OSIsoft®
USERS CONFERENCE
2009
SAN FRANCISCO

Leveraging SAP MII with OSIsoft PI Infrastructure

Presented by Mike Lyons

Celanese

Empowering Business in Real Time
PI Infrastructure for the Enterprise

Copyright Celanese International Corp. 2009

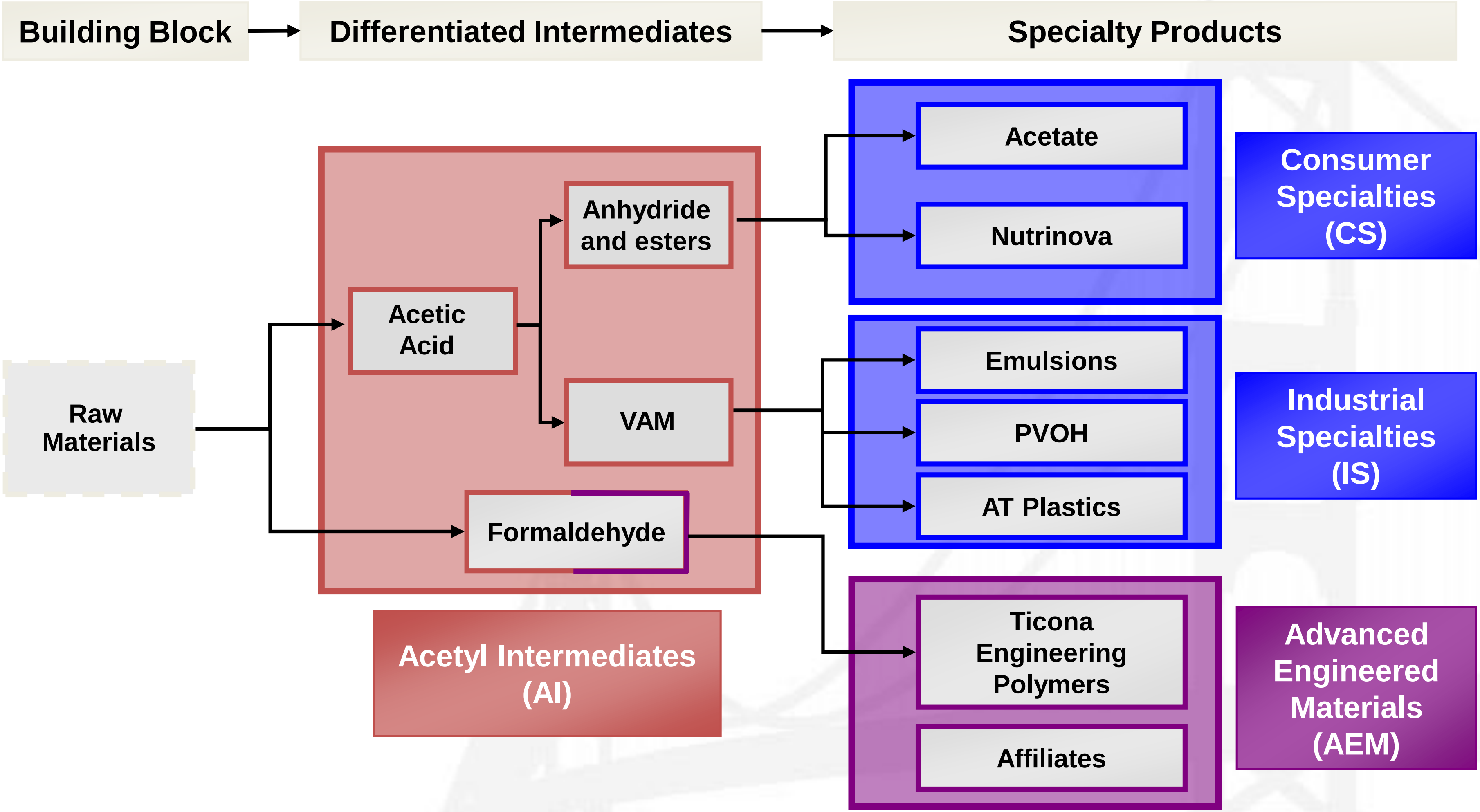
Agenda

- Celanese Overview
- Global Integration Challenges
- MII History
- PI History
- Landscape
- PI Connection Techniques
- Applications
- Summary

Celanese is a leading global chemical company

- We produce chemicals and advanced materials used in consumer products and industrial applications
- 95% of our products hold a leading market position
- Based in Dallas, Texas, we have approximately 8,000 employees worldwide.
- Ranked 367 on the Fortune 500 in 2008
- Over $6.8 billion in sales in 2008

Our integrated businesses are aligned to accelerate growth


Building Block
Differentiated Intermediates
Specialty Products
Raw Materials
Acetic Acid
Anhydride and esters
VAM
Formaldehyde
Acetyl Intermediates (AI)
Acetate
Nutrinova
Consumer Specialties (CS)
Emulsions
PVOH
AT Plastics
Industrial Specialties (IS)
Ticona Engineering Polymers
Affiliates
Advanced Engineered Materials (AEM)

A leading global integrated producer

Celanese

($ in millions)

2008 Revenue[1,2]: $6,823

Our Core Businesses

Acetyl Intermediates

2008 Revenue[1]: $3,199

- Leading global integrated producer of acetyl products

Consumer Specialties

2008 Revenue[1]: $1,155

- Leading global producer of cellulose acetate products

Industrial Specialties

2008 Revenue[1]: $1,406

- Leading global producer of vinyl emulsion products

Adv. Engineered Materials

2008 Revenue[1]: $1,061

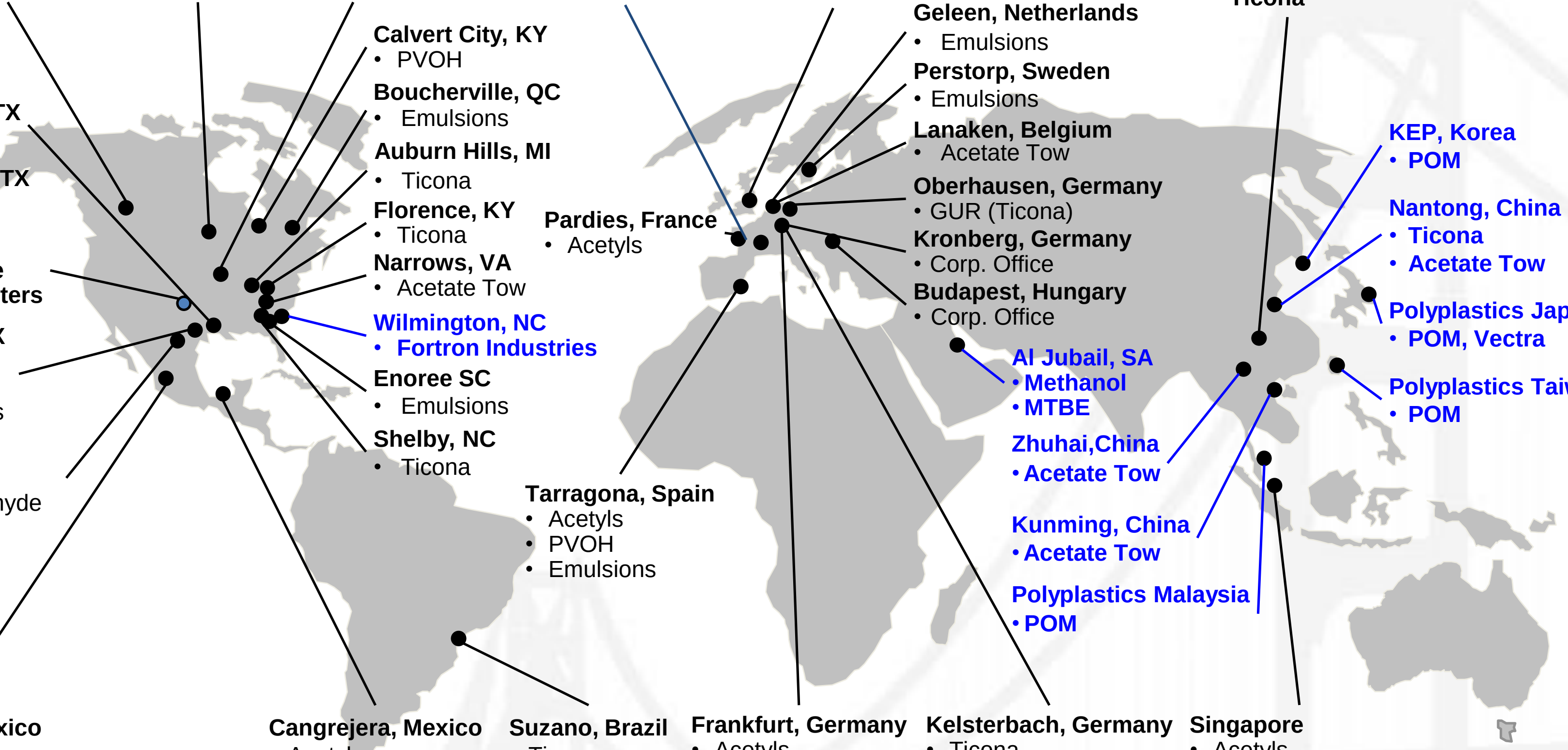
- Leading global producer of engineered polymers

---

[1] Represents Net Sales

[2] Total 2008 Revenue includes Other Activities of $2

Celanese Locations



Edmonton, Alberta
- AT Plastics

Winona, MN
- Ticona

Meredosia, IL
- Emulsions

Pasadena, TX
- PVOH

Clear Lake, TX
- Acetyls

Dallas, TX
- **Corporate Headquarters**

Bay City, TX
- Acetyls
- Acetyl derivatives

Bishop, TX
- GUR
- Formaldehyde

Calvert City, KY
- PVOH

Boucherville, QC
- Emulsions

Auburn Hills, MI
- Ticona

Florence, KY
- Ticona

Narrows, VA
- Acetate Tow

Wilmington, NC
- **Fortron Industries**

Enoree SC
- Emulsions

Shelby, NC
- Ticona

Roussillon, France
- Acetyl Derivatives

Pardies, France
- Acetyls

Spondon, UK
- Acetate Tow

Tarragona, Spain
- Acetyls
- PVOH
- Emulsions

Geleen, Netherlands
- Emulsions

Perstorp, Sweden
- Emulsions

Lanaken, Belgium
- Acetate Tow

Oberhausen, Germany
- GUR (Ticona)

Kronberg, Germany
- Corp. Office

Budapest, Hungary
- Corp. Office

Al Jubail, SA
- **Methanol**
- **MTBE**

Zhuhai,China
- **Acetate Tow**

Kunming, China
- **Acetate Tow**

Polyplastics Malaysia
- **POM**

Nanjing, China
- **Acetyls**
- **Emulsions**
- **Ticona**

KEP, Korea
- **POM**

Nantong, China
- **Ticona**
- **Acetate Tow**

Polyplastics Japan
- **POM, Vectra**

Polyplastics Taiwan
- **POM**

Ocotlan, Mexico
- Acetate Tow

Cangrejera, Mexico
- Acetyls
- Acetyl derivatives
- Specialties

Suzano, Brazil
- Ticona

Frankfurt, Germany
- Acetyls
- Acetyl derivatives
- Emulsions
- Specialties
- Nutrinova

Kelsterbach, Germany
- Ticona

Singapore
- Acetyls
- Acetyls Derivatives

▬ **Joint Ventures**

The Integration Challenge

SAP
ECC 6

Many process units around the globe with …

Many different process control systems

Honeywell
TDC-3000

Siemens
S5 / S7

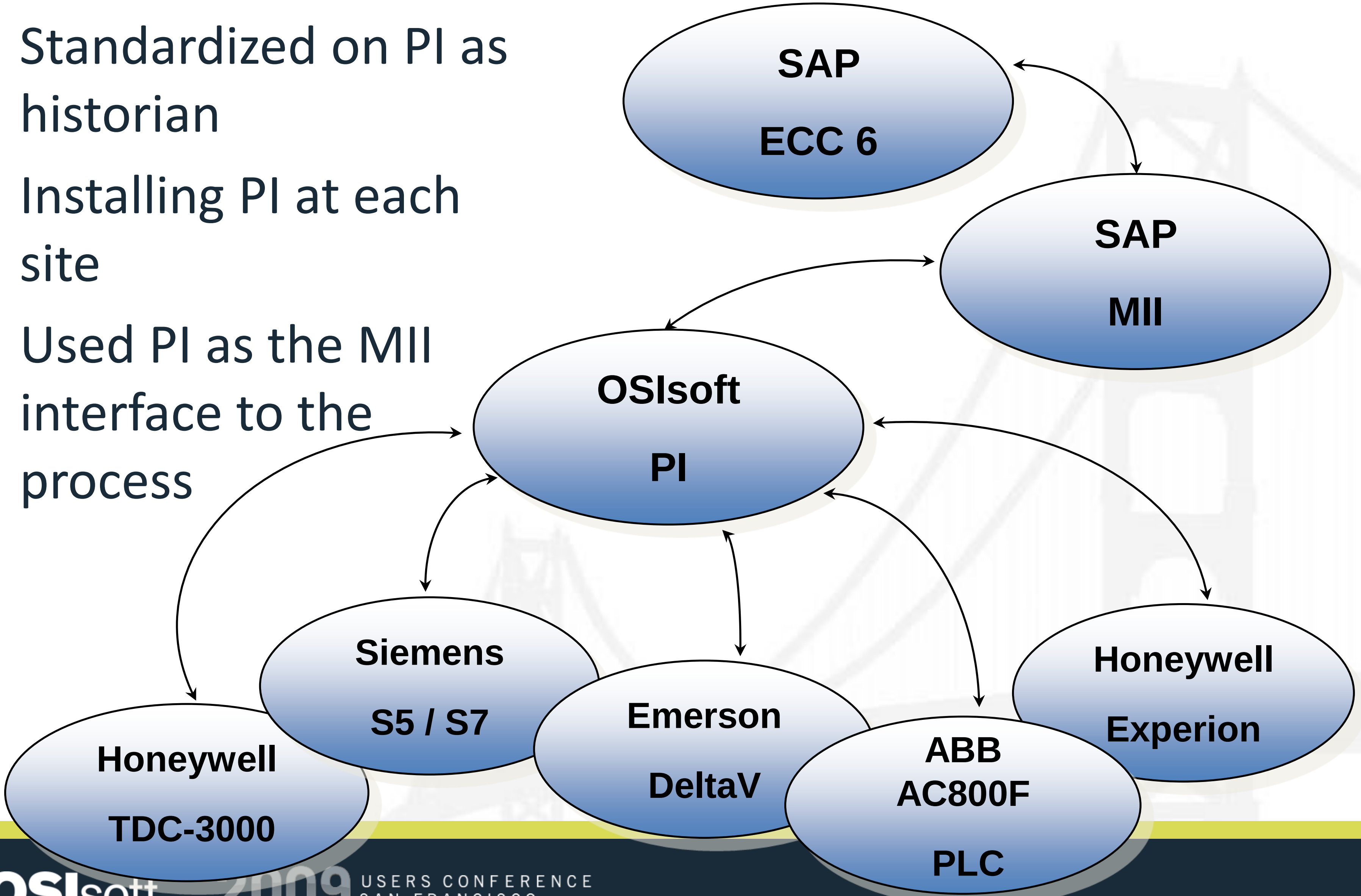
Emerson
DeltaV

ABB
AC800F
PLC

Honeywell
Experion

PI and MII to the Rescue

- Standardized on PI as historian
- Installing PI at each site
- Used PI as the MII interface to the process



SAP
ECC 6
SAP
MII
OSIsoft
PI
Siemens
S5 / S7
Emerson
DeltaV
Honeywell
TDC-3000
ABB
AC800F
PLC
Honeywell
Experion

History of SAP MII at Celanese

2004: Bishop Facility project; V10.1; PI UDS

2005: Nine new sites added

2006: MII Team formed; V11.0; PI OLE

2007: Application focus; One new site added

2008: Six new sites added; V11.5

2009: Plant Connectivity Ramp-up

History of PI at Celanese's Bishop Facility

1991: First Celanese PI Historian installed at Bishop

1998: Platform migration from VAX to Windows server

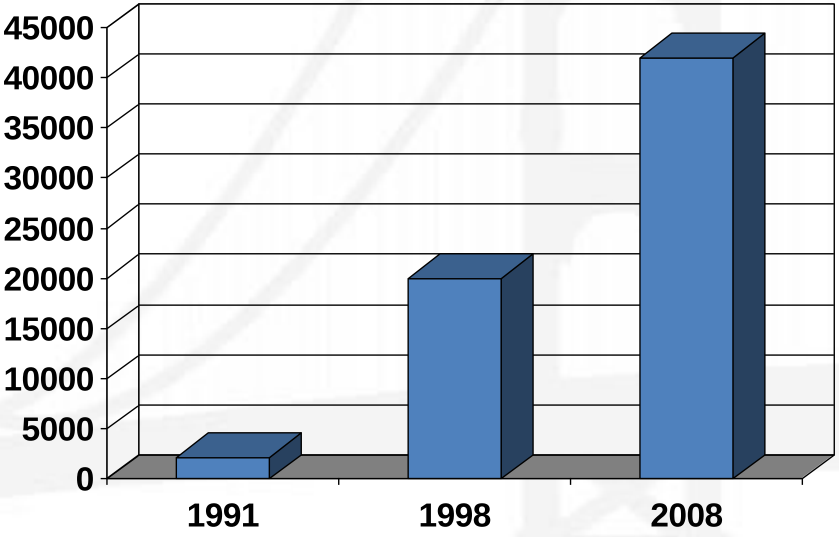
2004: First MII system connected; extensive use of PI-Batch

2007: Enterprise Agreement (EA) inked

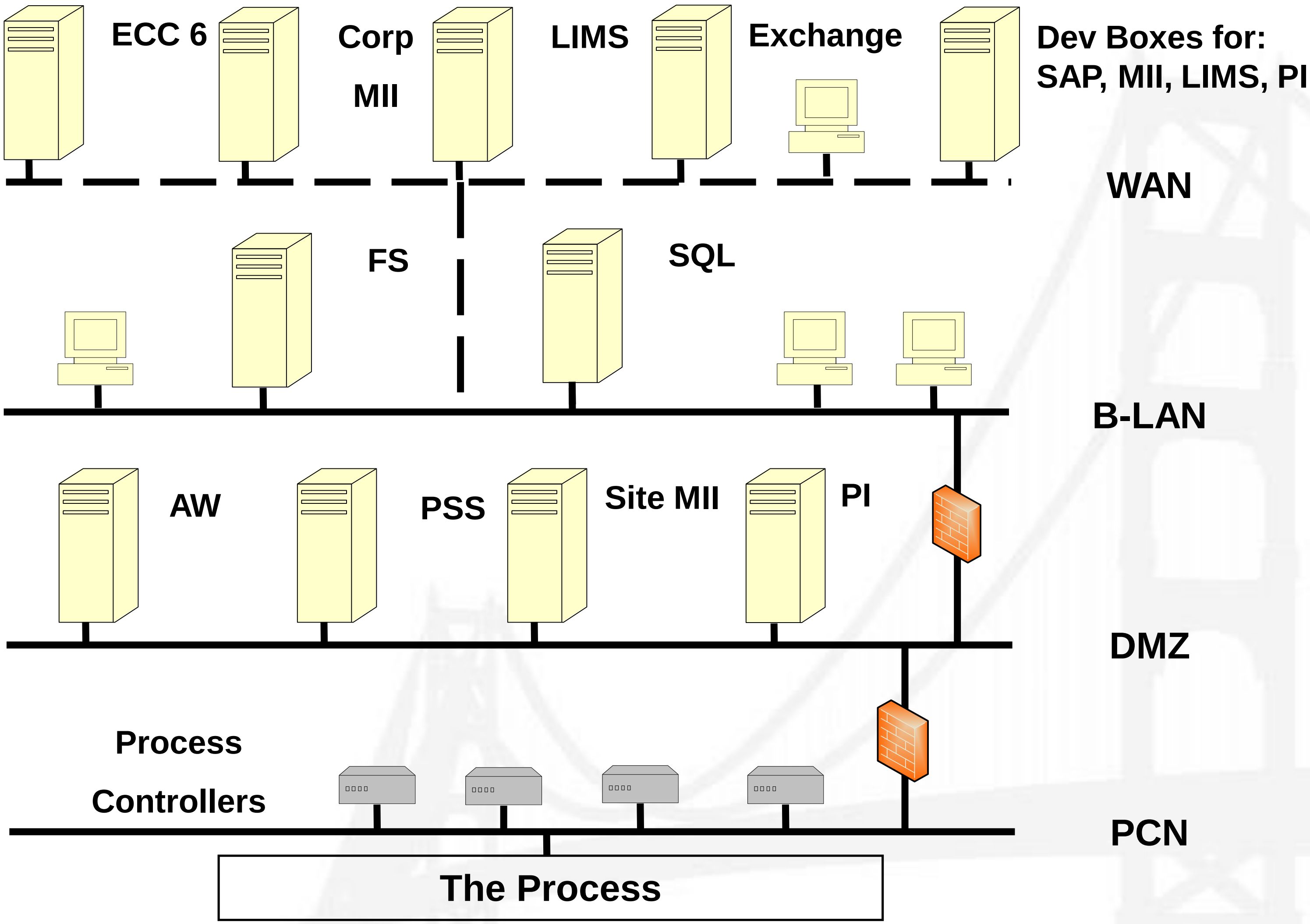
2009: First HA PI system

2009: Corporate PI resource

2009: NOC monitoring



Key Role of PI in Landscape

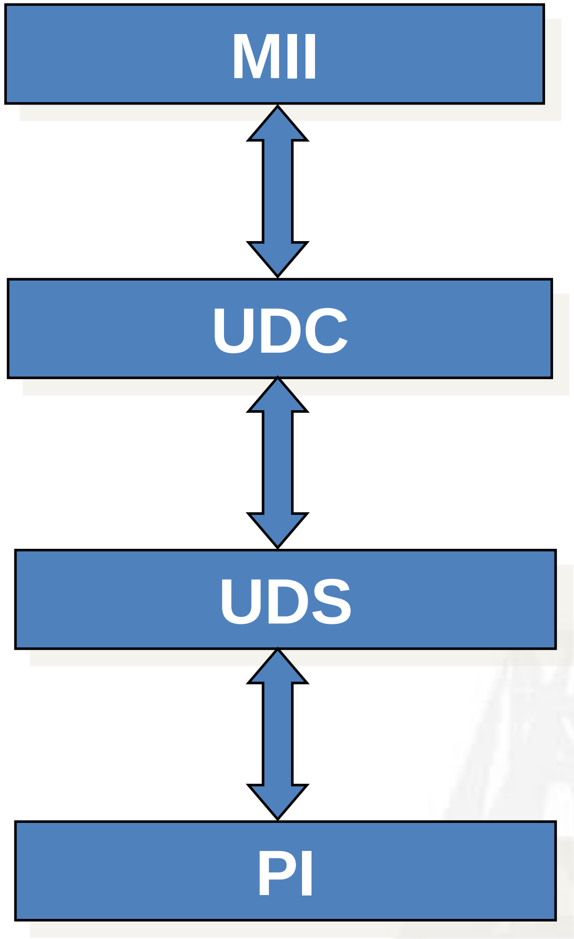

ECC 6
Corp
MII
LIMS
Exchange
Dev Boxes for:
SAP, MII, LIMS, PI
WAN
FS
SQL
B-LAN
AW
PSS
Site MII
PI
DMZ
Process
Controllers
PCN
The Process

SAP MII-PI Connectivity Methods

- Three connection types:
  - PI UDS (SDK/API)
  - PI UDS OLE (OLE)
  - Plant Connectivity 2.0 (OPC UA)

Let’s look at each more closely

UDS Connection Framework



MII Application

UDC Universal Data Connection

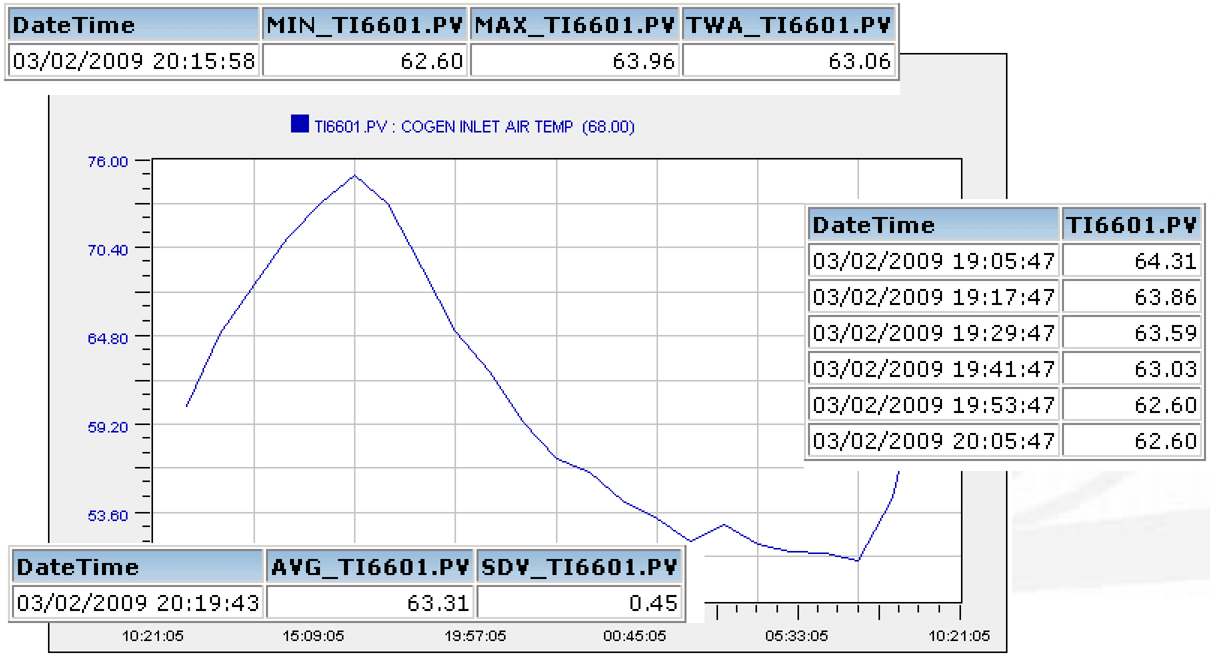
UDS Universal Data Server

PI Historian

PI UDS Tag Queries

- Easy template GUI
- Fast way to get archive data
- Common methods supported

- Current
- History
- HistoryEvent
- Statistics
  - Min
  - Max
  - Avg
  - Tot
  - Min, Max, Avg
  - Min, Max, TWA
  - Avg, SDV
  - TWA, SDV
- CurrentWrite



DateTime	MIN_TI6601.PV	MAX_TI6601.PV	TWA_TI6601.PV
03/02/2009 20:15:58	62.60	63.96	63.06

DateTime	TI6601.PV
03/02/2009 19:05:47	64.31
03/02/2009 19:17:47	63.86
03/02/2009 19:29:47	63.59
03/02/2009 19:41:47	63.03
03/02/2009 19:53:47	62.60
03/02/2009 20:05:47	62.60

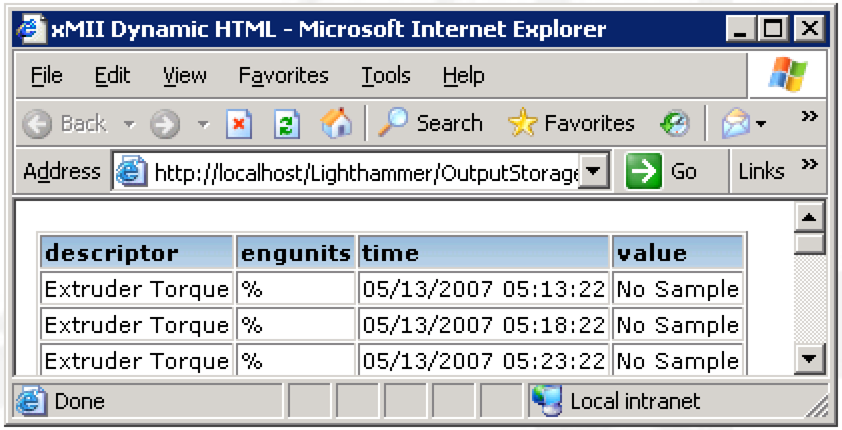
DateTime	AVG_TI6601.PV	SDV_TI6601.PV
03/02/2009 20:19:43	63.31	0.45

■ TI6601.PV : COGEN INLET AIR TEMP (68.00)
76.00
70.40
64.80
59.20
53.60
10:21:05
15:09:05
19:57:05
00:45:05
05:33:05
10:21:05

PI UDS OLE Queries

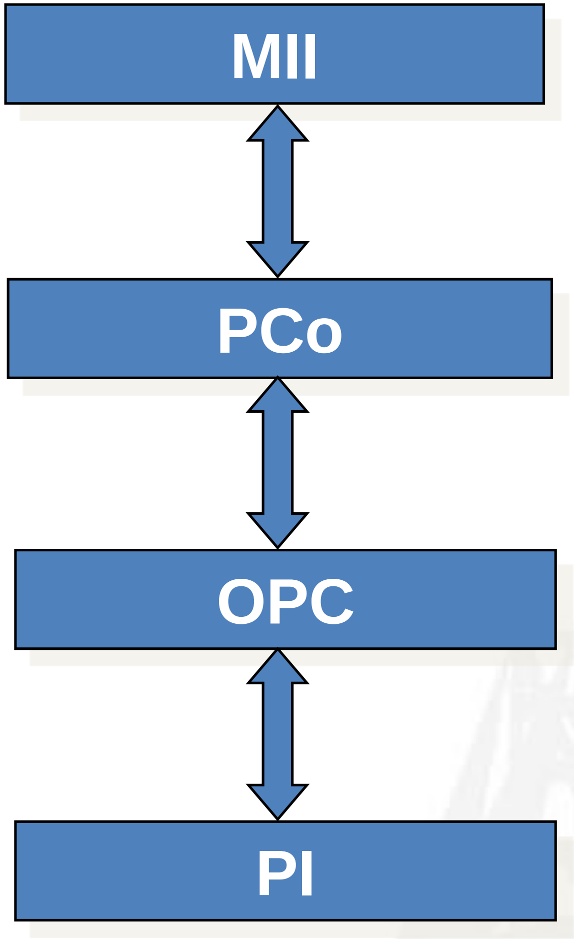
- Flexible SQL-style queries
- Great for tag attributes and filter expressions

```
SELECT p.descriptor, p.engunits, c.time, c.value

FROM piarchive..picalc c, pipoint..pipoint p

WHERE expr = 'If "[Param.1]" > [Param.3] then " [Param.2] " else "No Sample"'

AND time between [SD] and [ED]
AND timestep = '5m'
AND p.tag = '[Param.2]'
```


xMII Dynamic HTML - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://localhost/Lighthammer/OutputStorage
Go Links
Done
Local intranet

descriptor	engunits	time	value
Extruder Torque	%	05/13/2007 05:13:22	No Sample
Extruder Torque	%	05/13/2007 05:18:22	No Sample
Extruder Torque	%	05/13/2007 05:23:22	No Sample

OPC Connection Framework



Application

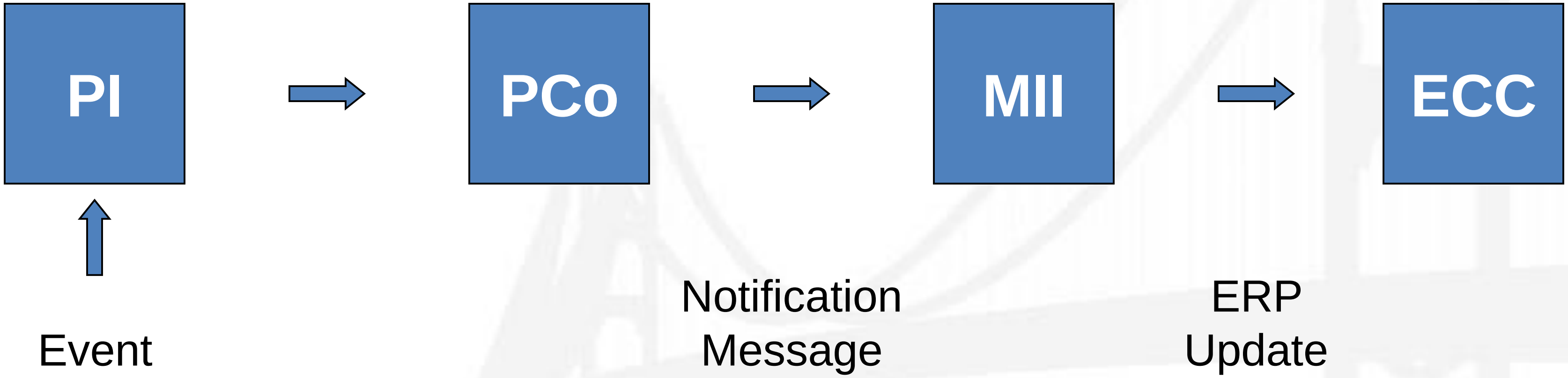
Plant Connectivity 2.0

OPC Server

Historian

Plant Connectivity 2.0

- Agent-based event subscriptions
- Notification messages
- MII can take specific action based on message
- Eliminates MII polling



PI
PCo
MII
ECC
Event
Notification Message
ERP Update

MII Applications

- SAP Integration
- Machine Setup
- Production Reports
- Schedule Compliance
- Batch Reports

MII Integration with SAP ECC 6

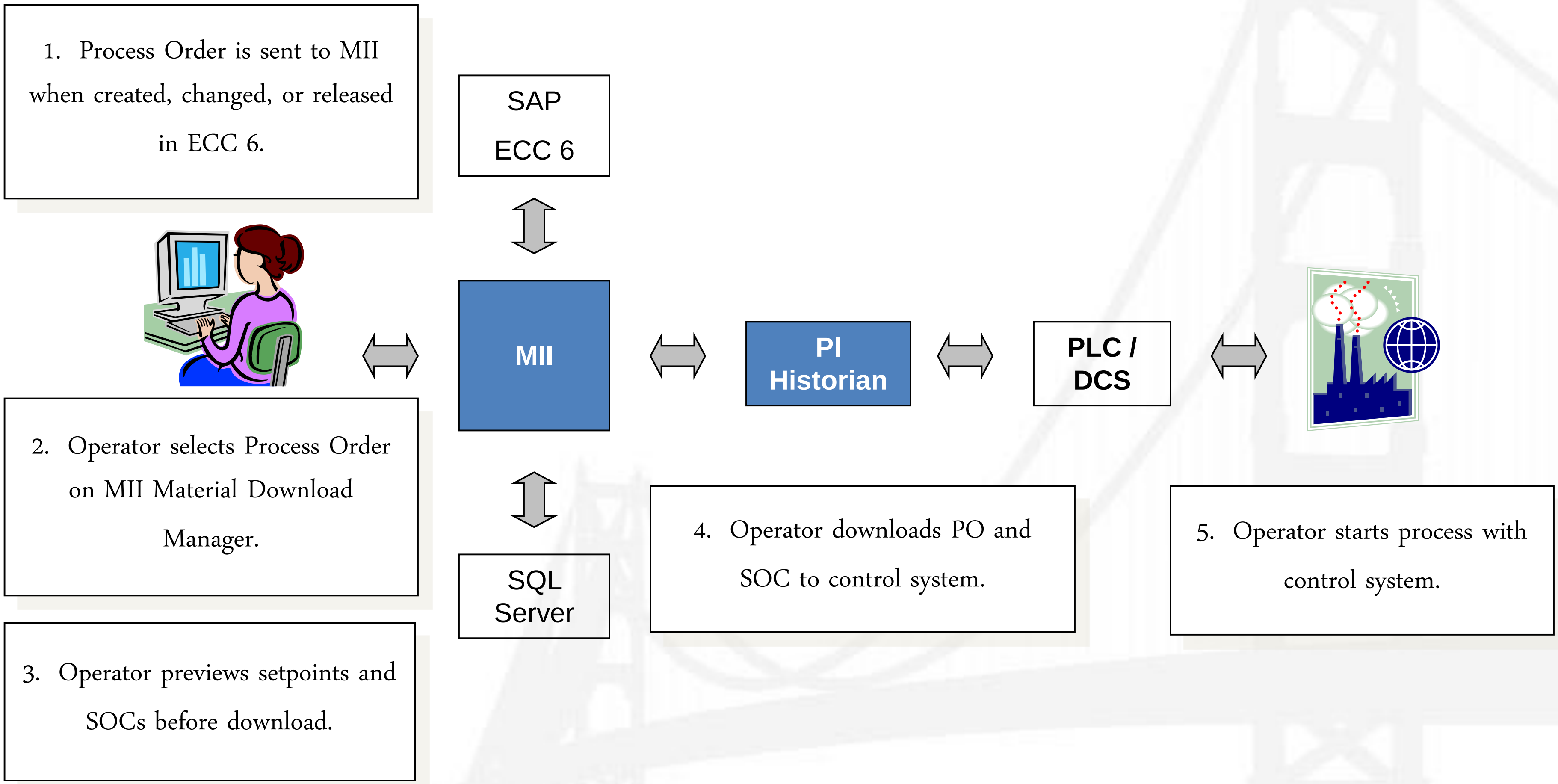
IDOCS

- Process Order
  - LOIPRO
  - Customized content
  - Change pointer table
- Bills of Material
  - LOIBOM
  - Change pointer table
- Received by MII JCo
- Processed by MII BLS

BAPI/RFC

- Standard
- Custom
- Scheduled
- Ad Hoc

Machine Setup



1. Process Order is sent to MII when created, changed, or released in ECC 6.

SAP
ECC 6

MII

PI
Historian

PLC /
DCS

SQL
Server

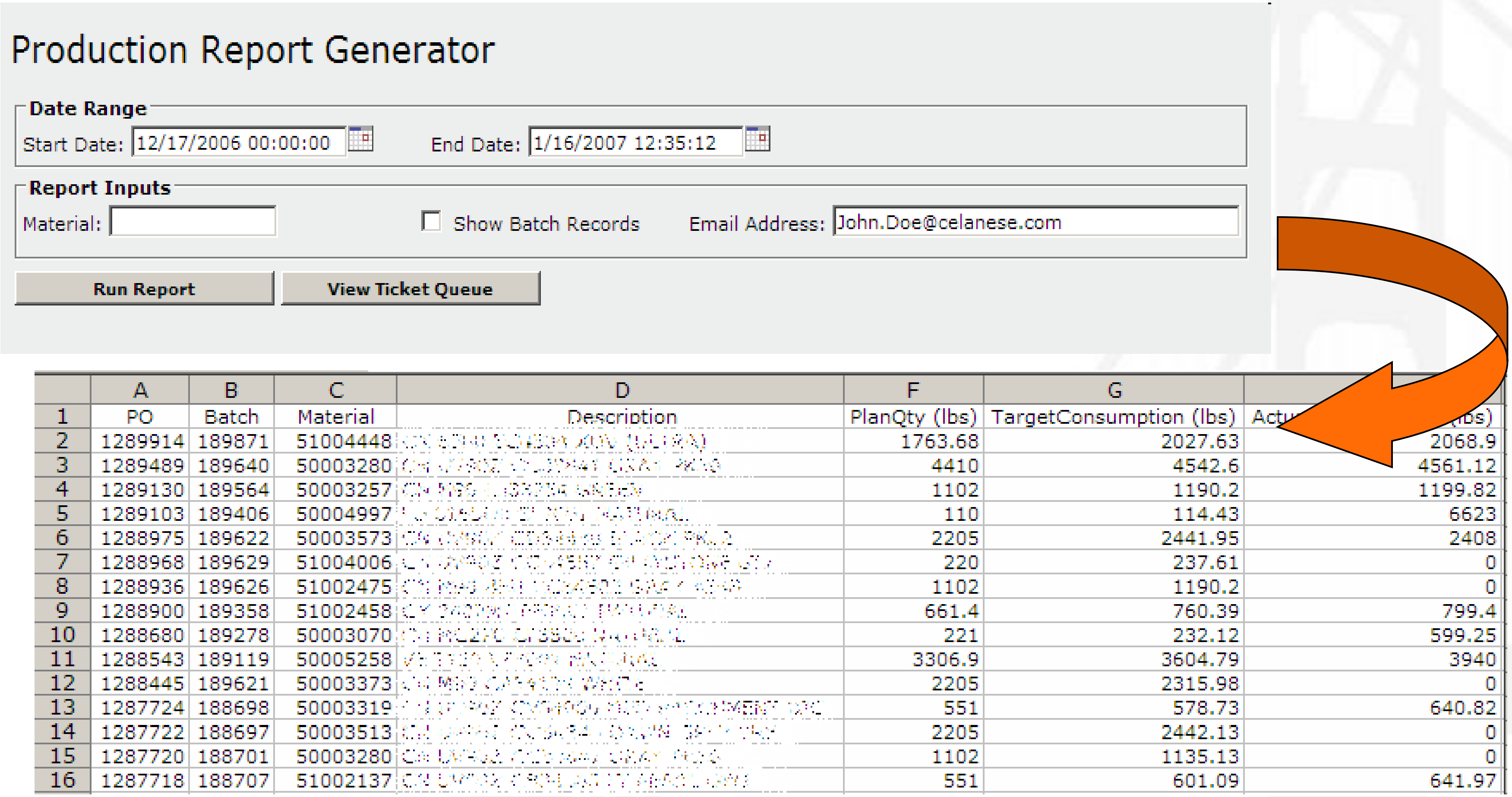
2. Operator selects Process Order on MII Material Download Manager.

3. Operator previews setpoints and SOCs before download.

4. Operator downloads PO and SOC to control system.

5. Operator starts process with control system.

Production Reports



Production Report Generator

Date Range

Start Date: 12/17/2006 00:00:00

End Date: 1/16/2007 12:35:12

Report Inputs

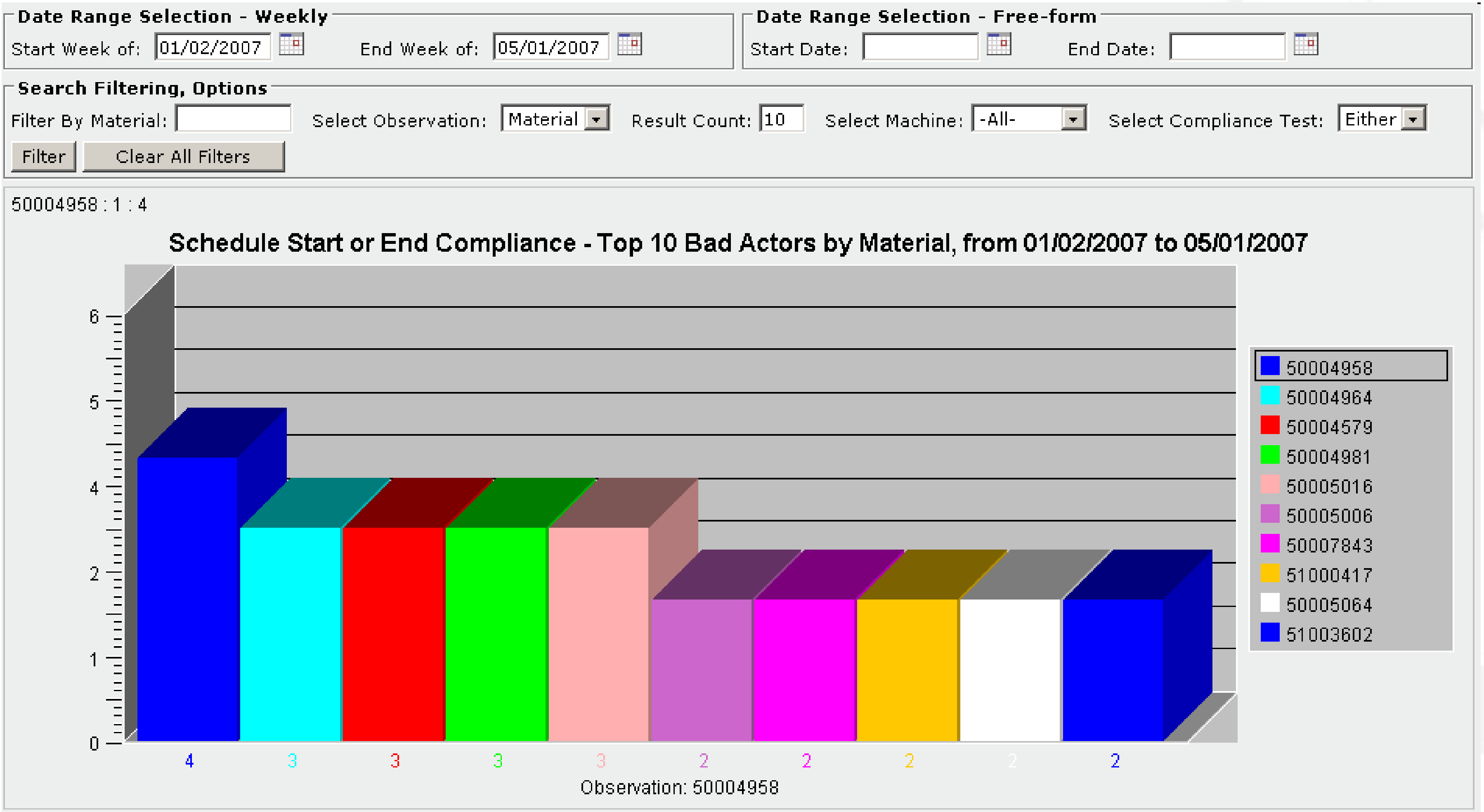
Material:

☐ Show Batch Records

Email Address: John.Doe@celanese.com

	A	B	C	D	F	G	
1	PO	Batch	Material	Description	PlanQty (lbs)	TargetConsumption (lbs)	Actu [illegible]bs)
2	1289914	189871	51004448	[redacted]	1763.68	2027.63	2068.9
3	1289489	189640	50003280	[redacted]	4410	4542.6	4561.12
4	1289130	189564	50003257	[redacted]	1102	1190.2	1199.82
5	1289103	189406	50004997	[redacted]	110	114.43	6623
6	1288975	189622	50003573	[redacted]	2205	2441.95	2408
7	1288968	189629	51004006	[redacted]	220	237.61	0
8	1288936	189626	51002475	[redacted]	1102	1190.2	0
9	1288900	189358	51002458	[redacted]	661.4	760.39	799.4
10	1288680	189278	50003070	[redacted]	221	232.12	599.25
11	1288543	189119	50005258	[redacted]	3306.9	3604.79	3940
12	1288445	189621	50003373	[redacted]	2205	2315.98	0
13	1287724	188698	50003319	[redacted]	551	578.73	640.82
14	1287722	188697	50003513	[redacted]	2205	2442.13	0
15	1287720	188701	50003280	[redacted]	1102	1135.13	0
16	1287718	188707	51002137	[redacted]	551	601.09	641.97

Schedule Compliance



Date Range Selection - Weekly

Start Week of: 01/02/2007

End Week of: 05/01/2007

Date Range Selection - Free-form

Start Date:

End Date:

Search Filtering, Options

Filter By Material:

Select Observation: Material

Result Count: 10

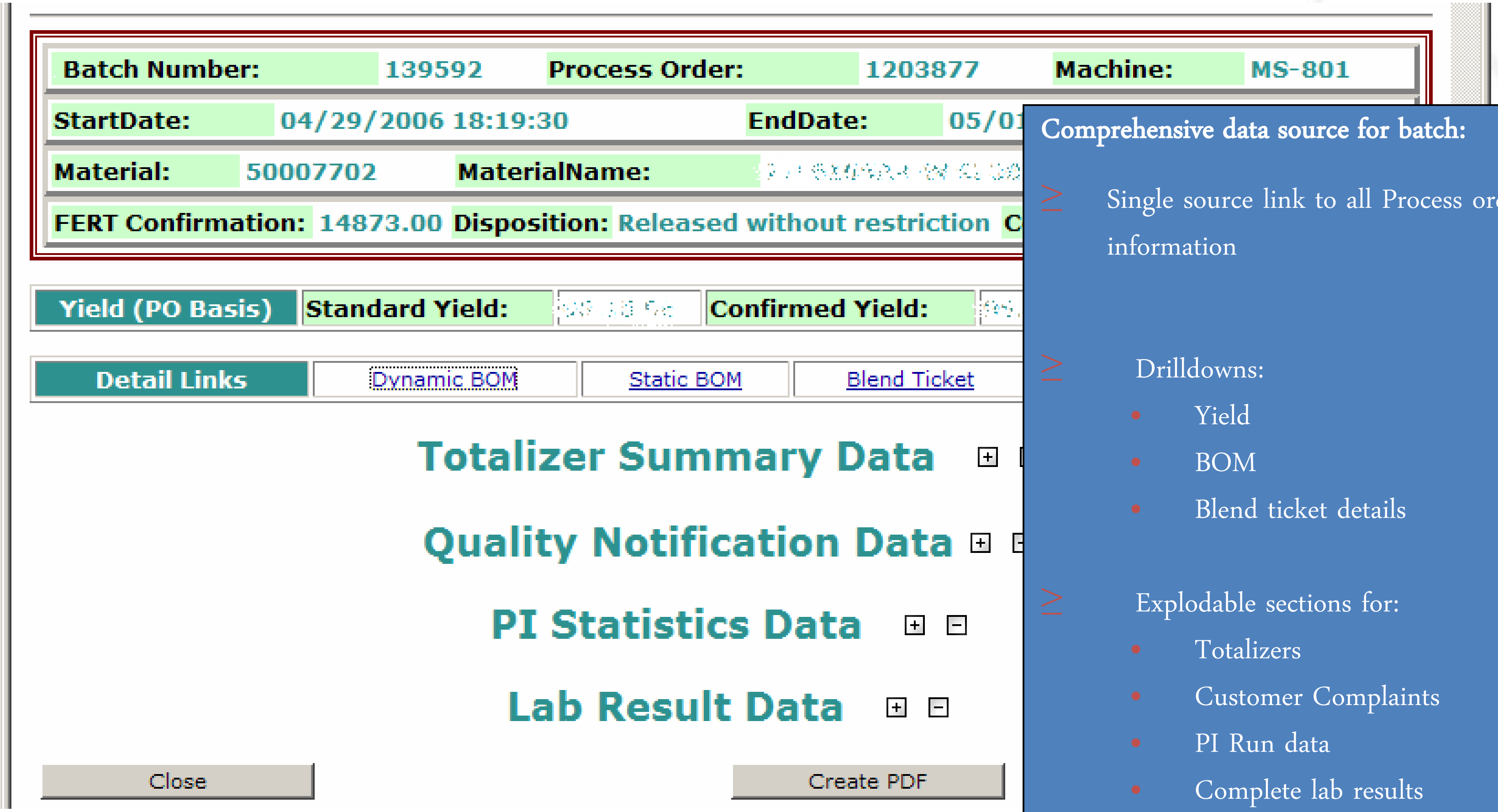
Select Machine: -All-

Select Compliance Test: Either

50004958 : 1 : 4

Filter
Clear All Filters
Schedule Start or End Compliance - Top 10 Bad Actors by Material, from 01/02/2007 to 05/01/2007
0
1
2
4
5
6
4
3
3
3
3
2
2
2
2
2
Observation: 50004958
50004958
50004964
50004579
50004981
50005016
50005006
50007843
51000417
50005064
51003602

Batch Report



Batch Number: 139592 **Process Order:** 1203877 **Machine:** MS-801

StartDate: 04/29/2006 18:19:30 **EndDate:** 05/01

Material: 50007702 **MaterialName:** [redacted]

FERT Confirmation: 14873.00 **Disposition:** Released without restriction C

Yield (PO Basis) **Standard Yield:** [redacted] **Confirmed Yield:** [redacted]

Detail Links
Dynamic BOM
Static BOM
Blend Ticket
Totalizer Summary Data ⊞
Quality Notification Data ⊞
PI Statistics Data ⊞ ⊟
Lab Result Data ⊞ ⊟
Close
Create PDF

Comprehensive data source for batch:

- Single source link to all Process order information
- Drilldowns:
  - Yield
  - BOM
  - Blend ticket details
- Explodable sections for:
  - Totalizers
  - Customer Complaints
  - PI Run data
  - Complete lab results

Summary

- PI Historian
  - Key role in Celanese integration strategy
  - Robust process interface to numerous systems
  - Foundation of shop floor integration to ERP
- MII
  - Variety of PI connection and query methods
  - Workflow integration and portal visualization
  - Easy integration with ERP system

Q & A