

An Application of Kaizen Continuous Process Improvement Principles to Construction Management and Contract Administration Processes

**A continuous Improvement
Mission**

61ST

**Annual Ohio Transportation Engineering
Conference 10/24/07**

SESSION 37

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Presentation outline

- **Overview and Background.**
 - **Initial Progress**
 - **Limited Contractor's Survey**
- **Goals & objectives**
- **What is the Continuous Improvement (CI) Program?**
- **Process Decomposition/standardization**
- **Solution-Active Tasks**
- **Electronic Information Management System**
- **Advantages/Disadvantages/cost**
- **Question?**

OVERVIEW AND BACKGROUND

- City Initiative:
To adopt a Continuous Improvement (C.I) program.
- Initial Progress
 - The system: process, hardware, software
 - Contractor Payments Process
 - Office/project Control:
 - ❖ The Manpower needs assessment
 - ❖ Inspection assignment chart
 - ❖ Dash board project/payment tracking
 - ❖ The Financial impact and budget needs
 - ❖ Resident complaints-311
- Current status

Contractors Monthly Estimate Tracking Transportation Division

Project Name	Contractor	Next Payment Due	Current Step In The Process	On Time, or Tracking "x" days early/late	Remarks
Traffic Calming Strawberry Fm.	G & G Cement	June17	6	On Time	
Long, Burt Curb & Walks	G & G Cement	May 26	6	On Time	
Concrete Rehab. & Joint Seal 5	Columbus Asphalt		6	On Time	
Brick Rehab. 2005	McDaniels Constr.	July 13	6	On Time	
Street Furniture	G & G Cement				
Jeffery Pl. Civitas	Corn / Kokosing	Sept 9	6	On Time	
Sawmill / Billingsley	Columbus Asphalt	Sept 10	6	On Time	
Short North Arches	The Righter Co.	Aug 17	6	On Time	
Lincoln Street	G & G Cement	Mar 21	6	On Time	In Final
Greenview Estates	Miracit Development		6	On Time	
Resurfacing 06 Project 2	The Shelly Co.	Aug 25	6	On Time	
Gay St. Phase I	Gaddis & Son	June16	6	1 Day	
McKinley Avenue OPWC	Kokosing Construction	Sept 17	6	3 Days	
Greenview Estates	Miracit Development	Mar 14	6	On Time	
Waverly Court	Columbus Housing	Mar 14	6	On Time	
Gowdy Field	Trucco/Cols. Urban	Sept 25	6	On Time	
Standby Generator #1	Dynalectric Co.				
Standby Generator #2	Dynalectric Co.	May 30	6	On Time	
Marion Rd. Out Post	The Righter	Aug 10	6	1 Day	Modification Required
Gay St. Improvements	Complete Gen.	Sept 8	6	On Time	
Parson Ave. Alley	The Shelly Co.	July 14	6	2 Days	
Raised Pavement Markers 06	W L Markers	Aug 6	6	On Time	
Oakland Park Imprv.	Columbus Asphalt	Sept16	6	On Time	
Resurfacing 07 Project 1	Shelly & Sands	Sept 23	6	On Time	
High St. Resurfacing & Bridge	Strawser Paving	Sept 25	6	On Time	

Contractors Monthly Estimate Tracking Public Utility Department

Project Name	Contractor	Next Payment Due	Current Step In The Process	On Time, or Tracking "x" days early/late	Remarks
SEWERS AND DRAINS					
Woodland Ave. / 5 th Ave.	Complete General	Aug 27	6	On Time	
Briggs Rd.Open Channel	Shelly & Sands	Aug 30	6	On Time	
Iuka Ravine Sanitary	Complete General	April 15	6	1 Day	
			6	On Time	
5 TH Ave. Underpass	Complete Gen.	Sept 16	6	4 Days	
Refugee Rd. Pump Sta.	Complete General	Sept 29	6	On Time	
Glendower / Liewellyn Storm	Columbus Asphalt	May 13	6	On Time	
Noe Bixby Storm	McDanniels Construction	Oct 28	6	2 Days	
Iuka Ravine Storm	Complete General	April 5	6	1 Day	
Hilliard-Rome Rd. Storm	George J. Igel	Feb. 2	6	On Time	
Leland Ditch Storm	Nickolas Savko	Sept 23	6	On Time	
Oaklawn St/Piedmont	Nickolas Savko	Aug 18	6	On Time	
WATER DIVISION					
Cleveland Ave. Area	Complete General	Sept 13	6	On Time	
Westside W/L Noe-Bixby	McDanniels Construction	Aug 28	6	On Time	
Far East Waterline Imprv.	Columbus Asphalt	Oct 7	6	3 Days	
SR 317 London/Groveport 24"	McDanniels Construction	Aug 11	6	On Time	
Hamilton / Broad W/L	Darby Creek	Aug 23	6	On Time	
Oaklawn/Piedmont	Nickolas Savko	Nov 19	6	On Time	
Woodland / 5 th W/L	Complete Gen.	Aug 27	6	On Time	
Demorest / Sullivant W/L	Complete General	Mar 21	6	5 Days	Questions
Fisher Rd. Booster Sta. Dischar	Complete General	Aug 26	6	7 Days	
Scioto & Darby 30" W/M	Fields Excavating	July 25	6	On Time	

Projects Manpower Tracking Public Utility Projects

Project Name	Projected Completion Date	Inspector	Inspector Start Date	10-Month End Date	12/1	12/8	12/15	12/22	12/29	1/5	1/12	1/19	1/26	2/2	2/9	2/16	2/23	3/2	3/9	3/16	3/23	3/30	Notes	60-DAY SEPERATION
5th/Woodland	2/23/2006	Vince Thomas	5/8/2006	3/9/2007																				
Briggs Road	7/11/2007	John Hammond Roman Lojas	8/22/2006 4/17/2006	6/25/2007 2/16/2007																				
Oaklawn-Piedmont	12/22/2006	Merlin Pond Scott Buckley	5/8/2006 4/10/2006	3/9/2007 2/9/2007																				May be let go sooner for early return
Cleveland - Morse	3/9/2007	Jason Webster Scott Compton	5/22/2006 4/10/2006	3/23/2006 2/9/2007																				May be let go at project completion/early return May be let go at project completion
Jasonway	9/24/2007																							May be let go for early return
Southgate-Landers	12/31/2006	Todd Hills	5/1/2006	3/2/2007																				May be let go at completion
Refugee Road Pump Station	10/11/2007																							
Marsdale Ave	2/3/2007	Vince Thomas	5/8/2006	3/9/2007																				May be let go at completion/early return
Hague Ave	5/12/2007	Rick Radcliff	4/24/2006	2/23/2007																				Will need someone to finish this project
Maize - Morse Phase 1	10/15/2007	John Hammond	8/22/2006	6/25/2007																				
Leland Ditch	4/15/2007																							
Wilson Road	10/15/2007																							
Strimple-Kilbourne- Minerva Sanitary	3/9/2007																							
Sullivant - Demorest	5/1/2007	Emmitt Johnson Mike Farms	4/10/2006 5/8/2006	2/9/2007 3/9/2007																				Will be let go 12/15 - will not be returning
Hamilton - Broad Water line		Ibrahim Ahmed	5/1/2006	3/2/2007																				May be let go at completion
Scioto-Darby Creek 24" Water Main	4/2/2006	Brian Tussing	4/17/2006	2/16/2007																				
Fisher Road Booster Station (Water)	1/15/2008																							
24" Watermain Easement E/W of I-270	10/15/2007																							
HR 317 Part 2	1/31/2007	Charlie Fox	7/31/2006	6/1/2007																				
North Linden Alley Lighting	10/1/2006																							
Greenhill Acres	1/15/2008																							

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Legend
 FTLs needed
 Project duration
 Current FTL duration

Department Overview of Path Forward

Projects Manpower Tracking Public Utility Projects

Project Name	Projected Completion Date	Inspector	Inspector Start Date	10-Month End Date	12/1	12/8	12/15	12/22	12/29	1/5	1/12	1/19	1/26	2/2	2/9	2/16	2/23	3/2	3/9	3/16	3/23	3/30	Notes	30-DAY SEPERATION
5th/Woodland	2/23/2006	Vince Thomas	5/8/2006	3/9/2007																				
Briggs Road	7/11/2007	John Hammond	8/22/2006	6/25/2007																				
		Roman Lojas	4/17/2006	2/16/2007																				
Oaklawn-Piedmont	12/22/2006	Merlin Pond	5/8/2006	3/9/2007																				
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Fisher Road Booster Station (Water)	1/15/2008																							
24" Watermain Easement E/W I-270	10/15/2007																							
HR 317 Part 2	1/31/2007	Charlie Fox	7/31/2006	6/1/2007																				
North Linden Alley Lighting	10/1/2006																							
Greenhill Acres	1/15/2008																							

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Legend

- FTLs needed
- Project duration
- Current FTL duration

Projects Needs Forecast

Inspection Services Section (ISS) Project/Manpower Forecast as of 1/8/2007

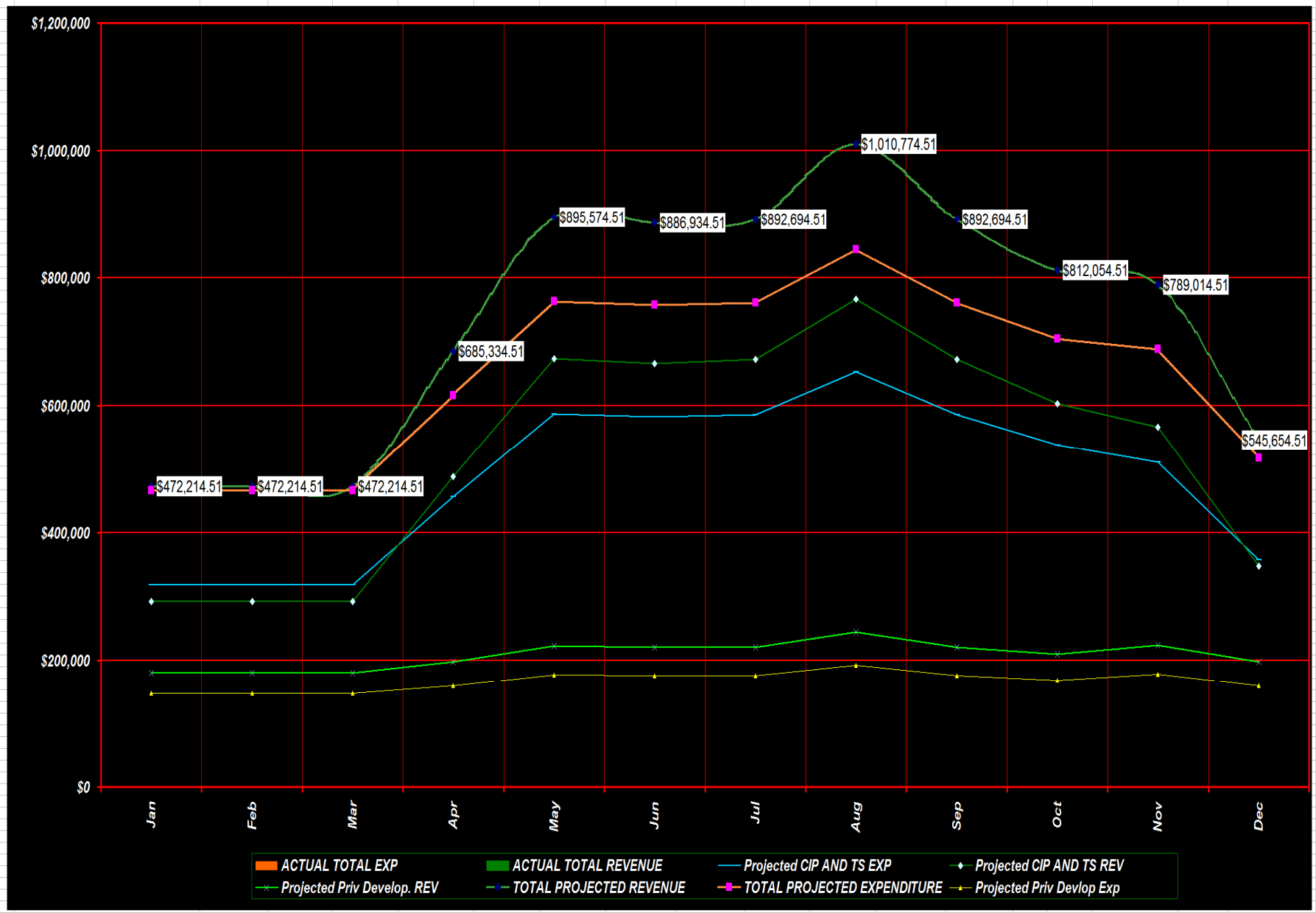
TRANSPORTATION DIVISION		2006		2007											
PROJECT	Estimated Amount For Duration	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
TRANSPORTATION CIP															
2005 Brick Rehabilitation (Carry Over)	\$288,841.00				0.5										
2006 Resurfacing Project 1	\$4,022,656.00				0.5	0.5	0.5								
2006 Resurfacing Project 2	\$700,000.00						0.5								
2006 Slurry Seal (complete)	\$400,000.00														
2007 Crack Seal	\$750,000.00								1.0	1.0	1.0				
2007 Resurfacing Phase 1	\$4,000,000.00						4.0	4.0	6.0	6.0	6.0	4.0			
2007 Resurfacing Phase 2	\$2,000,000.00								4.0	4.0	4.0	4.0	4.0		
2007 RPMs	\$150,000.00					1.0	1.0	1.0							
Atwood Terrace Sidewalks	\$1,050,000.00				1.0	1.0	1.0	1.0	1.0	1.0					
Chambers Sidewalks	\$500,000.00								1.0	1.0					

DOSD-STORM		Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Briar Meadow Drive Culvert	\$259,427.40															
Briggs Rd. SSI	\$4,670,371.14	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0							
CIP-850 Phase 1 (Morse/Maize)	\$2,400,000.00		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
Cleveland Ave. Storm Improvement CIP-945 (2007)	\$1,530,000.00	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0				

DIVISION OF POWER AND WATER		Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
DIVISION OF WATER																
Scioto Darby Creek Rd 30" water main	\$600,000.00			2.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5			0.5		
Dublin Road 36" Water Main (2007)	\$5,300,000.00								2.0	2.0	2.0	2.0	2.0	2.0		
Fisher Rd Booster Station Discharge Line	\$2,250,000.00			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0			2.0		
Hamilton/Broad Area Water Line Improvements	\$750,000.00					0.5	0.5	0.5								
S.R. 317 - London Groveport 24" Trans. Main Phase 2	\$813,941.60	1.0				0.5	0.5									
Scioto Darby Creek Rd 24" water main	\$2,050,000.00	1.0	2.0								3.0	3.0	3.0	3.0		

Summary of Forecasts:	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
CIP Transportation	13.0	7.5	5.0	9.0	19.0	32.5	29.5	45.0	40.0	39.0	28.5	20.0	11.0
CIP Sum of DOSD-STORM, DOSD-SAN., DOE, DOW	16.0	20.0	22.0	19.5	19.5	21.5	23.0	27.5	29.0	30.0	26.5	23.5	18.0
3P Projects	2.0	2.5	4.5	6.0	15.0	16.0	13.0	10.0	10.0	11.0	12.0	7.0	3.0
Private Development Inspection Forecast	21.0	13.0	12.0	13.0	19.0	22.0	23.0	24.0	24.0	24.0	24.0	23.0	23.0
Testing Personnel Forecast	7.0	6.0	6.0	6.0	7.0	7.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0
Survey Personnel Forecast	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
ISS Total Estimated Personnel Needed By Month	61.0	51.0	51.5	55.5	81.5	101.0	98.5	116.5	113.0	114.0	100.0	82.5	64.0

Projects Cash flow Projection



Limited Contractor Survey (Lower Project Cost?)

QUESTION 1

If the City could make payments to the contractor in fourteen (14) after submittal of the estimate, do you believe that the City would recognize a lower cost during the bidding process?

Contractor Responses:

- (A) “Yes, Definitely”
- (B) “No question about it, Yes!!”
- (C) “Yes, and the more I think about it, Yes”
- (D) “Yes, because of cash flow”
- (E) “Absolutely”

Question 2

If you believe we would receive lower bid prices or a project cost savings, what would be your best guess as to the percent of savings?

Contractor Responses:

- (A) About 1%
- (B) ½ to 1%
- (C) Minimum of 1 to 2%
- (D) Maybe 5%
- (E) About 1.5%

Question 3

Based on a fourteen day turn-around, what other benefits do you believe the City may witness?

Contractor Responses:

- (A) Bring more bidders to the table.
- (B) Project will run much smoother, subs will work better together.
- (C) Lowers prices from the subs and material suppliers.
- (D) Smaller contractors could afford to carry their subs.
- (E) Probably more interest in your projects

GOALS (Business Case)

- Become more efficient
- Attract More Competition
- Eliminate Untimely Delays
- Eliminate Financial Constraints
- Promote Good Will
- Lower Project Cost

OBJECTIVES

- **To examine and document the current contractor payment process**
- **To analyze the current processes and recommend an effective solution.**
- **To standardize the new processes and establish guidelines for implementation.**
- **To complete the above by Date Certain**



CONTINUOUS IMPROVEMENT

what?

7 Step
Improvement
Process

PROCESS ORIENTED THINKING
VS
RESULTS ORIENTED THINKING



Put it all together and it makes a complete cycle!

KAIZEN

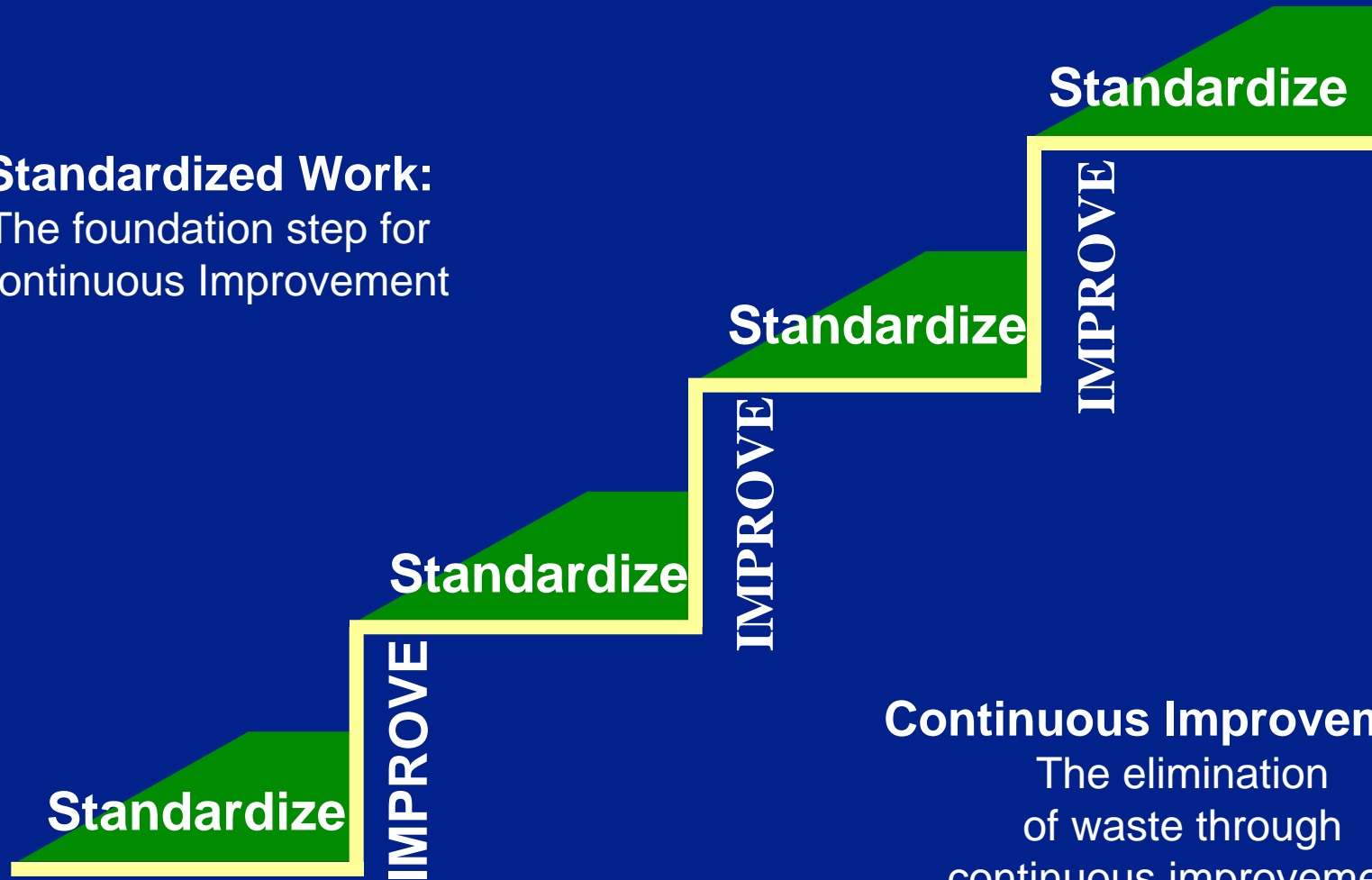


How Does It Work?

How?

Continuous Improvement Stair Steps

Standardized Work:
The foundation step for
Continuous Improvement



Continuous Improvement:
The elimination
of waste through
continuous improvement
In small steps



How Does It Work?

Find The Waste!

A fundamental component of Continuous Improvement involves identifying and eliminating waste.

85% of the waste is in the system.



Types of Waste

- Processing
- Inventory
- Motion
- Conveyance
- Correction
- Over Production
- Waiting

THE CONTRACTOR PAYMENT PROCESS

PROJECT DECOMPOSITION/ TEAMS

Inspection Services Process ESTIMATES GENERATION

David Beck Task Leader
Ben Giffin
Paul Chilton
Dick Cummins
Mark Richard
Doug Daily

Fiscal/Financial Process ESTIMATE PROCESSING

Elaine Brunney Task Leader
Linda Righter
Sharon Wilkinson
Cheryl Hill
Christy Burns
Dr. Shafi- Facilitator/Coach

Customer Summary Worksheet Standardized Work

Operation: Generating Monthly progress payment estimate for construction contract

Date 6/23/2004 **Staff:** TD-Construction Inspection **Manager:** Subsection Head **Location:** 17th. Av.

Customer Requirements

Customer Operation: **Internal:** contractor/superintendent/inspector/supervisor/payment coordinator

External: Division/PS Department/ other Departments

Contact Customers in Operation: Payment coordinator/Supervisor/Subsection Head

Method(s) to Contact Customer: Two-way radio/Cell Phone/e-mail/Hand deliver






Requirements: To make accurate and timely estimates for monthly progress payment to contractor.

Consequenses: Delays may result in:

- 1) Cash flow problems to contractor
- 2) Backlog of critical elements in the process
- 3) Delay in project completion
- 4) Delay claims by contractor
- 5) complaints by every one including the Public

Department Overview of Path Forward

Operation Analysis Worksheet Standardized Work

Operation:		GENERATING MONTHLY PROGRESS PAYMENT ESTIMATE FOR CONSTRUCTION CONTRACT					
Date	6/23/2004	Staff:	FTR/FTL	Supervisor:	EA II	Location:	LANE AVENUE SITE OFFICE
Seq	Major Step	Key Point/Special Instruction			Diagram / Picture /Drawing /Sketch /Blue print Insert		
1	INSPECT THE CONSTRUCTED UNIT	1.1 Visual observation and remarks					
		1.2 Measure the field quantity					
		1.3 Check for QC/QA measures					
2	RECORD MEASUREMENTS	2.1 Fill in the Daily Diary(DD)					
		2.2 Make calculation and verify measurements					
		2.3 Record data in Field Book					
3	RECONCILE DATA WITH CONTRACTOR	3.1 Fill in the quantity agreement sheet(QAS)					
		3.2 sign the QAS as well as the contractor superintendent					
		3.3 Submit DD and QAS to Supervisor					
4	GENERATE ELECTRONIC RECORD USING THE EXCELL SOFTWARE ALREADY PROGRAMMED	4.1 Supervisor review math and diagrams and enter data electronically					
		4.2 Supervisor generates Draft estimate and submit it to payment coordinator					
5	REVIEW AND GENERATE ESTIMATE	5.1 Payment Coordinator review calculations and estimate					
		5.2 Payment Coordinator attach Voucher and Certified Payroll, and contractor affidavit					
		5.3 Payment Coordinator sign, obtain Project Engineer signature and process estimate					
6	PROCESS ESTIMATE	6.1 Payment Coordinator send estimate to Section Head and City Engineer for processing					
		6.2 Payment coordinator make necessary copies					
Revisi Date	Supervisor	Operation Sequence Symbols					
	Manger	Spec	WIP	Safety	Quality	Enviro	
							

Cycle Time Worksheet Standardized Work

Date : 6/24/2004 Operation: Progress Payment

Supervisor: A. Bennett

Staff: FTR/FTL

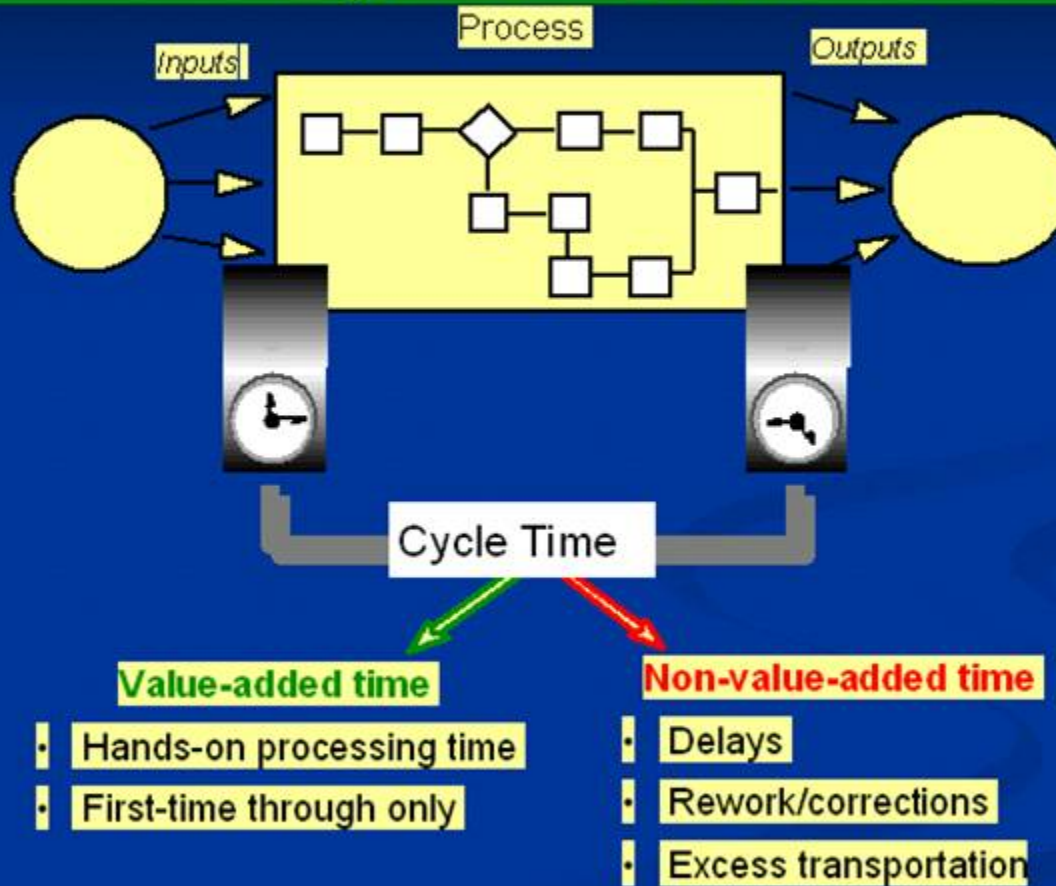
Location: Lane Avenue sit office

Manager: Dr. Shafi

Step	Operation	Value-Added			Non-Value Added			Machine	Time Measure Sec,Min.Hrs,Days (Specify)- HRS
		Quality	Safety	Hand	Walk	Wait	Hand	Auto	
	GENERATING MONTHLY PROGRESS PAYMENT ESTIMATE FOR CONSTRUCTION CONTRACTS								0.00
1.1	Visual Examination of constructed unit			4.00					4.00
									0.00
1.2	Make field measurements			4.00					4.00
									0.00
1.3	Check for QC/QA data/reports	2.00							2.00
									0.00
2.1	Fill in Daily Diary (DD)			2.00					2.00
									0.00
2.2	Make calculations and verify			2.00					2.00
									0.00
2.3	Record data in field book			1.00					1.00
									0.00
3.1	Fill in Quantity reconciliation form			1.00			1.00		2.00
									0.00
3.2	Sign it with the contractor superintendent					1.00			1.00
									0.00
3.3	Submit work to supervisor			2.00					2.00
									0.00
4.1	Supervisor review work and enter data in computer			2.00					2.00
									0.00
4.2	Supervisor generates Draft estimate and submit it			1.00	0.20	2.00			3.20
									0.00
5.1	Pay coordinator (PC)review DD and enter data in computer	2.00		4.00					6.00
									0.00
5.2	PC prepare estimate and request all attachments			1.00		48.00		0.50	
									0.00
5.3	PC process estimate in house			1.00					1.00
									0.00
5.4	PC make copies			0.50				0.50	1.00
									0.00
6.1	PC send estimate to other processing centers			0.10					0.10
								Sub Total Time	33.3
								Total Time	

Page 1

Cycle Time



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TEMPLATE

SOLUTION/ ACTIVE TASKS

C. I. is the Key to the Solution:

- **Elimination of waste through
CYCLE TIME REDUCTION.**
- **Productivity improvement
Electronic Information
Management System**

Electronic Information Management System (EIMS)

SOFTWARE / HARDWARE SYSTEM

EIMS

Field Inspectors



Use Laptops or Tablet PC's in the field to track completed quantities and test results — then wirelessly download that information once back at the agency.

An IPM Network allows access to all agency associates no matter what phase of the project they are working on. Information flows back and forth as your inspectors enter job completion quantities and pay estimates are generated for your contractor.

Budgeting



Information from your historic pricing and previous job records allows you to calculate accurate budgeting for your future projects.

Construction



Generate payment estimates based on completed work quantities entered by your Inspectors. Work with change orders, retention amounts, materials on hand, and any other changes that affect the project.

IPM Network



Design/Estimating



Use pricing filters to select from your custom Standard Items table and local Vendors to arrive at an estimate that accurately reflects the current project and its unique needs.

Bid Opening



Enter bid result totals using the Quick Entry window — or use our Bid Connect® software to do it for you! The Budgeter also allows you to save all bidder prices back to the historic Standard Item table.

Advertisement



Generate a report which includes all needed project information and is immediately ready to be sent for publication.

Funding



Enter one or more funding sources and jurisdictions for each budget item. Track each fund's use and remaining balance.

ELECTRONIC INFORMATION MANAGEMENT SYSTEM

EIMS

DAILY DIARY ON: PDA OR PC

PROJ MGR

PHONE

PIN

PROJECT NAME

CONST SUPR

PHONE

REF #	CO	ITEM #	DESCRIPTION	CONTRACT QUANTITY	UNIT MSR	UNIT PRICE

CIP LINE ITEM DATA

SAVE

VIEW ALL CHANGE ORDER ITEMS

MISC CONTRCTR LTRS

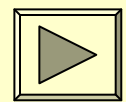
FORCE ACCOUNT ITEM INPUT

REF #	FA	ITEM #	DESCRIPTION	QTY	UNIT MSR	UNIT PRC	DT LTR	REV LTR	REASON	STAT US	DT
											VW
											VW
											VW
											VW

SAVE

VIEW ALL FA ITEMS

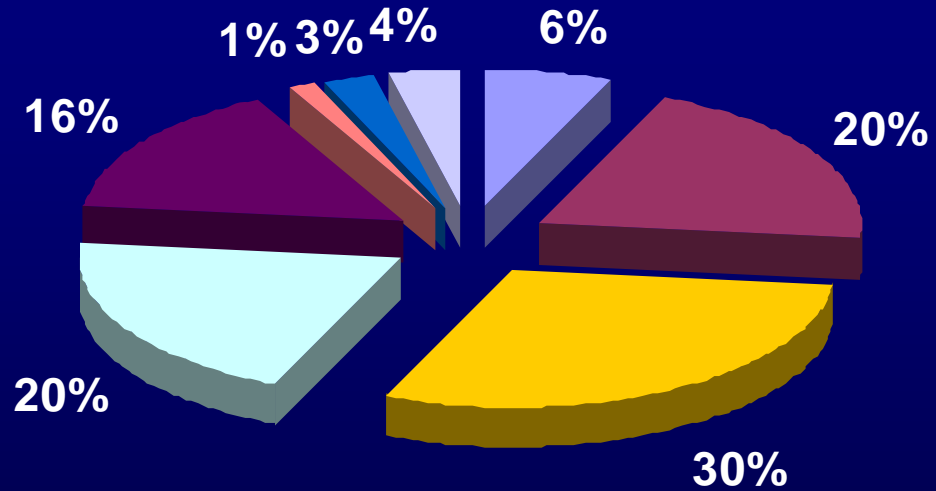
FA STATUS REPORT



ADVANTAGES:

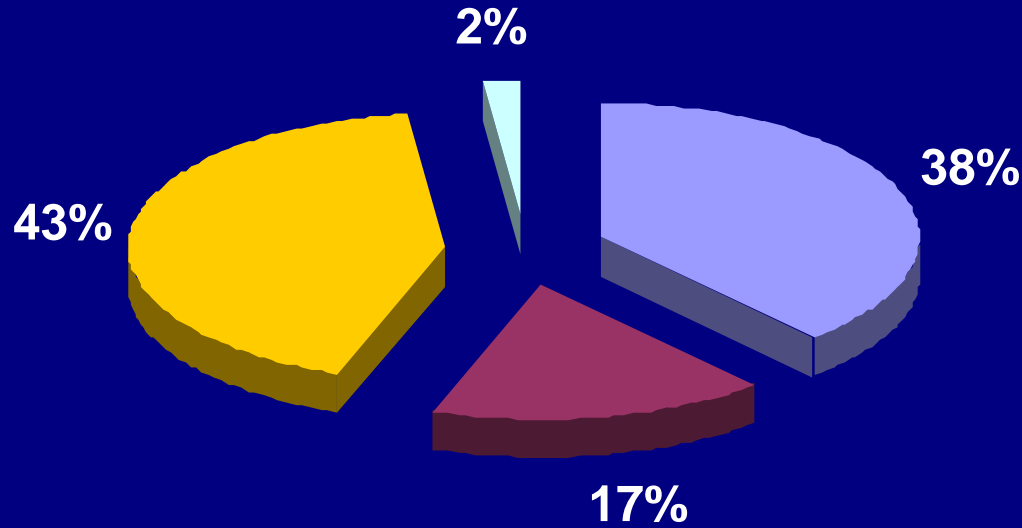
1. Reduce processing time by up to 60%.
2. Enables quicker close out of projects.
3. Frees up CIP funds faster.
4. Reduces holding of contractor's bond.
5. Accelerates review of Force Account.
6. Promotes more inspection time.
7. Enables faster contractor payments.
8. Sustain accurate billing records of State/Federal Loans.
9. Enables electronic Bidding on line.
10. Reduces math errors and incorrect bidding items.
11. Enables faster and accurate project cost estimating.
12. Enables faster and timely Project tracking.
13. Enables Project cost reconciliation of over/under runs.
14. Enables data transmission/communication via e-mails.
15. Enable faster and accurate tracking of funding sources.

Total= \$99,985.00



- Base Software
- 10 Fixed License
- 6 Concurrent License
- 25 Inspectors License
- Annual Fees
- Instalation
- Data Conversion
- Training

ANNUAL MAINTENANCE FEE
Total= \$34,385.00



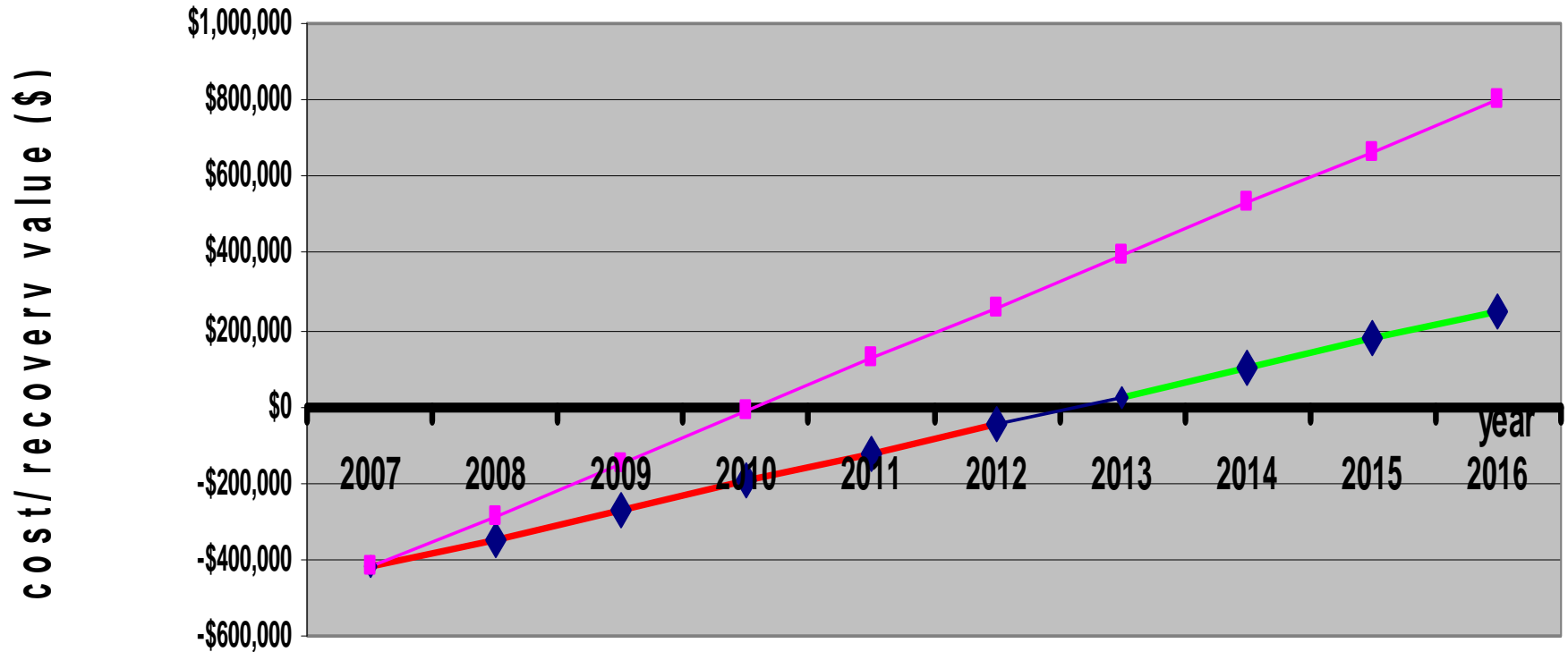
■ 30 Fixed License

■ 6 Concurrent License

■ 75 Inspector License

■ 1 Network License

COST RECOVERY



	Jan-07	Jan-08	Jan-09	Jan-10	Jan-11	Jan-12	Jan-13	Jan-14	Jan-15	Jan-16
Billing RECOVERY	-\$421,080	-\$346,560	-\$272,040	-\$197,520	-\$123,000	-\$48,480	\$26,040	\$100,560	\$175,080	\$249,600
Billing & Productivity RECOVERY	-\$421,080	-\$285,153	-\$149,226	-\$13,299	\$122,628	\$258,555	\$394,482	\$530,409	\$666,336	\$802,263

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By applying a 2% (an average of the estimated cost savings) savings factor to the CIP contracts projected in 2007, the City theoretically could have saved 1.6 million dollars.

QUESTIONS?

