0.0
RM6	6666	6666	6666	0.0	0.0
RM7	7777	7777	7777	0.1	0.6
Total material costs				19.1	
	Steam [Mlb/h] Cooling [MMBTU/hr]	Variable energy costs [M\$/month]	Monthly energy costs [M\$/month]		
Energy					
Steam 75 PSIG	32.3	151	151	0.8	3.7
Steam 300 PSIG	57.7	269	269	1.4	6.7
Steam 600 PSIG	0.1	0	0	0.0	0.0
Cooling(NH ₃)	13.0	50	50	0.2	1.2
Cooling(Tower Water)	15.0	0	0	0.0	0.0
Summe Total energy costs		471	471	2.5	
Total costs				21.7	100

Done Local intranet

Complex Calculations

Fouling Calculation

Dormagen Site UNIT1 CA32WA01-CSC Splitter

Dormagen Site--> UNIT1>CA32WA01-CSC Splitter-->

Start: 4/21/2006 7:23:27 PM End: 4/22/2006 7:23:27 PM HOUR

Show Equation

Calculate

$$CA32WA1 \quad k = \frac{CA32F_{301} * (-10.7 * (P_g + 1.013) + 2128)}{(102.51 * (P_g + 3.013)^{0.2414} - CA32T_{304}) - (102.51 * (P_g + 1.013)^{0.2414} - T_{prod-in})} / A$$

$$\ln \left(\frac{(102.51 * (P_g + 3.013)^{0.2414} - CA32T_{304})}{(102.51 * (P_g + 1.013)^{0.2414} - T_{prod-in})} \right)$$

$$T_{prod-in} = \frac{(CA31F_{KB1}) * CA31T_{110} + (CA31F_{KB2}) * CA31T_{210} + (CA32F_{KB1}) * CA32T_{110} + (CA32F_{KB2}) * CA32T_{210}}{(CA31F_{KB1}) + (CA31F_{KB2}) + (CA32F_{KB1}) + (CA32F_{KB2})}$$

$$CA31F_{KB1} = CA31F_{101} + CA31F_{102} + CA31F_{103}$$

$$CA31F_{KB2} = CA31F_{201} + CA31F_{202} + CA31F_{203}$$

$$CA32F_{KB1} = CA32F_{101} + CA32F_{102} + CA32F_{103}$$

$$CA32F_{KB2} = CA32F_{201} + CA32F_{202} + CA32F_{203}$$

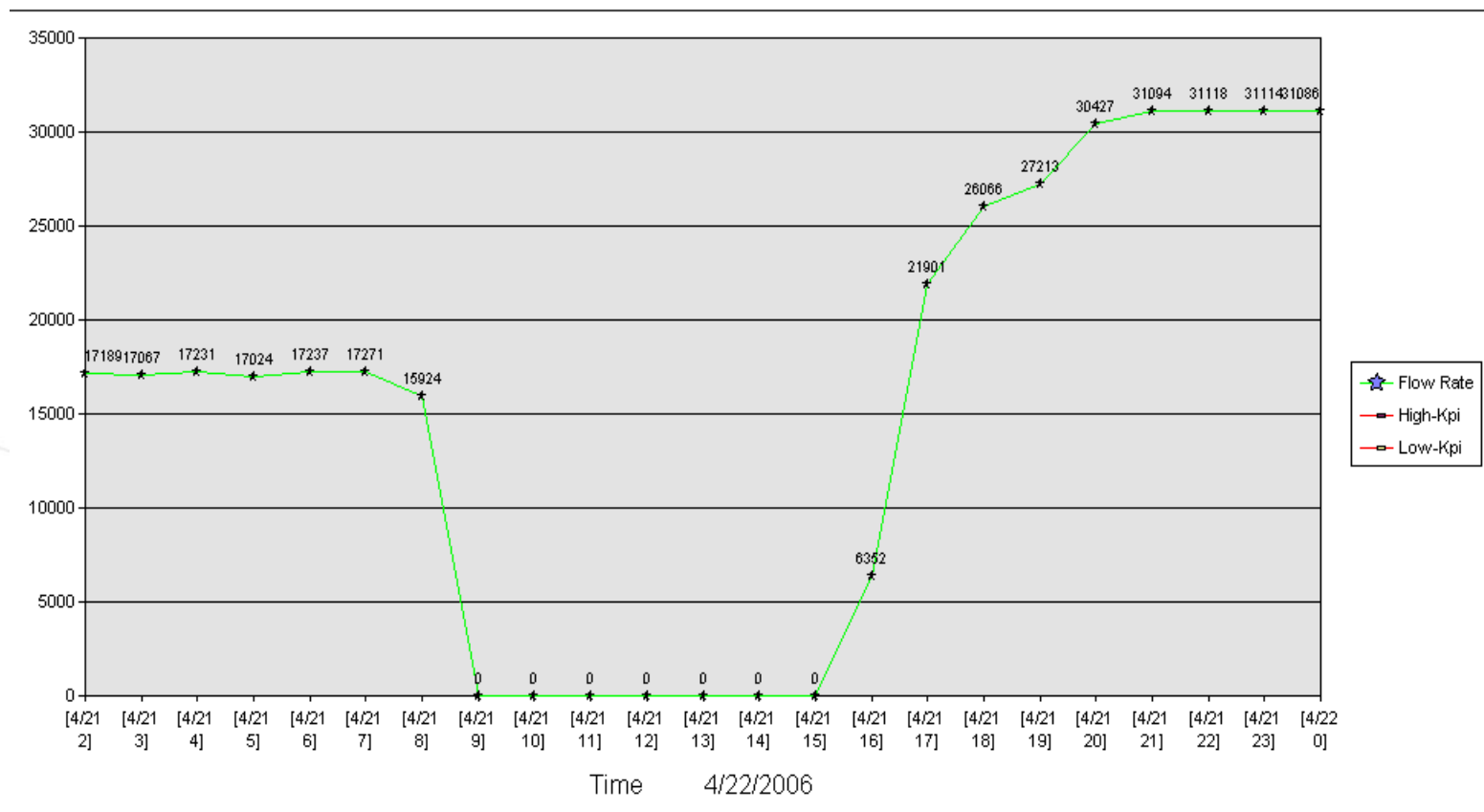
$$A = 198m^2$$



Process Monitoring

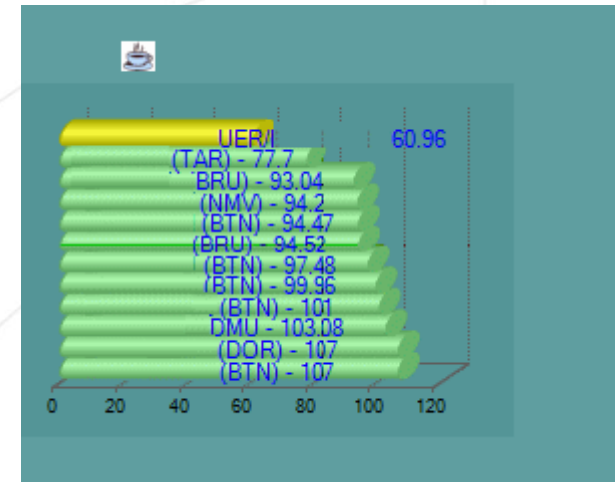
Export To Excel

Build Graph



Management Information

TAR	
Unit	TAR
OeeValue	77.7
UnitOfMeasure	t
DailyProd	25
DailyCapacity	32
LosscodeL1	Materias primas/Auxiliares
LosscodeL2	Materias primas
LossKpi	Quality



AF - Tank Transfers Project



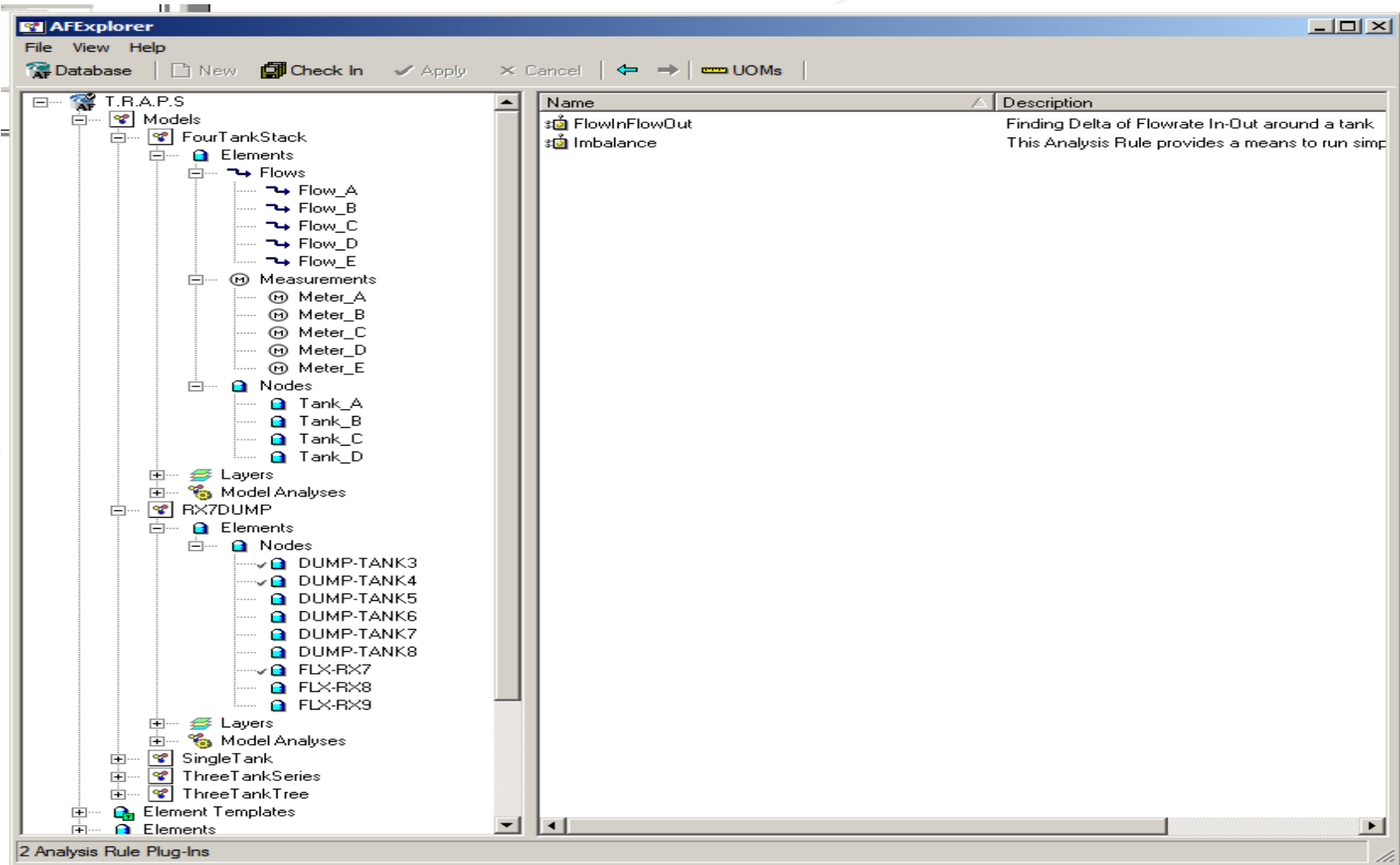
Develop and implement a Transfer Program in PI/ DCS to help plan, monitor and document product transfers.

**Web-based application that will record and monitor the manual transfers -
Allowing the field operator to setup monitor and record the following items:**

- Source tank
- Receiving tank (include: Rail Car, Tank Truck, Tank Car, Barge etc.)
- Transfer resource (which line, hose or other piece of equipment to transfer
- Date and time of transfer start and finish
- Estimate time remaining to complete transfer
- Tank Levels now and after transfer
- Monitor all transfers past and present.
- Record completion of special monitoring requirements for transfers



AF - Tank Transfers Project



The screenshot shows the AFExplorer application window. The left pane displays a hierarchical tree structure of the project. The right pane shows a table with two columns: 'Name' and 'Description'.

Name	Description
\$FlowInFlowOut	Finding Delta of Flowrate In-Out around a tank
\$Imbalance	This Analysis Rule provides a means to run simp

The project tree on the left includes the following structure:

- T.R.A.P.S.
 - Models
 - FourTankStack
 - Elements
 - Flows
 - Flow_A
 - Flow_B
 - Flow_C
 - Flow_D
 - Flow_E
 - Measurements
 - Meter_A
 - Meter_B
 - Meter_C
 - Meter_D
 - Meter_E
 - Nodes
 - Tank_A
 - Tank_B
 - Tank_C
 - Tank_D
 - Layers
 - Model Analyses
 - RX7DUMP
 - Elements
 - Nodes
 - DUMP-TANK3
 - DUMP-TANK4
 - DUMP-TANK5
 - DUMP-TANK6
 - DUMP-TANK7
 - DUMP-TANK8
 - FLX-RX7
 - FLX-RX8
 - FLX-RX9
 - Layers
 - Model Analyses
 - SingleTank
 - ThreeTankSeries
 - ThreeTankTree
 - Element Templates
 - Elements

2 Analysis Rule Plug-Ins



AF - Tank Transfers Project



Untitled Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Google G

Address <http://localhost:1303/Traps/trPersonal.aspx> Go

J.R.A.P.S. Bayer MaterialScience

Transfers in - FLX-RX9 status:success Volume:132507.84375 Percentage:78.0892028808594 Product:1134 9-187 J391_I01 2006-187 RXDUMP:PO FEED1 █	Transfers in - DUMP-TANK8 status:success Volume:7181.2822265625 Product:1134 9-185 Percentage:3.46462202072144 █
Transfers in - FLX-RX8 status:success Volume:132534.34375 Percentage:77.808952331543 RXDUMP:EO FEED Product:M3901 8-565 J385_I03 2006-565 █	Transfers in - DUMP-TANK5 [2] status:success Volume:147205.90625 Product:M3901 8-564 Percentage:74.5753860473633 █
Transfers in - DUMP-TANK6 status:success Percentage:2.95358562469482 Product:M3901 8-563 Volume:6207.6259765625 █	Transfers in - DUMP-TANK3 status:success Volume:160890.1875 Product:E828 7-104 Percentage:81.2993621826172 █

Done Local intranet





What Have We Learned by Using AF ?

- Obtaining more value from our installed base
- Manageable data from various sources using a hierarchal naming convention versus tags
- Store data only once, making PI available to all that require the information
- Consistency of applications
- Reusable applications
- Configurable development of templates and models
- Integration of our investment in custom programs into configurable PI applications
- Have one place to view the data from
- Configuration versus programming
- Completion time to implement reduced
- Time to ROI reduced
- Send data to the Web - engineers, operators, managers and view the data
- AF relationships developed will be used to produce ProcessBook displays





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CONFERENCES
2006**