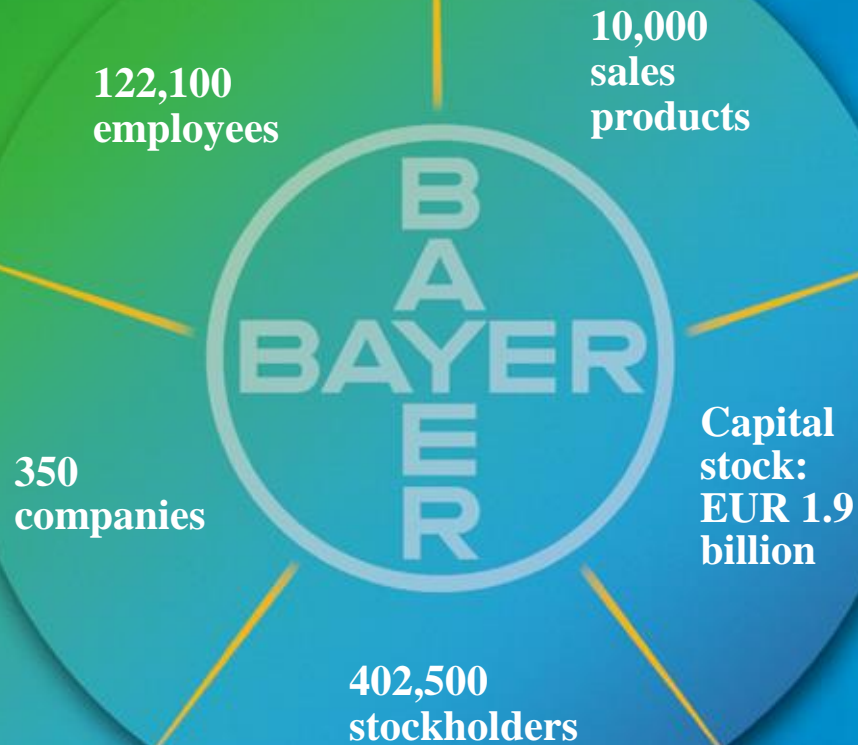


PIMS - one step ahead in process optimization

Lothar A. Lang
Bayer Corp.

Bayer Group



Locations Worldwide



Employees

Bayer Group **122,100**

Europe **69,500**
Germany *56,200*

**Asia/
Pacific** **12,400**

North America **25,000** **Latin America/
Africa/Middle East** **12,000**



Key Data 2000



* from continuing operations

Polymers

Business Groups and Business Units



Plastics

Polycarbonates

Styrenics

Semicrystalline
Thermoplastics

Films

Sheets

Thermoplastic
Polyurethanes

Rubber

Synthetic Rubber

Rubber
Chemicals

PolymerLatex

Rhein Chemie

Polyurethanes

Specialties

Comfort

Insulation

Coatings and Colorants

Aliphatic Isocyanates

Aromatic Isocyanates

Resins

Special Raw Materials

Aqueous Dispersions

Inorganic Colorants

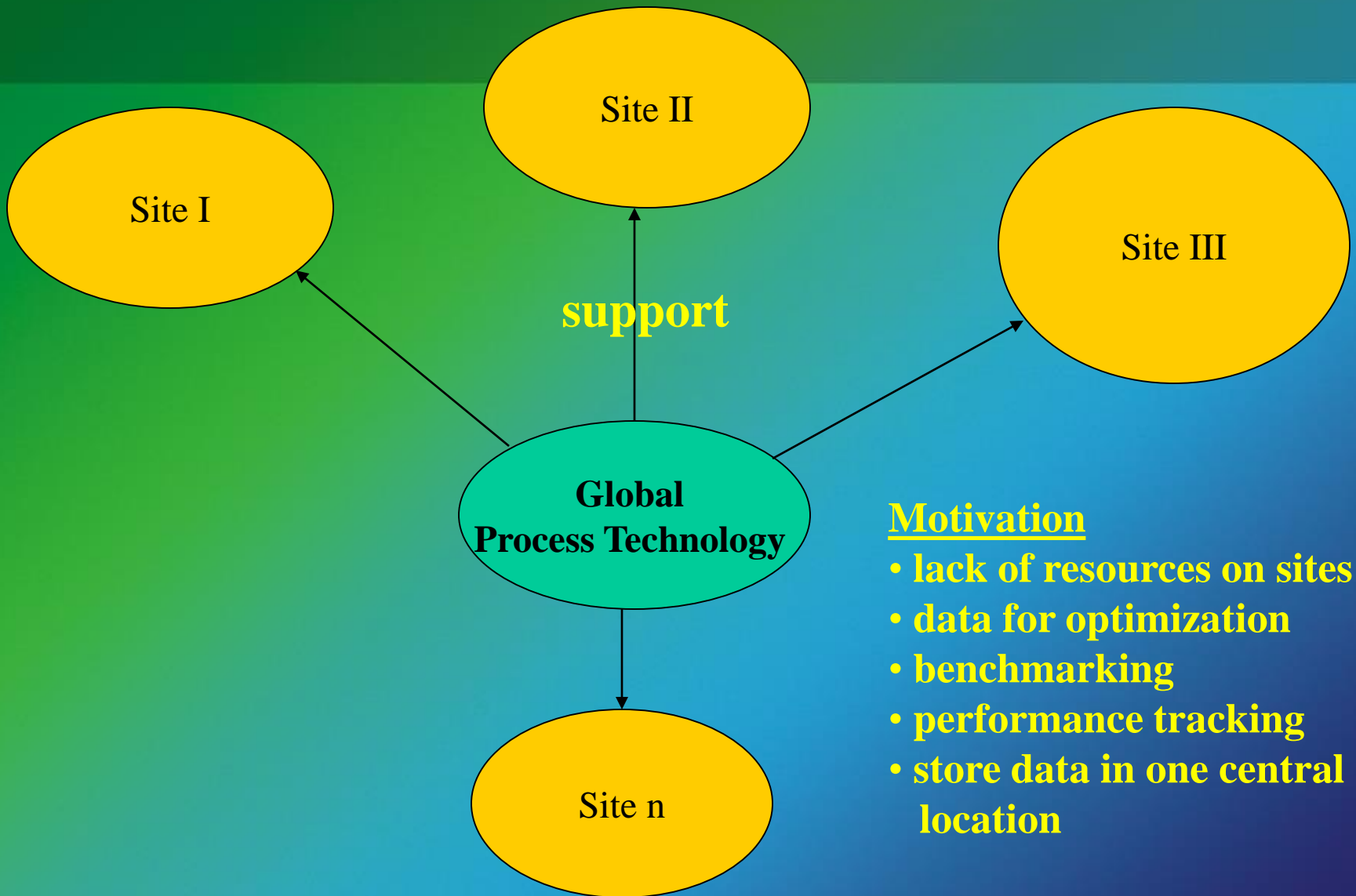
Organic Colorants

Fibers

Dorlastan

Monofil

As of January 1, 2002

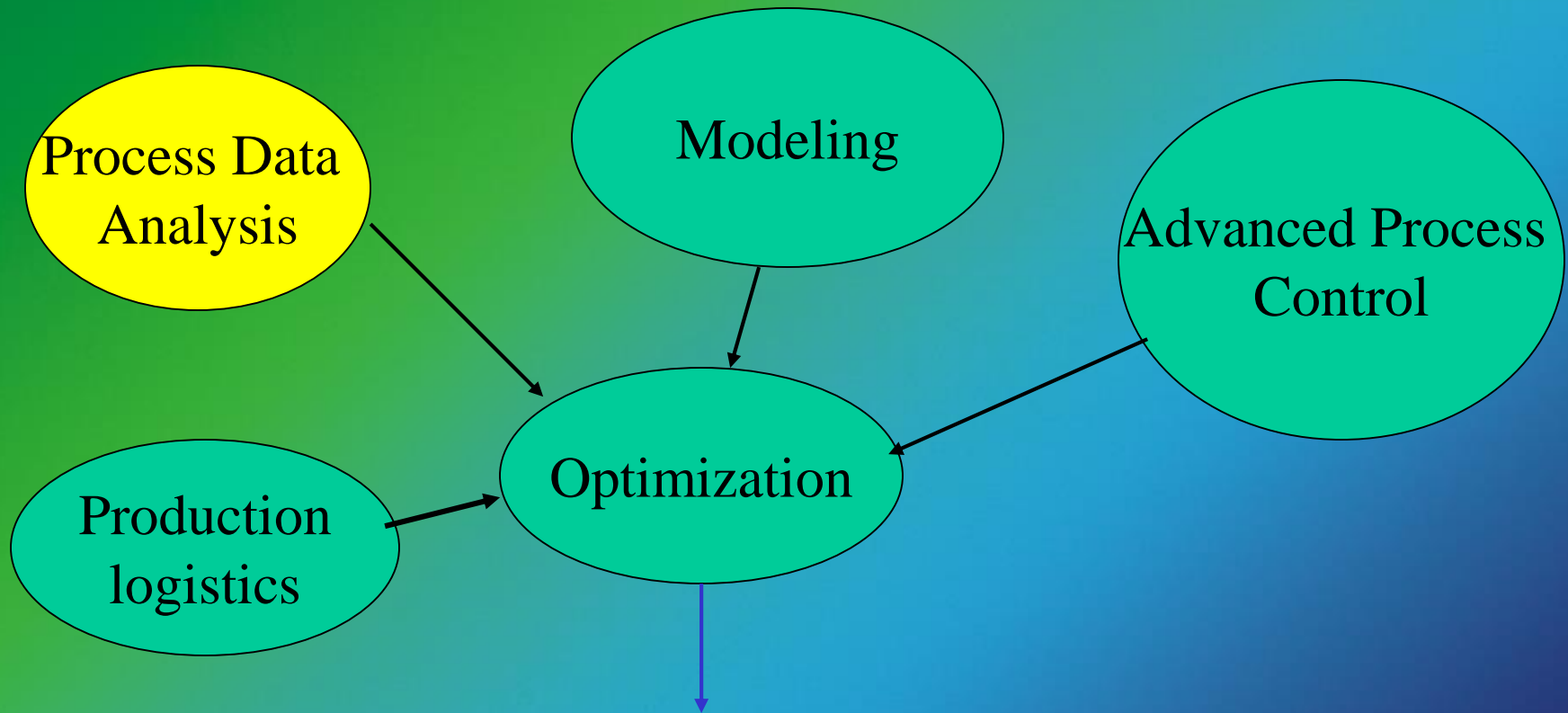


Motivation

- lack of resources on sites
- data for optimization
- benchmarking
- performance tracking
- store data in one central location

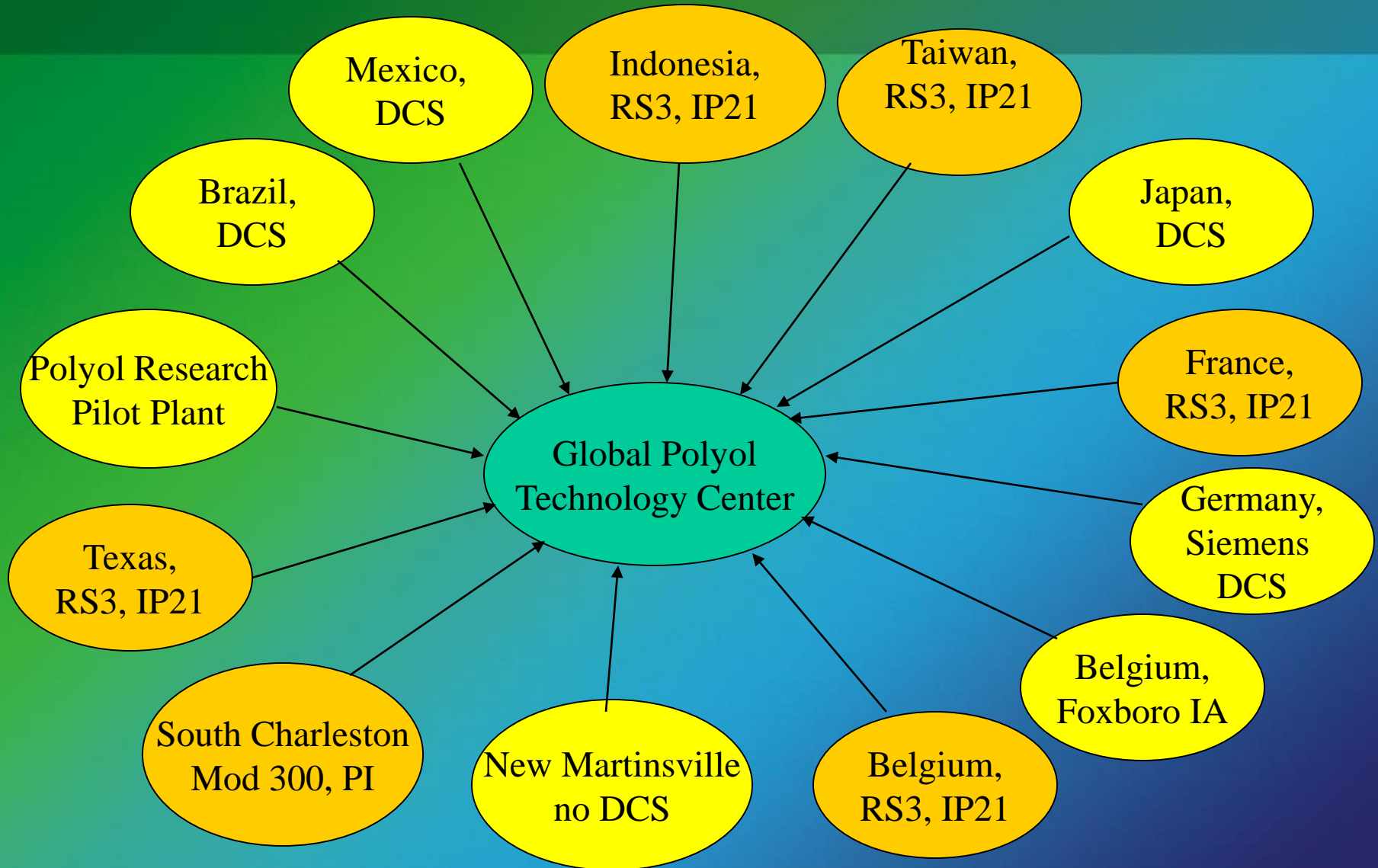
Improve asset utilization

Optimization issues



- Reduce specific production cost
- Increase capacity
- Reduce process and quality variations

PIMS network for Polyol

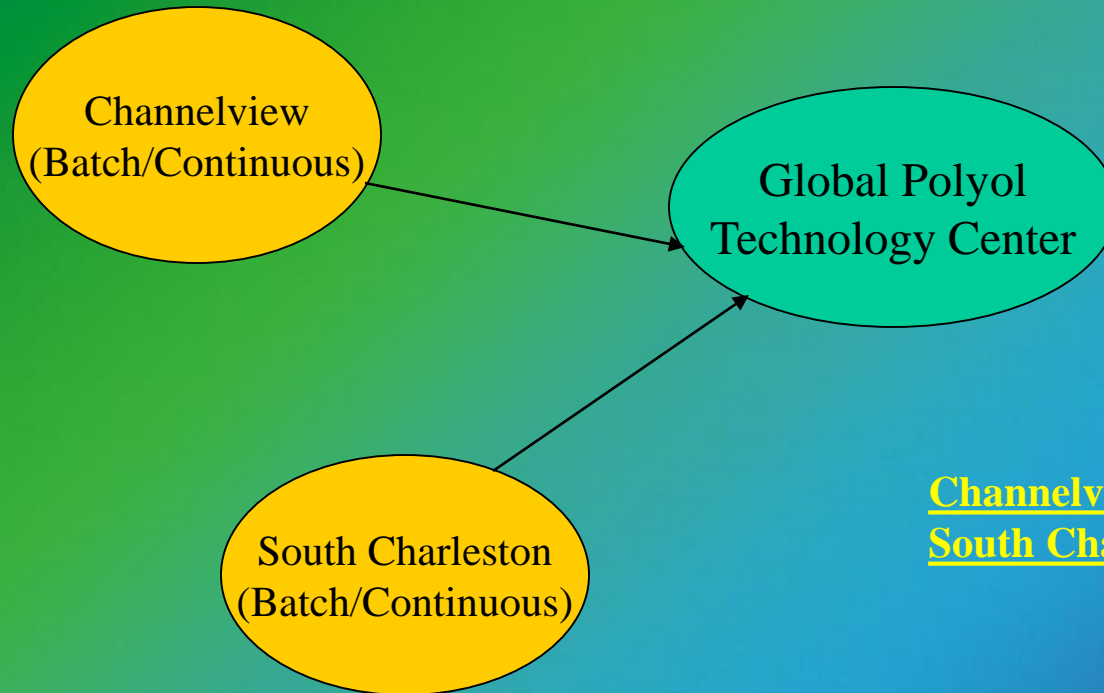


→ Process, Lab and Batch data

Selection of PI system

- Complex process data infrastructure
- International environment
- Batch tracking and handling
- Modular database
- Support / understanding for our needs
- Use off the shelf analysis products

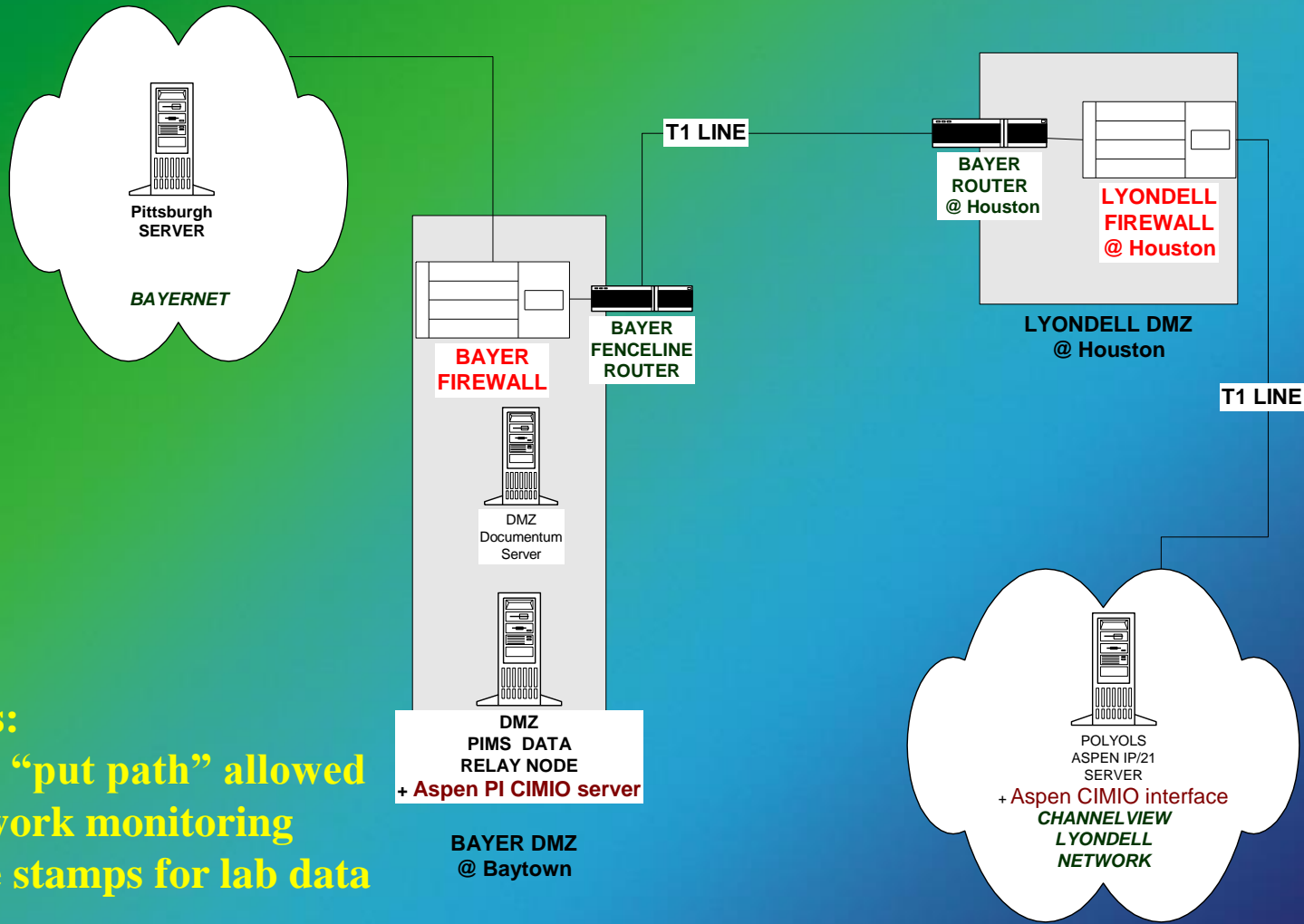
PIMS network for Polyol (phase I)



Channelview: InfoPlus21 (=> CIM-IO)
South Charleston: ABB DCS (MOD300)
and PI system since Nov
2001

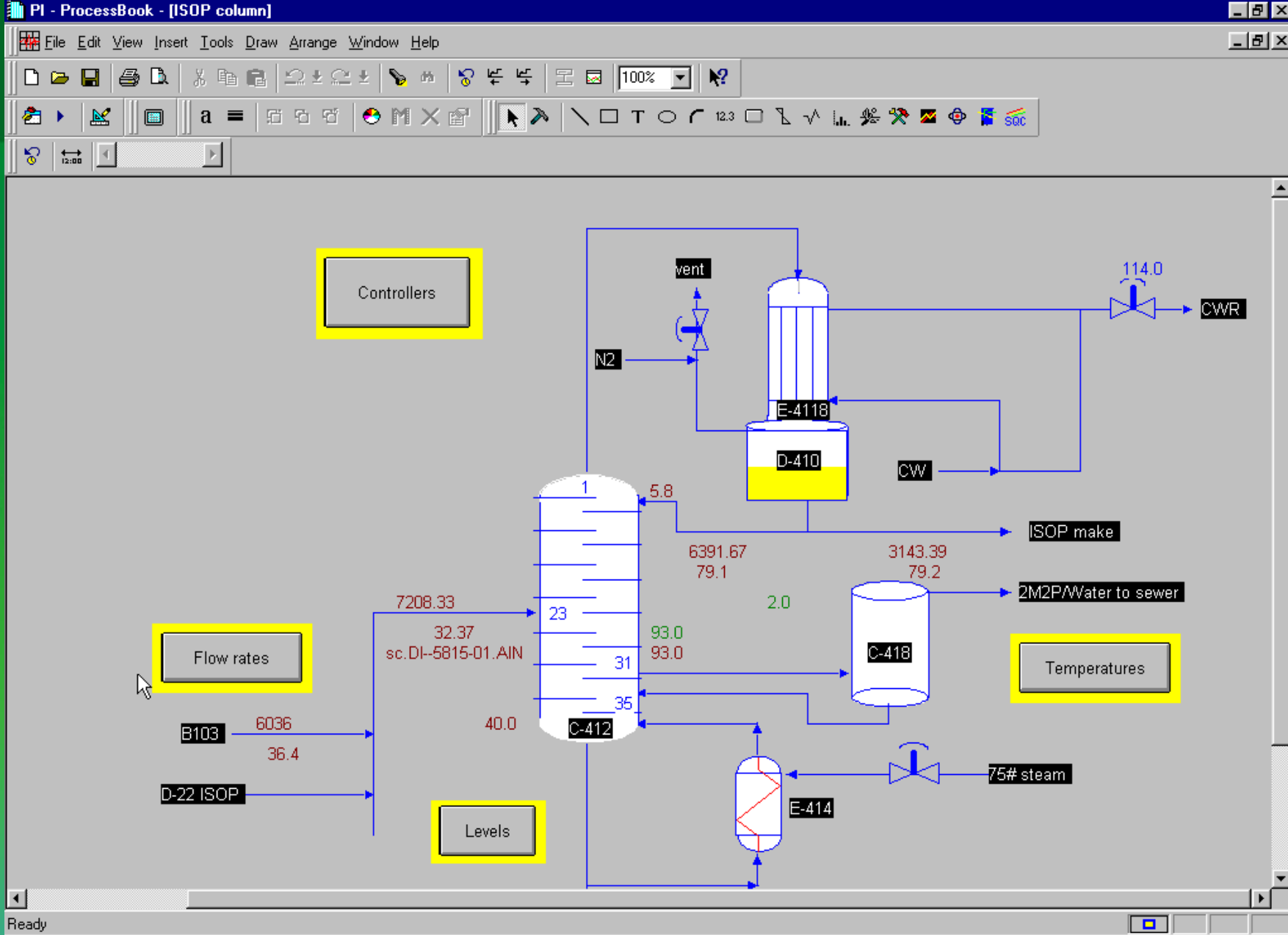
→ Process, Lab and Batch data

Channelview PIMS Connectivity Plan



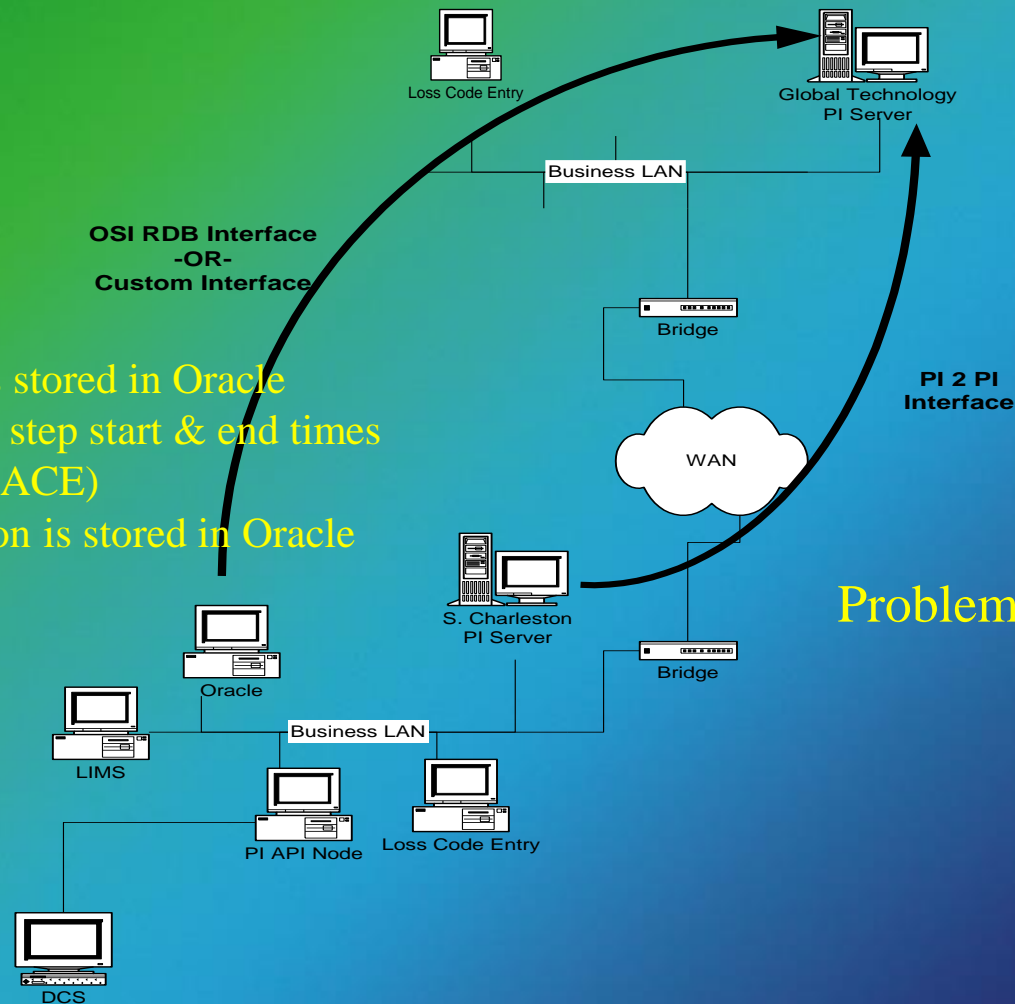
Issues:

- only “put path” allowed
- network monitoring
- time stamps for lab data



PI Architecture for South Charleston

- All recipe information is stored in Oracle
- All actual batch & batch step start & end times are stored in Oracle (via ACE)
- All Loss code Information is stored in Oracle



Problem: Limited Analysis

What PI Products Were Installed

- PI UDS 3.3
- New PI Batch System
- PI Module Database
- PI ACE
- Processbook
- Batch Tools (Batch View & Batch Trend)
- SDK (Software Development Kit)

How Where The Tools Used

- New Batch System

PI Module Database Editor - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Reload Search Favorites History

Address C:\Program Files\pipc\SMT\MDBEditor\MDBEditor.html Go Links

Reactor 1

Folder Items

- My Module Databases
 - localhost
 - PI BatchDB
 - PI ModuleDB
 - %OSI
 - BatchTrend
 - BatchUnits
 - Reactor 1
 - Reactor 10
 - Reactor 11
 - Reactor 12
 - Reactor 2
 - Reactor 3
 - Reactor 4
 - Reactor 5
 - Reactor 6
 - Reactor 7
 - Reactor 8
 - Reactor 9
 - Templates
 - Reactor 1
- Register PI Servers


Sub-Modules

PIAlias Name	Tag Name	Server	Snapshot Value	Snapshot Time
Comments\OperatorComments\FLEXOL_PHASE.DA4	Point A	localhost	99.11861	3/6/2002 7:41:00 AM
Comments\OperatorComments\FLX-RX:STR	Point B	localhost	96.7765	3/6/2002 7:41:00 AM
Operation\Operation\FLEX_SIC:STR	Point C	localhost	95.23626	3/6/2002 7:41:00 AM
Sensors\BOT_BACK_PSI.AIN	Point D	localhost	98.02559	3/6/2002 7:41:00 AM
Sensors\BOT_BACK_PSI.AOT	Point E	localhost	96.66879	3/6/2002 7:41:00 AM
Sensors\BOT_BACK_PSI.PID	Point F	localhost	91.98066	3/6/2002 7:41:00 AM
Sensors\BOT_DTNK_LL.AIN	Point G	localhost	83.68296	3/6/2002 7:41:00 AM
Sensors\DSPA.AOT	Point H	localhost	90.36099	3/6/2002 7:40:30 AM

PI Properties

0 Objects Type: PIModule Aliases: 8 Properties: 0 Effective Date: 12/31/1969 7:00:01 PM Query Date: 3/6/2002 7:41:25 AM Creator: piadmin ParentCount: 1

Done My Computer



How Where The Tools Used

- Module Database

PI Module Database Editor - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites History Print View Source Help

Address C:\Program Files\pvc\SMT\MDBEditor\MDBEditor.html Go Links

Transfer

Folder Items

- My Module Databases
 - localhost
 - PI BatchDB
 - PI ModuleDB
 - %OSI
 - BatchTrend
 - RecipeSteps
 - Agitate
 - Default
 - Fill A
 - Transfer
 - UnitXRef
 - BatchUnits
 - Templates
 - Reactor 1
 - Register PI Servers

PIProperty Name	Value	Datatype
Sensors\BOT_BACK_PSI.PID	Sensors\BOT_BACK_PSI.PID	String
Sensors\BOT_DTNC_LL.AIN	Sensors\BOT_DTNC_LL.AIN	String

0 Objects Type: PIModule Aliases: 0 Properties: 2 Effective Date: 12/31/1969 7:00:01 PM Query Date: 3/6/2002 7:40:16 AM Creator: piadmin ParentCount: 1

Done My Computer

How Where The Tools Used

- SDK Processbook & Batch Tools

Batch Process SIC - SICPRD_PIV

File View Batch Help

Mode: View

Batch #: 412

Recipe: XYZ_R1

Resource: Reactor 1

Reactor 1

Batch Plot

	Actual	Target
Availability	100%	100%
Rate	120%	100%
Quality	100%	100%
OEE	120%	100%

Step	Time	Duration	Loss Codes					
#	Title	Start	End	Actual	Target	Diff.	Avail	Rate
1	RECIPE CALC	11:45	11:48	00:03	00:15	-00:11		
2	INITIALIZE	11:48	11:52	00:03	N/A	00:03		Equipment Failure\Con
3	FILL A	11:52	12:15	00:22	00:32	-00:09		
4	AGITATE	12:15	14:01	01:46	03:54	-02:08		
5	FILL B	14:01	21:55	07:54	08:51	-00:57		
6	AGITATE	21:55	06:43	08:48	09:15	-00:26		
7	COOKOUT	06:43	10:48	04:04	04:35	-00:30		
8	TRANSFER	10:48	14:28	03:40	04:00	-00:19		

Total Duration: 1 02:42 Target Duration: 1 07:22 Quality: PASS Loss Code:

Recipe Batch Weight: 100000 Lbs Actual Batch Weight: 999998 Lbs Material Charges: Lbs

Instructions

Step 1 Tasks

Value 1 Value 2

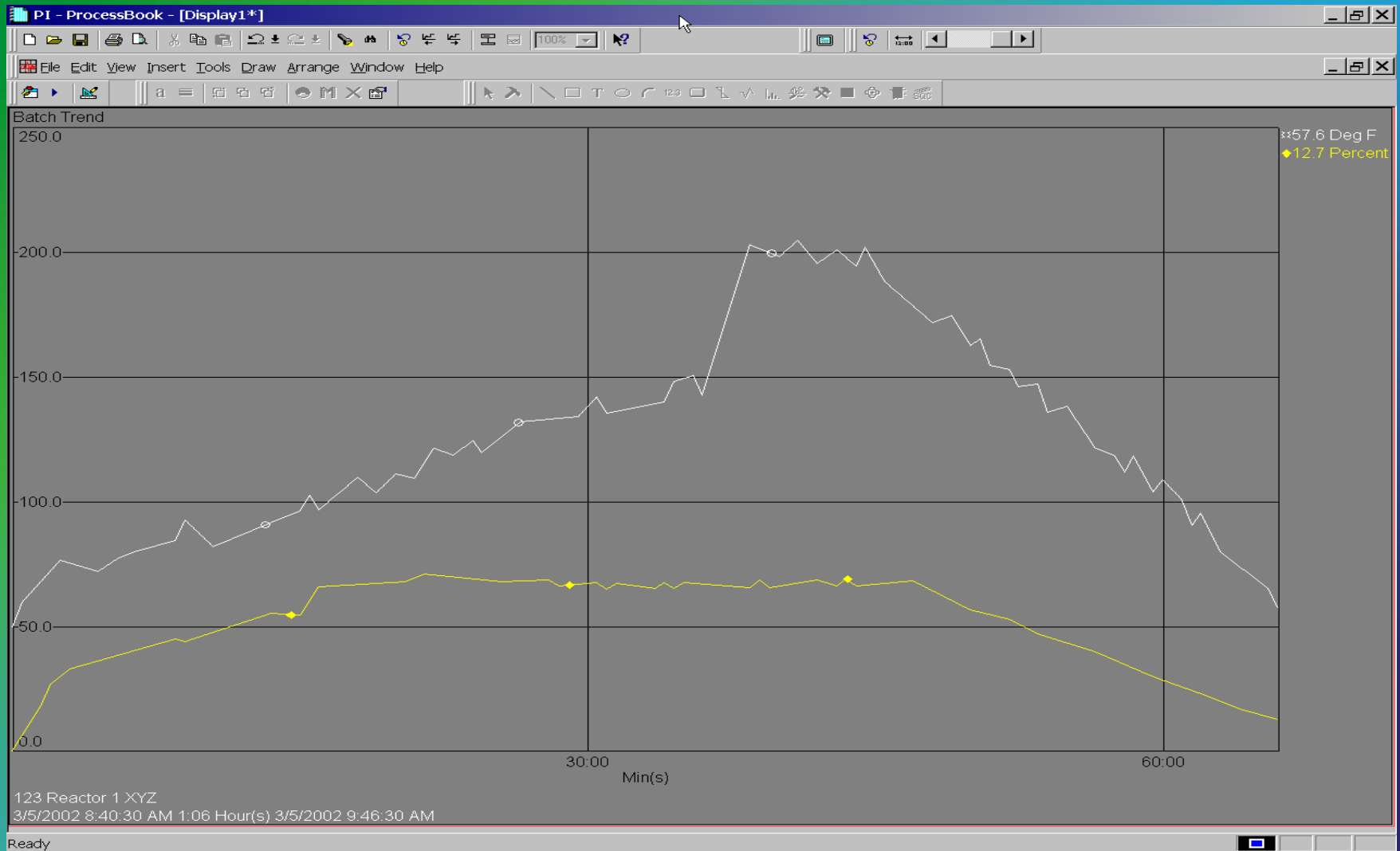
Logged on User: None

Show Comments



How Where The Tools Used

- SDK Processbook & Batch Tools



Plant Benefits from PIMS

- On-line archiving of all relevant process and lab data
 - Complete data sets (including loss codes)
 - High quality of data
 - Fast search and access to data (including loss codes)
 - Use real time data for step analysis
 - Prove of process capability (to customer)
- Automatic documentation of production
 - no longer manual documentation
 - less routine work for production staff
 - better access and availability of information
 - Batch tracking
- Profitability
 - Opportunities for reduction of energy cost
 - Improve customer relation

Plant Benefits of PIMS

- Correlation of quality data with process data
 - Base for reducing quality variations and off spec production
 - Easy support of debottlenecking
 - Increase process capability
- Opportunity for online monitoring
 - Early detection of bad batches
 - Early detection and correction of quality deviations
 - Reduction of off spec production
 - Reduction of lab cost
- Support of recipe controlled production
 - direct transfer of recipe to DCS before start of a new batch production
 - reduction of operational staff from manual inputs
 - “produce reproducible”

Bayer Additional Benefits from Global PIMS

- On-line archiving of all relevant process and lab data
 - Actual overview of the different Polyol units
 - Benchmarking
 - Reduction of travel to sites for data gathering
 - Quick reconciling for debottlenecking or expansion projects
 - Allow for batch to batch analysis
- Capacity
 - Help increasing asset utilization by reducing variability and increasing availability and reliability
 - Support root cause analysis with loss codes
- Profitability
 - Optimization (better process knowledge)
 - Competitive advantage

Keys to success

- Acceptance and ownership of the sites
- Increase sensibility
- Inclusion of process data for root cause analysis
- Convince upper management about profitability
- Responsiveness of management
- Good instrumentation (measurable)
- Decrease variations
- Good control performance