

Reducing Frequently Occurring Quality and Downtime Problems

Using TapRoot® Proactively to Get Great Results

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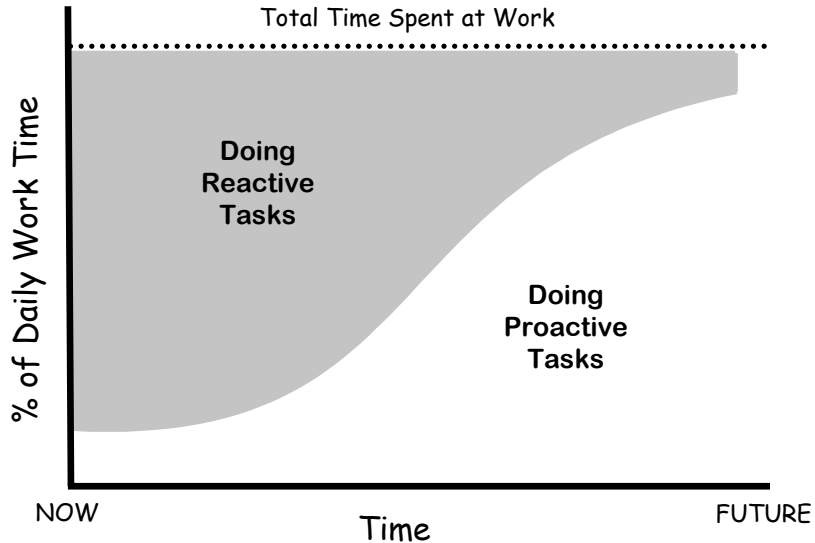


Key Improvement Questions

- **Where do you spend your time and money each day?**
- **Where do you waste time and money each day?**
- **Who should do trend analysis?**
- **When should trend analysis occur?**
- **What are the key numbers you need to track each day?**
- **Who needs to learn which process improvement skills?**
- **What DAILY actions do you need to take to improve performance in these areas?**
- **What will you start doing differently NEXT WEEK?**

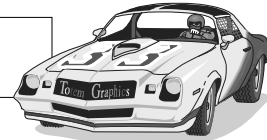


Shifting Mindsets



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Why Can't We Go Faster?



Faulty work systems are similar to restrictor plates on NASCAR vehicles

We ask our people to drive faster, but we leave the restrictor plates on at the same time.

If we want to go faster (higher levels of performance), we have to take the plates off.



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Five Key Concepts

- All work is a process
- All processes produce results
- Systems shape culture
- Systems give you what they are designed to give you
- People make the difference



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The Key to Proactive Improvement

The goal of proactive improvement is to find and analyze high leverage causal factors!

How do you find causal factors?

Trend and audit key processes on a daily basis!!



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How to Reduce Frequently Occurring Problems

- Capture key waste incidents **DAILY** in a database
- Capture daily process data in a performance spreadsheet
- Use Pareto charting to find high leverage improvement areas
- Investigate the causal factors for each high waste area
- Use the TapRoot® tree to analyze each causal factor
- Develop corrective actions for identified root causes
- Use trending and auditing to verify that your corrective actions worked
- Continue capturing waste incidents and trending key indicators **DAILY** for each key process



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Key to Problem Prevention

Every process owner should be responsible for tracking and trending process performance and process waste on a regular basis, and for using that information to improve those processes.



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Finding Problems and Causal Factors

Using Audits

- Audits can be formal or informal
- Audits involve observing, asking, and reviewing
- All process owners should regularly audit their processes
- Audit findings can easily be written as a causal factor
- Audit findings can be captured and sorted in a database

Using Trending

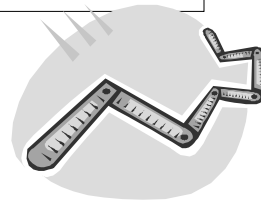
- Begin by defining a balanced set of measures for each process
- Capture key data and waste incidents in a daily dashboard report
- Use a database to sort your waste incidents
- Use Pareto charts to identify high leverage opportunities
- Use process behavior curves to gauge your progress



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Why Should You Measure?

- To catch people doing something wrong
- To hold people accountable
- To provide a focus
- To improve systems



Assumptions that Emerge

- We can't be trusted
- We won't hold ourselves accountable
- We don't need data to improve our systems
- We don't have time to improve our systems

When people are pressured ...

- They can work to improve the system
- They can distort the system
- They can distort the data



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Why is Trending Necessary?

- Trend lines are needed to observe system behaviors over time
- Multiple trend lines allow you to do 'gap analysis'
- Trend lines show you the rate of change a system is experiencing
- Process variation cannot be understood without trend lines
- Trend lines are need to build sound theories about performance
- "No theories, no learning"
- Trend analysis helps you increase your investment success rate

Why is a picture worth a thousand words?



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Imagine This Challenge ...

You have to control
the temperature of
someone else's
shower ...



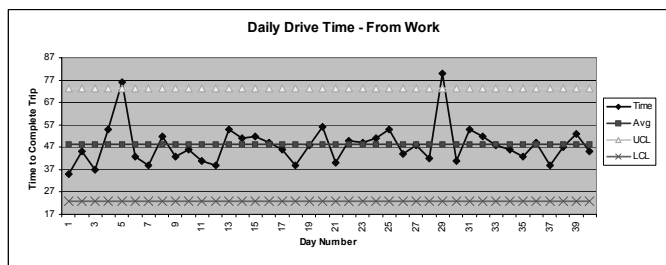
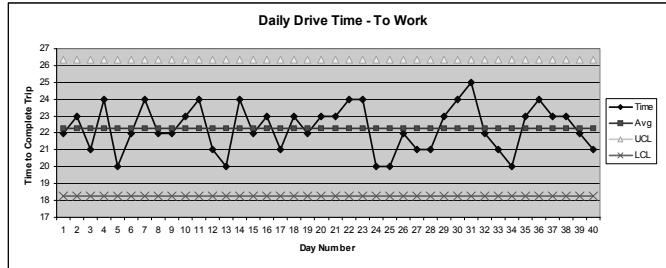
But you can't talk
to them, hear
them, or feel the
water!

Why do you need to measure?



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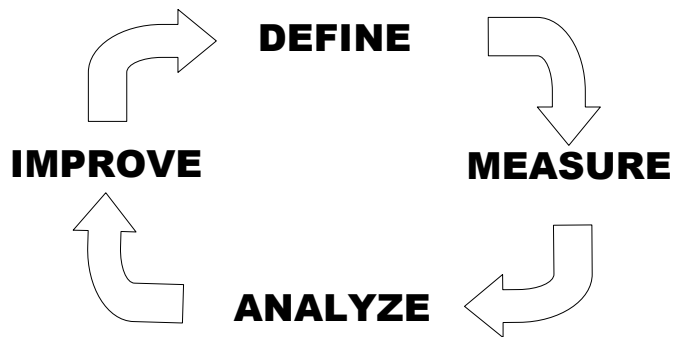
How Fast Can You Drive?



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Basic Problem Prevention Model

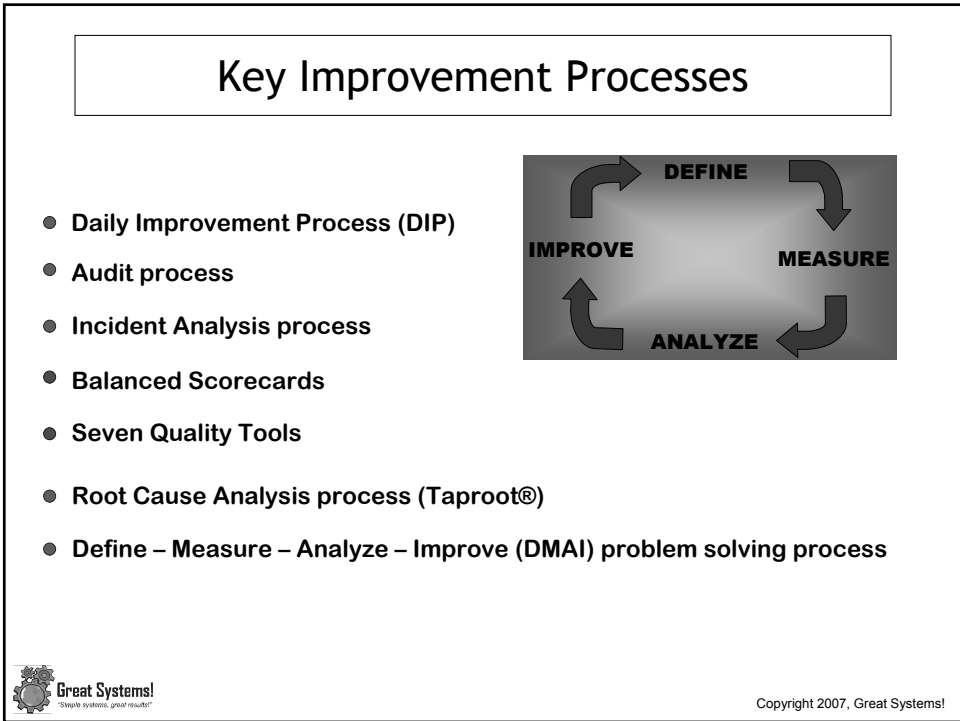
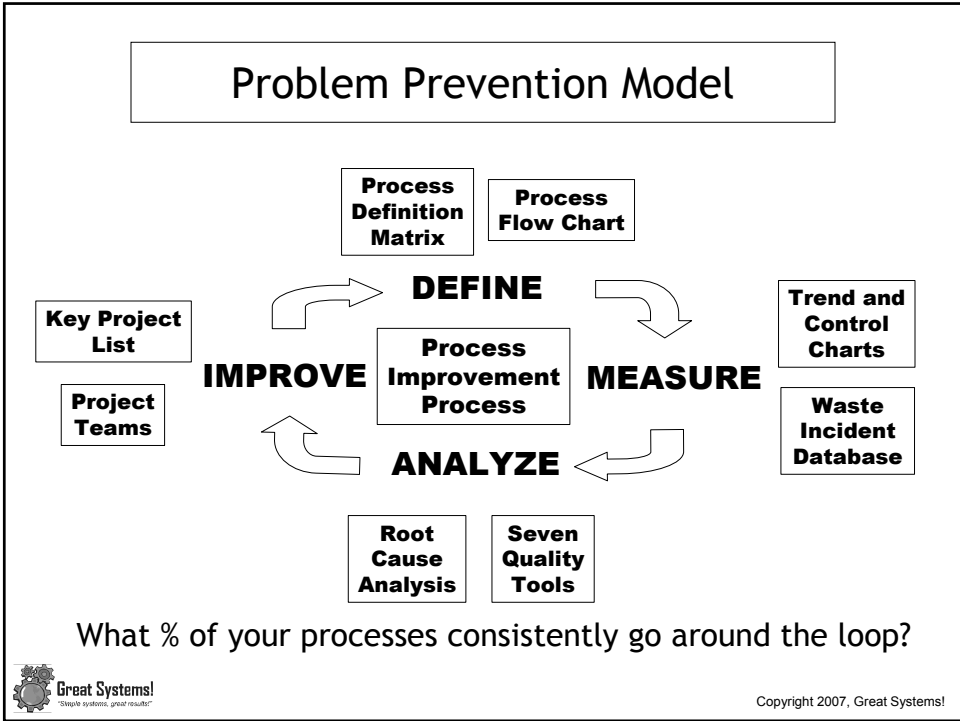
For ANY Process ...



What are your key processes?



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Key Analysis and Improvement Tools

- Line / control charts (behavior curves)
- Pareto charts
- SnapCharT® (TapRoot®)
- Root Cause Analysis software (TapRoot®)
- Corrective Action matrix
- Waste incident database
- Performance Summary spreadsheet
- Performance Dashboard
- Balanced Scorecard



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Types of Waste Incidents

- Accidents
- Downtime
- Material waste
- Absenteeism / turnover
- Rework
- Complaints / returns
- Equipment damage

Questions About Waste

- What does waste cost you each day?
- What are your primary waste streams?
- What are your front line waste streams?
- What are your management waste streams?
- How much profit is waste costing you?
- How does waste impact your customers?
- Do your employees notice the waste?



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Exploring Incidents and Causal Factors

Possible Incidents

Possible Causal Factors

Line goes down	<ul style="list-style-type: none"> ○ Box jams in case sealer ○ Label roll breaks ○ Bottle breaks in encapsulator
Product placed on hold	<ul style="list-style-type: none"> ○ Operator mislabels product cases ○ Bottle does not have proper product code ○ Bottle labels are wrinkled
Customer complaint	<ul style="list-style-type: none"> ○ Sticky syrup bottles ○ Product received does not match order ○ Foreign material in product



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Using Audits to Find Causal Factors

Top Audit Findings

Possible Causal Factors

Personal Safety	<ul style="list-style-type: none"> ○ Operator not using safe lifting techniques ○ Operator not wearing gloves ○ Pallets sticking out in aisle way
Quality	<ul style="list-style-type: none"> ○ Cases are not stacked correctly ○ Incorrect date stamp on bottle labels ○ Flavors are not organized in storage area
Food Safety	<ul style="list-style-type: none"> ○ Work area containers are not labeled ○ Packers are ○ Foreign material in product



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Process Definition Matrix

Value Creation Process Area	Key Customer Requirements	Key Processes and Tools	Key Process Measure(s)
New Product Development	Improve product features Develop new products Reduce production costs	Development process Customer listening posts Performance review process	Development cycle time Development cycle cost New product success %
Sales and Marketing	Retain current customers Attract new customers Maintain account accuracy	Account development process Customer targeting process Account updating	Customer retention % Revenue growth % Customer satisfaction index
Customer Service	Prompt response to calls Accurate information Timely information	Order entry process Information retrieval process Complaint resolution process	Call abandonment rate External survey score % calls answered in 10 sec.
Purchasing and Receiving	On time material delivery Cost effective raw materials Performance to specs	Receiving process Material ordering process Supplier management	Material cost per pound Avg. \$ in inventory On time delivery %
Production	On time schedule completion Quality product Minimal waste	Preparation Assembly Packaging	Process cost per pound Rework / waste % % production to schedule
Shipping	On time shipments Accurate shipments Prompt order fulfillment	Order assembly Shipment scheduling Order labeling	On time % Order cycle time Shipping accuracy score



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Example Balanced Scorecard

Team	Key Performance Areas and Measures			
	SAFETY	PEOPLE	QUALITY	COST
Plant	# of LT Accidents OSHA Incident Rate	Absenteeism % Turnover % Survey Score	Waste % Rework % Back Order Rate	Cost per Pound Cost per Manhour
Production	# of LT Accidents OSHA Incident Rate	Absenteeism % Turnover %	Waste % Rework % Monthly Inspection Score	Cost per Pound Cost per Manhour Efficiency %
Maintenance	# of LT Accidents OSHA Incident Rate	Absenteeism % Turnover %	Repeat Repairs rate Monthly Inspection Score Internal Customer Sat	Cost per Pound Cost per Manhour Downtime %
Warehouse	# of LT Accidents OSHA Incident Rate	Absenteeism % Turnover %	Back Order Rate Monthly Inspection Score Order Accuracy %	Cost per Pound Cost per Manhour Orders per Manhour
Sanitation	# of LT Accidents OSHA Incident Rate	Absenteeism % Turnover %	Pre-Op Score - average Monthly Inspection Score Internal Customer Sat	Cost per Pound Cost per Manhour
Quality Assurance	# of LT Accidents OSHA Incident Rate	Absenteeism % Turnover %	Internal Customer Sat Complaint Rate	Cost per Pound Cost per Manhour



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Performance Summary Spreadsheet

January 2006 Performance Summary for Injection Molding Department

Avg. Labor Cost per Hour = \$12.50 Avg. Production per Day = 441 Std. Pounds per Hr. = 450 Mat'l \$ / # = \$0.140

Date	BASE DATA										PERFORMANCE RATIOS and LEVELS					
	Total Man-Hrs	Total Pounds	Total Scrap #	Total Rework #	Downtime Minutes	Labor Cost	OSHA Accidents	% Output Gain	Labor \$ per M #	Mat'l \$ Spent	Downtime %	Total \$ per Pound	Dept. Effy. %	Scrap %	Rework %	
4-Jan	65	28,600	50	1,500	5	\$813	0	-0.2%	\$28.41	\$4,221	1.0%	\$0.176	98%	0.17%	5.0%	
5-Jan	71	31,000	150	3,000	10	888	0	-1.0%	28.63	4,781	2.1%	0.183	97%	0.44%	8.8%	
6-Jan	58	25,140	200	4,500	15	725	0	-1.7%	28.84	4,178	3.1%	0.195	96%	0.67%	15.1%	
7-Jan	62	27,500	50	900	0	775	1	0.6%	28.18	3,927	0.0%	0.171	99%	0.18%	1.8%	
8-Jan	63	27,200	250	750	10	788	0	-2.1%	28.95	3,948	2.1%	0.174	98%	0.80%	2.7%	
11-Jan	71	31,240	125	2,700	20	888	0	-0.2%	28.41	4,769	4.2%	0.181	98%	0.37%	7.9%	
12-Jan	59	25,960	175	1,400	10	738	0	-0.2%	28.41	3,855	2.1%	0.177	98%	0.64%	5.1%	
13-Jan	60	25,400	300	7,500	25	750	0	-4.0%	29.53	4,648	5.2%	0.213	94%	0.90%	22.6%	
14-Jan	66	29,510	75	600	5	825	1	1.4%	27.96	4,226	1.0%	0.171	99%	0.25%	2.0%	
15-Jan	65	28,420	225	1,400	15	813	0	-0.9%	28.59	4,206	3.1%	0.177	97%	0.75%	4.7%	
18-Jan	63	27,600	300	1,000	15	788	0	-0.7%	28.53	4,046	3.1%	0.175	97%	1.04%	3.5%	
19-Jan	70	30,950	175	5,800	20	975	0	0.3%	28.27	5,142	4.2%	0.184	98%	0.48%	15.2%	
20-Jan	59	24,800	450	8,500	35	738	0	-4.7%	29.74	4,725	7.3%	0.220	93%	1.33%	25.2%	
21-Jan	62	26,830	250	4,300	5	775	2	-1.9%	28.88	4,393	1.0%	0.193	96%	0.80%	13.7%	
22-Jan	63	27,460	100	6,500	0	788	0	-1.2%	28.68	4,768	0.0%	0.202	97%	0.29%	19.1%	
25-Jan	67	29,700	25	1,250	0	838	0	0.5%	28.20	4,337	0.0%	0.174	99%	0.08%	4.0%	
26-Jan	61	26,750	325	2,400	20	763	0	-0.6%	28.50	4,127	4.2%	0.183	97%	1.10%	8.1%	
27-Jan	60	26,250	300	5,300	5	750	0	-0.8%	28.57	4,459	1.0%	0.198	97%	0.94%	16.6%	
28-Jan	68	30,100	110	3,200	15	850	0	0.4%	28.24	4,677	3.1%	0.184	98%	0.33%	9.6%	
29-Jan	70	31,500	25	500	0	875	0	2.0%	27.78	4,484	0.0%	0.170	100%	0.08%	1.6%	
Totals	1,283	561,910	3,680	62,400	230	\$16,038	4	-0.7%	\$28.54	\$87,916	2.4%	\$0.185	97%	0.58%	9.9%	
Avg.	64	28,096	183	3,120	12	813										
05 Avg.	65.5	27,904	193	3,200	13.5	825										
Jan '05	66.3	25,867	201	3,343	15.1	847	5	-11.5%	32.74	4,118	3.1%	0.192	87%	0.68%	11.4%	



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Example Daily Dashboard

Daily Syrup Production Summary

Date:	21-Jan-04	Prod:	750 P	Volume:		021 Productivity		
				7,252 bottles	959.8 cases	\$/case	\$/bottle	Hrs/Th
Shift	Days		750 G	38,068 bottles	3,299.8 cases	0.51	0.068	36.7
Supervisor	Kevin		50 ml	2,000 bottles	16.7 cases	0.50	0.043	36.3
			.5 G Sauce	5,400 jugs	900.0 cases	0.57	0.095	42.4
			Rework	2,160 bottles	180.0 cases	1.15	0.096	81.1

966 Borders / WM Six Packs

1 int'l batch - GER (1)

Lost Time: Case Coder -- 5 min used to adjust case coder print quality -- 021404
 Changeover -- 46 min used to change from 750 P to 750 G
 Batching -- 24 min lost due to high brix batch / no test before transfer

Safety: No injuries
 0 on light duty
 0 out on injury

Other Costs: \$118 - Make Borders six packs

Quality: Hold -- One batch of 750 GER Vanilla for high brix -- 021435
 Hold -- 367 cases of 750 SF Vanilla for suspect pH -- 021407-9
 Rework -- Inspected 180 cases of SBX 750 product
 120 cases of rework to be processed

People: 0 tardy
 0 absent
 70% perm. Hours
 8.8 hours of setup time



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Example Waste Incident Database

Date	Duration	Location	Waste Incident	Action Taken	Product
1-Oct	12	Filler	Filler overflowed	Adjust probes / clean up	750 G
1-Oct	14	Bottle Coder	Coder not printing consistently	Adjust coder setup	750 G
2-Oct	8	Filler	Filler overflowed	Adjust probes / clean up	750 G
2-Oct	5	Bottle Coder	Coder not printing consistently	Adjust coder setup	750 G
3-Oct	9	Filler	Filler overflowed	Adjust probes / clean up	750 G
3-Oct	8	Capper	Cap grippers need to be changed	Change gripper	750 G
3-Oct	7	Line	Broken bottle on accumulator	Clean up mess	750 G
4-Oct	17	Naturals	Wait time between naturals	Wait	750 G
4-Oct	19	Naturals	Wait time between naturals	Wait	750 G
4-Oct	28	Naturals	Wait time between naturals	Wait	750 G
4-Oct	40	Naturals	Low brix naturals batch	Recirculate / wait	750 G
4-Oct	11	Line	Broken bottle on accumulator	Clean up mess	750 G
8-Oct	15	Capper	Missing caps on bottles	Adjust capper - first two batches	750 G
8-Oct	15	Box Coder	Setup problems - int'l cases	Improve coder setup process	750 G
8-Oct	10	Box Coder	Resetup to run 20 more GDR cases	Resetup box coder	750 G
8-Oct	8	Line	Broken bottle on accumulator	Clean up mess	750 G
8-Oct	33	Labeler	XYZ back panel problems	Adjust 2nd labeler	750 G
9-Oct	10	Box coder	Setup problems - int'l cases	Improve coder setup process	750 G
9-Oct	10	Capper	Missing caps on bottles	Adjust capper #4	750 G
9-Oct	8	Capper	Missing caps on bottles	Adjust capper #6 - change gripper	750 G
9-Oct	14	Labeler	Flag problems w/ Alpha label	Adjust photoeye / label slower	750 G
10-Oct	16	Capper	Missing caps / bottle vibration	Adjust timing	187 G
10-Oct	28	Filler	Stuck limit switch	Fix limit switch	187 G
10-Oct	5	Filler	Bottle spills	Clean up line	187 G
11-Oct	20	Labeler	Wrinkles w/ Kava labels	Slow down line to correct	750 G
11-Oct	7	Box Coder	Switch from Kava to Taiwan	Improve coder setup process	750 G
11-Oct	21	Filler	Drive chain broke	Fix drive chain	750 G
11-Oct	10	Labeler	Wrinkled labels	Stop to peel labels and adjust	750 G
11-Oct	7	Labeler	Wrinkled labels	Stop to peel labels and adjust	750 G
11-Oct	7	Line	Broken bottle on accumulator	Clean up mess	750 G



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Using a Waste Incident Database

Set up the Excel spreadsheet

Set up a table where each row represents one waste event. Use the columns to capture facts about each event, including cost and cause

Capture waste events daily

Use a spreadsheet to capture up to 15-20 waste events a day – use separate databases to analyze more frequent problems

Sort by cause and cost

Use the Excel sort feature to identify the high cost waste events and the high frequency waste events

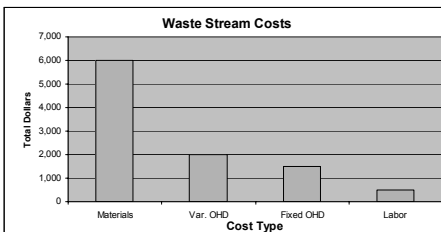
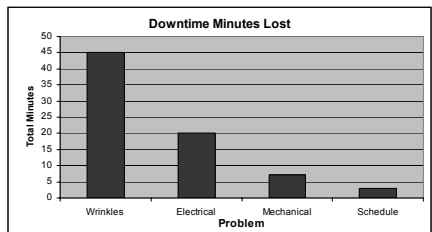
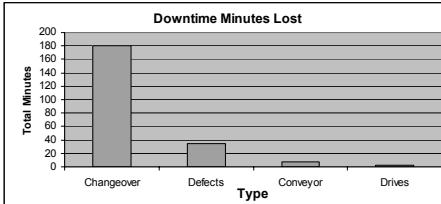
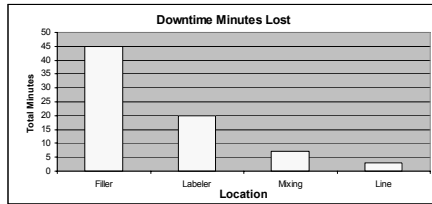
Create charts to help see the system

Do a Pareto and trend analysis, complete with charts, on at least a monthly basis



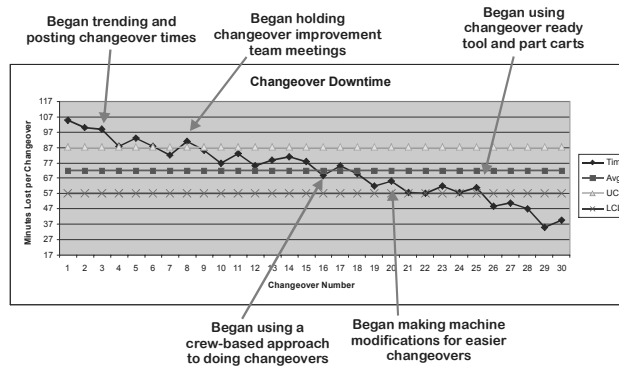
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Example Pareto Charts



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Example Annotated Trend Line



- Changes were identified and acted on after each changeover
- Limits were NOT recalculated as improvements were made
- Improvement occurred over a 20 week time frame
- Tools, procedures, training, and measuring systems were changed
- Supervisor was responsible for tracking improvement and actions



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What Happens When You Improve?



System Changes

- Cross-functional Safety Committee formed / redesigned agenda
- Monthly safety audits conducted
- Began using Taproot® process on all reportable incidents
- Improved safety recognition process for all work teams
- Changed supervisor safety improvement responsibilities



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High Performance Building Codes

- Key data should be captured daily
- All measures have trend lines (process behavior)
- Each process owner should keep a spreadsheet
- Balanced dashboards should exist for all processes
- Safety, quality, cost, and people 'gauges' should be on all dashboards
- Work teams should be involved in process analysis and improvement daily
- Waste streams should be known and tracked daily
- All organizations should have cross-functional project teams



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Ten Great Places to Start

- Install a process for measuring leadership effectiveness
- Add time percentages to all of your job descriptions
- Use a central database for all improvement ideas
- Create a key measures vs. performance area matrix
- Minimize the use of lecture in your training course designs
- Install some form of profit sharing for all employees
- Develop a technology utilization plan for your site
- Complete the two types of process definition matrices
- Complete a communication events matrix
- Define your scorecard for tracking satisfaction / dissatisfaction of internal and external customers



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