



Improved Connectivity Between the Shop Floor and the Enterprise with SAP xApp Manufacturing Integration and Intelligence (SAP xMII)

Stephen Cloughley
SAP Labs



Manufacturing challenges

What is xMII?

Customer successes

Wrap-up

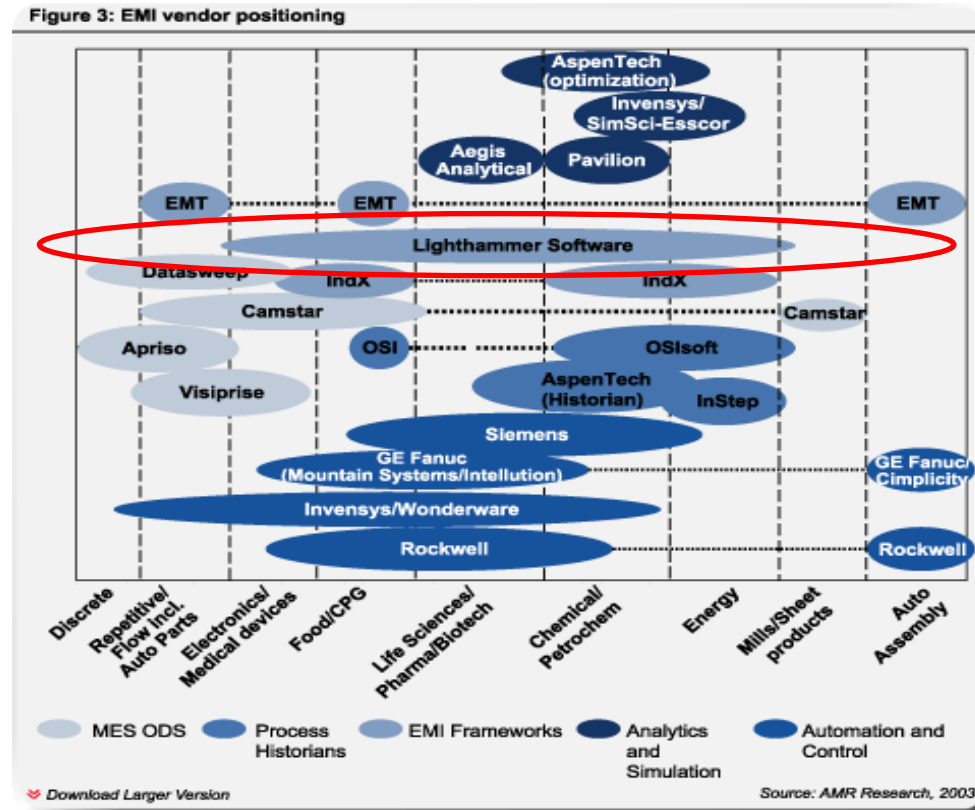
Lighthammer's Origin



Lighthammer was the recognized leader in enterprise manufacturing intelligence

- **Founded in 1998**
- **Over 100 customers and 500 installations**
- **Annual growth in excess of 250% per year**

Recognized leader in the emerging Enterprise Manufacturing Intelligence space (Manufacturing Intelligence)



Recognized leader in the emerging Enterprise Manufacturing Intelligence space (Manufacturing Intelligence)

Figure 3: EMI vendor positioning



“*The announcement by SAP that it acquired Lighthammer will gain big points with SAP users who’ve bought into the Adaptive Manufacturing vision. It’s a signal to the market that SAP clearly gets what’s needed to meet customers’ strategic goals for manufacturing.*”

***The Bottom Line:** This is a strategic acquisition that moves SAP one step further along the path toward its Adaptive Manufacturing vision by adding a much-needed conduit for the delivery of real-time, shop-floor information to SAP’s Manufacturing Dashboard for Plant Managers.”*

- Alison Smith

“Lighthammer – SAP gets it,” June 23, 2005



Download Larger Version

Historians

and
Simulation

Control

Source: AMR Research, 2003

The acquisition of Lighthammer exemplifies SAP’s commitment to helping customers increase business performance and reduce Total Cost of Information (TCO)

Sampling of Joint SAP-Lighthammer Customers

DOW CORNING

AIR PRODUCTS



EASTMAN

Campbell's



Kellogg's

P&G



PHILIPS

NOVARTIS

Abbott Laboratories



Celanese

Armstrong

CertainTeed
QUALITY MADE CERTAIN, satisfaction guaranteed.

we energies

Lilly

Wyeth

THE BEST-RUN BUSINESSES RUN SAP™





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Manufacturing Challenges Today

Global competitiveness is here, placing tremendous pressure on cost, quality, and responsiveness

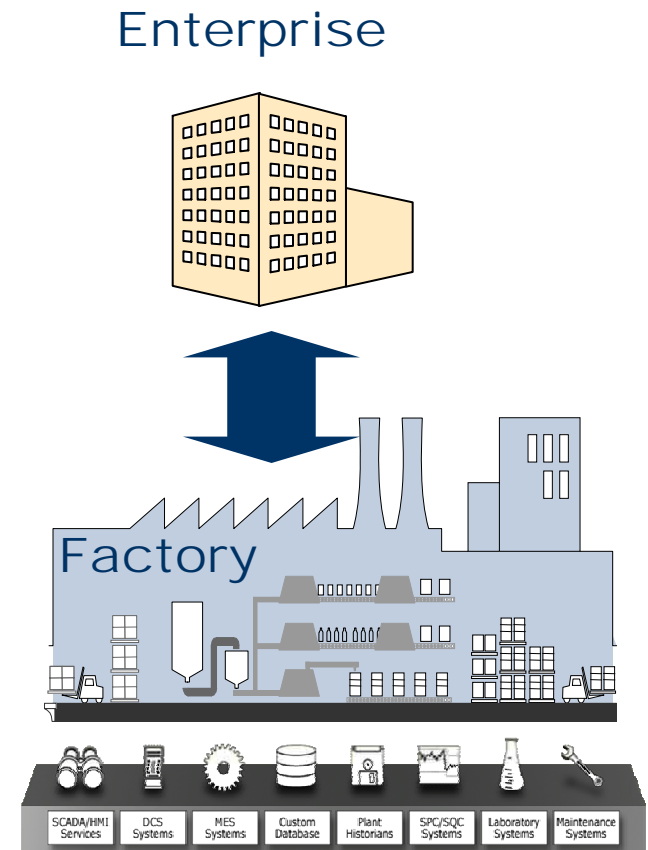
- Production personnel **lack the decision support** information to meet their targets
- Manufacturing nodes are being pushed out to distant locations, leading to a **loss of visibility and control**
- Business and financial impact of **production exceptions cannot be monitored** or controlled at the enterprise level
- Plants use **copies of master data**, creating compliance and quality issues

Connecting the Factory to the Enterprise and Supply Chain is critical to deliver on customer expectations cost-effectively

SAP's Vision — “Adaptive Manufacturing”

Adaptive Manufacturing is the ability of a **factory** ...

- To profitably replenish a supply chain,
- While dynamically responding to unpredictable change

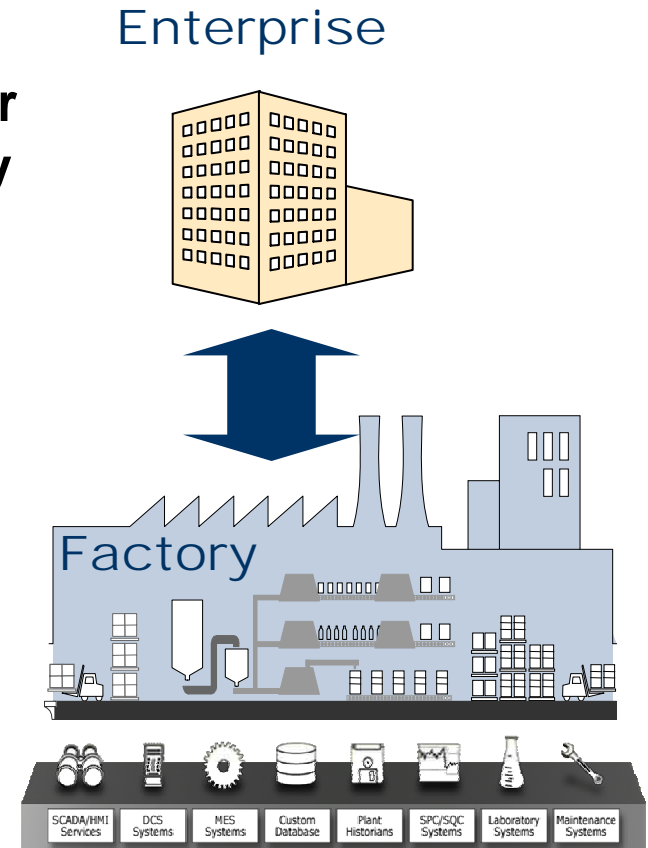


To become an Adaptive Manufacturer requires companies to achieve
Manufacturing Excellence and
Manufacturing Synchronization

Excellence and Synchronization Defined

Manufacturing Excellence — the ability to reliably produce to target with year-over-year improvements in cost, quality, and efficiency

Manufacturing Synchronization — electronically linking enterprise business processes with plant manufacturing processes and people to run from a “single version of the truth”



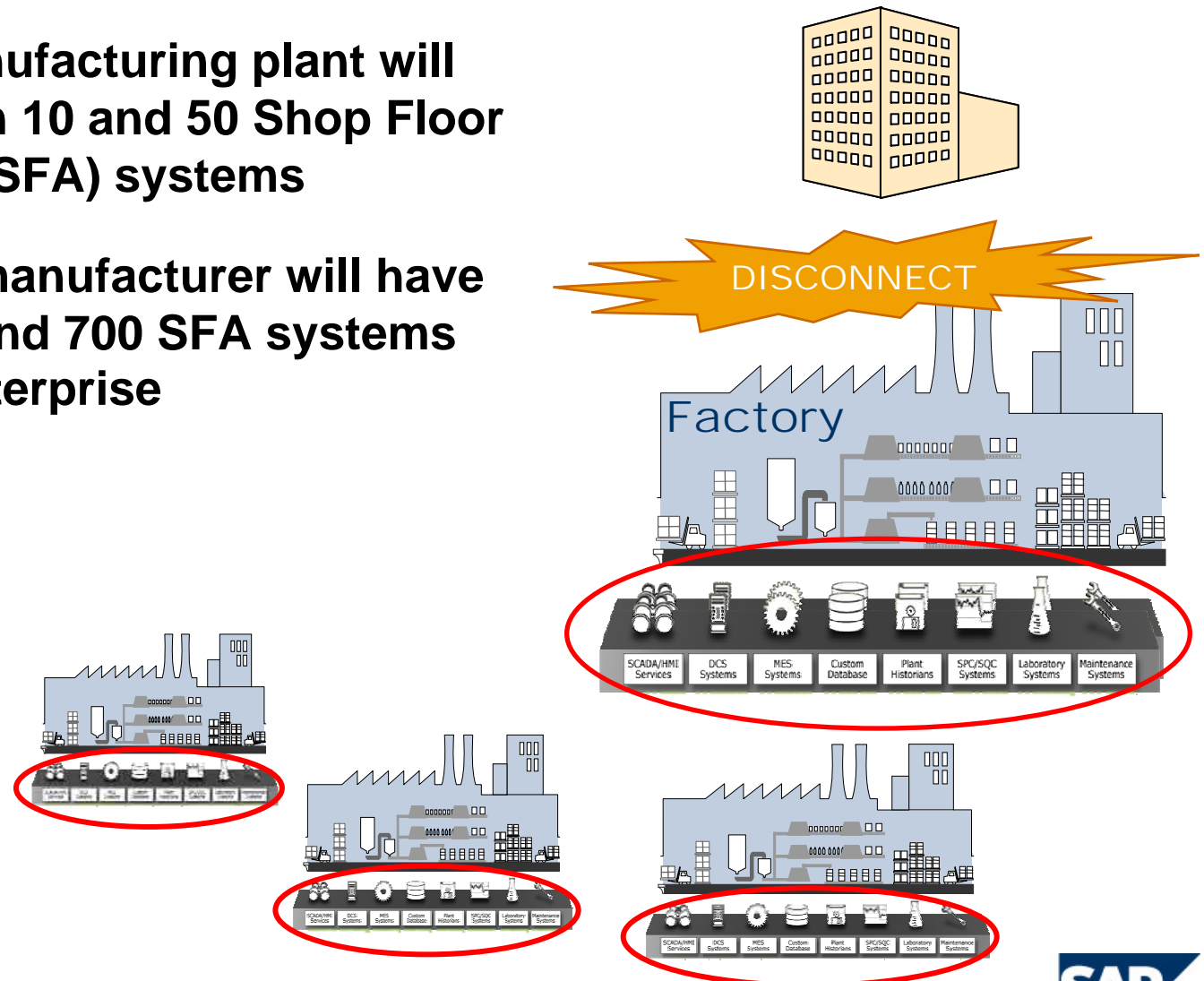
Manufacturing excellence and synchronization are the foundations of Adaptive Manufacturing

Adaptive Manufacturing Challenge — Synchronization

Disparate plant systems

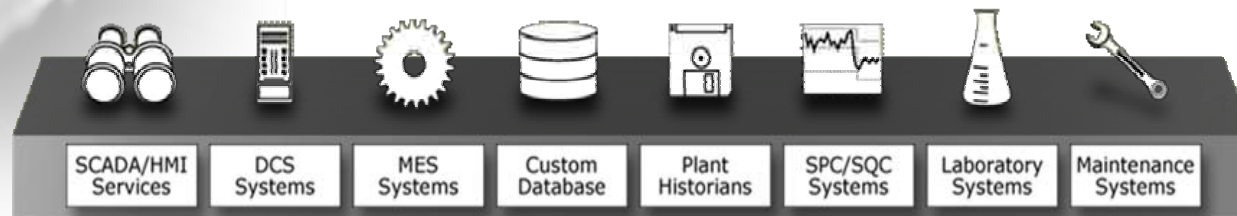
- A typical manufacturing plant will have between 10 and 50 Shop Floor Automation (SFA) systems
- A multi-site manufacturer will have between 40 and 700 SFA systems across its enterprise

Enterprise



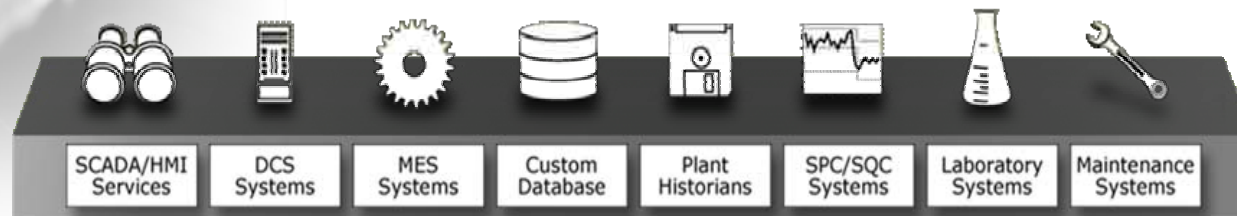
Adaptive Manufacturing Challenge — Systems

- Hundreds of unique systems
- Old (5-25 years)
- Frequently proprietary APIs
- Unstructured data
- Unusual data type



Adaptive Manufacturing Challenge — Data

- Unusual data types
- Unstructured
- Distributed context
- Alternate taxonomies
- High volume



What's Needed to Achieve Adaptive Manufacturing?

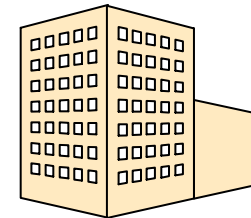
Manufacturing Integration:

A manufacturing integration platform to *synchronize manufacturing processes* with enterprise and supply chain processes

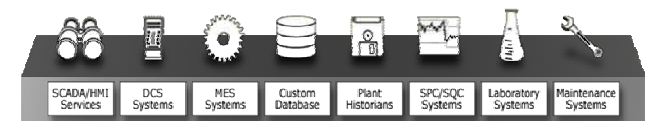
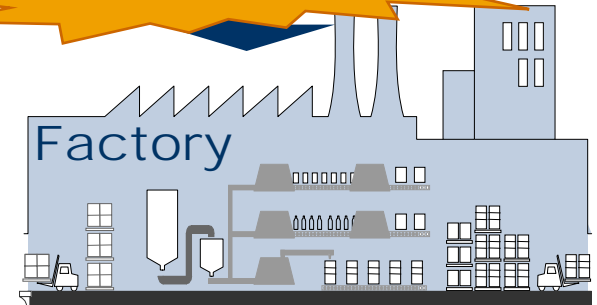
Manufacturing Intelligence:

Real-time actionable analytics and decision support for production personnel so they can deliver *manufacturing excellence*

Enterprise



DISCONNECT



Manufacturing integration and intelligence functionality enable manufacturing synchronization and excellence

Manufacturing Integration

“Less than 1% of respondents indicated that manufacturing data is automatically integrated with ERP with no manual intervention.”

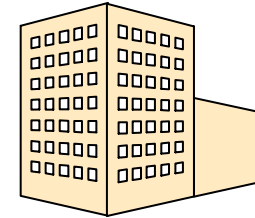
Managing Automation and AMR Research
September 2005, Customer Survey

Manufacturing Intelligence

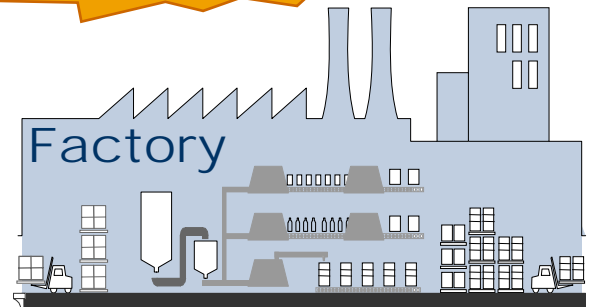
“There are gaps in providing adequate visibility into manufacturing KPIs, Financial performance, and multi-site performance analysis.”

Managing Automation and AMR Research
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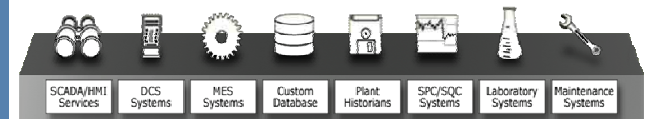
Enterprise



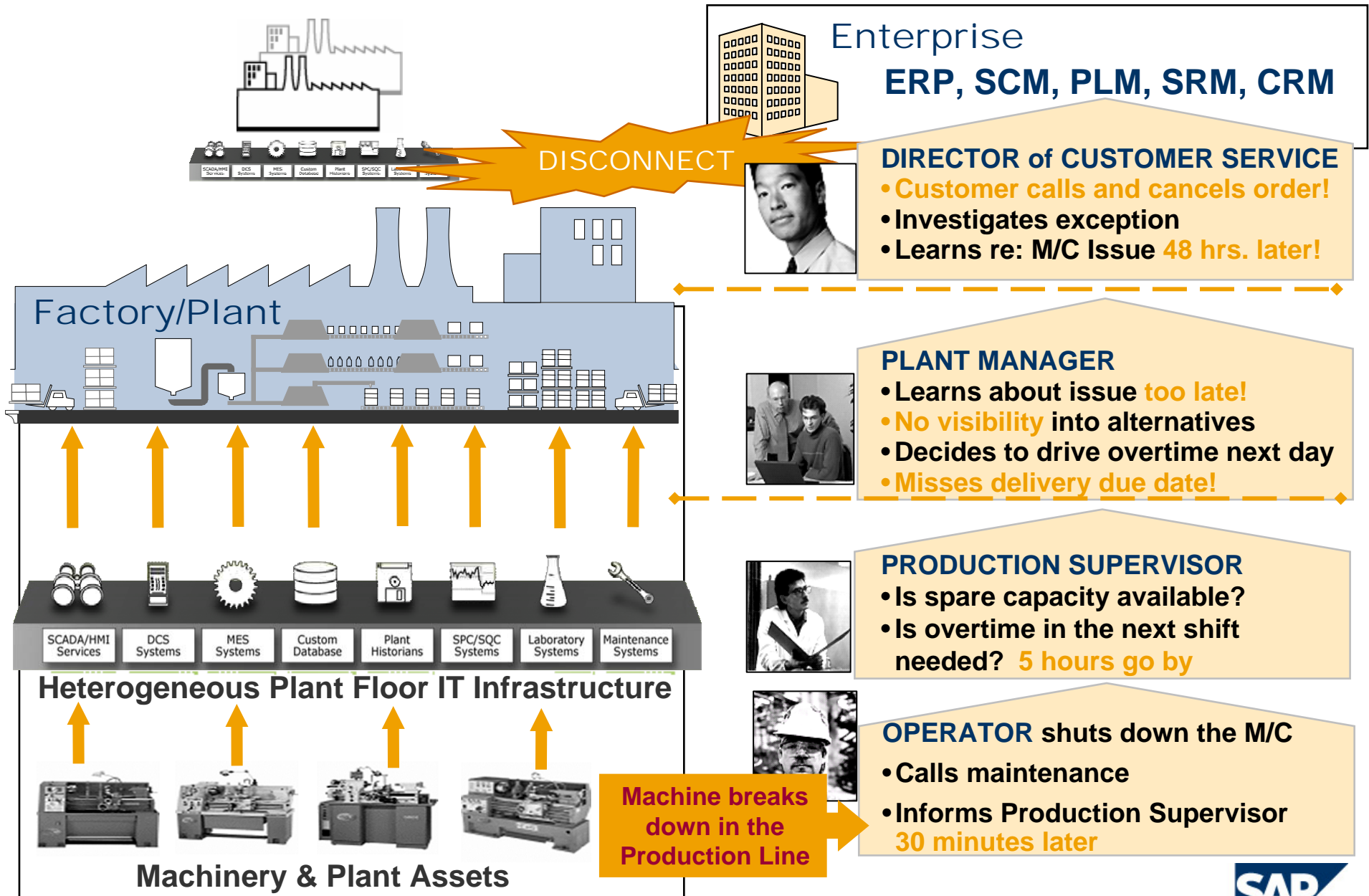
DISCONNECT



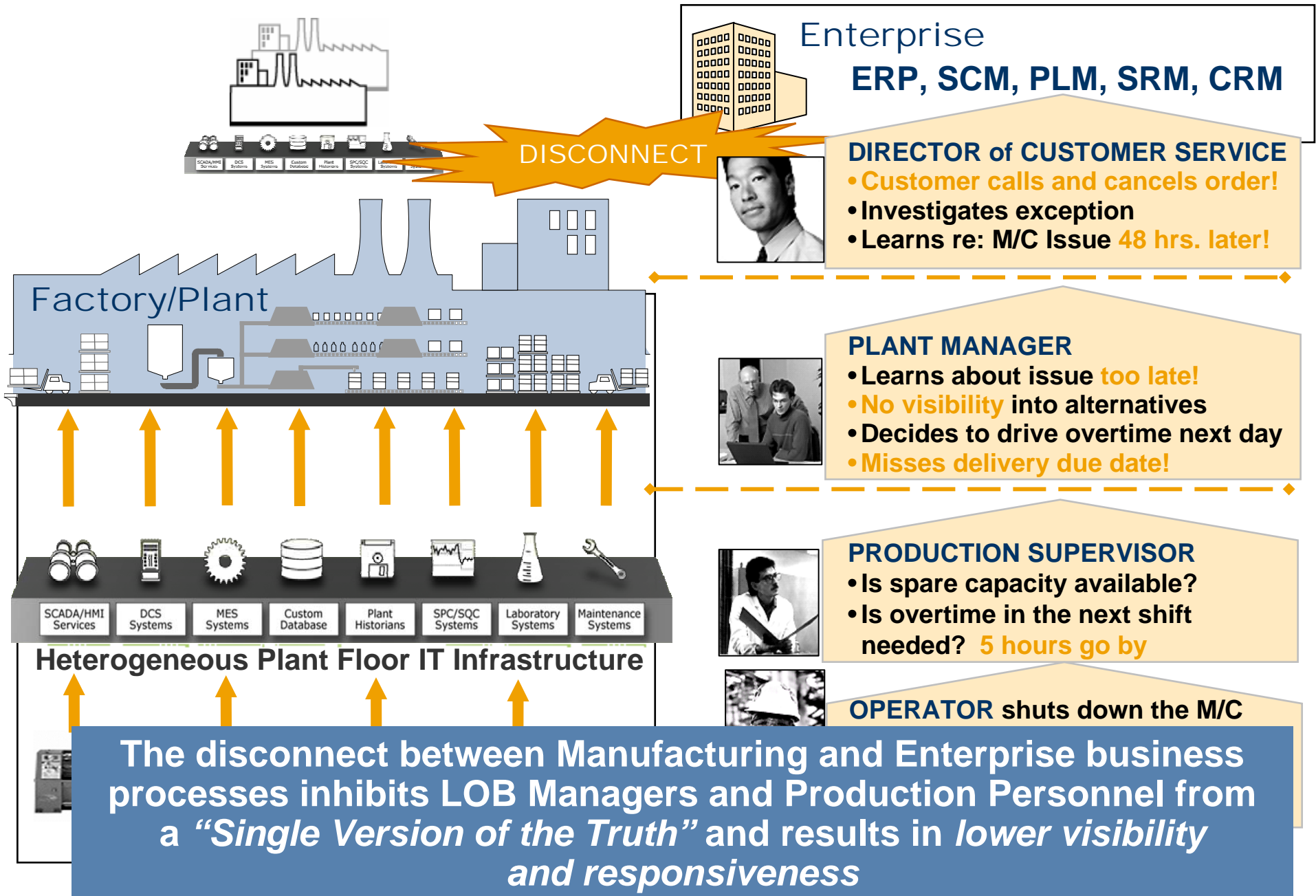
Factory



Why is Manufacturing Synchronization Critical?



Why is Manufacturing Synchronization Critical? (cont.)



Challenges to Delivering Manufacturing Excellence

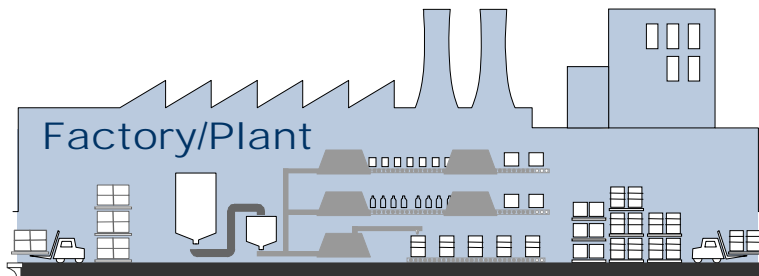
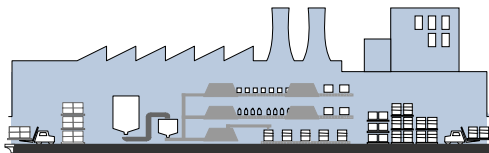
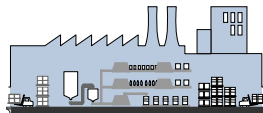
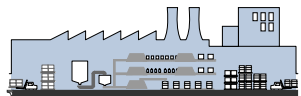
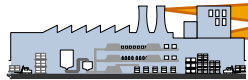
 Enterprise
ERP, SCM, PLM, CRM



VP of Supply Chain or Operations

- Can I fulfill an order profitably against current inventory?
- Which assets are currently available for a rush order?
- Which is the most efficient plant to produce this product?
- Which underperforming assets can we rationalize?

DISCONNECT



Plant Manager



- What is my actual cost of production vs. budget?
- What are my best and worst performing assets?
- What is my Overall Equipment Effectiveness (OEE)?
- How can I analyze, isolate, and improve on OEE variances?

Production Supervisor



- Which orders have been impacted by the asset failure?
- Which lines are currently available?
- Which line is the most efficient for this order?

Line or Machine Operator



- How am I performing against my production targets?
- How am I performing against my peers?
- How can I make more given pay-for-performance model?

Challenges to Delivering Manufacturing Excellence (cont.)



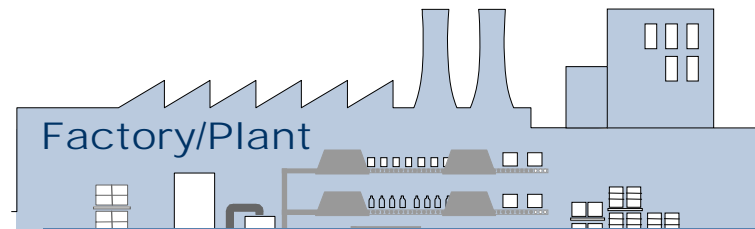
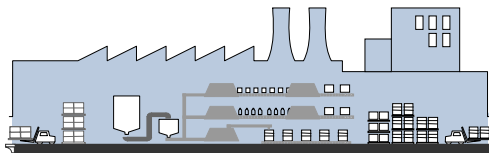
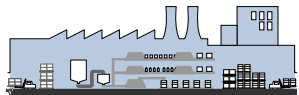
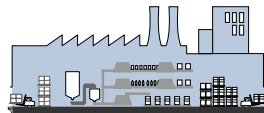
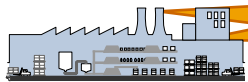
Enterprise
ERP, SCM, PLM, CRM




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Line or Machine Operator

- 
- How am I performing against my production targets?

Can you afford anything less than the highest levels of performance from your production personnel, assets, and plants in today's competitive environment?

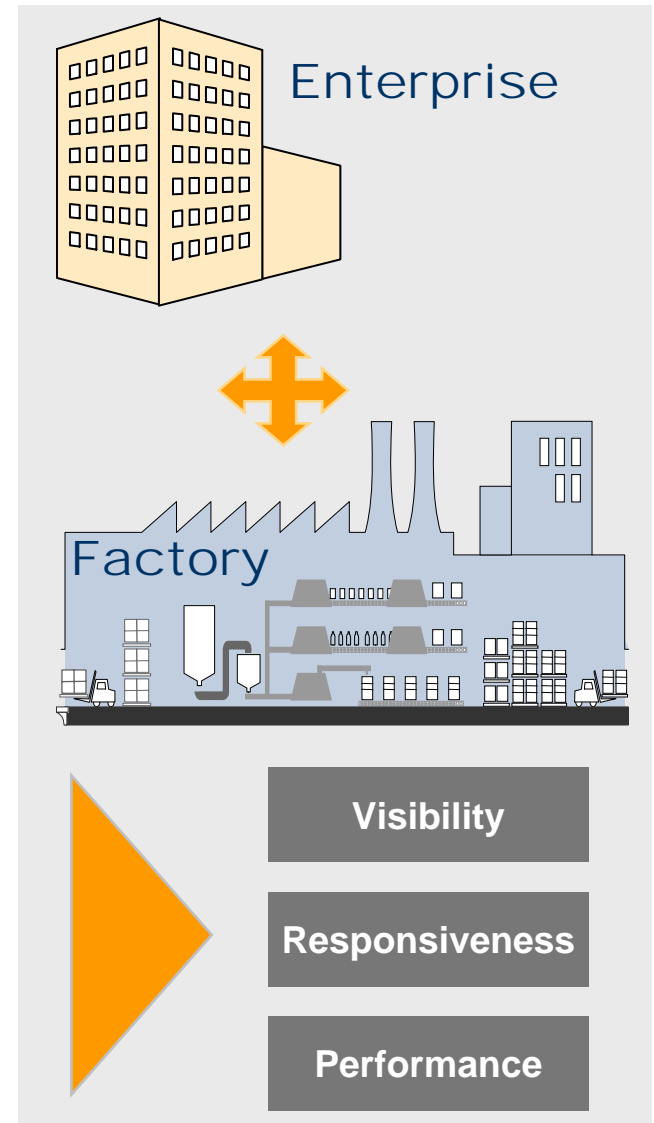
What Capabilities Do Manufacturers Need to Be Adaptive?

To be adaptive, companies need capabilities for:

- **Manufacturing Operations:** An integrated ERP solution for managing manufacturing with workflows that enable closed-loop operations

- **Manufacturing Integration:** *A manufacturing integration platform to connect manufacturing processes with enterprise and supply chain processes*

- **Manufacturing Intelligence:** *Real-time actionable analytics and decision support for production personnel so they can deliver on their performance goals*



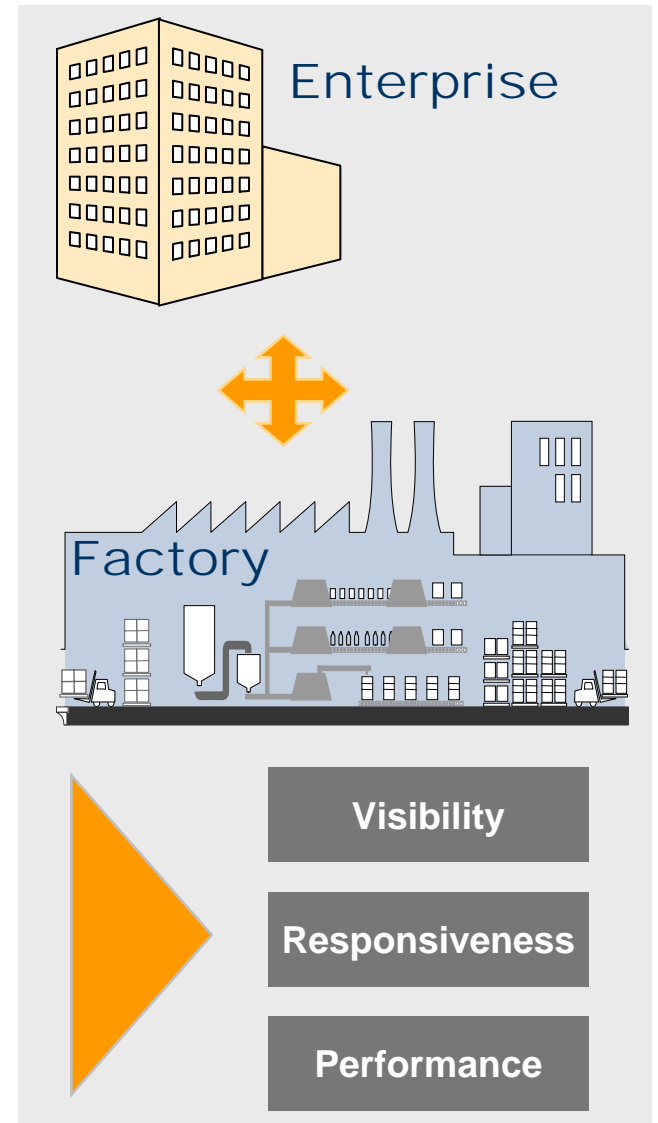
What Capabilities Do Manufacturers Need to Be Adaptive? (cont.)

To be adaptive, companies need capabilities for:

- **Manufacturing Operations:** An integrated ERP solution for managing manufacturing with workflows that enable closed-loop operations

■ **Manufacturing Integration:** A manufacturing integration solution to connect manufacturing operations with enterprise resource planning systems

■ **Manufacturing Intelligence:** A real-time analytics solution to support forecasting and personalization to deliver on their performance goals





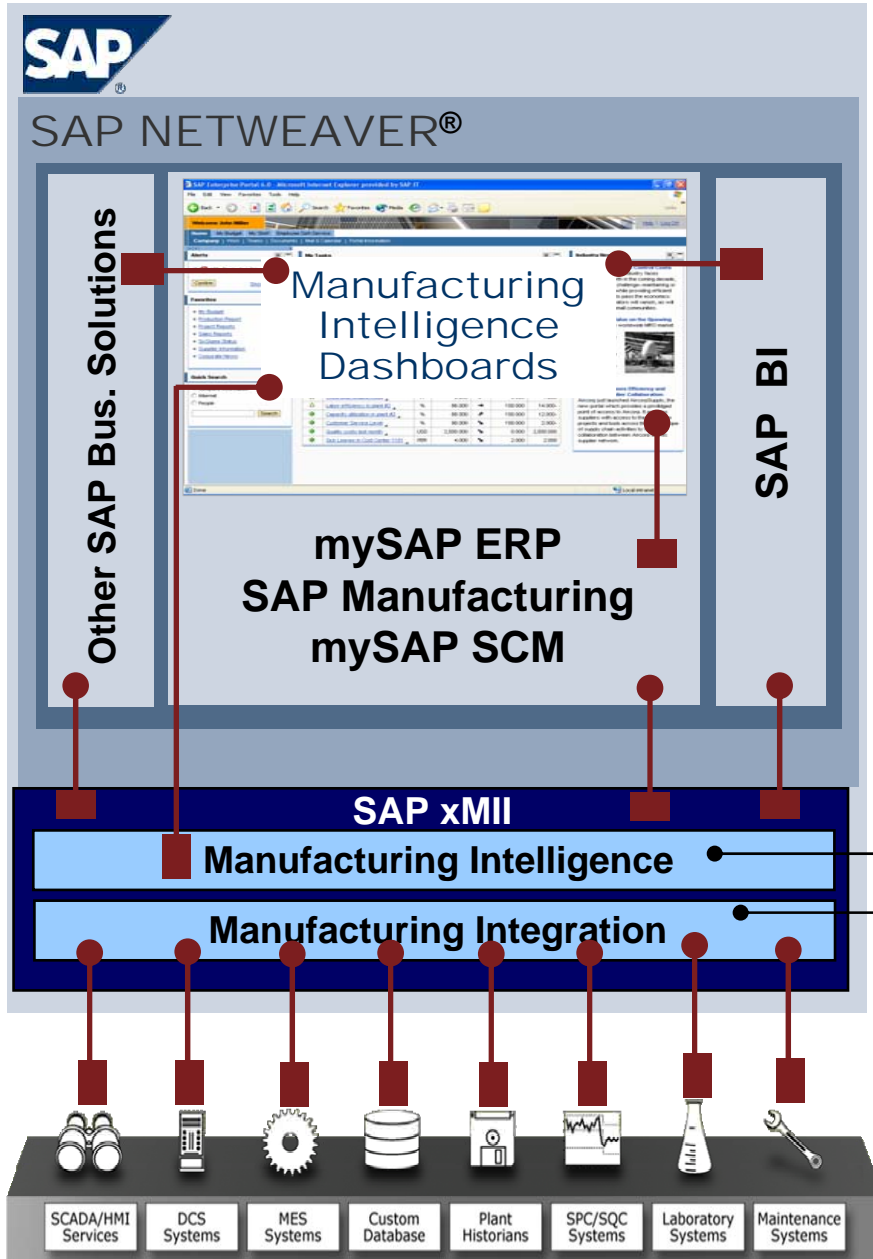
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Wrap-up

SAP xApp Manufacturing Integration and Intelligence (xMII)



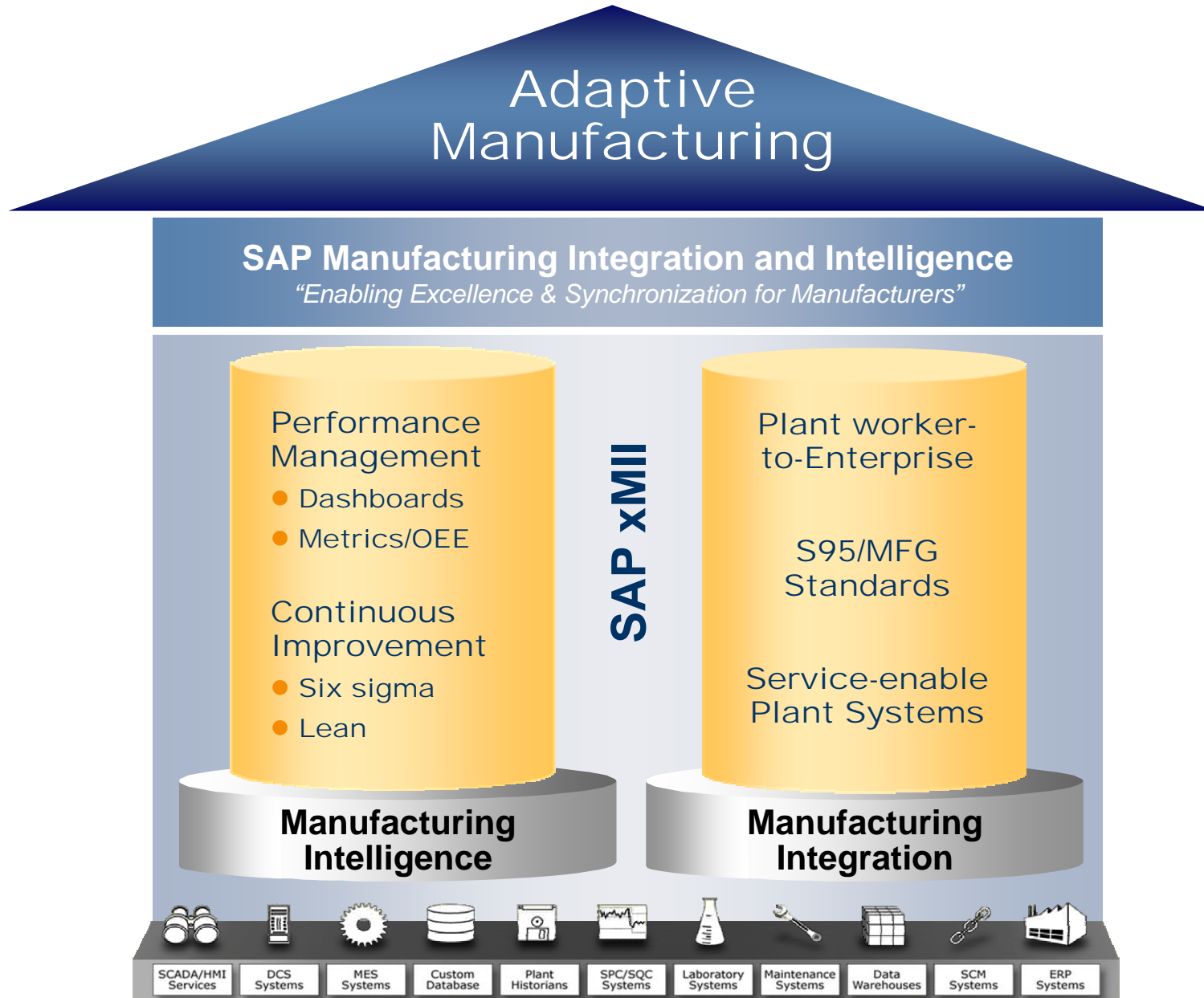
The **SAP xApp Manufacturing Integration and Intelligence (xMII)** is a packaged composite application that delivers:

Manufacturing Intelligence: Real-time analytics engine that aggregates and delivers unified visualization of events, alerts, KPIs, and decision support to production personnel through role-based dashboards

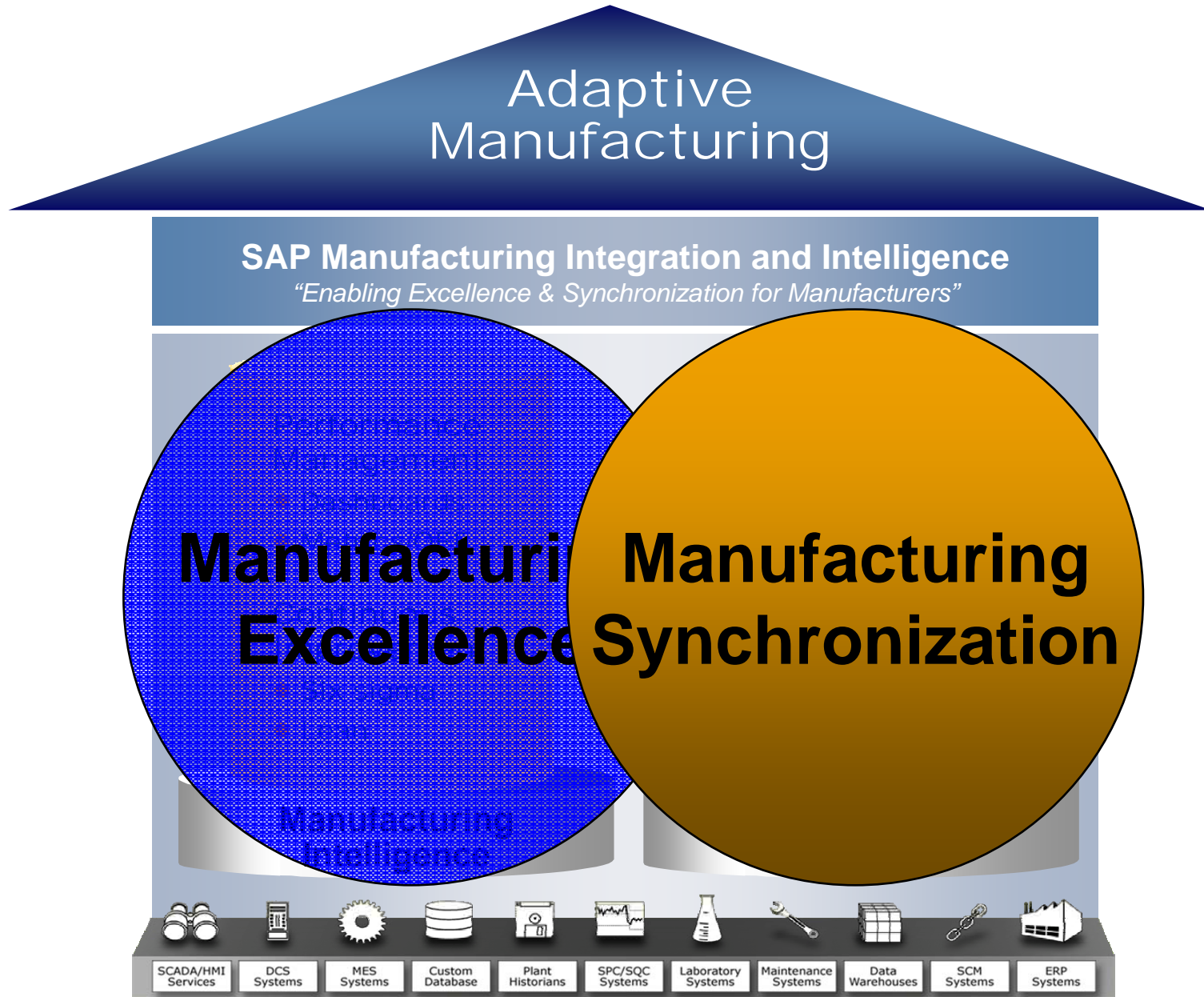
Manufacturing Integration: A single ISA-95-compliant layer enabling SAP ERP connectivity into real-time plant floor apps. (MES, SFA, legacy apps.) to drive plant-to-enterprise business process inter-operability

MES – Manufacturing Execution Systems, EMI – Enterprise Manufacturing Intelligence, BW – Business Warehouse (from SAP), SFA – Shop Floor Automation and Control

Typical xMII Applications



Typical xMII Applications (cont.)



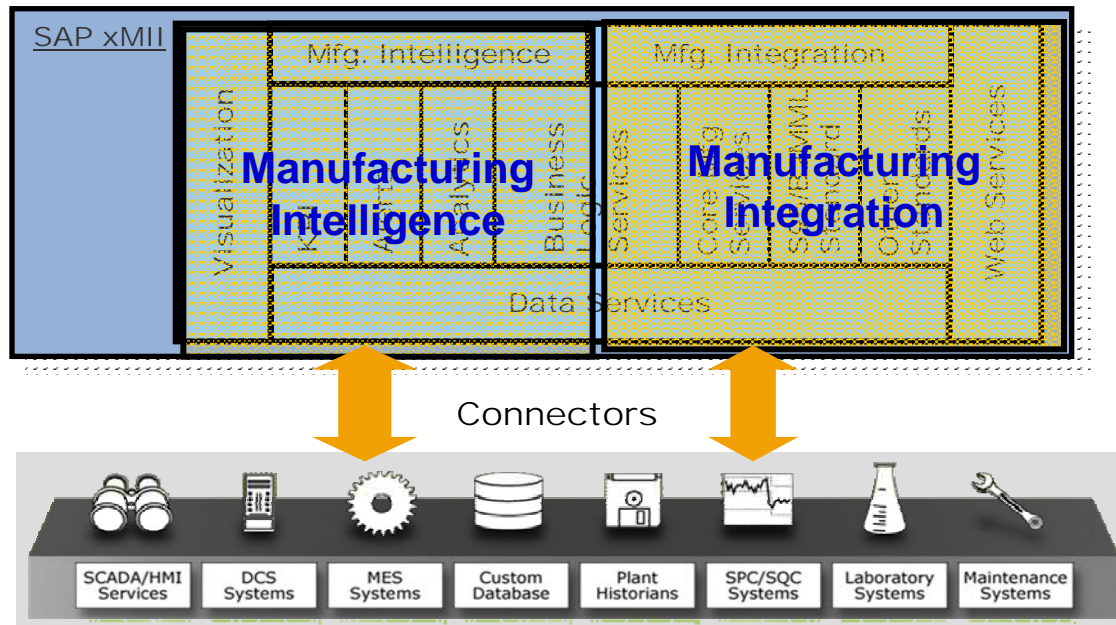
Core SAP xMII Functions/Services

MANUFACTURING INTELLIGENCE

- **Visualization Services**
 - Charts, grids, tickers, UI controls
 - Dashboard components
- **Metrics/Alerts**
 - KPIs and Alerts
- **Analytic Services**
 - SPC/SQC (Six Sigma) analyses
 - Statistical and other mathematical analyses

MANUFACTURING INTEGRATION

- **Data Services**
 - Bi-directional data access
 - Metadata browsing
 - XML-based data abstraction
 - Connectors to external systems
- **Business Logic Services**
 - Logic
 - Integration services
 - Notification services
 - Calculation and data transformation
 - MFG Standards implementations (S95)



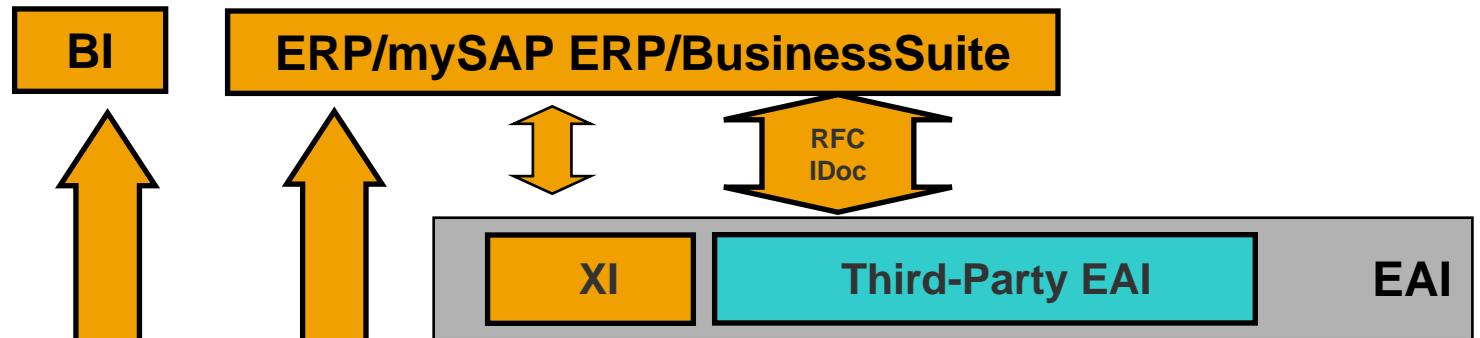
Web Service Composition

- Service Enable Existing plant applications
- All functionality exposed as Web services
- Includes user-defined composite services

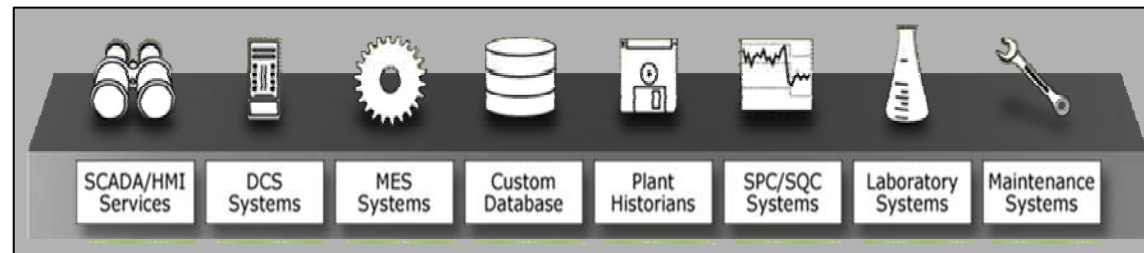
xMII — System Architecture

Corporate

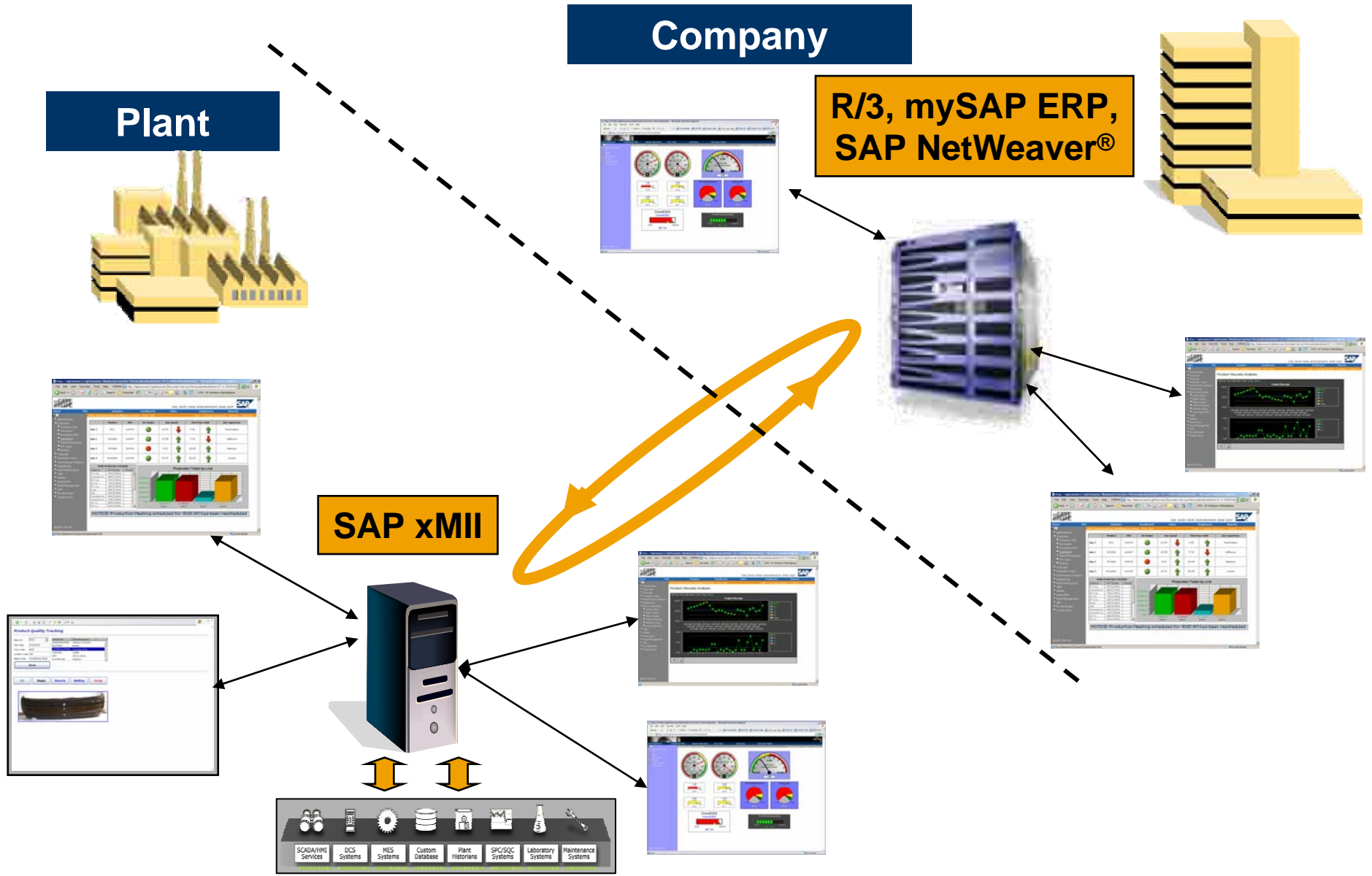
Enterprise Applications



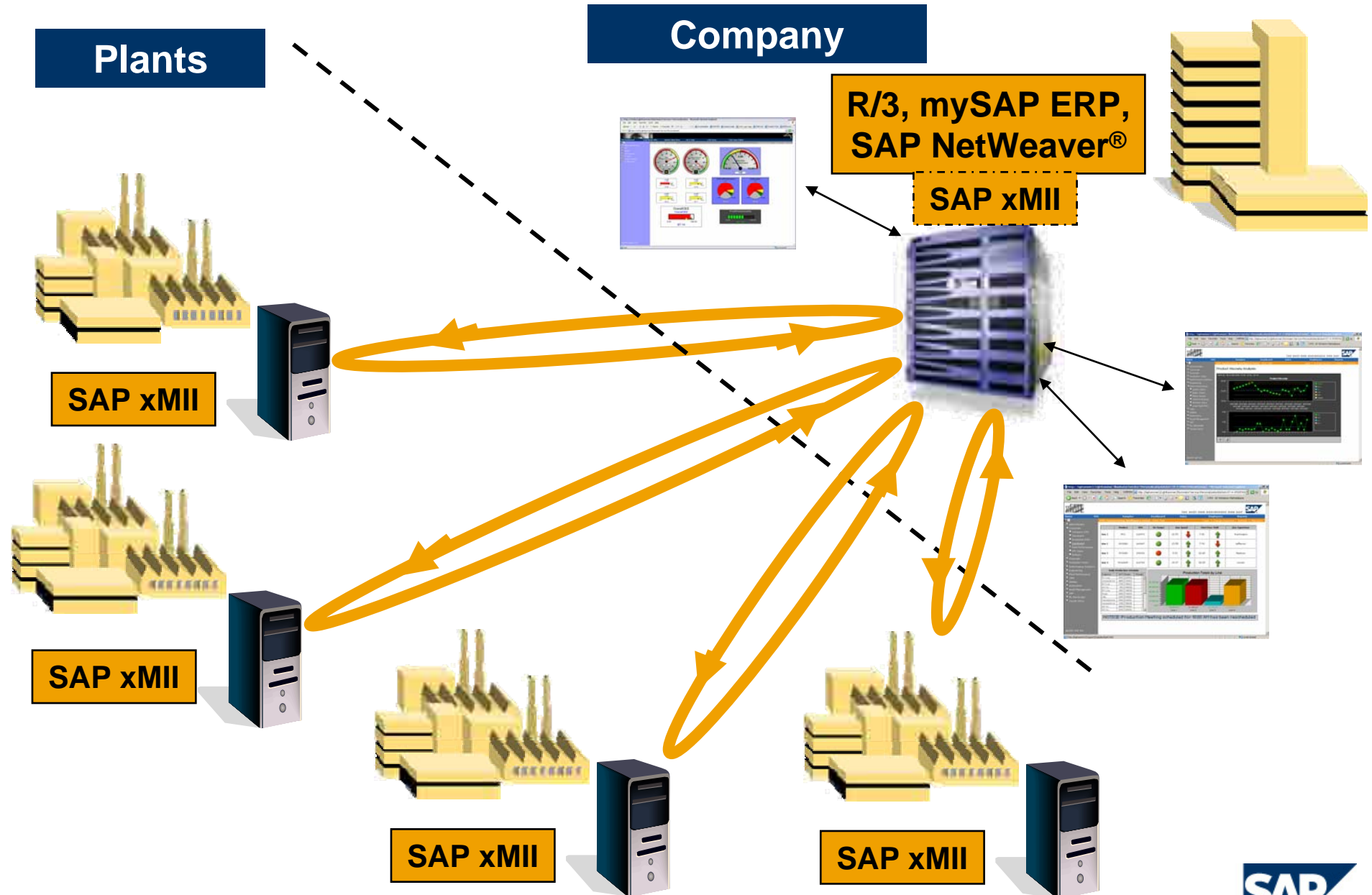
Plant



SAP xMII



SAP xMII (cont.)





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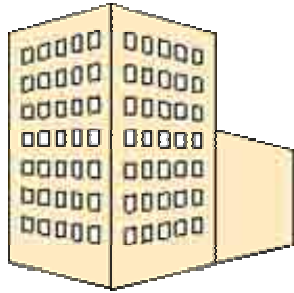
Wrap-up

Manufacturing Integration is the enabling technology for Manufacturing Synchronization

It is the electronic linking of enterprise business processes and master data with plant personnel and processes to run from a “single version of the truth”

Manufacturing Integration Scenarios

Enterprise



SAP ERP, mySAP BusinessSuite

Other Enterprise Applications

Plant

H2A

Human-to-ERP Integration



AH2A

ERP-to-Human-to-Machine Integration

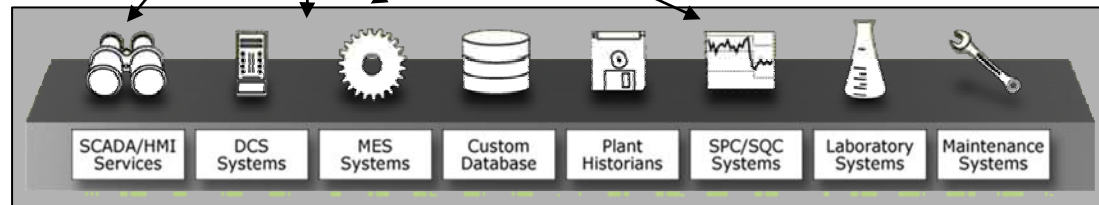
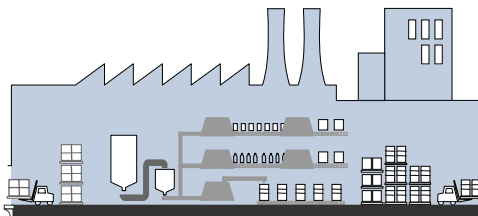


A2A

Legacy System Integration

A2A

Standards-based Transactional Integration



Required functionality:

- Plant system connectivity
- Data transformation and aggregation
- *Near* real-time performance
- Synchronous and asynchronous communication
- Small footprint, distributed, plant deployment
- Composite application
- Plant worker UI for customized delivery

H2A: Human-to-ERP

Pro-Cert Data Collection - Microsoft Internet Explorer provided by CSC for PWC

File Edit View Favorites Tools Help

Address: <http://wcalqk11.pwc.ca/pwc/qm/ProcertDataRecording.irpt?userSession=&userid=bi32772&lang=en&txtProdOrderNo=&txtMaterialNo=3910>

Operator Dashboard

[New Inspection](#) [CMM Data](#) [Confirm Operation](#) [Log Off](#)

Prod Order: 001000003778 Material: 3910981-02 **MONO CASE -CASE-GAS GENERATOR ASY**
Inspection Lot: 030000006475 Operation: 2020 Rev Level: 06 Remain to Record: 4
Serial No: A00001H5 Machine No: machine 15

Seq: 0001 Description: **AVG.DIA** 2.26850 - 2.27000 CP: 0.52 CPK: 0.24 Points: 283

Value:

Multiple Entries:

Outlier:

Breakpoint:

XBAR (21) : 2.27000 [030000006475] <2.26850 : 2.26925 : 2.27000>

 Highlight: **Inspection Lot**

Seq: 0002 Description: **BAND TOL** 0.03000 CP: 0.60 CPK: -0.66 Points: 207

Value:

Multiple Entries:

Outlier:

Breakpoint:

 Highlight: **Inspection Lot**

H2A: Confirm Operation (Replace C011)

Operator Dashboard

Prod Order: 001000003315 Material: 3123131-02 BLADE-HIGH TURBINE

Inspection Lot: 030000005817 Operation: 0080 Rev Level: 01

Serial No: Not Applicable Machine No: 000000000000123456

Yield: 2 Scrap: 4

Seq: 0004 Description: TP 0.045000 CP: 3,20 CPK: 1,78 Points: 20

Value: [] XBAR (20) : 0.02760 [] <0.00000 : 0.04500 : 0.04500>

Seq: 0005 Description: ROUNDEDGES 0.01500 - 0.04000 CP: 1,47 CPK: 0,97 Points: 123

Value: []

Confirm Operation

Yield: 2

Scrap: []

Confirmation of Production Order Create: Actual data

Production Order: 001000003315

Material: 3123131-02

Machine: 000000000000123456

C011

- Manufacturing Analytics
 - Correlated Views
 - Plant Summary
 - WIP
 - Supply Chain
 - Operations Overview
 - Chart Drill Downs
 - Work Order Analysis
 - SPC
 - Work Process Management

Operations Overview

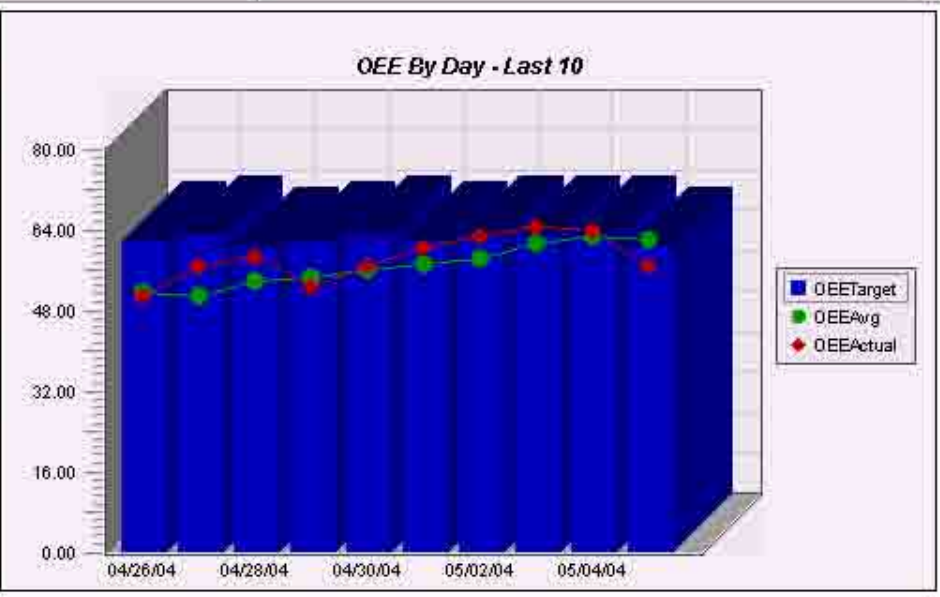
Daily Production Totals			
SKU	Product	Machine	Output
70442	Strawberry Kiwi	L1 Casepacker	157896
70442	Strawberry Kiwi	L1 Filler	212524
70442	Strawberry Kiwi	L1 Labeler	259586

Production Totals By Shift			
Shift	SKU	Machine	Output
0	70442	L1 Labeler	396
0	70442	L1 Casepacker	0
2	70442	L1 Filler	-39434
1	70442	L1 Casepacker	200678
2	70442	L1 Labeler	19534

In Production		
SKU	Product	Size
70442	Strawberry Kiwi	700ml

Production Metrics	
OEE	69.08%
Stops	107.00
Breakdowns	15.00
MTBF	198.36
MTTR	5202.60
Scrap	NA

Equipment Status	
EquipmentName	StateName
L1 Filler	Out Of Bottles
L1 Labeler	Running
L1 Casepacker	Change Over
L1 Filler	Blocked
L1 Labeler	Down



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In Production

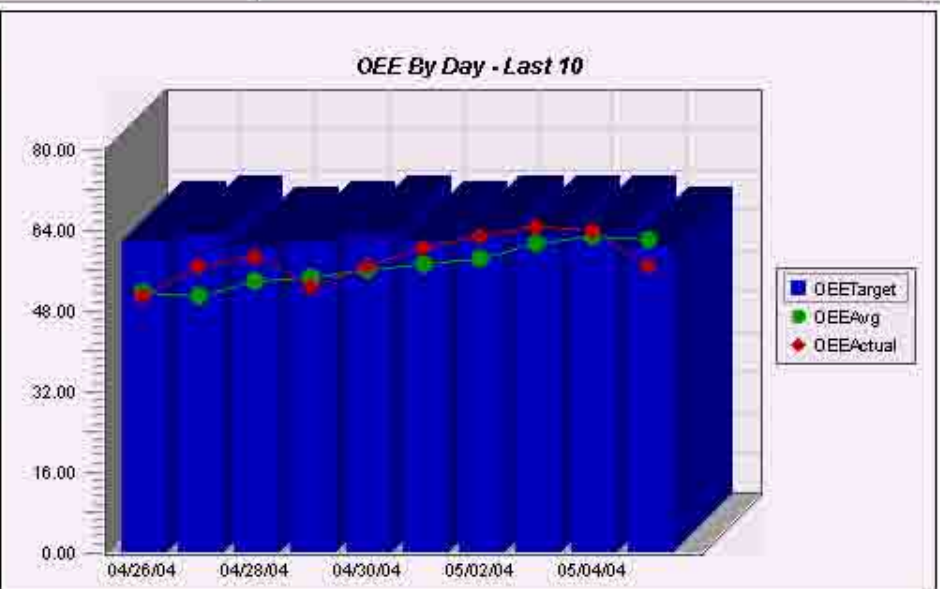
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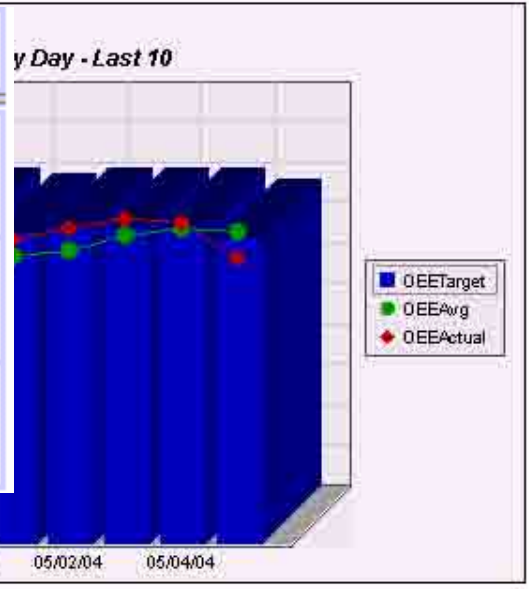
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Scrap	NA

Equipment Status	
EquipmentName	Status
L1 Filler	Out Of Order
L1 Labeler	Running
L1 Casepacker	Changeover
L1 Filler	Blocked
L1 Labeler	Clickable

ACTIVITIES - L1 LABELLER



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				2	70442	L1 Labeler	19534

In Product: L1 LABELER

Record Measurement Points

Read Operating Hours:

Read Operating Hours Hours:

Transaction Responses:

EquipmentName	State	
L1 Filler	Out Of E	
L1 Labeler	Runnin	
L1 Casepacker	Change	
L1 Filler	Blocked	
L1 Labeler	Clickable	

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In Product: L1 LABELER

Record Measurement Points

Read Operating Hours:

Read Operating Hours Hours:

Record Hours

Transaction Responses:

From Plant System

EquipmentName	State	Clickable
L1 Filler	Out Of E	<input type="checkbox"/>
L1 Labeler	Runnin	<input checked="" type="checkbox"/>
L1 Casepacker	Change	<input type="checkbox"/>
L1 Filler	Blocked	<input type="checkbox"/>
L1 Labeler	Clickable	<input checked="" type="checkbox"/>

Record Measurement

- Manufacturing Analytics
 - Correlated Views
 - Plant Summary
 - WIP
 - Supply Chain
 - Operations Overview
 - Chart Drill Downs
 - Work Order Analysis
 - SPC
 - Work Process Management

Operations Overview

Daily Production Totals				Production Totals By Shift			
SKU	Product	Machine	Output	Shift	SKU	Machine	Output
70442	Strawberry Kiwi	L1 Casepacker	157896	0	70442	L1 Labeler	396
70442	Strawberry Kiwi	L1 Filler	212524	0	70442	L1 Casepacker	0
70442	Strawberry Kiwi	L1 Labeler	259586	2	70442	L1 Filler	-39434
				1	70442	L1 Casepacker	200678
				2	70442	L1 Labeler	19534

In Product: L1 LABELER

Record Measurement Points

Read Operating Hours:

Transaction Responses: Measurement Document 8000000001007183

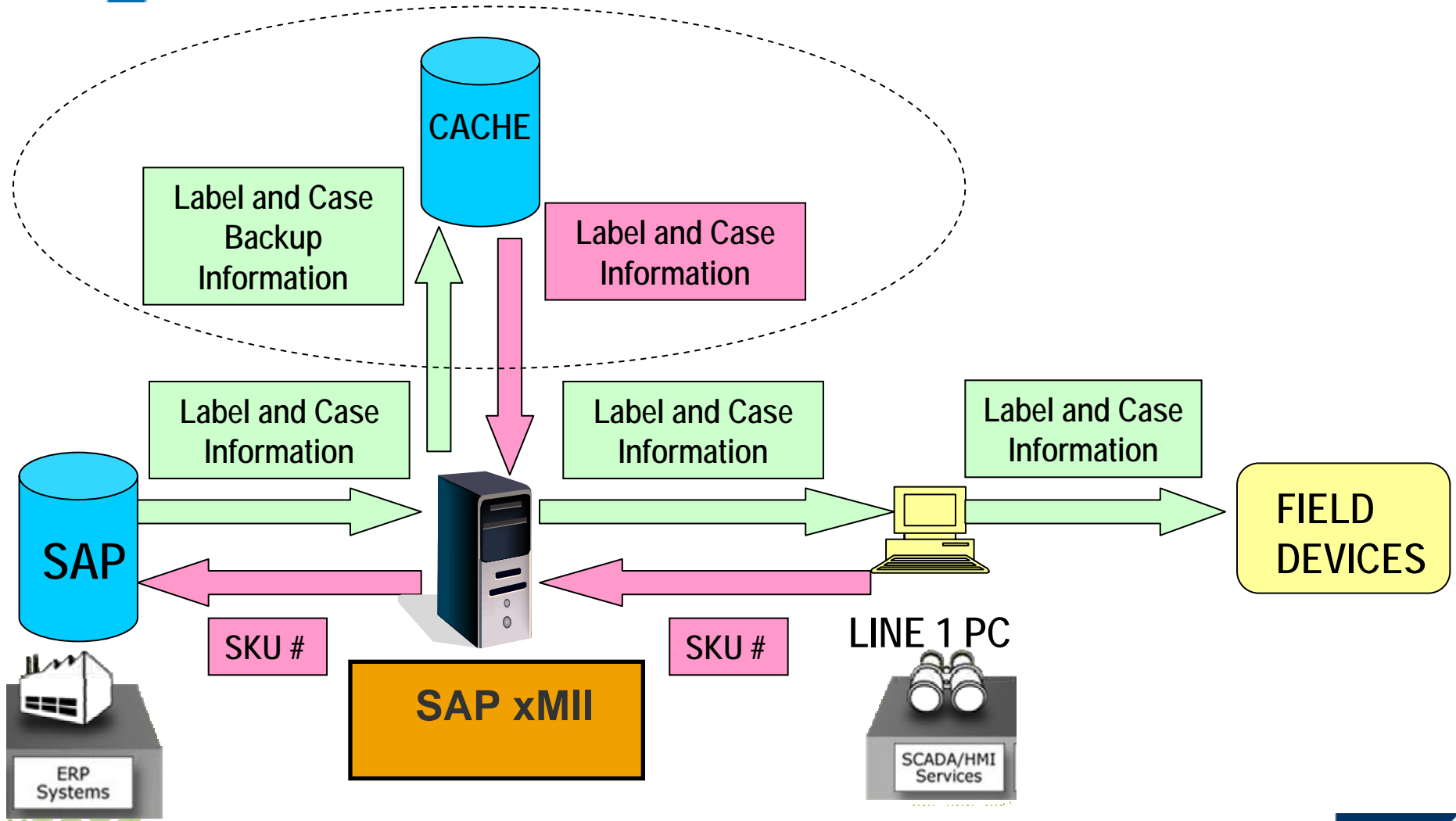
From Plant System

EquipmentName	Statel	
L1 Filler	Out Of E	
L1 Labeler	Runnin	
L1 Casepacker	Change	
L1 Filler	Blocked	
L1 Labeler	Clickable	

A2A: SFA to ERP (Label Verification)



COLGATE-PALMOLIVE COMPANY



Synchronization — Root Cause/Analytics

1

Customer Quality Notification - Containment Process

Customer Name: Intel | Purchase Order: Z3442-77

SAP Production Order: 44377-ML

BatchID	Color	Melt Pt (F)	Chips / Gm
BATCH00001	RED	300.00	25.00
BATCH00002	BLUE	304.00	22.00
BATCH00003	YELLOW	308.00	41.00
BATCH00004	GREEN	312.00	49.00
BATCH00005	BLUE	316.00	65.00
BATCH00006	RED	320.00	65.00
BATCH00007	BLUE	324.00	123.00
BATCH00008	GREEN	311.00	81.00
BATCH00009	GREEN	112.00	99.00
BATCH00010	RED	12.00	97.00
BATCH00011	YELLOW	340.00	105.00

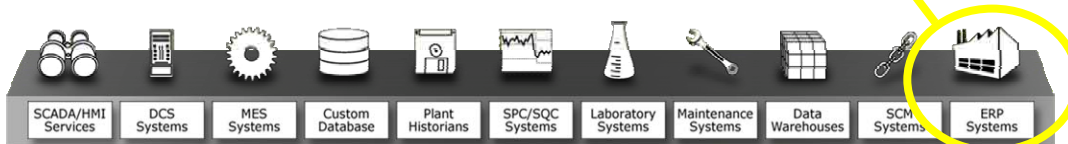
Lots Produced from Selected Batch:

Lot Identifier	Material Code	Location	Customer
FFFE_12	31649900000000000000	Shipped	Intel
FFFE_13	31649900000000000000	WH 3	Intel
FFFE_14	31649900000000000000	Shipped	AMD

Melting Point SPC Analysis - Highlighted Batch is BATCH00010

Profile For Batch BATCH00010

1. Look up customer PO from SAP and return SAP production order
2. Find Batch(es) created to satisfy production order
3. Get Historian and Laboratory Information Management System (LIMS) data for batches, run xMII Analytics
4. If there is a Statistical Process Control (SPC) Alarm, it is a Batch production problem — provide aggregate view of LOTS and CUSTOMERS
5. Email report to product manager, disposition to SAP QM, close record in QN System



Synchronization — Root Cause/Analytics (cont.)

1. Look up customer PO from SAP and return SAP production order
2. Find Batch(es) created to satisfy production order
3. Get Historian and LIMS data for batches, run xMII Analytics
4. If there is an SPC Alarm, it is a Batch production problem — provide aggregate view of LOTS and CUSTOMERS
5. Email report to product manager, disposition to SAP QM, close record in QN System

Customer Quality Notification - Containment Process

Customer Name: Intel
Purchase Order: Z3442-77, Z3452-88, Z3457-89, Z3466-12
SAP Production Order: 44377-ML

BatchID	Color	Melt Pt (F)	Chips / Gm
BATCH0001	RED	300.00	25.00
BATCH0002	BLUE	304.00	22.00
BATCH0003	YELLOW	308.00	41.00
BATCH0004	GREEN	312.00	49.00
BATCH0005	BLUE	316.00	65.00
BATCH0006	RED	320.00	65.00
BATCH0007	BLUE	324.00	123.00
BATCH0008	GREEN	311.00	81.00
BATCH0009	GREEN	112.00	99.00
BATCH0010	RED	12.00	97.00
BATCH0011	YELLOW	340.00	105.00

Melting Point SPC Analysis - Highlighted Batch is BATCH00010

Profile For Batch BATCH00010

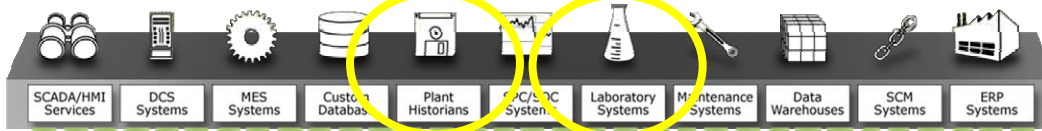
Navigation Bar: SCADA/MI Services, DCS Systems, MES Systems, Custom Database, Plant Historians, SPC/SQC Systems, Laboratory Systems, Maintenance Systems, Data Warehouses, SCM Systems, ERP Systems

Synchronization — Root Cause/Analytics (cont.)



3

1. Look up customer PO from SAP and return SAP production order
2. Find Batch(es) created to satisfy production order
3. Get Historian and LIMS data for batches, run xMII Analytics
4. If there is an SPC Alarm, it is a Batch production problem — provide aggregate view of LOTS and CUSTOMERS
5. Email report to product manager, disposition to SAP QM, close record in QN System



Synchronization — Root Cause/Analytics (cont.)

Customer Quality Notification - Containment Process

Customer Name: Intel
Purchase Order: Z3442-77

SAP Production Order: 44377-ML

BatchID	Color	Melt Pt (F)	Chips / Grm
BATCH0001	RED	300.00	25.00
BATCH0002	BLUE	304.00	22.00
BATCH0003	YELLOW	308.00	41.00
BATCH0004	GREEN	312.00	49.00
BATCH0005	BLUE	316.00	65.00
BATCH0006	RED	320.00	65.00
BATCH0007	BLUE	324.00	123.00
BATCH0008	GREEN	311.00	81.00
BATCH0009	GREEN	112.00	89.00
BATCH0010	RED	12.00	97.00
BATCH0011	YELLOW	340.00	105.00

Jobs Produced from Selected Batch

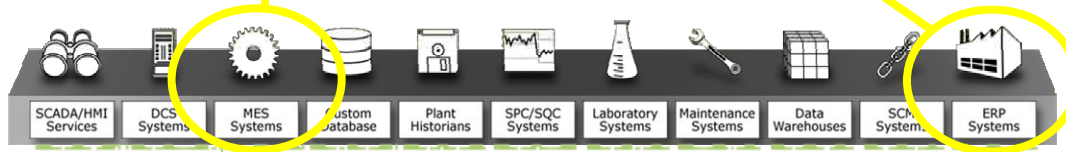
Lot Identifier	Material Code	Location	Customer
PETE_10	Phosphorus Triethylphosphate	Shipped	intel
PETE_30	Phosphorus Triethylphosphate	vWH 3	intel
PETE_10	Phosphorus Triethylphosphate	Shipped	AMD

Melting Point SPC Analysis - Highlighted Batch is BATCH00010

Profile For Batch BATCH00010

4

1. Look up customer PO from SAP and return SAP production order
2. Find Batch(es) created to satisfy production order
3. Get Historian and LIMS data for batches, run xMII Analytics
4. If there is an SPC Alarm, it is a Batch production problem — provide aggregate view of LOTS and CUSTOMERS
5. Email report to product manager, disposition to SAP QM, close record in QN System



Synchronization – Root Cause/Analytics (cont.)

Customer Quality Notification - Containment Process

Customer Name: Intel
Purchase Order: Z3442-77

SAP Production Order: 44377-ML

BatchID	Color	Melt Pt (F)	Chips / Grm
BATCH0001	RED	300.00	25.00
BATCH0002	BLUE	304.00	22.00
BATCH0003	YELLOW	308.00	41.00
BATCH0004	GREEN	312.00	49.00
BATCH0005	BLUE	316.00	65.00
BATCH0006	RED	320.00	65.00
BATCH0007	BLUE	324.00	123.00
BATCH0008	GREEN	311.00	81.00
BATCH0009	GREEN	112.00	89.00
BATCH0010	RED	12.00	97.00
BATCH0011	YELLOW	340.00	105.00

Melting Point SPC Analysis - Highlighted Batch is BATCH0010

Profile For Batch BATCH0010

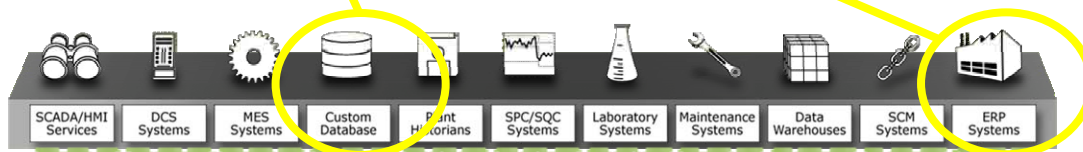
Lots Produced from Selected Batch

Lot Identifier	Material Code	Location	Customer
PETE_12	21040000000000000000	Shipped	Intel
PETE_10	21040000000000000000	vM 3	Intel
PETE_10	21040000000000000000	Shipped	AMD

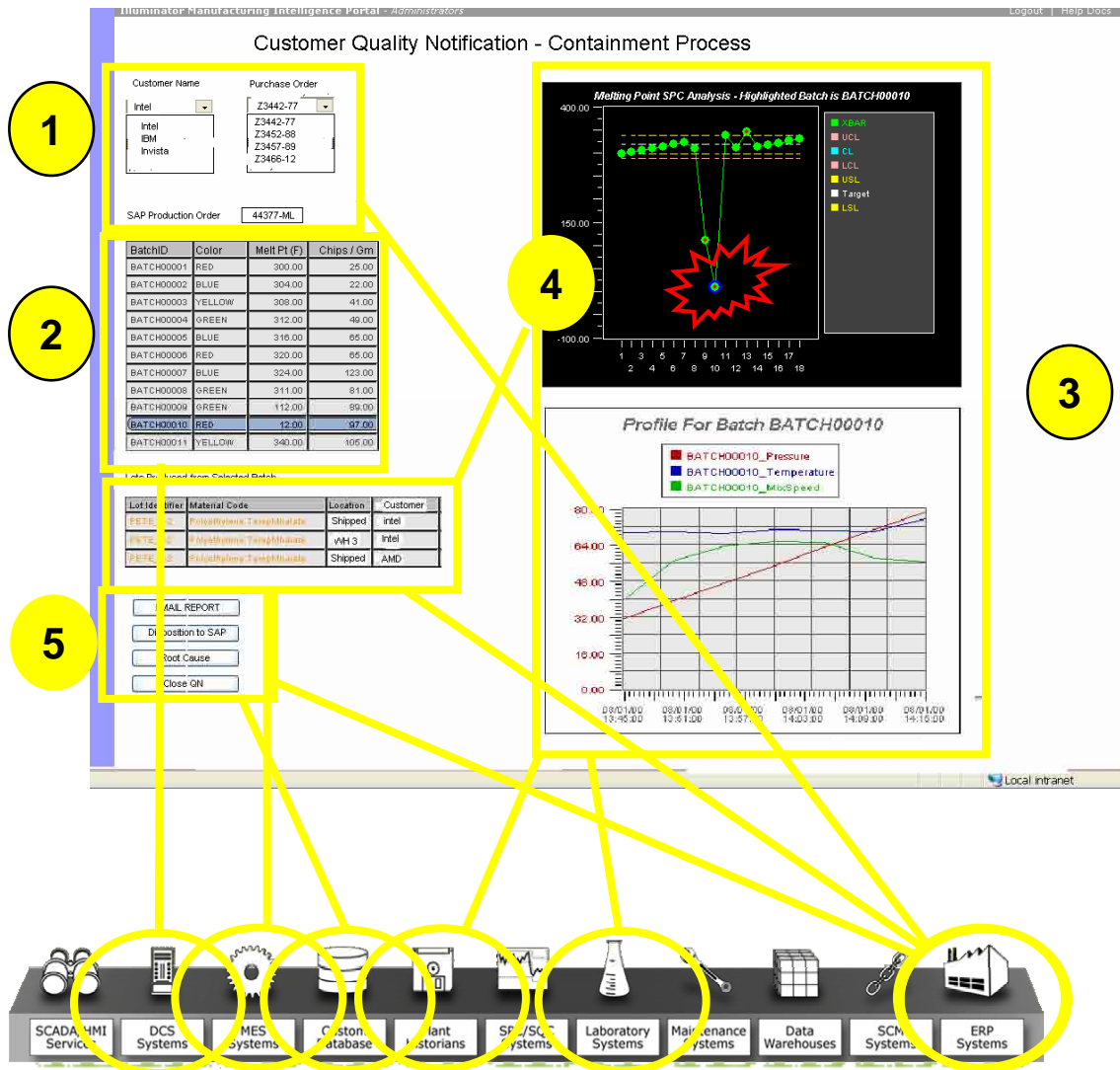
5

EMAIL REPORT
Disposition to SAP
Root Cause
Close QN

1. Look up customer PO from SAP and return SAP production order
2. Find Batch(es) created to satisfy production order
3. Get Historian and LIMS data for batches, run xMII Analytics
4. If there is an SPC Alarm, it is a Batch production problem — provide aggregate view of LOTS and CUSTOMERS
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Synchronization — Root Cause/Analytics (cont.)



1. Look up customer PO from SAP and return SAP production order
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xMII Customer Success Stories

- Whirlpool
- Dow Corning



Whirlpool

Driving Process Improvements Across Global Manufacturing Operations

Rui Fonseca

Director – Global Development – Manufacturing
Whirlpool Corporation

Presented at the SAP xMII User Group Conference,
October 2005

Whirlpool — Challenges and Objectives

Overview:

- **Founded in 1911**
- **World's leading manufacturer and marketer of major home appliances**
- **Whirlpool, KitchenAid, Brastemp, Bauknecht, Consul, and other brands marketed in more than 170 countries**
- **Annual sales of US\$13 billion**
- **520 manufacturers and technology centers worldwide; 68,000 employees**
- **Standardized on SAP's ERP**
- **SAP xMII in 15 plants worldwide**

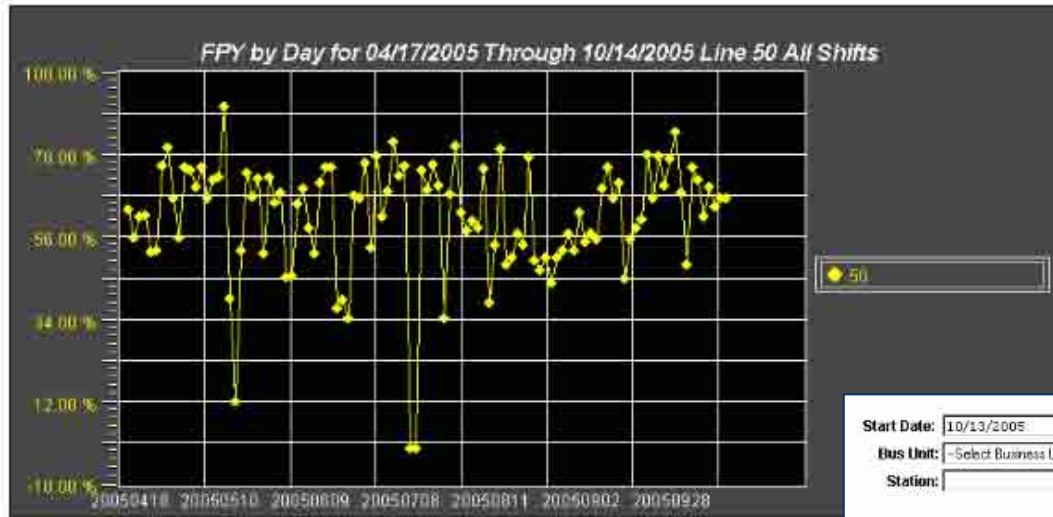
Key Challenges:

- **Transactional integration of multiple MES, legacy, and shop floor systems on the plant floor with SAP's ERP**
- **Extend SAP to production personnel and improve productivity/performance**
- **Improve information delivery and reporting to plant floor**
- **Drive continuous improvement programs**
- **Reduce defect/rework**

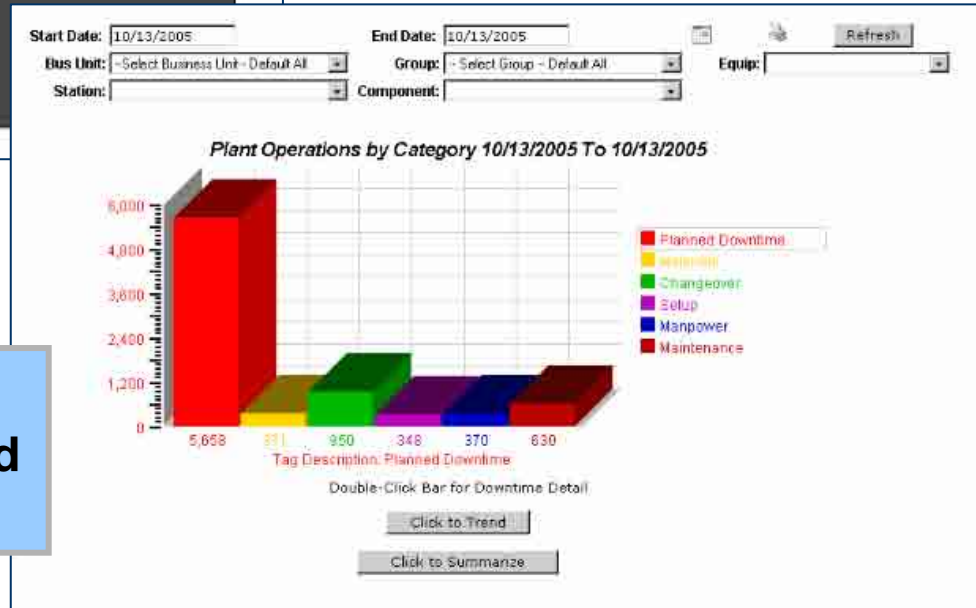


Manufacturing Metrics

Start Date: 04/17/2005 End Date: 10/14/2005 Refresh
 Line: Line 50 Shift: Combine All Shifts Time Interval: By Day

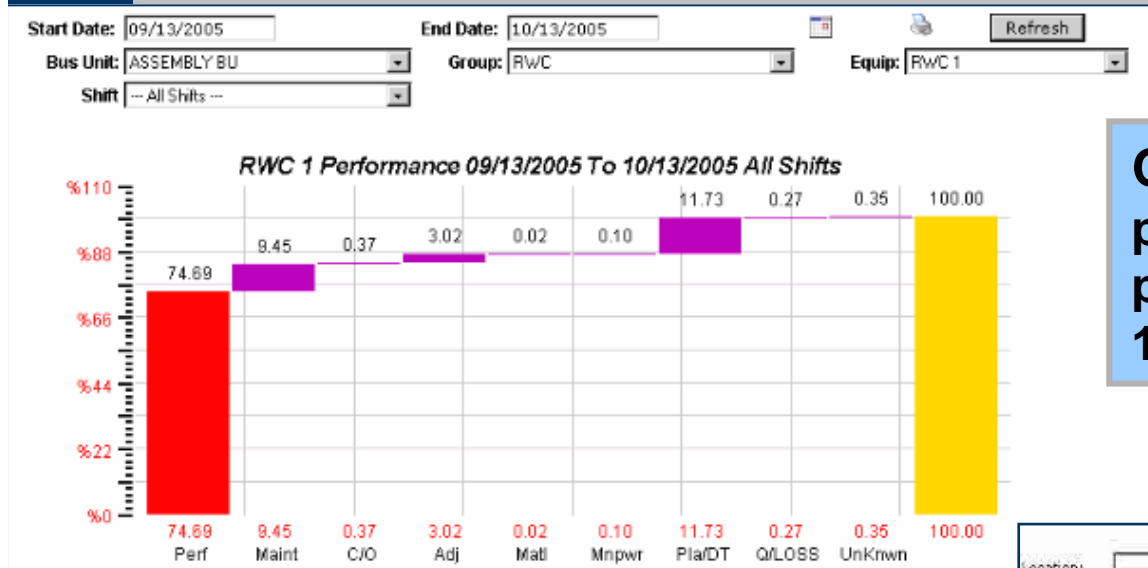


First Pass Yield — Data collected in real time at various points in the assembly process



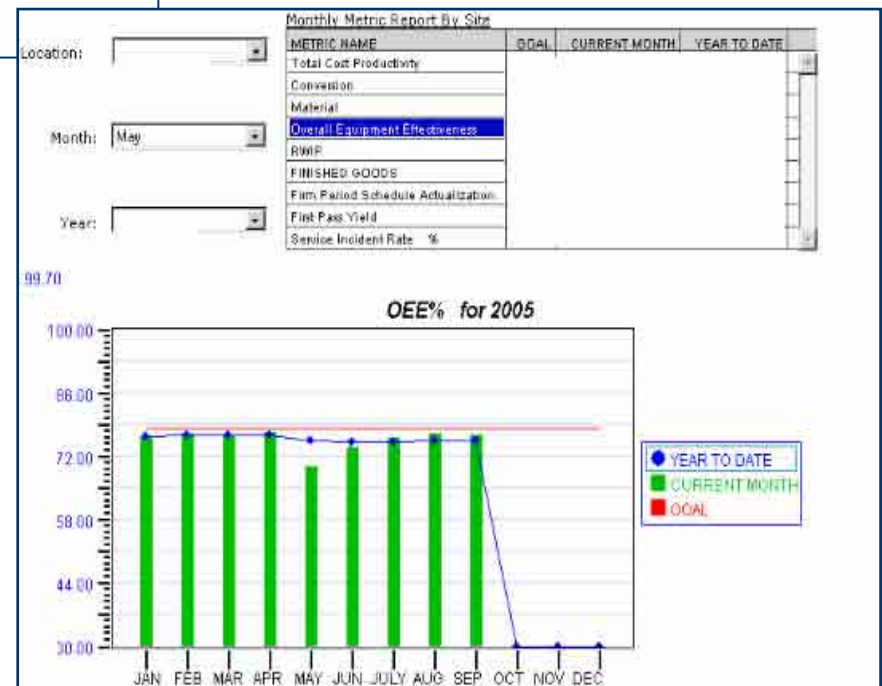
Downtime Tracking — Captured by category and used for OEE calculation

Manufacturing Metrics (cont.)



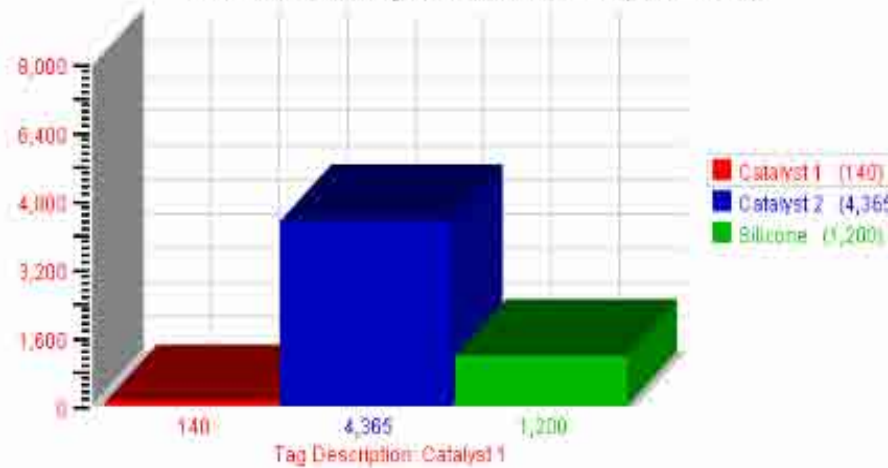
OEE — Waterfall chart of performance losses for a particular machine against 100% OEE

Global Metrics — Captured manually across all regions and summarized at a global level. Metric above the chart drives the chart view.



Real-Time Data

ChemTank Catalyst/Silicone Levels (In Gallons)



ChemTank Catalyst/Silicone Levels (In Pounds)

Catalyst 1	Catalyst 2	Silicone
1074	30120	9659

ChemTank Iso Bulk Levels (In Gallons)



ChemTank Iso Bulk Levels (In Pounds)

Iso Bulk N	Iso Bulk S	Iso Bulk W
233463	238520	94741

ChemTank Door Blend/Hold Levels (In Gallons)



ChemTank Door Blend/Hold Levels (In Pounds)

Door Blend	Door Hold A	Door Hold B
3997	50977	24521

Connected to Foam Chemical Tanks PLC — Used by Materials and Procurement as an alert for order points. Shop Floor technicians use it to know when mix is ready and when to unload rail tankers — replaced Excel spreadsheets, manually reading gauges, and many phone calls.

PM — Selecting SAP Inventory

Search for Material — List Display by Number or Description

Material Search

Material: CLEAR

Description: SEARCH

Material	Description
ZM0017829	PUMP - UNIST TWO OUTLET PUMP # 2000-2
ZM0023255	DIAPHRAM-ULTRA FLEX NEOPRENE 08-1020-51 FOR WILDON PUMPS
ZM0028018	PUMP-DD1 VALCO 560X589
ZM0028018R	PUMP - DD1 VALCO 560X589 REPAIRED
ZM0028019	KIT - PUMP SUPPORT EQUIPMENT VALCO560X5768
ZM0028020	KIT-PUMP SEAL VALCO 560X560
ZM0031473	PUMP-VICKERS V10-1P2P-1A20
ZM0040023	PUMP-AIR DRIVEN (USED IN NAGARA PRESSES
ZM0042050	COUPLING-SPLINE LOVEJOY MODIFIED TO DWG 27151-20A REXROTH PUMP HALF
ZM0042575	FUSE-VALCO 08SX053 GLLIE PUMP CONTROL
ZM0042576	BOARD-DD1 PUMP CONTROL VALCO 151XX121
ZMT11064	CONTROL-CUTOFF PUMP & LOW WATER CLEAVER-BROOKS 817-1307
ZMT11644	PUMP-VACUUM 101 Q 1/2 HP 1725 RPM GAST 0823 P/N G273
ZMT11670	PUMP-VERTICAL 4X3X12 300GPM 20 HP HAYNES 6853 SS FIT
ZMT11711	PUMP-VERTICAL 3X2X10 200GPM 7.5 HP HAYNES 6551 SS FIT
ZMT11718	PUMP-VERTICAL 4X3X10 500GPM 15 HP HAYNES 6551 SS FIT
ZMT11825	PUMP-DIAPHRAGM SANDPPER AIR POWER EBTMTB-3-1
ZMT113097	PUMP-PISTON 14.1 INORDSON 181424

WHERE USED INVENTORY ADD TO CART DISPLAY CART

Inventory By Location

Material:

Description: RETRIEVE

Current Bal	Stock Category	Reorder Point	Last Issue Date	Created On
1	Non-Stock	1		02/03/2005
Consignment	Issue Unit	Econ Order Point	YTD Issues	Created By
0	EA	1	0	HANKSLK
Storage Bin	Order Unit	On Order Qty	Last Year	Material Group
A0100		N/A	0	10000012
Qty Reserved	Current Price	Lead Time	2 Years Ago	ABC Indicator
0	377.08	42	0	A
Old Material No.	Haz Material	Store Room	3 Years Ago	Default Account
		M010	0	0000607500

WHERE USED Material BOM RETRIEVE ON ORDER ADD TO CART DISPLAY CART

Result Screen — Displays information from Material Master in addition to the current balance. This use of the xMII tools provides a more controlled user experience in a Web browser instead of having people log into SAP and go to multiple screens for the same information.

PM — SAP Work Order View

Order: EM 80003864 Broken Pump

Person responsible: PlannerGrp 020 / P097 planner 02, Mn.wk.ctr ASYLINE2 / P097 Assembly Line 2

Dates: Bsc start 08/18/2005, Priority 1 Very high, Basic fin. 08/18/2005

Reference object: Func. Loc. TU-OPER-ASBLY-LIN..., Equipment ET2198, Assembly PYRO - SCOTT SIDE PANEL HPU

First operation: Operation Broken Pump, WkCtr/Pint ASYLINE2 / P097, Acty Type MLABOR

Work Order (WO) View — SAP ERP display of work order created through the SAP xMII interface!

Add To Shopping Cart

Charge To: 80003864 Broken Pump

Charge To Category: Work Order Cost Center

Material: ZMT11644

Description: PUMP-VACUUM

Required: 1

Available: 1

Storage Bin: F0707

Microsoft Internet Explorer: Material ZMT11644 was successfully added to the shopping cart.

Add to Cart — Once a WO exists, the material can be added to a shopping cart for that WO

Plant to ERP — Production Operations

Production & Repetitive Manufacturing Orders

Start Date: 1/1/2005 End Date: 8/18/2005 Line: -- All Lines -- Refresh

Order Number	Order Type	Material Number	Alt BOM	Production Version	Line	Start Date	Remaining Quantity	Confirmed Qty	MRP Controller	Pro Sch
003700000000	ZP37	000000858915320	01	0001	---	07/27/2005	8	7	001	---
003700000019	ZP37	000000858746099	03	0003	---	07/28/2005	100	0	001	---
003700000020	ZP37	000000858746099	03	0003	---	07/28/2005	0	100	001	---
003700000021	ZP37	000000858746099	03	0003	---	07/28/2005	0	100	001	---
003700000022	ZP37	000000858746099	03	0003	---	07/28/2005	0	100	001	---
003700000024	ZP37	000000858746099	03	0003	---	07/29/2005	0	10	001	---
003700000017	ZP37	000000858746099	03	0003	---	08/12/2005	100	0	001	---

Interactive Work Center Schedule: Production Schedule updated every 30 minutes

Double-clicking on a production order provides the confirmation screen to enter new production

Production & Repetitive Manufacturing Order Operations

Order No: 003700000019 Order Type: ZP37 Material No: 000000858746099230

Legend
■ Confirmation
■ Scrap
■ Both

SAP Backup Solution Production Order Confirmation

Production Order Confirmation

Date/Time: 07/18/2005 13:57:26

Order Number: 003700000019

Operation: 0010

Order Qty: 8

Total Produced: 78

Short Run:

Add/Modify Confirmation

Delete Confirmation

Cancel

Confirmation Add/Modify Scrap Order Header



Value from the SAP (ERP and SAP xMII) Solution:

- Manufacturing Performance applications delivered with SAP xMII across North America in weeks
- Quality improvements recognized immediately through reduced defects and rework
- Plant-to-plant comparisons via SAP xMII available for management in consistent format
- Accelerated containment of quality issues before shipping
- Value of SAP's ERP extended with SAP xMII, without incremental training of plant floor personnel



Value from the SAP (ERP and SAP xMII) Solution:

- Manufacturing Performance applications delivered with SAP xMII across North America in weeks

- Quality improvements recognized immediately through reduced



Lighthammer (now SAP xMII) is the only solution we have found that is robust enough to address manufacturing performance applications driving operational excellence across our 30+ plants worldwide, as well as provide the transactional integration with SAP ERP.”

- Jim Shimp, Senior Director, Global Apps.
Development, Whirlpool

- Value of SAP's ERP extended with SAP xMII, without incremental training of plant floor personnel

Dow Corning

DOW CORNING

Realizing the Adaptive Manufacturing Vision at Dow Corning

Keith Carey

Enterprise Architect, Dow Corning

Presented at the SAP xMII User Group Conference,
October 2005

Business Overview

- Joint venture between Corning and the Dow Chemical company
- Serving the diverse needs of more than **25,000 customers** worldwide
- Offering more than **7,000 products and services**
- **8,200 employees** across 33 manufacturing sites
- **2004 Sales \$3.37B/2004 Q1-Q3. Sales up 17%** vs. 2003 same period.

Strategic and Tactical Goals

- Increase revenues and customer satisfaction with better responsiveness and delivery performance
- Reduce response time to customer enquiries from days to hours

Key Challenges

- Customer demand for superior delivery and responsiveness
- Right-time information delivery to employees
- Shop floor-to-enterprise process integration

SAP Solution

- SAP R/3 4.7
- SAP NetWeaver
- SAP Manufacturing Intelligence dashboards
- **SAP xMII (Lighthammer)**

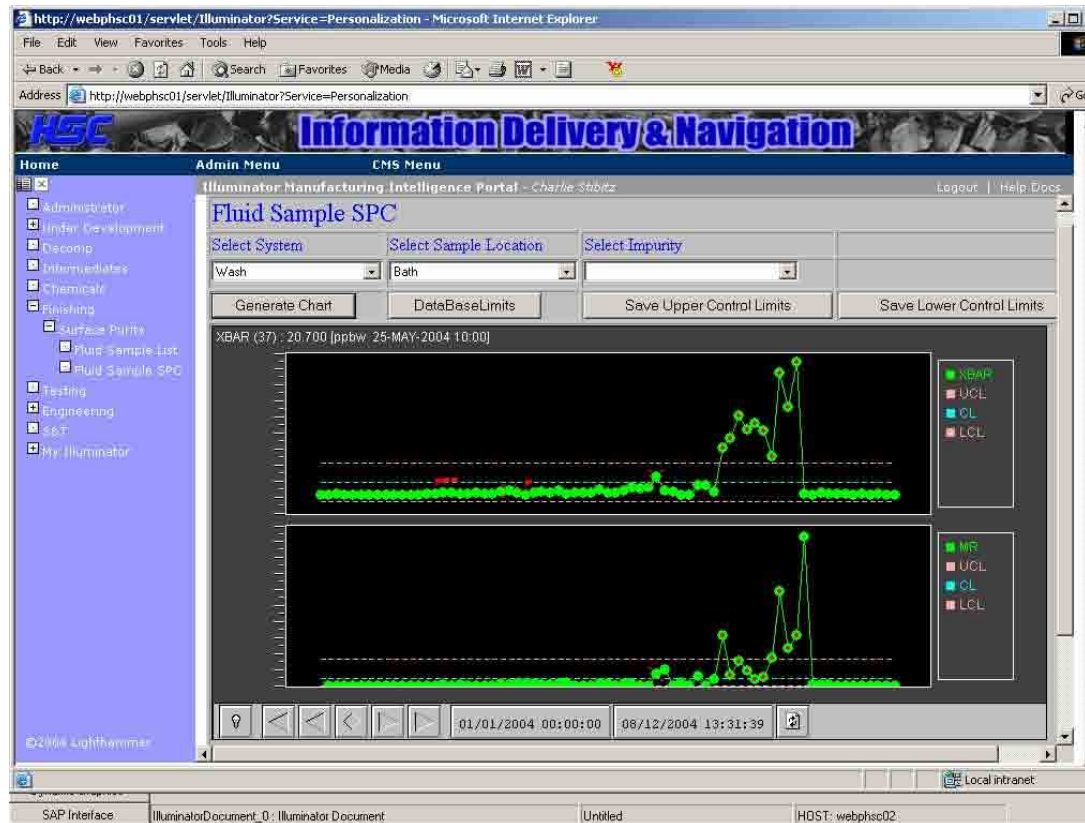
Quick Glimpse: HSC xMII Projects

Information Navigation at HSC: A Step Change in Productivity

“The two-fold purpose for information delivery is to:

- 1) Provide a step change in our ability to monitor and improve work and manufacturing processes
- 2) Improve stability and root cause analysis, and provide step change improvements in quality and cost reduction.”

– Arv Arvidson, Technology Consultant/Project Leader



Current Breadth of HSC SAP xMII Applications

Decomp

- Production Summary
- Bulk Purity SPC
- Reactor/Site Dashboards
- Batch Report
- Resistivity Profile
- Run Parameter SPC
- Reactor PI Trends
- SAP Material Tracking
- SAP Process Order Display
- Batch Sales

Intermediates

- Chemical Sample SPC
- EPI SPC
- Susceptor Tracking
- Online GC Analyzers
- DCS/TCS Sales SPC

Finishing

- Production Summary
- S-22 FRS Batch Report
- Fluid Sample List and SPC
- Surface Metals List and SPC
- Surface Metals Analysis
- Experimental Samples
- First Pass Yield
- Carbon End Loss
- Etch Depth Entry and SPC
- Particle Count Entry and SPC

Testing

- Acid Blank Comparison
- Acid Blank SPC
- Sample Search/Results
- Electrical Purity by Zoner

Value from the Solution:

DOW CORNING

- Response time to customer enquiries slashed from **days to one to two hours**
- Better product quality and delivery performance
- Higher Employee Productivity from more accurate, right-time information accessibility to needed content and applications
 - ◆ Hours/month impact for employees equates to millions of dollars
- Higher customer satisfaction and higher sales conversion rates on the Web
- Estimated development costs (TCO) reduced by three to four times using SAP NetWeaver®

Value from the Solution:

DOW CORNING

- Response time to customer enquiries slashed from **days to one to two hours**



■ Better product quality and delivery performance

SAP's xApp MII and the dashboards provide the top-level KPI data and the drill downs to the production data for alerts and workflows.

Accountability has become much more realistic. Individuals with objectives to improve performance are now aware of and sensitized to that performance on a day-in and day-out basis.”

Kirk Royster, Global Enterprise Architecture Manager

Quoted in “Dashboards Drive Improved Performance at Dow Corning,” Automation World, January 2005

- Estimated development costs **(TCO) reduced by three to four times** using SAP NetWeaver



Manufacturing challenges

What is xMII?

Customer successes

Wrap-up

The Business Case for Manufacturing Intelligence



Tangible Benefits* Impact

Revenue

- Chemical MFG – Increased Revenue through enhanced customer service 2-3%
-

Operating cost

- Chemical MFG – Improved Material Conversion Rates \$2.5M/site
 - CP MFG – Reduced material costs \$3M/site
 - Discrete MFG – Increased First Pass Yield \$1M/site
-

Working capital

- CP MFG – Increased Asset Utilization \$80M
-

* Examples from survey of existing xMII Customers

The Business Case for Manufacturing Intelligence (cont.)

“

EMI is the rare low-risk, high-reward project. It can be installed without risk to your existing operational systems like Enterprise Resource Planning (ERP), Manufacturing Execution System (MES), and Controls, but generates short-term payback and sets the stage for long-term benefits.

Large-scale producers showed payback in six months on the average, with benefits cascading over time to result in larger accrued returns.

One manufacturer projected an accrued three-year return of \$20M, based on the performance improvement achieved in its pilot project from a \$1M investment in EMI software.”

December 31, 2003
Bill Swanton and Alison Smith



* Examples from survey of existing xMII Customers

Quantifiable Value of Integration

Potential cost savings

Comprehensive enterprise-wide manufacturing solution requirements	With SAP solution	With a non-integrated competitor solution
Number of interfaces to SAP components*	None	50–100
Estimated cost (\$16-32k per interface)	\$ 0	\$2.2M – \$4.4M
Estimated on-going support costs (\$4K-\$8K per interface per year)	\$ 0	\$.56M – \$1.12M
Five years cumulative integration costs	\$ 0	\$5M – \$10M

* Recognizing that each instance of a component will be a separate, yet similar interface

Based on customer experience and benchmarking estimates, the five-year cost is typically \$5 million (above estimate is therefore conservative and achievable)

Quantifiable Value of Integration (cont.)

Potential cost savings

Comprehensive enterprise-wide manufacturing solution requirements	With SAP solution	With a non-integrated competitor solution
Number of interfaces to SAP components*	None	50-100
Estimated five-year cost (\$4K per interface)	<p>Typical Customer Benefits delivered:</p> <ul style="list-style-type: none"> ■ Five-year TCO reduced by \$200K-\$500K/Plant ■ Time-to-value typically between 60-120 days 	
		400M
		120M
		300M

* Recognizing that each instance of a component will be a separate, yet similar interface

Based on customer experience and benchmarking estimates, the five-year cost is typically \$5 million (above estimate is therefore conservative and achievable)

■ Whirlpool

- Rapid deployment model
- Undisturbed ERP landscape that is tightly integrated to the manufacturing environment
- 20 times the ROI in the first two years

■ Dow Corning

- Significant breadth of applications deployed
- Deep integration of manufacturing and business data delivered directly to users at all levels
- Significant direct business value driven by visibility

The Importance of Choosing Your Manufacturing Partner

Identify one that can deliver:

- **Manufacturing Synchronization:** A single-layer of pre-built connectivity to multiple manufacturing applications to *synchronize real-time manufacturing and enterprise business processes at a lower Total Cost of Ownership (TCO)*
- **Manufacturing Excellence:** Unified, real-time analytics and decision support to enable production personnel to *monitor, measure, analyze, and control KPIs for higher productivity and performance*

True Manufacturing Performance Management (MPM) delivers:

- **Manufacturing Integration** — A single-layer of pre-built connectivity to multiple manufacturing applications to integrate real-time manufacturing and enterprise business processes for exception-based management
- **Manufacturing Intelligence** — Unified, real-time analytics and decision support for production personnel to enable them to monitor, measure, analyze, and control KPIs for higher productivity and performance

The right choice enables manufacturers **to become adaptive** and **to deliver superior manufacturing performance**

SAP xMII Web page on sap.com:

- www.sap.com/solutions/xApps/xMII/index.epx

SAP xMII Web seminar archived on Managing Automation Web site for access on demand:

- www.managingautomation.com/maonline/research/webcast/view/5111809

7 Key Points to Take Home

Become adaptive or become extinct

- **Profitability in the Supply Chain – develop a true end-to-end strategy**
- **Dynamic Response to Unpredictable Demand – you can't improve what you can't see**

Leverage your existing data

- **Most organizations have all the Shop Floor Data they need to get started**
- **Rip-and-Replace creates significant risk, and can be costly in time and dollars**

Leverage your existing systems

- **Data replication is unnecessary and compounds accuracy and synchronization problems**
- **It's difficult to be adaptive when you have to wait for the next Batch Update**

Plants function differently than the enterprise

- **Business Processes need to be targeted and simplified for use by Front-Line Personnel**
- **The granularity of Enterprise Data is insufficient to support the needs of the Manufacturing Improvement Teams**

7 Key Points to Take Home (cont.)

It's hard to provide all the answers until you know all the questions

- Be careful not to implement technologies that cement bad behavior
- Ensure composites can evolve as your organization becomes adaptive and identifies new opportunities

Time-to-value is critical!

- Rapid Prototyping and Speed in Deployment are critical to Maintaining Momentum
- While ROI this year is good, ROI this Quarter is better

Get started

- When you understand the impact of becoming an Adaptive Manufacturer, you will understand why delay can be so costly!

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