



Heavy Truck Utilization

Fleet Services
Brenda Stonehouse



Executive Summary

- ▶ Considered the 66 trucks used for plowing – looked at utilization, maintenance, age, make, type
- ▶ Compiled data and did statistical analysis which resulted in:
 - Contracting out 4 routes
 - Reduced fleet by 8 trucks
 - Saved \$224,222.98 in maintenance/contracts
 - Cost avoidance of \$1.8 million (8 trucks eliminated)
 - Productivity in maintenance & admin \$50,720
 - Eliminated internal transactions

Define Phase



- CVOB – Commercial Vehicle Operator Registration
- LOS – Level of Service
- MMS – Minimum Maintenance Standards
- PM – Public Works

DEFINITION OF TERMS

Definition of Terms

- ▶ PW – Public Works
- ▶ MMS – Minimum Maintenance Standards
- ▶ LOS – Level of Service
- ▶ CVOR – Commercial Vehicle Operator's Registration



Step #1 - Develop Business Case

▶ **Problem Statement**

There is significant variation in truck utilization and we are not sure we have reliable data. Understated utilization is causing an accounting problem.

▶ **Project Goals**

- Consistent utilization of trucks
- Utilization \geq **500** hours annually **95%** of the time
- Eliminate internal financial transactions for utilization

▶ **Scope**

In scope: Single, tandem and tri-axle trucks

Out of scope: All other vehicles

Step #1 - Financial Implications

	Projected savings
Reduced maintenance costs	\$138,370.98
Estimated sale value of surplus trucks	\$28,000.00
Winter control contracts savings	\$37,852.00
Improved Productivity – Maintenance	\$32,000.00
Cost avoidance (8 trucks)	\$1,800,000.00
	\$2,036,222.90

Step #2- Voice of the Customer

S	I		P	O		C	
Suppliers	Inputs	Critical to Quality	Process	Outputs	Critical to Quality	Customers	Undesirable Effects
Fleet	Use requirements - where is it going?	Specifications Council approval	Determine the Need for a Truck	The Right Truck	Needs to meet the specs	PW - Roads	Not getting the right vehicle for the right purpose
Purchasing & Fleet	Fleet policy Purchasing policy	Adherence to policy	Buy the Truck and Prepare for delivery	The Right Truck	Need it at the right time	PW - Roads	Trucks not on time - have to keep old trucks on the road longer
PW - Roads	Minimum Maintenance Standards (MMS)	Compliance with standards	Use the Truck	Work being done	Level of Service (LOS)	Ratepayers Citizens	Customer complaints
Payroll/Finance	Vehicle hours from time cards	Accurate records	Billing for use of the truck	Monthly Report	Accuracy of data (number of hours used)	Fleet	Usage can be low due to cost to operate
Fleet	Preventative maintenance statement CVOR	Circle Checks Clean Trucks Accurate records for usage details of breakdown	Fuel and Maintain the Truck (daily, scheduled, unscheduled)	Skilled Technicians Parts on hand	Timely - Maintenance schedule (2x/year)	PW - Roads	Trucks out of service waiting for repair
Fleet	Supervisors & Managers - is it reliable? Regular replacement cycle	Usage data maintenance costs age of vehicle	Assessment of Asset	Fleet determines what happens with the asset	Having correct data to analyze - maintenance history	Fleet	Keeping a vehicle too long or not long enough
Fleet	disposal decision	We know what to take off to De- CKL vehicle	Decomission	send to auction delivery	Vehicle Info - lifecycle of truck	Auction company	Selling assets before their time

Step #2- Voice of the Customer

CTQ	METRIC	DEFINITION	STANDARD OR SPECIFICATION
CVOR	Overall Safety Rating	The CVOR (Commercial Vehicle Operator Rating) is provided to the City semi-annually. The review considers collisions, convictions, safety inspections under taken by MTO and ministry interventions with respect to the City Fleet with CVOR status (120 trucks and 10 buses).	Overall Safety Rating is Satisfactory
On time delivery of the truck	cycle time	The time it takes from ordering to delivery	Adherence to schedule outlined in tender
True data on truck - maintenance, use, cost, life cycle	accuracy	Recording of truck usage (in hours) for billing purposes	None
Utilization	Hours and/or km	Recording of truck usage to determine utilization and maintenance schedule	% utilization based on 750 hours/year

Step #2 - VOC – Operational Definitions

- ▶ **Define the Measure** - Truck utilization in hours, maintenance costs per vehicle
- ▶ **Purpose** – To determine the optimal number of trucks that can be used to the benchmark of similar municipalities of 500.
The Fleet Policy uses 750 hours as average annual usage to determine hourly rate which is causing an accounting issue.
- ▶ **Data** is located in Fleet and Finance – hours billed and maintenance cost per truck, type, make and age for 2011, 2012 and 2013.

Step #4 - Project Management

	October	November	December	January	February
Launch Project					
Training Sessions					
Define Phase					
Measure Phase					
Analyze Phase					
Improve Phase					
Control Phase					
Certification Exam					
Presentations to Team					
Defense Date					
Financial Sign-off					

► Slide #10

Step #4 - Project Management

Team Members	
Michelle Hendry Director of Public Works	Process Champion
Todd Bryant Manager of Fleet	Process Owner
Brenda Stonehouse Process Improvement Facilitator	Facilitator
Pat Russell Area Manager, Public Works Operations	
Scott Berdan Supervisor, Public Works Operations	
Ian Parker Supervisor, Fleet Maintenance	
Rod Porter Supervisor, Public Works Operations	

Define Phase Summary & Conclusions

- ▶ Clear understanding of customer requirements
- ▶ Financial waste estimated at \$2,036,222.90
- ▶ Project scope is sufficient
- ▶ Team in place

Measure Phase

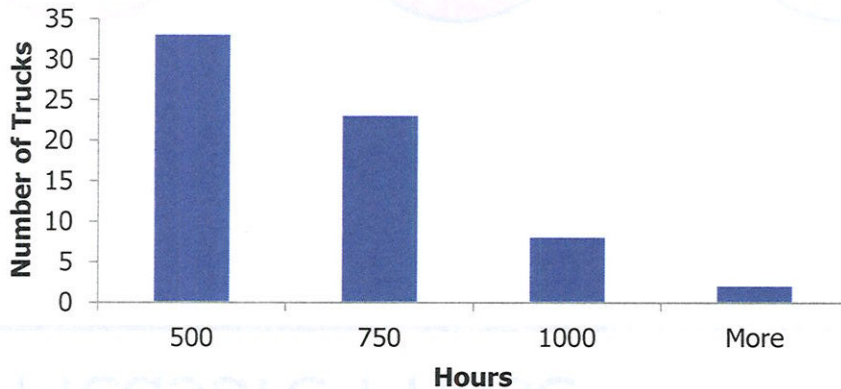


Step #5 - Project Metrics

33 out of the 66 trucks in service in 2011 were used LESS than 500 hours.

That's 50%

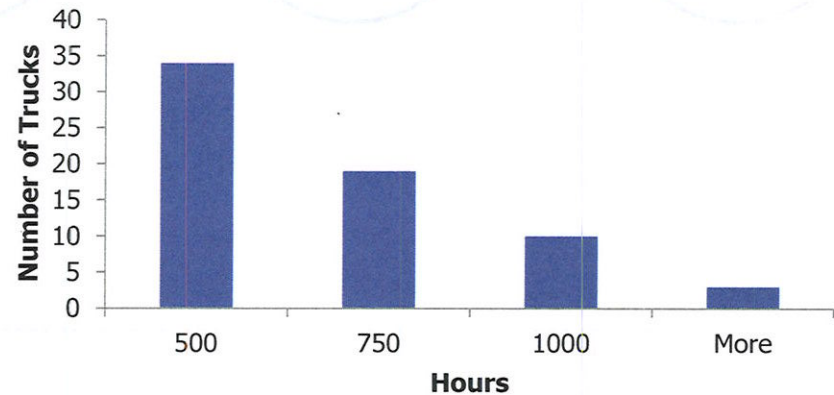
2011 Usage



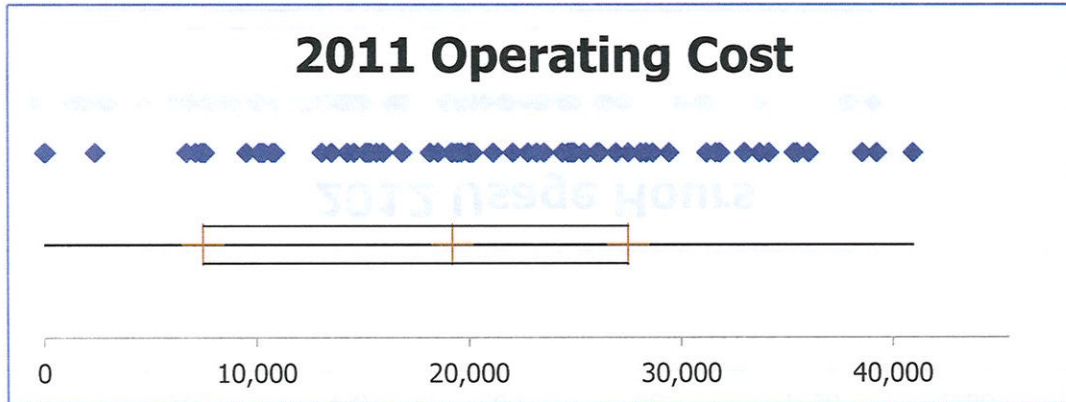
34 out of the 66 trucks in service in 2012 were used LESS than 500 hours.

That's 51.5%

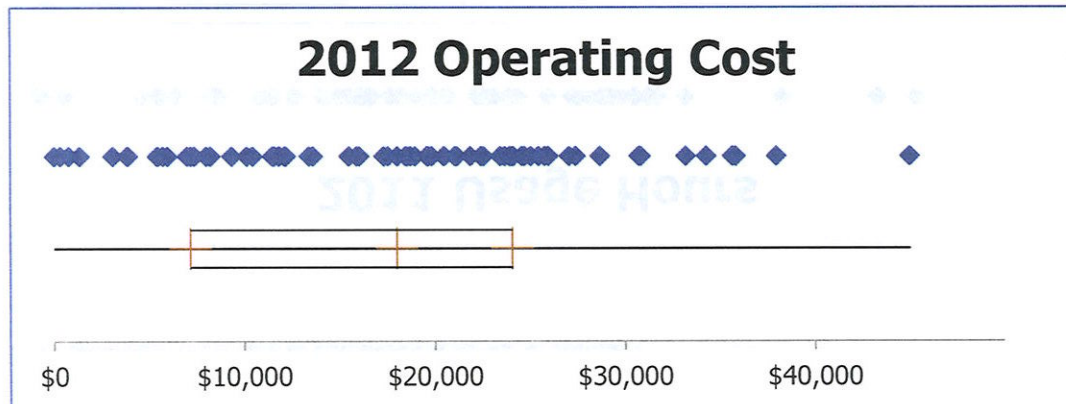
2012 Usage



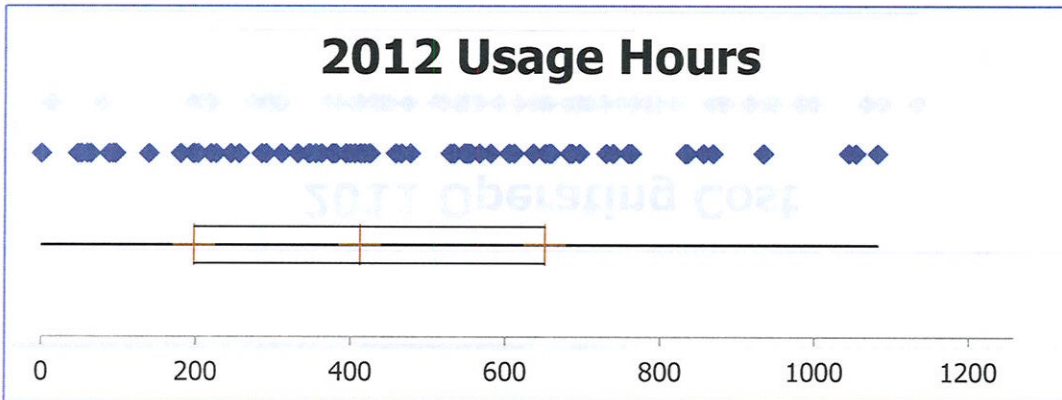
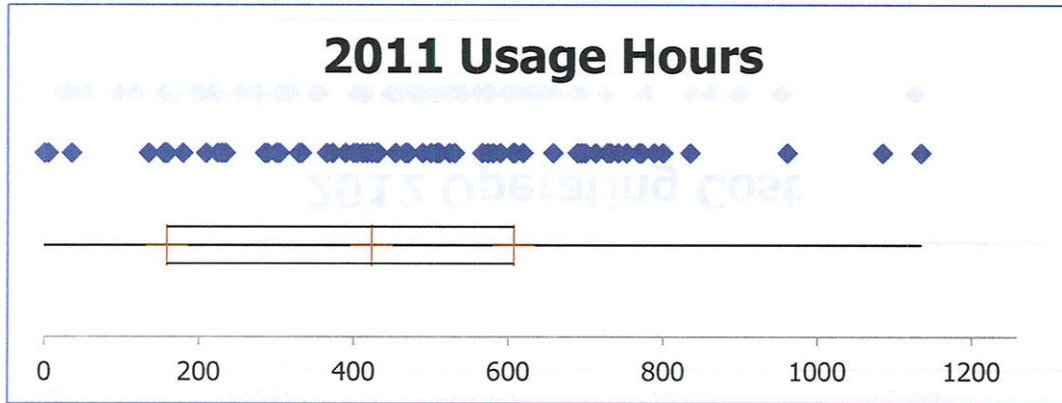
Step #5 - Project Metrics



Operating cost includes maintenance and fuel.
The median is
\$19,215 in 2011
\$18,009 in 2012



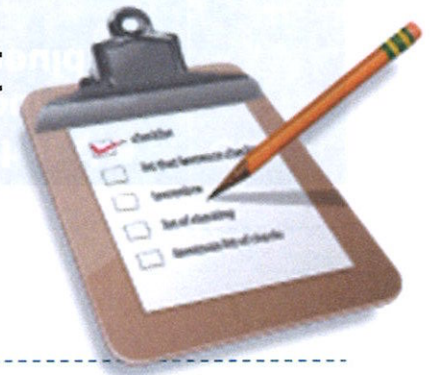
Step #5 - Project Metrics



The median for revenue hours has been relatively consistent:
423 hours in 2011
412 hours in 2012

Step #5 - Project Metrics

- ▶ Usage hours are recorded on a time card by Roads operators each day
- ▶ Fleet charges an **hourly rate** for use of the vehicle based on this data. The hourly rate has two components: operating costs (fuel, maintenance, repairs) and capital replacement
- ▶ The charges are outlined in the City's Fleet Management Policy adopted in 2011



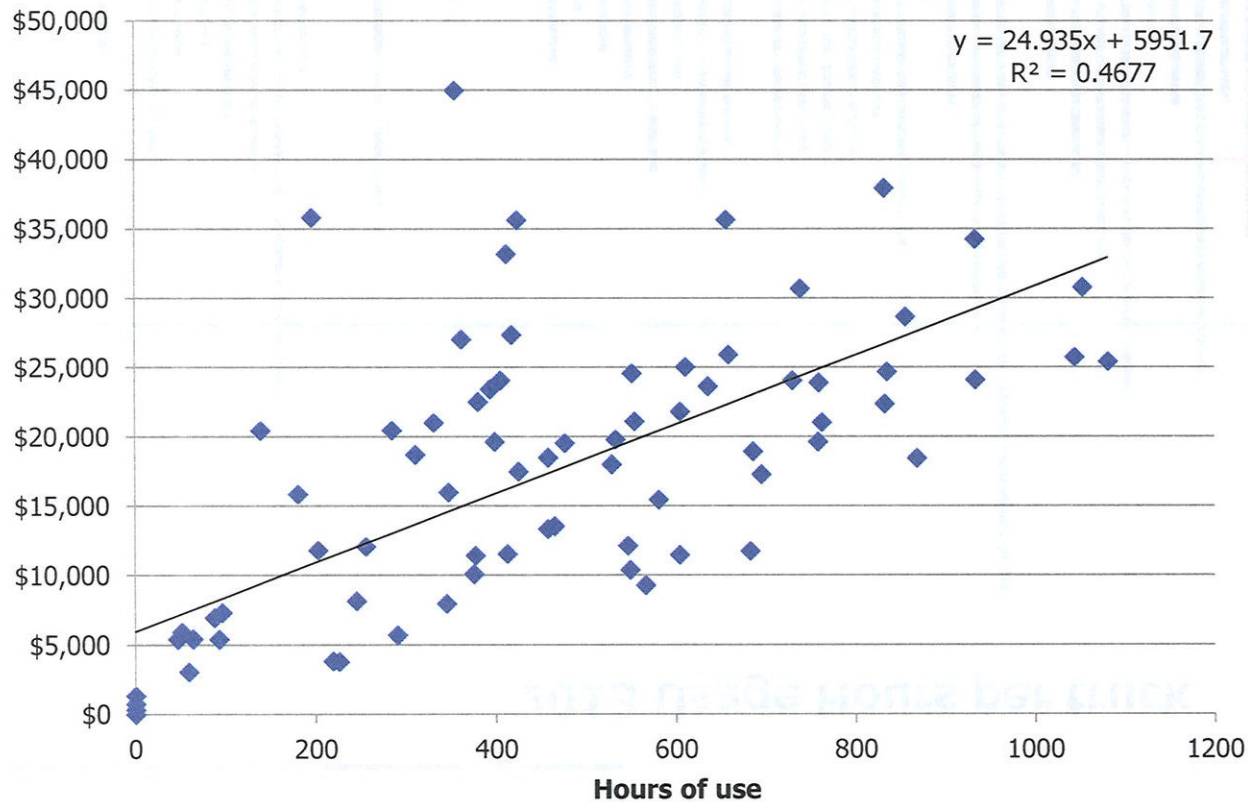
Step #5 - Project Metrics

Vehicle Type	Total Annual Charge Rate	Total Monthly Charge Rate	Avg. Annual Usage (hours)	Hourly Charge Rate	What the hourly rate should be	Gap
Single Axle	\$25,334	\$2,111	500	\$50	\$50	\$0
Tandem Axle	\$35,350	\$2,946	750	\$53	\$80	\$27
Tri-axle	\$45,000	\$3,750	750	\$60	\$90	\$30

The rate is based on a target annual usage of 750 hours – a target only 19.7% of the 66 trucks reached in 2012

Step #5 - Project Metrics

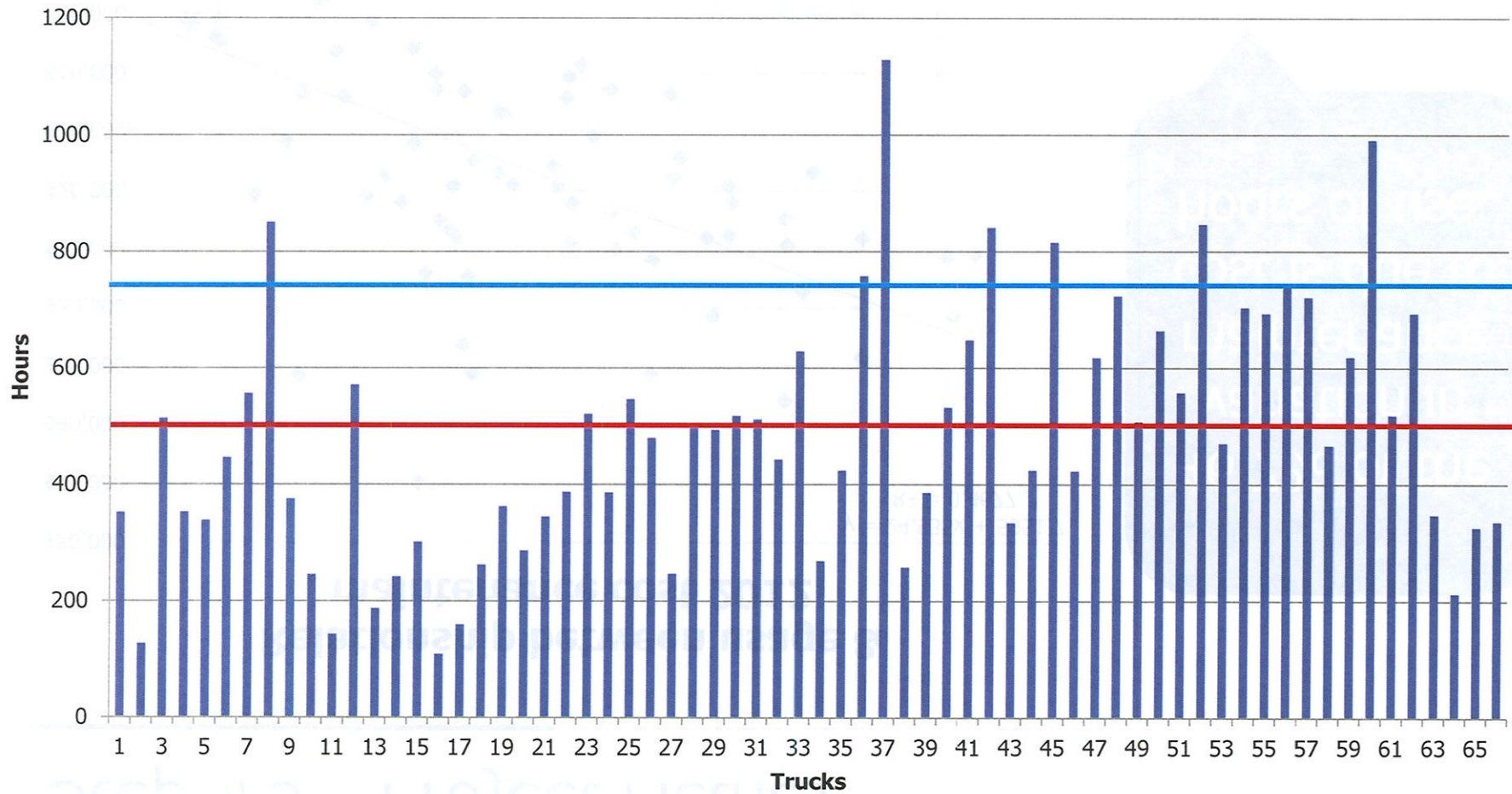
Relationship between usage & maintenance cost 2012



46.7% of the variation in maintenance cost is due to hours of use.

Step #5 - Project Metrics

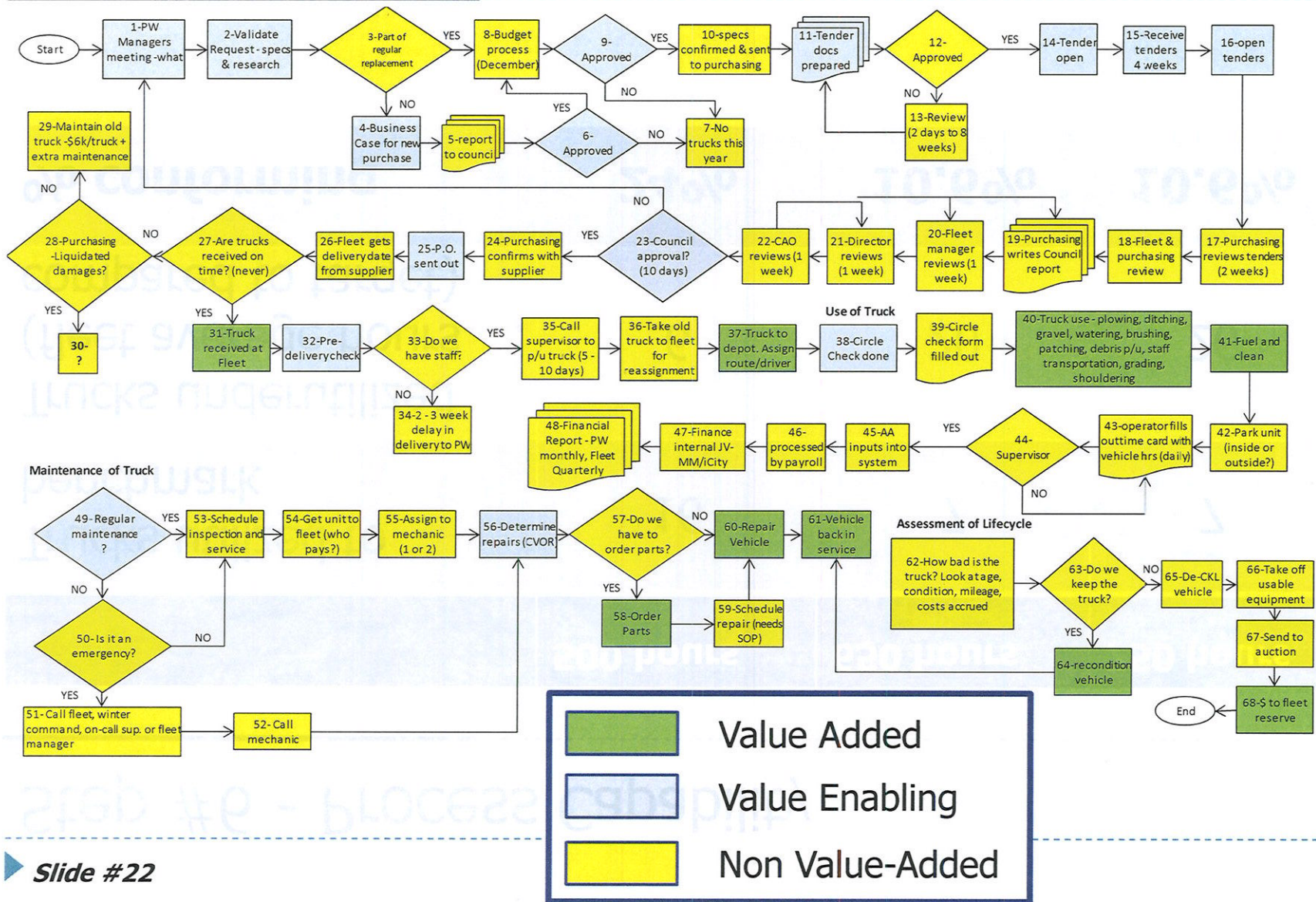
2013 Usage Hours per truck



Step #6 - Process Capability

	500 hours	650 hours	750 hours
Trucks utilized to benchmark	16	7	7
Trucks underutilized (fleet average hours compared to target)	6	20	26
% conforming	24%	10.6%	10.6%

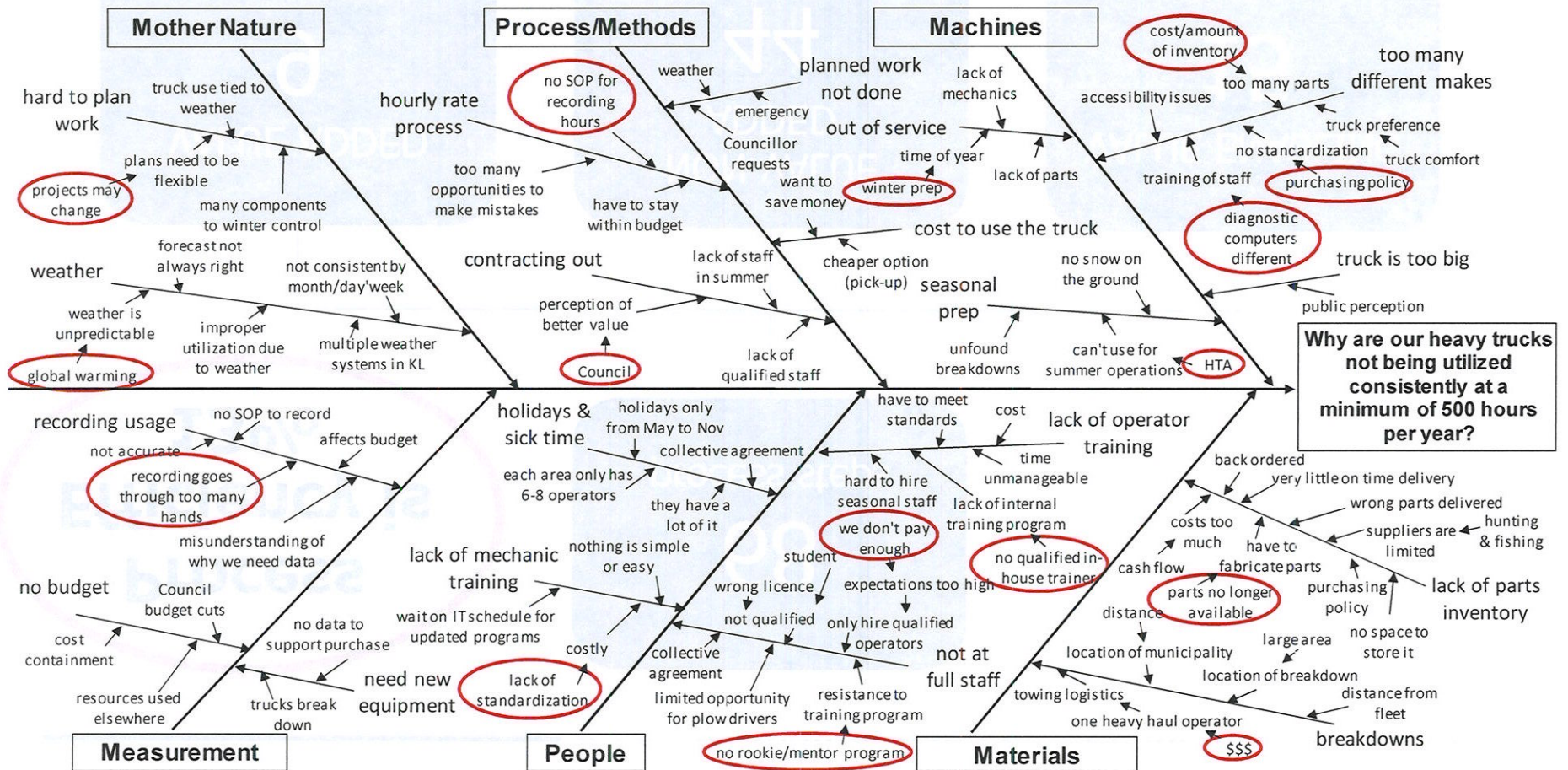
Step #7 - View the Current Process



Step #7 - View the Current Process



Step #8 - Identify Variables that affect the Process Output



Step #9 - Assess the Strength of Relationships between Input and Outputs

		Key Process Outputs									
Customer Importance		4	5	4	5	3	5	1	(1-5)		
		Needs to meet the specs	Need it at the right time	Level of Service (LOS)	Accuracy of Data (number of hours used)	Timely - Maintenance schedule (2x per year)	Having correct data to analyze maintenance history	Vehicle Info - lifecycle of truck			
Process Step	Key Process Inputs	1	2	3	4	5	6	7	Rank	Total	
Process Steps	Determine the Need for a Truck	Use Requirements	9			3		3	3	8	69
	Buy the Truck and Prepare for Delivery	Fleet Policy	9			3		9		3	96
		Purchasing Policy	9	9						6	81
	Use the Truck	MMS		9	9					6	81
		No SOP for recording hours				9	9	9		2	117
	Billing for the Use of the Truck	Projects may change			3		3			14	21
		Vehicle hours from time cards				9	9	9	9	1	126
		Recording goes through too many hands				9		9		4	90
	Fuel and Maintain the Truck	Preventative Maintenance Statement				9	9	3		5	87
		Cost/amount of inventory						9	3	10	48
		Lack of standardization					9			12	27
		Parts no longer available					9			12	27
	Assessment of Asset	Regular replacement cycle				3		9	9	8	69
Decommission	disposal decision					3	3	9	11	33	

Top 3 input factors:
 Vehicle hours from time cards, no SOP for recording hours, Fleet policy updates

Step #10 - Assess the Integrity of the Data

Interviews were conducted at each depot to determine how truck usage is recorded on time cards.

Depot	record time out of depot	circle check included	Fuel/clean included	Run time not time out of depot	Lunch, breaks removed
Burnt River	X	X	X		
Eldon	X	X	X		
Manvers	X	X	X		
Fenelon	X				
Lindsay	X	X	X		
Coboconk	X	X	X	10%	20%
Oakwood	70%	50%	50%	30%	
Emily	90%	X	X	10%	
Bobcaygeon	X	X	X		

The trucks assigned to the Oakwood depot have been removed from the data set. Otherwise, the method of recording is sufficiently consistent to conclude that the hours recorded are a reasonable representation of the actual truck utilization.

Step #12 - Failure Modes and Effect Analysis

Process Step/ Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Potential Cause(s) / Mechanism(s) of Failure	Occurrence	Current Process Controls Prevention	Current Process Controls Detection	Detection	Risk Priority Number
Buying the truck	Not delivered on time	We can't use it Have to maintain older vehicle	5	Delay in process Vendor has issues (staff loss)	10	bi-weekly updates with salesperson	bi-weekly updates with salesperson	3	150
	Not the right truck (not within specs)	We can't use it Have to maintain older vehicle	7	Delay in process, specs not clear	10	bi-weekly updates with salesperson	bi-weekly updates with salesperson	3	210
Using the truck	Out of Service in winter	Can't do the work (plowing snow)	8	Mechanical	8	Spare vehicles, graders, on-call mechanics, mobile units	Maintenance records	1	64
				Mechanical Annual Inspection Lack of staff	7	Need fewer trucks in summer, flexibility in scheduling	Scheduling	1	21
Billing for use of the truck		data for future plans Poor justification for council decision making		No SOP for data collection Time cards not reviewed properly	7	None	None	10	700

Hourly billing for the use of the truck was ranked highest for risk priority.

Quick Hits & Factors impacting utilization

Summary of Define and Measure Phases					
	Item	SIPOC	Process Flow	Cause and Effect Diagram	Cause and Effect Matrix FMEA Group Knowledge
Quick Hit #1	Create SOP for recording truck usage	X	X	X	X
Quick Hit #2	Billing - change to annual charge	X	X	X	X
Quick Hit #3	In-house training program		X	X	X
Quick Hit #4	SOP for cleaning vehicles		X	X	
Quick Hit #5	Fleet Policy updates		X		X
Potential X #1	Age of vehicle			X	
Potential X #2	Make of vehicle (standardization?)		X	X	
Potential X #3	Depot		X	X	X
Potential X #4	Storage - inside or out		X		
Potential X #5	Maintenance cost	X		X	X
Potential X #6	Seasonality		X		
Potential X #7	Staffing levels		X	X	

Measure Phase Summary and Conclusions

- ▶ Truck utilization is well below the benchmark used to calculate the hourly rate for fleet (750 hours)
- ▶ Recording of utilization hours is inconsistent resulting in inaccurate data
- ▶ A lot of resources are used to pay ourselves (approximately \$10,000 in processing time)
- ▶ Changing the billing structure is a high priority

Analyze Phase



Step #13 - Data Collection Plan

Data Collection Plan for Analyze Phase											
Ref	Theories To Be Tested (Selected From The	List Of Questions That Must Be answered To Test Each Selected Theory	Data Type	Tools To Be Used	Where Applicable, State The Null and Alternative		Data To Be Collected				
	C-E Diagram, FMECA, and/or FDM)				H ₀	H _A	Sample Size, Number of Samples	Where to Collect Data	Who will Collect Data	How Will data Be Recorded	Remarks
X	Usage hours are a factor for maintenance cost	Do usage hours impact maintenance cost? (without fuel)	Interval Continuous	Correlation (Scatter)	H ₀ :No correlation	H _a :Correlation		Fleet Finance			
X	Hours of use being recorded are not accurate	Are operators recording the usage correctly?	Nominal	Interviews			20 - 30	PW Fleet	Brenda		Need to test the integrity of the data.
	The life cycle of a heavy truck is 12 - 15 years (other municipalities going to a 7-10 year cycle)	Where is the 'sweet spot' for replacement?	Interval Continuous					Fleet Finance industry trends			
X	Are the following factors affecting utilization: type, make, age	What are the factors affecting utilization?	Interval Continuous	Simple Linear Regression and Correlation	H ₀ :βi=0	H _a :βi≠0		Fleet Finance			
X	Are the following factors affecting maintenance costs: type, make, age	Maintenance cost by age of vehicle, type of vehicle	Interval Continuous	Multiple Regression	H ₀ :βi=0	H _a :βi≠0		Fleet Finance			
	Utilization is seasonal	Does the season affect utilization?	Interval Continuous	Correlation	H ₀ :No correlation	H _a :Correlation		Finance			Need monthly data
	Utilization by job type	does job type affect utilization? (winter control, ditching, brushing, etc.)	Nominal count	Boxplot				PW Finance			
	Number of operator vacancies affects utilization	Do staffing levels affect utilization?	Interval Continuous					HR			Need data from HR on vacations, vacancies
	Compliance to minimum maintenance standards	What is our level of compliance?	Interval Continuous	Line Chart				PW			
X	Depot location affects utilization	Is there a difference in utilization by depot?	Interval Continuous	Anova: Single Factor	H ₀ :μ ₁ =μ ₂ =μ ₃ =μ ₄	H _a : at least 2 means differ		Fleet Finance			
X	Depot location affects maintenance cost	Is there a difference in maintenance cost by depot?	Interval Continuous	Anova: Single Factor	H ₀ :μ ₁ =μ ₂ =μ ₃ =μ ₄	H _a : at least 2 means differ		Fleet Finance			