



Corporate Implementation of PI in Bulk Manufacturing Sites

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Answers That Matter.

Agenda

- *Lilly* At-A-Glance
- Tom & Joe in context
- Corporate Vision
- Project Challenges
- Approach
- Typical System Architecture
- Application Examples
- PI Deployment Status and Next Steps



At A Glance

- Large Pharmaceutical Manufacturer, founded 1876
- ~15.7 B\$ Sales (2004)
- ~43000 employees worldwide, 8300 in R&D.
- Products marketed in 143 countries
- Products treat depression, schizophrenia, attention-deficit hyperactivity disorder, diabetes, osteoporosis, cancer and many other conditions
- Clinical research conducted in more than 60 countries
- Manufacturing plants located in 13 countries
- Research and development facilities located in 9 countries

In Context - Joe Pluckebaum

- Tall, thin engineer type, founded in 1957
- 20+ years experience in automation
- Joined Lilly in 1997
- Platform experience OSIsoft PI, DeltaV, A-B PLCs, etc.
- Manufacturing plant experiences - automotive component parts, water & waste water treatment, antibiotic fermentation
- OSIsoft product experience ProcessBook, DataLink, SMT, PI Server 3.x, RtWebParts, RtReports
- Work conducted in more than 3 countries
- Will SME for PI

In Context – Tom Wagener

- Tall, thin IT type, founded in 1965
- 17 years experience in information technology
- Joined Lilly in 2002
- Manufacturing plant experiences - automotive component parts and final assembly, antibiotic fermentation and bulk pharmaceuticals
- Currently support PI installation at Tippecanoe Laboratories site – 5 PI servers, 11 IO nodes (5 clusters), 65,000 tags

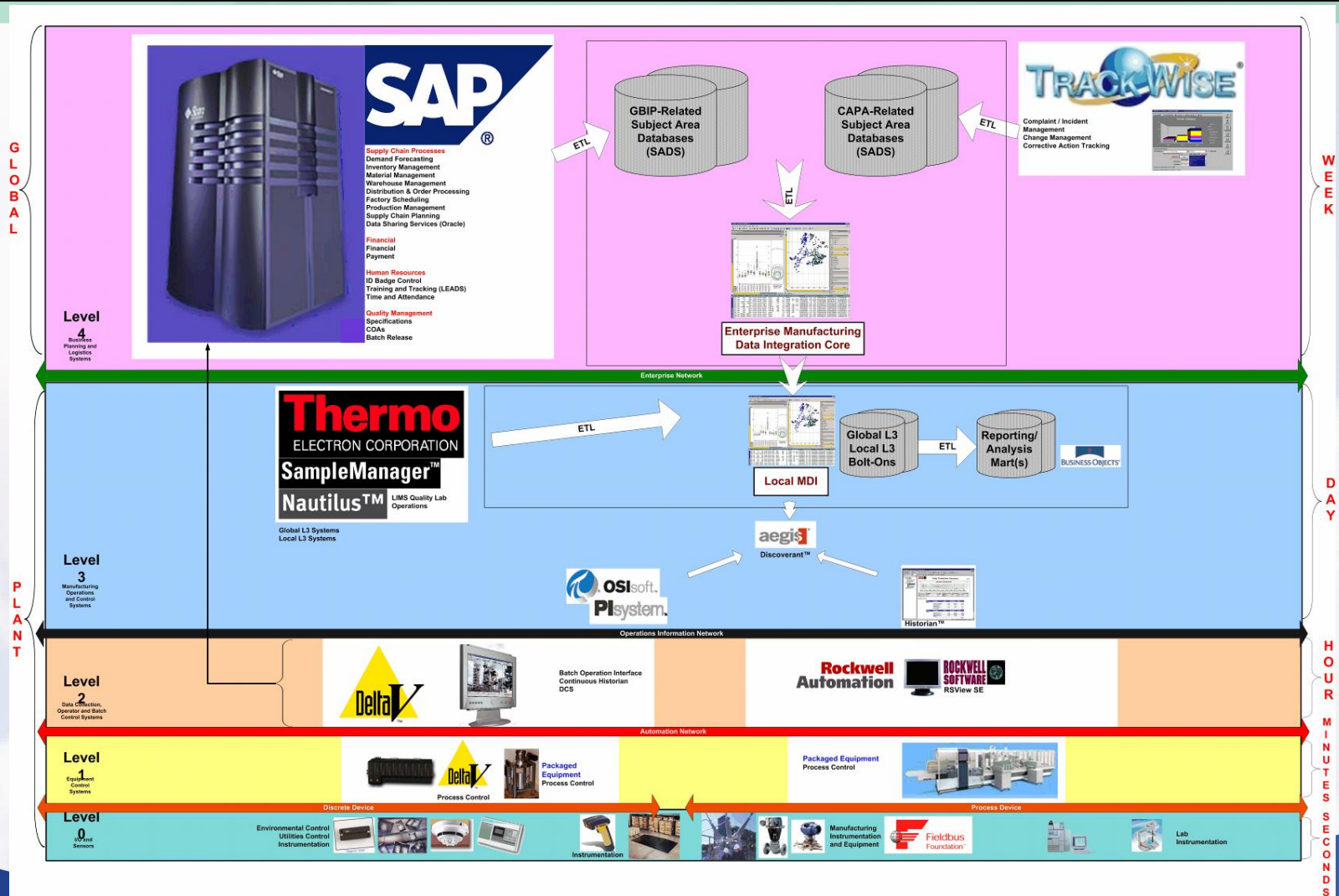
Corporate Vision

- Common data architecture covering the standard 5 levels of systems infrastructure i.e. S95.
- Based on the use of major commercial hardware and software solutions.
- OSIsoft PI used for process data.
- Data Warehouse used for 'transactional' data.

Typical data sources:

- ▶ SAP – Financial, Material Usage
- ▶ TrackWise – Incident Management
- ▶ LIMS – Lab assay data
- ▶ Maximo - Maintenance

Lilly Standard Data Architecture



Challenges

- Site roll-out and alignment with Corporate Vision
- Philosophical change for users /
Tailoring PI (COTS) to match legacy system functions
- Data Migration (thousands of batches and process data)
- Standardized implementation in all targeted plants
- Handling of OSIsoft products and applications evolution over time
- Validation, including secure data reporting in Excel

Approach

- Pre-implementation survey / study
- PI-Core and site-specific components
- PI-Core validation package and validation templates for site-specific components
- Corporate sponsorship / high-level management

Approach continued

- Corporate commitment:
 - ▶ PI Subject Matter Expert
 - ▶ Standardized PI software deployment tools (Intranet)
- Consistent deployment methods / teams
- Early applications prototyping
- Standardized training packages

Approach (a little deeper dive)

- Pre-implementation survey / study (roadmap):
 - ▶ Identify data sources/destinations
 - ▶ Standard and site-specific applications
 - ▶ Alignment with Corporate Vision
 - ▶ Implementation alternatives and recommendations
 - ▶ System architecture and licenses requirements

Approach (a little deeper dive)

- Pre-implementation survey / study (roadmap):
 - ▶ Implementation Plan:
 - Effort estimation (internal / external resources)
 - High-level schedule and milestones
 - Validation strategy

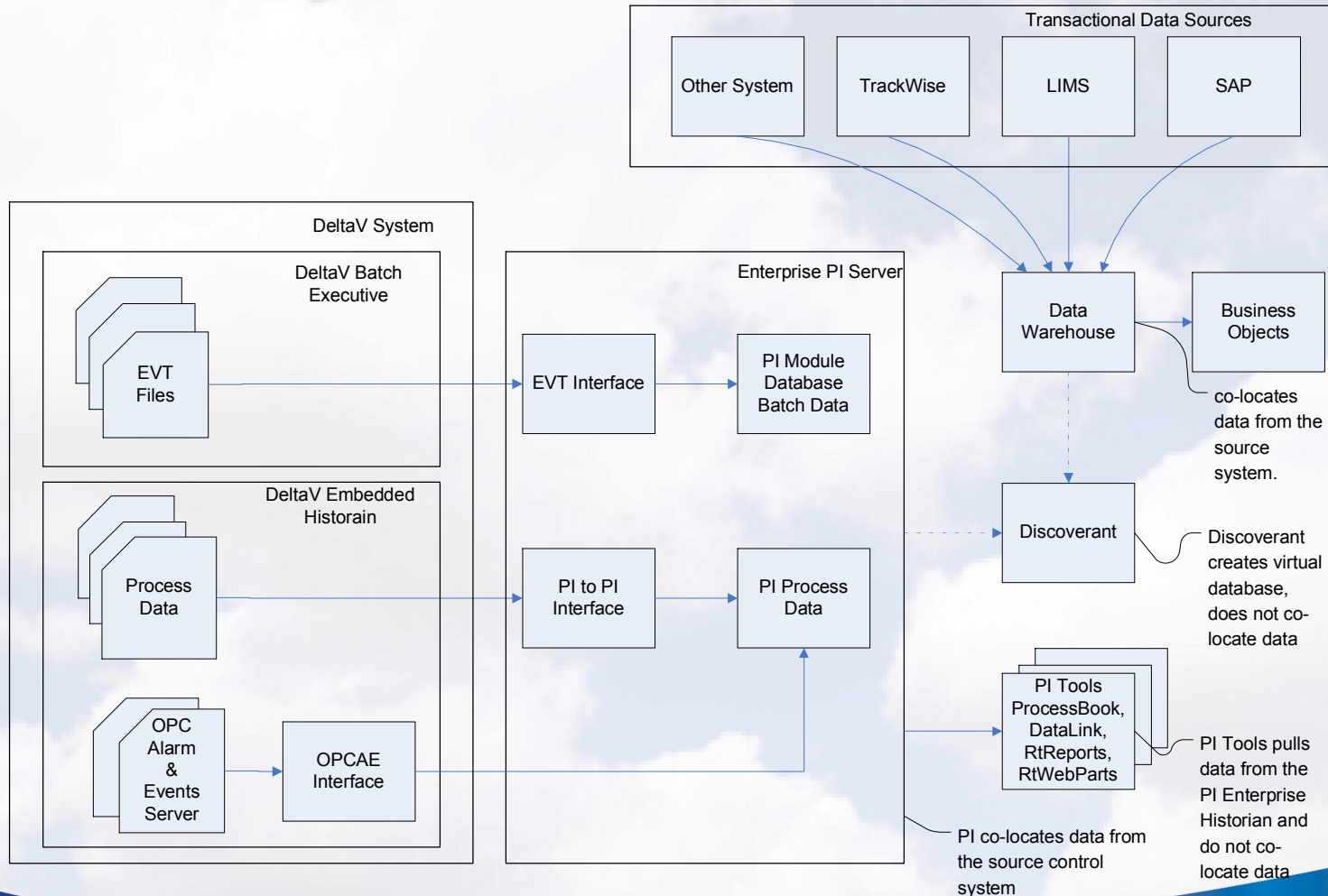
Approach (a little deeper dive)

- Early prototyping:
 - ▶ First draft of applications based on URS
 - ▶ Use of simulated data
 - ▶ Site presentation of all prototypes to multiple targeted users
 - ▶ Quick review/fix based on feedback
 - ▶ Second presentation to same users within the same week

Approach (a little deeper dive)

- Early prototyping:
 - ▶ Finalization of applications design and system configuration
 - ▶ Reduction in review and approval cycles
 - ▶ Early user buy-in

Typical System Architecture



System Architecture (a little deeper dive)

- PI-to-PI Interface:
- Lilly will continue using PI Continuous Historian until DeltaV version 10.x
- Historical Recovery Mode only
 - ▶ Exact replication of archived data
 - ▶ Compression settings only on the DeltaV side
 - ▶ Need to set compmax to force a regular refresh of data

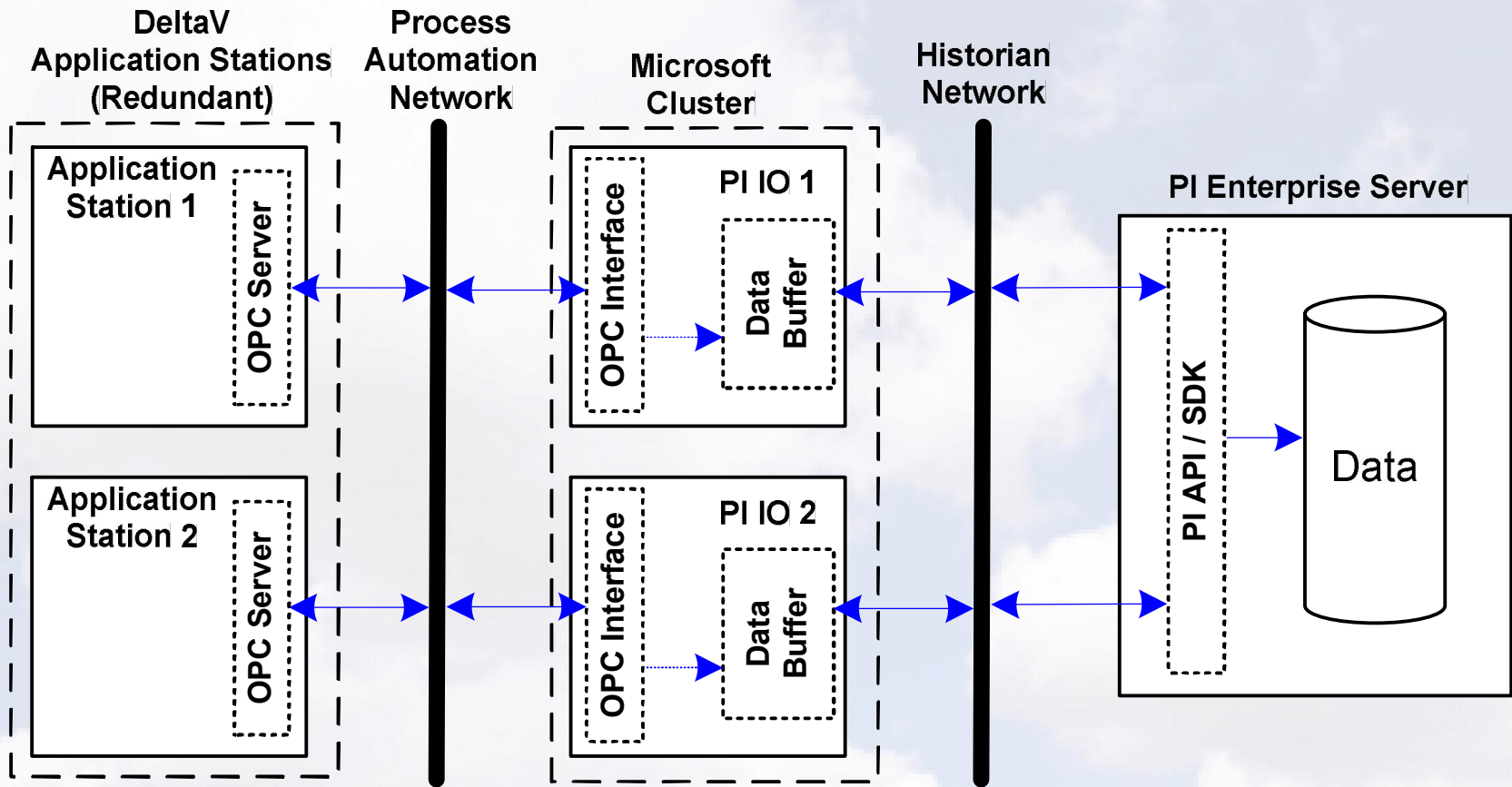
System Architecture (a little deeper dive)

- EVT File Interface:
- Use of EVT Sync Utility to preserve original evt files
- When interface is installed on PI server, requires the use of a special user account matching a local account on the DeltaV application workstation (no password change)
- Alternative: install interface on the DeltaV application workstation and setup a PI Trust
- Batch events stored in PI Properties (not in tags)

System Architecture (cont'd)

- OPC Alarms and Events Interface:
- Installed on the DeltaV application workstation to avoid data losses
- Make sure the Emerson OPC A&E server license was purchased!
- Requires the use of API buffering
- Setup to acquire all alarms and events types (simple, tracking and condition) into a single tag per DeltaV Module
- Setup to store only vendor-specific (DeltaV) attributes and to filter unnecessary event categories (download)

Redundant System Architecture



Redundant System Architecture

- Interface-level failover
- Isolated network traffic
- Supports regular administrative tasks (i.e. Microsoft security patch reboots)
- High availability of data
- Required to meet regulatory needs on data

Example Displays

Reports

C41 Fermentation Tank Status

6-Oct-05 11:13:50 Interface Status

N Bump N Ferm M Bump M Ferm T Bump T Ferm Common Param

Main Navigation Display. One button per tank

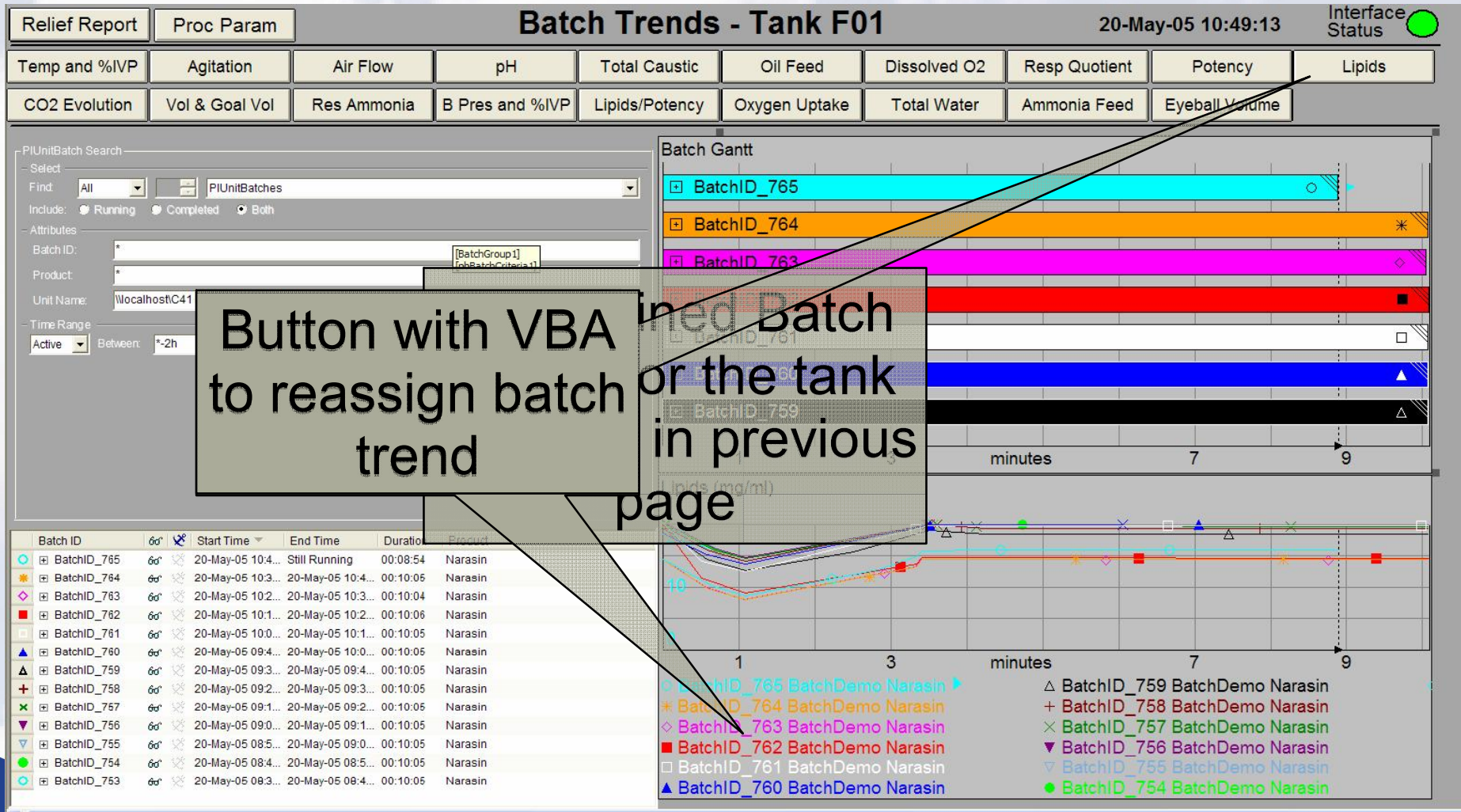
Buttons to individual products/tanks or process areas

Data integrity indicator based on Quick Process Templates and BatchView displays access for the tank

C41

Tank	Batch Number	Age	Phase	Product	Trends
B01	123456	30.2	FR	N	Template Batch
B02	5217	29.1	TA	M	Template Batch
B03	6314	79.2	ST	T	Template Batch
B04	7433	99.7	FR	N	Template Batch
B05	8534	29.7	FR	M	Template Batch
B06	9688	2.4	TA	M	Template Batch
B07	1789	5.3	FR	N	Template Batch
B08	1187	2.4	FR	N	Template Batch
B09	1295	29.4	FR	N	Template Batch
B10	1315	2.4	FR	N	Template Batch
F01	2464	98.7	FR	T	Template Batch
F02	12345	5.3	FR	T	Template Batch
F03	2625	13.3	HA	T	Template Batch
F04	2726	98.7	TA	M	Template Batch
F05	2827	5.3	FR	M	Template Batch
F06	2928	13.3	FR	M	Template Batch
F07	3275	13.3	ST	M	Template Batch
F08	3129	98.7	FR	N	Template Batch
F09	3230	5.3	HA	N	Template Batch
F10	3336	13.3	TA	N	Template Batch
F11	3433	99.7	FR	N	Template Batch
F12	3534	5.3	FR	N	Template Batch
F13	3635	13.3	ST	N	Template Batch
F14	3736	99.7	FR	M	Template Batch
F15	3837	5.3	HA	N	Template Batch
F16	3938	13.3	TA	M	Template Batch
B11	4413	29.1	HA	M	Template Batch
B12	4514	5.3	TA	N	Template Batch
B13	4615	5.3	FR	N	Template Batch
B14	4716	2.4	FR	M	Template Batch
F19	4140	9.0	FR	M	Template Batch
F20	4350	93.1	FR	M	Template Batch
F21	4442	79.2	HA	M	Template Batch
F22	4543	5.3	TA	M	Template Batch
F23	4645	0.7	FR	M	Template Batch
F24	4746	2.4	FR	M	Template Batch
F25	4847	13.3	ST	M	Template Batch
F26	4948	29.4	FR	M	Template Batch
F27	5477	98.0	HA	M	Template Batch
F28	5150	99.7	TA	M	Template Batch
F29	5251	93.1	FR	M	Template Batch
F30	5356	79.2	FR	M	Template Batch
F31	5453	5.3	ST	M	Template Batch
F32	5553	0.7	FR	M	Template Batch

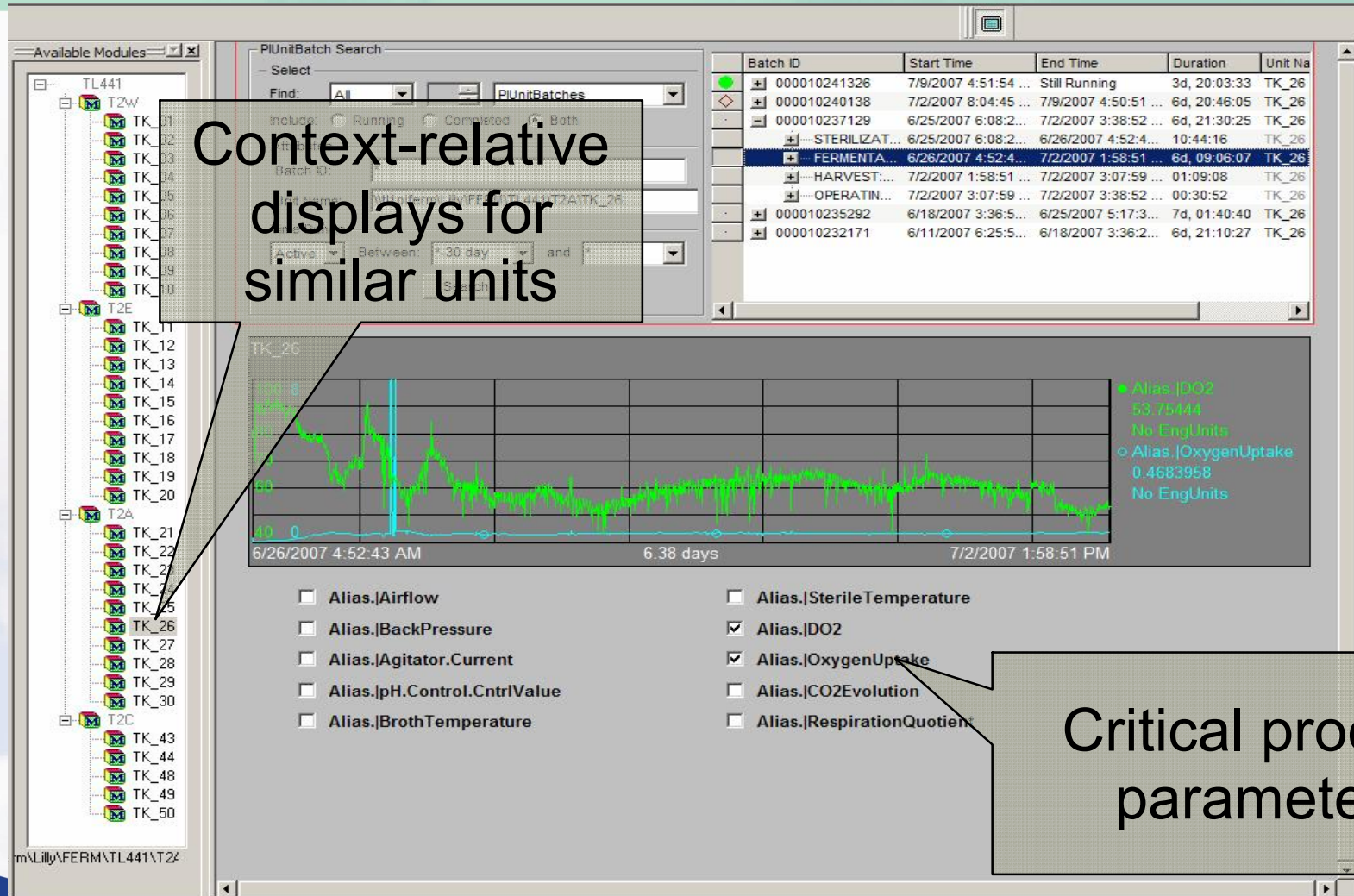
Examples – Displays (cont'd)



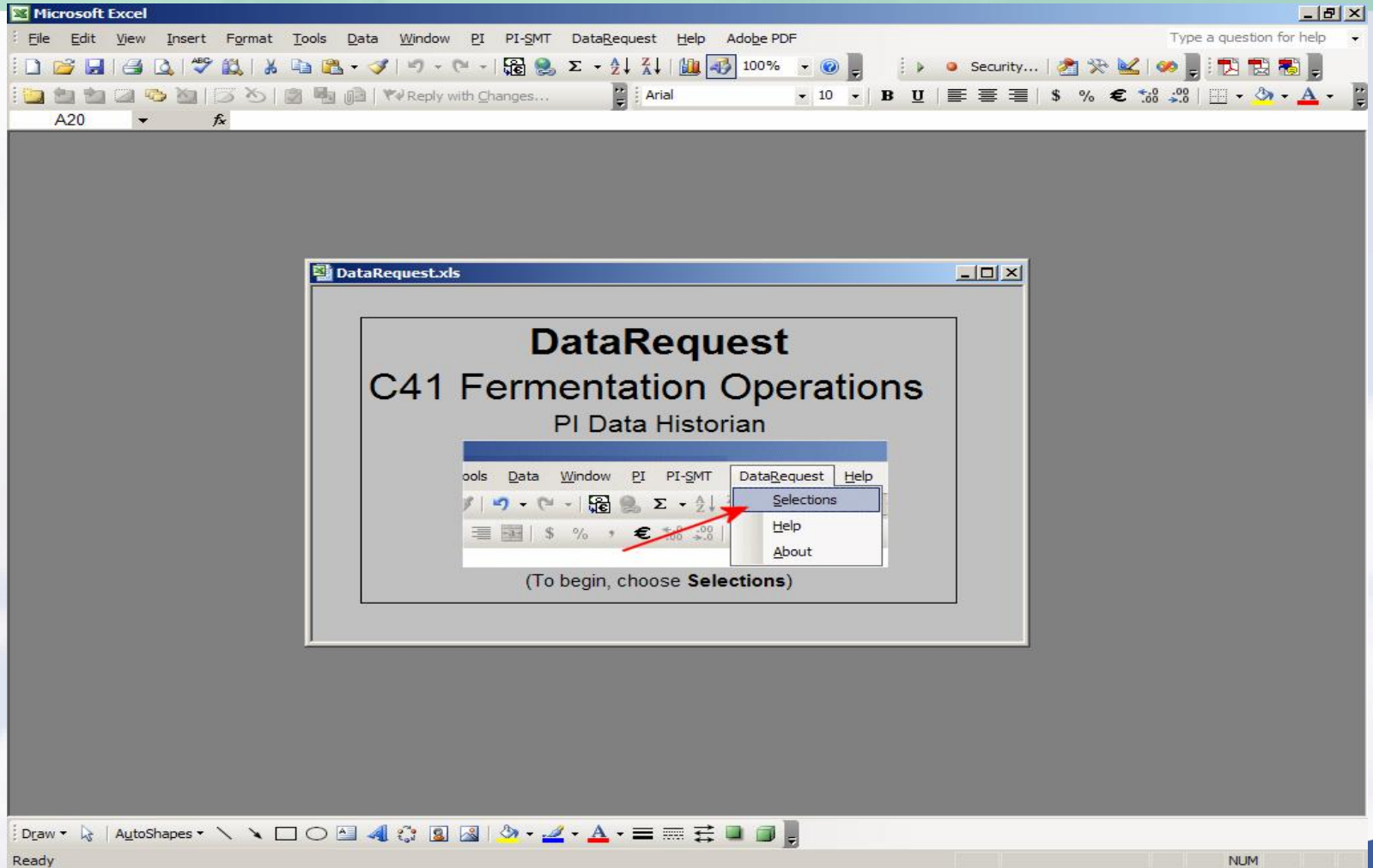
Examples – Displays (cont'd)

- BatchView displays:
- Buttons for batch trend reassignment was found very convenient:
 - ▶ Very easy to use
 - ▶ Prevents having to maintain multiple display pages
 - ▶ Minimum VBA code specifying list of aliases to plot and title
- Developed by our system integrator
Global Automation Partners GAP

Examples – Displays (cont'd)



Data Request



Data Request Form

DataRequest - Batch Selection Menu

Batch Search Time Criteria

Start Time: *-30d End Time: *

Process Criteria

Group/Area: C41 Fermenters

Tank/Unit: F04

Batch ID:
A307043
A309680
A313405
A316636
A319437

Alias: Lipids

Phase: FR

Selected Batches

A316636	F04	Potency
A316636	F04	Lipids

Add Item >> Clear All

Remove Item <<

Time Averaged Values

Calculate Averages 1h interval

Raw (recorded) Values

Report Raws Date/Age Date

Close Form

Data Request Results

Microsoft Excel - DataRequest.xls

File Edit View Insert Format Tools Data Window PI PI-SMT DataRequest Help Adobe PDF

Type a question for help

Security...

Reply with Changes...

Arial 10

B U

\$ % € .0% .0%

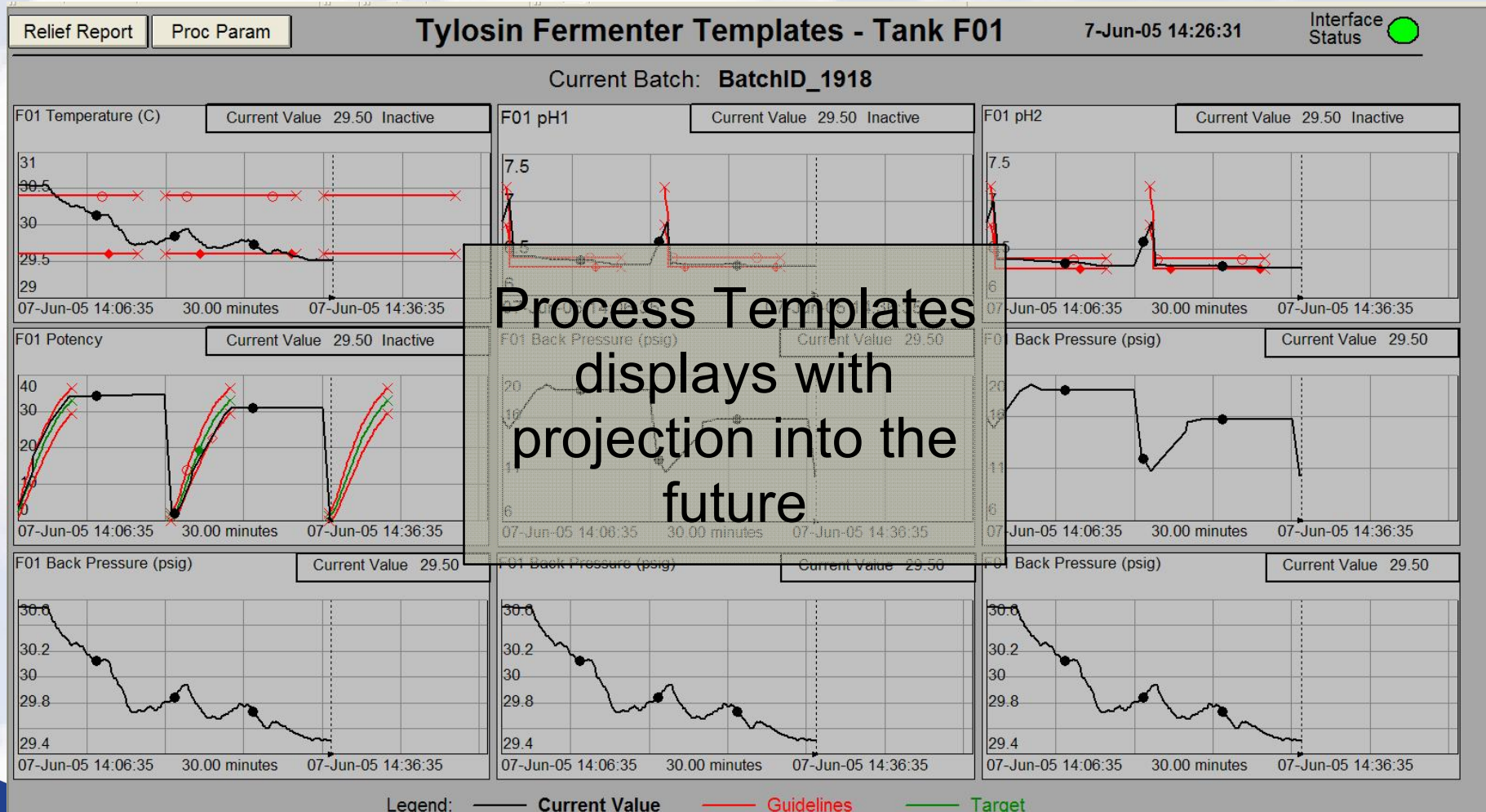
	A	B	C	D	E	F	G	H	I	J	K	L
1	F04 [FR]	A316636	F04 [FR]	A316636								
2	TankAge	Potency	TankAge	Lipids								
3	0.0	8.60000	0.0	19.40000								
4	1.0	8.60000	1.0	19.40000								
5	2.0	8.60000	2.0	19.40000								
6	3.0	8.60000	3.0	19.40000								
7	4.0	8.60000	4.0	19.40000								
8	5.0	8.60000	5.0	19.40000								
9	6.0	8.60000	6.0	19.40000								
10	7.0	8.60000	7.0	19.40000								
11	8.0	8.60000	8.0	19.40000								
12	9.0	8.60000	9.0	19.40000								
13	10.0	8.60000	10.0	19.40000								
14	11.0	8.60000	11.0	19.40000								
15	12.0	8.60000	12.0	19.40000								
16	13.0	8.60000	13.0	19.40000								
17	14.0	8.60000	14.0	19.40000								
18	15.0	8.60000	15.0	19.40000								
19	16.0	8.60000	16.0	19.40000								
20	17.0	8.60000	17.0	19.40000								
21	18.0	8.60000	18.0	19.40000								
22	19.0	8.60000	19.0	19.40000								
23	20.0	8.60000	20.0	19.40000								
24	21.0	8.60000	21.0	19.40000								
25	22.0	8.60000	22.0	19.40000								
26	23.0	8.60000	23.0	19.40000								
27	24.0	8.60000	24.0	19.40000								
28	25.0	8.60000	25.0	19.40000								
29	26.0	8.60000	26.0	19.40000								
30	27.0	8.60000	27.0	19.40000								
31	28.0	8.60000	28.0	19.40000								
32	29.0	8.60000	29.0	19.40000								
33	30.0	8.60000	30.0	45.15067								
34	31.0	8.60000	31.0	53.00000								
35	32.0	8.60000	32.0	53.00000								

Draw AutoShapes

Ready

NUM

Examples – Displays (cont'd)



Examples – Displays (cont'd)

- Process Templates displays:
 - ▶ Critical Operation Data monitoring
 - ▶ Phase-based templates
 - ▶ Based on Process Sciences data (fixed values) – PT provides good support for evolution of templates
 - ▶ One site has 35 defined templates and close to 500 monitors

Applications – Analysis & Reports

- Some pre-defined data analysis worksheets with some VBA code for providing full batch context
- Looking at expanding use of BatchView add-in for Excel
- Will implement RtReports for single batch reports

Observed Results

- Approach allows for improved expectation management and budget/schedule control
- Consistency and standardization can be achieved
- PI-Core & associated validation package was a good idea
- Data migration tools ensure smooth transition and eliminate the need to maintain retired data historian systems
- Empowered users
 - ▶ Modern, powerful tools
 - ▶ Self-configurable applications
 - ▶ Need for regular training / refresh sessions

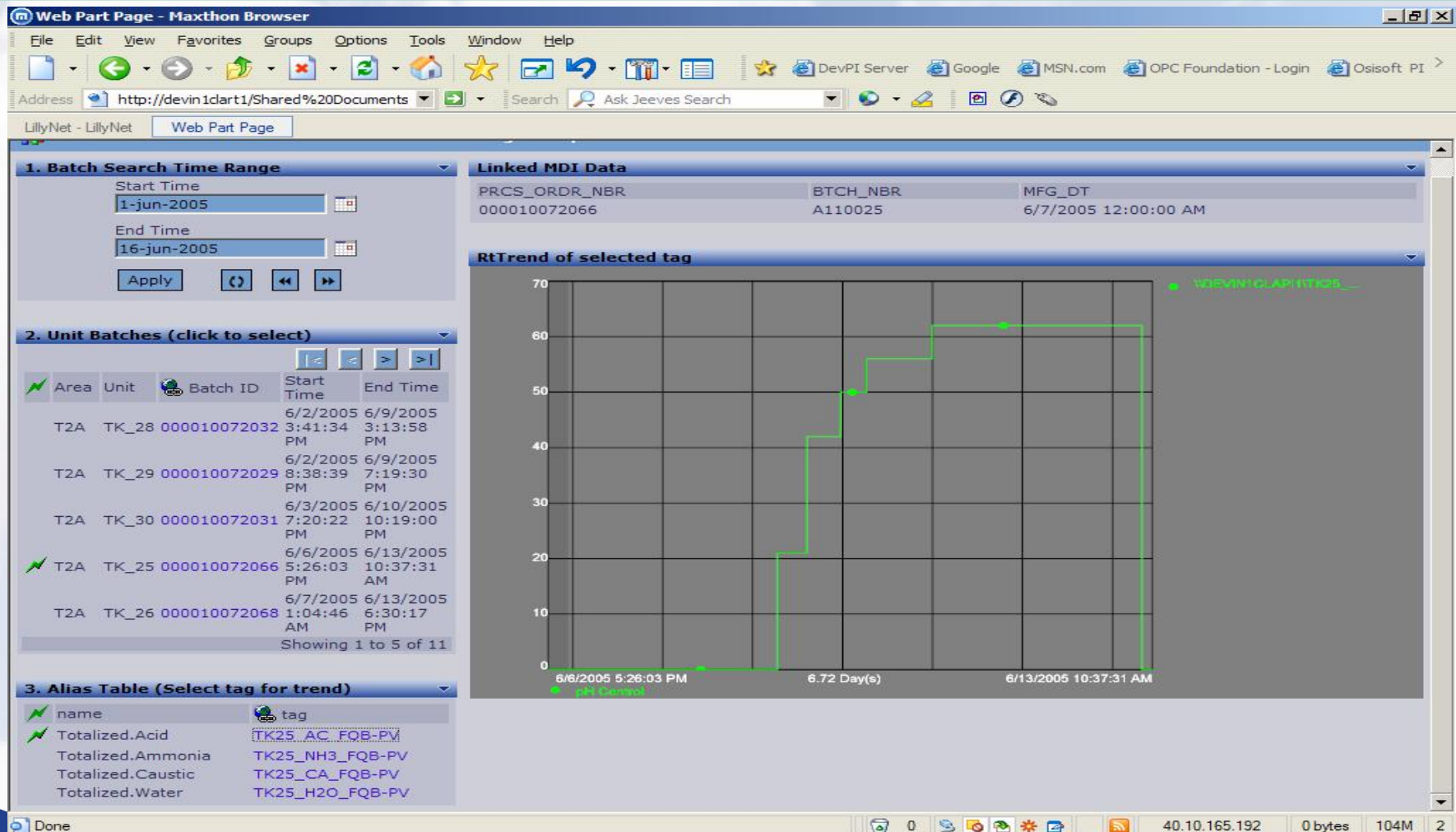
PI Deployment Status

- > 12 PI Enterprise Servers have been implemented
- Corporate Resource Maintains :
 - ▶ the coordination of the implementations
 - ▶ PI product evaluation and for supporting products deployment
 - ▶ Permanent lab setup for testing
 - ▶ Pilot tests
 - ▶ Intranet-based PI client deployment

Next Steps

- RtWebParts deployment
- RtReports deployment
- Replace multiple Biles and Associates AIM systems with PI
- Integration and use of PI data for extended data analysis and high-level business decision support

Portal Technology Prototype



Server Point Counts

Web Part Page - Maxthon Browser

File Edit View Favorites Groups Options Tools Window Help

Address http://devin1dart1/Shared%20Documents Search Ask Jeeves Search

LillyNet - LillyNet Web Part Page

Home Documents and Lists Create Site Settings Help

PI Server PerfMon

Modify Shared Page

Site Server Tag (Point) Count

ServerName	Descriptor	Time	Value	TagName
devin1clapi1	Total number of defined points. This number includes the Connector Point Count.	11/15/2006 1:41:15 PM	5510	piBasess_Point Count
cl1c41h01	Total number of defined points. This number includes the Connector Point Count.	11/15/2006 1:41:17 PM	9282	piBasess_Point Count
cl1chsh01	Total number of defined points. This number includes the Connector Point Count.	11/15/2006 1:41:14 PM	3331	piBasess_Point Count
dveyk2app06	Total number of defined points. This number includes the Connector Point Count.	11/15/2006 1:41:12 PM	1366	piBasess_Point Count
in1b110pi01	Total number of defined points. This number includes the Connector Point Count.	11/15/2006 1:41:12 PM	8190	piBasess_Point Count
in1b110pi02	Total number of defined points. This number includes the Connector Point Count.	11/15/2006 1:41:14 PM	2006	piBasess_Point Count

Site Server Module Count

ServerName	Descriptor	Time	Value	TagName
devin1clapi1	Module Count	11/15/2006 1:32:15 PM	824	DEVIN1CLAPI1_Module Count
cl1chsh01	Module Count	11/15/2006 1:35:04 PM	16	CL1CHSH01_PI Base Subsystem_Module Count
cl1c41h01	Module Count	11/15/2006 1:38:27 PM	827	CL1C41H01_PI Base Subsystem_Module Count
dveyk2app06	Module Count	11/15/2006 1:37:27 PM	120	DEVYK2APP06_PI Base Subsystem_Module Count
in1b110pi01	Module Count	11/15/2006 1:36:47 PM	98	IN1B110PI01_PI Base Subsystem_Module Count
in1b110pi02	Module Count	11/15/2006 1:37:54 PM	26	IN1B110PI02_PI Base Subsystem_Module Count

Done 0 40.10.165.192 0 bytes 121M 2

RtReports Prototype

RtReports Report Viewer - Microsoft Internet Explorer provided by Eli Lilly and Company

Address <http://devin1clart1/RtReports/webpages/ReportTemplate.aspx?ReportName=Fermentation%20Batch%20Report&ReportVer=3.0&UniqueID=ae240876-9823-4f04-baf3-49c> Go

 **Lilly TL441**
Lafayette, IN

Batch Report

Manufacturing Ticket Information:

Product	Tylosin
Process Order Number	000010072039
SAP Batch ID (from MDI)	---

Report Not Printed

Batch Feed Totals

Process Cell :	TK_49
Procedure :	QI0028

Parameter	Tag (Description)	Actual Value
Water	TK49_H2O_FQB-PV (WFO Feed)	21386.81
Acid	TK49_AC_FQB-PV (pH Control)	0.00
Ammonia	TK49_NH3_FQB-PV (Ammonia Feed)	117.73
Caustic	TK49_CA_FQB-PV (pH Control)	51173.09

Sterilization Step Data

Process Cell (Description):	TK_49
Procedure (Description) :	QI0028

Operation	Start Time	End Time	Duration
STERILIZATION:1-1	02-Jun-05 11:32:31 AM	02-Jun-05 07:44:37 PM	8 hours 12 minutes 5.7 seconds

Parameter	Tag (Descriptor)	Value	Time recorded
Max Sterile Temp:	TT-49B-PV (Sterilization Temperature Transmitter B)	122.06	02-Jun-05 03:33:48 PM
Sterilization:	ST_TIMER_49-PV (Sterilization Timer)	65.00	02-Jun-05 03:32:20 PM
Max F0:	TK49_F0-PV (Ro and Fo Calculations)	3.33	02-Jun-05 02:19:35 PM

VOYAGE2007



***Thank
You***

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VALUE NOW, VALUE OVER TIME