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**SEMINARS** 2013  
The **Power** of **Data**



# The PI System in a Discrete Manufacturing Setting

Presented by **John Dolewa**

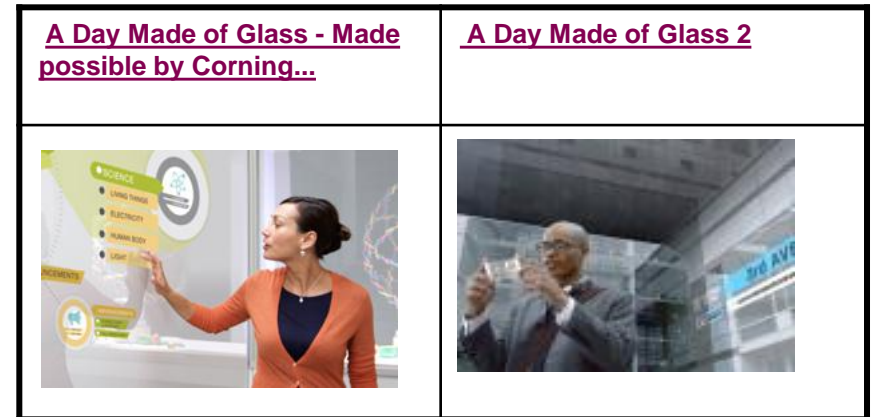
# Agenda

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- Corning
- Life Science – Kennebunk, Maine
- PI System Architecture
- PI System Integration
- Uses for the PI System
- Future State

# Corning (GLW)

- Based in Corning, NY
- 160 years old
- Divisions:
  - Display Technologies
  - Environmental Technologies
  - Telecommunications
  - Life Sciences
  - Specialty Materials



# A Culture of Innovation at Corning



Glass envelope for Thomas Edison's light bulb



Processes for mass producing the television bulb



Ceramic substrates for automotive catalytic converters

1879

1915

1947

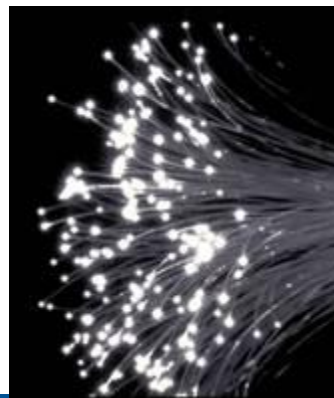
1970

1972

1984

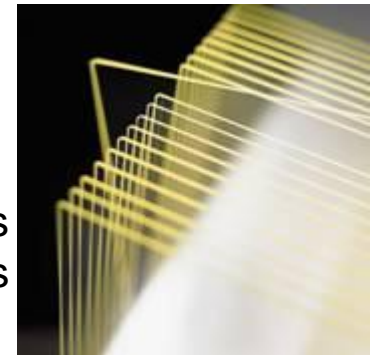


Heat-resistant Pyrex® glass

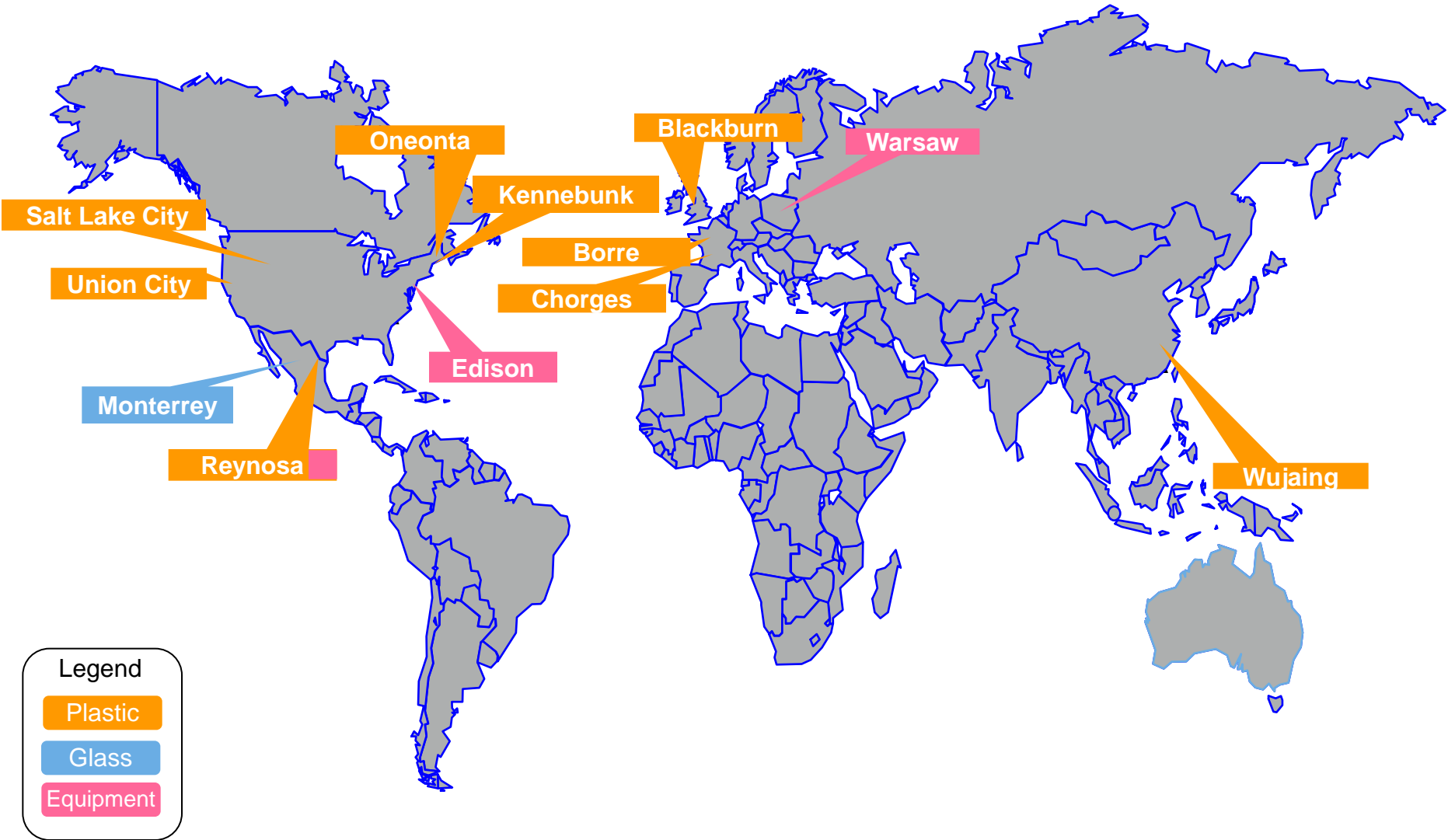


First low-loss optical fiber

AMLCD glass for computers and large screen TVs



# Life Science Division Global Manufacturing Network

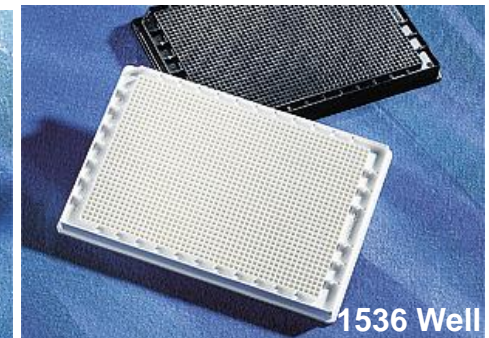
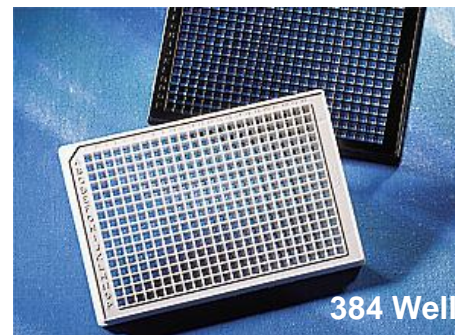
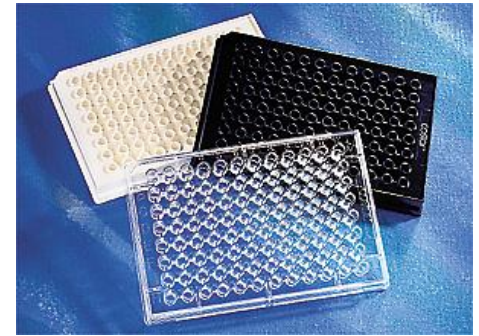




# Products - Drug Discovery & Development Business

## Product Lines

- **LEAD Identification:** Products for High Throughput Screening (HTS):
  - 96 & 384 Wells - Solid, Clear Bottom, NBS Coating
  - 1536 Well Assay
- **Drug Discovery Consumables:** Molecular Biology Products for Genomics
  - 96 & 384 Well Format
    - PCR Plates - HDPE, PP
    - Filter Plates - PVDF, Glass Fiber
    - Storage - PP Plates, Blocks, Sealing Mats
    - UV Plates



# Products - Drug Discovery & Development Business

## Product Lines (continued)

- **Cell Culture and Mass Cell Culture:**

Products for Cell Production and Cell Based Assays.

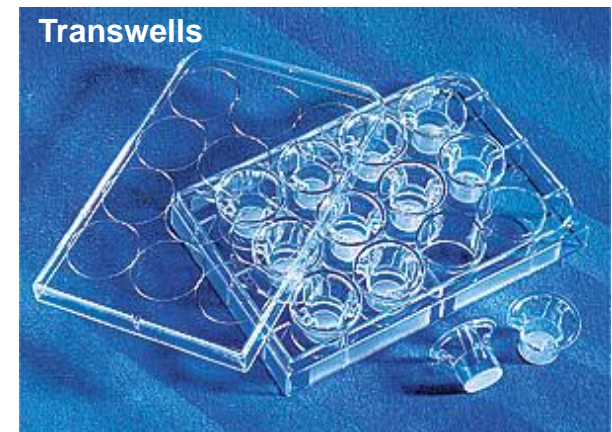
- TC Flasks - 25, 75, 150 cm
- Hyperflask
- TC Multiwells
- Cell Cube
- Cell Stack



- **Cell Culture Permeable Supports:**

Products for *in vivo* study of Cell Lines

- Transwells
- HTS Transwells



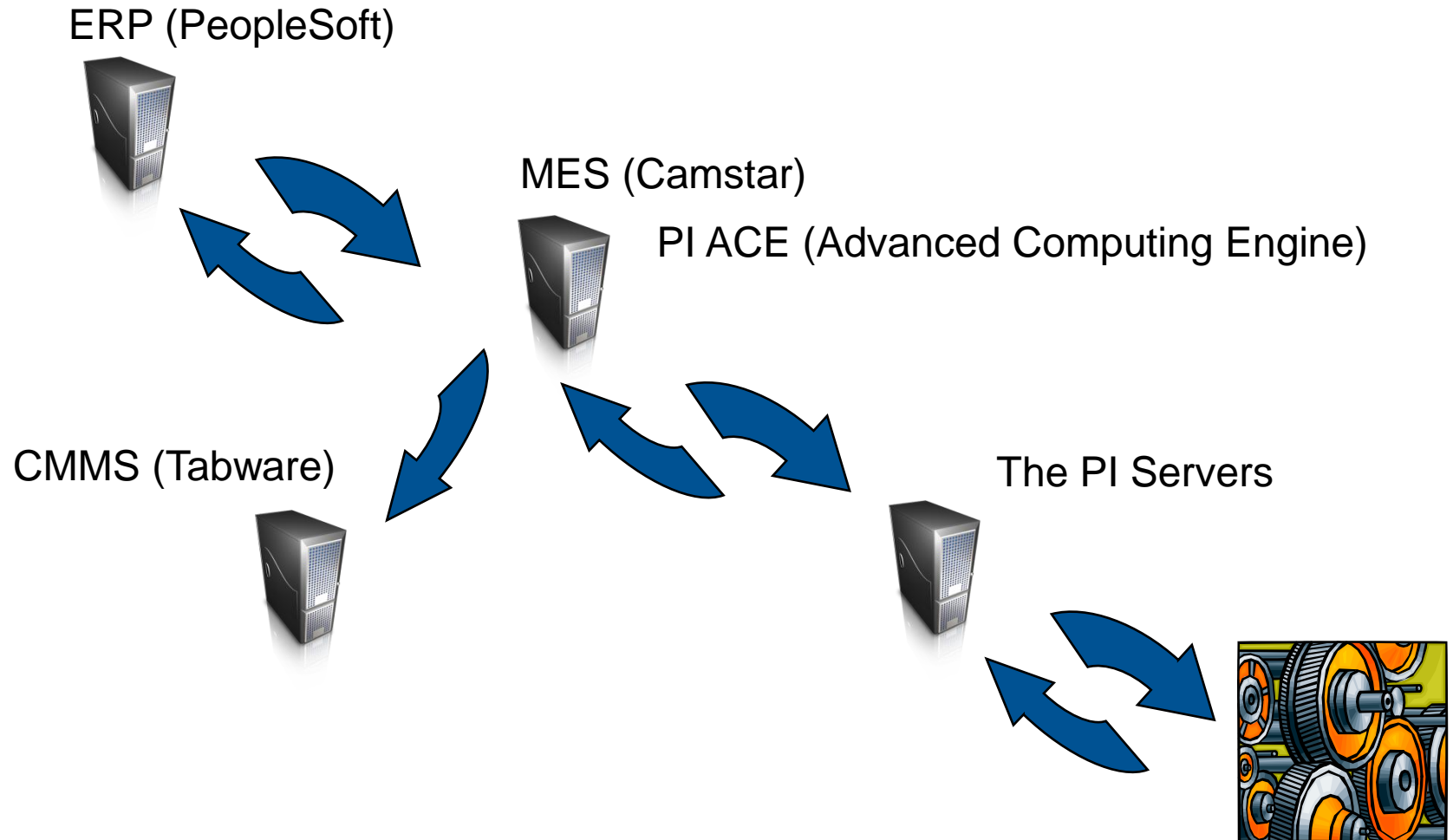


# Products - General Lab Product Lines

- **Liquid Handling: Products to accurately measure and dispense liquids.**
  - Serological Pipets
- **Diagnostics: Products used in Diagnostic Test Kits.**
  - Test Kit Components (1 X 8 Strips)



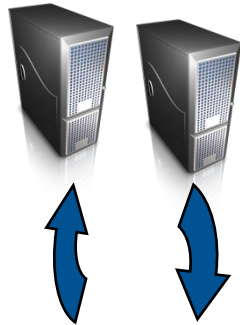
# MES Environment



# The PI System - HA Environment

## PI Server Collective

### PI Servers



### PI Interface Servers



### PI Buffer SubSystem

#### Interfaces:

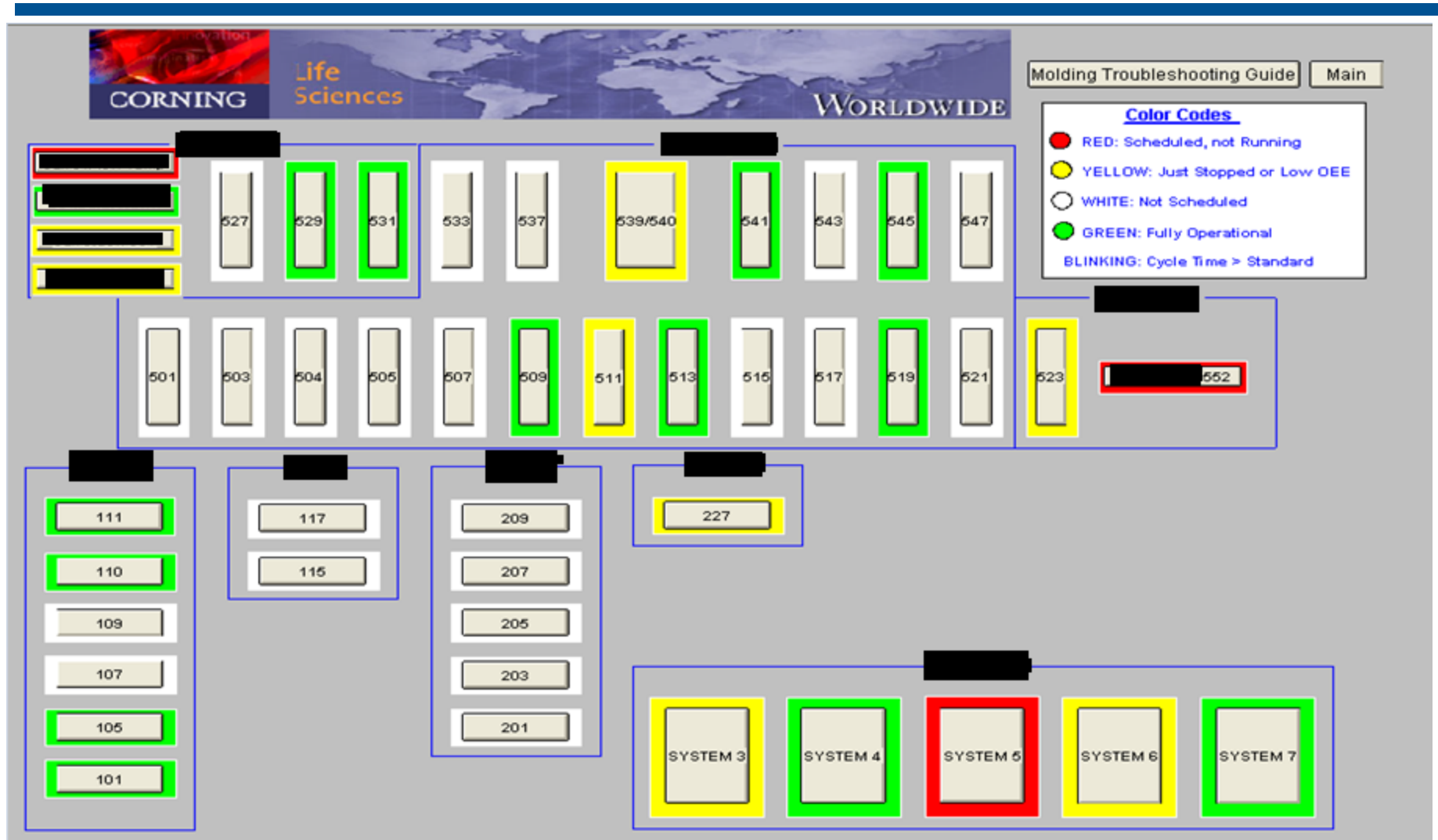
- Kepware OPC (1) using Uniint with WARM Failover
- Custom using PI API
- PI UFL (60+ instances)
- PI ACE

## Use of PI ProcessBook

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- Department dashboards
- Display OEE
- Machine state
- Process data
- Mechanic call board
- Integration with maintenance management

# Department Dashboard using PI ODBC client





# Drilldown

Process Sheet | 127 ASSET TAGS: MMH013659  
AUTOM161031  
FFS013717

Tabware (Mold)  
Tabware (Auto)  
Tabware (FFS)  
Machine State

Cushion: Shutdown  
Cycle Time: Shutdown  
Injection Pressure: Shutdown

Picker Cavitation: 4  
Picker Cycletime: 15.40  
Picker Parts Processed In: 3604  
Picker Good Parts: 3572  
Picker Reject Parts: 32  
Process Time: 284  
Uptime: 232

Treater Rejected Parts: 2

Conveyor Base & Lids Reject Parts: 203  
Conveyor Base Reject Parts: 0

Upstacker Base & Lids Good Parts Out: 3280  
Upstacker Base & Lids Reject Parts: 96  
Upstacker Base Good Parts Out: 0  
Upstacker Base Reject Parts: 0

Shutdown

127 MOLD

Shutdown

BASE PICKER

RUNNING

127 AUTO

BASES WITH LIDS MODE PACKED AT UPSTACKER

RUNNING

TREAT

<<<< LID PICK & PLACE <<<<

CONVEYOR

>>>> FFS PICK & PLACE >>>>

UPSTACKER

+

Shutdown

128 MOLD

Shutdown

LID PICKER

RUNNING

0

LIDS ONLY GOOD PARTS OUT:

39

LID REJECT PARTS:

0

FFS PARTS PROCESSED IN:

0

FFS GOOD PARTS OUT:

0

FFS REJECT PARTS:

0

FFS

IDLE

128 ASSET TAGS: MMH161339

Process Sheet  
Tabware (Mold)  
Previous  
Main

0.230 :Cushion  
15.45 :Cycle Time  
233 :Injection Pressure

4 :Picker Cavitation  
15.43 :Picker Cycletime  
3572 :Picker Parts Processed In  
3548 :Picker Good Parts  
24 :Picker Reject Parts  
284 :Process Time  
230 :Uptime

0 :Lids Only Good Parts Out:  
39 :Lid Reject Parts:

0 :FFS Parts Processed In  
0 :FFS Good Parts Out:  
0 :FFS Reject Parts:

# Drilldown

Asset Tag: MMH013659

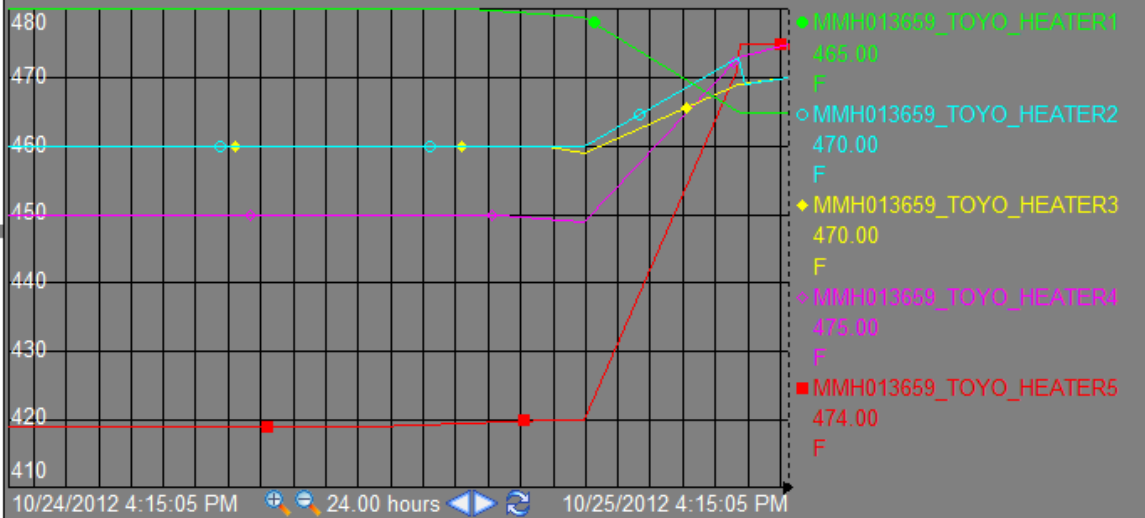
Main

Previous

Machine Mode: Shutdown

Set Date Range

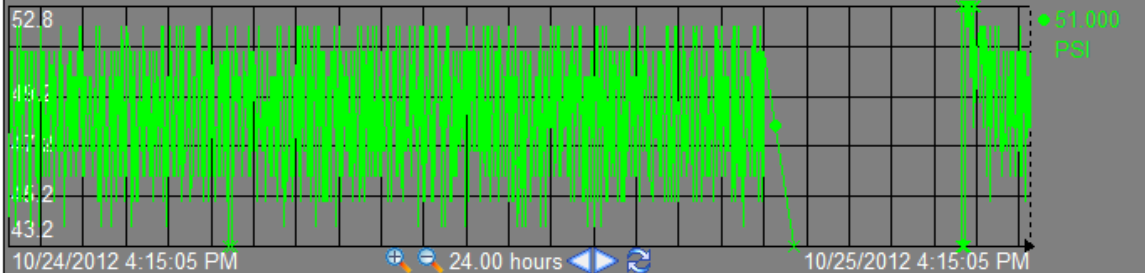
System 6 Molding 127 Temperatures



Temperatures

Nozzle Temp: 465  
 Front Temp: 470  
 Center Temp: 470  
 Rear Temp: 475  
 Rear Most Temp: 474

System 6 Molding 127 Pressures

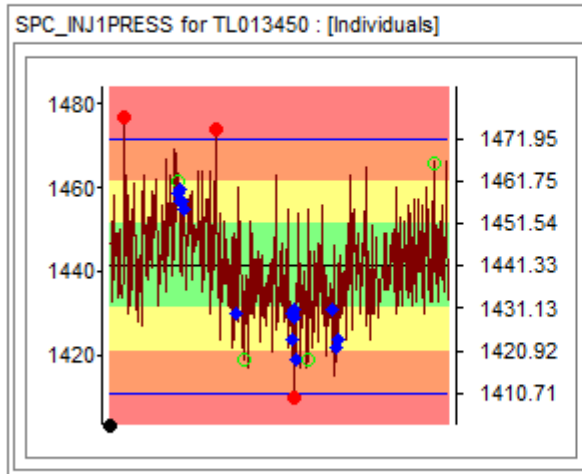


Pressures

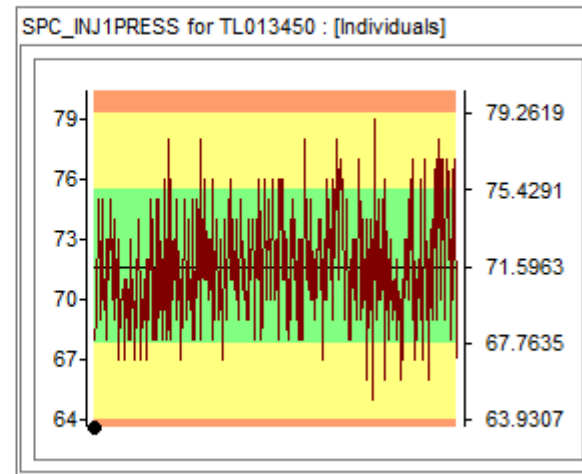
Back Press: 51  
 Max Inj Press: 1084  
 Min Inj Press: 697

# Drilldown

Sys3 Base 1st Inj Pressure



Sys3 Base Back Pressure



# Tabware (CMMS) Integration

Print

-1 Record(s) found.

**Work Order History Query**

**EQUIPMENT: MMH013659**  
**Toyo 300T H - 127**

DATE CREATED	WO #	STATUS	DATE CLOSED	EMPLOYEE	DESCRIPTION	REMARKS
6/18/2012	PM765281	Ready to Work			Daily mold cleaning & audit	
6/17/2012	PM764789	Completed	6/18/2012	DUMONTF	Daily PM - Not Completed - Machine Down	w/e
6/16/2012	PM764320	Completed	6/16/2012	DUMONTF	Daily PM - Not Completed - Machine Down	w/e
6/16/2012	PM764300	Ready to Work			Weekly Hopper Cleaning for Multiwell Sys	
6/15/2012	PM763882	Completed	6/15/2012	DUMONTF	Daily PM - Completed	done
6/14/2012	PM763397	Completed	6/14/2012	DUMONTF	Daily PM - Completed	done
6/13/2012	PM762921	Completed	6/13/2012	DUMONTF	Daily PM - Completed	done
6/12/2012	PM762456	Completed	6/12/2012	DUMONTF	Daily PM - Completed	done
6/11/2012	PM761983	Completed	6/11/2012	DUMONTF	Daily PM - Completed	done
6/10/2012	PM761502	Completed	6/11/2012	DUMONTF	Daily PM - Not Completed - Machine Down	down
6/9/2012	PM761037	Completed	6/9/2012	DUMONTF	Daily PM - Not Completed - Machine Down	/
6/9/2012	PM761015	Completed	6/11/2012	PARSONSS	PM Completed	.
6/8/2012	PM760677	Completed	6/8/2012	DUMONTF	Daily PM - Completed	done
6/7/2012	PM760106	Completed	6/7/2012	DUMONTF	Daily PM - Completed	done
6/6/2012	PM759635	Completed	6/6/2012	DUMONTF	Daily PM - Not Completed - Machine Down	down
6/5/2012	PM759170	Completed	6/5/2012	DUMONTF	Daily PM - Completed	done

# Collecting temperature and humidity

## TAS10

Chart Tag: ENVIRONMENTAL\_TAS10\_HUICpk:TY 1.50576  
 Humidity from Omega control  
 Value: 44.6000  
 Eng. Units: %RH  
 USL/LSL: 55 / 40  
 STDEV: 1.02858

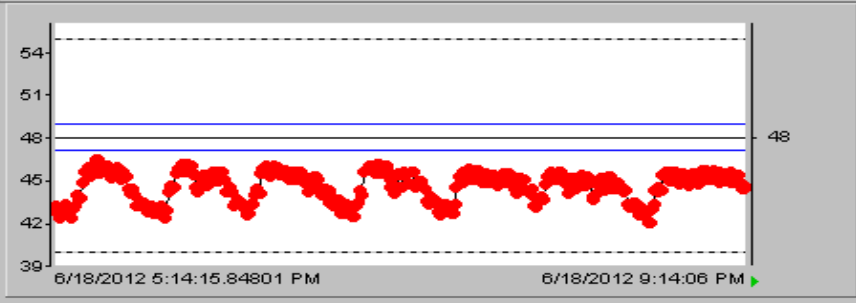
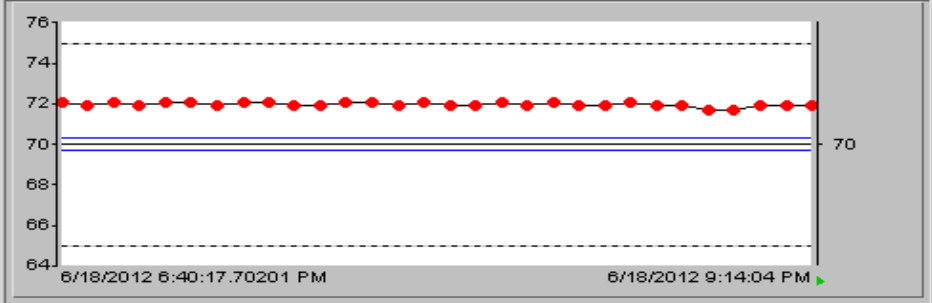


Chart Tag: ENVIRONMENTAL\_TAS10\_TEMPCpk:TURE 8.33597  
 Temperature from Omega Control  
 Value: 71.9000  
 Eng. Units: F  
 USL/LSL: 75 / 65  
 STDEV: 0.12129



## TAS11

Chart Tag: ENVIRONMENTAL\_TAS11\_HUICpk:TY 2.06763  
 Humidity from Omega control  
 Value: 47.4000  
 Eng. Units: %RH  
 USL/LSL: 55 / 40  
 STDEV: 1.20665

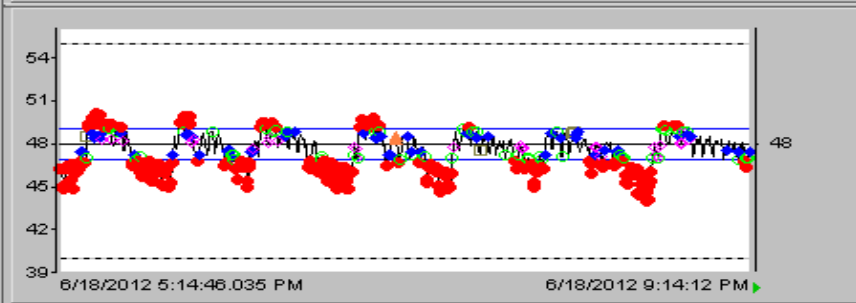
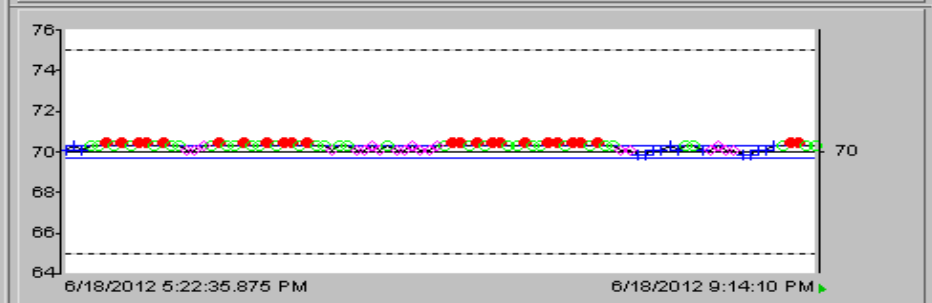
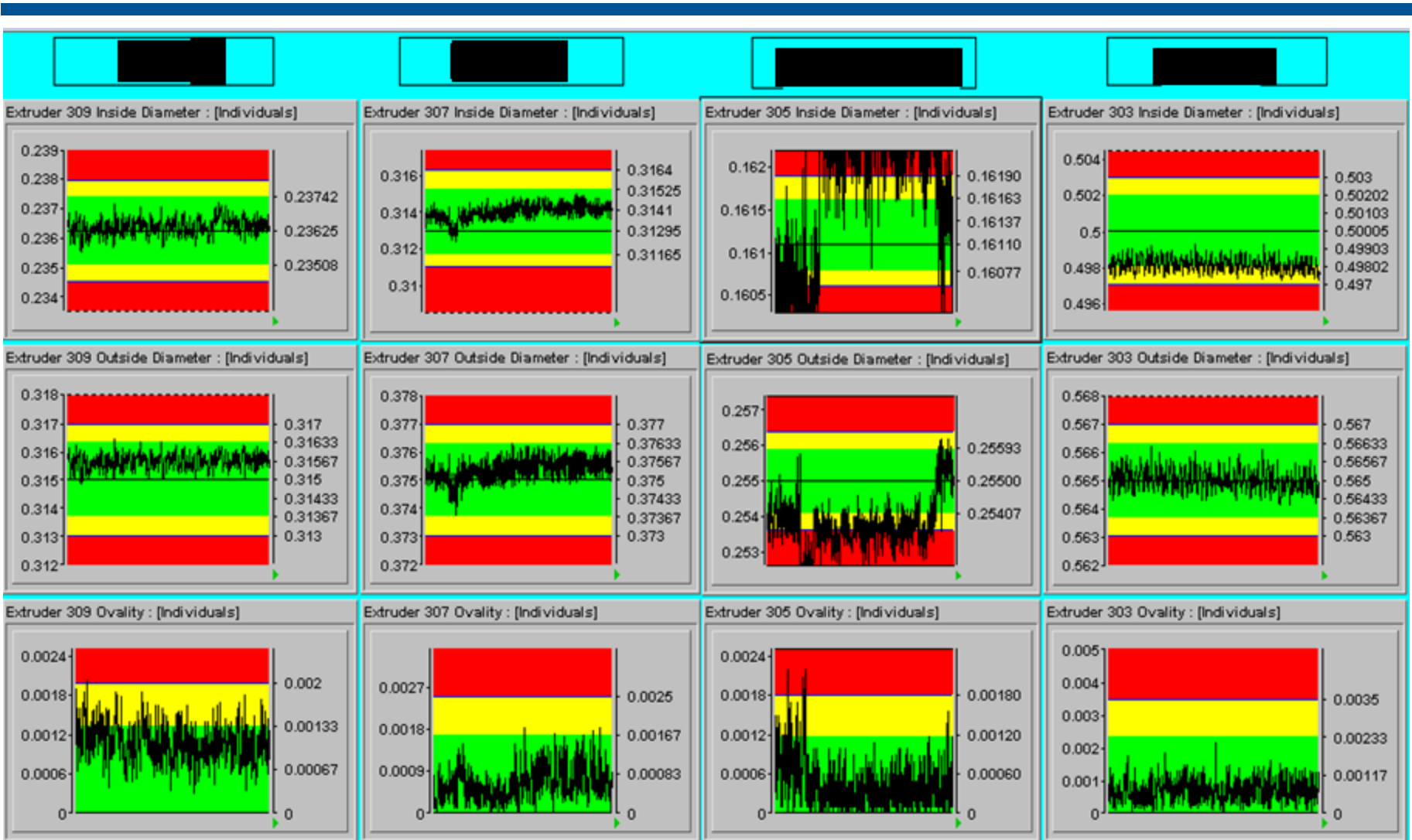


Chart Tag: ENVIRONMENTAL\_TAS11\_TEMPCpk:TURE 9.58727  
 Temperature from Omega Control  
 Value: 70.3000  
 Eng. Units: F  
 USL/LSL: 75 / 65  
 STDEV: 0.16393

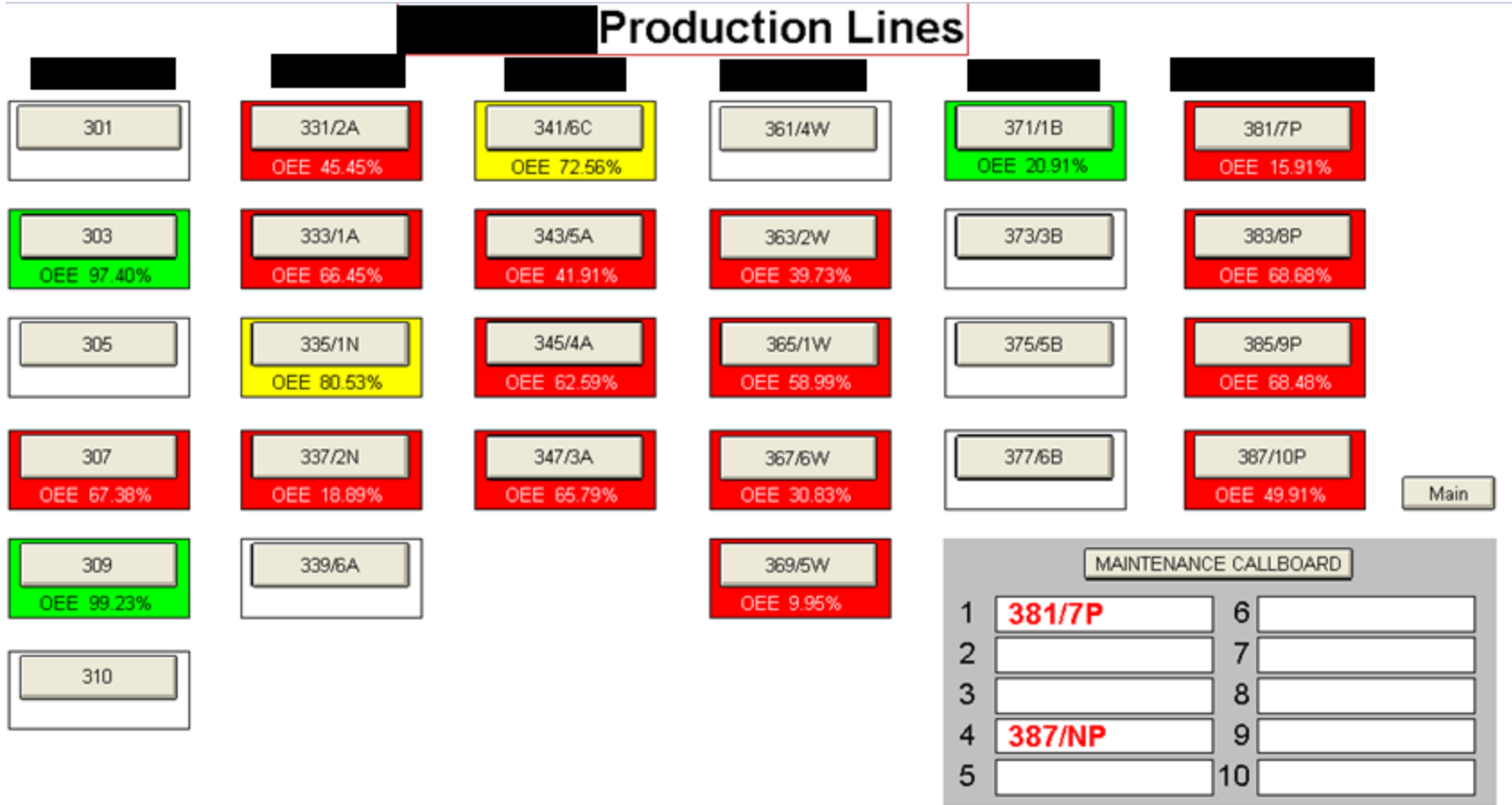




# PI UFL interface being used to measure and collect Inside, Outside Diameter and Ovality from shop floor equipment.



# Department Dashboard



# Drill down

## 1A Assembly Process

Availability:	88.70%
Performance:	100.00%
Quality:	98.09%
OEE:	87.02%

333 ASSET TAGS:  
FACER014932  
AUTOS014932  
PRNTA012928  
PLUGS012932

1A Facer

1A Draw

1A Printer

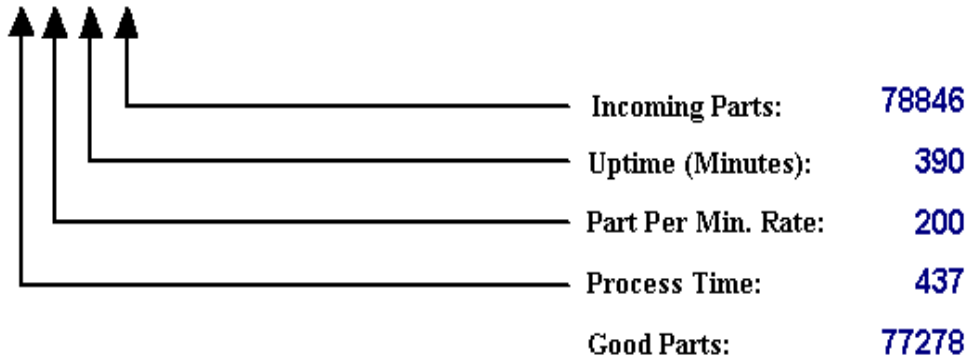
1A Plugger

OUTFEED TO DRAW IS FULL

OUTFEED TO PRINTER IS FULL

INFEED CHAIN JAM DETECTED.

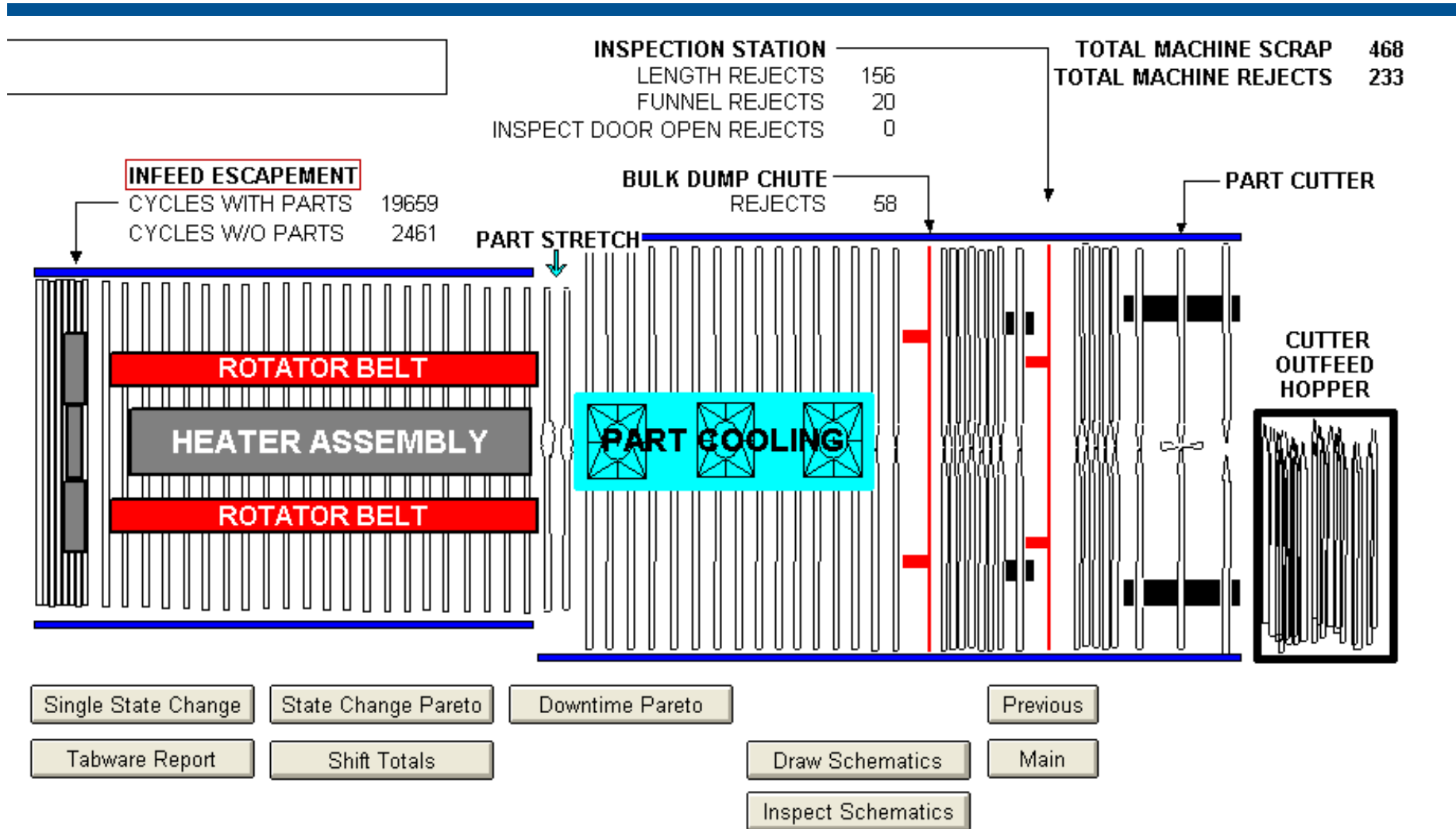
RUN MODE/WAITING FOR PARTS



Previous

Main

# Drill down further



# Mechanic Callboard

**Call Board**

1	<b>381/7P</b>	6	
2	<b>347/3A</b>	7	
3	<b>305</b>	8	
4	<b>387/NP</b>	9	
5		10	



# Integration with MES and CMMS

## AIMS TOOLROOM OVERVIEW

MACHINE	TOOL ID
101	TL010510
105	TL010511
107	TL014481
109	NO MOLD
110	TL012797
111	TL014196
115	Pt Created
117	TL012523
SYSTEM 3	TL013450
SYSTEM 4	TL014193
SYSTEM 5	NO MOLD
SYSTEM 6	TL014226

MACHINE	TOOL ID
201	NO MOLD
203	TL012693
205	TL012659
207	TL012795
209	TL014222
227	TL013710

MACHINE	TOOL ID
503	TL012792
505	TL160971
507	NO MOLD
509	TL013447
511	TL161088
513	TL162006
515	TL014282
517	TL013704
519	TL013700
521	TL002275
523	TL161394
527	TL161110
529	TL162015
531	TL161126
533	TL012794

# MES system

Scan Badge To Log In/Out

**Operator**  
EthierN  
MichaudDT  
swettb

**Production Summary**

Item: 251001008    Item Desc: FLASKETTE, HYPERFLASK(HDCCV), IN HOUSE

Current	Required		RTS		Remain		
	Pieces	Cases	Pieces	Cases	Pieces	Cases	
PID: PID0091878	20800	65	14080	44	6720	21	
Lot: 16512023	Shift: 2		960	3			
Total Unaccounted Pieces			269	Pieces at rework			0

UnSchedule    Suspend-MW    Lot Change    Start Dump    Mold Change

**Status Summary**

Time to Next Lot: 50 hrs 32 mins

OEE by Shift: 94%

Rate by Shift: 95%

Scrap by Lot & Shift: 0%

Downtime by Shift: 0.27%

**Downtime History**

Time	Up	Reason
6/18 16:13	Up	
6/18 16:12	Down	Jams
6/18 09:29	Up	
6/16 19:22	Down	WIP - Other
6/15 21:24	Up	
6/15 21:23	Down	Mold Wipe
6/14 18:51	Up	

**MACH\_523**

Schedule Status: **Scheduled**  
Suspend Status: **No**  
Dump Status: **Not Dumping**  
Available: **Up**  
Pcs Made: 14349

Mold #1    Mold #2

Asset Id	Cav.	Asset Id	Cav.
TL161394	1		0

Station: k2arwt523m    Labor Center: MSCC

Pi Parent Int.     Pi Child Int.     Validate PID

**Scrap History**

Time	Scrap Reason	Qty	From
6/18 09:57	Embedded	8	Mach
6/18 09:54	Embedded	9	Mach
6/18 09:51	Embedded	8	Mach
6/18 09:48	Embedded	8	Mach
6/18 09:45	Embedded	8	Mach
6/18 09:42	Embedded	8	Mach
6/18 09:39	Embedded	8	Mach

**Receipt**

Reprint Receipt

Pcs in Tote: 320

Receipt Label

**Shipper**

Shipper/Master Carton Label

**Pallet**

Reprint Pallet

Current Pallet Id

Total Allowed on Pallet: 2880

Pieces on Pallet: 0

Pallet

**Change Qty**    1

Scrap Entry

These buttons require sub Scrap Reason

Contamination    Visual Defects    Dimensional

Crack    Improper Treatment    Samples

More ...

# HA Environment - Future

PI Servers



PI Interface Servers



PI Buffer SubSystem

**Interfaces:**

- Kepware OPC (1)
- Custom using PI API
- PI UFL (60 instances)
- PI ACE

PI AF Server with SQL Server  
(standard)



# Future plans for the PI System

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- Planning for the upgrade to 2012 this year
- PowerPivot
- Notifications
- Server based SPC

# Benefits

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- Enables us to see opportunities for process improvements
- Proven track record of providing value
- Reliable software on reliable platform
- High Availability PI System



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# Questions?



# THANK YOU

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