

The image is a composite of three industrial scenes. The top-left shows blue electric motors in a factory. The top-right shows a large metal gear assembly. The bottom-left shows a worker in a blue hard hat and safety vest in a factory. The bottom-right shows a worker in a red safety jacket and glasses looking at a tablet. The entire image is overlaid with a white diamond-shaped grid pattern.

FLUKE®

Reliability

**Driving Metrics into
your CBM Program**

Meet the Speaker



Jeff Langford

*Owner/Manager of 13 Analyst
5 in U.S.*

8 in India

Management Coach, BDB Solutions LLC

-
- Background:
 - 25 years CBM experience
 - ISO Category III Vibration Analyst
 - Joined the Azima Team in Jan 2008

Topic: Driving Metrics into your CBM Program

- So, you have a CBM Program...
- That's Great, but...
 - Who manages it?
 - DIY (inhouse)
 - Service provider
 - Is it working?
 - How do you know?
 - How do you measure success?



DYI CBM Program:

- How do you manage workflow?

- Workload

- Due when?
 - Overdue?

- Large amounts of data

- Manual analysis?
 - 1:1 ratio?

- Results

- Results delivered?
 - Track actions taken?

- How do you measure or track success?

- What metrics are available?



KPI

(Key Performance Indicators)



Delante

KPIs:

Key Performance Indicators (KPIs) are the critical (key) quantifiable indicators of progress toward an intended result. KPIs provide a focus for strategic and operational improvement, create an analytical basis for decision making and help focus attention on what matters most.



Good KPIs:

- Provide objective evidence of progress towards achieving a desired result
- Measure what is intended to be measured to help inform better decision making
- Offer a comparison that gauges the degree of performance change over time
- Can track efficiency, effectiveness, quality, timeliness, compliance, economics, project performance, personnel performance or resource utilization

KPIs that could gauge program success

- Data Collection Compliance
- Proactive Response Index
- Total Test vs Delivered Results
- Data Review Efficiency
- Fault Rate
- Key Saves
- ROI
- Bad Actors
- Blind Spots

Tools:

Do you have the tools needed to identify and extract the data needed to make KPIs meaningful?



Services Provided by Azima DLI

- **Cloud hosted data**
 - Replication
 - Watchman Services
- **TRIO, Wireless, Online Systems**
- **Utilize external workflow management tool**
- **Highly automated EADS software 10+:1 ratio**
- **Highly efficient team of international analysts**
 - 2023 14 analysts over half a million results
 - 2024 Projections of 1.5 Million results

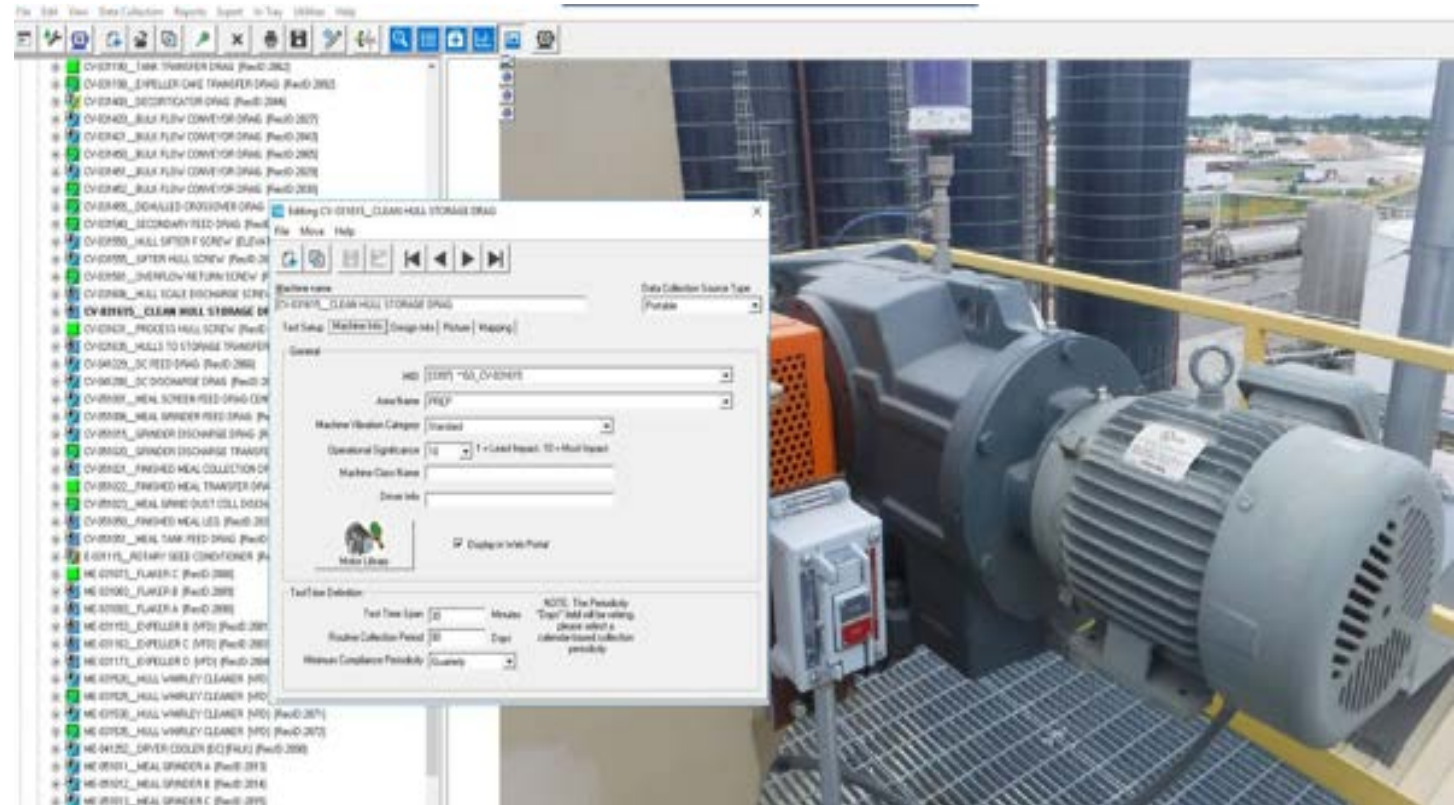


Azima History + Projections



Results by Azima DLI

- **Results via web portal**
 - Customizable dashboard
 - Built in metrics
- **Automated email alerts**
 - Customizable alerts by severity
- **Database machine details**
 - Include collection periodicity
 - This enables compliance tracking
 - Adjusted for seasonal machines to meet compliance
- **Database reports (PAR Reports)**
 - Data for KPIs



Results by Azima DLI

5 severity ratings

- **Green**=Healthy machine (no fault)
- **Slight**=Very early, low level fault (no action)
- **Moderate**= Emergent fault (one month or more to action)
- **Serious**=High priority fault (less than one month to action)
- **Extreme**=Very high priority fault (emergency)(shut down for repair asap)

Summary of Machine Faults and Severity

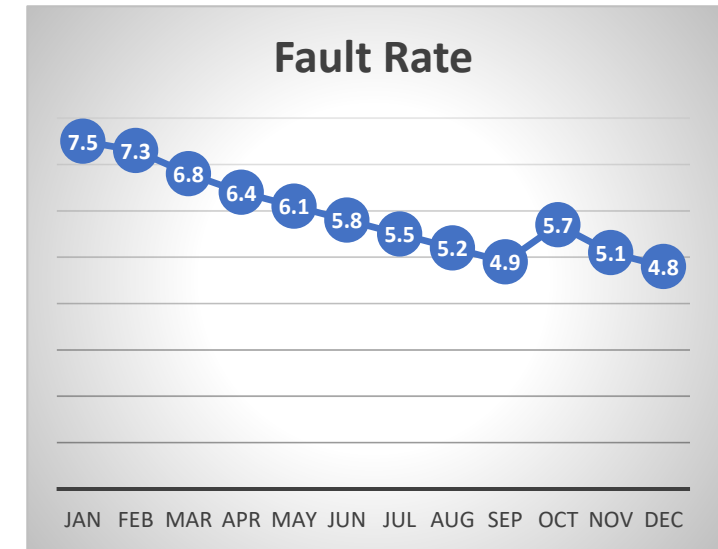
Area Name	Extreme	Serious	Moderate	Slight	No Faults Detected	Never Tested	Needs Review	Total Machines
REFINERY	0	2	18	81	74	0	0	175
UTILITIES	0	2	20	27	25	0	0	74
FEEDHOUSE	0	1	14	55	52	4	0	126
Z-NOT MONITORED/REMOVED	0	1	8	28	35	37	1	110
MILL	0	0	24	70	71	0	0	165
MOVE	0	0	0	0	0	1	0	1
Z-TEMPORARY OFF ROUTE/SEASONAL	0	0	1	0	4	0	0	5



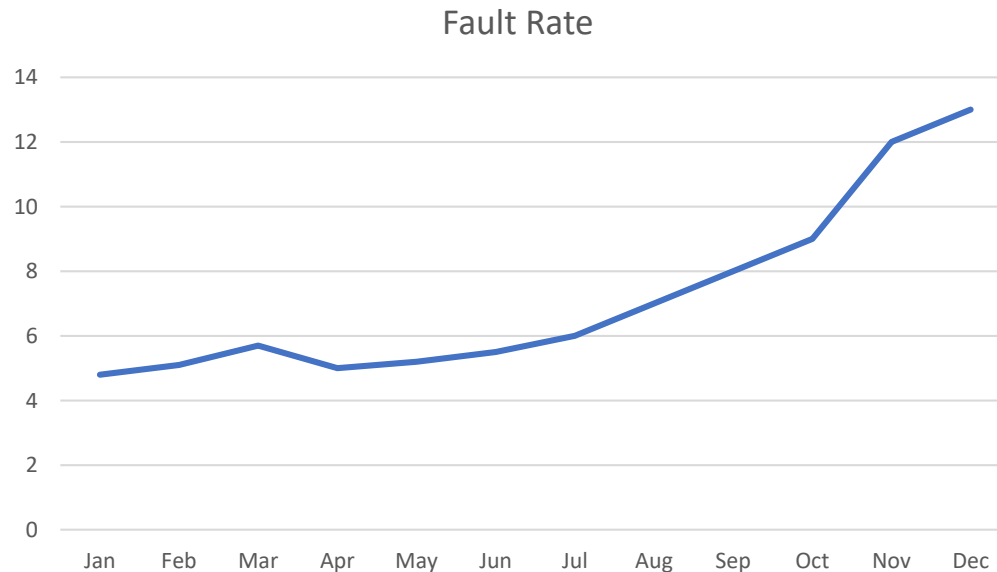
**Helps to prioritize work plans
and focus on high risk.**

Fault Rate

- Percentage of machines in significant fault
- Track program success
- Actions on machines in fault, rate will decrease
- New faults develop, fault rate is never static
- Standard fault rates are 5% +/- 2%



Unsuccessful



Successful

Fault Rate Reduction Success

95% decrease in Priority I and IIs in 4 years

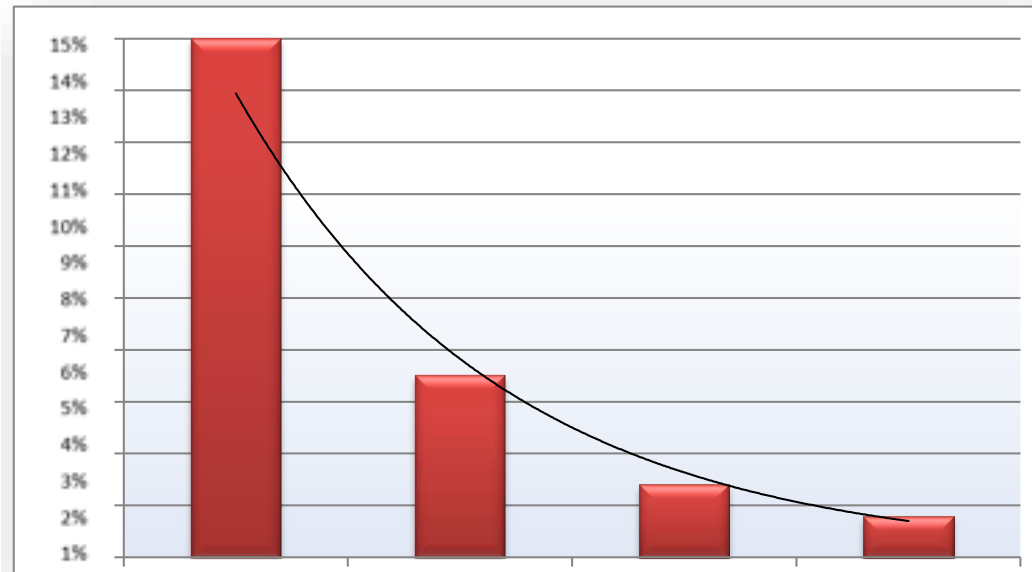
Year 1
175 Priority I & II Issues

Year 2
61 Priority I & II Issues

Year 3
25 Priority I & II Issues

Year 4
13 Priority I & II Issues

Large Customer
1200 machines
15% to 1%
4 Years



Estimated
Maintenance
Cost Savings
since program
inception ~ **\$8.2M**

PAR Reports

- **Program Assessment Reports**
 - PAR reports gauge program performance
 - KPIs measured and reported
 - Data Collection Compliance
 - Track data flow
 - Collection periodicity
 - Industry averages
 - Seasonal machines mitigated by seasonal scheduler
 - Track from plant to plant within an organization
 - Trend from year to year
 - Compare to other industries

PROGRAM ASSESSMENT REPORT

Oct 2021 - Sept 2022

Prepared For: **Compliance**

Customer: Tina Ricketts, Jeff Langford, Mike Broome, Zaheer Ibrahim, Dean Thiel, Steven Hu

This section details the Compliance at the reporting year Jan 2021 – Dec 2021. Findings: Manual Data Collection Compliance is 83%. Jan 2021 – Dec 2021

Number of Tests Performed / Number of Tests Scheduled

Plant	Machine #	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Total
124	75/124	66/124	4/124	6/124	31/124	95/124	97/124	76/124	90/124	111/124	99/124	126/124	61%	
62	41/62	26/62	25/62	37/62	30/62	27/62	27/62	34/62	27/62	28/62	34/62	24/62	97%	
76	67/76	76/76	76/76	74/76	72/76	75/76	76/76	76/76	76/76	76/76	76/76	76/76	100%	
42	26/42	36/42	36/42	35/42	34/42	35/42	27/42	36/42	36/42	36/42	36/42	36/42	96%	
302	67/302	78/302	74/302	81/302	82/302	94/302	94/302	74/302	101/302	103/302	76/302	97/302	89%	
78	33/78	11/78	23/78	26/78	40/78	31/78	46/78	25/78	40/78	71/78	74/78	60/78	62%	
67	60/67	58/67	61/67	60/67	62/67	63/67	63/67	67/67	67/67	67/67	67/67	67/67	99%	
61	59/61	56/61	62/61	60/61	59/61	57/61	56/61	57/61	60/61	60/61	59/61	60/61	100%	
41	27/41	31/41	31/41	32/41	30/41	31/41	34/41	32/41	31/41	39/41	39/41	40/41	75%	
35	38/35	48/35	50/35	47/35	52/35	51/35	47/35	48/35	54/35	49/35	46/35	51/35	88%	
79	58/79	71/79	71/79	71/79	69/79	74/79	62/79	64/79	74/79	71/79	71/79	74/79	88%	

Data Collection Compliance

65.82%

Compliance

For: Jan, 2024
Expected Collection: 1131

Compliance Legend:

Excellent	Excellent	Target/At Advantage if it exceeds average opportunities
Above Average	Above Average	
Fair	Fair	
Deficient	Deficient	Deficient indicates all result in multiple missed saving opportunities

Consistent regular data collection is the most important thing to maintaining a Predictive Maintenance program over the long term.

PAR Reports

Key Saves

- Identified as high priority faults
- Severity reduction
- Can include actual findings
- Feed the ROI calculation



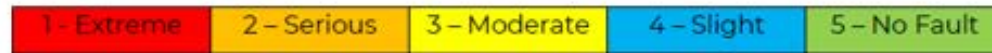
Program Overview

Key Saves -

This section details the highest value diagnoses for the report period.

Findings: 44 machines with high priority faults that were diagnosed and confirmed saves in the last 12 months. (showing first 5)

Plant Area Machine Name	Test Date	Priority	Diagnosis
GLYCERIN P-541002__GLY WATER EVAP 2ND STAGE CIRC P	12/11/2021	1	Motor Mounting Flexibility
Utilities #873__NORTH COOLING TOWER FAN [JBOX]	07/29/2021	1	Motor Foundation Transverse Flexibility
GV650__HYD TANK DISC PUMP [VFD]	10/2/2022	1	Motor To Gearbox Parallel Misalignment
#R51__FAN MEAL COL	8/2/2022	2	Fan Imbalance
738 UT WEST COOLING TOWER FAN [JBOX] [VFD]	2/11/2021	2	Motor Free End Bearing Non-Synchronous Impacting



Machines with repeated diagnoses tend to skew counts of total diagnoses issued. Often there may be extenuating circumstances that lead to corrective action being deferred, or apparent indications of mechanical faults could be due to rough loading during normal operating conditions. When these occur, Symphony Industrial AI analysts can adjust baseline or configuration settings or modify of the diagnosed severity based on specific knowledge of the machine.

Key saves are unique faults which have been addressed.

PAR Reports

- ROI
 - Severity improvement
 - Based on Key Saves
 - Industry standards
 - Cost Avoidance
- Bad Actors
 - % of priority faults in period.
 - Identifies assets at risk
 - Machines that stay in fault or return to fault condition frequently
 - Attention to machines for action such replacement/rebuild
 - Due to structural, base or process
 - Not a key save

Cost Saving Calculation	Assigned value	Qty	Total
Priority I	50000	0	\$0
Priority II	10000	2	\$20,000
Estimated Total Savings			\$20,000
Annual Investment			\$12,000
Actual Savings			\$8,000



Program Overview

Estimated return of investment of your WATCHMAN Services predictive maintenance program.

Findings: \$2,090,000 saved in avoided repairs and downtime in last 12 months

has saved an estimated \$2,090,000 in repair costs and avoided down time over the last 12 months using results from WATCHMAN predictive maintenance services program.

assigns monetary values to diagnosed problems based on avoided repair costs and production downtime. The values are based on estimates and may or may not be reflective of your actual savings. The assigned values are applied uniformly to all high-priority fault identifications, regardless of asset origin.

Assigned Values:

Priority I = \$50,000

Priority II = \$10,000

Calculation:

12 Priority I x assigned \$ value = 12 x \$50,000

149 Priority II x assigned \$ value = 149 x \$10,000

= Estimated Total Savings = \$2,090,000

Portal Metrics

- Wireless Dashboard Showing Date In: US Pacific, UTC-08:00

Health Score

71%
22 Feb 2024, 01:54 PM
Compliance
22 Feb 2024, 08:09 AM

Data Collection Compliance

94.02%
Compliance
Data Collected
For Jan, 2024
Expected Collection: 104

Historical Health Score Trend

Health Score (%)

Severity: Extreme, Serious, Moderate, Slight, OK

My Watch List

No Data Yet

Asset Status

46 Total Assets

- Extreme: 0 (0%)
- Serious: 0 (0%)
- Moderate: 9 (19.6%)
- Slight: 8 (17.4%)
- OK: 29 (63%)

Severity Trend

Assets

Severity: Extreme, Serious, Moderate, Slight, OK

Alerts Summary

Empty table

Collection Due

7 days remaining | 30 days remaining | All

Area Name	Assets Due	Planned Exception	Period Exception
BOILER / EVAP	4	0	0
CONDENSATED	1	0	0
PELLETS	0	0	0
BIOMASS LOADING	0	0	0
BIOMASSING	0	0	0

Bad Actors

Top Bad Actor Assets Last 12 M

Asset Name	Bad Actor Score (%)
027701_DUST FAN NORTH	39.98 %
0001_CONDENSATE #1 WEST PUMP (VTS)	2.60 %
0403_COALP AND FILL PUMP	0.24 %
00001_CONDENSATE PUMP #5 (VTS)	0.14 %
5701_DUST FAN COOLER DUST	0.14 %

Blind Spot

2 AREAS in Blind spot

Top Blind Spot Area: [BOILER / EVAP](#)



Conclusion

- Challenging to manage a sizeable CBM program and ensure its success without proper tools, time, and manpower
- Mission of Azima DLI is to assist you with managing your CBM program by implementing our proven methodology that has been developed over decades
- Strive to help you facilitate continuous improvement of your program
- Tools, processes, and procedures that we utilize are cutting edge and enable us to scale our services rapidly to any size facility or corporation



**Is your solution to ensuring a successful
Condition Based Maintenance Program at your
facility...!**



THANK YOU FOR YOUR TIME AND ATTENTION...!

Questions?