

# Real Time Analytics at Hershey

Russ Gregg  
Business Transformation Manager  
IS Global Supply Chain Solutions

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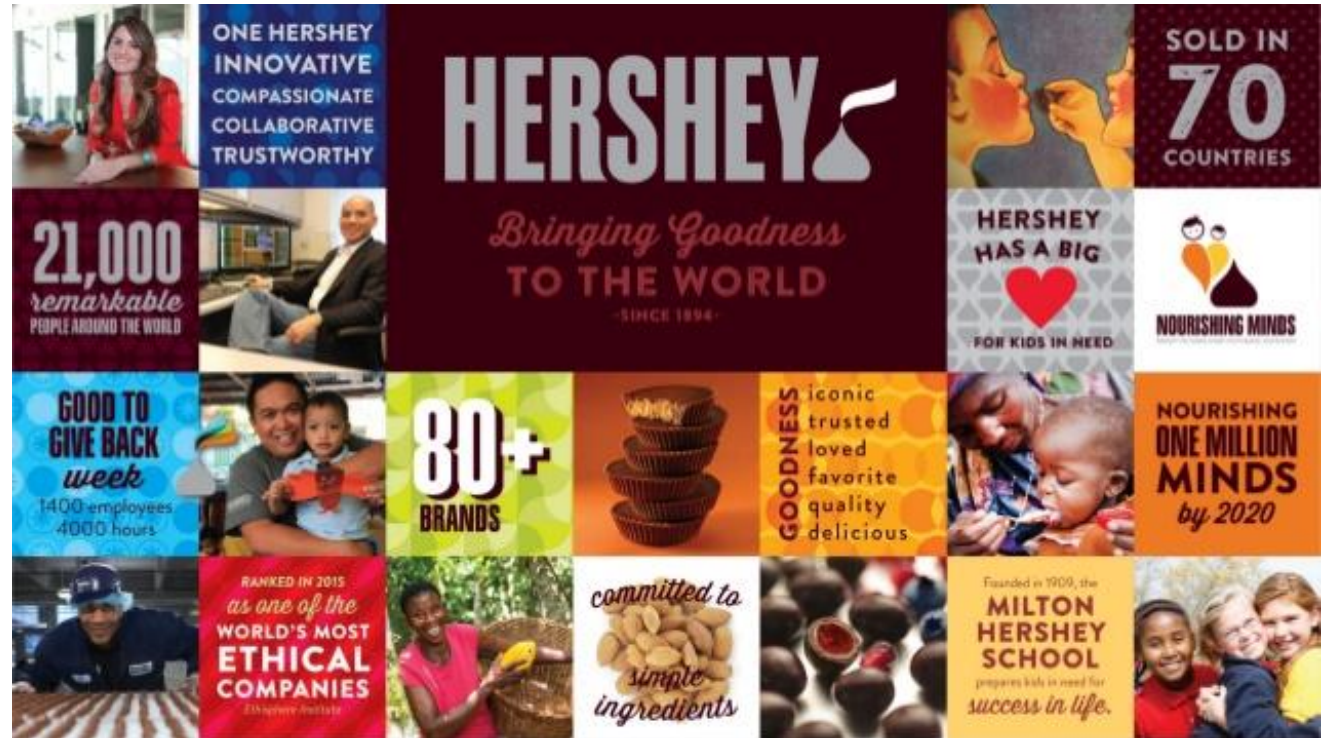
# Hershey Story – Do Well by Doing Good

Year	Event
1894	Milton S. Hershey establishes the Hershey company.
1905	The Hershey Chocolate factory begins operations and the Hershey Trust Company is established.
1909	Mr. Hershey and his wife Catherine establish a boarding school for orphan boys.
1918	Milton establishes the Hershey Trust Fund to benefit children in need.
1935	Milton establishes the M.S. Hershey Foundation to provide educational and cultural enrichment for Derry Township residents and visitors. (Penn State Medical Center, The Hershey Story, Hershey Gardens, Hershey Theatre, and Hershey Community Archives)
Today	Manages the \$12 billion trust to grow and maintain the Milton Hershey School which is a coed boarding school benefiting over 2,000 students from pre-K through High School.



# The Hershey Company

- 18,000 employees
- 80 Brands
- 70 Countries
- \$7.4 billion revenues

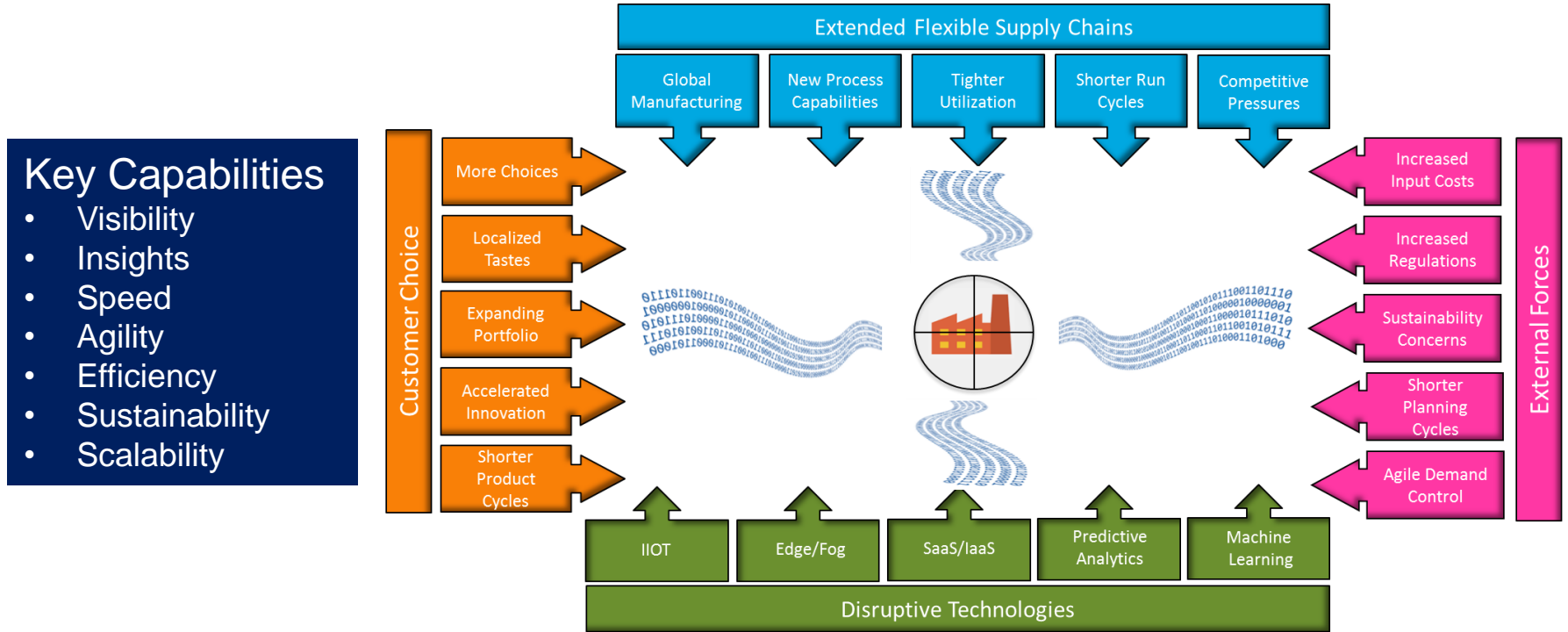


# Some Hershey Initiatives

- **Cocoa Sustainably-** [CocoaLink](#), [Learn to Grow](#), [CocaAction](#) are all part of meeting our 21<sup>st</sup> Century Cocoa Sustainability Goal of 100% certified and Sustainable supply by 2020. ( 2016 - Over 48,000 farmers and 60 % sustainable sourcing)
- **Nourishing Minds:** Improving the lives of children by developing and supporting manufacturing of daily nutritional supplement. (Reaching over 50,000 kids in Ghana each day.)
- **Rise Against Hunger** – Annual event where over 700 employee volunteers pack meal packs to feed school children. (Over 1 M meals packed in 4 years 285,120 meals in one afternoon)
- **Packaging Sustainability** –Reduce 25 Million pounds of packaging by 2025. (3.5 M lb. reduction through new innovative retail ready cases and over 9 M LB. reduction since 2014.)
- **Simple Ingredients:** No artificial flavors, no preservatives no artificial sweeteners and natural colors. (Milk Chocolate: Kisses, Nuggets, Bars and Simply 5-Syrup)
- **Smart Labels:** Goes beyond the printed labels to provide scannable code for quick online access to detailed ingredient information and certifications. (70 % complete and 90% by 2018).



# Supply Chain Challenges




# Visibility

Results of an IBM survey of over 400 supply chain executives in over 25 countries and 29 industries.

“70% of the executives stated their biggest challenge was visibility. They **don't have** the appropriate level of **insight** into what is happening within their operations on the ground-level or on the production floor in real time, and this lack of insight **hampers their ability** to make the **right decisions at the right time.**”

*IBM - Driving operational excellence with predictive analytics*



**SupplyChain  
Visibility**

**Definition:** Providing controlled access and transparency to accurate, timely and complete plans, event and data – transactions, content and relevant supply chain information. (Gartner, 2016)



# Real Time Enterprise

“The Real-Time Enterprise **monitors, captures and analyzes root-cause** and overt **events** that are critical to its success the instant those events occur to **identify** new **opportunities, avoid mishaps** and **minimize delays** in core business processes.

The Real-Time Enterprise will then **exploit that information** to progressively **remove delays** in the **management** and **execution** of its critical business processes.”

*Gartner*



# Achieving Operational Intelligence

## Evolutionary Process

- Move from reactive to proactive environment.
- Move from slow control responses to fast responses.
- Move from post event investigations to prevention.
- Move from data display to operation insights to predictive analysis.





# Operational Intelligence Transformation Stages



## ASSESSMENT

Create the blueprint for a secure and collaborative operation.



## SECURE & INTEGRATE

Securely integrate IT/OT networks and systems to modern information-enabled technologies.



## LIBERATE DATA

Define and organize operational data to deliver performance-critical information for better real-time decision making.



## ANALYTICS

Transform data into operational information that can help lower cost, increase productivity and improve customer satisfaction.

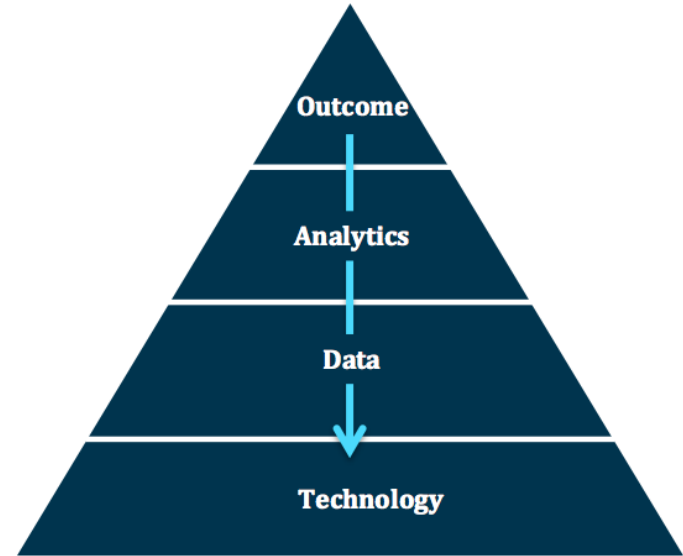


## OPTIMIZE

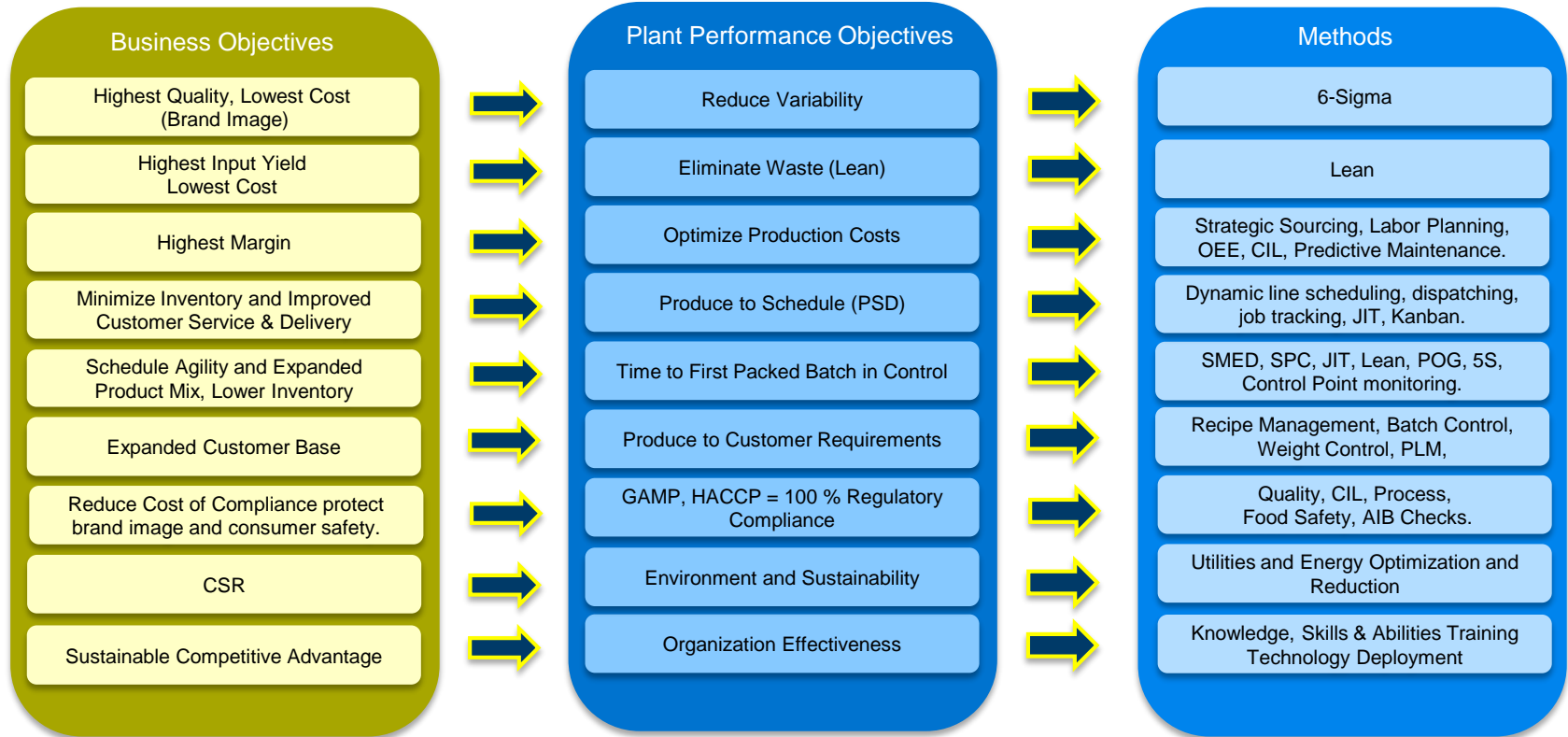
Leverage predictive capabilities to respond faster to external events and changing market conditions.

# Assessment - Start with the End in Mind

1. What are the desired business outcomes?
2. What are the measured business objectives?
3. How do plant objectives align to meet business objectives?
4. What methodologies are deployed to achieve the objectives?
5. What key insights/actions are required to determine effectiveness of deployed methodologies.
6. What KPI's best measure the operational results?
7. What are the key inputs and outputs for each KPI?
8. How can the inputs be economically captured?
9. What technology investments will best facilitate the entire process?



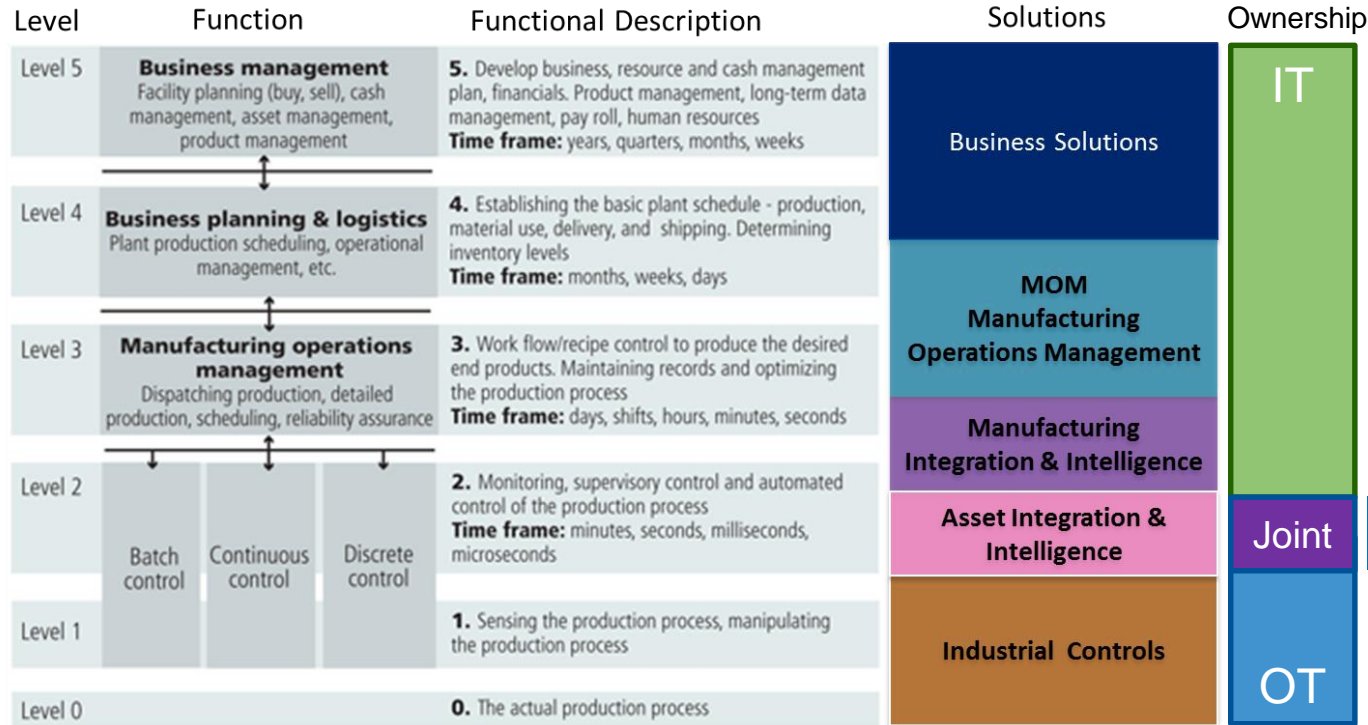
# Align Objectives and Methods



(Adapted from ARC Research)



# PI System – A Bridge Between IT and OT.



With the PI System changes in process or business conditions can be:

- Sensed with the proper context.
- Analyzed in the proper perspective.
- Delivered through multiple channels.
- Responded to rapidly.



ISA-95 with added business management

# Overcoming Challenges with the PI System

- Legacy Controls
- Multiple Vendors, Models
- Multiple Logic Models
- Variable Process Types.
- IIOT

## Integration

- PI Interfaces 400 +
- PI Connectors
- PI Developer Tech.
- PI Manual Logger

- Minimize touch points.
- Layered Security
- HA Service
- Single Source for Asset Data
- Windows User Security

## Manage Risk

- IT Monitoring
- High Availability
- User & Role Based Security
- Trust Tables
- Audit Trail
- Data Bridge

- Configurable
- Scalable
- Flexible
- Expandable
- Proven

## Unified Architecture

- PI Data Archives
- PI Interface Servers
- PI HA
- 1,000,000 + points.
- PI AF

- Streaming Data
- High Fidelity
- Event Capture
- Data Structure
- Meta Data
- Data Aggregation
- BI Capable

## Analyze

- AF Data Analytics
- AF Element Templates
- AF Event Frames
- Analytics
- Fast Response
- Generate & Track Events
- Aggregate
- Reusable

- Open Standards
- Multiple Data Delivery Methods
- Integrated Client Tools
- Handle Streaming Data

## Deliver

- Pi Vision (Coresight)
- PI Process Book
- PI DataLink(Excel)
- PI WebParts (SharePoint)
- PI Batch View
- PI OLEDB
- PI ODBC
- PI SDK



# Hershey Operational Intelligence Solutions

## Manufacturing Intelligence



## Asset Intelligence



Web Apps

**SAP Manufacturing Integration & Intelligence**

**OSIsoft**

**SAP**

- PM-Plant Maintenance.
- PP-Production Planning
- WM-Warehouse Mgmt.
- MM- Material Mgmt.

**MOM**

- Multi Platform
- Multi Vendor
- Custom Solutions

**SCADA**

- Multiple Vendors
- Multiple Platforms
- Multiple Versions

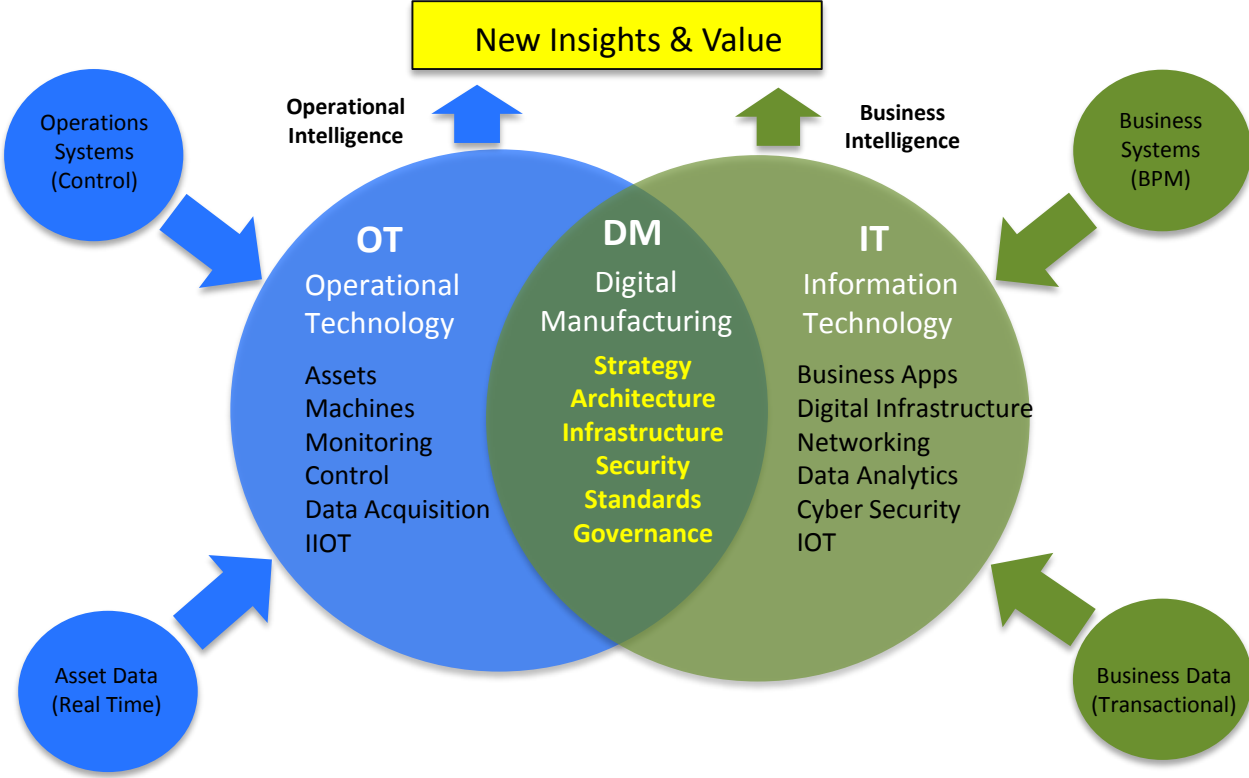
**Controls**

- Multiple Vendors
- Multiple Platforms
- Multiple Vintages

**Devices**

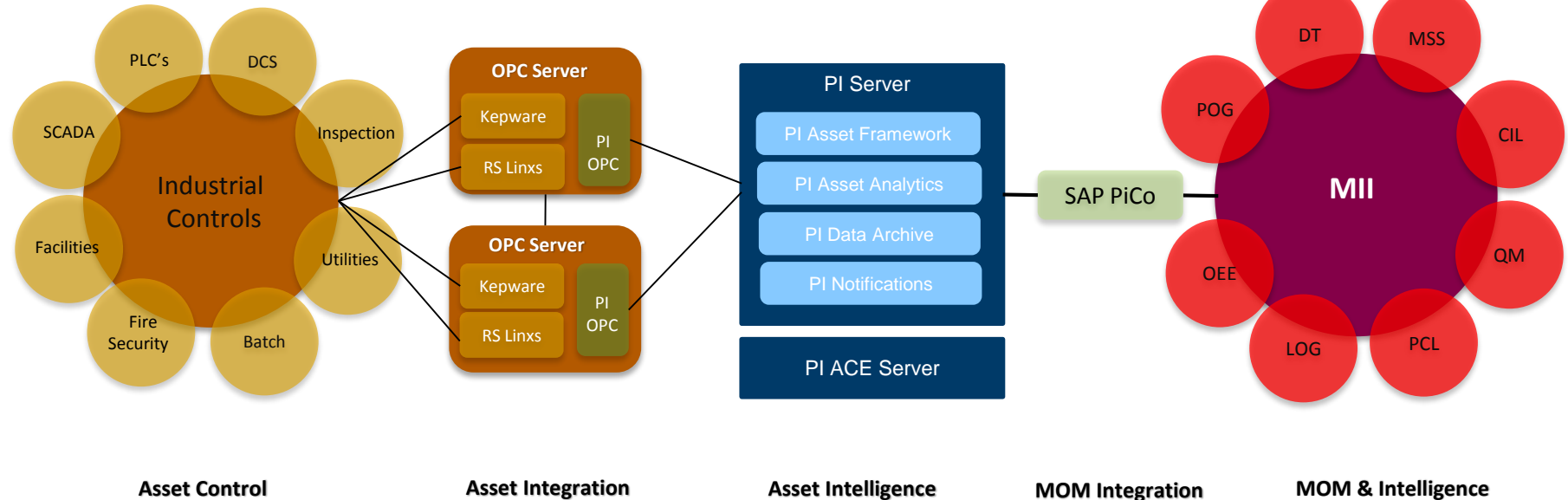
- Instrumentation
- Metal Detectors
- X-Ray
- Scales
- Vision Systems

# IT/OT Collaboration is no longer optional



# Hershey Operational Intelligence Solution Architecture

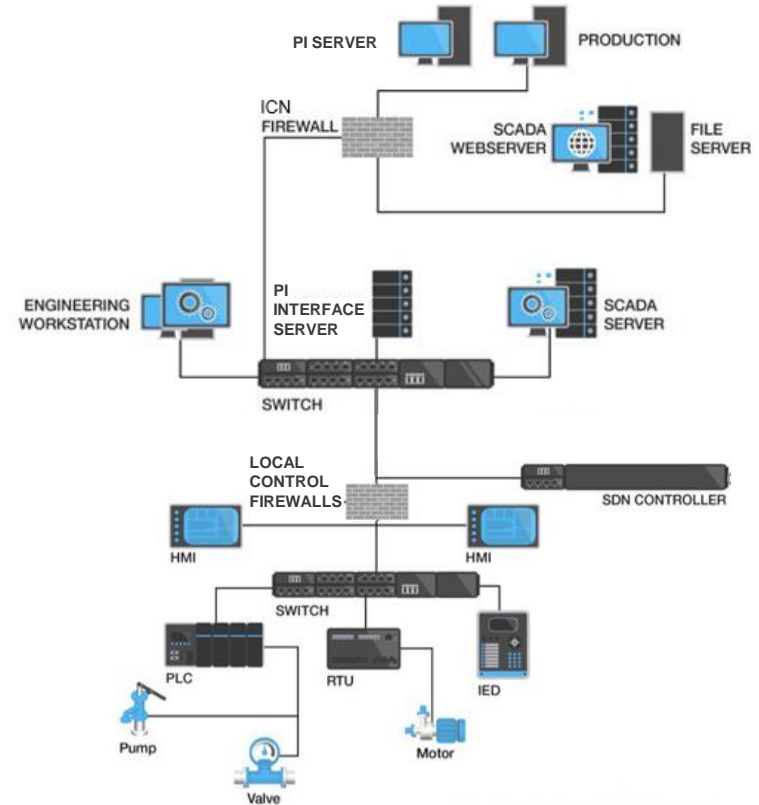
- Multiple Vendors
- Multiple Models
- Varied Implementation Models
- Unified Interface
- Data Buffering
- Open Standards
- Unified Data Storage
- Unified Asset Model
- Event Management
- Real Time Analytics
- MOM Platforms
- MOM Apps
- MOM Integration



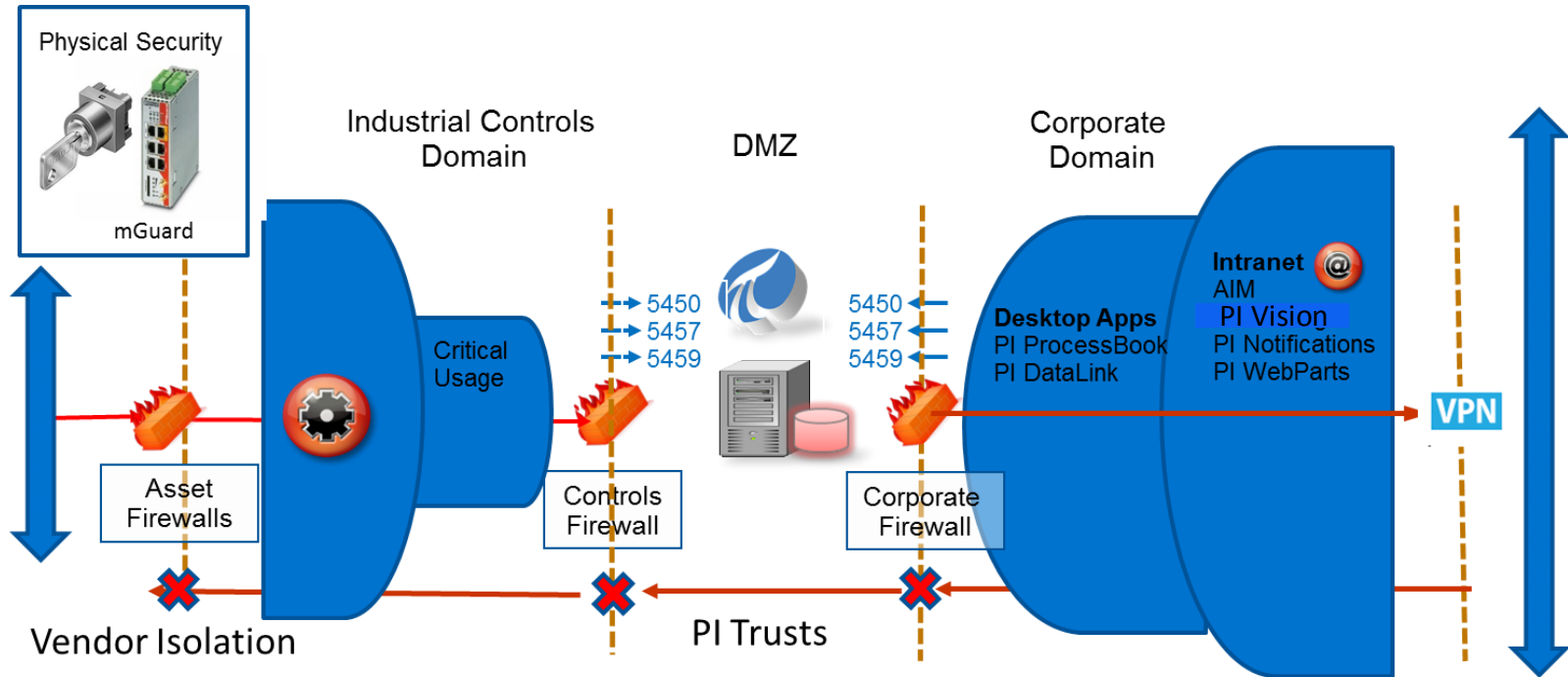


# Network & Security

- Distributed Model
- Multi Level Security
- Multi Level User Authentications
- Multi Level Firewalls
- Trusts/White Listed Traffic
- Threat Detection & Monitoring
- Packet Level Sniffing



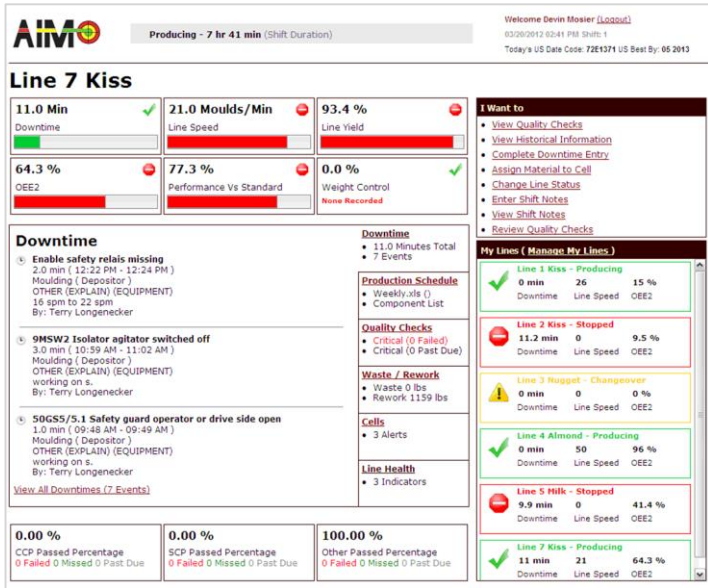
# PI System – DMZ



# Two Hershey Value Cases

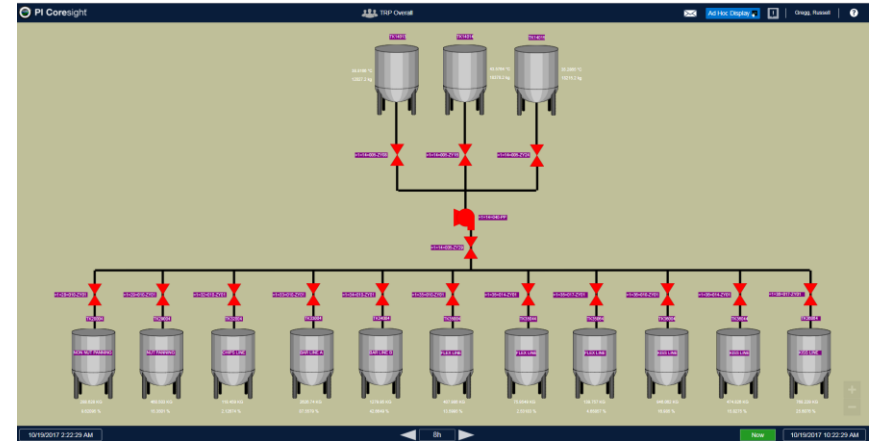
## MOM Integration

Provide a structured data delivery of real time machine data to SAP MII to support Hershey AIM Machine Performance Dashboards.



## Process Tracking, Visibility & Reporting

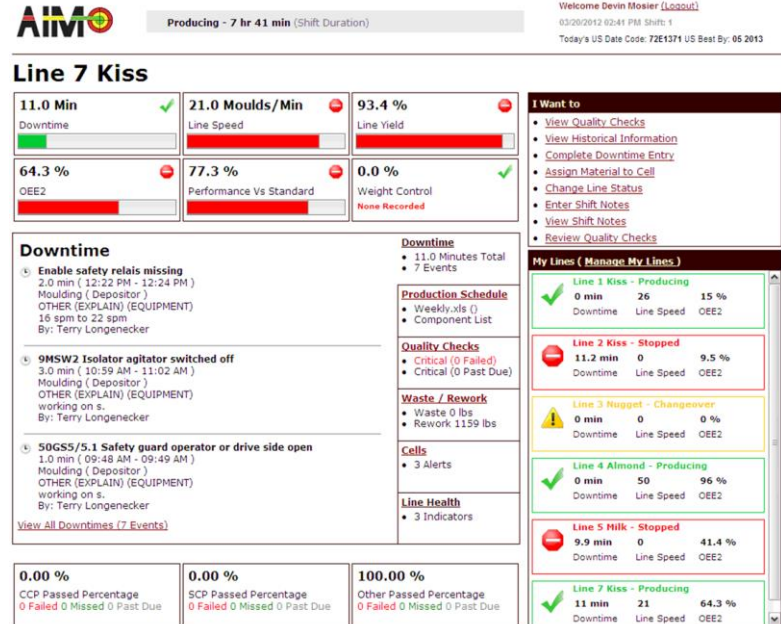
Provide real time visibility, analytics and reporting of chocolate paste production & transfer.



# MOM Integration Challenge

## Obstacles

- Variability in control data configuration and coding models.
- Wide span of both legacy control systems and newer technologies.
- Inconsistent data definitions and scaling that require data transformations.
- Required minimizing risk of over tasking legacy control systems.
- Need to open up connectivity while retaining security.
- Application layer requires a uniform data model to simplify integration of MOM platforms and SAP MII applications.



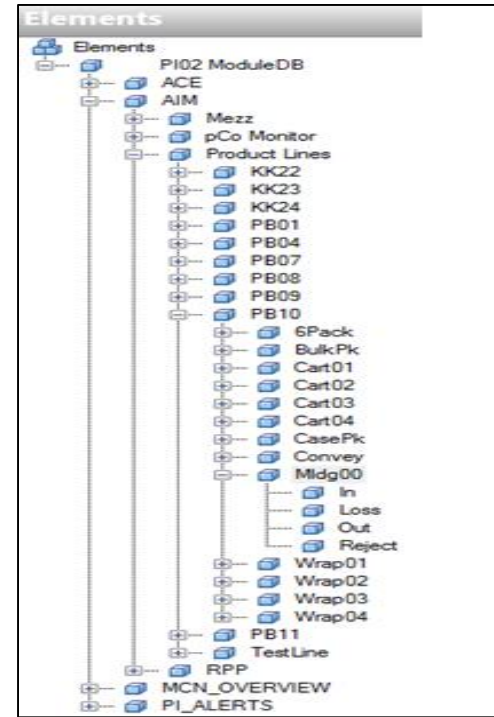
# Defining Outcomes and KPI's

Business Performance	Product Margin & Cost			
Plant Performance	Cost Variance	Utilization	Efficiency	Schedule Conformance
Line Performance	Yield %	OEE %	% Efficiency	% Downtime
Machine Performance Inputs	In Count	Line Speed	Line Mode	DT Reasons
	Out Count	Producing State	Reject Count	Net Weight

# Creating a Modular & Flexible Design

## PI AF (Asset Framework)

- Provides flexible hierarchical object structures with *reusable* templates.
- Enables the *standardization* of applications and reporting.
- Supports *real-time*, relational and calculated data elements.
- Supports integrated *event* and *schedule* based *calculations* and rules.
- *Easy to modify and expand* as new requirements arise.
- Easy to create *notifications*.
- Supports *open integration* with a full SDK.
- Ability to *create and track events* with PI Event Frames

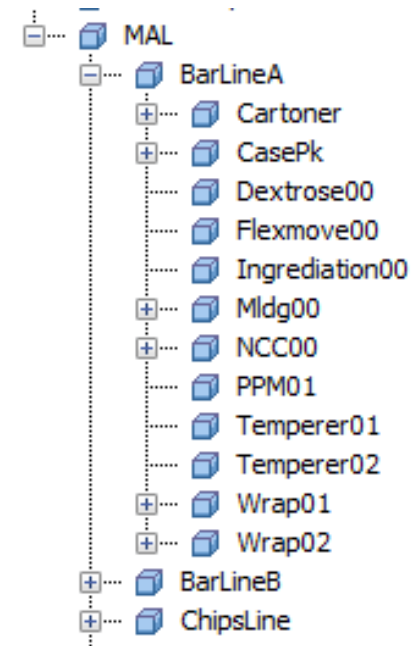


# Create Logical Data Structures

## PI AF Element Structure

- Multiple PI AF hierarchies can be created to provide views of the same data from different users or use case perspectives.
- PI AF makes it easy to see how the underlying data, analysis and events fit into the higher level structures.
- It provides an easy way for users to navigate the PI System to find data in the context of the user.
- PI SDK and AF SDK allow programmatic manipulation of PI and PI AF data and objects for custom developed solutions.
- PI DataLink, PI ProcessBook, Web Parts and PI Vision leverage PI AF in their native UI's.

## Plant/Line/Cell

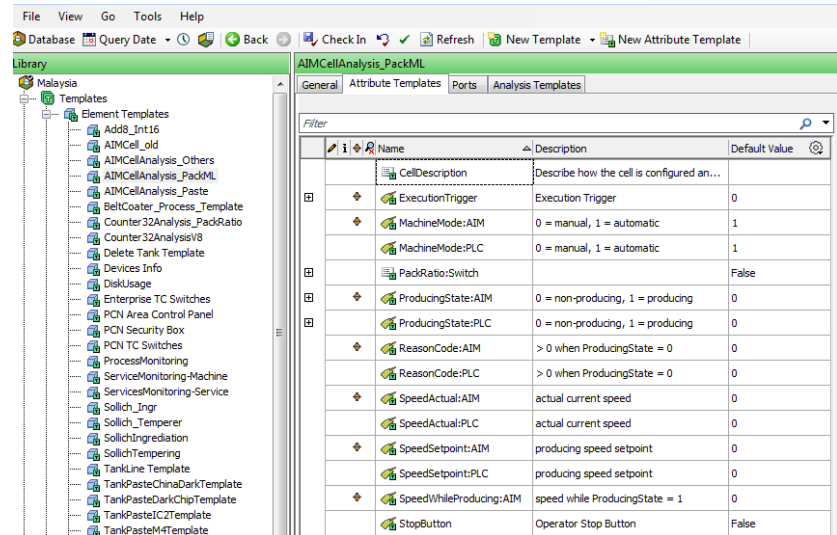


# Create Reusable Data Templates

## PI AF Templates

- Allow the creation of reusable data models.
  - Templates enforce standardization.
  - Templates support Parent/Child relationships through Derived Templates or Reference Templates.
  - Changes in templates are inherited by each object instance of an element.
  - Templates simplify administration, maintenance and changes.
  - Templates are recommended for all elements, notifications and event frames.
- Support a

## AIM Cell Analysis PackML Template



Name	Description	Default Value
CellDescription	Describe how the cell is configured an...	
ExecutionTrigger	Execution Trigger	0
MachineMode:AIM	0 = manual, 1 = automatic	1
MachineMode:PLC	0 = manual, 1 = automatic	1
PackRabo:Switch		False
ProducingState:AIM	0 = non-producing, 1 = producing	0
ProducingState:PLC	0 = non-producing, 1 = producing	0
ReasonCode:AIM	> 0 when ProducingState = 0	0
ReasonCode:PLC	> 0 when ProducingState = 0	0
SpeedActual:AIM	actual current speed	0
SpeedActual:PLC	actual current speed	0
SpeedSetpoint:AIM	producing speed setpoint	0
SpeedSetpoint:PLC	producing speed setpoint	0
SpeedWhileProducing:AIM	speed while ProducingState = 1	0
StopButton	Operator Stop Button	False



# Define Required Data Elements

## PI AF Elements

- Elements define the data objects for a specific asset or object.
- Attributes are defined for all required data.
- Attributes have data reference setting that can be relative to elements and/or data sources.

## Moulding Cell Element

Midg00								
General   Child Elements   Attributes   Ports   Analyses   Version								
Filter								
	Name	Value	Time Stamp	Description	Value Type	Data Reference	Setting	
[-]	Template: AIMCellAnalysis_PackML							
	CellDescription		1/1/1970 12:00:00 AM	Describe how the cell is configured and operates	String	<None>		
[+]	ExecutionTrigger	0	10/19/2017 4:59:30 PM	Execution Trigger	Int32	PI Point	WVALI	
[+]	MachineMode:AIM	0	10/19/2017 4:59:30 PM	0 = manual, 1 = automatic	Int32	PI Point	WVALI	
[+]	MachineMode:PLC	0	10/19/2017 4:49:46.922 PM	0 = manual, 1 = automatic	Int32	PI Point	WVALI	
[+]	PackRatio:Switch	False	1/1/1970 12:00:00 AM		Boolean	<None>		
[+]	ProducingState:AIM	1	10/19/2017 4:59:30 PM	0 = non-producing, 1 = producing	Int32	PI Point	WVALI	
[+]	ProducingState:PLC	6	10/19/2017 4:46:39.036 PM	0 = non-producing, 1 = producing	Int32	PI Point	WVALI	
[+]	ReasonCode:AIM	0	10/19/2017 4:59:30 PM	> 0 when ProducingState = 0	Int32	PI Point	WVALI	
[+]	ReasonCode:PLC	0	10/19/2017 4:45:19.038 PM	> 0 when ProducingState = 0	Int32	PI Point	WVALI	
[+]	SpeedActual:AIM	12	10/19/2017 4:59:30 PM	actual current speed	Double	PI Point	WVALI	
[+]	SpeedActual:PLC	12	10/19/2017 4:46:39.036 PM	actual current speed	Double	PI Point	WVALI	
[+]	SpeedSetpoint:AIM	12	10/19/2017 4:59:30 PM	producing speed setpoint	Double	PI Point	WVALI	
[+]	SpeedSetpoint:PLC	12	10/19/2017 4:46:39.036 PM	producing speed setpoint	Double	PI Point	WVALI	
[+]	SpeedWhileProducing:AIM	12	10/19/2017 4:59:30 PM	speed while ProducingState = 1	Double	PI Point	WVALI	
[+]	StopButton	False	5/25/2016 10:14:46.633 PM	Operator Stop Button	Boolean	PI Point	WVALI	
[+]	Template: <None>							
[+]	ReasonCodeDesc	NULL	10/19/2017 4:45:19.038 PM		BarAMidg00...	PI Point	WVALI	

# Create Required Data Analysis

## PI AF Analysis

- Manage process logic
- Manage data quality
- Filter data
- Manage data logic/rules
- Aggregate data
- Perform calculations
- Look up values in AF Tables

## Solution

- Create Producing State logic
- Assign Reason Codes
- Create trigger tag validation logic

## Moulding Cell – Producing State Analysis

The screenshot shows the Midas90 software interface for configuring a variable named 'ProducingState'. The main window displays the following logic:

```
Variable: if Contains(TagName('ProducingState:AIM'),"zero") then NoOutput() else if Contains(TagName('ProducingState:PLC'),"zero") then NoOutput() else if Contains(TagName('ReasonCode:PLC'),"zero") then NoOutput() else if Not SubStr('ProducingState:PLC') then if 'ProducingState:PLC' = 1 then 992 else if 'ProducingState:PLC' = 2 then 'ReasonCode:PLC' else if 'ProducingState:PLC' = 3 then 'ReasonCode:PLC' else if 'ProducingState:PLC' = 4 then 991 else if 'ProducingState:PLC' = 5 then 997 else if 'ProducingState:PLC' = 6 then 'ReasonCode:PLC' else if 'ProducingState:PLC' = 7 then 'ReasonCode:PLC' else if 'ProducingState:PLC' = 8 then 994 else if 'ProducingState:PLC' = 9 then 994 else if 'ProducingState:PLC' = 10 then 998 else if 'ProducingState:PLC' = 11 then 998 else if 'ProducingState:PLC' = 12 then 998 else if 'ProducingState:PLC' = 13 then 997 else if 'ProducingState:PLC' = 14 then 997 else if 'ProducingState:PLC' = 15 then 994 else if 'ProducingState:PLC' = 16 then 993 else if 'ProducingState:PLC' = 17 then 993 else 'ReasonCode:PLC' else NoOutput()
```

Below the expression editor, there is a 'Variable:' field with the value 'ExecutionTrigger'.

The right-hand side of the interface shows a 'Functions' panel with a list of functions and a description for the 'Abs' function: 'Return the absolute value of an integer or real number. Example: Abs[1]'.

# MOM Applications

## Operational Awareness

- Visibility
- Data with context
- Real Time Data to Insights
- Actionable

**AIM** Producing - 7 hr 41 min (Shift Duration)

Welcome [Logout](#)  
03/20/2012 02:41 Russ Gregg  
Today's US Date code: rzz13r1 us best by: 05 2013

### Line 7 Kiss

<b>11.0 Min</b> <span style="color: green;">✔</span> Downtime	<b>21.0 Moulds/Min</b> <span style="color: red;">✘</span> Line Speed	<b>93.4 %</b> <span style="color: red;">✘</span> Line Yield
<b>64.3 %</b> <span style="color: red;">✘</span> OEE2	<b>77.3 %</b> <span style="color: red;">✘</span> Performance Vs Standard	Weight Control <span style="color: green;">✔</span>

#### Downtime

- Enable safety relays missing  
2.0 min ( 12:22 PM - 12:24 PM )  
Moulding ( Depositor )  
OTHER (EXPLAIN) (EQUIPMENT)  
16 spm to 22 spm  
By: Terry Longenecker
- 9MSW2 Isolator agitator switched off  
3.0 min ( 10:59 AM - 11:02 AM )  
Moulding ( Depositor )  
OTHER (EXPLAIN) (EQUIPMENT)  
working on s.  
By: Terry Longenecker
- 50GS5/5.1 Safety guard operator or drive side open  
1.0 min ( 09:48 AM - 09:49 AM )  
Moulding ( Depositor )  
OTHER (EXPLAIN) (EQUIPMENT)  
working on s.  
By: Terry Longenecker

[View All Downtimes \(7 Events\)](#)

#### Downtime

- 11.0 Minutes Total
- 7 Events

#### Production Schedule

- Weekly.xls ( )
- Component List

#### Quality Checks

- Critical (0 Failed)
- Critical (0 Past Due)

#### Waste / Rework

- Waste 0 lbs
- Rework 1159 lbs

#### Cells

- 3 Alerts

#### Line Health

- 3 Indicators

<b>0.00 %</b> CCP Passed Percentage 0 Failed 0 Missed 0 Past Due	<b>0.00 %</b> SCP Passed Percentage 0 Failed 0 Missed 0 Past Due	<b>100.00 %</b> Other Passed Percentage 0 Failed 0 Missed 0 Past Due
--	--	--

#### I Want to

- [View Quality Checks](#)
- [View Historical Information](#)
- [Complete Downtime Entry](#)
- [Assign Material to Cell](#)
- [Change Line Status](#)
- [Enter Shift Notes](#)
- [View Shift Notes](#)
- [Review Quality Checks](#)

#### My Lines ( Manage My Lines )

✔	<b>Line 1 - Producing</b>	<b>0 min</b> <b>26</b> <b>15 %</b>
	Downtime Line Speed OEE2	
✘	<b>Line 2 - Stopped</b>	<b>11.2 min</b> <b>0</b> <b>9.5 %</b>
	Downtime Line Speed OEE2	
⚠	<b>Line 3 - Changeover</b>	<b>0 min</b> <b>0</b> <b>0 %</b>
	Downtime Line Speed OEE2	
✔	<b>Line 4 - Producing</b>	<b>0 min</b> <b>50</b> <b>96 %</b>
	Downtime Line Speed OEE2	
✘	<b>Line 5 - Stopped</b>	<b>9.9 min</b> <b>0</b> <b>41.4 %</b>
	Downtime Line Speed OEE2	
✔	<b>Line 7 - Producing</b>	<b>11 min</b> <b>21</b> <b>64.3 %</b>
	Downtime Line Speed OEE2	

# Paste Tracking Challenge

## Opportunity

Wei Chong Lai the IS Global Supply Chain Manufacturing Analyst at our Malaysian Plant used the PI System to solve a common production tracking challenge.

## Requirements

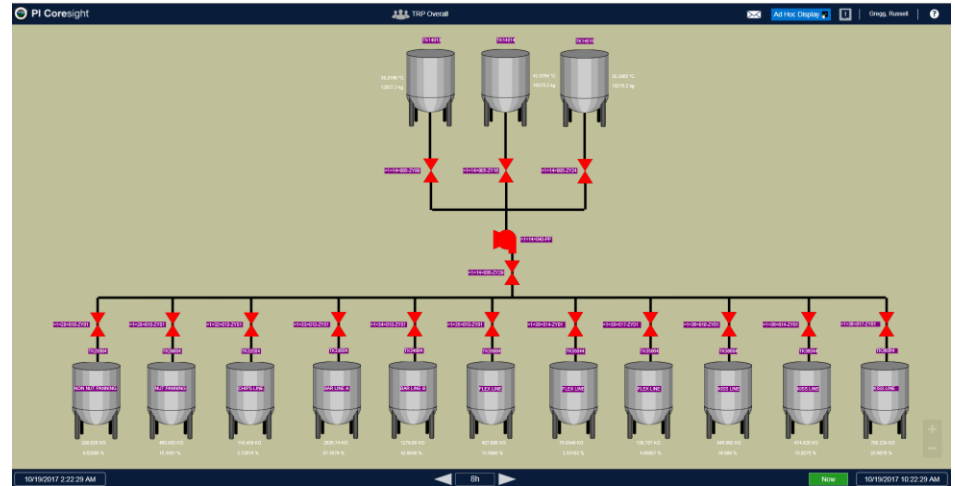
- Track & Report on paste transfers from conches to the tank farm.
- Track & Report on paste transfers from tank farm to production line feed tanks.



# Provide Process Visibility

## PI Vision

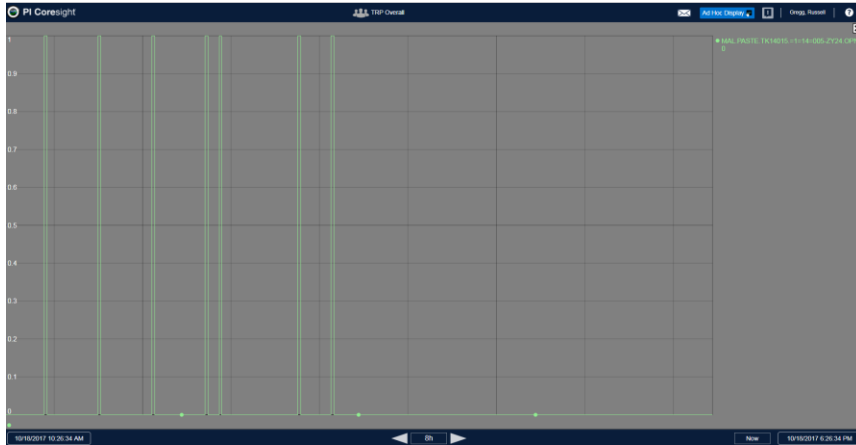
- The DSC system is connected to the PI Server through the PI Interface Server.
- The DSC system contained data on the current tank levels, valve position states and pump running states.
- This data was all that was required to work out the paste transfer logic that tracks the transfer periods and transferred weight.
- This DCS Screen was easily imported into PI Vision (Coresight) to provide real time visibility of the process states.



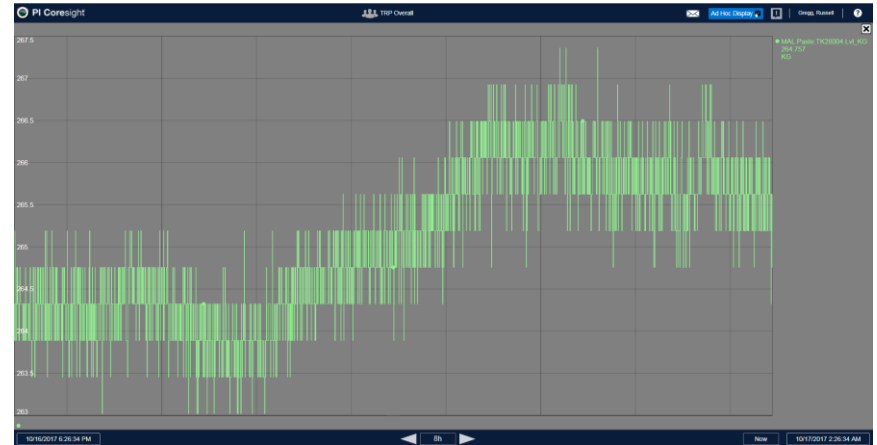
# View Data Trends

PI Vision provides functionality to see real time and historical data trends by just clicking on the objects on the display.

## Valve Status



## Tank Level

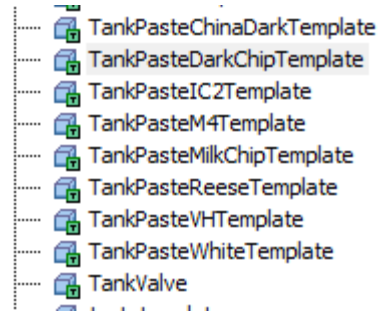


# Create Reusable Data Models

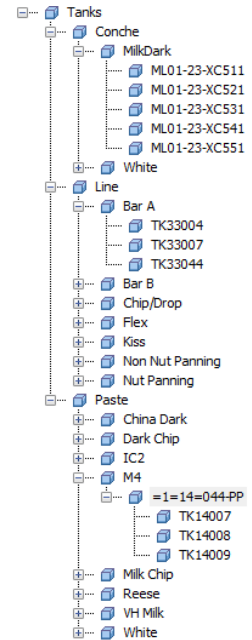
## PI AF Element Templates and Elements

- Create tank and valve templates
- Create conch, tank farm and line paste tank elements.

## AF Element Templates



## AF Elements



# Define Required Attributes

## Conche Element Attributes

- Each Out Valve State
- Transfer Pump Status
- Conch Usage.

ML01-23-XC511							
General Child Elements Attributes Ports Analyses Version							
Filter							
Name	Value	Time Stamp	Desc...	Value Type	Data Refere...	Settings...	
Template: <None>							
ChinaDarkOutValve	Close	10/25/2017 8:47:28.74 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.=ML01-23-XC511_CHP.=1=14=001-ZY06.OPN;TimeMethod=AtOrBefore	
Conche Usage	0	10/25/2017 9:03:01.805 AM		Int32	PI Point	\\MALPI02\MAL.PASTE.ML01-XC511.ConcheUsage	
DarkChipOutValve	Close	10/25/2017 8:50:22.673 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.=ML01-23-XC511_CHP.=1=14=001-ZY07.OPN;TimeMethod=AtOrBefore	
IC2OutValve	Close	10/25/2017 8:50:15.409 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.=ML01-23-XC511_CHP.=1=14=001-ZY05.OPN;TimeMethod=AtOrBefore	
M4OutValve	Close	10/25/2017 8:50:15.409 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.=ML01-23-XC511_CHP.=1=14=001-ZY05.OPN;TimeMethod=AtOrBefore	
MilkChipOutValve	Close	10/25/2017 8:50:22.726 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.=ML01-23-XC511_CHP.=1=14=001-ZY08.OPN;TimeMethod=AtOrBefore	
Pump Status	Off	10/25/2017 8:49:55.401 AM		OffOn	PI Point	\\MALPI02\MAL.PASTE.=ML01-23-XC511_CHP.CMD	
VHMilkOutValve	Close	10/25/2017 8:50:52.266 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.=ML01-23-XC511_CHP.=1=14=001-ZY56.OPN;TimeMethod=AtOrBefore	



# Define Required Attributes

## Valve Element Attributes

- Valve State
- Valve Position Status

=1=14=040-PP

General Child Elements Attributes Ports Analyses Version

Filter

Name	Value	Time Stamp	Desc...	Value Type	Data Refere...	Settings...
Template: <None>						
Output	Off	10/25/2017 8:44:55.439 AM		OffOn	PI Point	\\MALPI02\MAL.PASTE.=1=14=040-PP.CMD
Valve Status	Close	10/25/2017 8:44:55.439 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.=1=14=040-PP.=1=14=005-ZY29.OPN

## Tank Element Attributes

- Levels
- Valve Position Status
- Agitator Status
- Temperature

TK14013

General Child Elements Attributes Ports Analyses Version

Filter

Name	Value	Time Stamp	Desc...	Value Type	Data Refere...	Settings...
Template: TankPasteIC2Template						
HIHI	1	10/19/2017 11:04:52.393 PM		Int16	PI Point	\\MALPI02\MAL.Paste.TK14013.HIHI
InValve	Close	10/25/2017 8:44:33.208 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.TK14013.=1=14=005-ZY01.OPN
Level_%	70.15...	10/25/2017 9:00:34.915 AM		Single	PI Point	\\MALPI02\MAL.Paste.TK14013.Lvl_%
Level_KG	18385...	10/25/2017 9:00:34.915 AM		Single	PI Point	\\MALPI02\MAL.Paste.TK14013.Lvl_KG
OutValve	Close	10/25/2017 8:50:23.202 AM		CloseOpen	PI Point	\\MALPI02\MAL.PASTE.TK14013.=1=14=005-ZY08.OPN
TA	False	10/25/2017 8:47:15.383 AM		Tank ...	Boolean	\\MALPI02\MAL.Paste.TK14013.TA
Temperature	35.47...	10/25/2017 9:00:34.915 AM		Single	PI Point	\\MALPI02\MAL.Paste.TK14013.TT

# Define Event Templates

## Conch to Tank Farm Transfers

- Event Frame Analysis were configured to read the receiving tank level when the tank inlet valve is opened.

## Event Frame Template

Name	Expression
ConcheUsage	
HiHi Alarm	
NotificationLvl	
PasteUsage	

Example Element: [Select an example element](#)

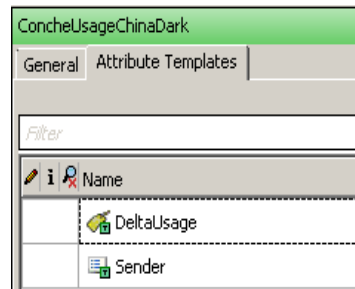
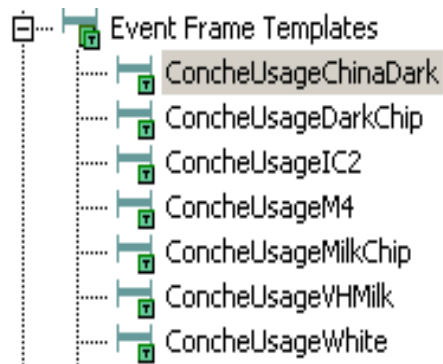
Event Frame Template:

Name	Expression
Variables	
Variable1	'Level_%'
Start triggers	
StartTrigger1	'InValve'="Open"
End trigger	
EndTrigger	Type an expression (optional)

# Define Event Attributes

## Conche Usage

- PI AF Event Frames were created to track each transfer event from the individual Conches.
- Each event creates an event name and collects the start and end times. Additional data are captured as attributes of the Event.



# Define Required Analysis

- PI AF Element Analysis is used to create the logic for determining which Conche is transferring product when the transfer pump is “On”.

The screenshot displays the 'PI AF Element Analysis' software interface. The main window is titled 'ML01-23-XCS11' and has tabs for 'General', 'Child Elements', 'Attributes', 'Ports', 'Analyses', and 'Version'. The 'Analyses' tab is active, showing a tree view with 'Conche Usage Analysis' selected. To the right, the 'Name' field is set to 'Conche Usage Analysis', and the 'Analysis Type' is set to 'Expression'. Below this, a table lists the analysis logic.

Name	Expression	Value at Evaluation	Value at Last Trigger	Output Attribute
Variable1	<pre>If 'Pump Status' = "On" Then ( If 'ChinaDarkOutValve' = "Open" Then '\Tanks\Paste\China Dark Conche Usage' + 110 Else If 'DarkChipOutValve' = "Open" Then '\Tanks\Paste\Dark Chip Conche Usage' + 210 Else If 'IC2OutValve' = "Open" and '\Tanks\Paste\IC2 Conche Usage' &gt; 0 Then '\Tanks\Paste\IC2 Conche Usage' + 310 Else If 'M4OutValve' = "Open" and '\Tanks\Paste\M4 Conche Usage' &gt; 0 Then '\Tanks\Paste\M4 Conche Usage' + 410 Else If 'MilkChipOutValve' = "Open" Then '\Tanks\Paste\Milk Chip Conche Usage' + 510 Else If 'VH\MilkOutValve' = "Open" Then '\Tanks\Paste\VH Milk Conche Usage' + 710 Else 0 ) Else { If 'ChinaDarkOutValve' = "Open" Then '\Tanks\Paste\China Dark Conche Usage' + 100 Else If 'DarkChipOutValve' = "Open" Then '\Tanks\Paste\Dark Chip Conche Usage' + 200 Else If 'IC2OutValve' = "Open" and '\Tanks\Paste\IC2 Conche Usage' &gt; 0 Then '\Tanks\Paste\IC2 Conche Usage' + 300 Else If 'M4OutValve' = "Open" and '\Tanks\Paste\M4 Conche Usage' &gt; 0 Then '\Tanks\Paste\M4 Conche Usage' + 400 Else If 'MilkChipOutValve' = "Open" Then '\Tanks\Paste\Milk Chip Conche Usage' + 500 Else If 'VH\MilkOutValve' = "Open" Then '\Tanks\Paste\VH Milk Conche Usage' + 700 Else 0 } }</pre>			Conche Usage
Variable2	<pre>'ChinaDarkOutValve'</pre>			Map

# PI System Explorer

## Searching and viewing Event Frames

- PI System Explorer is used to create, edit and view PI AF Elements, Event Frames, Tables and Notifications,.

The screenshot displays the PI System Explorer interface. The left pane shows a tree view of 'Event Frame Searches' with 'Event Frame Search 1' expanded, listing various event frames for 'Almond' and 'ConcheUsageChinaDark'. The right pane shows the details for the selected event frame 'ConcheUsageChinaDark-China Dark-TK14019-2017-10-24 22:27:10'. The 'General' tab is active, showing a table of event data.

Name	Value	Time Stamp	Desc...	Value Type	Data Referenc...	Settings...
Template: ConcheUsageChinaDark						
DeltaUsage	6165.25 kg	10/24/2017 10:51:40.268 AM		Double	PI Point	.\Elements[...]\Level_KG;TimeRangeMethod=Delta
Sender	3	10/24/2017 10:47:28.74 AM		Int32	Formula	A=\Report\Conche\ML01-23-XC511\ChinaDarkOutValve;B=\Rep

# Paste Usage Reporting

## PI DataLink

- Excel with PI DataLink was used to create the paste and conche usage report.
- Events are returned based on the date range entered.
- Using Excel Pivot Table functionality the data was arranged and summarized by the sending and receiving tank ID's.

9 / 1 / 2017		9 / 30 / 2017		Refresh Pivot		
Sum of DeltaUsage						
	IC2	White	VH Milk	China Dark	Milk Chip	Grand Total
2017	(329,916.70)	(173,286.76)	(7,048.71)	(118,212.79)	(2,449.42)	(630,914.37)
Sep	(329,916.70)	(173,286.76)	(7,048.71)	(118,212.79)	(2,449.42)	(630,914.37)
1-Sep		(6,893.25)				(6,893.25)
2-Sep		(5,778.50)				(5,778.50)
TK14029		(921.38)				(921.38)
TK36084		(921.38)				(921.38)
TK14031		(4,857.13)				(4,857.13)
TK36084		(4,857.13)				(4,857.13)
4-Sep	(12,504.92)	(3,154.67)				(15,659.58)
5-Sep	(4,466.58)	(3,727.21)	(7,048.71)	(5,494.13)		(20,736.62)
6-Sep		(7,003.21)		(12,387.37)		(19,390.58)
7-Sep	(6,267.63)	(8,383.37)		(11,845.16)		(26,496.16)
8-Sep	(8,713.25)	(8,550.21)		(10,119.96)	3.79	(27,379.63)
9-Sep	(4,333.88)	(12,303.96)		(9,228.92)	(7.58)	(25,874.34)
10-Sep		(5,509.29)		(1,387.75)		(6,897.04)
11-Sep	(1,440.83)	(8,235.50)		(7,689.50)	(3.79)	(17,369.63)
12-Sep	(1,998.21)	(37,757.42)		(8,796.67)		(48,552.29)
13-Sep	(7,958.71)	(24,300.79)		(144.08)		(32,403.58)
14-Sep	(6,908.42)	(16,914.63)				(23,823.04)
15-Sep	(11,621.46)					(11,621.46)
16-Sep	(20,854.17)					(20,854.17)
17-Sep	(8,777.71)					(8,777.71)
18-Sep	(12,459.41)					(12,459.41)
19-Sep	(10,605.29)			(1,827.58)		(12,432.87)
20-Sep	(8,345.46)			(8,504.71)		(16,850.17)
21-Sep	(13,938.16)			(25,794.71)		(39,732.87)
22-Sep	(38,845.62)	(527.04)		(773.50)		(40,146.16)
23-Sep	(49,014.87)	(633.21)				(49,648.08)
24-Sep	(4,428.67)					(4,428.67)
25-Sep	(20,975.51)					(20,975.51)
26-Sep	(15,174.25)	(428.46)				(15,602.71)
27-Sep	(20,069.29)	(6,639.21)		(3,825.79)		(30,534.29)
28-Sep	(16,933.58)	(8,618.46)		(4,489.33)		(30,041.38)
29-Sep	(23,280.83)	(7,928.38)		(5,903.63)	(2,441.83)	(39,554.65)
<b>Grand Total</b>	<b>(329,916.70)</b>	<b>(173,286.76)</b>	<b>(7,048.71)</b>	<b>(118,212.79)</b>	<b>(2,449.42)</b>	<b>(630,914.37)</b>

감사합니다

谢谢

Danke

Merci

Gracias

**Thank You**

ありがとう

Спасибо

Obrigado



# Contact Information

Russ Gregg

Business Transformation Manager

IS Global Supply Chain Solutions

