
AVEVAWORLD

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Fuel Optimization & Sustainability: Newmont's $1.5M Diesel Savings and 3% Uptime Improvement

Presented By:

MARK BOWLES
SR. MANAGER
Newmont™

CHRIS KIDDLE
DIRECTOR - ANZ
CEREBULB

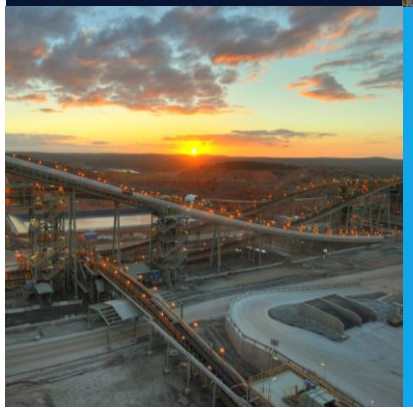
Newmont at a Glance

THE INDUSTRY'S LEADING GOLD AND COPPER BUSINESS

Founded in
1921

10
Tier 1 Operations

#1
Gold producer in the world. Listed in the S&P 500 Index



+40K
Employees and contractors

135.9Moz
Industry's largest gold reserves

Go-Forward Portfolio Focused on Tier 1 Operations

TIER 1 OPERATIONS**

10

Leading portfolio of Tier 1 assets to support decades of profitable and responsible gold

WORLD-CLASS COPPER-GOLD PROJECTS

6

Red Chris Block Cave, Wafi-Golpu Block Cave, Yanacocha Sulfides, Galore Creek, Nueva Unión and Norte Abierto

ANTICIPATED DIVESTITURES

6

CC&V, Éléonore, Musselwhite, Porcupine, Akyem and Telfer

**Newmont's minority ownership interest is 38.5% of Nevada Gold Mines and 40% of Pueblo Viejo. **See endnotes re Tier 1 assets.*

Located in the World's Most Favorable Mining Jurisdictions

Lihir

PAPUA NEW GUINEA

134Koz

FY23 Gold Production*

22 years

Gold Reserve Life

17.5Moz

Gold Reserves*

20.2Moz

Gold Resources*

Location: Niolam Island, 900 km from Port Moresby, Papua New Guinea

Metals: Gold

Operations: Open pit

Process: Most of the ore that Lihir produces is refractory and treated using pressure oxidation before the gold is recovered by a conventional leach process.

Date of First Production: 1997

**As of December 2023*

Project Goals

Digital to improve Carbon Foot & Equipment Health

Digitalization

Collect & Store & Scale

- Single Source of truth from equipments
- Integration of ERP, FMS information
- Data Standards and Data Structure

Equipment Health

Monitor & Predict & Plan

- Break Down to Condition Based Analytics: Operator - Mechanical - Electrical
- Analytics & Notification
- Visualizations & Reports

Sustainability

Efficiency & Optimization

- Monitor Fuel Consumption
- Extension of Component Life
- Monitor & Quantify

Selected A Transformational Partner In CEREBULB

CereBulb is a global company that helps organizations navigate the ever-evolving world of digital transformation. Our mission is to act as a catalyst, empowering businesses to leverage technology and data to achieve their goals

Start-Up of the Year

Entrepreneur of the Year

GLOBAL ENERGY DIGITALISATION CONCLAVE

3

Global Locations

USA IND AUS

75+

Technology Portfolio

Open Source & Licensed

140+

Team of

Global Experts

Project Management | Software Development | IoT | Analytics |Strategy Building

450+

Years Combined Industrial Experience

AVEVA Solution Provider

Technology Portfolio

aws, salesforce, tableau, mongoDB., React, PostgreSQL, Microsoft Azure, Power BI, Grafana, python, R, Google Cloud

Schneider Electric

SI Partner

databricks

Partner

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Operating & Owning Cost -789D

CAPEX to OPEX Cost Mapping

Purchase Price

USD

$5.5 million to $6.5 million

Typical mine has around 40 to 50 Trucks

Total Operating & Owning Cost USD $600 to $1200 Per hour

Owning Cost in USD

Depreciation	$ 500K to $900 K
Insurance	$ 50K to $100 K
Finance Cost	$ 360K to $720K
Total Owning Cost	**$910,000 to 1.7 Million**

Operating Cost in USD

Fuel	$ 500K to $800 K
Maintenance	$ 400K to $600 K
Tires	$ 100K to $320K
Labor	$ 200K to $600K
Consumable	$ 75K to $100K
Total Operating Cost	**$1.2 Million to 2.2 Million**

*These are indicative numbers not Newmonts

Challenges to Solutions

Challenges to Opportunities

Challenges

01 Connectivity

02 Single Source of Truth

03 InterOperability

04 Analytics at Scale

05 Action

Solutions

Automated data collection at site from equipment using OEM (CAT) hardware

Converting encrypted data and storing them at Scale in PI System monitoring data processing

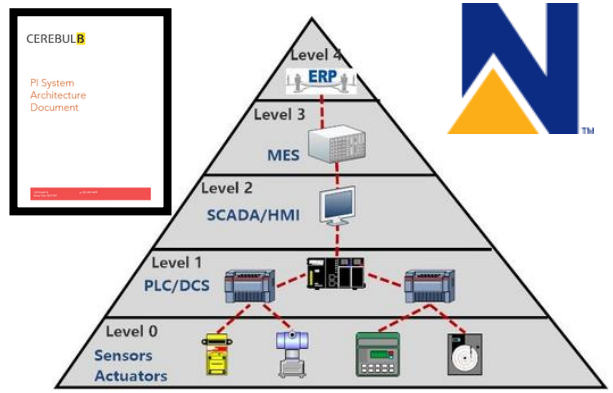
Create a data standard aligned with ERP (SAP) structure (AF, ERP - Metadata, FMS)

Around 50+ Real Time analytics from simple to Complex analytics (Fuel, Production, Operator & Mechanical)

Driving Action at the site from Insights - Mining Subject Matter Expert handling change management

Architecture at High Level

ISA 95 & Data from Multiple Source (End to End Visiblity)



ISA 95 Architecture

No. of Equipment

40

CAT | 789D

Data Types

5

Payload
Faults
FMS
ERP

Time Series: 1s & 1hr

Data Points

300 M

Processed Daily

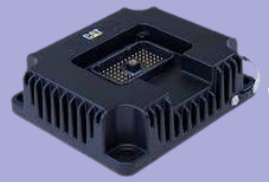
Analytics

80

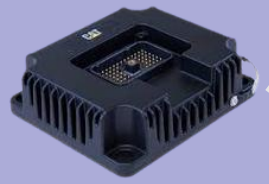
Simple to Complex

Zone 1 - OT Network

Fleet Management



HIM - VIMS



PLE

Dealer CAT

Batch File
Collection Server
File Decryption
Process

Zone 2 - iDMZ

DMZ

PI Interface
&
Data Processing
Middleware

Zone 3 - IT Network

IT Network

AVEVA PI DATA
Archive (HA)

AVEVA PI Asset
Framework

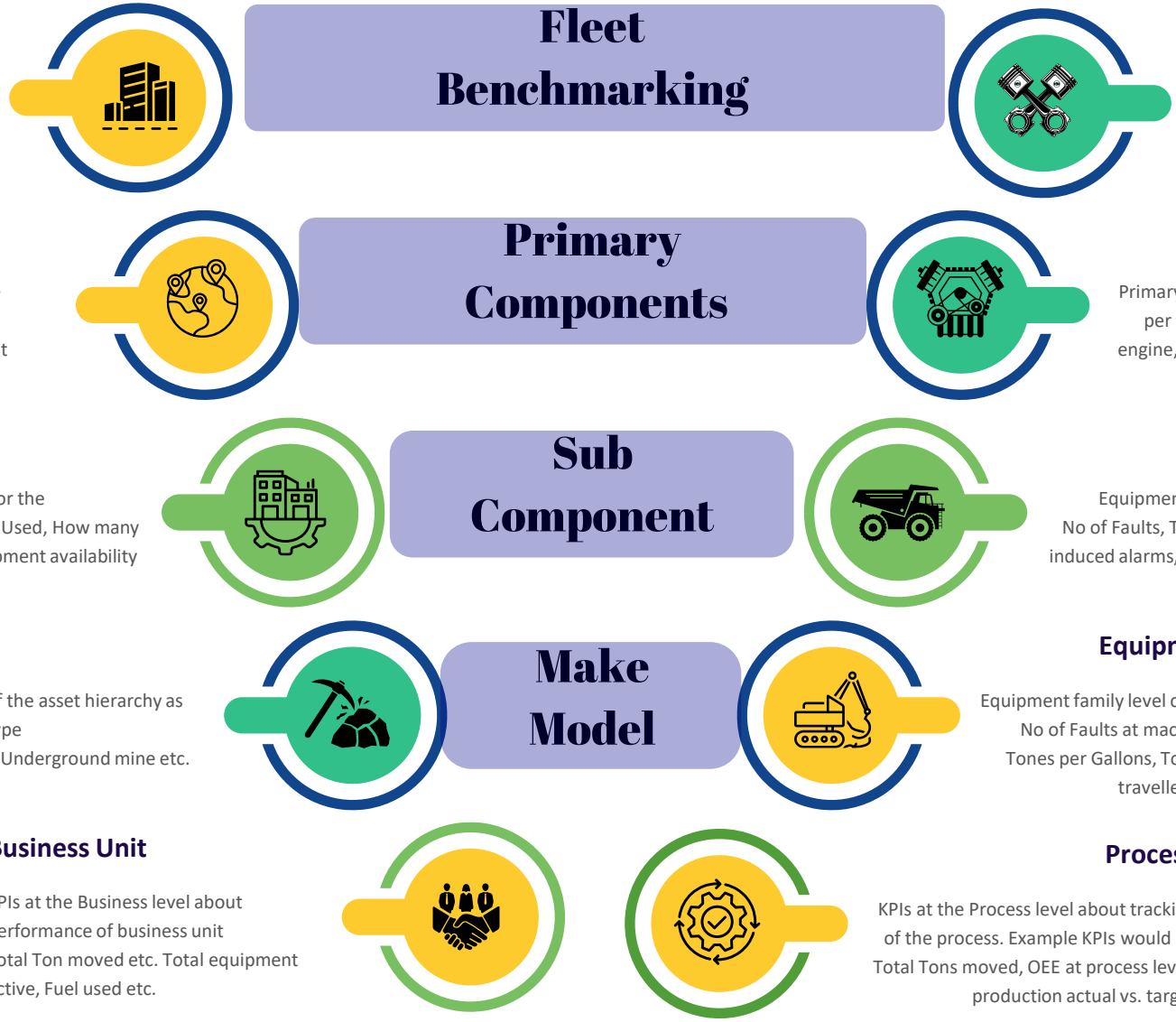
AVEVA PI Vision

PI RDBMS
(FMS & ERP)

Users

Data Standard & Structure

Data Interoperability of Data across all Systems



01 Enterprise

Highest level of hierarchy to get visibility of key KPIs, Production, availability etc.

02 Country

Country level roll-ups, KPIs for the performance of organization
Fuel Used, Production , equipment availability etc.

03 Site

Site level roll-ups, KPIs for the performance of siteFuel Used, How many faults Production , equipment availability etc.

04 Mine Type

Segmentation of the asset hierarchy as per the mine type
Open Cut Mine, Underground mine etc.

05 Business Unit

KPIs at the Business level about performance of business unit
Total Ton moved etc. Total equipment active, Fuel used etc.

Subcomponent 10

Subcomponent level attribute separation for each sensors such as air filter, coolant temp etc.

Primary Component 09

Primary component level segregation as per the SAP component code such as engine, transmission, brakes, final drive, suepsnsion

Machine 08

Equipment level calculation & KPIs
No of Faults, Trend Violation, Operator induced alarms, Total Tons moved, Total Fuel Consumed

Equipment Family 07

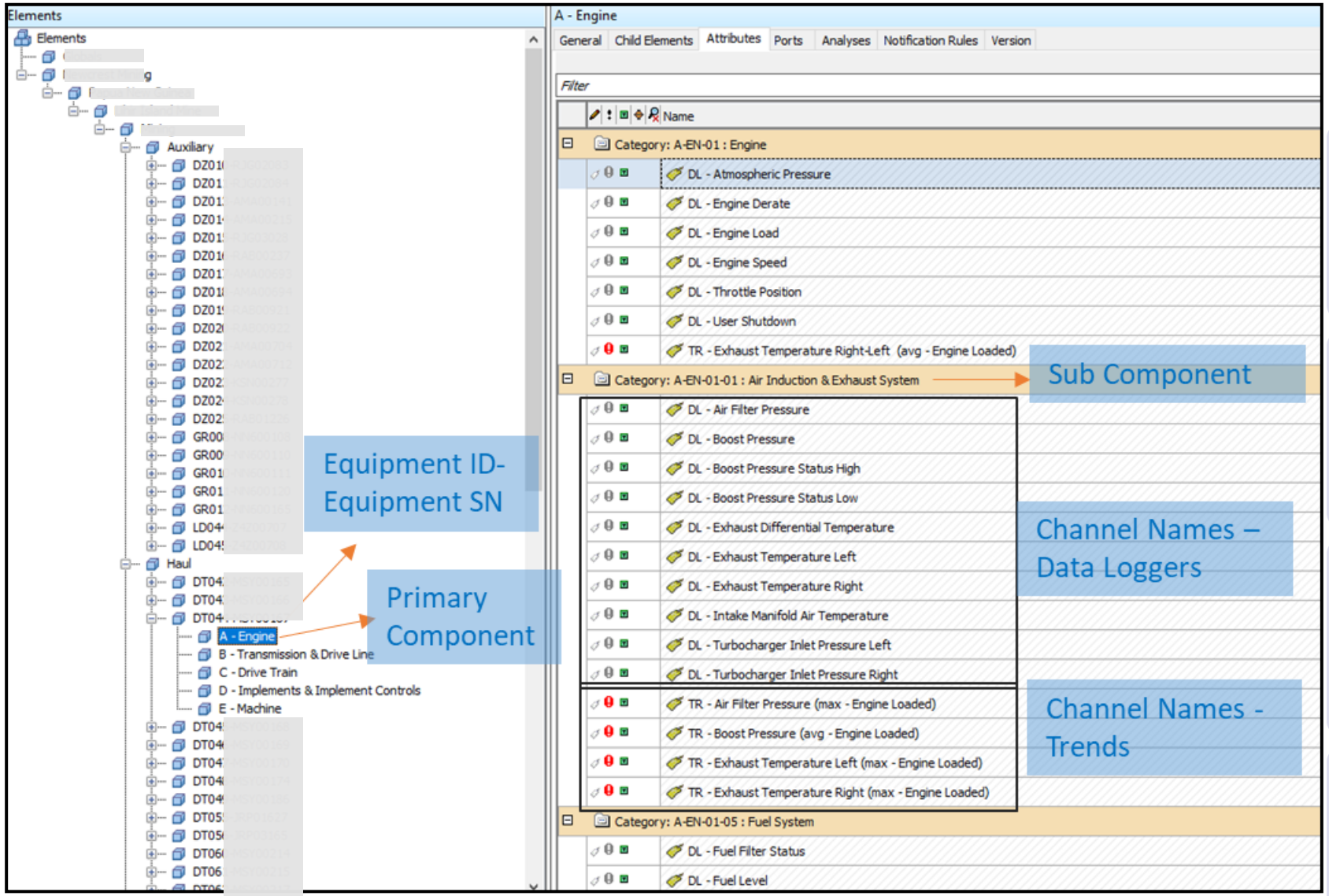
Equipment family level calculation & KPIs
No of Faults at machine family level, Tones per Gallons, Tones per distance travelled, 10-10-20 rule.

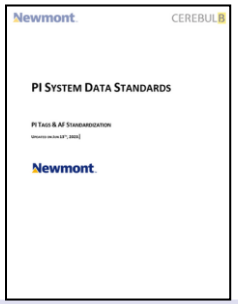
Process 06

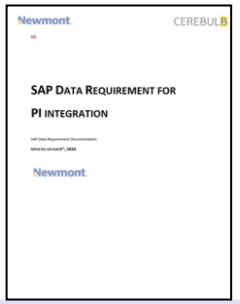
KPIs at the Process level about tracking of the process. Example KPIs would be Total Tons moved, OEE at process level, production actual vs. target

Data Standard & Structure

Asset Frame Work (Templates to Element)







INTEGRATION OF THE ERP CODES INTO AF STRUCTURE

SAP PM SCHEDULE AND WO INFORMATION

FMS CURRENT STATUS AND FUEL FILL LINE INFO

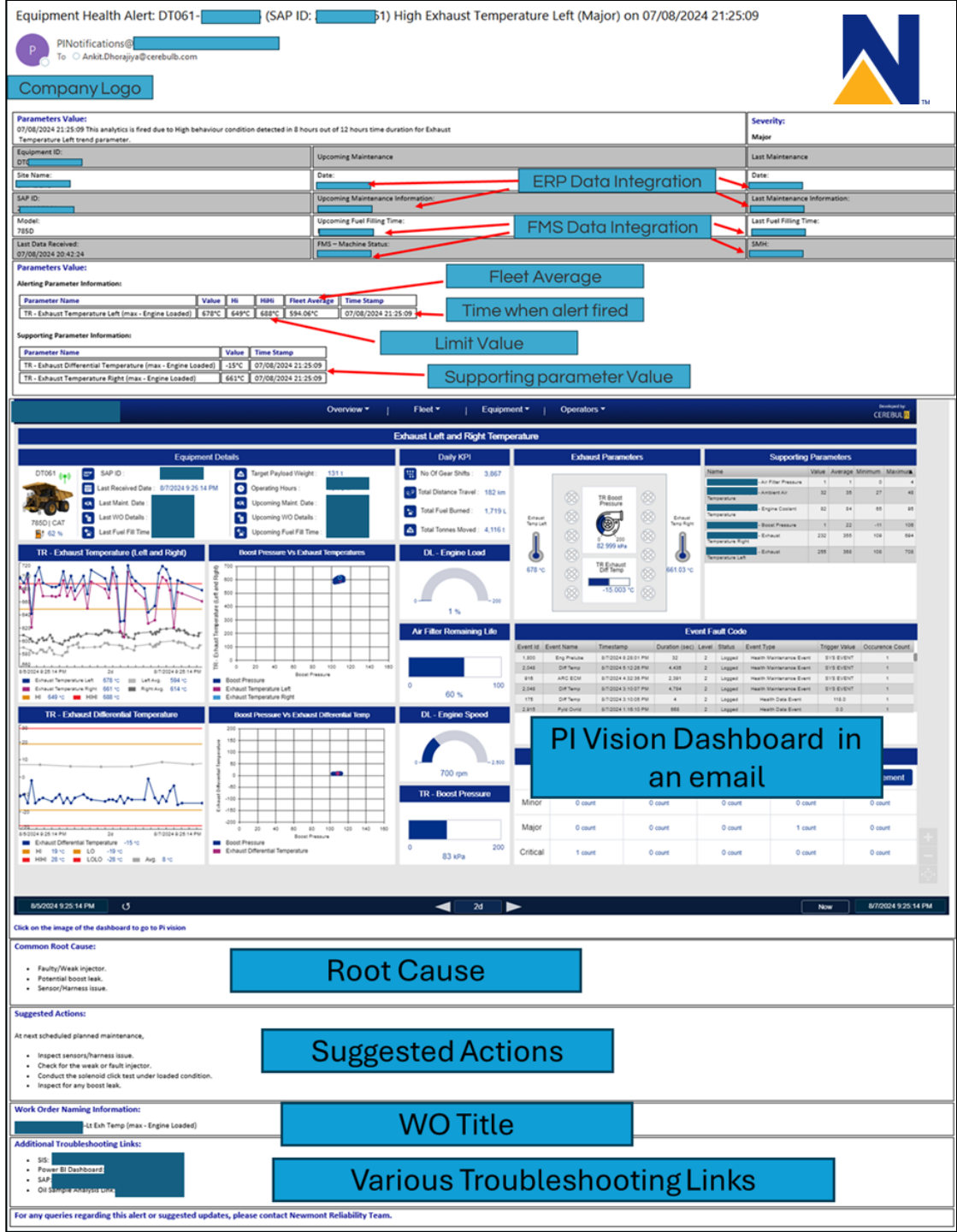
ASSET META DATA INFORMATION

Prescriptive Notifications

Email to ERP Integration

- **Integration of the ERP (SAP) and FMS (Fleet Management System) data into the PI System**
- **Detailed Notifications with supporting parameter and Prescriptive Notifications**
- **Meta data integration from ERP**
- **Embedded PI Vision display**
- **Integration of the Root Cause and Suggested Actions into the Notifications**
- **SAP integration possible**
- **Integration of the Support material links (Fluids data, O&M manual, BI dashboard, ERP Links)**

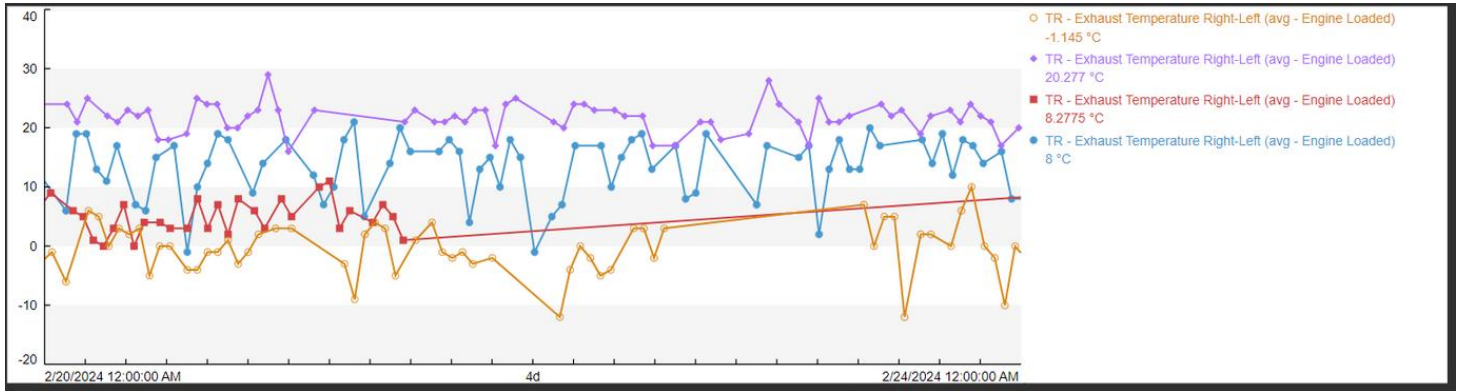
Efficiency in creating recommendation 2+ hours
Reviewing data of fleet of around 50+ trucks every day vs. once a week due to separate data sources.



Value Story Fuel Savings

lean Fuel Burn due to Low Boost Pressure

- Investigating engine to ensure it performs correctly on the haul cycle, the two major clues are Boost pressure and Exhaust temperature difference between the right and left exhaust temperatures.
- As you will notice there is a large difference in exhaust temperatures and a variance of over 12 kPa in boost pressures.
- The first clue is the boost pressure. The maintenance team needs to investigate the engine for boost leaks. Boost leaks will reduce power from the truck, and it will burn an additional 10-20 liters of additional fuel per hour.



Path	Description	Value	Units	Trend	Average	Minimum	Maximum	Range
Island Mine\Open Pit Mining\Mining\Haul\Dump Truck\DT063 Engine\TR - Exhaust Temperature Right-Left (avg - Engine Loaded)	Rt-Lt Exh Temp (avg - Engine Loaded)	-1.145	°C		0.33767	-12	10	22
Island Mine\Open Pit Mining\Mining\Haul\Dump Truck\DT065 Engine\TR - Exhaust Temperature Right-Left (avg - Engine Loaded)	Rt-Lt Exh Temp (avg - Engine Loaded)	20.277	°C		21.667	16	29	13
Island Mine\Open Pit Mining\Mining\Haul\Dump Truck\DT072 Engine\TR - Exhaust Temperature Right-Left (avg - Engine Loaded)	Rt-Lt Exh Temp (avg - Engine Loaded)	8	°C		13.527	-1	21	22
Island Mine\Open Pit Mining\Mining\Haul\Dump Truck\DT083 Engine\TR - Exhaust Temperature Right-Left (avg - Engine Loaded)	Rt-Lt Exh Temp (avg - Engine Loaded)	8.2775	°C		4.8326	0	11	11

Path	Description	Value	Units	Trend	Average			
[redacted] Open Pit Mining\Mining\Haul\Dump Truck\DT063-[redacted]A - Engine\TR - Boost Pressure (avg - Engine Loaded)	Boost Pres (avg - Engine Loaded)	119.9	kPa		109.9			
[redacted] Open Pit Mining\Mining\Haul\Dump Truck\DT065-[redacted]A - Engine\TR - Boost Pressure (avg - Engine Loaded)	Boost Pres (avg - Engine Loaded)	116.9	kPa		112.9	75.0	129.5	54.5
[redacted] Open Pit Mining\Mining\Haul\Dump Truck\DT072-[redacted]A - Engine\TR - Boost Pressure (avg - Engine Loaded)	Boost Pres (avg - Engine Loaded)	118.3	kPa		104.5	34.0	129.5	95.5
[redacted] Open Pit Mining\Mining\Haul\Dump Truck\DT083-[redacted]A - Engine\TR - Boost Pressure (avg - Engine Loaded)	Boost Pres (avg - Engine Loaded)	84.3	kPa		88.0	63.0	119.0	56.0

Low Boost pressure causing more leaner fuel burn

Slow truck across the fleet

Value Story - Fuel Savings Continued

Fuel Benchmarking for Fleet

Truck	Fuel Sum	SMH Difference	Average Fuel Rate (Operational Hours)	Additional fuel burned per HR	Extra fuel burned	Diesel price per L	Cost of additional fuel burned
_DT0	40116.88002	427.0039063	93.9	18	7,686	$1.70	$13,066
_DT0	39810.29002	447.9492188	88.9	13	5,811	$1.70	$9,878
_DT0	41896.03996	474.2304688	88.3	12	5,688	$1.70	$9,669
_DT0	35565.22998	406.8125	87.4	11	4,466	$1.70	$7,592
_DT0	40575.92004	464.34375	87.4	11	5,104	$1.70	$8,676
_DT0	42125.10007	498.2578125	84.5	9	4,482	$1.70	$7,619
_DT0	46336.78001	549.2890625	84.4	9	4,941	$1.70	$8,400
_DT0	41688.80007	494.4980469	84.3	8	3,952	$1.70	$6,718
_DT0	42965.44999	516.234375	83.2	7	3,612	$1.70	$6,140
_DT0	34188.29002	414.78125	82.4	6	2,484	$1.70	$4,222
_DT0	46287.42996	562.2109375	82.3	6	3,372	$1.70	$5,732
_DT0	9307.390011	114.0234375	81.6	5	570	$1.70	$969
_DT0	47046.56999	578.109375	81.4	5	2,890	$1.70	$4,913
_DT0	35285.72003	434.2421875	81.3	5	2,170	$1.70	$3,689
_DT0	34241.34996	421.890625	81.2	5	2,105	$1.70	$3,578
_DT0	39328.5501	488.7460938	80.5				
_DT0	43195.80005	538.9140625	80.2				
_DT0	31501.73999	393.203125	80.1				
_DT0	25634.41002	322.5390625	79.5				
_DT0	37608.92003	478.2734375	78.6				
_DT0	45401.74006	580.2226563	78.2				
_DT0	35212.77999	452.8417969	77.8				
_DT0	40432.29002	526.8515625	76.7				
_DT0	29894.71995	393.5078125	76.0				
_DT0	35794.77003	488.0234375	73.3				
_DT0	31800.21004	441.0703125	72.1				
_DT0	37388.86	542.84375	68.9				
_DT0	0	568.15625	0				
				Total	59,333		$100,861

Engine which are burning high fuel and having boost related issues

This is what the ideal trucks should look like

Cost Avoidance

Data normalization by operating hours, operating conditions and operation during same area of mine

Fuel Usage Reduction up to 59,000 Liters per month has been identified which eluates to 5% Fuel consumption

5% Fuel Saving

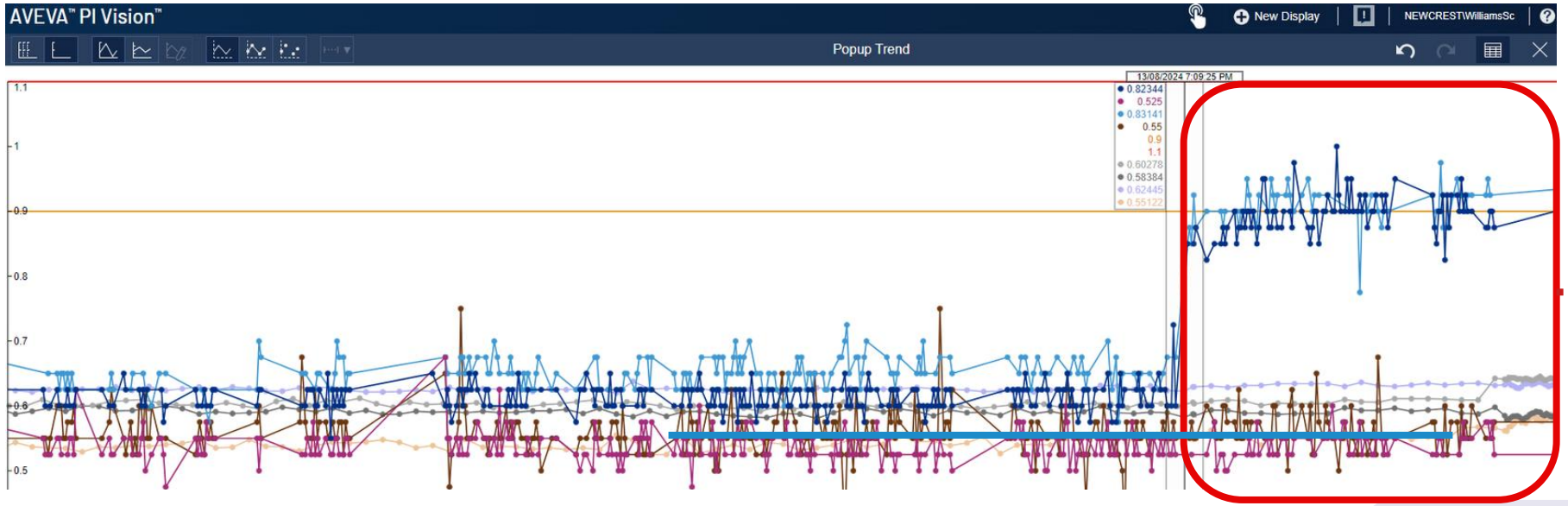
Total Emission
159 Tons of CO^2 per month

$100k per month

Cost avoided

Value Story - Transmission Failure

Abnormal shift time detection



Aug 13

Higher Shift Time
of
Gear Shift 2 to 3
Gear Shift 4 to 5

Abnormal | **Documentation**

Aug 13

PI notifications for
Abnormal Shift &
High Transmission Oil Temp

Aug 21

Fluid Sample revealed
High Oxidation &
Elevated Nonferrous Material in
the Trans Screen

Cost Avoidance

Abnormal Shift led to high Cycle Time. (High Shift can cause machine to run slow)

100 hrs Saving — Production Downtime Savings (Failure of component)

$120k — Parts Cost Avoidance (Planned Downtime vs. Unplanned)

Low Engine Oil Pressure

Data Interoperability of Data across all Systems

Abnormal → **Documentation**

Aug 01 — Suboptimal oil pressure; exhaust temperature disparity

Aug 13 — Optimization Component longevity yielded

Cost Avoidance

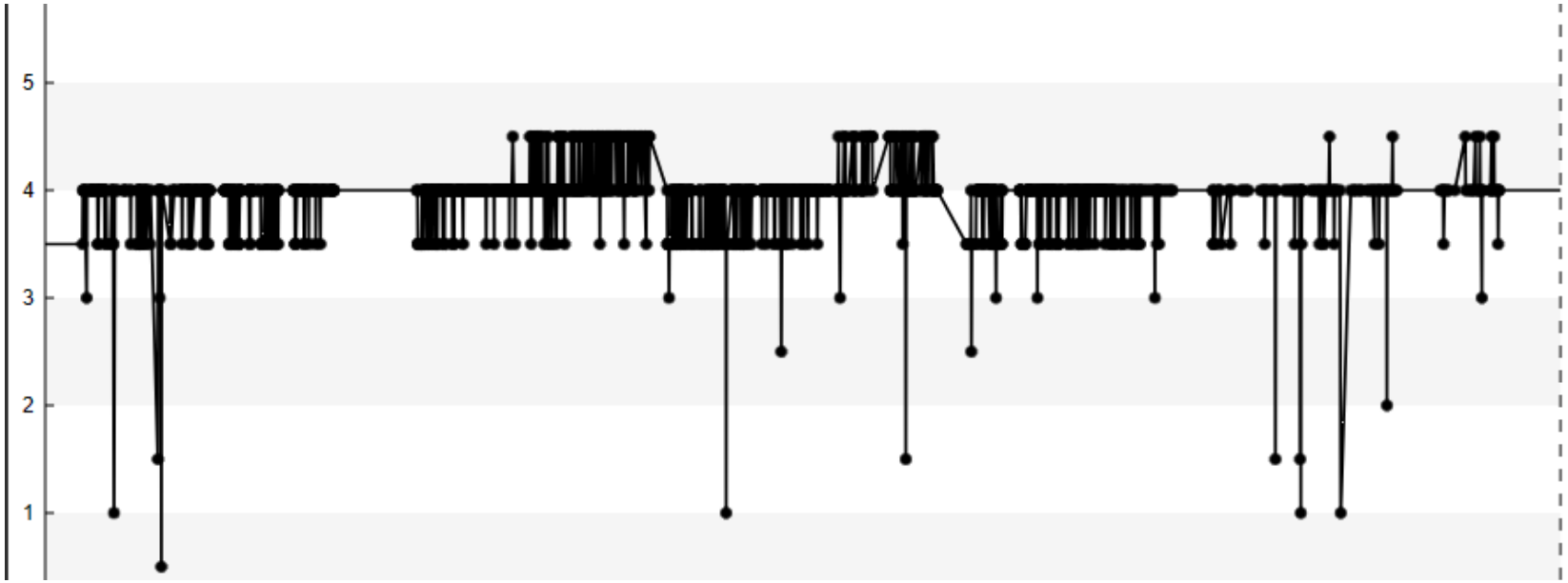
Report
Severely compromised injector seals and a fractured rocker arm, resulting in a non-firing injector, necessitated immediate component replacement, impacting planned maintenance schedules

70 hrs Saving — Production Downtime Savings (Failure of component)

$175k — Parts Cost Avoidance (Planned Downtime vs. Unplanned)

Optimization of Consumables

Extension of the component life



Engine filter behaviour for 6 months

Cost Avoidance

Condition Based Change of Filters → Extend servicing by over 1,000 -1,500 hours → Reduce Labour & Part Cost

$4.3k to $6.5k Parts reduction per truck per anum

Fuel Optimization & Sustainability: Newmont's $1.5M Diesel Savings and 3% Uptime Improvement

Challenge

- Absence of the single source of truth for the mobile fleet data
- Use of the analytics in the field
- Data interoperability was minimal
- Change Management

Solutions

- PI System was implemented to capture mobile fleet data and various analytics were written and enabled by SME's
- To implement action on insights generated by PI Analytics, change management, coaching and mentoring was critical

Result

- Availability Improvement - 3%
- Fuel Reduction Opportunity Identified - 5% ($1.5 M)
- Emission Reduction Opportunity Identified - Significant Tons of CO^2
- Data Driven decision making

Newmont™

THANK YOU

Digitalization Partner

CEREBULB