

**ENABLING MOBILE ASSET CONNECTIVITY AND DATA
ACCESS AT AGNICO EAGLE'S DETOUR LAKE MINE**
NORTHERN ONTARIO, CANADA
A CASE STUDY



SUSTAINABILITY

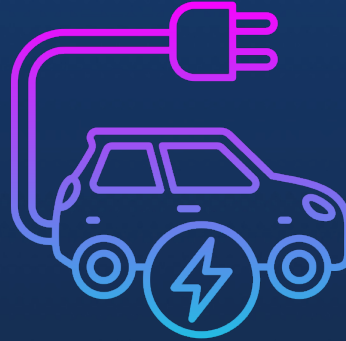
ESG FACTORS ARE BECOMING CRITICAL FOR THE INDUSTRY

1.1 Gt CO₂e



Annual GHG emissions of heavy-duty mining vehicles globally

72 kg



Weight of CO₂ intensive critical minerals in a smaller EV battery

\$1.2 B



Annual cost of mining safety incidents in the US alone

MAINTENANCE

EQUIPMENT MAINTENANCE COSTS IN MINING STRONGLY IMPACT PROFITABILITY

50%



Share of maintenance in the operating costs in resource industries

\$130,000



Cost of one hour of equipment downtime in mining

43%



Mining companies said they will invest in predictive maintenance in short term

DIGITIZATION IN MINING

High potential



Digitization-related improvement across operational KPIs is 10%-30%

Strong traction



Growing number of CEOs includes automation and digitization goals in long-term corporate strategy

DIGITIZATION BARRIERS

Remote locations



Connectivity problems due to remote locations,
high network investment required

Multi-vendor fleets



Different data streaming specifications prevent
collection data on the single platform

DETOUR LAKE MINE

Largest gold mine in Canada

- Open-pit mine operated by Agnico Eagle
- Annual diesel consumption: 80 M litres (estimate)
- Annual emissions: 216,000 tonnes of CO₂e (estimate)

Private LTE/5G

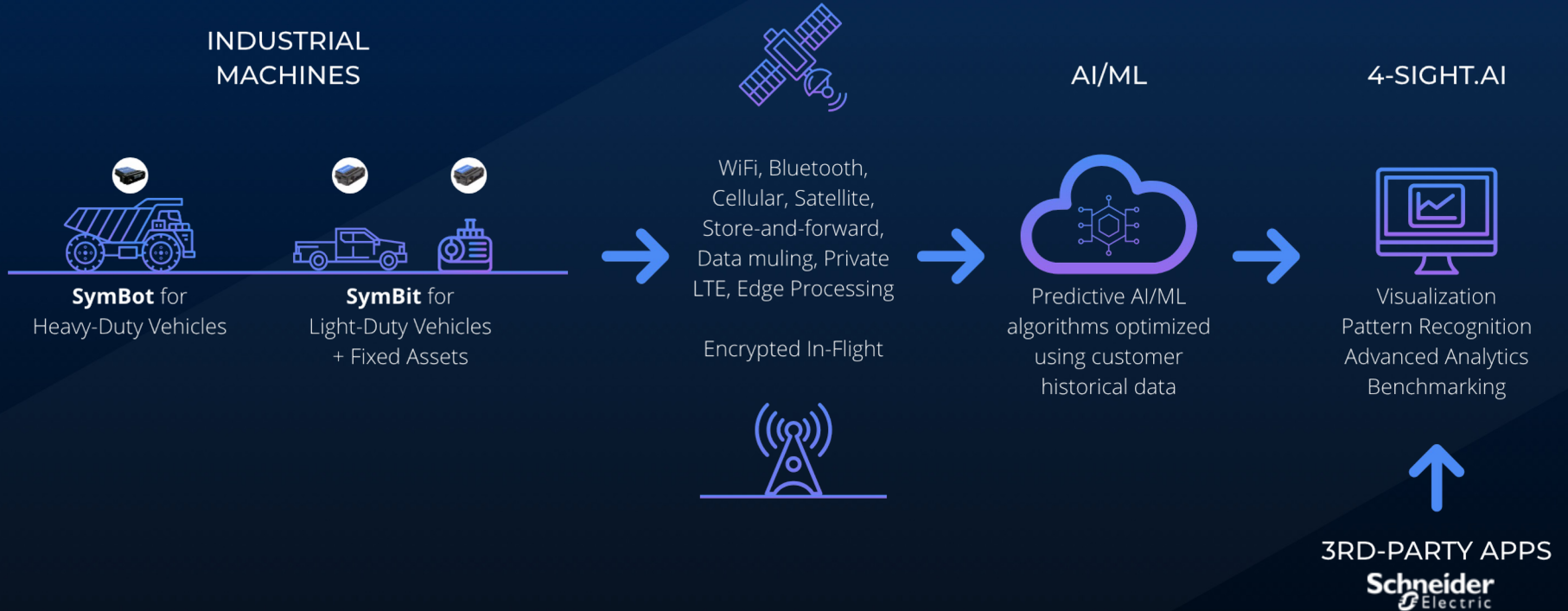
- Built by Rogers
- Covers most of the mine site (but not all)

Digitization barriers

- Remote location (Northern Ontario, beyond the reach of consumer cellular networks)
- Sparse territory (some vehicles operate outside of the connectivity)
- Mixed fleet: CAT trucks (42), CAT loaders and shovels, Epiroc drills



4-SIGHT.AI: IMPLEMENTED SOLUTION



SAVING FUEL



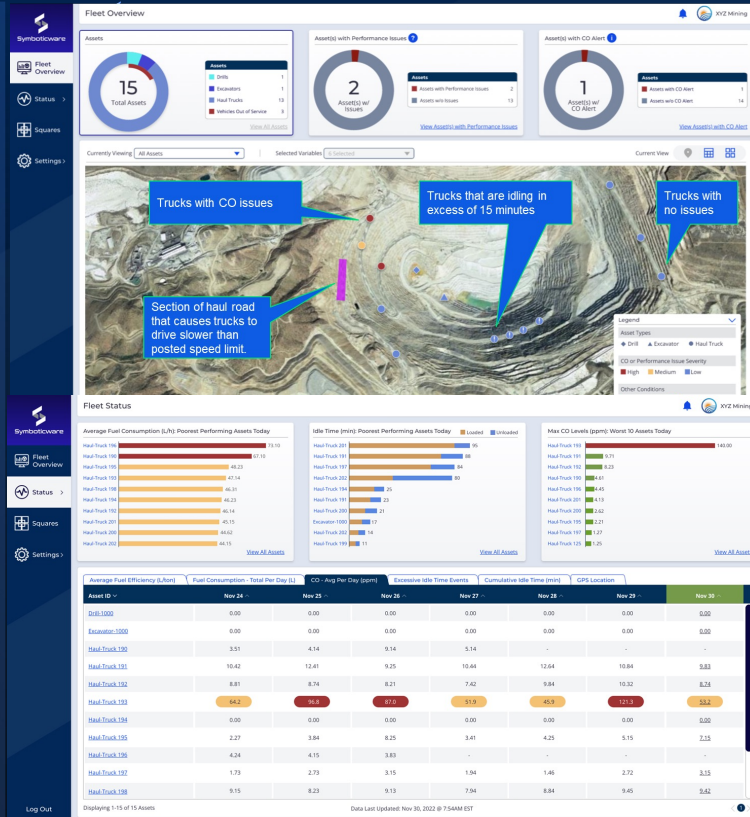
SAVING FUEL

Situation

- Annual diesel consumption: 80 M litres (approx.)
- Annual fuel cost: USD \$115M
- 350 litres/hr (haul trucks)

Objective

- Reduce fuel consumption (initial goal is 2%, stretch goals of 5-10%)



Impact

- Idling prevention
- Greater speeding control
- Road condition awareness

Symboticware's Role

- Real-time insight into operator activities (idling, driving behavior)
- Haulage road condition data
- Real-time data access

PROMOTING SAFE OPERATING ENVIRONMENT



PROMOTING SAFE OPERATING ENVIRONMENT

Situation

- Exceeded CO concentration limits in some haul trucks' cabs

Objective

- Ensure that operating environment in the cabs is safe all times

Haul-Truck-254	Haul-Truck-259
0.00 ppm CO	0.00 ppm CO
440.00 Kpa	564.00 Kpa
16.80 L/h	29.70 L/h
75.00 °C	78.00 °C
0.40 Kpa	2.35 Kpa
10.00 Kpa	24.00 Kpa

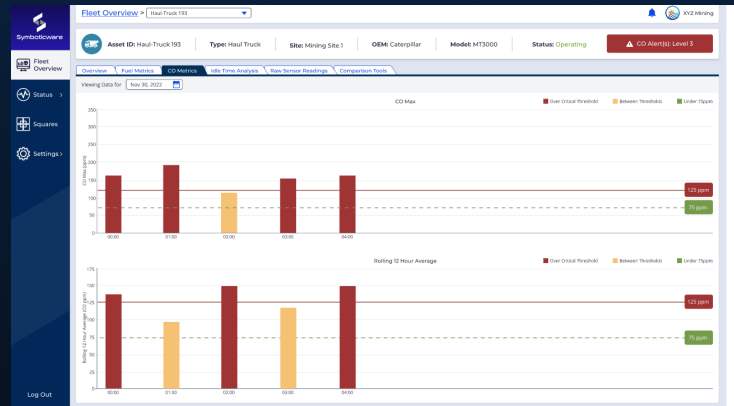
Haul-Truck-298	Haul-Truck-300
0.00 ppm CO	0.00 ppm CO
400.00 Kpa	588.00 Kpa
19.50 L/h	589.30 L/h
85.00 °C	85.00 °C
0.15 Kpa	0.90 Kpa
30.00 Kpa	8.00 Kpa

Impact

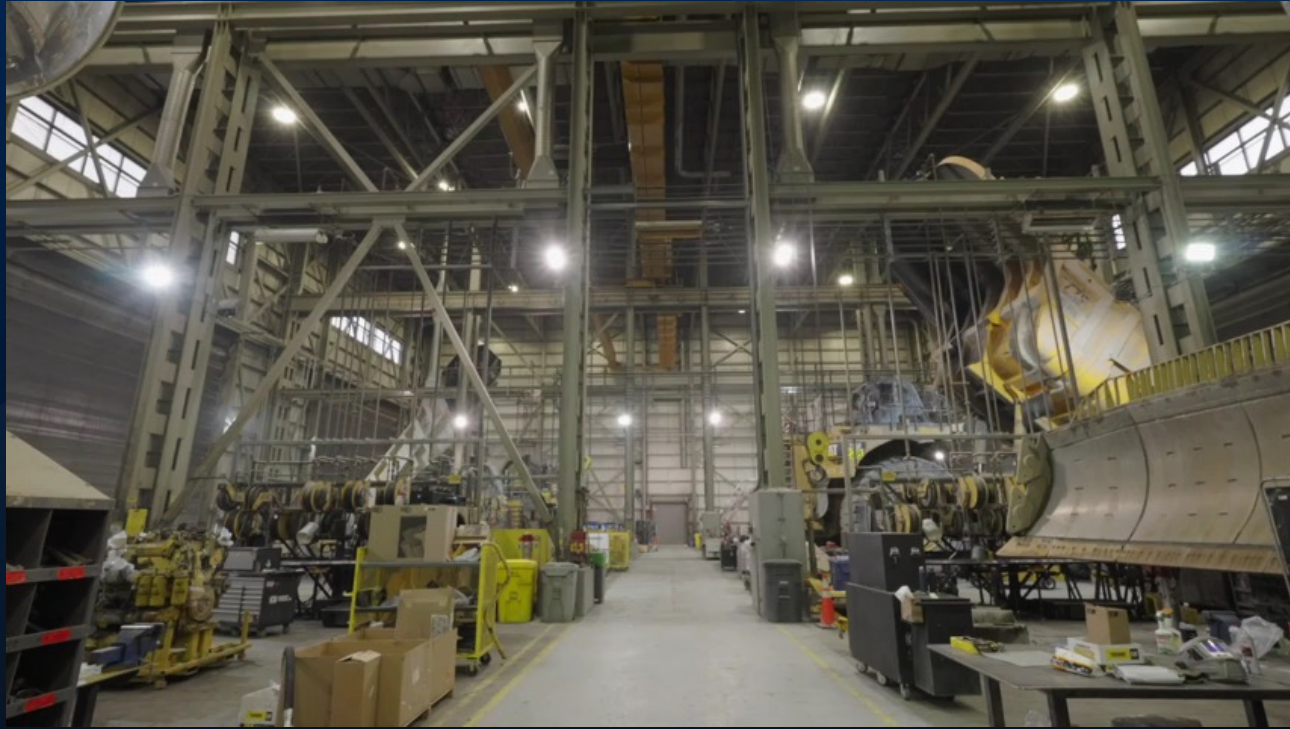
- Cabs with higher CO concentrations flagged
- Maintenance on door seals applied for prevention

Symboticware's Role

- Installation and integration of CO sensors in 4-Sight.ai
- Provision of real-time data on the CO concentration across the fleet



IMPROVING MAINTENANCE



HISTORICAL DATA PROCESSING AT SCALE

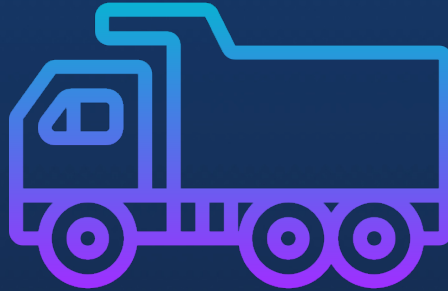
IS CLOSE TO IMPOSSIBLE DUE TO THE KEY FEATURES OF DATASETS

Created in natural language



Unusable without manual work

Very high volume



Thousands of lines of unstructured data

Erratic

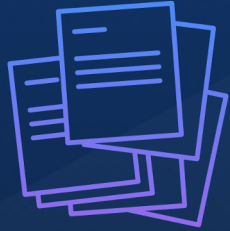


A lot of errors and inconsistencies

SQUARES

NLP REPLACES MANUAL WORK AND CUSTOM ALGORITHMS

Maintenance Logs



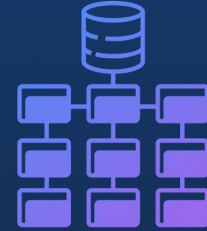
Unstructured, unusable, human-generated records



Natural Language Processing Engine



Data Insights



Machine-readable data to

- Control costs
- Improve maintenance
- Avoid unscheduled downtime

GENERATING INSIGHTS FROM WORK ORDERS

SAVING TIME AND MITIGATING EQUIPMENT FAILURE RISKS

Raw Data

Order	Main W	Description	Sched. start	Actual Finish	Total act.co	Funcnt	User st	Description	Bas. start d	Equipment	MaintActiv	Mainte	Nc
411	S1042723	Replace Left Rear Tires	10/16/2014		128,653.51	DL-MO-02	SCHD	HT-297 TRUCK-HAUL 795F AC	10/16/2014	1000077		400	
412	S1128559	replaced both front steer tires	1/26/2015		140,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	1/26/2015	1000071		400	
413	S1005697	Change both fronts and L&R - K&R	5/11/2014		106,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	5/11/2014	1000073		400	
414	S1014222	Change Over LF/RF, K&R	10/21/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	10/21/2014	1003023		301	
415	S1341932	Change P1/P2	1/20/2015		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	1/20/2015	1000075		400	
416	S1339171	Change P1/P2	11/24/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	11/24/2014	1000071		400	
417	S1341743	Change P1/P2	1/20/2015		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	1/20/2015	1010425		400	
418	S1005939	Change Tires - K&R	6/11/2014		106,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	6/11/2014	1002543		400	
419	S1185047	install front tires for new build	5/14/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	5/14/2014	1011084		400	
420	S1275145	Install pos 1, 2 tire	6/11/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	6/11/2014	1000070		400	
421	S1089880	installed LF and RF tires	11/24/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	11/24/2014	1009254		400	
422	S1332552	P-1, 2 Change out	10/14/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	10/14/2014	1007237		400	
423	S1323568	P-1, 2 Change out	6/11/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	6/11/2014	1010426		400	
424	S1328664	P-1/P-2 Change out	6/11/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	6/11/2014	1000062		400	
425	S1320289	P-1/P-2 Change out	6/11/2014		101,000.00	DL-MO-02	EXEC WM	HT-297 TRUCK-HAUL 795F AC	6/11/2014	1011081		400	
426	S1321157	P-2/P-1 Change out	11/24/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	11/24/2014	1003715		400	
427	S1251030	Replace 1&2 tires	10/14/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	10/14/2014	1000072		400	
428	S1203642	Replace 1&2POS tires	10/11/2014		101,000.00	DL-MO-02	EXEC	HT-297 TRUCK-HAUL 795F AC	10/11/2014	1009253		400	

All records indicate front tire(s) replacement

Processed Data

Component:
Front tires

Total cost:
\$1.7M

HT-297 P1 Tire lifecycle:



Risk level:
Low

REAL-TIME VEHICLE HEALTH INSIGHTS

ENABLEMENT OF PREVENTIVE MAINTENANCE

Health Indices

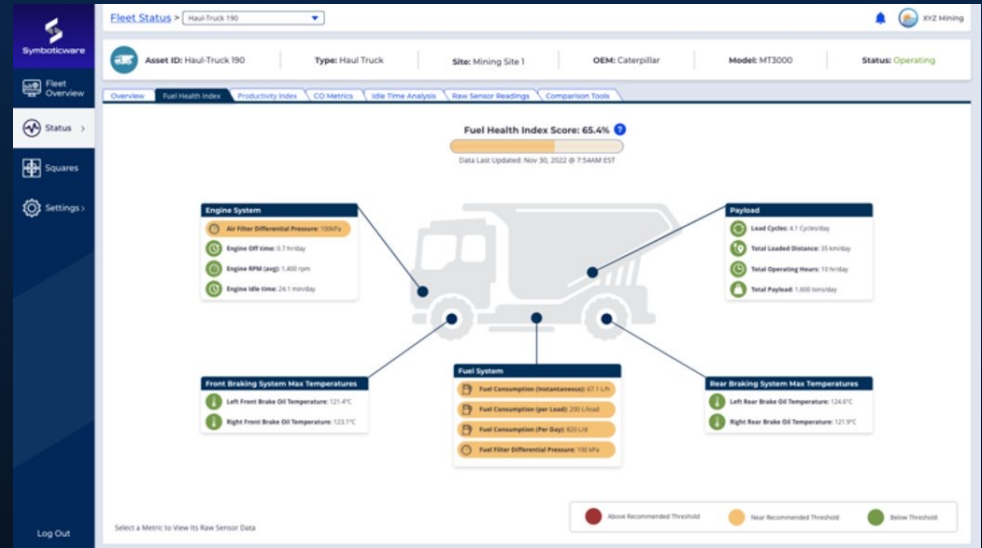
ML-enabled analysis of the operating parameters, including fuel consumption, engine load, tire pressure, and others.

Components covered in short-term:

- Fuel Filter Health
- Air Filter Health

Benefits

- Data-driven maintenance schedules
- Failure prevention
- Time/risk mitigation



OTHER OPPORTUNITIES

MOBILE ASSET MANAGEMENT IN THE REMOTE AREAS (FUEL, EMISSIONS, LOCATION, OTHER)

Mine Challenges

Sparse territory

Private LTE is not available everywhere. LTE infrastructure expansion is very costly.

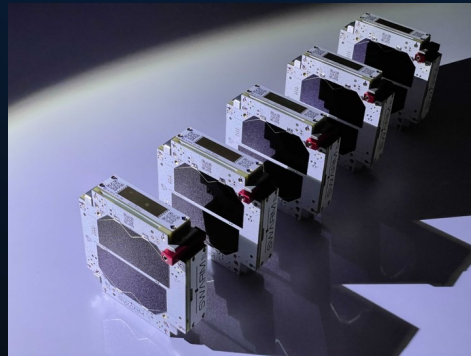
Vehicles moving between sites

LTE is not covering the entire Northern Ontario.

Cybersecurity and network management

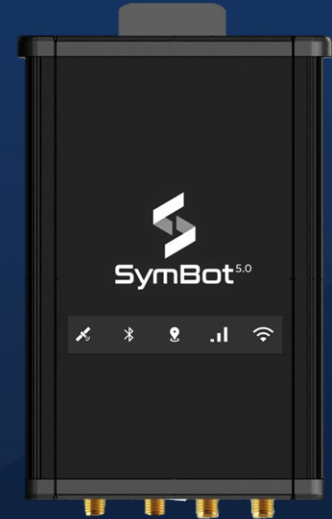
Better management of contractor/external network access.

SWARM
(A SpaceX Subsidiary)



Solution

SymBot 5.0, powered by Swarm (a SpaceX subsidiary) connectivity



THANK YOU



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