- This example provided for Training Purposes Only -

Steel Foundry – OTD Project Summary

December 2005 (Update)

The Task, Team:

- In July 2005, at the request of the VP of Supply Chain and Continuous Improvement, a cross-functional team was formed to complete continuous improvement initiatives and to improve the Foundry on-time delivery (OTD) performance – specifically in two fabrication areas: the Shell (DS) and the No-Bake (NB) departments.
- Most Foundry associates participated in the CIP efforts. This update (report-out) is to highlight their efforts and share lessons learned and document physical changes and results of the efforts…

Team below represents those involved with the OTD project in Shell and No-Bake:

Name	**Job Function**	**Location**
--------	Project Champion/ Site GM	Corp. -
--------	OTD Project Lead/ CIP MBB	Corp. –
--------	Mfg. Manager/ CIP Black Belt	Foundry
--------	Supervisor	No Bake Area
--------	Supervisor	Shell Area
--------	Operator	No Bake Area
--------	Operator	No Bake Area
--------	Operator	Shell Area
--------	Operator	Shell Area
--------	Maint. / Purchasing Manager	Foundry
--------	Site Controller	Foundry
--------	Maintenance Manager	Foundry

CIP efforts throughout all aspects of the Foundry…

Quantify:

Problem Statement:

From Jan. through July 2005, average OTD for the (DS) area was 79.4%, range of 72% to 87%, and the average OTD for the No-Bake area was 63 %, range of 58% to 77%, resulting in increased expediting and dissatisfied Flowserve customers.

Objective:

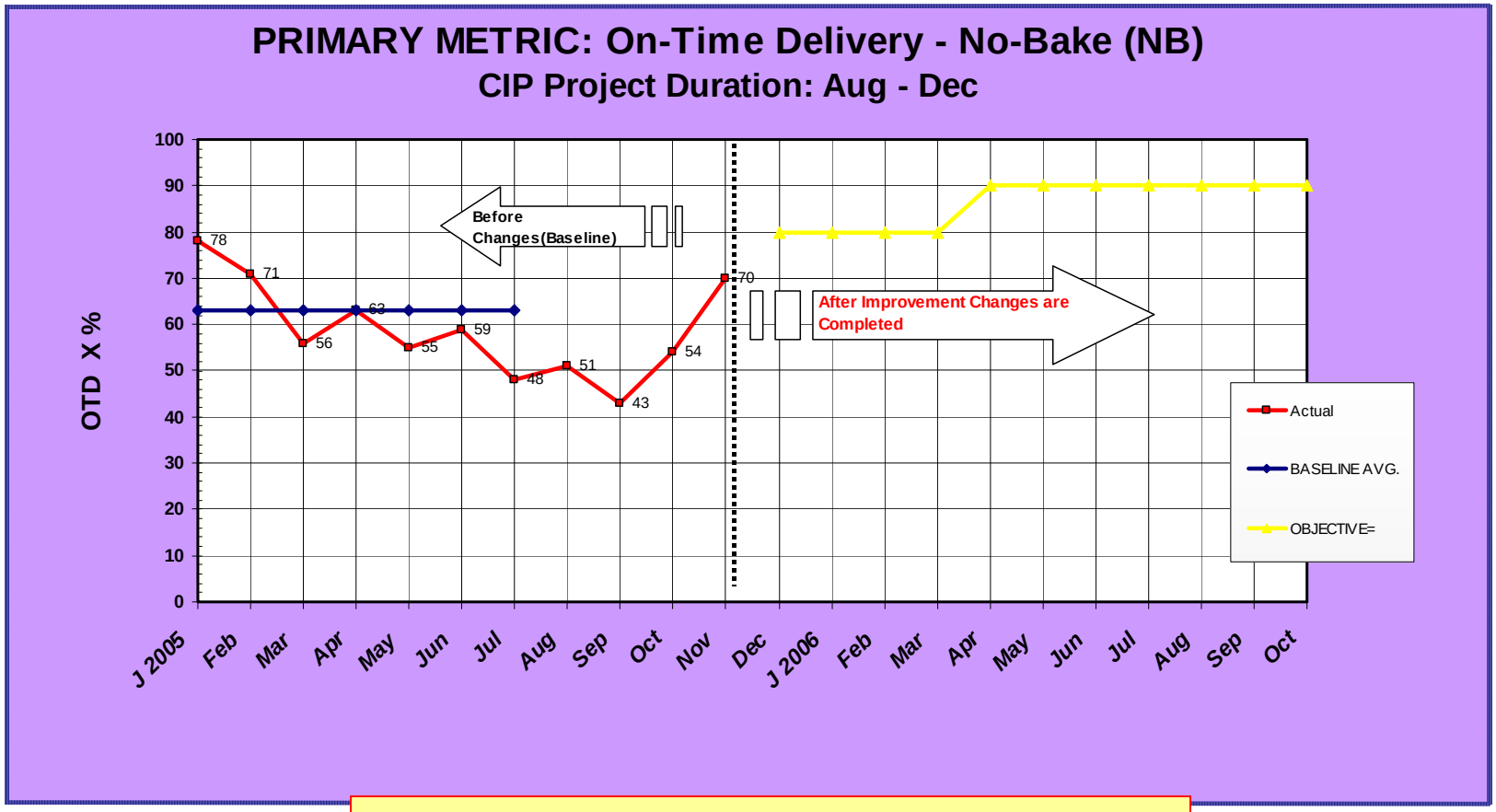
By Dec 31st, 2005, increase OTD in SHELL area to 90% and No-Bake area to 80% then to 90% by April 2006, resulting in improved Customer Satisfaction and other benefits.

Schedule

	Task	Date	Status
Q	Project Charter	August 26	Complete
M	Data, Process Map(s)	Aug/ Sept	Complete, Data Collection on-going
A	X-Y Matrix, Pareto Analysis	Sept/ Oct	Complete
I	Evaluating, implementing ideas	Oct/ Nov	Complete
C	Control and response planning	Nov/ Dec	Remaining tasks

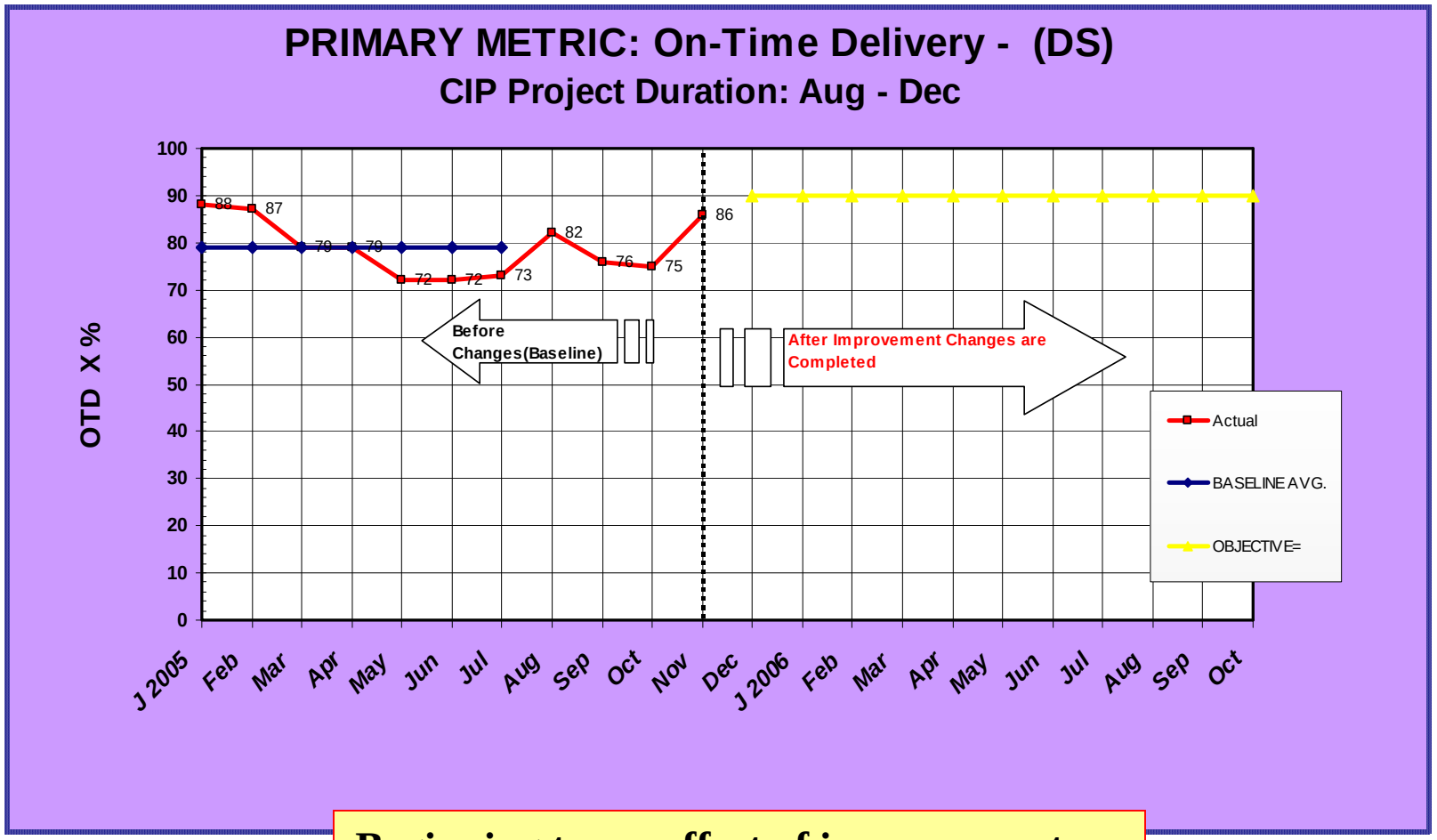
More realistic Objective for No-Bake Area…

Measure:



Beginning to see effect of improvements…

Measure:



Beginning to see effect of improvements…

Analyze/ Improve:

NO BAKE AREA/ Actions from Team Meetings

Issue	Cause	Corrective Action(s)	Timing
Surface defects	Sand loosened in mold	I.D. rough, pothole areas and patch floor	complete
Surface defects	Sand sticking in mold	Standardize Mold Wash procedures	complete
Shell molding in NB	Lack of standards	Documentation on Molding practice – chills, flange changes, etc	complete
Mold delays on floor	Molds inaccessible	Adding Material Racks (Kanban) in areas to eliminate bottlenecks and having to move pieces retrieve another	complete
Worn/ lost tools	No secure locations	Identified, ordered hand tools, small equipment … i.e. –Hammer, Drill, Crowbar, Wrench	complete
End of line rejects	Lack of Inspection criteria	Inspection Course developed and taught (Plan to conduct w/ molders and metal pourers also)	complete
Wait for skill to be available	Operators not cross-trained	Added 2 new 'multi-functional' job descriptions in areas	complete

Project managed with weekly action lists…

Analyze/ Improve:

SHELL AREA/ Actions from Team Meetings

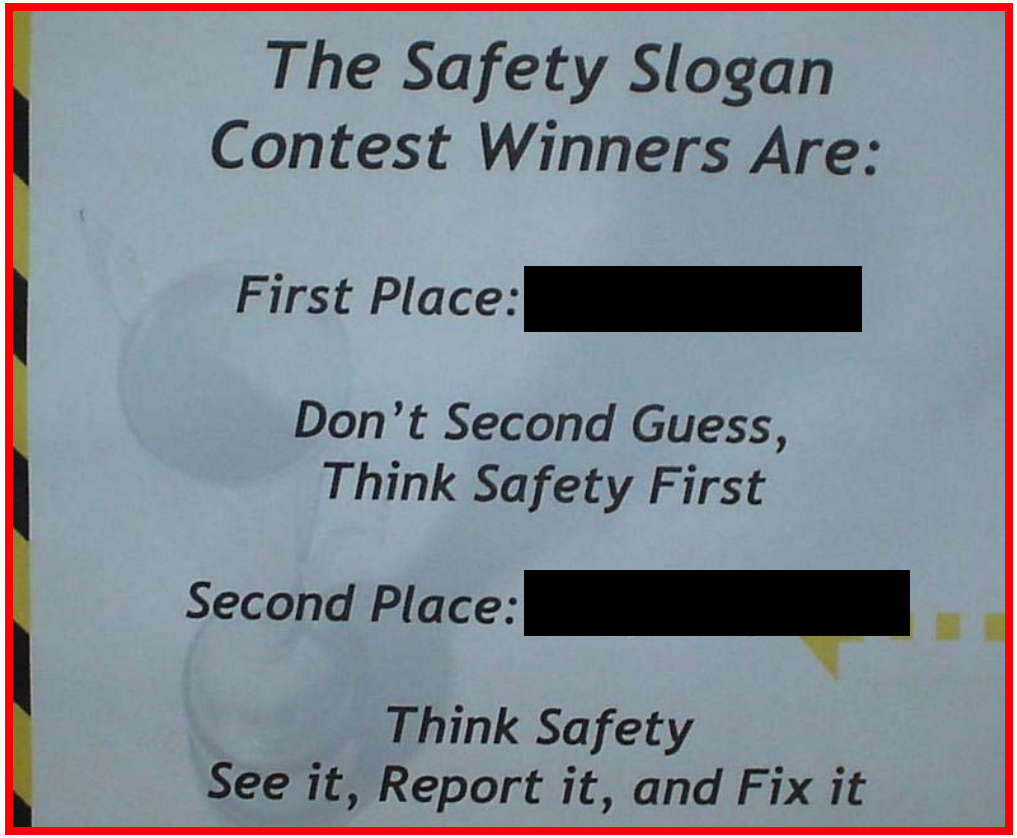
Issue	Cause	Corrective Action(s)	Timing
Surface defects	Sand loosened in mold	I.D. rough, pothole areas and patch floor	complete
Rollover changes	Long set-ups	Review actions from last Kaizen	Feb 2006
Sand blast patterns	Sand type	Sand Analysis in Resin Shell Molding, QA and Engineering certified new sand	complete
Mold delays on floor	Molds inaccessible	Adding Material Racks(Kanban) in areas to eliminate bottlenecks and having to move pieces retrieve another	complete
Stamp Heat #'s	Increase cycle times	Evaluate alternate stamping methods	complete
Surface defects	Glue over-runs	Evaluating new SCREENS/ Filters	Feb 2006
Long Delays	Time to locate correct molds	Quick I.D. of molds by marking last 3 letters on molds	complete
Wait for "alloy" symbols (die)	Worn patterns	Pattern replacing (rotating basis)	complete

Project managed with weekly action lists…

Safety:

Safety slogan contest held …

(highlighted in November CIP Newsletter)



Keeping Safety on the Forefront…

Safety:

New lighting installed …

(lighting fixtures located in storeroom, transferred from Springboro facility)

Keeping Safety on the Forefront…

Safety:

Painting key areas …

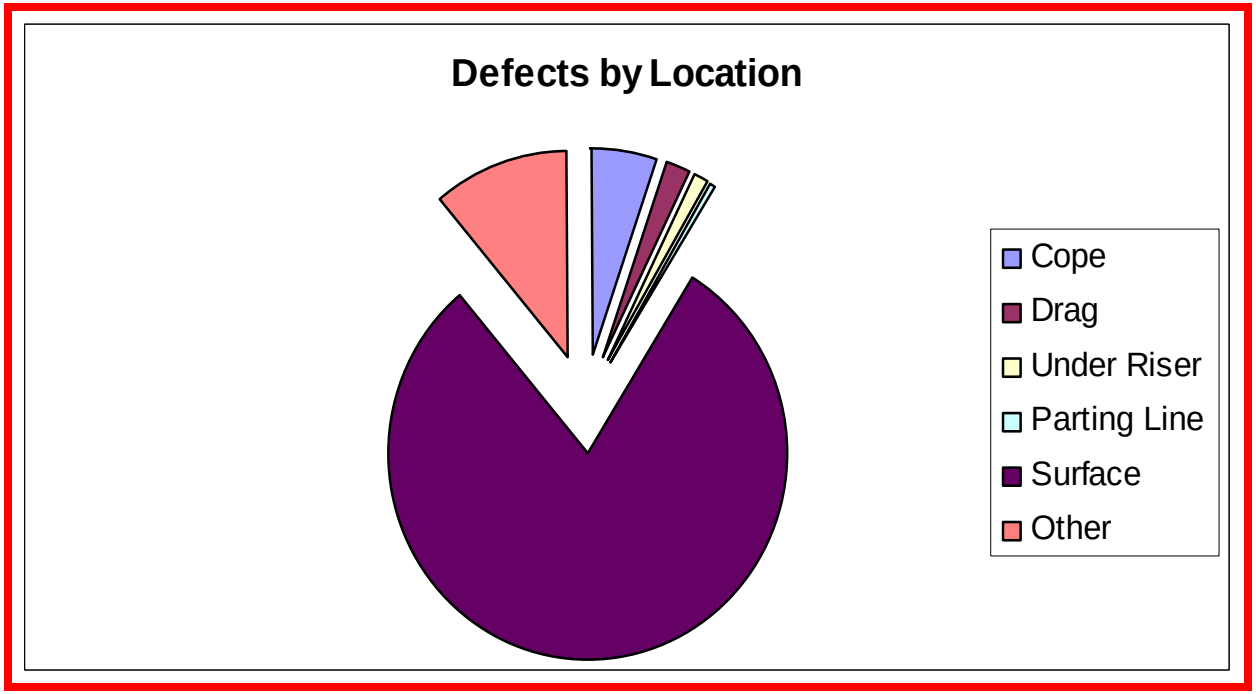
(upgraded toilet rooms, locker rooms, break rooms)

Keeping Safety on the Forefront…

Quality:

Identifying defect types by location …

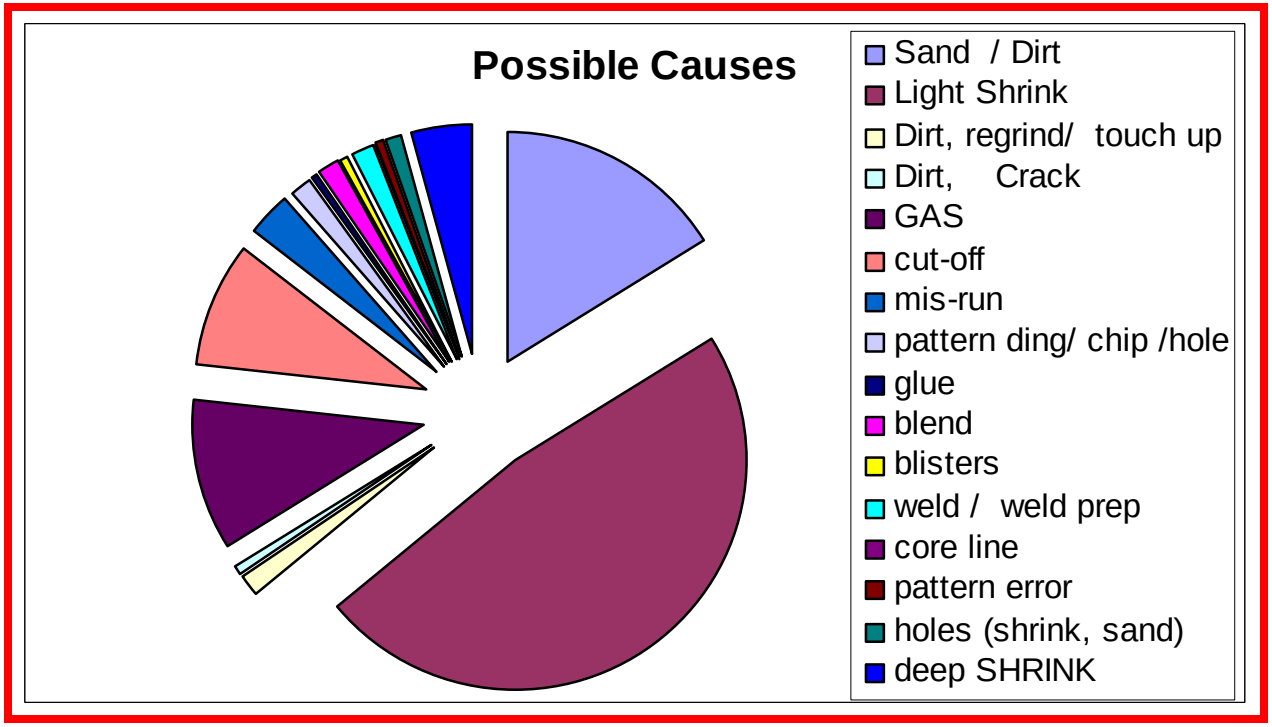
(n = 1,284)



Surface defects largest issue…

Quality:

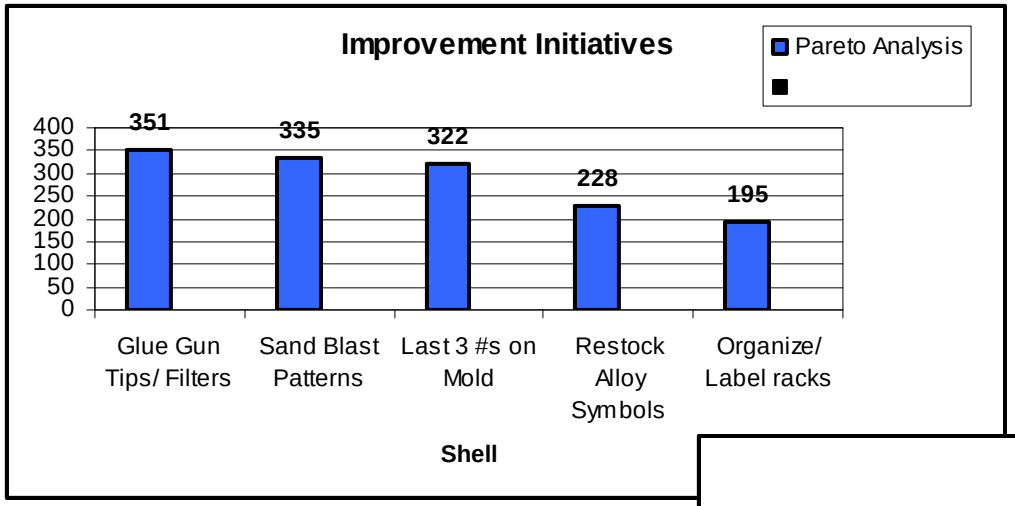
Tracking defect types/ causes …

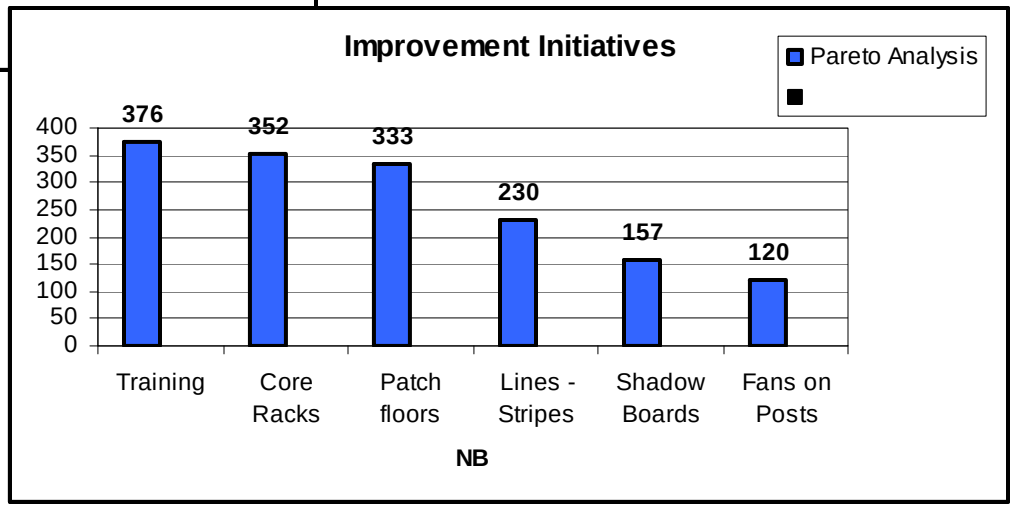


Shrink, sand and dirt possible causes…

Quality:

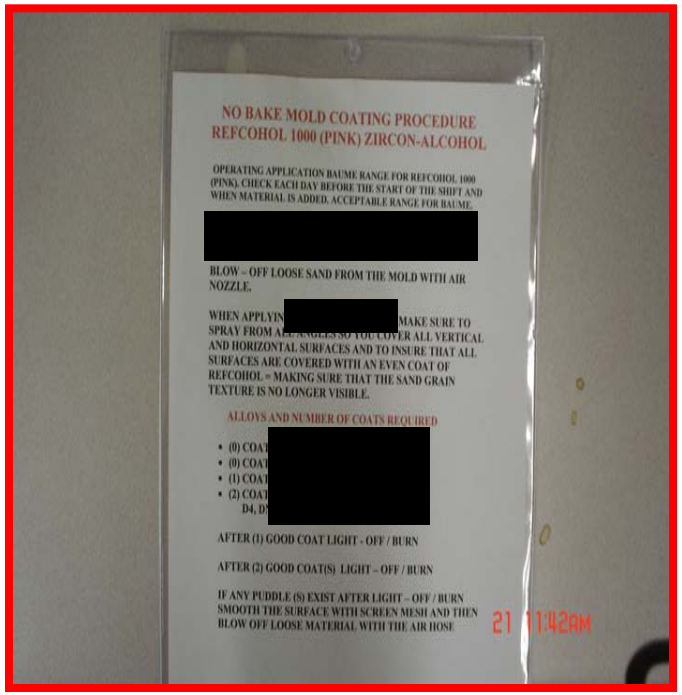
Developed solutions that address causes…





Operator utilization, visual management/ control, facility upgrades…

Quality:

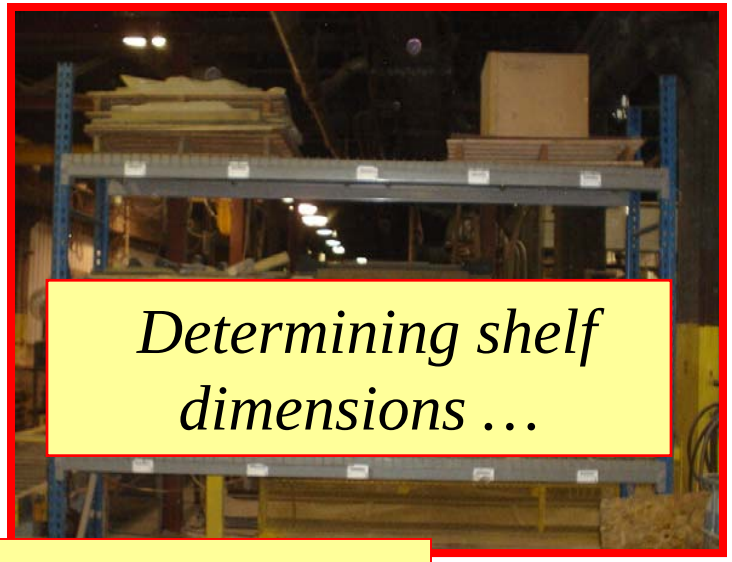


Visual Management: mold spray coating standards
(with accompanying procedures)

Sample boards hung in work area…

Speed of execution:

Kanban: Material shelves placed in strategic locations within each area.

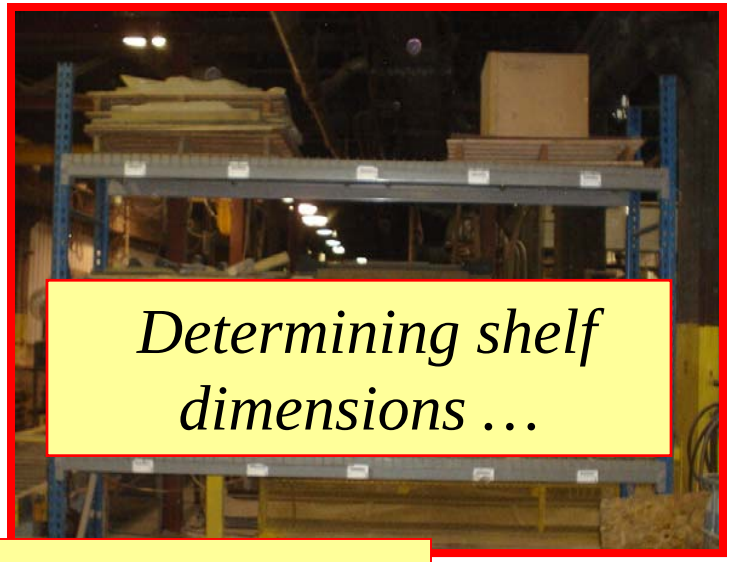


Determining shelf dimensions …

Beginning to see effect of improvements…

Speed of execution:

Kanban: Material shelves placed in strategic locations within each area.

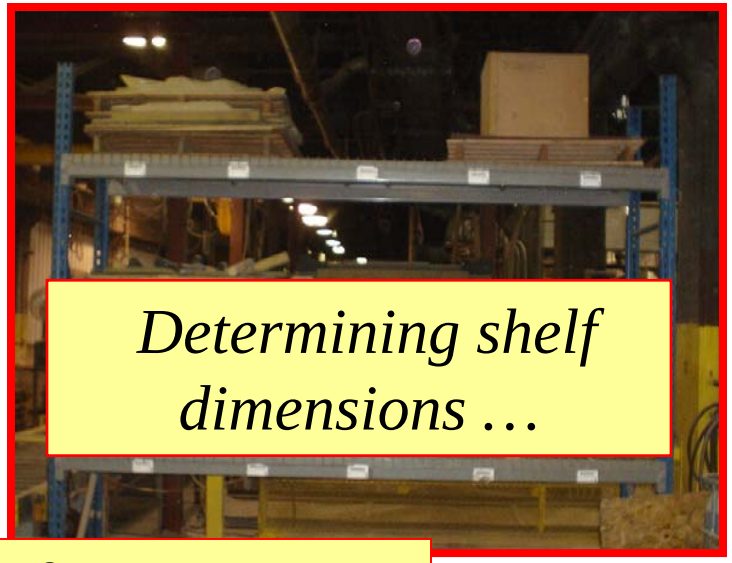


Determining shelf dimensions …

Beginning to see effect of improvements…

Speed of execution:

Kanban: Material shelves placed in strategic locations within each area.



Determining shelf dimensions …

Beginning to see effect of improvements…

Speed of execution:

Kanban: Material shelves placed in strategic locations within each area.

Beginning to see effect of improvements…

Speed of execution:

Kanban: Material shelves (w/ clear labels) placed in strategic locations within each area.

Shelf dimensions/ containers match common product…

Beginning to see effect of improvements…

Addressing Bottleneck in Core Loop:

Re-Configure area/ better space utilization:

- **Install rollover**
- **Install conveyers**
- **Install mixer**

“S” conveyor curve will be replaced…

New configuration will add 2 more lanes…

Addressing Bottleneck in Core Loop:

Configure area in Q1 2006:

- **Install rollover**
- **Install conveyers**
- **Install mixer**

Obsolete mixer head will be replaced…

Additional lanes will add product mix flexibility…

Addressing Bottleneck w/ High Risk castings:

Tagging Process procedure developed 10 Oct 2005 for:

- **Pattern Shop**
- **Molding Operation**
- **Pouring Operation**
- **Shakeout/Blast (Shell and No Bake)**
- **Cleaning (Cut off and Grind)**

Material identified for special handling…

Additional CIP activity: (update)

Visual Management/ Visual Control (Safety):

- **ID location, Assemble existing shelves (Materials discovered in storage)**

Note: Safety glasses, gloves and spotter

Note: Double-check the locking mechanism

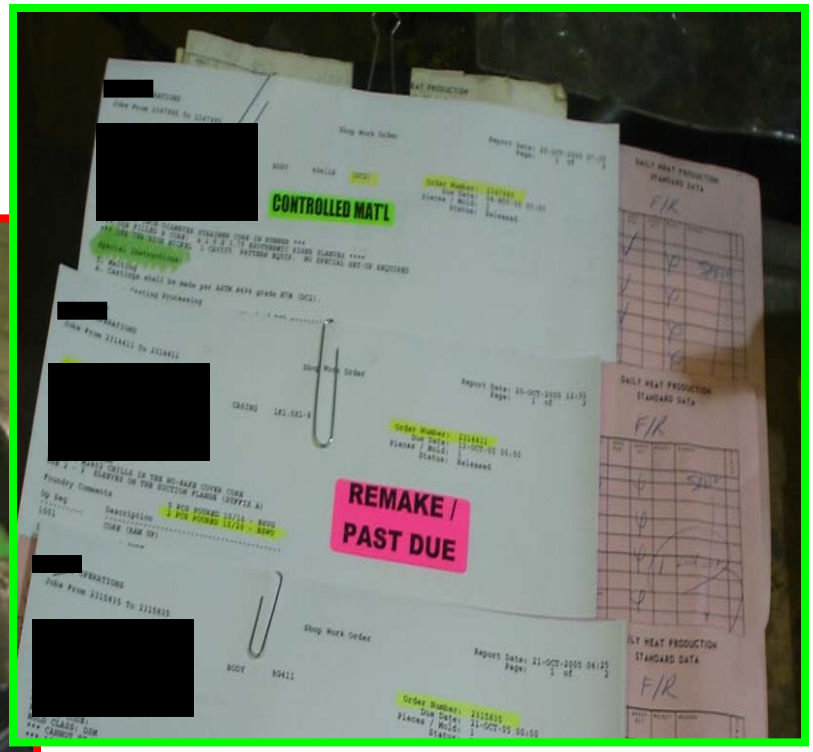
Note: Shelves required to get parts off floor (safety hazard)

Continue to promote CIP efforts at Foundry…

Additional CIP activity: (update)

Visual Control:

Color coded traveler for 'Controlled Material' or past dues…



Continue to promote CIP efforts at Foundry…

Additional CIP activity: (update)

Visual Control (Safety):

- **Aisle Stripes to define Work Areas**

before

after

Continue to promote CIP efforts at Foundry…

Additional CIP activity: (update)

Energy savings (Cost control):

Awnings and Drive-through plastic curtains

Outside -

Reduces slippery surfaces

Inside –

No need to leave door open all day

Continue to promote CIP efforts at Foundry…

Additional CIP activity: (update)

HR:

- **Cross functional (enhanced) job descriptions developed for Cleaning and Pour-off operations**
-

Other:

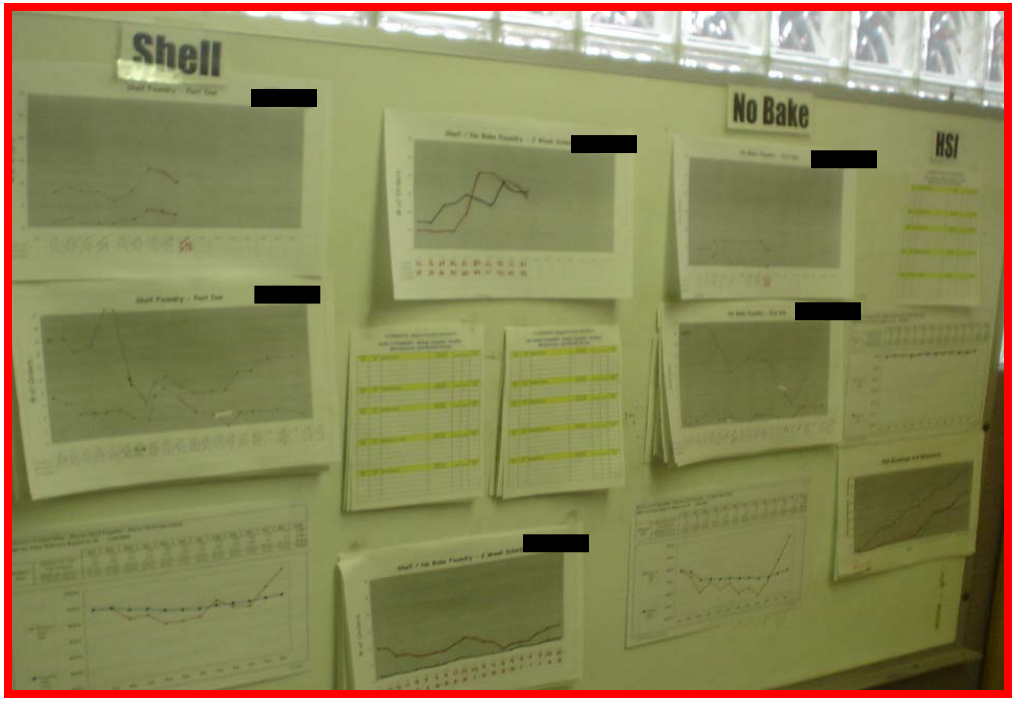
- **Transferred ‘low-run’ Shell molds to No Bake core loop**
- **From the weekly Quality reviews – enhanced pattern changes, standardized metal pouring, standardized training**
- **Investment Area – tooling enhancements to reduce cycle time on machining (Group II - shaft sleeves)**

Continue to promote CIP efforts at Foundry…

Control:

Sustain momentum – utilize Daily Accountability Meetings

- Key performance Indicators from all areas are reported with site leadership each morning
- Results posted in common work area (lunch room)



Continue to track and document improvements in 2006…

Next Steps:

Sustain project momentum w/ weekly team meetings:

- **Collecting/ tracking Defects by Alloy type (continue through Dec 31st)**
- **Install new Core Loop layout with multi-head turntable and multiple conveyor lanes addressing current bottleneck (Coordinate w/ Maintenance)**
- **Actively Working open items on project via Rotating Action Item List (RAIL) and Corrective Actions (CAM form)**
- **Tracking OTD metrics from each area (on-going)**
- **Plan Kaizen Event in Investment Mold Storage Area (crib)**

Supporting Trips to Dayton: (Watson)

- **July 26-28**
- **August 9-11**
- **August 23-25**
- **Sept 7-9**
- **Sept 20-22**
- **Oct 17-21**
- **Nov 8-10**

Remaining 2005 follow-up visit conducted to assure process controls, transition operational improvements to process owners and celebrate success:

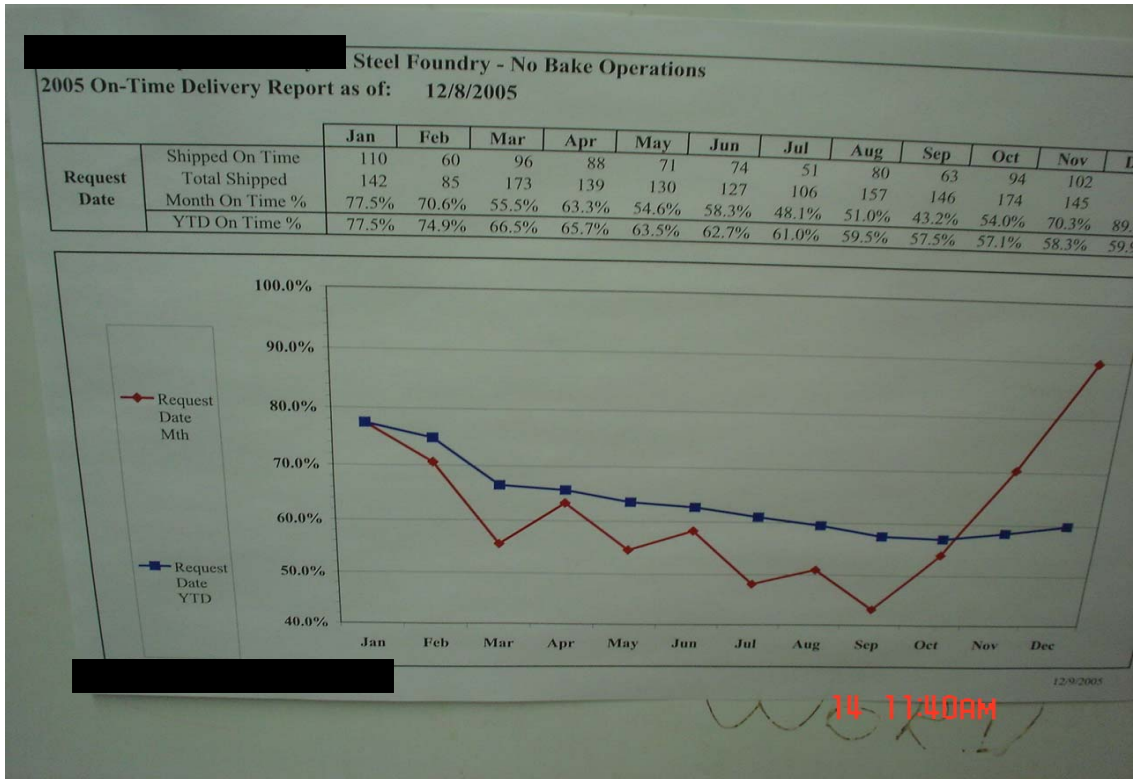
- **Dec 13-15**

Continue to track and document improvements in 2006…

Next Steps:

Sustain project momentum w/ weekly team meetings:

- **Tracking OTD metrics from each area (Dec 8th)**



[redacted] Steel Foundry - No Bake Operations

2005 On-Time Delivery Report as of: 12/8/2005

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Request Date	Shipped On Time	110	60	96	88	71	74	51	80	63	94	102
	Total Shipped	142	85	173	139	130	127	106	157	146	174	145
	Month On Time %	77.5%	70.6%	55.5%	63.3%	54.6%	58.3%	48.1%	51.0%	43.2%	54.0%	70.3%
	YTD On Time %	77.5%	74.9%	66.5%	65.7%	63.5%	62.7%	61.0%	59.5%	57.5%	57.1%	58.3%

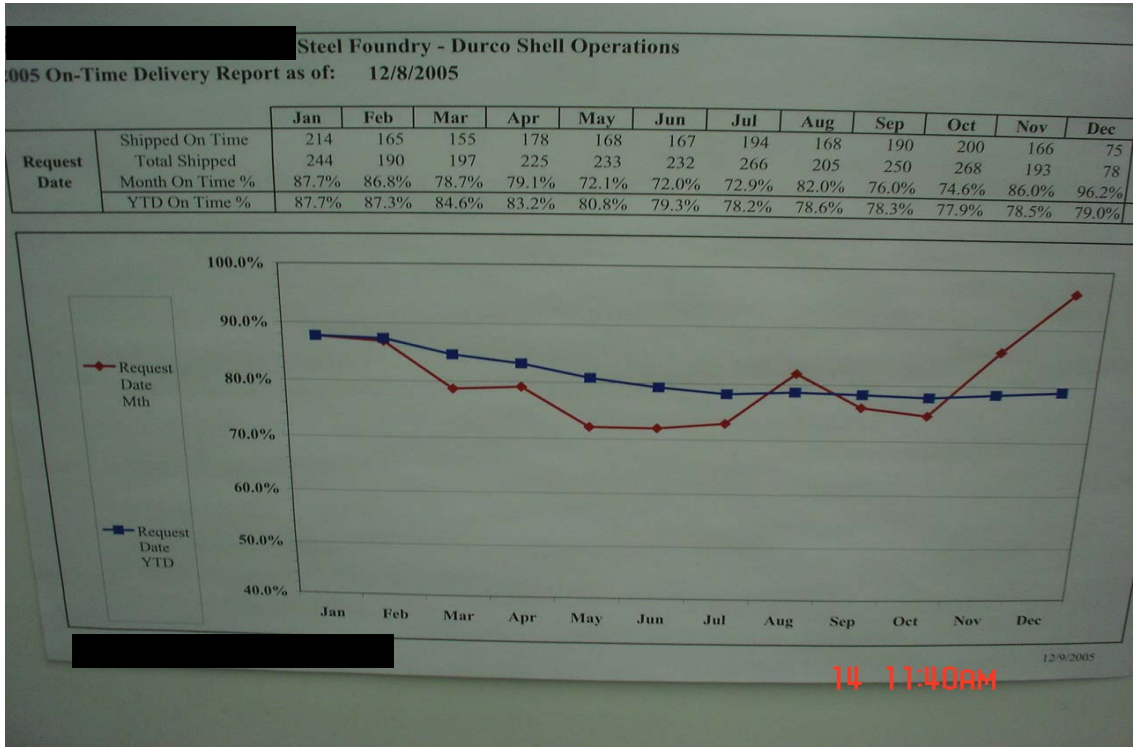
No Bake Area – 89% OTD

Continue to track and document improvements in 2006…

Next Steps:

Sustain project momentum w/ weekly team meetings:

- **Tracking OTD metrics from each area (Dec 8th)**


[redacted] Steel Foundry - Durco Shell Operations

005 On-Time Delivery Report as of: 12/8/2005

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Request Date	Shipped On Time	214	165	155	178	168	167	194	168	190	200	166	75
	Total Shipped	244	190	197	225	233	232	266	205	250	268	193	78
	Month On Time %	87.7%	86.8%	78.7%	79.1%	72.1%	72.0%	72.9%	82.0%	76.0%	74.6%	86.0%	96.2%
	YTD On Time %	87.7%	87.3%	84.6%	83.2%	80.8%	79.3%	78.2%	78.6%	78.3%	77.9%	78.5%	79.0%

Shell Area – 96% OTD

Continue to track and document improvements in 2006…

Green Belt activity: (update)

Foundry:

- **Engineering Manager, GB certified**
- **Award given in Daily Accountability meeting**
- **Presentation by Site Manager, Mfg Manager,**
- **Documented with Digital Pictures**
- **Promote via CIP Webpage**

FLS Technology Center:

- **Continue to mentor GB candidate, (GB week 2, Q1 2006)**

Continue to promote CIP efforts in Dayton area…

Steel Foundry – OTD Project Review

December 2005 (Update)