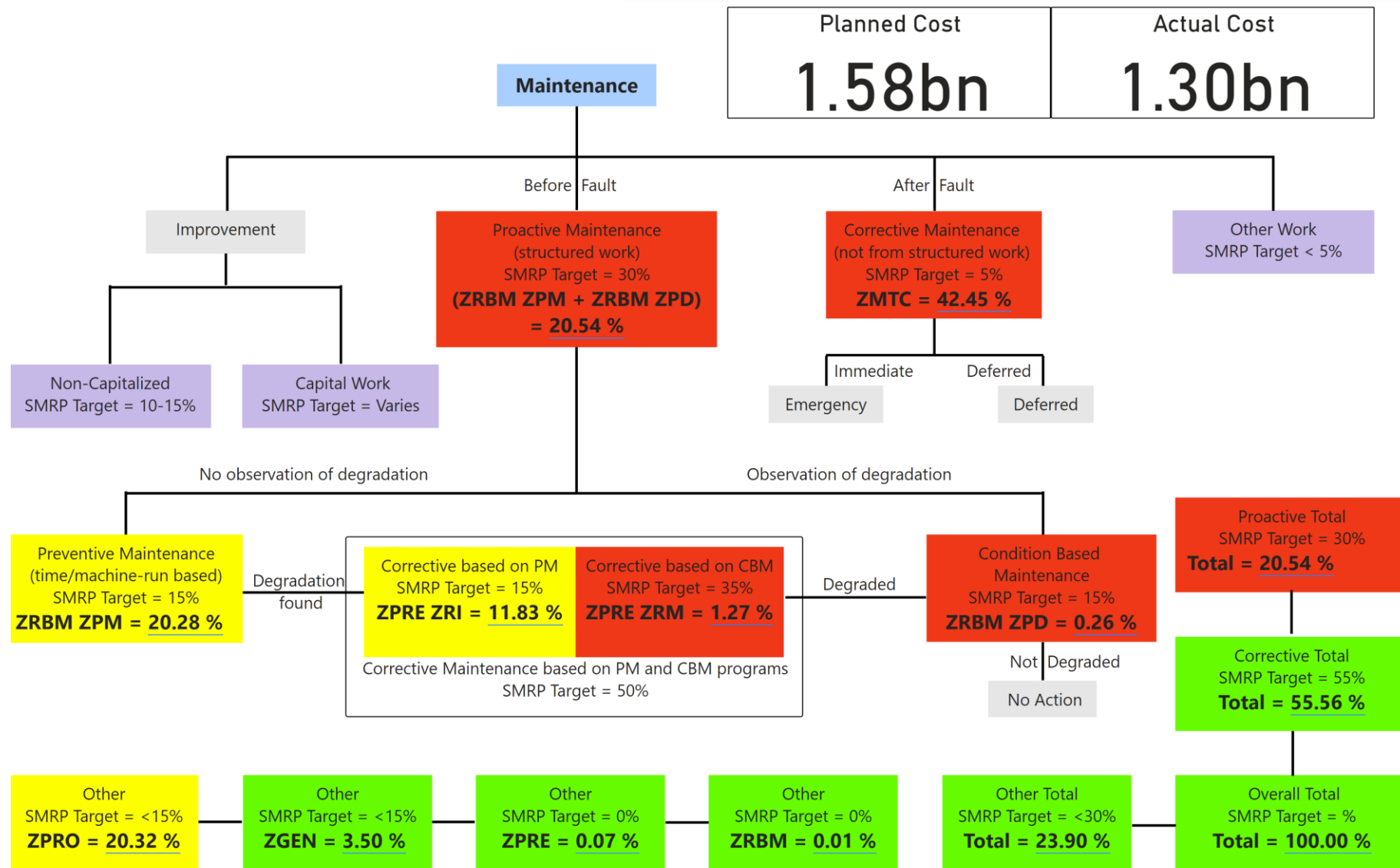


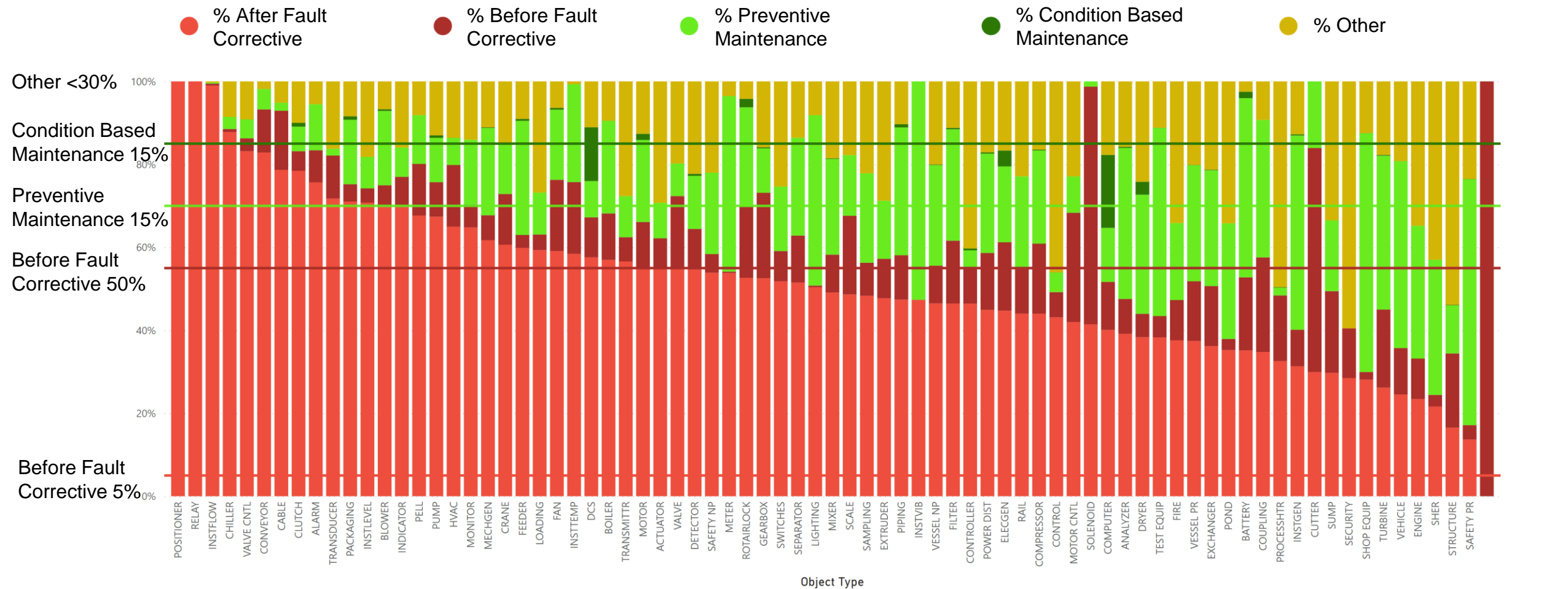
## The APM Journey: A Story of What it Takes to Move from Time Based to Condition Based Maintenance - It's Different Than You Think!

**Norm Poynter** Co-founder and Managing Director, Asset Management Advocates  
**Graham Macleod** Vice President Asset Integrity & Supply Chain, Precision Drilling  
**Dieter Hässlein** SVP, Head of Asset & Service Management, SAP SE



Notification ▾	Notification Description ▾	Equipment ▾	Object ▾	Object Code Text ▾	Damage ▾	Damage Code Text ▾	Damage Text ▾	Cause ▾	Cause Code Text ▾	Cause Text ▾
2334675	22RV002: Replace Obsolete Rotary Valve	3022938	P999	No Code Available						
3054952	200FCM 103HV659: SOLENOID PASSING N2	3153107	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
3013358	13RV004: Packing Leak	3022208	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
2851526	13RV002:Leaking Resin.	3022204	P999	No Code Available	D001	Leakage / Passing	packing is leaking	C003	Expected Wear and Tear	
3342534	23RV001: Inspect/adjust/replace packing	3023132	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
2712815	22RV002: Replace packing	3022938	P999	No Code Available	D001	Leakage / Passing	Packing Leaking	C003	Expected Wear and Tear	
3082617	103RV006: LEAKING SHAFT SEAL	3153008	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
3274654	13RV001: Replace packing	3022202	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
3368333	103RV001: OIL LEAK ON OB END OF GEARBOX	3149732	P999	No Code Available	D001	Leakage / Passing		C010	Abnormal Wear and Tear	
2986205	43RV013: RV is leaking resin	3025974	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
3041712	103HV659: SOLENOID PASSING NITROGEN	3153107	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
3082655	103RV001: LEAKING SHAFT SEAL	3149732	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
2694177	23RV002: Tighten packing	3023134	P999	No Code Available	D001	Leakage / Passing		C008	Operating Condition	
3274655	13RV002: Replace Packing	3022204	P999	No Code Available	D001	Leakage / Passing		C003	Expected Wear and Tear	
2663211	103RV022 REPLACE GEARBOX /FIX MOUNTING	3149735	P999	No Code Available	D002	Deformation		C008	Operating Condition	
3027019	85RV150: 3 MONTH AIRLOCK INSPECTION	3242724	P999	No Code Available	D003	Looseness	Found loose motor hold down	C005	Installation Error	
2948205	R3 CALLOUT 87RV280: Motor fault	3242749	P999	No Code Available	D003	Looseness		C005	Installation Error	
2652681	23RV002: Pakcing needs tightened	3023134	P999	No Code Available	D003	Looseness	Packing was loose	C003	Expected Wear and Tear	
2890203	12RV002: please reinstall valve in RV	3021984	P999	No Code Available	D003	Looseness	Pipe came out of socket on RV	C003	Expected Wear and Tear	The nozzle is glued into p
2405240	CALLOUT 103RV020:NOT TURNING IN AUTO	3153107	P999	No Code Available	D003	Looseness		C010	Abnormal Wear and Tear	
2948402	R3 CALLOUT 87RV277: Motor fault	3242744	P999	No Code Available	D003	Looseness	Loose motor connection in field	C005	Installation Error	Crimp terminations not c
2465520	103RV022 WILL NOT TURN	3149735	P999	No Code Available	D004	Sticking/Seized		C010	Abnormal Wear and Tear	
3100964	103RV016: REPAIR INLET HOPPER	3149734	P999	No Code Available	D008	Wear	DID NOT WELD AS PER INSP RE	C010	Abnormal Wear and Tear	
3215002	103RV001: ASF BIN HOUSING CRACK REPAIR	3149732	P999	No Code Available	D008	Wear	REPAIRED CRACK AND INSPECT	C010	Abnormal Wear and Tear	
3376751	13RV003: Leaking Resin	3022206	P999	No Code Available	D008	Wear		C003	Expected Wear and Tear	
2733673	46RV913: 1YR S/D GEARBOX OIL CHANGE	3026542	P999	No Code Available	D008	Wear	chain worn out	C003	Expected Wear and Tear	
3452690	13RV004: Resin leaking out from RV	3022208	P999	No Code Available	D008	Wear		C008	Operating Condition	
3356211	13RV002: Replace cracked gearbox	3022204	P999	No Code Available	D008	Wear		C010	Abnormal Wear and Tear	
2858064	23RV002: Replace RV	3023134	P999	No Code Available	D008	Wear		C003	Expected Wear and Tear	
2413480	46RV916 bolts on motor need replaced	3026543	P999	No Code Available	D009	Breakage	all of the gearbox feet were brc	C010	Abnormal Wear and Tear	bin above rv was full of s
3522625	103RV001: PREP FOR SHIPPING	3149732	P999	No Code Available	D009	Breakage		C012	Cause Under Investigation	
2949464	103RV016: CRACKED NOZZLE REPAIR	3149734	P999	No Code Available	D009	Breakage	REPAIRED WELDS	C010	Abnormal Wear and Tear	
2896299	103RV005: REPLACE TENSION ROD	3153505	P999	No Code Available	D009	Breakage		C010	Abnormal Wear and Tear	
3492653	82RV001: N2 Blaster to Rader Valve plug	3242720	P999	No Code Available	D009	Breakage		C006	Maintenance Activity	
3116633	13RV002:Purge Air Press. Gauge Off Scale	3022204	P999	No Code Available	D009	Breakage	Gauge on Purge Air Broken	C003	Expected Wear and Tear	
3010550	12RV014: New Insulation Blanket Req.	3091050	P999	No Code Available	D009	Breakage	blanket falling apart	C003	Expected Wear and Tear	deteriorated over time
3481529	87RV220: BROKEN GND BETWEEN OUTLET PIPES	3242732	P999	No Code Available	D009	Breakage	Bonding jumper broken at lug	C003	Expected Wear and Tear	Replaced lug and reattac
3209082	103RV001: NOISE FROM RV	3149732	P999	No Code Available	D009	Breakage		C010	Abnormal Wear and Tear	







## Precision Drilling at a Glance



**257** Drilling Rigs:

Canada (135)  
U.S. (105)  
International (17)

**210** Service Rigs:

Canada (202)  
U.S. (8)

**Complementary Services:**

Camps & Catering,  
Rentals and Water  
Treatment



## Project ONE | Vision & Mission

**ONE Company, ONE Way is about unity.**

Simplify the business processes and systems to prove  
High Performance, High Value

01

Business performance improvement

04

Improved insights and information

02

Enable decision-making

05

Standardized, integrated processes and systems

03

Improved data management systems

06

ONE Company, ONE Way.

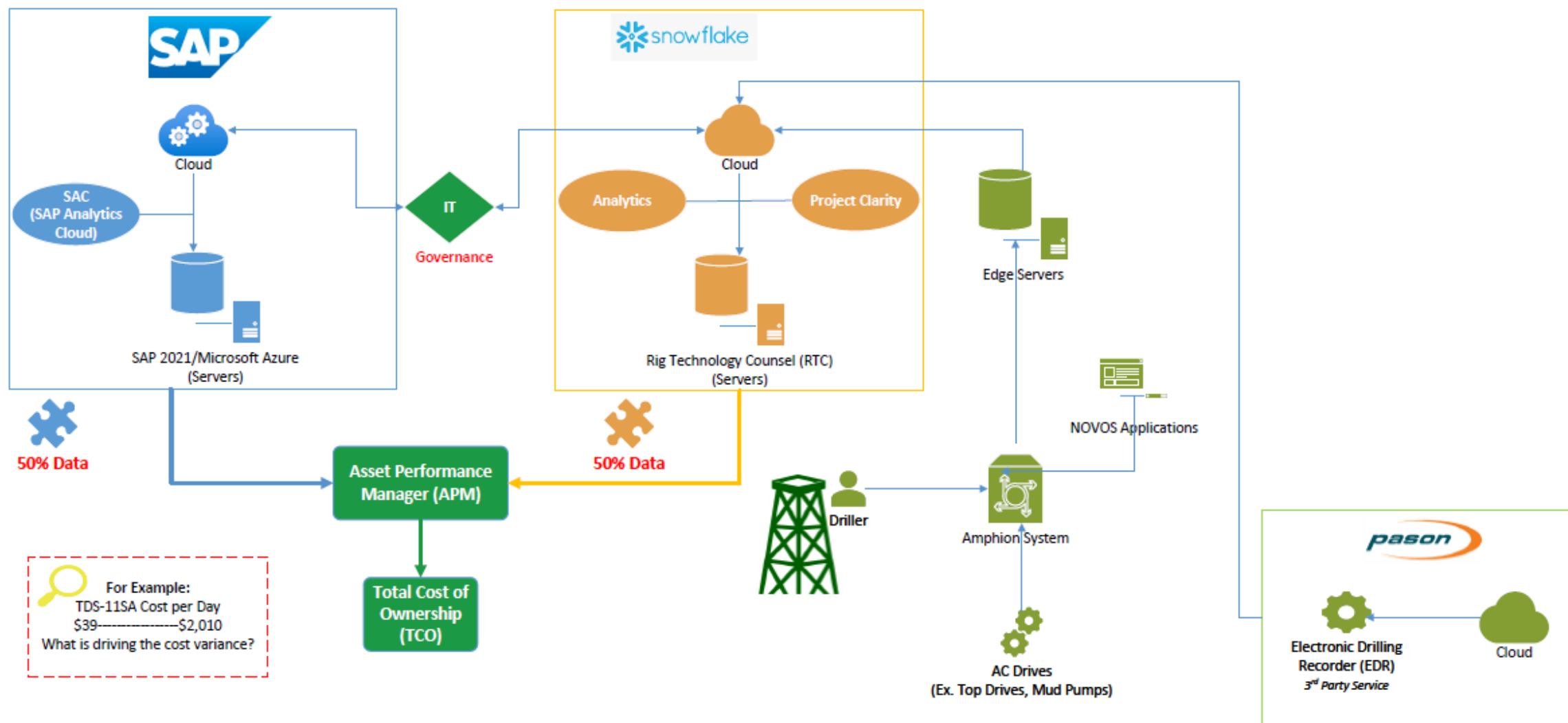
## Project ONE | Vision & Mission

**ONE Company, ONE Way is about unity.**

Simplify the business processes and systems to prove  
High Performance, High Value



## Bridging the Gap: Database Architecture





## Asset Maintenance Lifecycle – Best Case Scenario

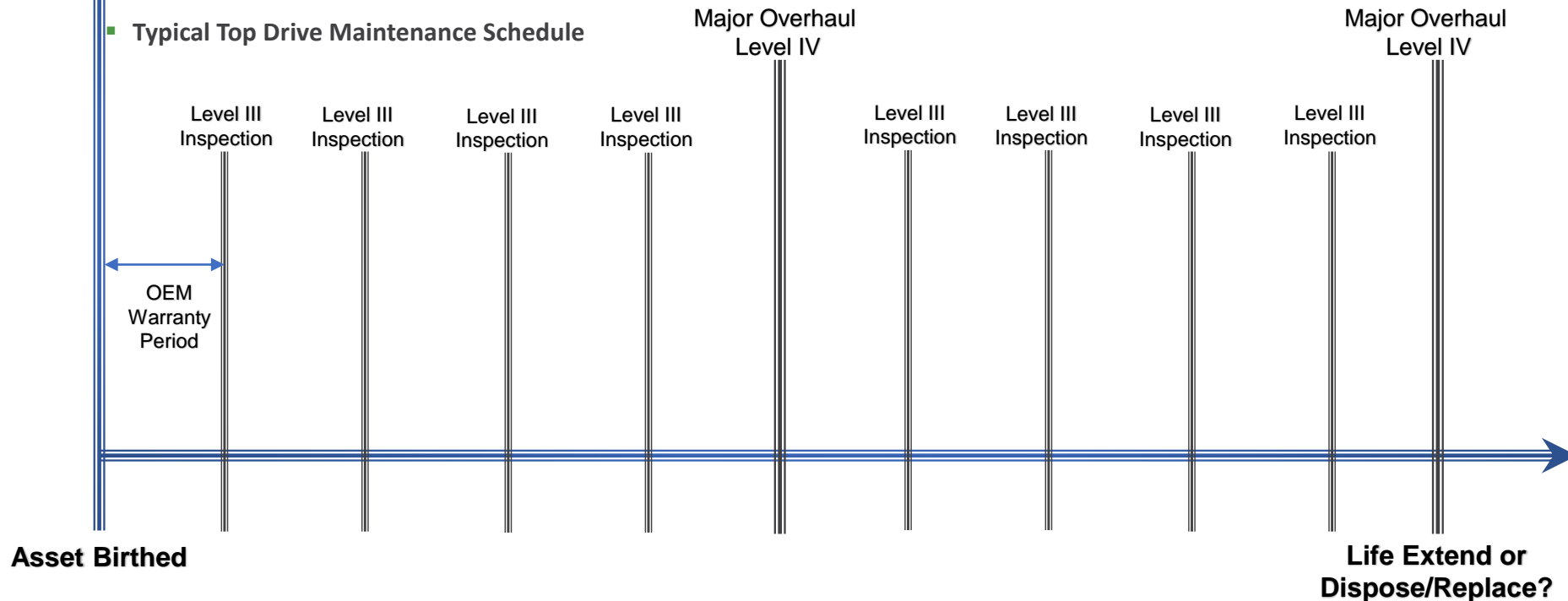
**Below graph depicts no in-service breakdowns due to:**

**All Level III & IV Inspections completed as per scheduled maintenance frequencies.**

**Full maintenance scope of works completed as per equipment maintenance procedures.**

**Equipment not run outside of operating limits.**

**Drilling process hasn't exceeded equipment thresholds.**

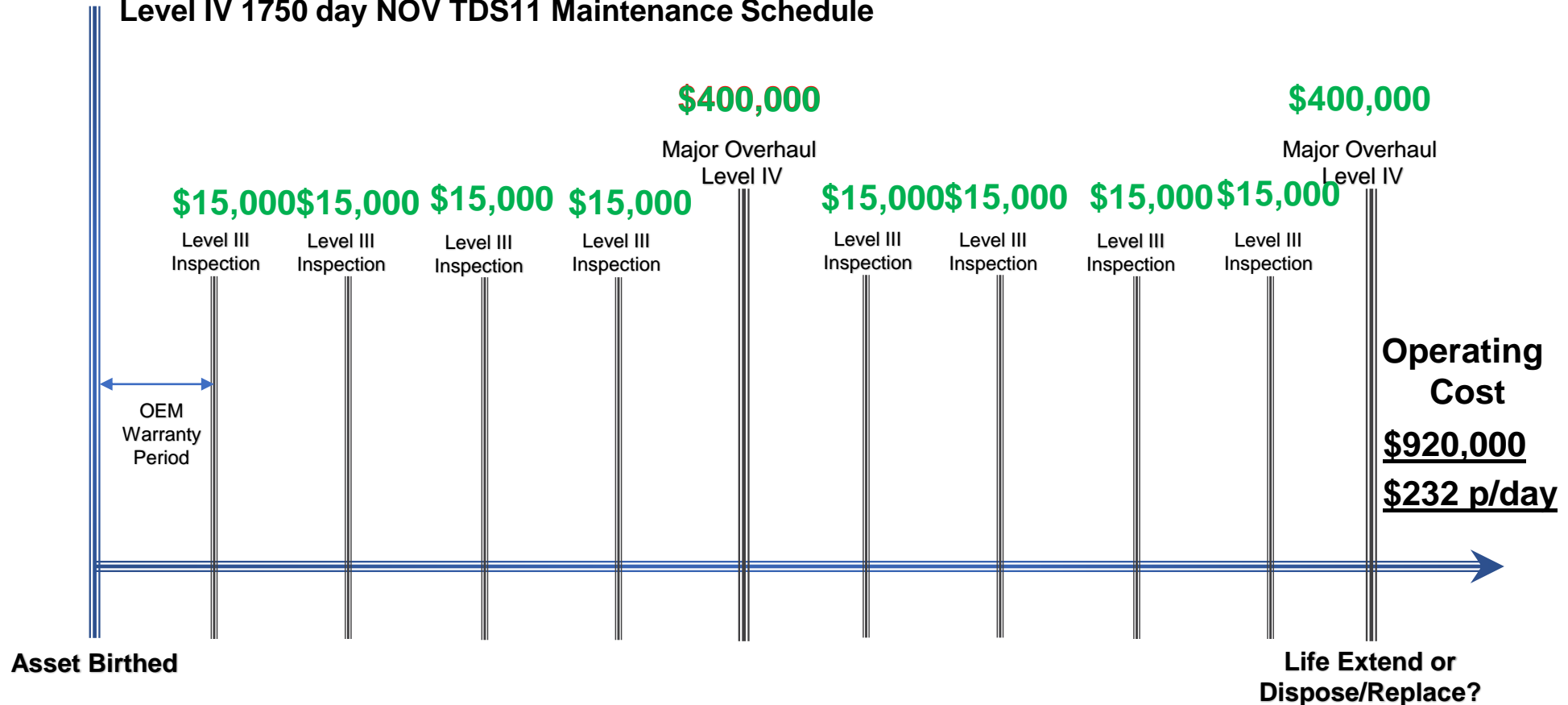


# Asset Maintenance Lifecycle – Best Case Scenario

**Below graph depicts Typical Cost of Ownership for a TDS 11 Top Drive:**

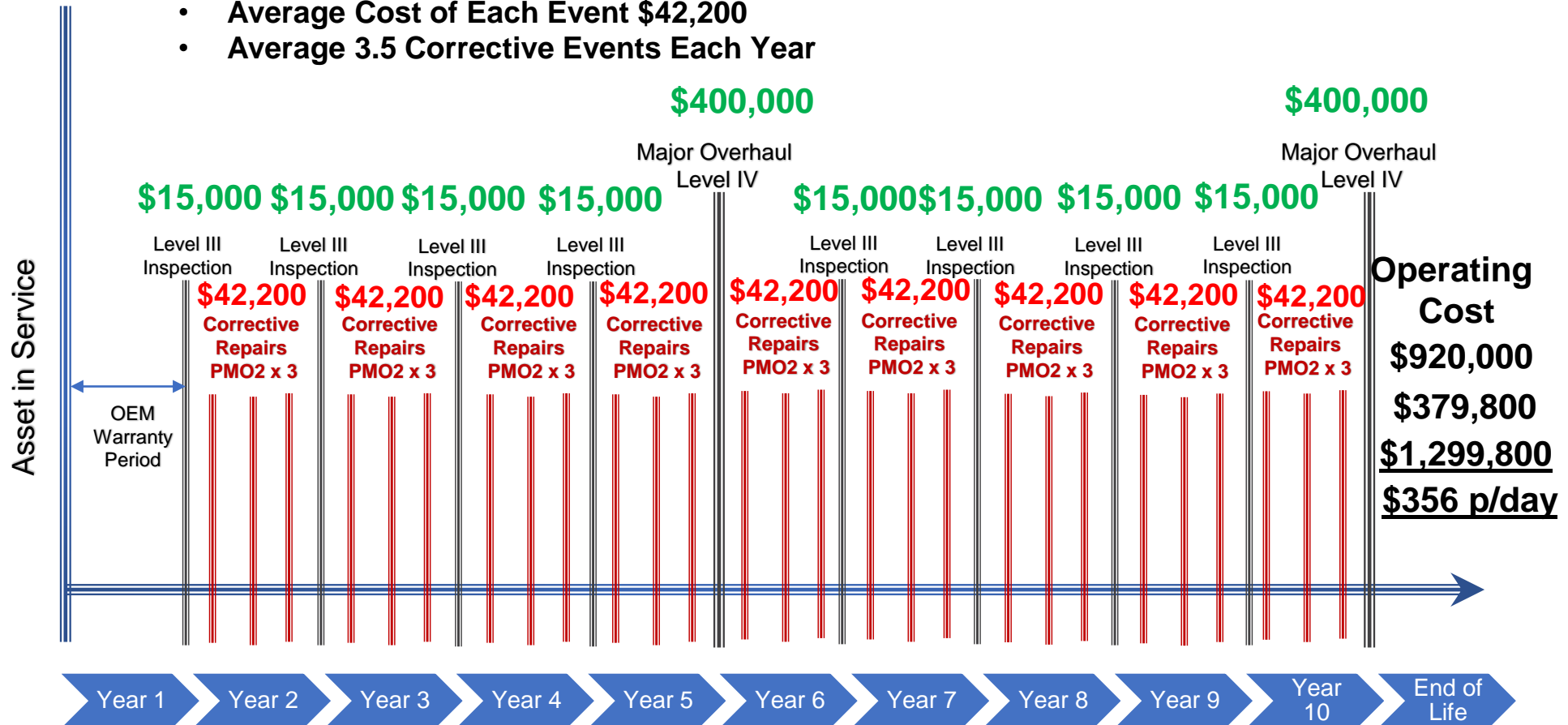
**Level III 350 day NOV TDS11 Maintenance Schedule**

**Level IV 1750 day NOV TDS11 Maintenance Schedule**



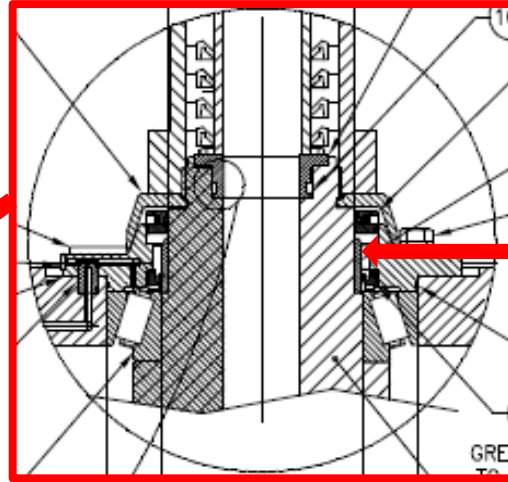
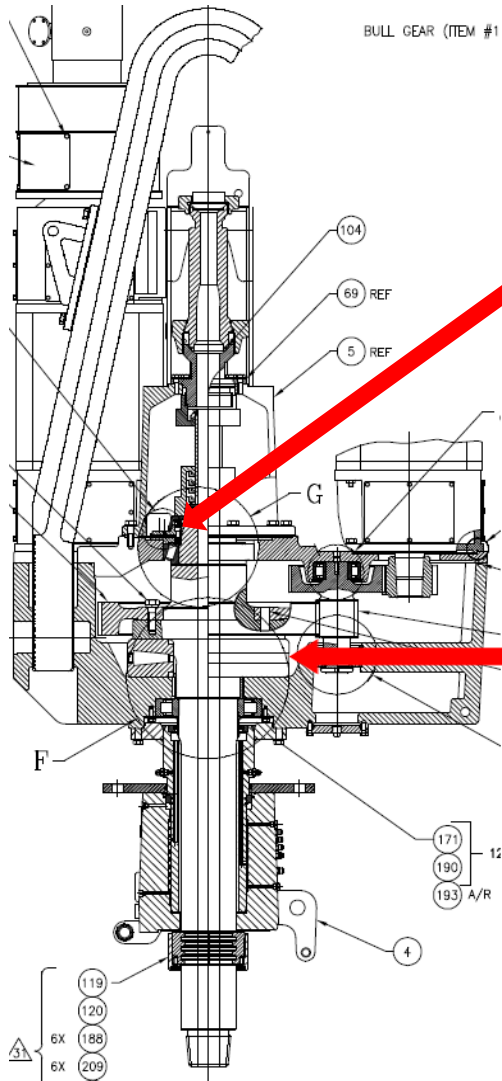
## Test Case - 2019 NOV TDS 11 Top Drive Average Corrective Costs & Events per year

- Below graph depicts Average Cost of Ownership for a TDS 11 Top Drive:
  - Level III 350-day NOV TDS11 Maintenance Schedule
  - Level IV 1750-day NOV TDS11 Maintenance Schedule
  - Average Cost of Each Event \$42,200
  - Average 3.5 Corrective Events Each Year





## Asset Financial Optimization - NOV TDS11SA Top Drive Lifecycle Costs



**Thrust Bearing**



**Quill Wear Sleeve**



### **Scheduled Asset Lifecycle Costs**

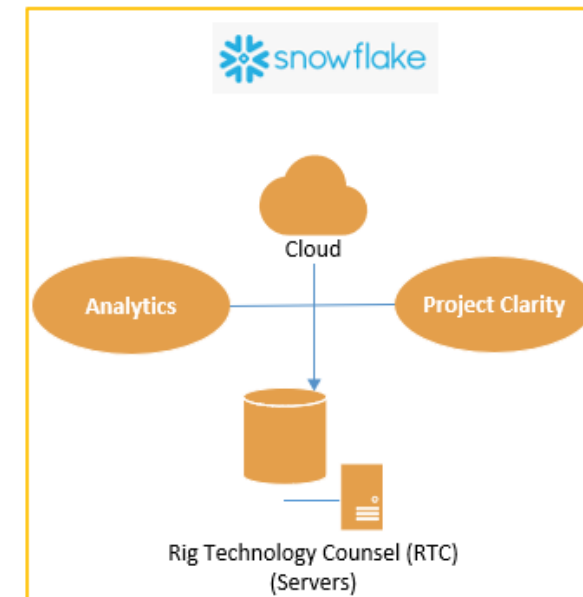
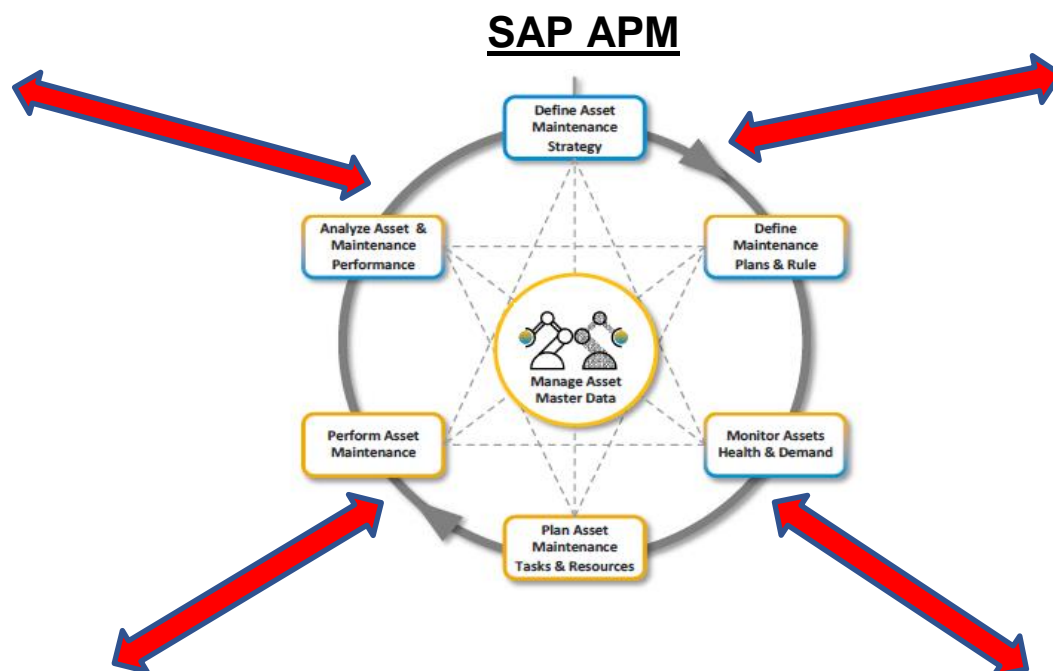
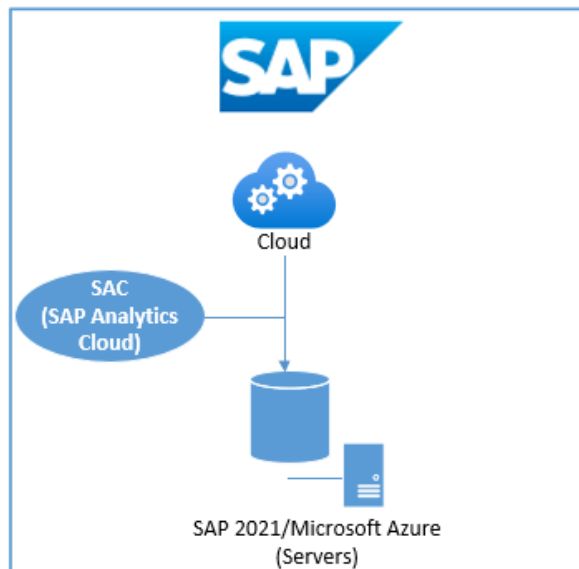
Level III = 350 Operating Days @ \$14,000 x 4 = \$56,000

Level IV = 1750 Operating Days @ 350,000 x 1 = \$350,000

Projected TCO = \$406,000 / 1750 = **\$232 /day**

**Actual TCO = \$458,595 /1000 = \$458 /day**

## Asset Financial Optimization - NOV TDS11SA Top Drive Lifecycle Costs



### Cost Per Day Model

0-350 Operating days Projected \$ Per/day = **\$0 /day**

0-350 Operating days Actuals \$ Per/day = **\$120.83 /day**

350 - 700 Operating days Projected \$ Per/day = **\$39.72 /day**

350 - 700 Operating days Actuals \$ Per/day = **\$152.97 /day**

700 - 1050 Operating days Projected \$ Per/day = **\$80.22 /day**

700 - 1050 Operating days Actuals \$ Per/day = **\$1036.46 /day**

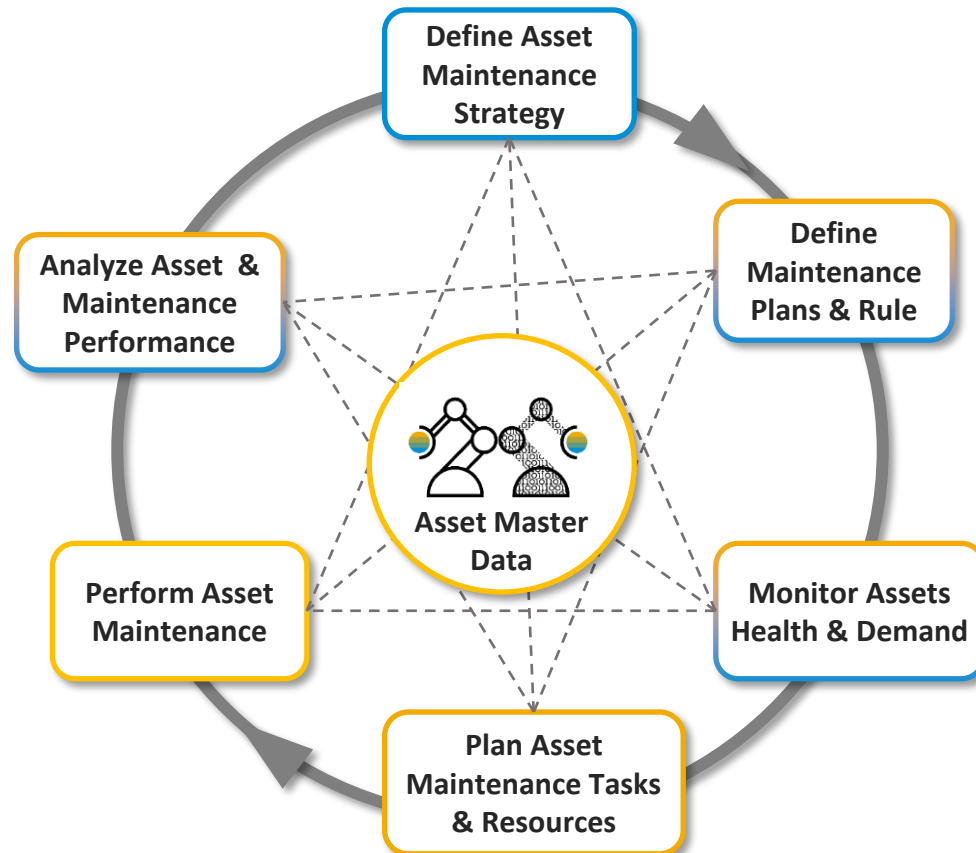
### SAP Asset Performance Management Configuration

Once the daily costs exceed the projected costs by 20% a notification would be initiated to investigate the cause of the cost increase i.e.

- Inspections completed as per scheduled maintenance.
- Full maintenance scope of works completed.
- Has equipment not run outside of operating limits.
- Drilling process hasn't exceeded equipment thresholds.

## Intelligent Asset Management with SAP: Converging Strategy & Execution

Seamlessly extend **Enterprise Asset Management** with **Asset Performance Management** along end-to-end processes: close the loop between maintenance strategy and execution to **continuously improve asset maintenance**.



■ SAP S/4HANA Asset Management  
■ SAP Asset Performance Management



If you have additional questions or would like to take a deeper dive, please join us tomorrow at **Masterclass: The APM Journey Continued**



## How to Connect with Me

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