

PI@DowCorning.com

PI Tools Lead to Plant Profits

Barry MacGregor
(***b.macgregor@dowcorning.com***)

and

Kris Zywicki
(***kris.zywicki@dowcorning.com***)

DOW CORNING

Dow Corning Profile

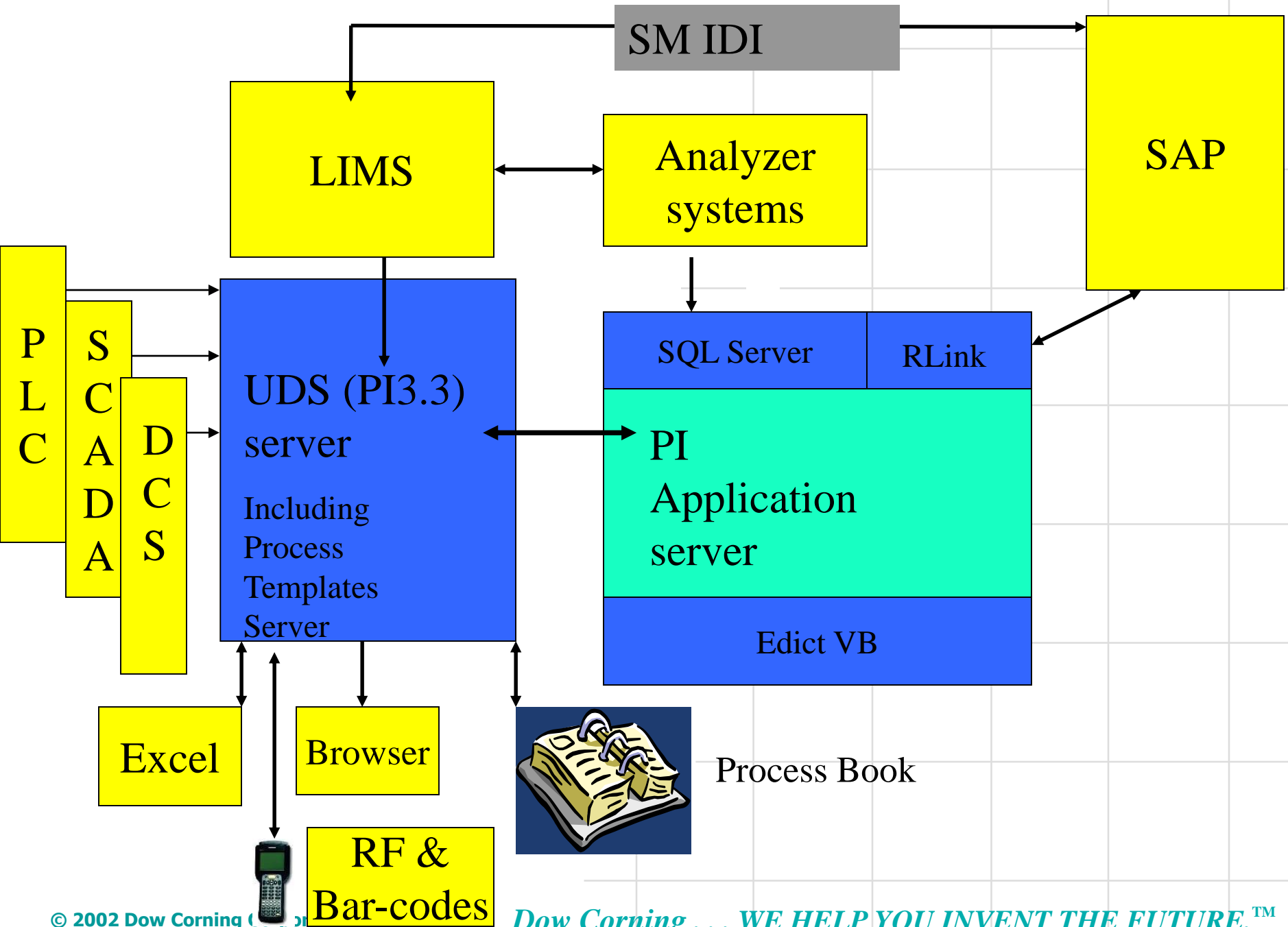
- 2001 Sales: 2.44 Billion
- Employees: 7500 globally
- Manufacture of Silicon based chemicals
- Significant softwares
 - OSI Soft PI tools including RLink
 - SAP 4.6B – single instance globally
 - Sample Manager LIMS
 - Web based bar-coding interface to PI and SAP
 - Various Control Systems (one of everything)

OSI Soft in Use at Dow Corning

- First PI system in 1992 – VMS based PI 1.X
- Interfaces – Sixteen, including Dow Corning written
- UDS/Edict (PI3.3)– 14 sites with 18 servers, 250,000 tags
- PI Batch – 200 batch units
- Process Template SPC – 35 implementations
- Process Book & Excel Add-in – 700 clients
- RLink PM & PP/PI– 22 implementations at 3 sites

Current PI Server Locations





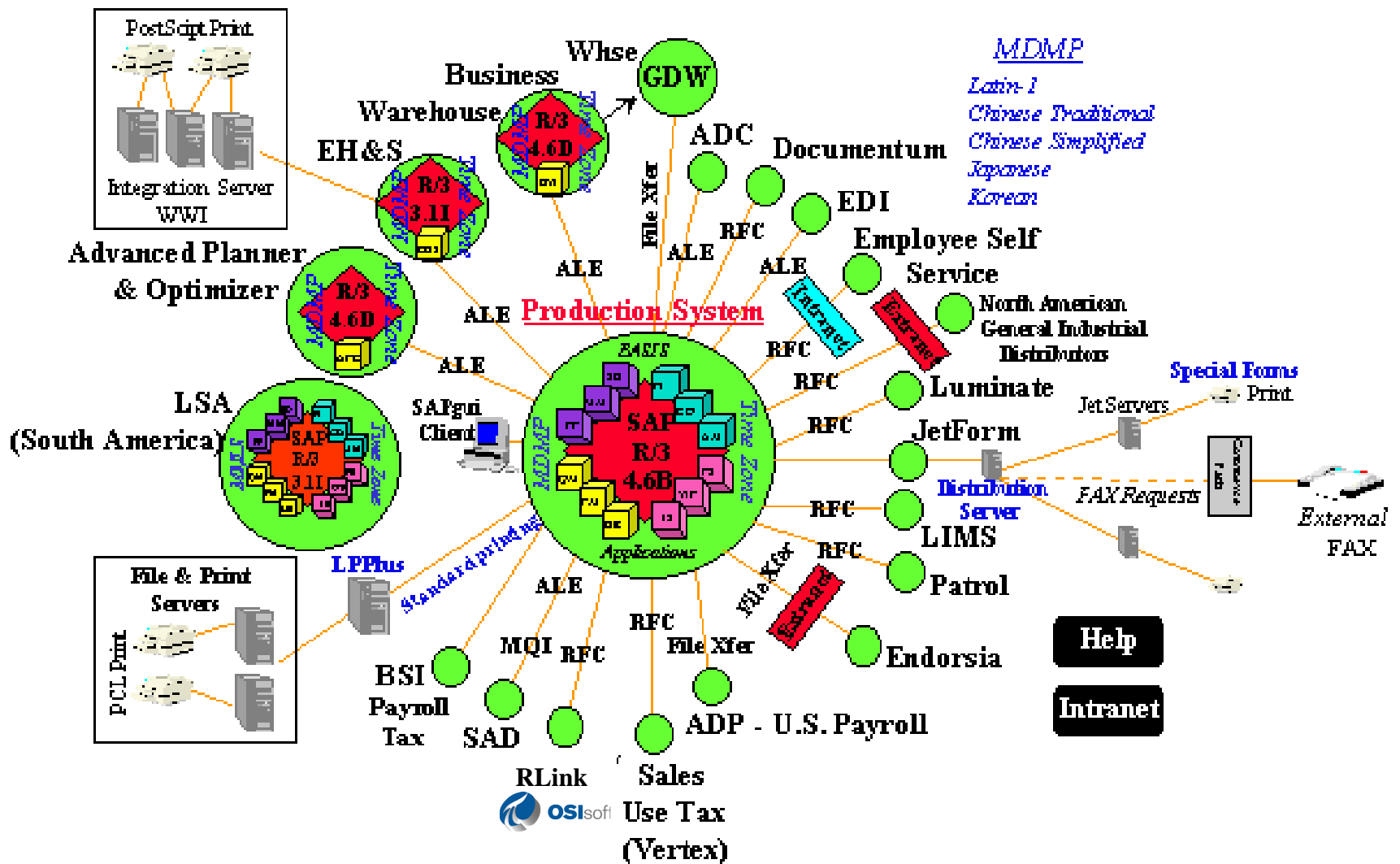
Industry Types within DC

- Process
 - Batch
 - Continuous
 - Semi-continuous
- Discrete
 - Packaging
 - Robotics

Process Controller Interfaces

- Fischer & Porter / Bailey
- Allen Bradley PLC
- Siemens PLC
- Intellution SCADA
- Foxboro I/A
- Fisher/Rosemont Delta V
- Batch Execution Systems (Batch Engines)
- Radio Frequency and Bar-coding for manual data entry
- PC based manual data entry

SAP Architecture



SAP Modules

- PP

- PS

- APO

- MM

- SD

- WF

- PP/PI

- QM

- BW

- WM

- CO

- IS

- PM

- FI

- HR

- CRM

- AM

PI Specifics – Presentation Agenda

- Rlink
 - PP/PI
 - PM
- PI Process Templates SPC
- PI analytics
- Mass Balance
- PI for IT

RLink

- 22 Implementations – globally
 - PM – 2
 - PP/PI – 20
- Provided PM RLink implementation and follow up consulting to the mining operations at BHP Escondida in Chile - Cedric Luyt presentation

Kris reviewed our SAP-RLink-PI configuration and stabilised its operation. It had been operating but with the generation of some errors. He also reviewed R-Link behaviour when SAP and/or PI were down and fed the results to Osisoft to review. He carried out training for our system support people as well as for the Chilean Osisoft personnel.

Joe Garcia, project manager at BHP in Escondida

RLink Specifics – PP/PI

- 5 Batch processes
 - Tank Truck inventory
 - Batch Mixers – manual data entry
- 15 continuous processes
 - Reactors
 - Storage tanks
 - Meters

RLink Specifics – PP/PI

- SAP Transactions
 - Consumption (GI)
 - Production (GR)
 - Inventory movements (MM)
 - Order confirmations
 - Partial
 - Full
 - Resource confirmation

RLink Specifics – PP/PI

- Automated Calculations – eliminate human intervention
 - Mass balance
 - Data reconciliation
 - Unit conversion
 - Status testing
 - Temperature compensated volume to mass conversions

RLink Example(s)

RLink Key Information



Active Recipe

Control Recipe	100000000000122989
Process Order	000101357180
PO Description	502,4000213,BLEND,BULK,KET20841-RLINK
Material	000000000004000213
Status @ Time	0 @ 2/25/2002 2:54:34 PM
Planned Start Time	2/25/2002 10:00:00 AM
Planned Finish Time	3/4/2002 10:00:00 AM
Plant	0052
Resource Network	KET20841
Building/Area	502
Process	Cabot Mix Tank

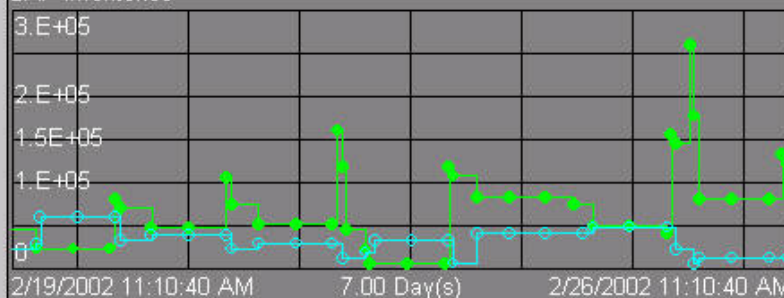
Get RLink Details

Get Previous Values

Other Related Key Tags

Current SAP Inventory for STC (4006576) 2/26/2002 11:25:00 AM 12585.41 KG
Current SAP Inventory for TCS (1958640) 2/26/2002 11:25:00 AM 109086.49 KG

SAP Inventories



Default Server: CTNTP13 PI Version: PI 3.3 Build: 361.50 Domain User: BJSOWER

RLink Example(s)

RLink Details for PPPI

RLink Servers

- Production
 - Midland
 - Midland Plant
 - HSC
 - Auburn
 - Hemlock Medical
 - Carrollton
 - Barry
 - Seneffe
- Development
 - Midland
 - Carrollton
 - Barry
 - Seneffe

SAP Plant 0160 **Plant Resource Network** TCSSTOR

Recipe **Process Order** **Control Recipe**

recipe_id	material_id	status_id	process_order	issue_time	issue_date	total_quantity
100000000000122945	000000000003270033	0	000101348344			500000
100000000000122870	000000000003270033	1	000101341739			500000
100000000000122865	000000000003270033	5	000101341733			500000

Operation

recipe_id	operation_id	operation_alias	operation_description	status_id	resource_id	duration	operation_order
100000000000122870	0010			0	TCSSTOR		

Phase

recipe_id	phase_id	phase_alias	phase_description	resource_id	status_id	duration
100000000000122870	0020	STOR	T/T TO BULK UNLOADING PHASE	TCSSTOR		4

Material List

recipe_id	phase_id	material_id	item	quantity	eng_unit_id	actual_quantity	reservation
100000000000122870	0020	000000000003270033		-500000	KG		
100000000000122870	0020	000000000001467549	0010	500000	KG		

Phase Status Detail

recipe_id	phase_id	status	timestamp
100000000000122870	0020	4	2/20/2002 10:01:32 AM
100000000000122870	0020	4	2/20/2002 7:50:03 AM
100000000000122870	0020	4	2/19/2002 2:02:21 PM
100000000000122870	0020	4	2/19/2002 10:36:12 AM
100000000000122870	0020	4	2/19/2002 8:10:49 AM
100000000000122870	0020	4	2/18/2002 12:15:19 PM
100000000000122870	0020	4	2/18/2002 10:25:41 AM
100000000000122870	0020	1	2/18/2002 9:00:01 AM

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RLink Example(s)

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SAP Plant 0160 **Plant Resource Network** TCSSTOR

Recipe **Data Transfer** SAP Transfer Tables RLink Configuration PI Tag Values

Message Request

request_id	request_name	request_timestamp	request_category	status_timestamp	status	retur
7072	100000000000122870	2/8/2002 9:08:58 AM	APROD_1	2/8/2002 9:08:58 AM	N	PI_F
7071	100000000000122870	2/8/2002 9:08:58 AM	APHST_I	2/8/2002 9:08:58 AM	N	PI_F
7070	100000000000122870	2/8/2002 9:08:57 AM	ACRST_I	2/8/2002 9:08:57 AM	N	PI_C

Request Part

request_part_id	request_id	request_part_name	required	status	format	eng_unit_id	part_order	trace_flag
59926	7072	PPPI_UNIT_OF_MEASURE		N	CHAR		0009	
59925	7072	PPPI_MATERIAL_PRODUCED		P	NUM		0008	8
59924	7072	PPPI_EVENT_TIME		N	TIME		0007	

Request Part Values

request_part_id	order_no	status	status_timestamp	value	complete_flag	trace_flag
59926	170734	C	2/18/2002 10:25:41 AM	KG		
59926	170757	C	2/18/2002 12:15:19 PM	KG		
59926	170872	C	2/19/2002 8:10:49 AM	KG		
59926	170910	C	2/19/2002 10:36:12 AM	KG		

Action Results

request_part_id	field1	field2	field3	field4	field5	status	eng_uni
59925	0160_0537_TM_UNLOAD_Net.SAP	22 Feb 2002 09:59:38	22 Feb 2002 09:59:15			P	KG

Action Results Values

request_part_id	order_no	status	status_timestamp	value
59925	171462	W	2/22/2002 9:59:38 AM	20724.0000
59925	171452	W	2/22/2002 9:59:15 AM	20547.0000
59925	171305	W	2/21/2002 2:55:31 PM	20711.0000
59925	171283	W	2/21/2002 11:39:03 AM	20720.0000

Action Send

id	request_id	trigger_timestamp	field1	field2	field3	field4	field5	field6	field7	status	status_timestamp	tri
No Records Found												

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RLink Example(s)

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Recipe Data Transfer **SAP Transfer Tables** RLink Configuration PI Tag Values

MSHD

msid	request_id	order_no	werk	mscla	tstzk	sedat	seuzt	source	rcode	read_status
445145	7072	171462	0160	PI_PROD		20020222	112605	MID01RLNK	0	S
445138	7072	171452	0160	PI_PROD		20020222	100126	MID01RLNK	0	S
444994	7072	171305	0160	PI_PROD		20020221	145827	MID01RLNK	0	S
444974	7072	171283	0160	PI_PROD		20020221	114200	MID01RLNK	0	S
444967	7072	171273	0160	PI_PROD		20020221	100148	MID01RLNK	0	S

MSEL

msid	request_id	order_no	atnam	atwrt	atfor	rcode	trace_flag
445145	7072	171462	PPPI_UNIT_OF_MEASURE	KG	CHAR	0	0
445145	7072	1	PPPI_STORAGE_LOCATION	MTCS	CHAR	0	6
445145	7072	1	PPPI_PROCESS_ORDER	000101341739	CHAR	0	6
445145	7072	1	PPPI_PHASE	0020	CHAR	0	6
445145	7072	1	PPPI_OPERATION	0010	CHAR	0	6
445145	7072	171462	PPPI_MATERIAL_PRODUCED	20724.0000	NUM	0	0
445145	7072	1	PPPI_MATERIAL	000000000003270033	CHAR	0	6
445145	7072	171462	PPPI_EVENT_TIME	095938	TIME	0	0
445145	7072	171462	PPPI_EVENT_DATE	20020222	DATE	0	0
445138	7072	171452	PPPI_UNIT_OF_MEASURE	KG	CHAR	0	0
445138	7072	1	PPPI_STORAGE_LOCATION	MTCS	CHAR	0	6
445138	7072	1	PPPI_PROCESS_ORDER	000101341739	CHAR	0	6
445138	7072	1	PPPI_PHASE	0020	CHAR	0	6
445138	7072	1	PPPI_OPERATION	0010	CHAR	0	6
445138	7072	171452	PPPI_MATERIAL_PRODUCED	20547.0000	NUM	0	0
445138	7072	1	PPPI_MATERIAL	000000000003270033	CHAR	0	6
445138	7072	171452	PPPI_EVENT_TIME	095915	TIME	0	0
445138	7072	171452	PPPI_EVENT_DATE	20020222	DATE	0	0
444994	7072	171305	PPPI_UNIT_OF_MEASURE	KG	CHAR	0	0
444994	7072	1	PPPI_STORAGE_LOCATION	MTCS	CHAR	0	6
444994	7072	1	PPPI_PROCESS_ORDER	000101341739	CHAR	0	6
444994	7072	1	PPPI_PHASE	0020	CHAR	0	6
444994	7072	1	PPPI_OPERATION	0010	CHAR	0	6
444994	7072	171305	PPPI_MATERIAL_PRODUCED	20711.0000	NUM	0	0

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RLink Example(s)

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SAP Plant 0160 **Plant Resource Network** TCSSTOR

Recipe Data Transfer SAP Transfer Tables **RLink Configuration** PI Tag Values

Plant Resource Network

plant_id	resource_network	type	partial_dur_min	partial_dur_hr	partial_dur_month	shift_duration_min	shift_duration_hr	shift_d
0160	TCSSTOR	BPI						

Material Tag

material_id	resource_id	quantity_tag_id	plant_id	consumed_pro
000000000001467549	TCSSTOR	0160_0537_TM_UNLOAD_Net.SAP	0160	C
000000000003270033	TCSSTOR	0160_0537_TM_UNLOAD_Net.SAP	0160	P

Point Group

group_num	group_description	group_type	process_book
51	HSICL3 TRAILER UN-LOAD	RECIPE	
52	STOR	PI_BATCH	

Point Group Members

group_num	tag_id	tag_alias
51	0160_0537_TM_UNLOAD_Recipe_ID.SAP	RECIPE_ID
51	0160_0537_TM_UNLOAD_Recipe_Status.SAP	SAP
52	0160_0537_TM_UNLOAD_Phase_Recipe_ID.SAP	BATCH_ID
52	0160_0537_TM_UNLOAD_Recipe_Phase_Status.SAP	SAP
52	0160_0537_TM_UNLOAD_YIELD_CURRENT.SAP	YIELD_TO_CONFIRM

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SAP Plant 0160 **Plant Resource Network** TCSSTOR

Recipe | Data Transfer | SAP Transfer Tables | RLink Configuration | **PI Tag Values**

PI Data Selection

Start Date: 22-Feb-02 Time: 12:03:43 PM Values Back in Time: 10 Go

Descriptor	S37 TM trailer net weight,	S37 TM trailer batch id	S37 TM trailer net weight,
PI Server	MPPIHSC1	MPPIHSC1	MPPIHSC1
PI Tag	0160_0S37_TM_UNLOAD_Net.SAP	0160_0S37_TM_UNLOAD_Batch_Numb...	0160_0S37_TM_UNLOAD_Net...
Ext. Desc.	S37 TM trailer net weight, KG	S37 TM trailer batch id	S37 TM trailer net weight, KG
Units	KG		KG
Pt. Source	M	M	M
Table.Field	Material_Tag . Quantity_Tag_ID	Material_Tag . Batch_Tag_ID	Material_Tag . Quantity_Tag_ID
More Info	Matl. No.: 000000000001467549	Matl. No.: 000000000001467549	Matl. No.: 000000000003270033

	Time Stamp	PI Value	Time Stamp	PI Value	Time Stamp	PI Val
1	22-Feb-2002 09:59:38 AM	20724	22-Feb-2002 09:59:38 AM	0000994230	22-Feb-2002 09:59:38 AM	
2	22-Feb-2002 09:59:15 AM	20547	22-Feb-2002 09:59:15 AM	0000994230	22-Feb-2002 09:59:15 AM	
3	21-Feb-2002 02:55:31 PM	20711	21-Feb-2002 02:55:31 PM	0000993208	21-Feb-2002 02:55:31 PM	
4	21-Feb-2002 11:39:03 AM	20720	21-Feb-2002 11:39:03 AM	0000993208	21-Feb-2002 11:39:03 AM	
5	21-Feb-2002 09:57:22 AM	20711	21-Feb-2002 09:57:22 AM	0000993208	21-Feb-2002 09:57:22 AM	
6	21-Feb-2002 08:45:16 AM	20738	21-Feb-2002 08:45:16 AM	0000993208	21-Feb-2002 08:45:16 AM	
7	20-Feb-2002 01:39:31 PM	20829	20-Feb-2002 01:39:31 PM	0000992176	20-Feb-2002 01:39:31 PM	
8	20-Feb-2002 01:06:33 PM	20824	20-Feb-2002 01:06:33 PM	0000992176	20-Feb-2002 01:06:33 PM	
9	20-Feb-2002 10:01:32 AM	20928	20-Feb-2002 10:01:32 AM	0000992176	20-Feb-2002 10:01:32 AM	
10	20-Feb-2002 07:50:03 AM	20638	20-Feb-2002 07:50:03 AM	0000992176	20-Feb-2002 07:50:03 AM	

22-Feb-2002 12:16:13 PM 22-Feb-2002 05:16:13 PM(UTC)

RLink Specifics - PM

- Other Dow Corning Presentation by Bryan Sower
- Process monitoring
 - Both Batch and Continuous
 - Equipment/machine service hours
 - On/off Cycles
 - Run times
 - Threshold calculations

RLink Specifics - PM

- SAP Transactions
 - Automated PM Notifications
 - Measurement document creation
 - Automated measures
 - Overall Equipment Effectiveness (OEE)
 - Total Effective Equipment Productivity (TEEP)

PM strategic measure of TEEP / OEE

Summary Analysis

Detail listing

REPORT #: ZPM00042 DOW CORNING CORPORATION PAGE# 1

RUN DATE: 10/03/2001 PM strategic measure of TEEP / OEE

RUN TIME: 15:42:36

Period - from 01/2001 to 12/2001

Functional Location : 0054-5205

Period	TEEP (%)	OEE (%)	PR (%)	AR (%)	ER (%)	QR (%)	Actual Cost	Unit	#Error
01/2001	50.29	50.29	100.00	96.00	52.39	100.00	41,364.83	USD	0
02/2001	77.92	77.92	100.00	99.14	78.60	100.00	61,466.06	USD	0
03/2001	62.32	62.32	100.00	80.94	76.99	100.00	97,279.76	USD	0
04/2001	75.16	75.16	100.00	92.02	81.68	100.00	62,498.55	USD	0
05/2001	78.60	78.60	100.00	100.00	78.60	100.00	28,436.61	USD	0
06/2001	73.87	73.87	100.00	100.00	73.87	100.00	20,575.47	USD	0
07/2001	66.92	66.92	100.00	98.78	74.55	90.88	30,144.72	USD	0
08/2001	83.92	83.92	100.00	100.00	83.92	100.00	34,176.41	USD	0
09/2001	100.00	100.00	100.00	100.00	100.00	100.00	32,532.43	USD	0
10/2001	100.00	100.00	100.00	100.00	100.00	100.00	362.32	USD	0
11/2001	100.00	100.00	100.00	100.00	100.00	100.00	0.00	USD	0
12/2001	100.00	100.00	100.00	100.00	100.00	100.00	0.00	USD	0

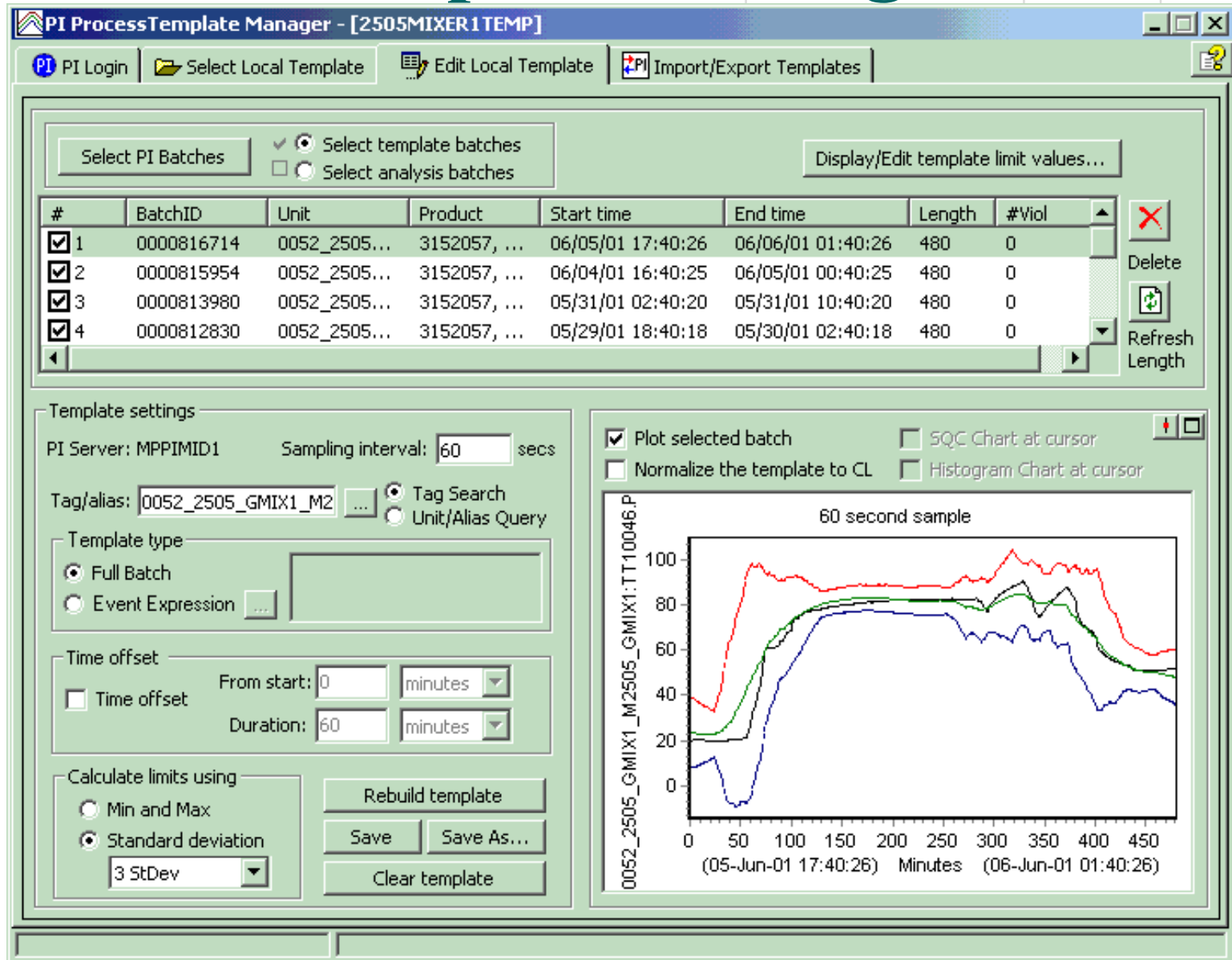
PI Process Templates SPC

- Concepts
 - “3D SPC”
 - Value of concept
- Software
- Dow Corning’s Implementation
 - Wrote original – 8 years ago
 - Exele Version now in 3 sites globally

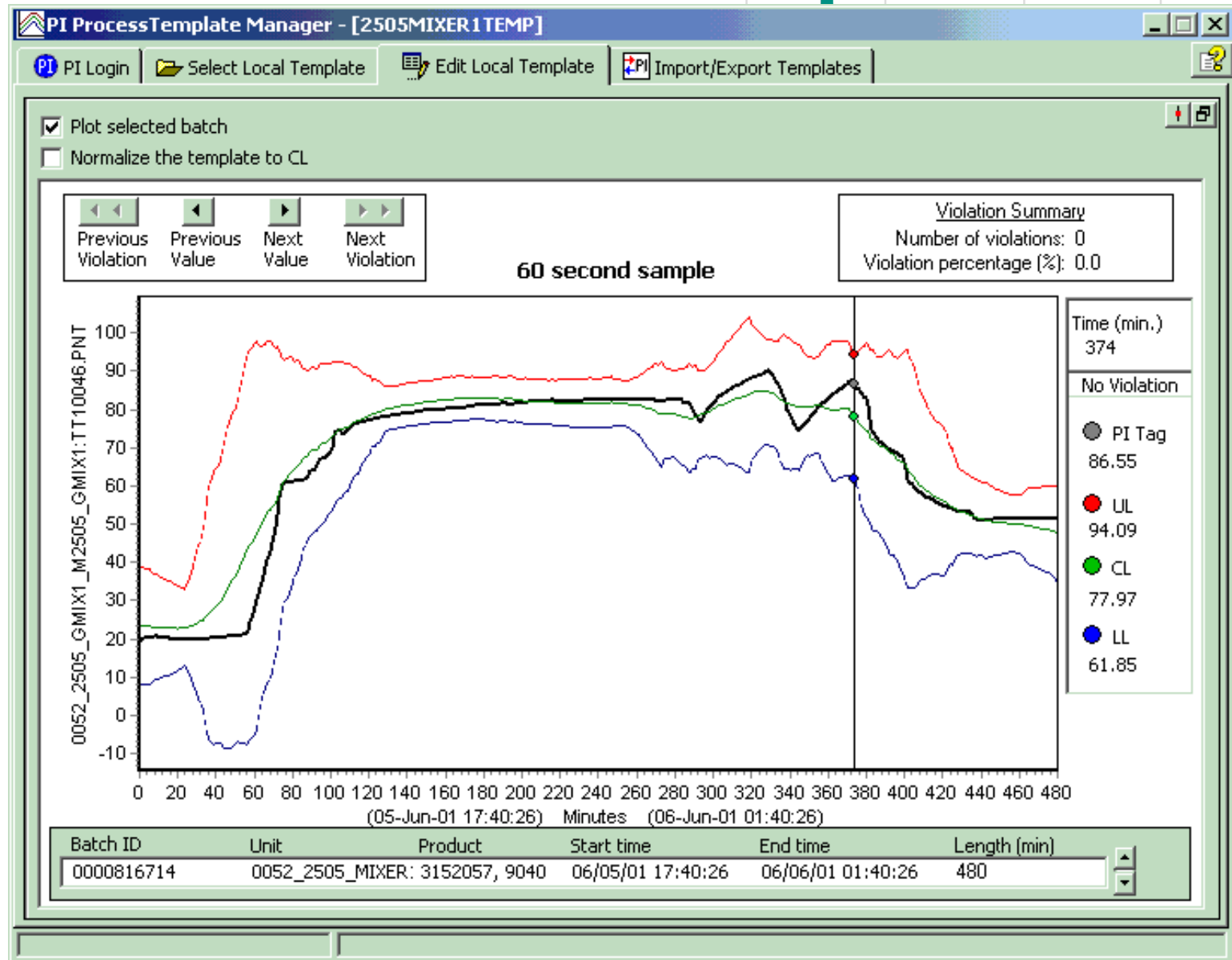
Process Template Concepts

- A control Chart for every minute
 - Each point on the display has a control chart associated with it
 - Drilldown to specific chart via the point on the template
- Combine the limits and center line into a “trend”
- Plot the current batch in real time on this trend

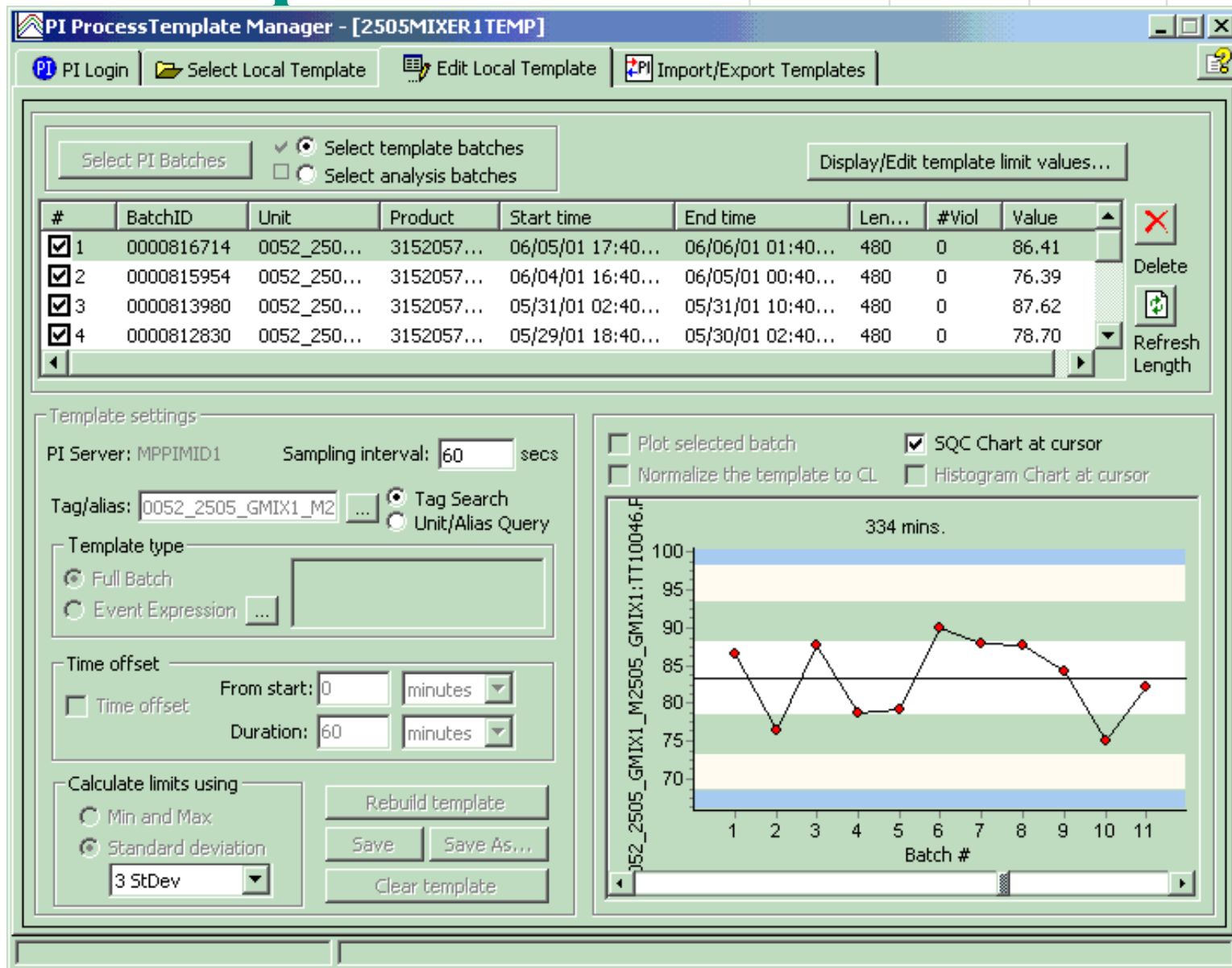
Template Manager



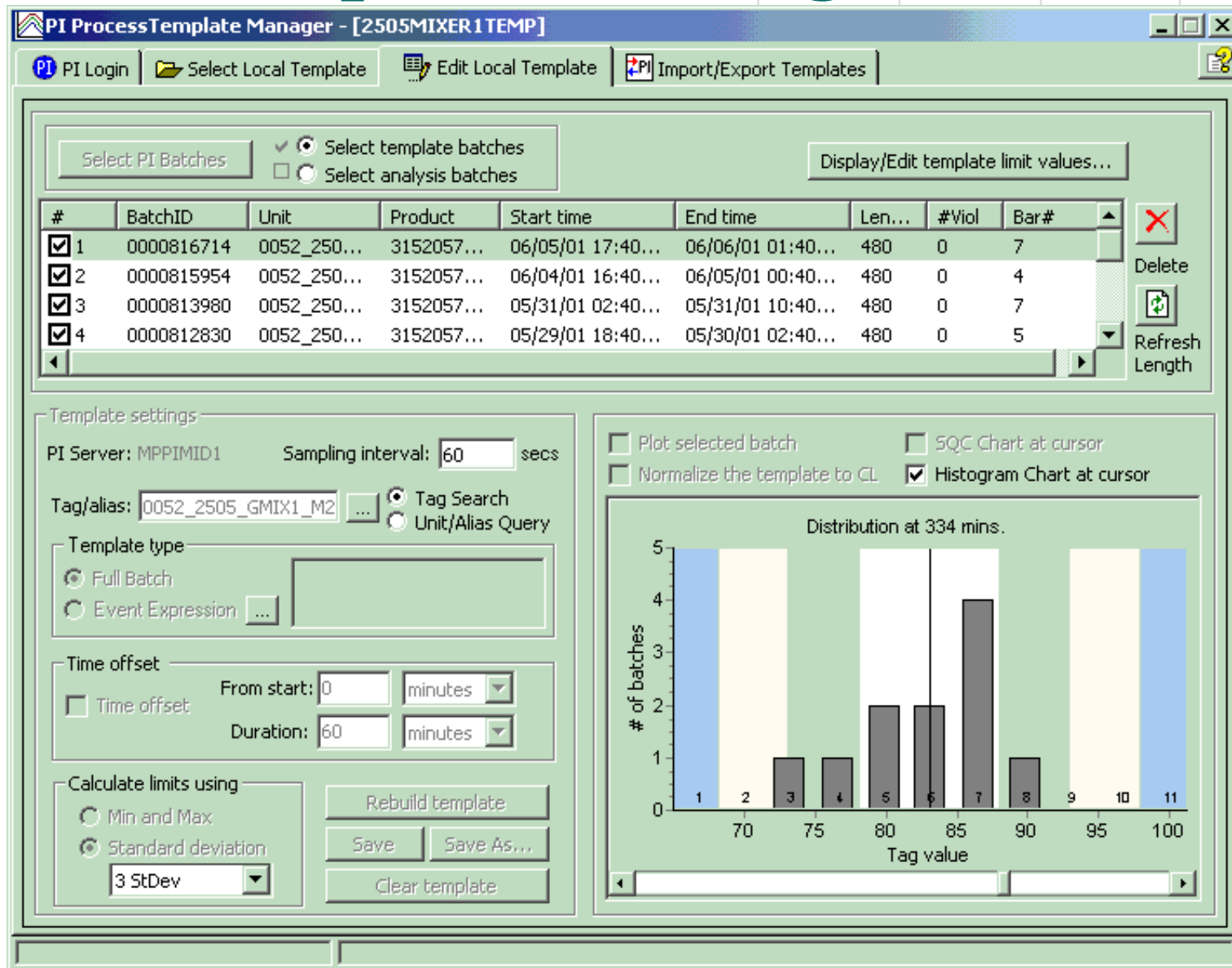
Historical Template



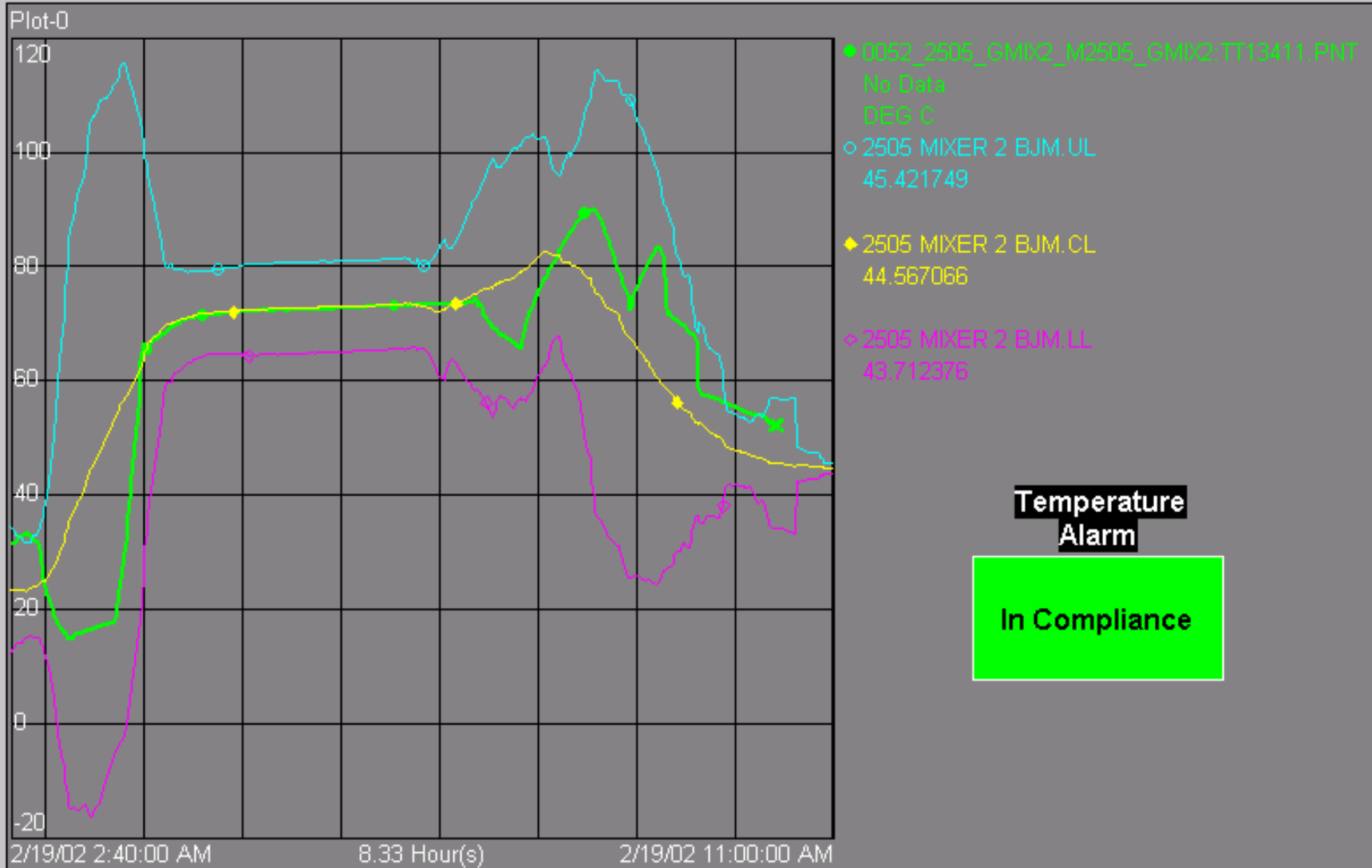
Specific Control Chart



Specific Histogram



Real-time Monitoring



PI Analytics

- PI SQC
 - Continuous Processes
 - Batch Process
 - QA data (LIMS data in PI)
- Process Book and VB
 - Active X Container
 - Multiple data sources
- Data Link – Excel
 - Primary analytical tool
 - User flexibility
- Exele – Edict VB

PI for IT

- Provisions
 - Historical views of instantaneous measures
 - Detection of cumulative problems (memory leaks)
 - Alarming
 - Diagnostics
- OSI Software provided
 - PI – PerfMon
 - PI – SMTP Monitor
 - PI - Ping

PI for IT

- Monitored Servers
 - PI Servers (included with UDS 3.3)
 - MS Exchange Servers
 - SCADA
 - MS SQL
- Monitored NT Statistics
 - Memory
 - Disk
 - CPU
 - Specified Processes

PI for IT

- Network Monitoring – 4000 tags
 - Ping Time
 - SNMP Response Time
 - Dropped Packets
 - Router health calculations

Mass Balance

- PI data on tank levels
- PI data on inventory meters
- Manual data entry into PI & Excel
- Data reconciled in Excel via Datalink
- SAP data into PI and Excel via IDOC and ALE
- Comparison between PI and SAP data
- SAP “adjusted” to match PI (inventory transactions)

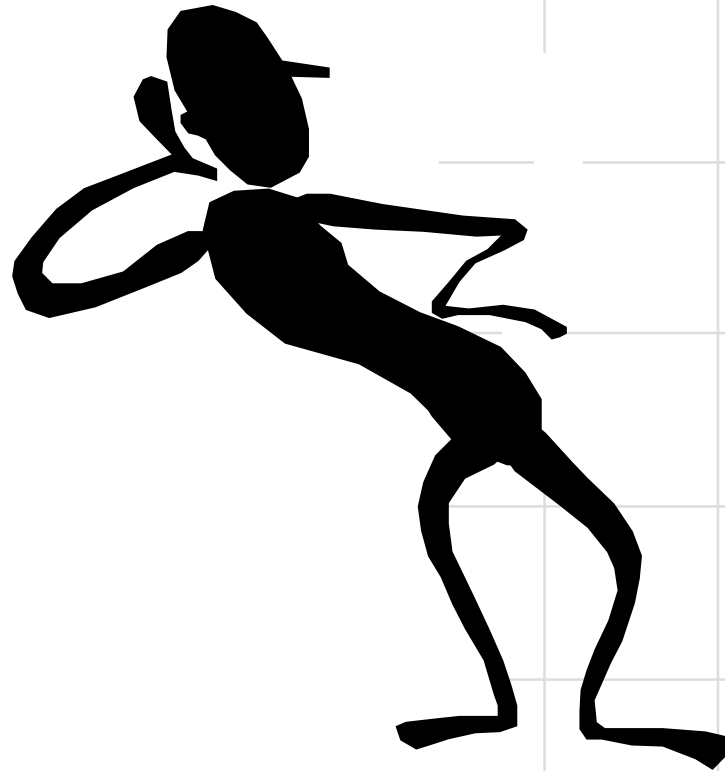
Plant Profits

- Estimated greater than 5,000,000 USD saved per annum with PI tools
 - At line recovery of batches
 - Data entry via RLink, not manual
 - Fewer data errors and corrections
 - Predictive Maintenance fewer unplanned shutdowns
 - Assignable causes determined more quickly
 - Etc.

Summary

- UDS Servers
- Interfaces to PI
- Rlink interfaces to SAP
- Batch Monitoring
- PI Analytics
- PI for IT
- Inventory balancing
- Service Offerings
- Plant Profits

Questions & Hopefully, Answers



DOW CORNING

PI@DowCorning.com