Moving Data to Move People

Relationship between asset condition and customer experience

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Regional Transportation District

Asset Management

Denver, Colorado

5th International Transportation Systems Performance Measurement and Data conference

What relationships exist between the condition of our assets and our customer's experience?

Background

RTD Overview

- RTD Formed in 1972
- Service area of 2,410 sq. miles
- 1000 transit coaches, >140 routes
- 106 Park-N-Rides and Stations, >10,000 stops
- 172 LRV's, 6 rail lines
- Accessibility services, Call-n-Rides, seasonal rides and many other programs

Asset Management

- Strategic Objective
  - Goal to create Asset Management program
- Tactical Planning
  - 2012 Pilot Program
- Implementation
  - AM Division created and implementation begins
- TAMP and Goals

Goals of this presentation

- Provide an overview of our program
- Improving confidence in data
- Context of data
- Converting information into action
- Answering how condition impacts our customer

Lifecycle Management

Commissioning

Lifecycle Management

Operation and Maintenance

Lifecycle Management

Condition Assessments

Lifecycle Management

Performance Metrics

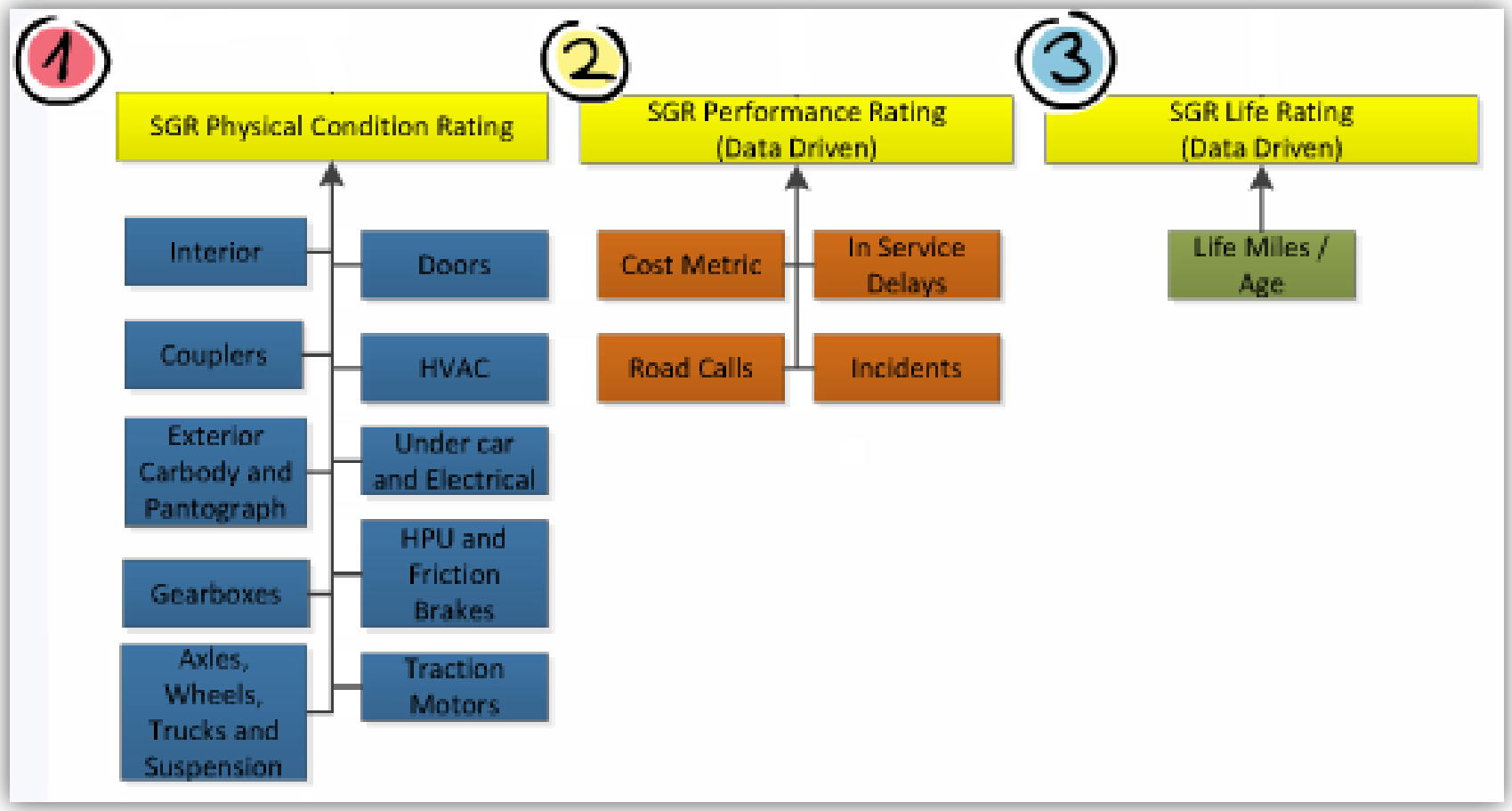
Lifecycle Management

Decision Point

Lifecycle Management

Retirement
Lessons Learned

Monitoring Condition



Performance

GR BUS Dashboard

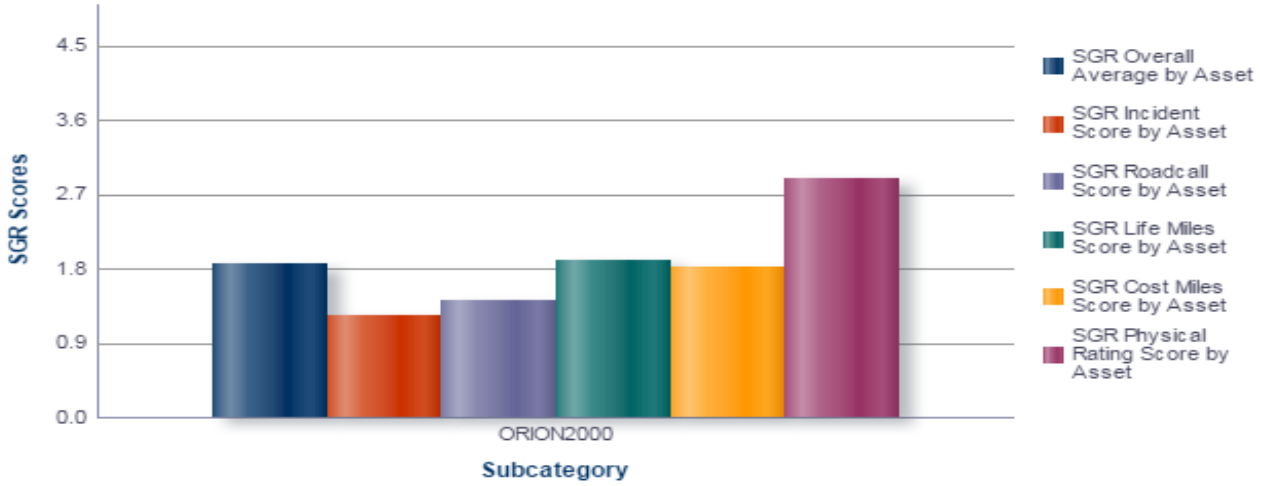
SGR Scores by Criteria | Assets PI - Life & OM Costs | Assets PI - Parts & Labor | Assets PI - Energy Consumption | Assets PI - In Service Delay

SGR Scores by Subcategory for a Year

Time run: 5/19/2015 8:48:19 AM

Report 1.5.1 (SGR Scores by Subcategory for Calendar Year): Breakdown of individual score measures, which makes up the Overall SGR Score .

Calendar Year CURRENT



SUBCATEGORY is equal to **ORION2000**
and CATEGORY is equal to / is in **BUS**
and ASSET is not LIKE (pattern match) **%-R**
and LATEST_PHY_INS_FLG is equal to **Y, C**
and LOCATION is not equal to / is not in **RETIRE**

Data Confidence

- We all rely heavily on the data captured at the transaction level.
- *If the quality of data is low then decisions based on this data without external input cannot exceed our level of confidence in the data.*
- How do we address data quality?

Testing Data Quality

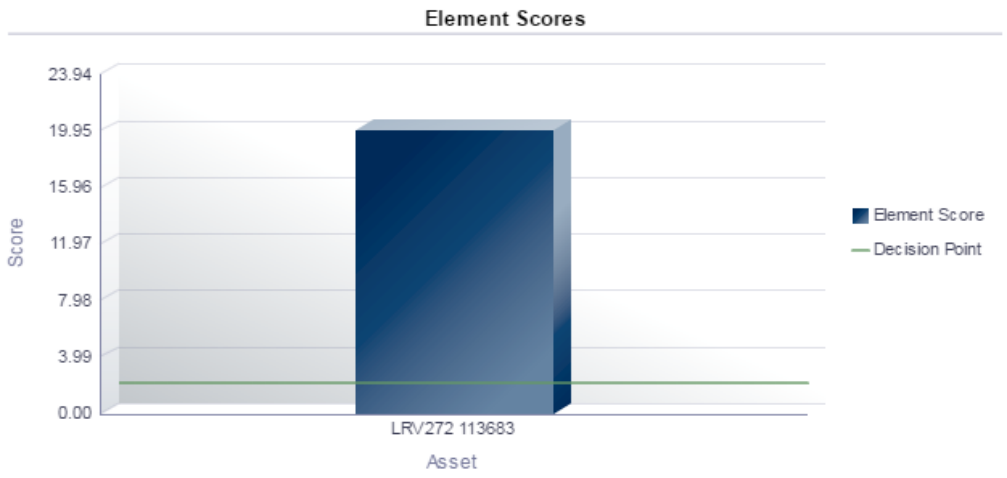
- SGR Inspectors evaluate and score system data accuracy
- Automated data mining techniques evaluate the confidence so immediate actions can be taken to correct / improve the quality of input.
- System exception reports further automate the process of identifying suspect records.

Exception Report

LRV Test Element Score Exception Report
Time run: 5/19/2015 12:55:22 PM

SG
tha

Report 2.3.2 (SGR LRV Element Score Exceptions): This report displays test element scores of "NULL", greater than score of "FIVE" or Less than "Zero".



VEHICLE_ID	Test Element	Test Description	Element Score	TEST ID
LRV272	SGR2009	TRACTION MOTORS	20.00	113683

CATEGORY is equal to / is in **LRV**
and VEHICLE_ID is not LIKE (pattern match) **%-R**
and SCOREAVG is greater than **5**

Now that we have a lot of good and clean data maybe we can answer and important question?

What relationships exist between the condition of our assets and our customer's experience?

Passenger Delay Hours

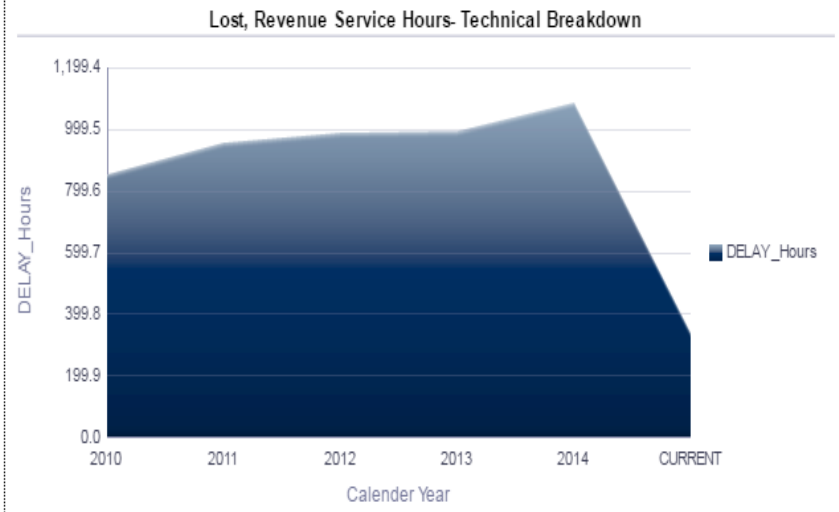
- Other Data needed
  - Asset type
  - Day / Date
  - Route schedule
  - Number of passengers on vehicle
  - Passengers by stop*
  - Number of Stops/Blocks impacted*
  - Count of un-boarded passengers affected by delay* (Cascading impact)

Passenger Delay Hours

In-Service Delay Hours By Year

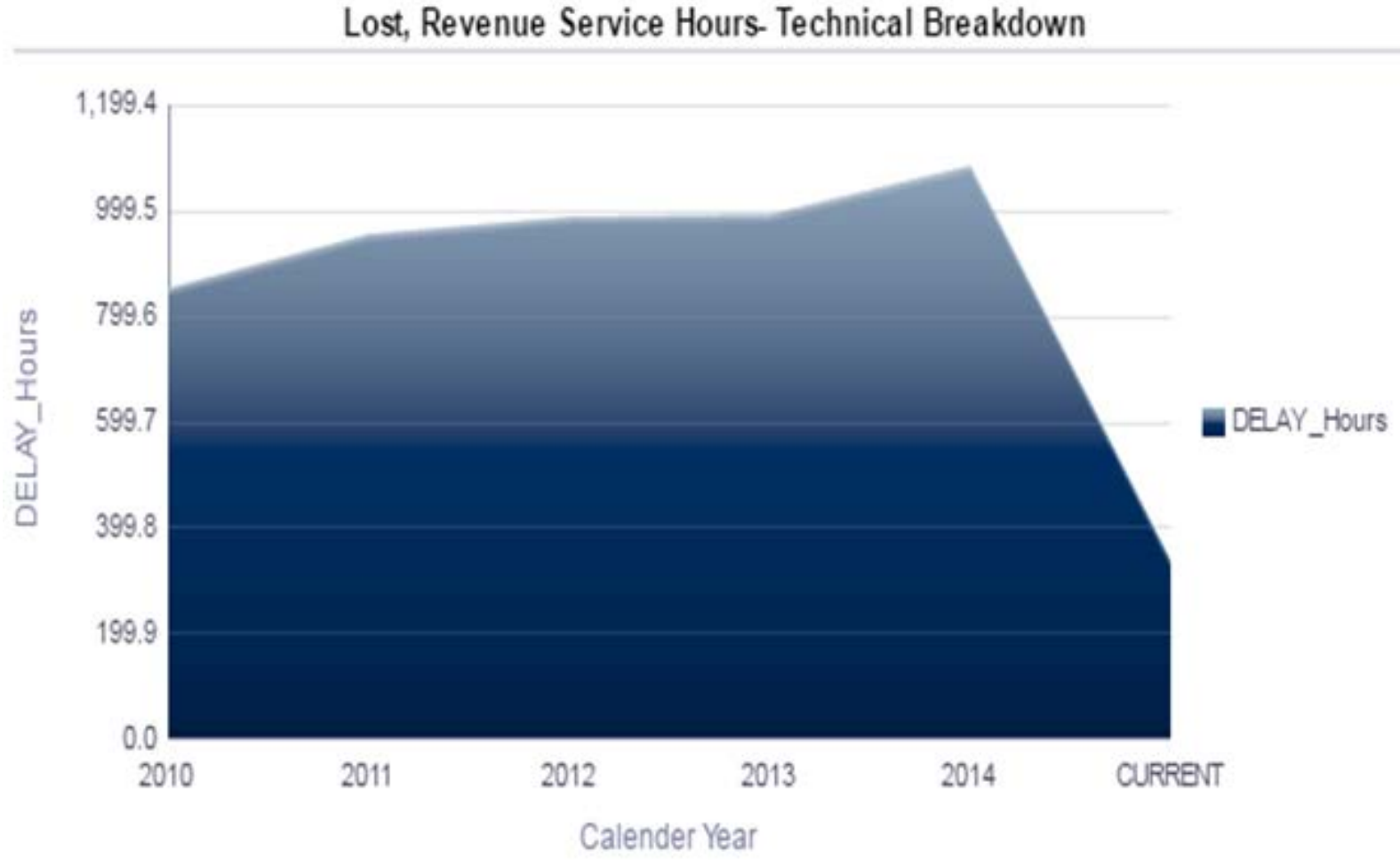
Time run: 5/19/2015 8:38:39 AM

Report 2.1.1 (In-Service Hours By Year Comparison): This report displays Revenue Service Delay, Lost Hours due to Technical Breakdown for Rolling Assets Catagory[RTD BUS & LRV] by Year Since Year 2010.



Calender Year	DELAY_Hours
CURRENT	335.7
2014	1,086.5
2013	994.7
2012	989.9
2011	955.1
2010	849.9

Passenger Delay Hours

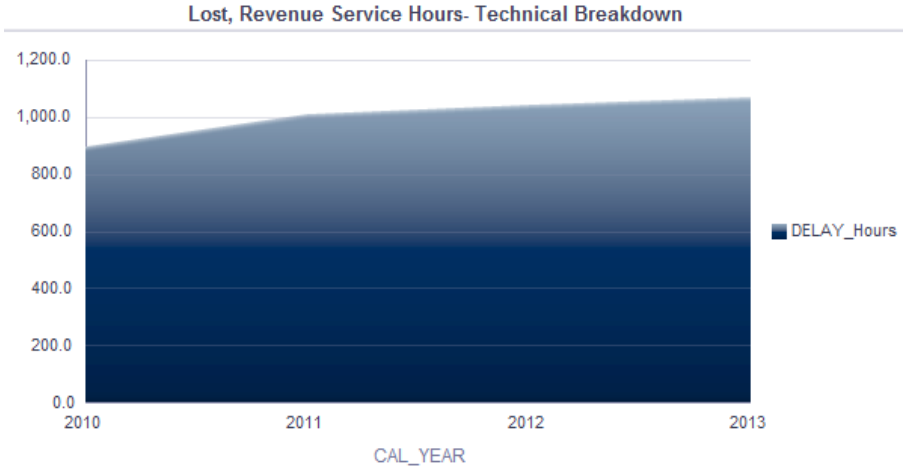


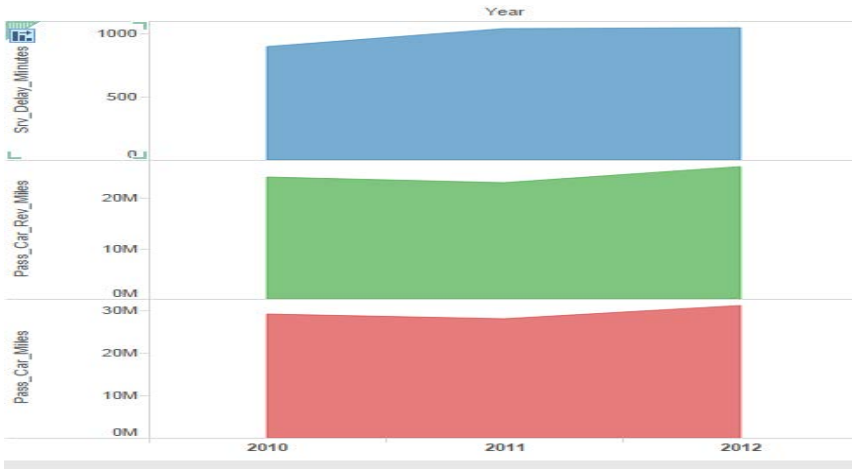
Options

- Now that we have identified a pattern what next?
- More questions

Passenger Delay Hours

- Key Performance Indicator ‘In-Service Delay Minutes’ indicates Lost Revenue Service is in increasing trend while Revenue mile is almost flat for the period.





- Increasing trend of Lost In-service Delay without significant Revenue mile increase is an indication of Assets deterioration trend due to Age and Condition.

Performance

In-Service Delay By Month Comparison

Time run: 5/19/2015 8:42:00 AM

Report 6.1.2 (SGR In-Service Delay By Month Comparison): Displays Monthly BUS Revenue Service Delay Minutes due to tech. breakdown. Base year is since 2010.

MONTH	CALENDER	DELAY MINUTES
1	2010	3,321.0
	2011	4,953.0
	2012	3,575.0
	2013	3,881.0
	2014	5,406.0
	CURRENT	3,753.0
1 Total		**24,889.0**
2	2010	3,224.0
	2011	6,302.0
	2012	5,171.0
	2013	3,662.0
	2014	4,711.0
	CURRENT	4,242.0
2 Total		**27,312.0**
3	2010	3,537.0
	2011	3,321.0
	2012	4,406.0
	2013	5,511.0
	2014	5,148.0
	CURRENT	4,955.0
3 Total		**26,878.0**
4	2010	3,590.0
	2011	3,130.0
	2012	4,116.0
	2013	3,746.0

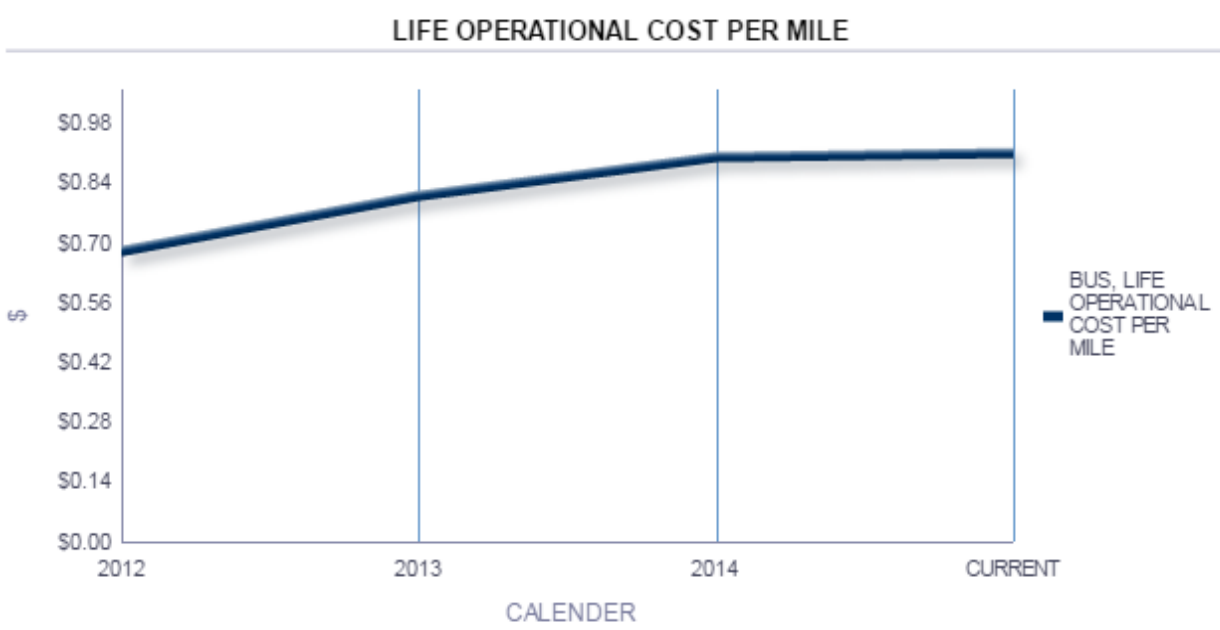
Rows 1 - 25

CATEGORY is equal to / is in **BUS**

Cost Per Mile

Life Operational Cost Per Mile By Category

Report 3.2.1 (Life Operational Cost Per Mile By Category): Life operational cost Per Vehicle Mile and base year is since 2010.



CATEGORY	CALENDER	LIFE OPERATIONAL COST PER MILE
BUS	2012	$0.68
	2013	$0.81
	2014	$0.90
	CURRENT	$0.91

BUS	BUS	BUS	BUS
$0.68	$0.81	$0.90	$0.91
2012	2013	2014	CURRENT

SGR Scores by Sub-fleet

RTD- SGR Score by SubCategory

Excluding All Assets In Replacment Process

Report 1.2.1 (State of Good Repair Score By Subcategory): Overall Average SGR Score based on Age, Condition & Performance basis (Cost, Road call & Incidents) by Sub Fleet.

SUBCATEGORY	Age Based Score	Condition Based Score	Cost Based Score	Road Call Based Score	Incident Based Score	SGR Overall Score
TRANSTEQ2000	2.2	3.0	0.6	0.0	0.0	1.2
TRANSTEQ2001	2.2	3.0	0.7	0.0	0.0	1.2
TRANSTEQ2002	2.2	3.0	1.3	0.0	0.0	1.3
MCI1998	1.4	2.6	1.8	1.9	0.6	1.7
ORION2000	1.9	2.9	1.8	1.4	1.2	1.9
NEOPLAN2001	2.2	3.0	1.4	2.0	1.0	1.9
NABI2000	1.9	2.9	1.0	1.3	2.6	1.9
GILLIG2005	3.1	3.5	2.8	3.0	2.0	2.9
GILLIG2006	3.8	3.1	3.0	2.6	4.1	3.3
GILLIG2008	3.9	3.5	3.5	2.9	3.4	3.4
BLUEBIRD2009	3.4	3.6	3.2	3.5	4.0	3.5
MCI2010	4.0	3.6	3.7	3.9	3.4	3.7
MCI2013	4.4	4.4	4.7	4.6	4.4	4.5
GILLIG2014	4.9	5.0	5.0	4.6	4.7	4.8
NEW FLYER2014	4.7	5.0	4.9	4.9	4.8	4.9

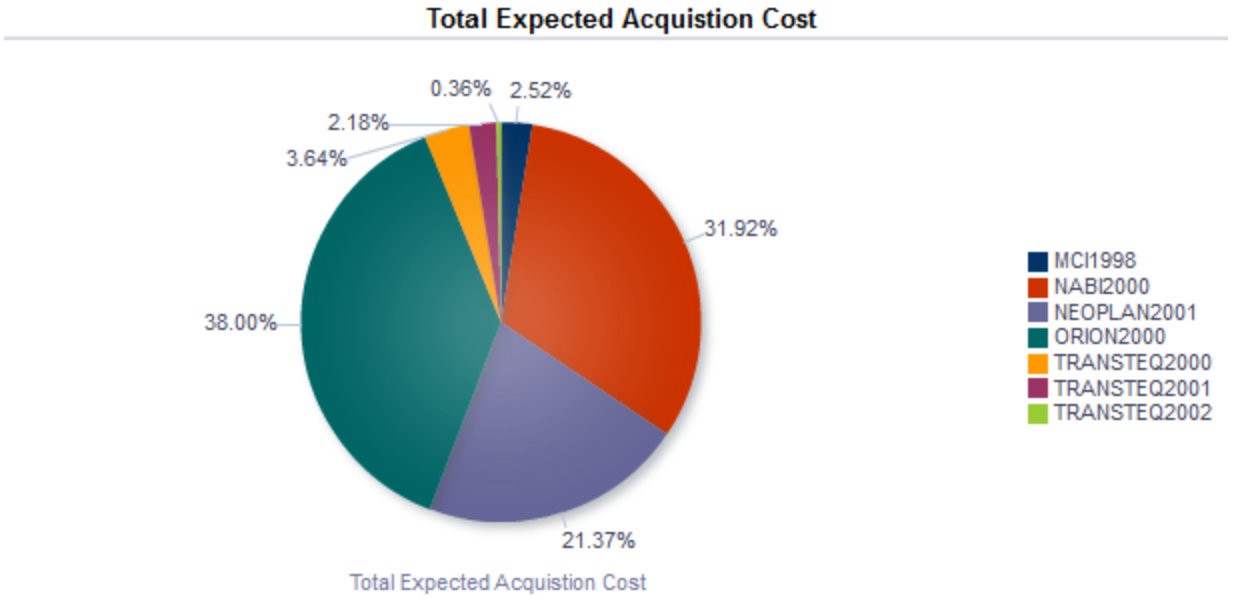
CATEGORY is equal to / is in **BUS**
and SGR_PHY_RATING_SCORE_BY_ASSET is not null
and ETL_CONTROL_FLG is equal to / is in **C**
and ASSET is not LIKE (pattern match) **%-R**
and LOCATION is not equal to / is not in **RETIRE**

Backlog

SGR Backlog Amount

Report 1.5.1 (Assets with SGR Backlog): This report displays SGR Backlog Amount.Expected Acqusion cost is derived from the recent replacement cost against the inital purchase price. E.g GILLIG2014 $412,351 to replace ORION2000 $226,950; MCI2013 $545,324 to replace MCI1998 $294,341; NewFlyer2014 $652,338 to replace NABI2000 $335,535 results in an approximate 80% increment and the report uses factor of 1.8 for expected dollar purchasing power to replace Asset in Backlog.

SUBCATEGORY	Assets-SGR Backlog	Unit Acquisition Cost	Expected Acquisition Cost	Total Expected Acquistion Cost
MCI1998	[redacted]			
NABI2000				
NEOPLAN2001				
ORION2000				
TRANSTEQ2000				
TRANSTEQ2001				
TRANSTEQ2002				
Grand Total				



Assets scoring less than 2.5 are in backlog

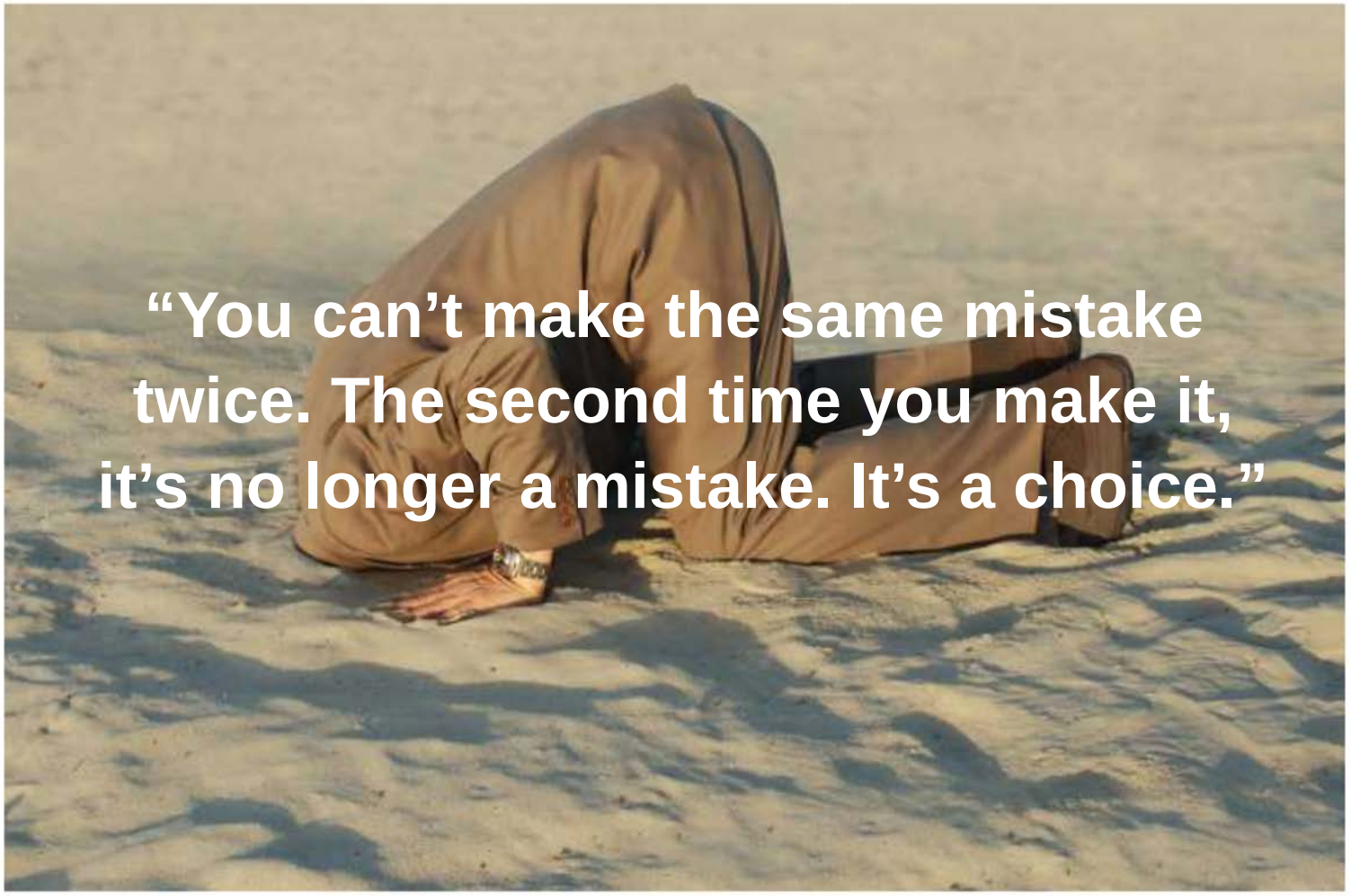
Lifecycle Management

Decision Point

Passenger delay hours, cost per mile and other data clearly shows how end of life performance negatively impacts our customers.

Results

Using a comprehensive approach to Asset Management we have been able to better establish a link between the condition of our assets and our customer's experience?


“You can’t make the same mistake twice. The second time you make it, it’s no longer a mistake. It’s a choice.”