

OCTOBER 24, 2023

Driving towards the Vision of Sustainable Autonomous FPSO Operations – Project Polaris

Jan-Viggo Johansen - VP Asset Lifecycle Management, Yinson

Arvin Singh - Global Executive Business Leader – Operations, AVEVA

AVEVA

“Autonomous Operations”

we hear about it in industry....

This is how we are together leading the way....

AVEVA

YINSON
Production 



PURPOSE

To design, construct, and operate industry-leading production assets for the offshore oil and gas industry towards improving global access to stable and affordable energy.

STRATEGY

SHORT TO MEDIUM TERM
(1-5 YEARS)



Build sustainable project pipeline, including through mergers and acquisitions



Drive ESG initiatives towards reducing Group carbon intensity by 30% by 2030



Invest in asset lifecycle management via proactive digitalisation strategy



Enhance learning, leadership, safety and corporate culture

LONG TERM
(6-10 YEARS)



Continuous development of asset portfolio to create strong order book and stable cashflows

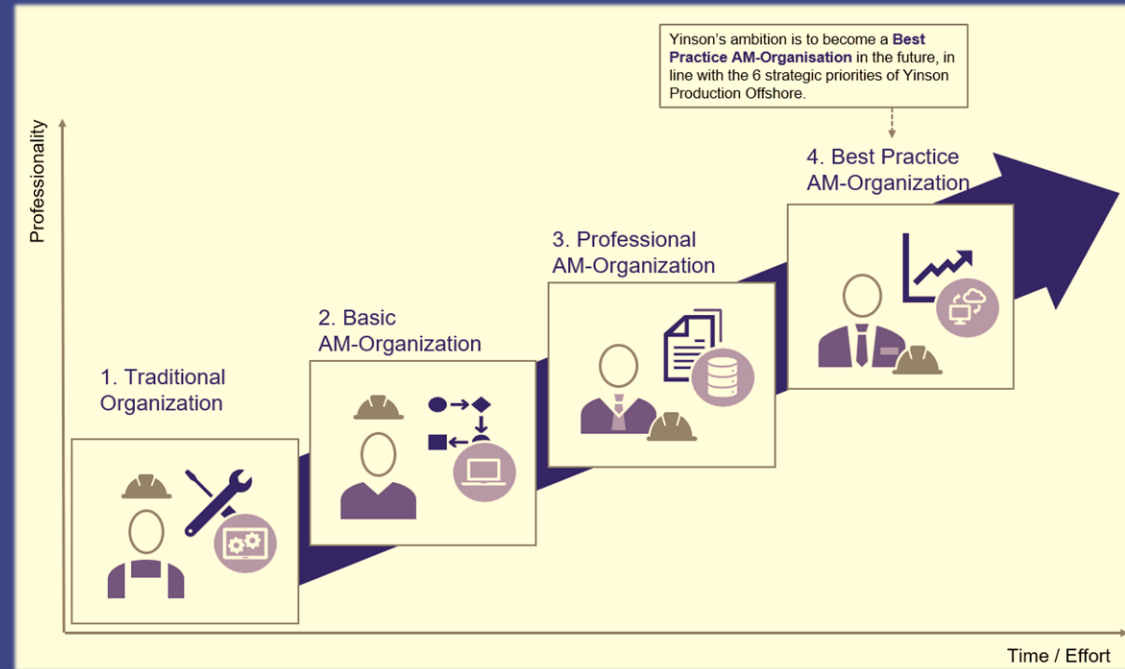


Optimise capital structure, increase capital velocity, and expand capital pool to support growth and capture market opportunities



Continuously evaluate effectiveness of supply chain and Project Execution Philosophy

The Vision



Conventional Asset

- Basic Digital Adoption
- Maintenance Management
- Physical Inspections
- Condition Monitoring On Selected Equipment
- Preventive Maintenance

Assisted Asset

- Selective Advanced-Analytics Adoption
- Real-Time Monitoring
- Spare Part Management
- Data Collection & Management
- Predictive Maintenance

Semi - Autonomous Asset

- Cross-Discipline Optimization
- Reduced Crew
- Remote Operations & Control
- Module-Based Maintenance
- Continuous Real-Time Monitoring
- Prescriptive Maintenance

Autonomous Asset

- Systems Optimization
- No Fire-Water System
- Smart Maintenance
- No Accommodation, Helideck Or Lifeboats
- No Cranes & Limited Storage

The Partnership

Driving Towards Sustainable Autonomous FPSO Operations

AVEVA

Thought Leadership



Industry and Technology Experts



Best in Class Technology



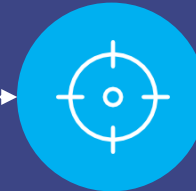
Asset Performance Management Market Leader



Sustainable
Autonomous
FPSO

YINSON Production

Expert FPSO Industry Experience



Management and Operational Experts



Industry Specific "Know-How"



Localised and Available Data/Assets



Project Polaris

Driving Towards Sustainable Autonomous FPSO Operations

Integrated Asset Performance Management Solution to improve the overall operations, maintenance and reliability of Yinson's enterprise FPSO assets toward Sustainable Autonomous FPSO Operation.

15 Unique Use-Cases Defined

7 Core Success Criteria

Integrated with existing Yinson Applications

Scalability & Flexibility

Solution Platform powered by:

- AVEVA Asset Strategy Optimization → Enable asset maintenance optimization from risk and cost perspective
- AVEVA Predictive Analytics → Proactive approach leveraging AI technologies and data analytics
- AVEVA BI Gateway → Intelligence data warehouse
- AVEVA Unified Operations Centre → Powerful visualization to improve decision making
- AVEVA Work Task → Business process capabilities, continuous improvement loop processes

Existing Yinson Solutions :

AVEVA PI

AVEVA AIMS

IFS

UNISEA

NOVACURA

Integrated Asset Performance Management Solution

Unified Operating Centre – Common User Experience

Operational
KPIs / Metrics

Dashboards &
O&A Health

Value
Realization

Maintenance
& Reliability

Engineering

Life Cycle
Costing

Workflow

Asset Strategy
Optimization

Predictive
Analytics

BI Gateway

CMMS (IFS)

Novacura

HSEQ

Industrial Information Management

AVEVA AIM
(Engineering)



AVEVA PI
(Operations)

Integrated Asset Performance Management Solution

Yinson's Business Challenges

Unified Visualization and Decision Making

Drive towards Zero Unplanned Downtime

Perform Precision Maintenance when Needed

Monitoring Asset Reliability and Efficiency

Optimizing Operational and Maintenance Costs

Real-Time Operational and Asset Health Analysis

Predictive Analysis and Failure Management

Integrating IT/OT Driving Operational Transparency and Decision Making

Maximizing Production Through Effective Asset Lifecycle Management

The Partnership Solution

Unified Operating Centre – Common User Experience

Operational
KPIs / Metrics

Dashboards &
O&A Health

Value
Realization

Maintenance
& Reliability

Engineering

Life Cycle
Costing

Workflow

Asset Strategy
Optimization

Predictive
Analytics

BI Gateway

CMMS (IFS)

Novacura

HSEQ

Industrial Information Management

AVEVA AIM
(Engineering)



AVEVA PI
(Operations)

Actual Capacity

Uptime/Production: 24H 7D 30D 90D 1Y

Map Compare



MARIA QUITERIA ✓

Oil (BOPD)	100,000
Liquid (BLPD)	240,000
Gas Comp (MMSCFD)	177
Water Inj (BWPD)	330,000
Technical Uptime	99% ↑



ATLANTA ✓

Oil (BOPD)	50,000
Liquid (BLPD)	144,000
Gas Comp (MMSCFD)	12.4
Water (BWPD)	134,000
Technical Uptime	99% ↑



ANNA NERY ✓

Oil (BOPD)	70,000
Liquid (BLPD)	250,000
Gas Comp (MMSCFD)	142
Water Inj (BWPD)	240,000
Technical Uptime	99% ↑



JOHN AGYEKUM KUFOUR ✓

Oil (BOPD)	70,000
Liquid (BLPD)	250,000
Gas (MMSCFD)	Inj 165 Exp 210
Water Inj (BWPD)	55,000
Technical Uptime	99% ↑



AGOGO ✓

Oil (BOPD)	120,000
Liquid (BLPD)	280,000
Gas Inj (MMSCFD)	215
Water Inj (BWPD)	105,200
Technical Uptime	99% ↑



ABIGAIL-JOSEPH ✓

Oil (BOPD)	50,000
Liquid (BLPD)	60,000
Gas Lift (MMSCFD)	15
Gas Inj (MMSCFD)	39
Technical Uptime	99% ↑



PTSC LAM SON ✓

Oil (BOPD)	18,000
Liquid (BLPD)	31,000
Gas Comp (MMSCFD)	35
Water Inj (BWPD)	15,000
Technical Uptime	99% ↑



PTSC BIEN DONG 01 ✓

Floating Storage and Offloading (FSO)



HELANG ✓

Oil (BOPD)	7,903
Liquid (BLPD)	9,880
Gas Comp (MMSCFD)	102
Water (BWPD)	1,977
Technical Uptime	99% ↑

Uptime/Production: **24H** 7D 30D 90D 1Y

HELANG



Commercial Uptime
100 %

Technical Uptime
100 %

Availability Operational RAM
99 %

Contractual Compliance
100 %

HSEQ

LTI Free Days: **1,286** Since: Dec 2019

Last Incident: N/A

Environmental Incidents (12 Months)

Incident Type	Count	Total Volume	Incident Type	Count	Total Volume
Liquid Spill to Environment	0	0	Gas Release	0	0

PRODUCTION

Oil (BOPD): 7,903

Gas Comp (MMSCFD): 102

Liquid (BLPD): 9,880

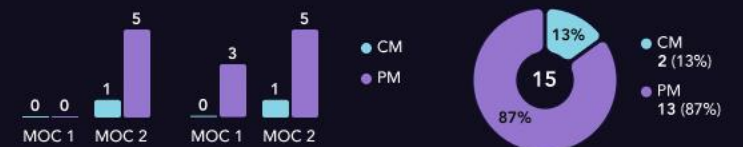
Water (BWPD): 1,977

MAINTENANCE

Overdue

Postponed

Workload



Workload Backlog (hrs)



HELANG ✓

Oil (BOPD)	7,903
Liquid (BLPD)	9,880
Gas Comp (MMSCFD)	102
Water (BWPD)	1,977
Technical Uptime	99% ↑



HSEQ

Achievement



LTI Free Days: 1,286

Since: Dec 2019 Last Incident: NA

Overdue Corrective Actions: 0

Reduction of Environment Impact%: 96%

Major Non-Conformance Reports from Audits: 0

Senior Leadership Visits: 96%

Compliance to Training Matrix: 95%

Compliance to Training Plan: 95%

EPR: 95%

PRODUCTION & MARINE



SUPPLY CHAIN

MTD QTD YTD OVERALL

Urgent Purchase Orders: 7 Open

Total Goods Procured (USD): 3,168,988

Purchase Orders: 178

Critical Materials Stock without PO

Below Safety Stock



Local Purchases PO Spend: 87%

Local Purchases Qty of PO's: 88%

FPSO HELANG

Overall Indicator

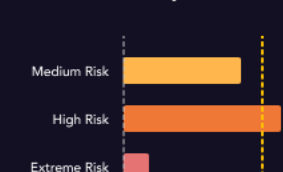


RELIABILITY

Current MTD QTD YTD



Bad Actors Count by Risk

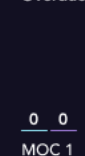


Bulk Group Count: 5

MAINTENANCE

Current MTD QTD YTD

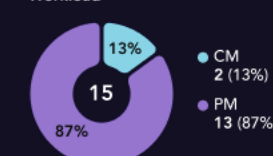
Overdue



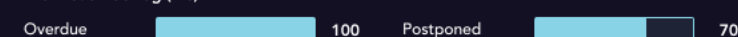
Postponed



Workload



Workload Backlog (hrs)



REALIZATION VALUE

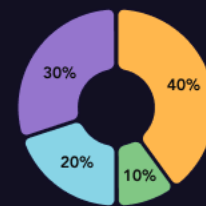
MTD QTD YTD

Total Realization Value

USD\$ 1 M

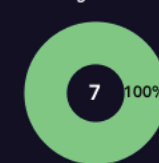
- Predictive Analytics: USD\$ 0.4 M
- RCA: USD\$ 0.1 M
- RCM: USD\$ 0.2 M
- CBM: USD\$ 0.3 M

Value Contribution



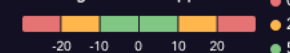
INTEGRITY

Mooring Tension

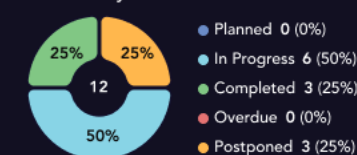


- Out of Range: 0 (0%)
- Within Range: 7 (100%)

Mooring Tension Stopper



RBI Summary



RBI (YTD)



EXPOSURE HOURS

MTD QTD YTD

POB ###,###

Accumulated Manhours ## hours

| Yinson Production ## hours

| Contractors ## hours

HSEQ ACHIEVEMENT (2023)



RISK MANAGEMENT

MTD QTD YTD

Type of Overdue Assessments

MOC

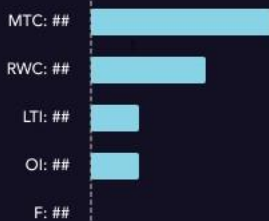
Total Types of Overdue Assessment ##

Completed Vs Scheduled



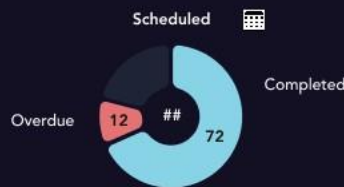
INJURY STATISTICS

All data in the period of 12 Months Rolling



AUDITS

MTD QTD YTD



OBSERVATION CARDS

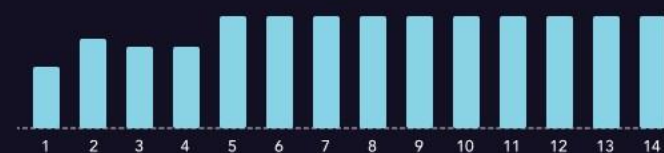
EVENT REPORTING

All data in the period of MTD

Total Event Reported

##

Type | Category | Risk Ranked | Consequence



CORRECTIVE/PREVENTIVE

MTD QTD YTD



Due in next 30 Days Due in next 7 days Overdue

COMPETENCY & CAPABILITY

MTD QTD YTD



Training ## hours

Operational ## hours

Completed Vs Operational



ENGAGEMENT

MTD QTD YTD

Completed Vs Scheduled



Workers NPS ##%

Leaders NPS ##%

EMERGENCY PREPAREDNESS & RESPONSE (EPR)

Completed Vs Scheduled



CERTIFICATION & CALIBRATION

MTD QTD YTD

Total Valid Certification ## (##.# %)



Due in next 30 Days

Due in next 7 days

Overdue

Overdue by Safety Critical Equipment (20%)

PERMITS

By Location Work type



PTW Live ## VS Scheduled ##

PRODUCTION

Today

Last 12 Months Last Quarter

Oil Condensate
(BOPD)

Actual: 7,903 Capacity: 12,000
66% ↑ 3.5%



15
Forecasted
Days to Offtake

08 Jun 2023
Forecasted
Offtake Date

Offtake Opr No:
LMT-001

Gas Exported
(MMSCFD)

Actual: 102 Target: 170
60% ↑ 3%



35,570
1 Year Total

Water
(BOPD)

Actual: 1,977 Capacity: 5,000
40% ↑ 3.5%



702,441
1 Year Total

Liquids
(BPD)

Actual: 9,880 Capacity: 17,000
58% ↑ 1.5%



2,985,394
1 Year Total

MARINE

June 2023 Current

Quantity Available (bbl) 250K

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Jun				● Min-Cargo							● Tank Top																				
					Parcel Size: 300K Avail for lifting: 200K																										
Jul											● Min-Cargo							● Tank Top													
Aug									● Min-Cargo									● Tank Top													

ABS CC & CA

CC 0

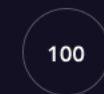
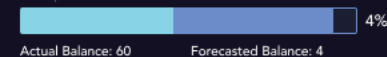
CA 0

FORECASTED GHG EMISSION & FG CONSUMPTION

Cumulative GHG Emission

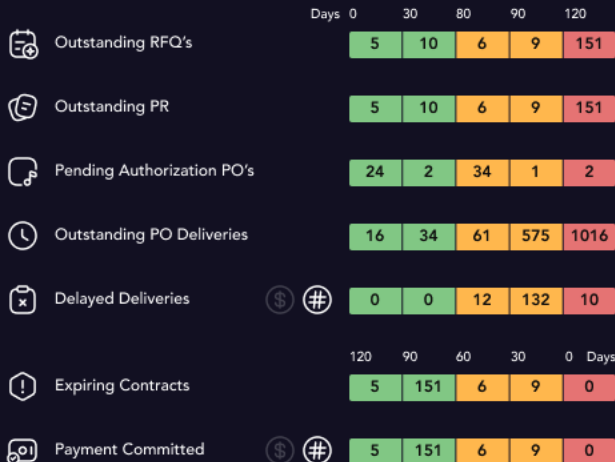
Cumulative FG Consumption

Actual: 40 Forecasted: 56 Allowable: 100
Input: 40



Mode	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1 FG: 2.91 GHG: 0.1 (GTCC + GTG + Boiler)	0	0	0	0	0	4	0	0	0	0	0	0	FG: 11.6 GHG: 0.4 Days: 4
2 FG: 4.79 GHG: 0.4 (2 GTCC + GTG + Boiler)	0	0	0	0	0	26	0	0	8	30	0	0	FG: 306.56 GHG: 25.6 Days: 64
3 FG: 3.32 GHG: 0.2 (GTCC + STG + 2 Boilers)	0	0	0	0	0	0	29	11	0	0	0	0	FG: 132.8 GHG: 8 Days: 40
4 FG: 5.41 GHG: 0.5 (2 GTCC + STG + 2 Boilers)	0	0	0	0	0	0	0	20	20	0	0	0	FG: 216.4 GHG: 20 Days: 40
5 FG: 3.7 GHG: 0.3 (GTCC + GTG + STG + 2 Boilers)	0	0	0	0	0	0	2	0	0	1	1	0	FG: 14.8 GHG: 1.2 Days: 4
6 FG: 5.75 GHG: 0.6 (2 GTCC + GTG + STG + 2 Boilers)	0	0	0	0	0	0	0	0	2	0	0	0	FG: 11.5 GHG: 1.2 Days: 2

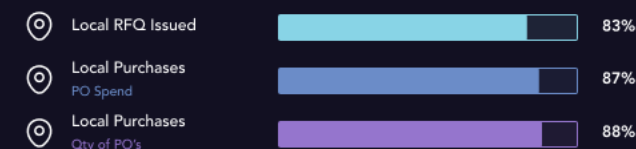
ALERTS (PR, RFQ, PO) ✓ ?



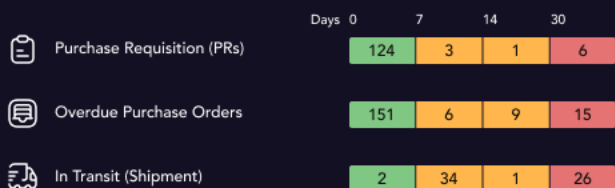
PROCUREMENT EFFICIENCY ✓ ?



LOCAL CONTENT



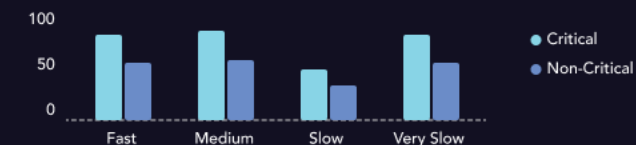
URGENT ORDERS ✓ ?



INVENTORY BY CRITICALITY ✓ ?



MATERIAL MOVEMENT



TOP 10 SUPPLIER



MATERIALS ✓ ?

Material Type	Value\$
Commodity 1	23,000
Commodity 2	53,000
Commodity 3	3,000
Commodity 4	12,000
Commodity 5	43,000

[View all](#)

Quantity of completed inventory count reports by



Actual Spent on PO / FA



RELIABILITY ✓ ⓘ

Equipment Availability for Top 5 Equipment Classes



Health Index for Top 5 Equipment Classes



All Turbines (D) Pumps (P) Compressors (K) Heat Exchangers (H) Heaters & Boilers (F)

Bad Actors Summary Associated with the Equipment Class (GT, ST & EG)

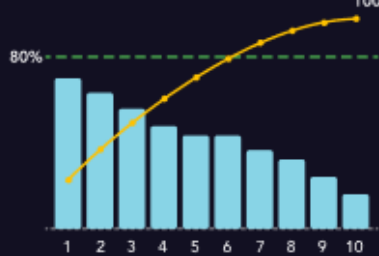
Risk Bulk Group

ID	Criticality Class	Main P...	Asset Group	Equipment	FailureFre...	FailureDur...	Production	Cumulativ...	WorkOrder...
1	E (BA Class - High)	MCH 1	Asset A	GT	5	35	70	410000	5
2	E (BA Class - Medium)	MCH 2	Asset B	GT	4	30	60	350000	2

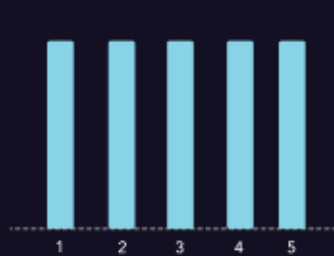
MTBF for Top 5 Equipment Classes



Failure Mode Pareto



Availability



MAINTENANCE ✓ ⓘ INTEGRITY

CURRENT MONTH M-1 M-2

PM: CM Man-hours vs Available Hours



MOC Closed Too Late



Workload by Maintenance Dept



Next Planned Maintenance Activities

ID	WOID	Work Type	Criticality	PlanStartDate	PlanEndDate	Actual Start Date	Status
1	WO0006	Maintenance Work 06	MOC 1	2023-06-05	2023-06-08	2023-06-06	In Progress
2	WO0007	Maintenance Work 07	MOC 1	2023-06-06	2023-06-08	2023-06-06	In Progress
3	WO0008	Maintenance Work 08	MOC 1	2023-07-06	2023-07-10		Pending
4	WO0009	Maintenance Work 09	MOC 1	2023-07-07	2023-07-10		Pending
5	WO0010	Maintenance Work 10	MOC 1	2023-07-07	2023-07-11		Pending

MOC 1 Overdue Maintenance Activities

ID	WOID	Work Type	Criticality	PlanStartDate	PlanEndDate	Status
6	WO0001	Maintenance Work 06	MOC 1	2023-05-05	2023-05-08	Overdue

ASSET TYPE

All Assets Predictive Analytics CBM

- All
- Compressors (K)
- Turbines (D, E)**
- Pumps (P)
- Heat Exchangers (H)
- Heaters & Boilers (F)

Sort ↑↓

Gas Turbine(DT)

Gas Turbine (DT) - 55XM0201



Running

Predictive Analytics Cases



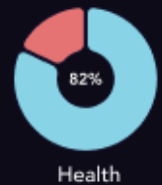
14 Open Cases
33 Closed Cases

95%
Availability

65 hrs
Continuous Running Hours

35
Days for Next Maintenance

168
Run Hour this Week



Gas Turbine (DT) - 27DT7001



Running

Predictive Analytics Cases



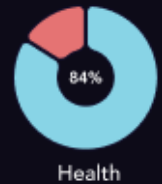
11 Open Cases
11 Closed Cases

90%
Availability

74 hrs
Continuous Running Hours

19
Days for Next Maintenance

160
Run Hour this Week



Steam Turbine(DC)

Steam Turbine (DC) - 33DC0001A



Running

Predictive Analytics Cases



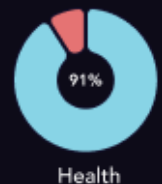
10 Open Cases
19 Closed Cases

91%
Availability

120 hrs
Continuous Running Hours

67
Days for Next Maintenance

167
Run Hour this Week



ASSET INFORMATION »

AIM Tag	55XM0201
Description	STEAM TURBINE GENERATOR
Model	Frame 7A
Manufacturer	Peter Brotherhood, UK
Supplier	ALLION

PROCESS INDICATORS »

Lube Oil Supply Pressure	2.5 Bar(g)
Oil Cooler Inlet Temp 1	72 DegC
Control Oil Pressure	5.5 Bar(g)
Lube Oil Filter DP	0.584 Bar(g)

MECHANICAL INDICATORS »

Turbine SE Journal Bearing Temp	66 DegC
Turbine Thrust Bearing Temp	53 DegC
Turbine Axial Displacement	5.0 mm
Turbine EE Journal Bearing Temp.	56 DegC

PERFORMANCE INDICATORS

Efficiency	90 %
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MAINTENANCE

Cont. Running Hours **105** Hrs

Overdue

MOC 1	0 ✓	
MOC 2	3 ⚠	
Work Order	3 ⚠	

RELIABILITY

Health Index

Availability

Utilization

Bad Actor Status Indicator
Not Bad Actor

PREDICTIVE ANALYTICS

	14 ⚠	33	5
	Open Cases	Closed Cases	WO Created
	5	\$ 0.15 M	
	Total Catch	Cost Savings (YTD)	

● Open ● Closed

CBM

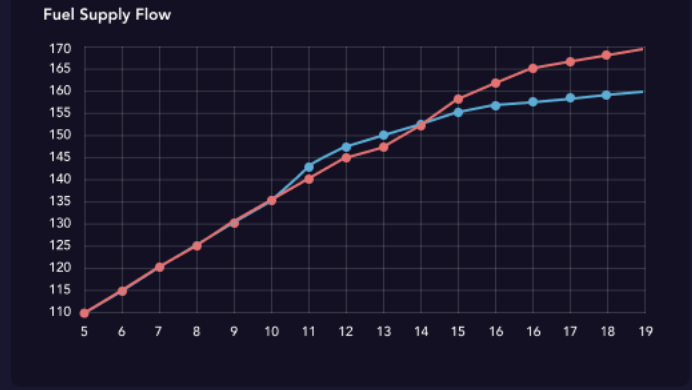
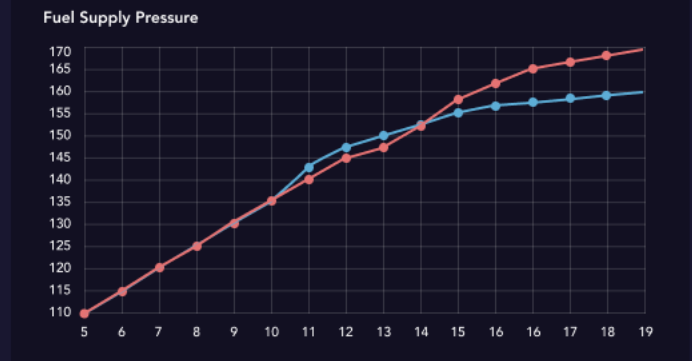
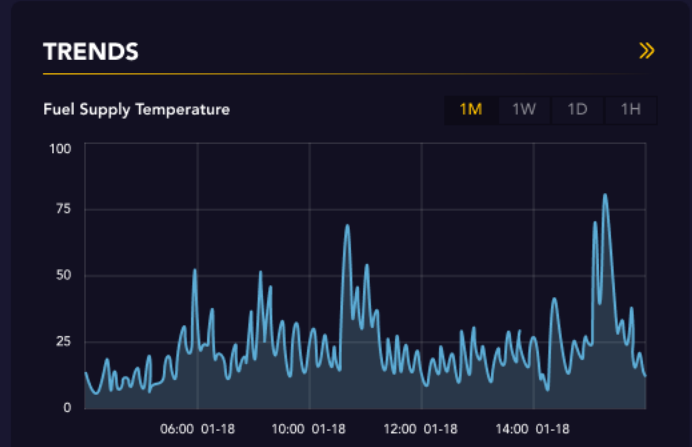
Deviation from Normal (%)

Lube Oil Supply Pressure	1
Thrust Bearing Temp	35 ⚠
SE Journal Bearing Temp	5

Maintenance Required in 30 days

REPORTS

Vibration Status	✓
Lube Oil Analysis Status	✓



Integrated Asset Performance Management Solution

Yinson
Potential Value

Reduction
Maintenance Overall Cost

Optimized
Asset Analysis and Collaboration

Improved
Overall Planned Maintenance

Increased
Asset Visibility, Control and Contextualization

Improved
Resource Planning

Efficient
Feedback to Engineering Design and
Construction

Improved
Overall Equipment Efficiency

Efficient
Asset Failure Management Engagement

Reduced
Unplanned breakdowns

Reduced
Work Order Execution and Management
Time

Reduced
Operational Downtime

Optimized
Spare Parts Inventory

Integrated Asset Performance Management Solution

Driving Towards Sustainable Autonomous FPSO Operations

Conventional Asset

- Basic Digital Adoption
- Maintenance Management
- Physical Inspections
- Condition Monitoring On Selected Equipment
- Preventive Maintenance

Assisted Asset

- Selective Advanced-Analytics Adoption
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Semi - Autonomous Asset

- Cross-Discipline Optimization
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- Module-Based Maintenance
- Continuous Real-Time Monitoring
- Prescriptive Maintenance

Autonomous Asset

- Systems Optimization
- No Fire-Water System
- Smart Maintenance
- No Accommodation, Helideck Or Lifeboats
- No Cranes & Limited Storage



As One Team

Driving towards Autonomous FPSO Operations

Presenter Information

Feel free to reach out if you saw anything of interest or had any questions



Jan-Viggo Johansen

- VP – Asset Lifecycle Management, Yinson
- Singapore
- jan.viggo.johansen@yinson.com



Arvin Singh

- Global Executive Business Leader – Operations, AVEVA
- Dubai
- arvin.singh@aveva.com



Questions?

Please wait for the microphone.
State your name and company.



Please remember to...

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Thank you!

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AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

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