Update on CSX Rail Life Extension Initiatives

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How Do I Justify A Change To My Rail Maintenance Program?

- Studies have shown benefit of artificial metal removal vs no metal removal
  - About 70% life extension has been achieved
- Limited success in measuring incremental changes to programs
  - Approval board requires trust in engineering leadership due to lack of data to support
  - Difficult to determine cost benefits due using real world data due to inability to isolate individual variable and lengthy time frame to measure results

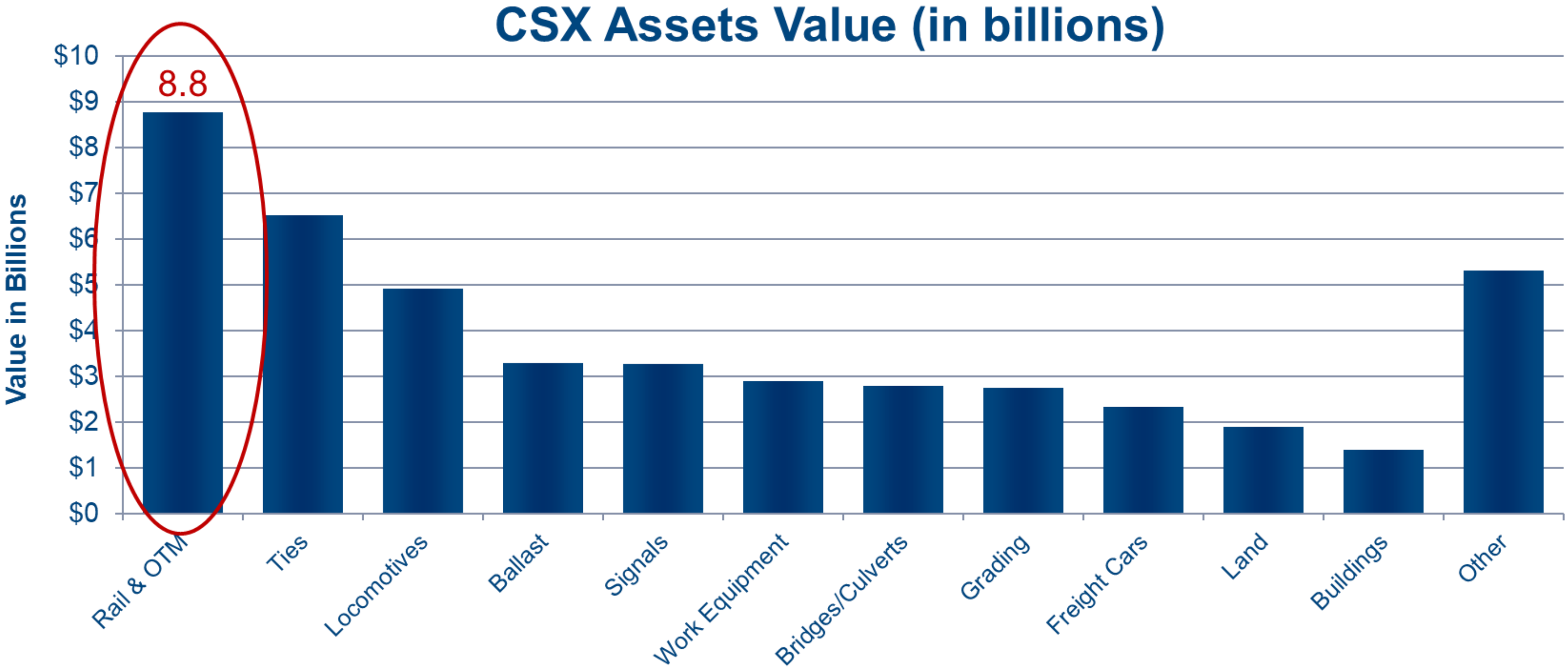
Cost Benefit Analysis

- Need to know the costs of implementation vs the life extension and the value of that life extension
- Three approaches:
  - Look at end of life field data
    - Will take decades to establish feedback loop
    - Inability to isolate individual improvements
  - Use actual wear and defect data trends to predict life
    - Based on past maintenance approaches and does not account for current improvements
    - Inability to isolate individual improvements
  - Modeling life using field data
    - Isolate individual improvements
    - Modeling accuracy/validation

Depreciation

- Depreciation helps account the cost of the rail over the life of the rail
- If a maintenance action extends the life of the rail, then the depreciation costs per year should reduce
- Material is purchased today but depreciation is set using the data from rail installed 15-70 years in the past
  - In some cases, Ultra Premium Rail installed in 2022 will have depreciation based on the life of Standard Rail installed in 1992
- There is a gap in the depreciation life vs real life for the rail being installed today

Heavy Haul Rail Maintenance – Managing Costs



Source: CSX 2021 Annual Report

Executive Summary - Opportunity

(Dollars in Millions)	Fiscal Years 2021	Fiscal Years 2020	$ Change	% Change
Revenue	**$ 12,522**	$ 10,583	$ 1,939	18 %
Expense				
Labor and Fringe	**2,550**	2,275	(275)	(12)
Purchased Services and Other[(a)]	**2,135**	1,719	(416)	(24)
Depreciation	**1,420**	1,383	(37)	(3)
Fuel	**913**	541	(372)	(69)
Equipment and Other Rents	**364**	338	(26)	(8)
Gains on Property Dispositions	**(454)**	(35)	419	NM
Total Expense	**6,928**	6,221	(707)	(11)
Operating Income	**5,594**	4,362	1,232	28
Interest Expense	**(722)**	(754)	32	4
Other Income - Net	**79**	19	60	316
Income Tax Expense	**(1,170)**	(862)	(308)	(36)
Net Earnings	**$ 3,781**	$ 2,765	$ 1,016	37
Earnings Per Diluted Share[(b)]	**$ 1.68**	$ 1.20	$ 0.48	40 %
Operating Ratio	**55.3 %**	58.8 %		350 bps

Executive Summary - Opportunity

SECOND QUARTER EARNINGS SUMMARY

Second Quarter Income Statement

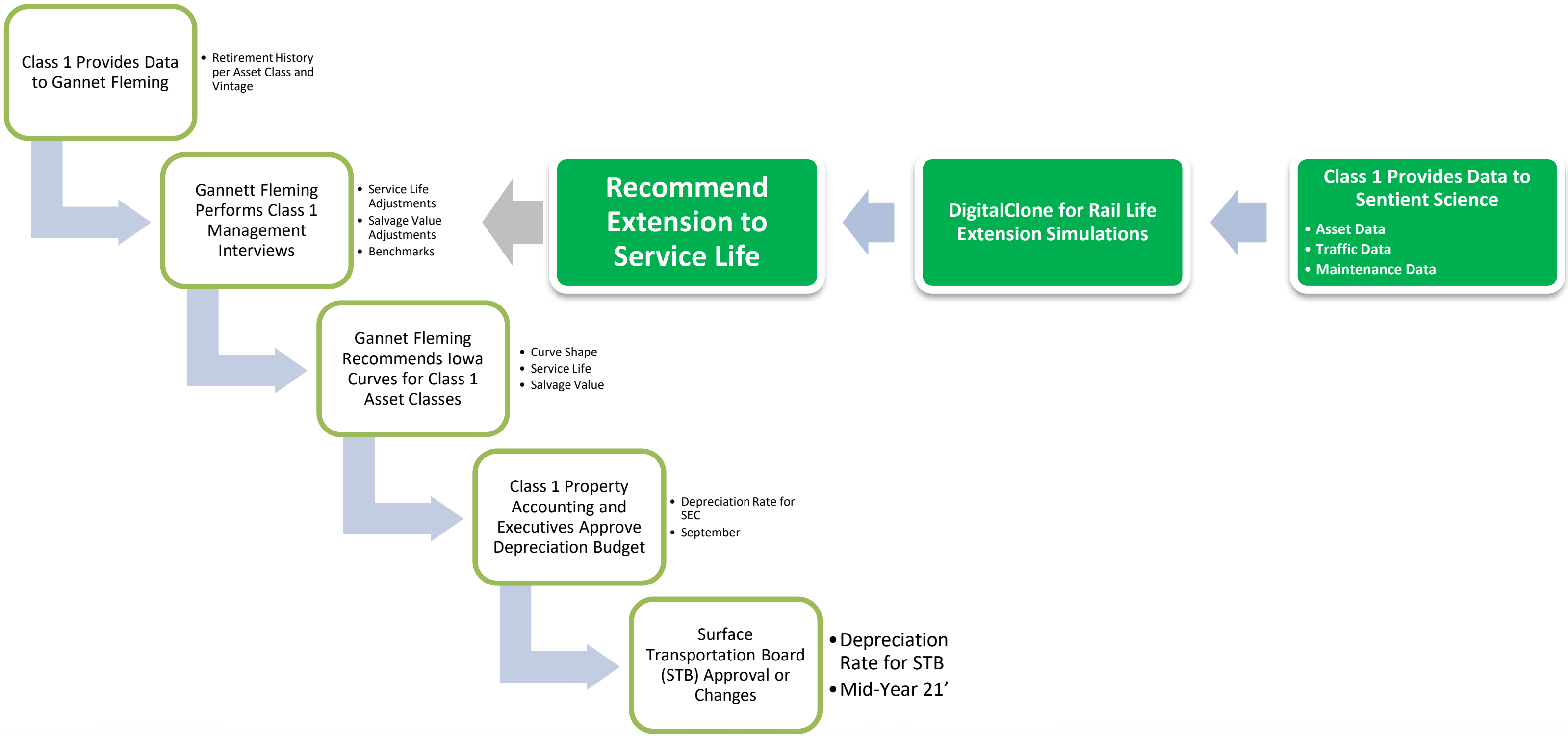
Dollars in millions	2020	2019	Variance
Revenue	$ 2,255	$ 3,061	(26%)
Expense			
Labor and Fringe	507	648	22%
Materials, Supplies and Other	407	445	9%
Depreciation	344	337	(2%)
Fuel	91	234	61%
Equipment and Other Rents	78	92	15%
Total Expense	1,427	1,756	19%
Operating Income	828	1,305	(37%)
Interest Expense	(191)	(184)	(4%)
Other Income – Net	15	25	(40%)
Income Tax Expense	(153)	(276)	45%
Net Earnings	$ 499	$ 870	(43%)
Earnings Per Share	$ 0.65	$ 1.08	(40%)
Operating Ratio	63.3%	57.4%	(590 bps)

Execution Strategy

- Realizing the life in deprecation calculation will result in lower operating saving today and reduced capital spending tomorrow
  – Cost Benefit Analysis to quantify individual or set of maintenance strategies with the highest ROI
  – Bridge the gap between depreciation life and real life of rails today

Determine Ideal Depreciation Study Workflow

6 Year Timeframe



DigitalClone Simulator

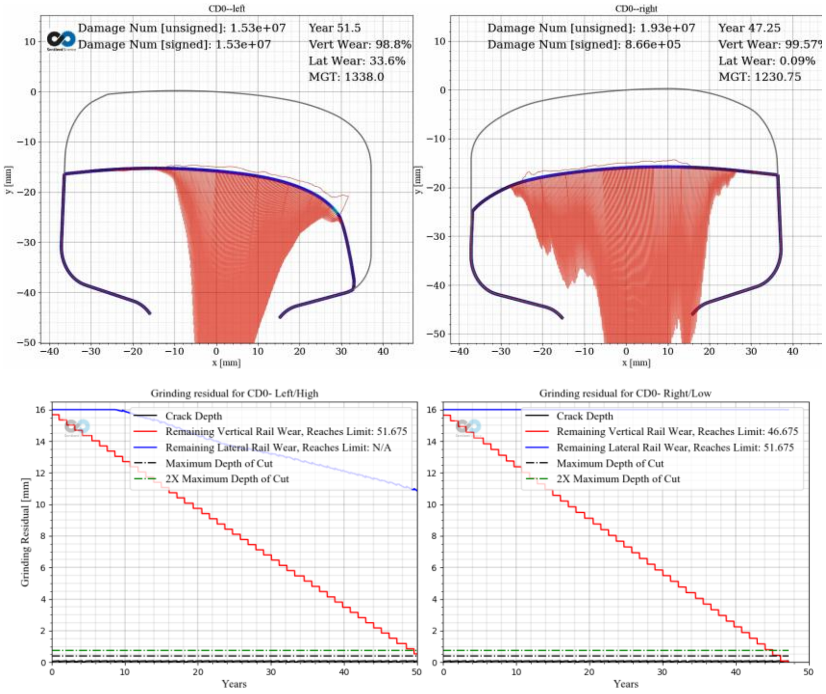
1. Collect and Analyze Required Data

Rail Degradation Simulator:

1. Visualize Rail Profile Changes due to each Scenario
2. Choose Condemning Limits for Vertical and Lateral Wear
3. Compare Rail Profile Change from Maintenance Strategies

Outputs of Physics Models:

1. Natural Wear due to Wheel-Rail Interaction
2. Artificial Wear due to Grinding
3. Rail Life in Years and AMGT
4. Crack Initiation Risk



Sharp Curve Simulator for Class 1

Variable Parameters:

1. Target Rail Profile
2. Rail Grinding Frequency
3. Rail Grinding Passes
4. Rail Material/Brand
5. Traffic Tonnage
6. Rail Coefficient of Friction
7. Wear Life Limit

Fixed Parameters from VTI Output:

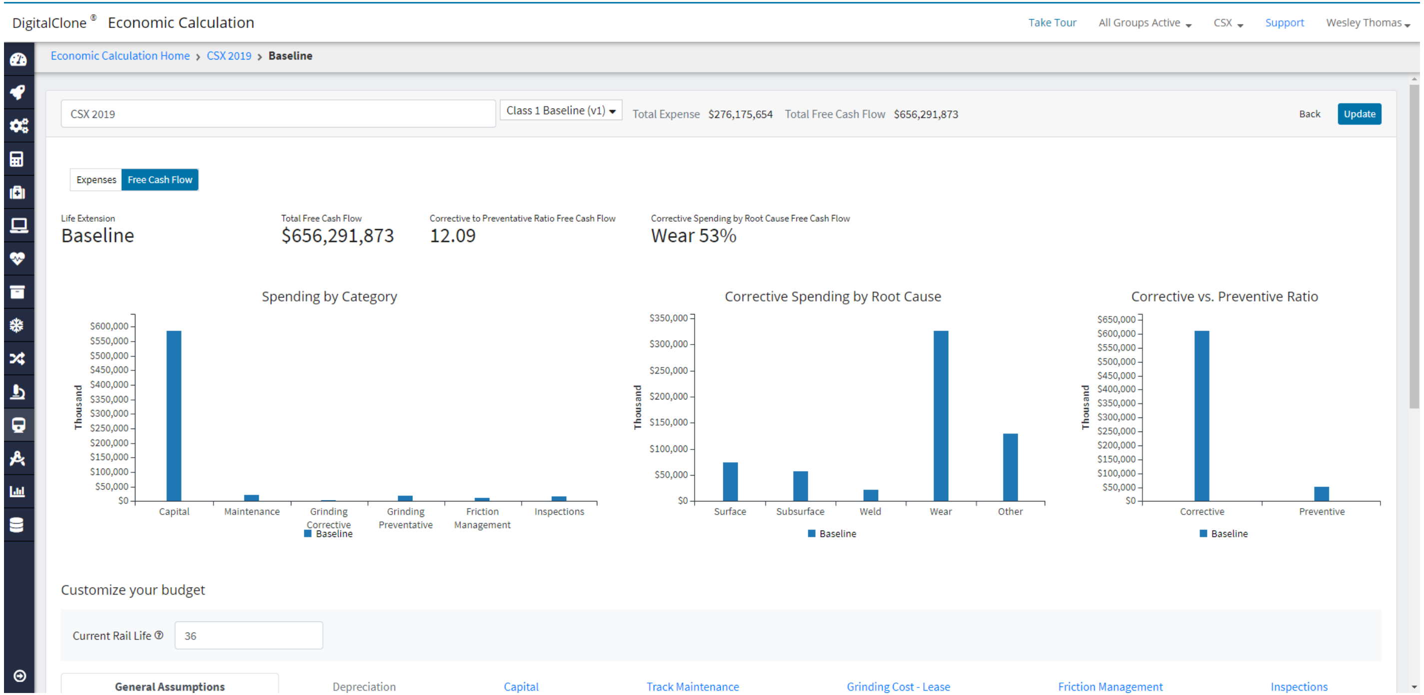
8. Curvature
9. Track Geometry
10. Super-Elevation
11. Train Configuration
12. Traffic Speed
13. Wheel Profile Distribution

1. Collect and Analyze Required Data

- Collected 10 Years of CSX track maintenance costs including:
  - Capital Plan Data
  - Maintenance Defect Data
  - Grinding Data
  - Friction Management Data
  - Inspection Data

- These data were used for economic analyses

- Capital plan stored in DigitalClone Economic Model



Determine Representative Simulators

- Analyzed 28,000 Curve Data to Identify 3 Representative Curves of CSX Network

- Identified 3 Simulators that Represented Properties of Representative Curves

Route	Curvature	Tonnage (Annual)	Timetable Speed
AVERAGE DENSITY I SHARP	4	40	40
AVERAGE DENSITY I MILD	1.2	40	40
AVERAGE DENSITY I TANGENT	0	40	60

Route	Curvature	Tonnage (Annual)	Timetable Speed
CLEVELAND SHORT LINE	6	46.65	25
W AND A	6	25.23	35
NORTH END	4	25.28	40
W AND A	3	28.13	35
NORTH END	2	26.81	40
ERIE WEST	1	44.93	60
ERIE WEST	0		
NORTH END	0		
W AND A	0		

Determine Past/Present/Future Scenarios

- Management interviews and standards identified changes to maintenance
- Friction Management Improvements Were Not Included (Conservative)

Scenario	Past Depreciation Study(2015)			Present Depreciation Study (2020)			Future Depreciation Study (2025)		
	Target Profile	Grind Frequency	Rail Material	Target Profile	Grind Frequency	Rail Material	Target Profile	Grind Frequency	Rail Material
AVERAGE DENSITY I SHARP	CSX Current Target Profile	Time Based 2x Per Year	Premium	CSX Current Target Profile	Tonnage Based 28 MGT Avg.	Premium	New Updated Target Profile	Condition Based 28 MGT Avg.	Premium *Ultra-Premium*
AVERAGE DENSITY I MILD	CSX Current Target Profile	Time Based 2x Per Year	Intermediate	CSX Current Target Profile	Tonnage Based 28 MGT Avg.	Premium	New Updated Target Profile	Condition Based 28 MGT Avg.	Premium *Ultra-Premium*
AVERAGE DENSITY I TANGENT	CSX Current Target Profile	Time Based 2x Per Year	Standard	CSX Current Target Profile	Tonnage Based 56 MGT Avg.	Intermediate	New Updated Target Profile	Condition Based 56 MGT Avg.	Intermediate *Premium*

Determine Representative Weighting

- Analyzed 10+ Years of CSX economic data based on Curvature & Failure Mode (McKinsey)
- Service Life Extension from Simulations Applied to sub-set of population
  - **Survivor**: What % of the network is represented by that curvature/failure mode
  - **Retirement**: What % of capital is replaced due to that curvature/failure mode

Route	Percent of Rail Replaced due to Wear	Percent of Capital Plans 2010-2020	Weight (Wear Retirement Method)	Percent of Network	Weight (Wear Survivorship Method)
AVERAGE DENSITY I SHARP (>=3 deg)	79%	24%	**19.3%**	8.5%	**6.7%**
AVERAGE DENSITY I MILD (1-3 deg)	71%	22%	**15.2%**	12.7%	**9.0%**
AVERAGE DENSITY I TANGENT (<1 deg)	16%	53%	**8.5%**	78.8%	**12.6%**
TOTAL	N/A	100%	**60%**	100%	**22.5%**

- **Recommend Weighted Life Extension**

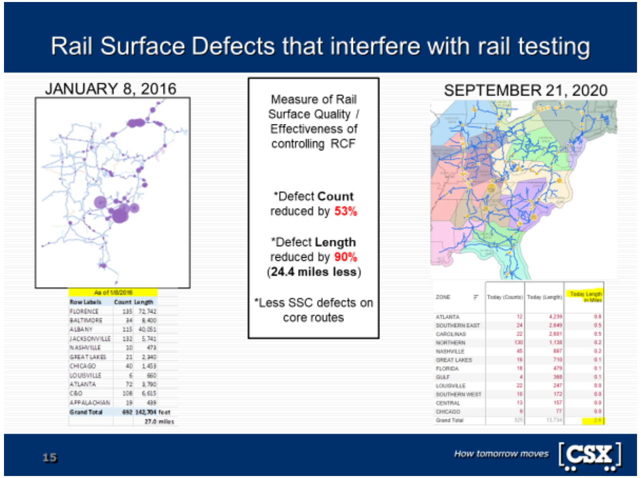
1. Estimated Life with 100% Implementation
    1. Recommended Average Service Life increase of **21%** based on Present Retire
    2. Recommended Average Service Life increase of **25%** based on Present Survive
2. Estimated life accounting for Rail Replacement Schedule
    1. Recommended Average Service Life of **5% - 7%** based on Present Retire
    2. Recommended Average Service Life of **5% - 8%** based on Present Survive

Scenario	Past (2015)			Present (2020)			Future (2025)		
	Target Profile	Grind Frequency	Rail Material	Target Profile	Grind Frequency	Rail Material	Target Profile	Grind Frequency	Rail Material
AVERAGE DENSITY I SHARP	Baseline		Baseline	100%		35% (16%)	100%		70% (32%)
AVERAGE DENSITY I MILD	Baseline		Baseline	100%		21% (16%)	100%		42% (32%)
AVERAGE DENSITY I TANGENT	Baseline		Baseline	100%		8% (16%)	100%		16% (32%)

Impact on Rolling Contact Fatigue (RCF) on Life

SSC & SDZ Defects Over Time

- Cause by rolling contact fatigue (RCF)
- Grinding seeks to remove RCF cracks
- 90%~ Reduction in SSC



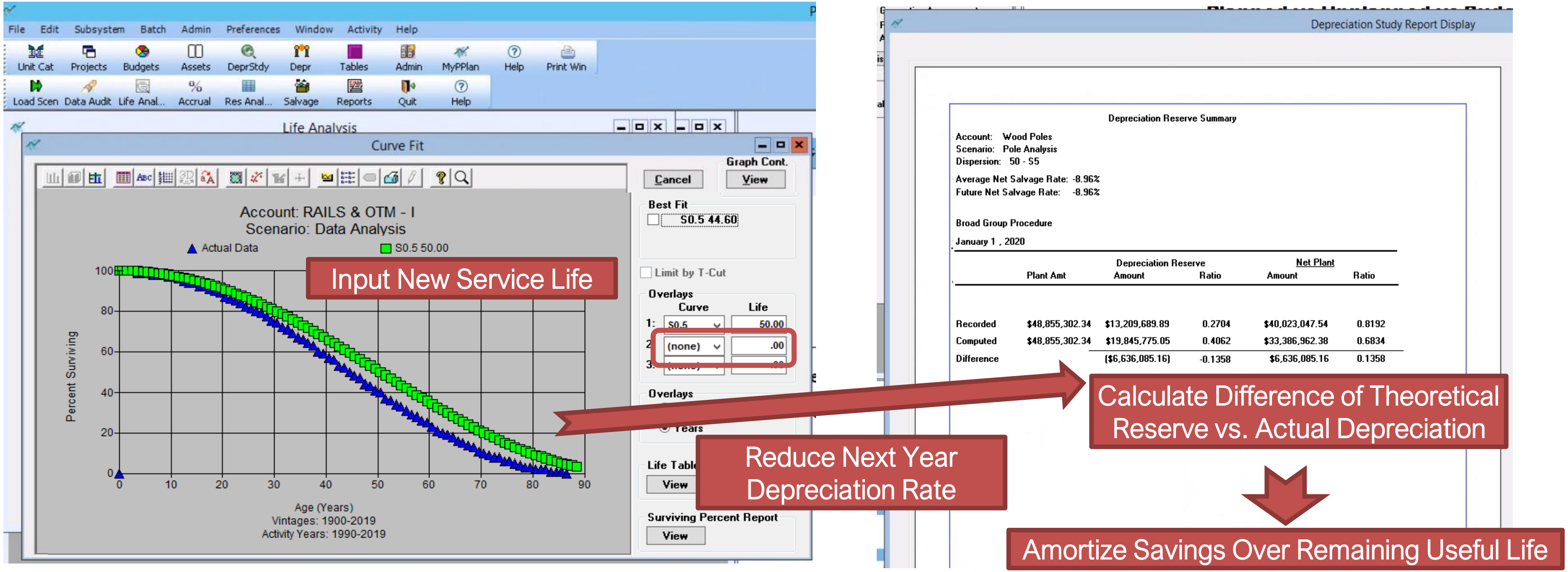
TDD/TDC/TDT Defects Over Time

- Cause by rolling contact fatigue (RCF)
- Grinding seeks to remove RCF cracks
- 20%~ Reduction in TDD

Year	2016	2017	2018	2019
TDC	84	60	69	64
TDD	4137	3766	3311	3407
TDT	321	248	249	279
TOTAL	4542	4074	3629	3750
	100%	90%	80%	83%

Executive Summary - Opportunity

- Translate Longer Service Life = Savings - Future and Past



Depreciation Reserve Summary

Account: Wood Poles
Scenario: Pole Analysis
Dispersion: 50 - S5

Average Net Salvage Rate: -8.96%
Future Net Salvage Rate: -8.96%

Broad Group Procedure

January 1 , 2020

		Depreciation Reserve		Net Plant	
	Plant Amt	Amount	Ratio	Amount	Ratio
Recorded	$48,855,302.34	$13,209,689.89	0.2704	$40,023,047.54	0.8192
Computed	$48,855,302.34	$19,845,775.05	0.4062	$33,386,962.38	0.6834
Difference		($6,636,085.16)	-0.1358	$6,636,085.16	0.1358

Executive Summary

- Rail is replaced for three main causes - **(1) Wear (2) Defects & (3) Other Service Failures**
- From 2015 to 2020, CSX upgraded 3 O&M actions - **(1) Materials (2) Grinding and (3) Friction**
  - Initial benefits observed in CSX data (**20% - 90% fewer RCF defects**)
  - **Improvements to the Wear life**
    - However, Wear life extension are not represented in CSX asset end of life data (2000 – 2020) due to length of life
- DigitalClone for Rail calculated Wear life extension to quantify benefits not shown yet in the data
- **Average service life extension of 20-25% (When Fully Implemented)** due to 2/3 of O&M changes evaluated
- Use the same methodology to evaluate proposed future changes
- Use field testing and wear & defect data trends to build confidence in the models for leadership and auditors

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Thank you!

Acknowledgements: Alexandre Woelfle (NRC-C), Eric Magel (NRC-C), Charles Rudeen (LORAM),Wesley Thomas, Ashkan Darbani (Sentient)