21ª CONFERENCIA INTERNACIONAL SOBRE PALMA DE ACEITE

21st International Oil Palm Conference

AI-BASED SMART PALM OIL MILL

PRESENTED BY:
SURENDRAN KURANADAN
FOUNDER & CHIEF EXECUTIVE OFFICER, AIREI SDN BHD

fedepalma | cenipalma
CON EL APOYO DEL FONDO DE FOMENTO PALMERO

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ABOUT THE PRESENTER - SURENDRAN KURANADAN

- 3rd generation in Malaysia's palm oil industry (upstream & downstream).

- Education:
  - Bachelor of Mechanical Engineering, Universiti Tenaga Nasional (UNITEN)
  - Master of Chemical Engineering, Universiti Putra Malaysia (UPM)

- Professional Experience:
  - Over 15 years in palm oil engineering
  - Consults plantations and mills
  - Certified Grade 1 Steam Engineer (DOSH Malaysia)

- Member of:
  - Board of Engineers Malaysia (BEM)
  - Institution of Engineers Malaysia (IEM)
  - ASEAN Engineering Register (AER)
  - Institution of Mechanical Engineers UK (IMechE)

- Industry Roles:
  - Internal Auditor, Palm Oil Millers Association (POMA)
  - Member, National Working Technical Committee for Clean Air Regulation (2014)
  - Technical advisor for emission control in biomass boilers
  - Involved in MSPO, SCCS, and MS2530-4 compliance initiatives

- Founder & CEO of AIREI Sdn Bhd:
  - Focuses on AI, Big Data & Robotics for the palm oil industry

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ABOUT AIREI SDN. BHD.

AIREI is a Malaysian-based company headquartered at Cyberjaya providing:

- Comprehensive Data Analytics Using Artificial Intelligence
- Supply Chain Traceability Using Secured Software Platforms and BlockchainTechnology (Hyperledger Fabric)
- Customized Robotics Development and Fabrication

Our company has been the market leader in AI adoption through out the entire palm oil supply chain, from upstream to downstream, ensuring a strong foundation and deep industry knowledge in this sector.

AIREI™
Artificial Intelligence Robotics Engineering Industries

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THE WORLD'S FIRST AI-BASED SMART PALM OIL MILL


Kilang Sawit AI pertama di dunia dilancar di Kuala Kangsar

19 November 2024, 3.04pm

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The Star Perak facility is world's first palm oil mill to adopt AI

Perak facility is world's first palm oil mill to adopt AI

By MANJIT KAUR

NATION

Tuesday, 19 Nov 2024
2:16 PM MYT

Related News

NATION 1d ago
AI boost for palm oil production

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KEY CHALLENGES IN PALM OIL MILL OPERATIONS

Heavy Reliance on Manual Processes

Many mill operations still depend on manual work, which can lead to inconsistencies, fatigue-based errors, and slow response time.

Increasing Cost of Production

Millers are facing constant increase in operation cost every year.

Limited Optimization & Real-Time Insights

Manual monitoring without integrated data systems hinders fast, accurate decision-making and efficient operations.

Compliance & Sustainability Pressure

Meeting RSPO standards, traceability requirements, and government regulations is becoming increasingly challenging without digital tools.

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HOW AI-BASED SMART PALM OIL MILL WORKS

Installation of Sensors:

Advanced sensors are installed throughout the mill for real-time data gathering. These sensors monitor crucial parameters such as temperature, pressure, amperage and machine performance.

Installation of AI-Based CCTV:

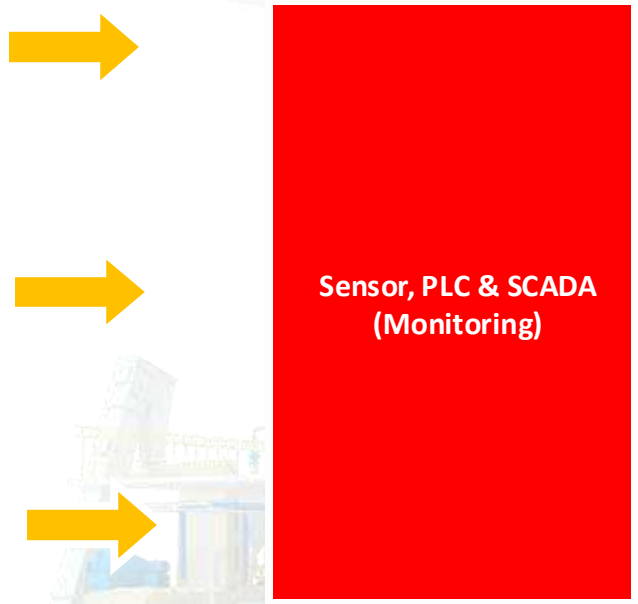
AI-enabled CCTV cameras are strategically placed to monitor key areas of the mill. These cameras can detect FFB volume, anomalies and provide valuable insights that will be integrated with the process control.

Installation of Control System:

AI-driven control systems are implemented to automate and optimize processes. These systems regulate equipment operations, manage resource utilization, and ensure optimal performance based on real-time data analysis.,

AI Integration:

AI technologies, including sensors, data analytics, and machine learning algorithms, are integrated into palm oil mill operations to analyze the real-time data to provide actionable insights and optimize operations.



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KEY HIGHLIGHTS OF AI-BASED SMART PALM OIL MILL

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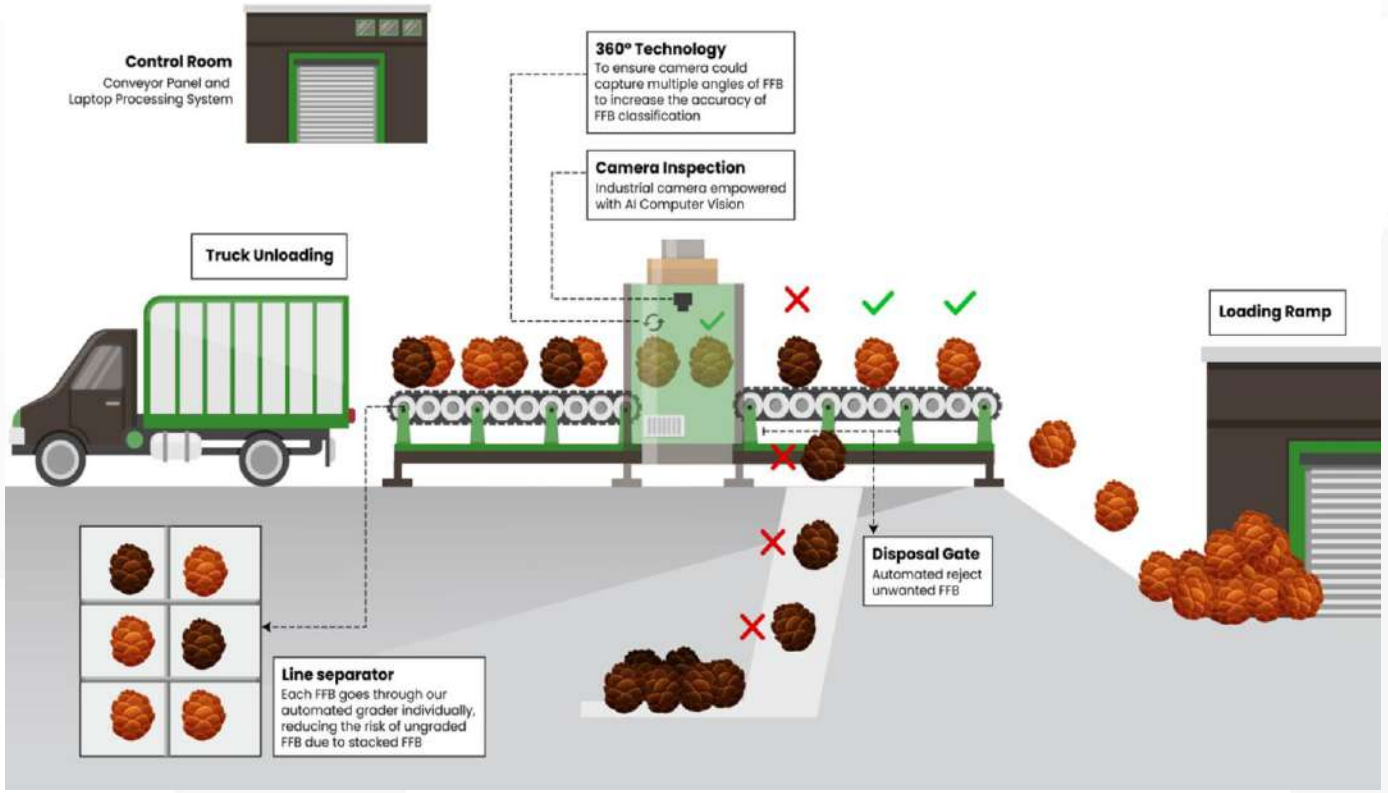
KEY HIGHLIGHT 1: UNMANNED AI FFB GRADING SYSTEM

- AI-powered system that uses cameras to grade Fresh Fruit Bunches (FFB) in real time.
- Automatic detection and rejection of unripe or poor-quality bunches
- Automated data recording for traceability and reporting



KEY HIGHLIGHT 2: REMOTE AND AUTOMATIC RAMP DOOR OPERATION

- Automatic opening and closing of the ramp gate using AI detection

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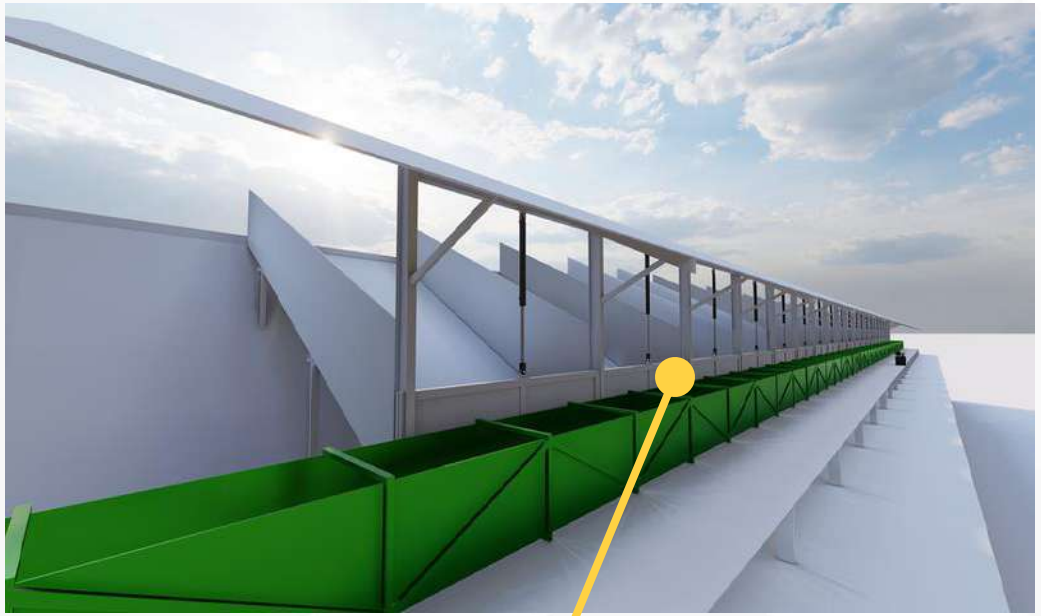
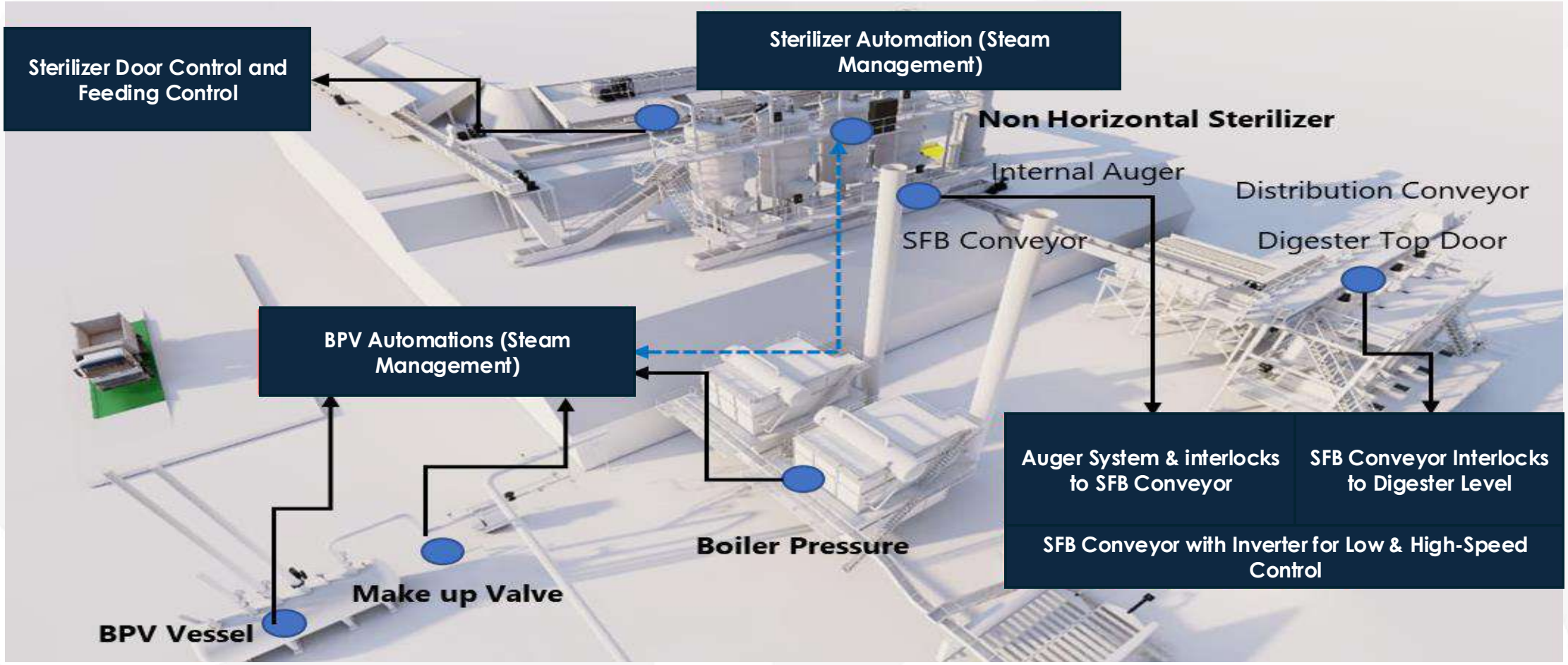
KEY HIGHLIGHT 3: ONLINE ANALYSIS OF FFB QUALITY WITH AI

1. Real-time FFB analysis on the FFB conveyor to determine cooking recipes of the sterilizer based on ripeness percentages.



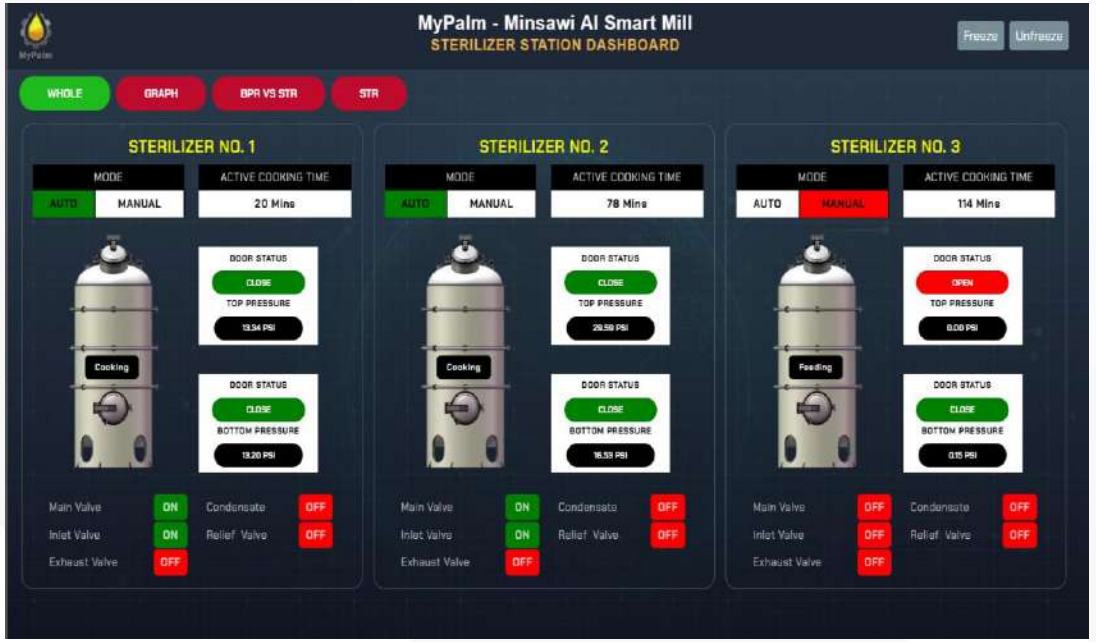
AI-Powered CCTV used in FFB Conveyor for Automated FFB Quality Analysis

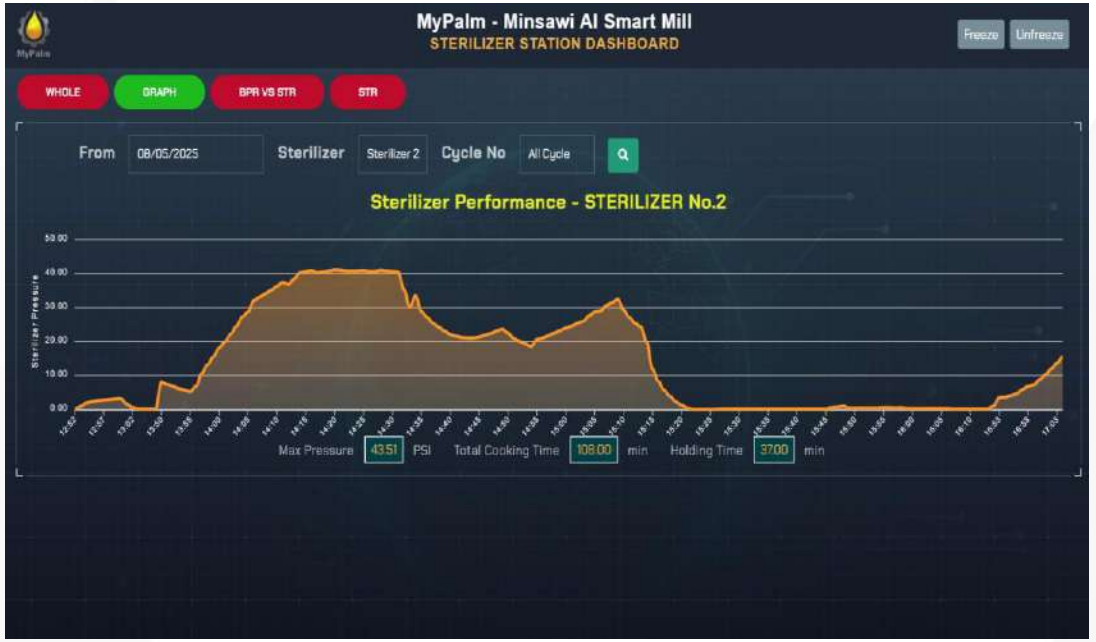
KEY HIGHLIGHT 4: STERILIZATION AI AUTOMATION & DATA ANALYTICS



KEY HIGHLIGHT 4: STERILIZATION AI AUTOMATION & DATA ANALYTICS

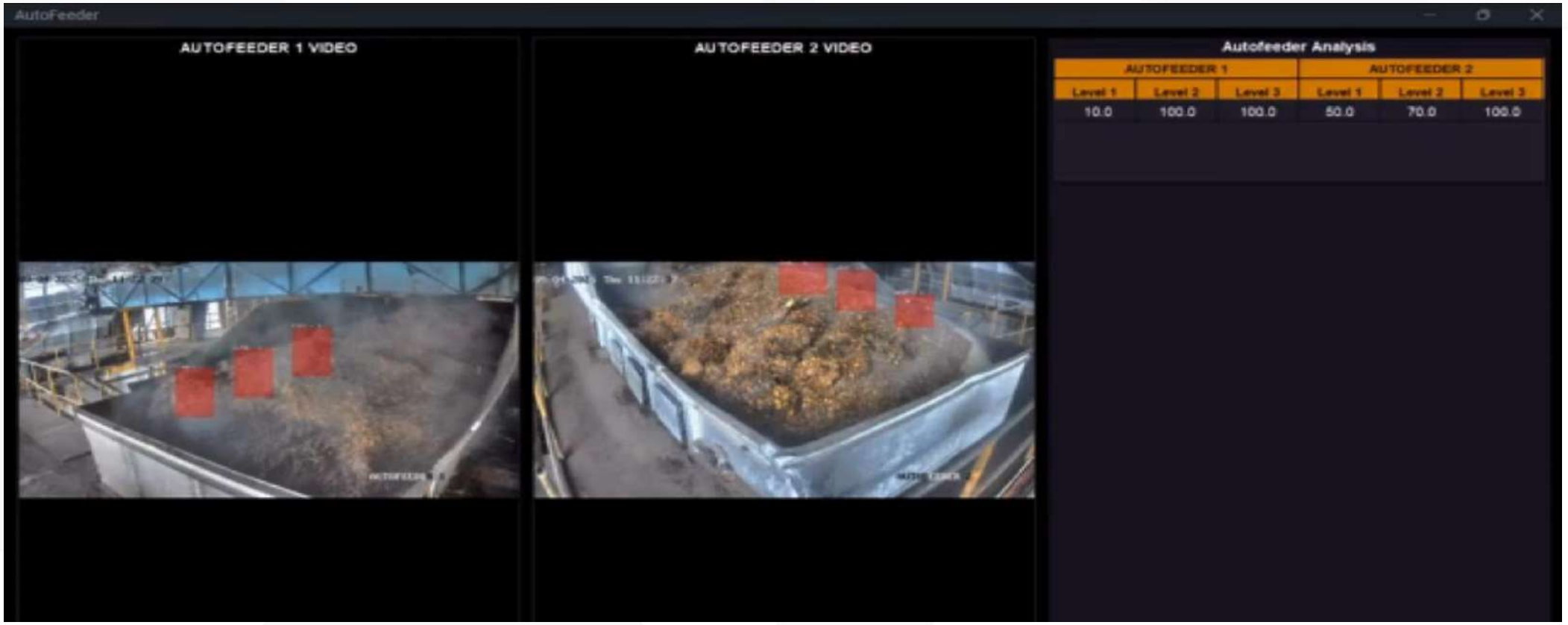
- Detailed information about the sterilizer and door control.
- Automated feeding time based on the AI-powered camera.
- Automatic cooking adjustment based on AI analysis of the CFF on the conveyor.
- Display of pressure readings, valve and sterilizer status, signal indicator, and process time.
- Real-time graphic and information display via the MyPalm system.



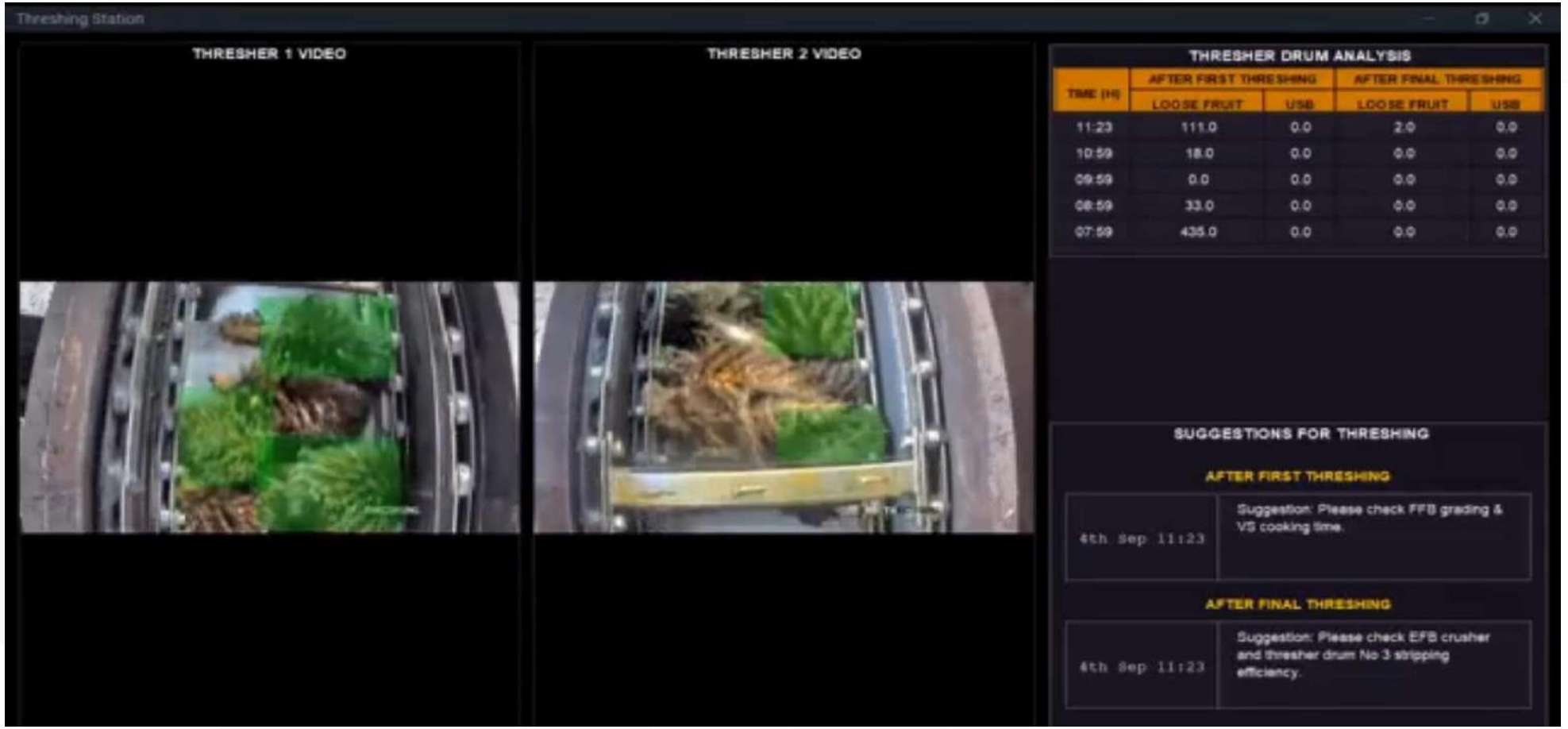


Sterilizer Dashboard

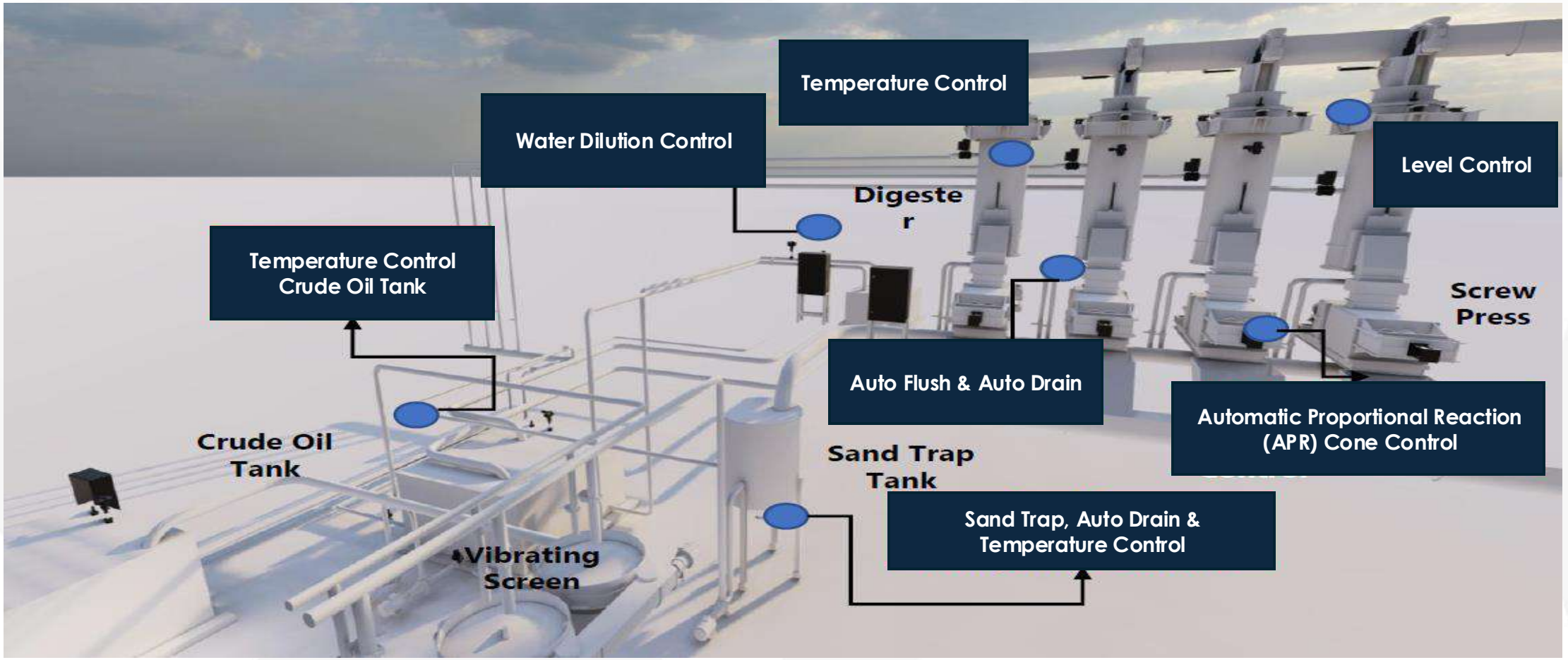
KEY HIGHLIGHT 5: THRESHER STATION – AI ONLINE AUTOFEEDER LEVEL AN



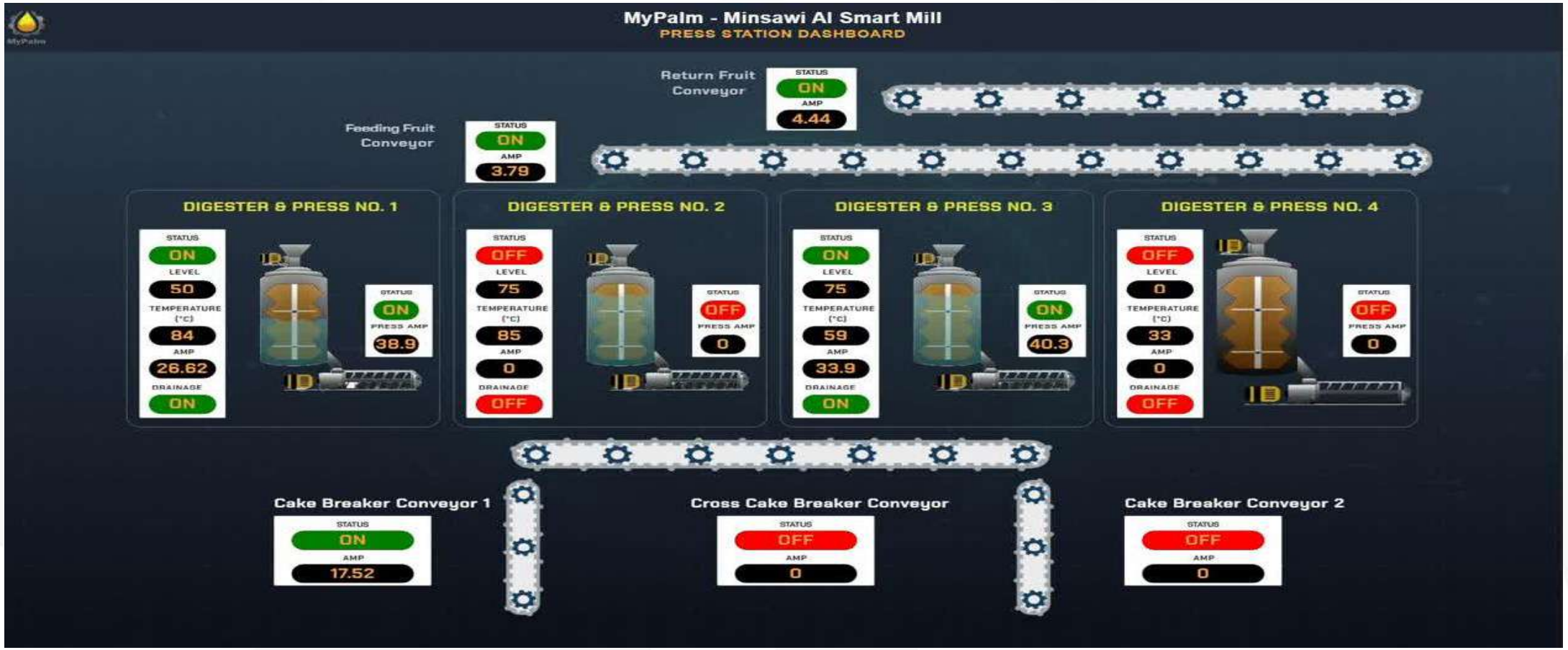
KEY HIGHLIGHT 6: THRESHER STATION – AI ONLINE UNSTRIPPED BUNCH ANALYSIS



KEY HIGHLIGHT 7: INTEGRATED PRESS STATION AUTOMATION & AI CONTROL



KEY HIGHLIGHT 8: PRESS STATION – INTERACTIVE AI CONTROL DASHBOARD



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KEY HIGHLIGHT 9: PRESS STATION - SCREW PRESS CONE CONTROL (APR SYSTEM)

Screw Press Cylinders

Screw Press Panel & Hydraulic Power Unit

APR Panel

APR Manifold Block

3 in 1 Panel (Screw Press with Inverter)

APR Hydraulic Power Unit

KEY HIGHLIGHT 10: PRESS STATION – SMART DIGESTOR LEVEL SYSTEM

Top Door Cylinder

Top Door Cylinder

Loadcell

Limit Switch to Pendulum

Bottom Door Cylinder

Digester Level Control Panel

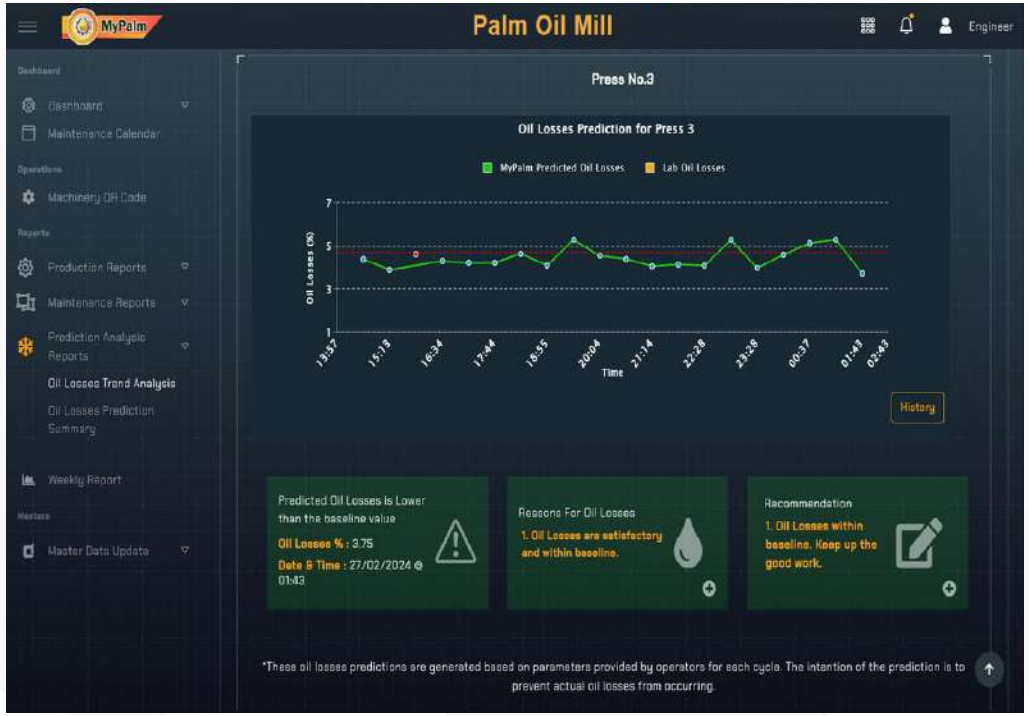
KEY HIGHLIGHT 11: PRESS STATION - TEMPERATURE CONTROL, AUTO DRAIN & AUTO FLUSH

Drain Control Valve and Flushing

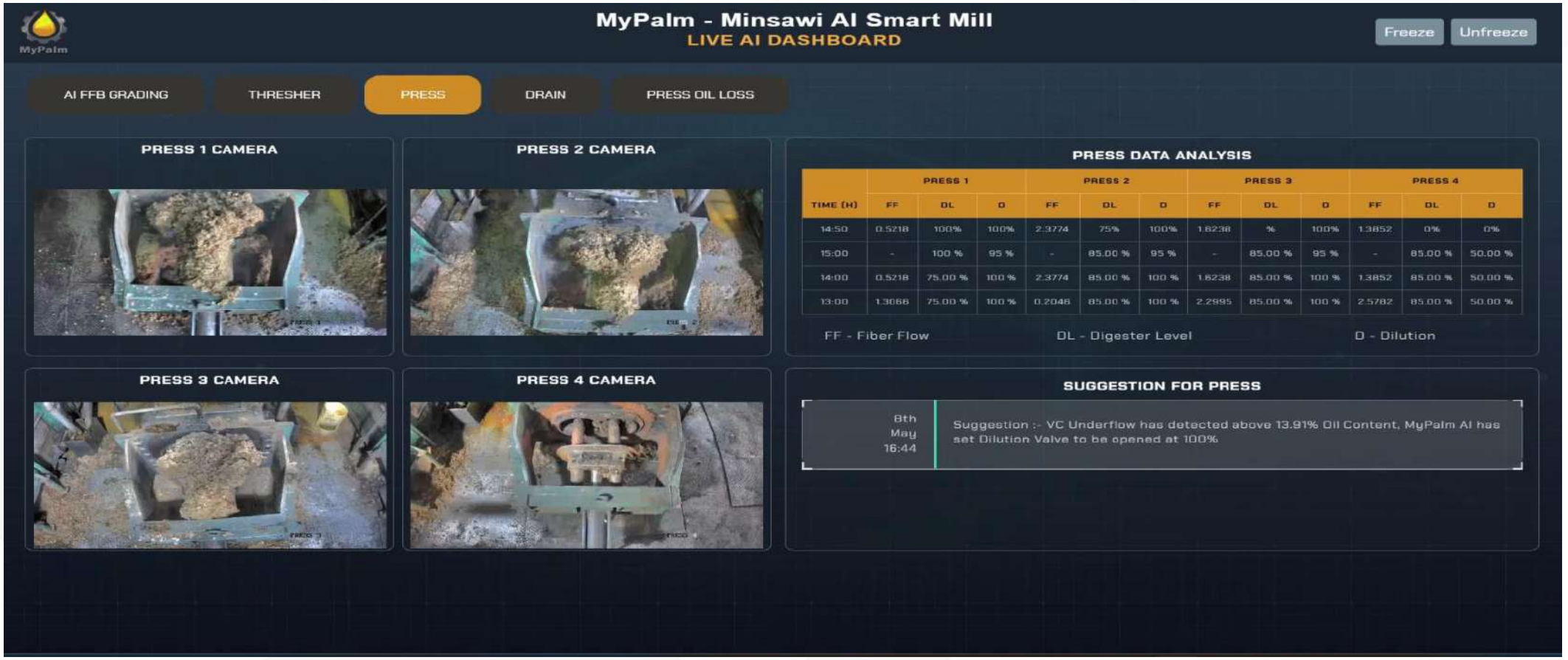
Inlet Steam Valve

KEY HIGHLIGHT 12: PRESS STATION - WATER DILUTION CONTROL

KEY HIGHLIGHT 13: PRESS STATION – REAL-TIME MESOCARP FIBRE OIL LOSS PREDICTION

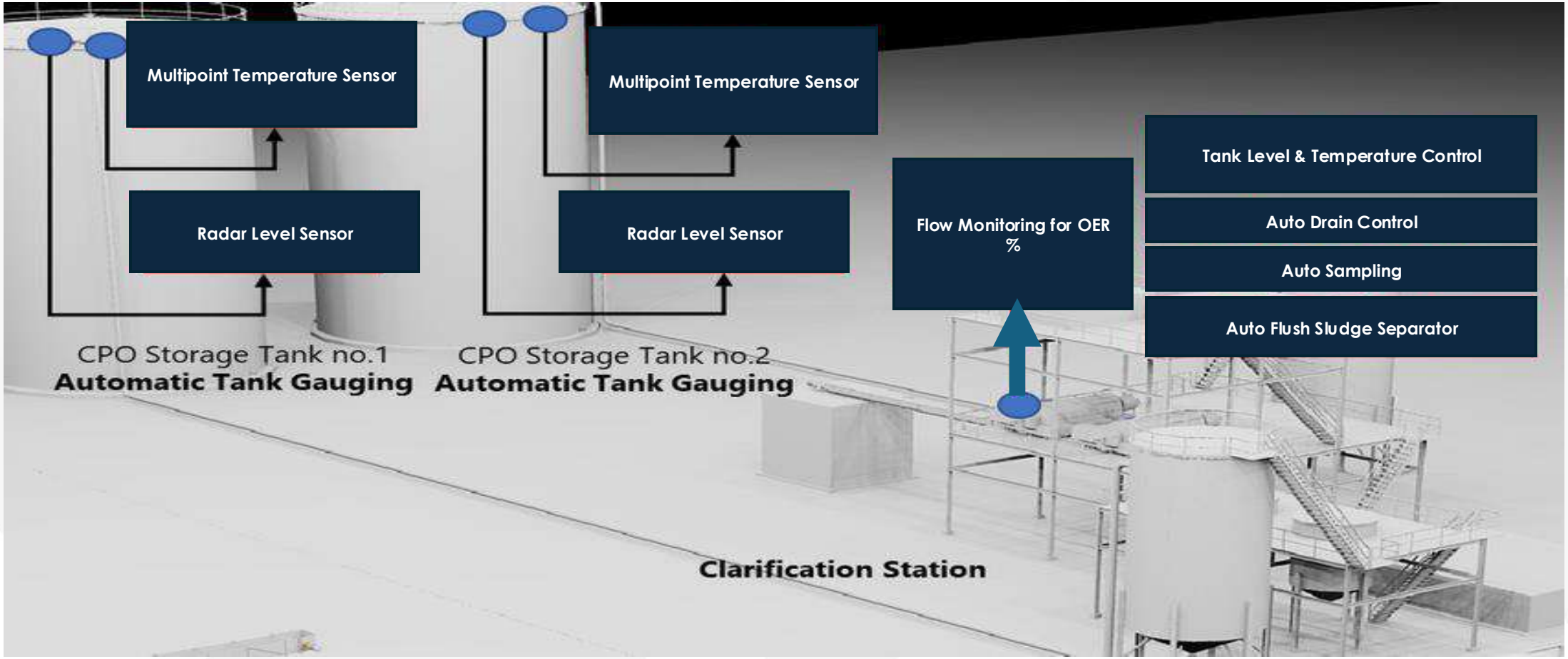


KEY HIGHLIGHT 14: PRESS STATION – PRESS CAKE VELOCITY DETECTION

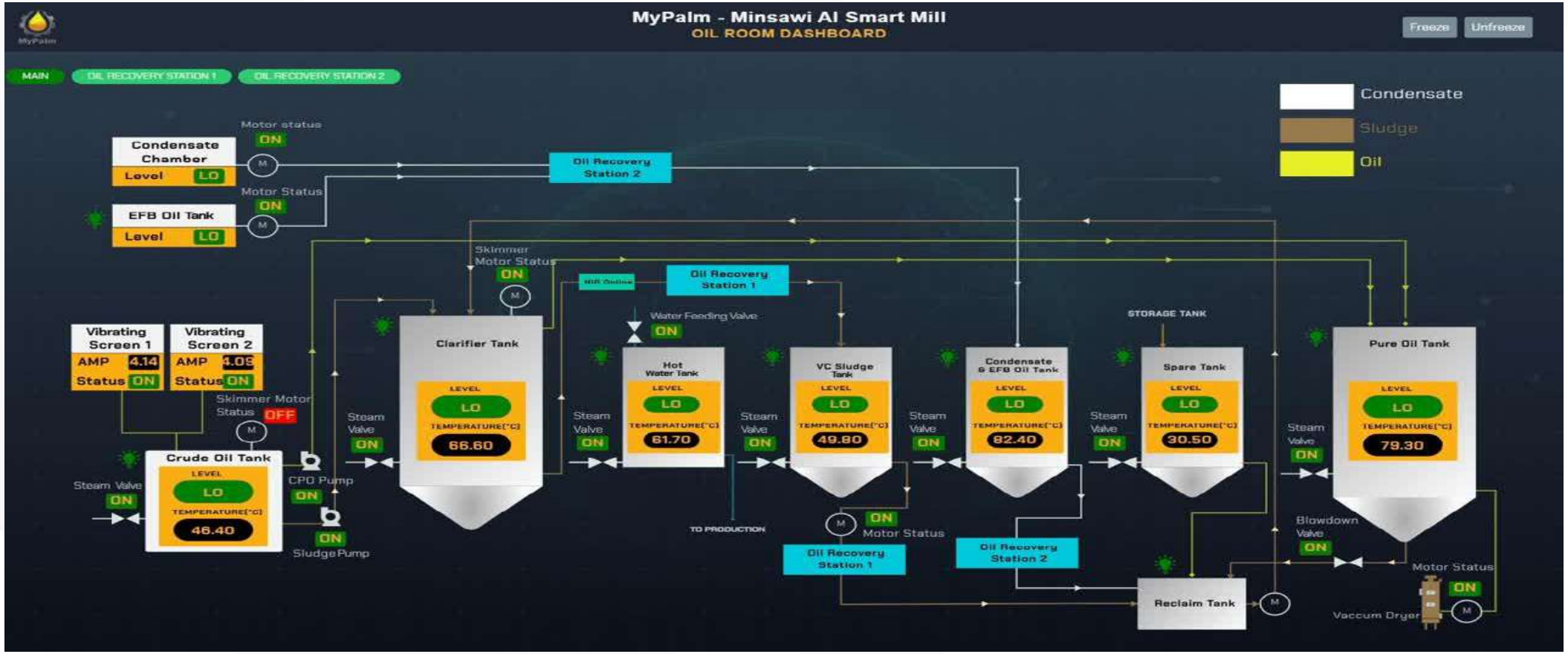


TIME (H)	PRESS 1 FF	PRESS 1 DL	PRESS 1 D	PRESS 2 FF	PRESS 2 DL	PRESS 2 D	PRESS 3 FF	PRESS 3 DL	PRESS 3 D	PRESS 4 FF	PRESS 4 DL	PRESS 4 D
14:50	0.5218	100%	100%	2.3774	75%	100%	1.8238	%	100%	1.3852	0%	0%
15:00	-	100 %	95 %	-	85.00 %	95 %	-	85.00 %	95 %	-	85.00 %	50.00 %
14:00	0.5218	75.00 %	100 %	2.3774	85.00 %	100 %	1.8238	85.00 %	100 %	1.3852	85.00 %	50.00 %
13:00	1.3068	75.00 %	100 %	0.2046	85.00 %	100 %	2.2995	85.00 %	100 %	2.5782	85.00 %	50.00 %

KEY HIGHLIGHT 14: INTEGRATED CLARIFICATION STATION AUTOMATION AND AI CONTROL



KEY HIGHLIGHT 14: CLARIFICATION STATION – INTERACTIVE AI CONTROL DASHBOARD



KEY HIGHLIGHT 14: CLARIFICATION STATION – LEVEL & TEMPERATURE CONTROL

Steam Inlet Control Valve - VCT

Steam Inlet Control Valve - VCT

Temperature Transmitter

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KEY HIGHLIGHT 15: CLARIFICATION STATION – AUTO DRAIN

Drain Control Valve

Drain Control Valve

Drain Control Valve

KEY HIGHLIGHT 16: CLARIFICATION STATION – AUTO SKIMMING

Mechanical Skimmer with Servo Motor

Mechanical Skimmer with Gearmotor

Mechanical Skimmer

Skimmer

KEY HIGHLIGHT 17: CLARIFICATION STATION – REAL-TIME OIL CONTENT ANALYSIS

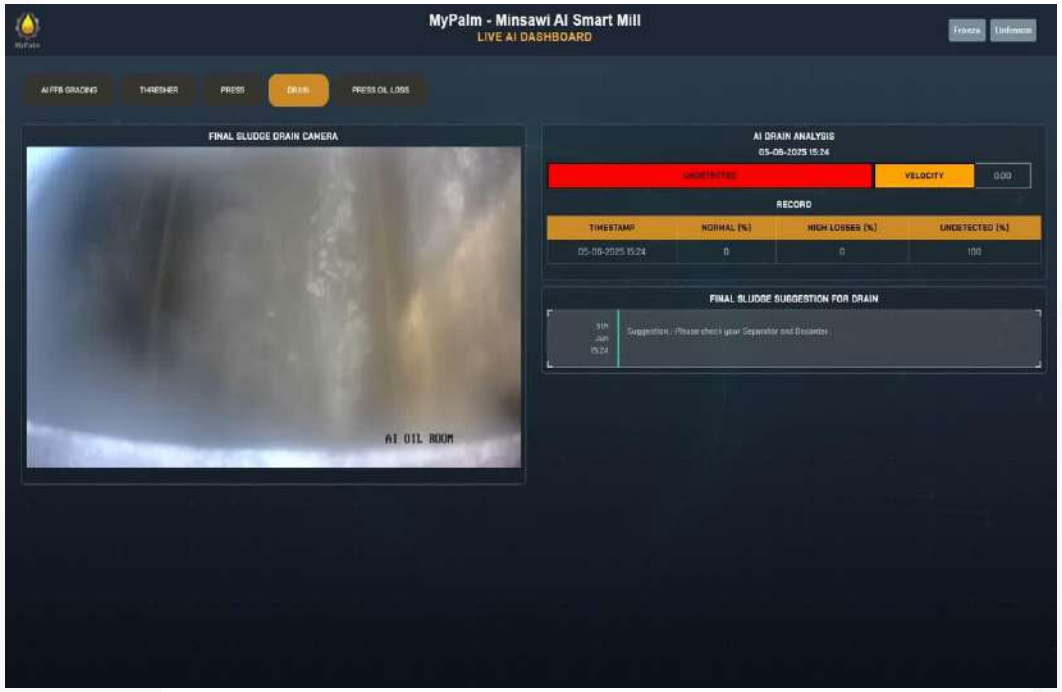
Oil Content in Diluted Crude Oil Analysis

Oil Content in Vertical Clarifier Underflow

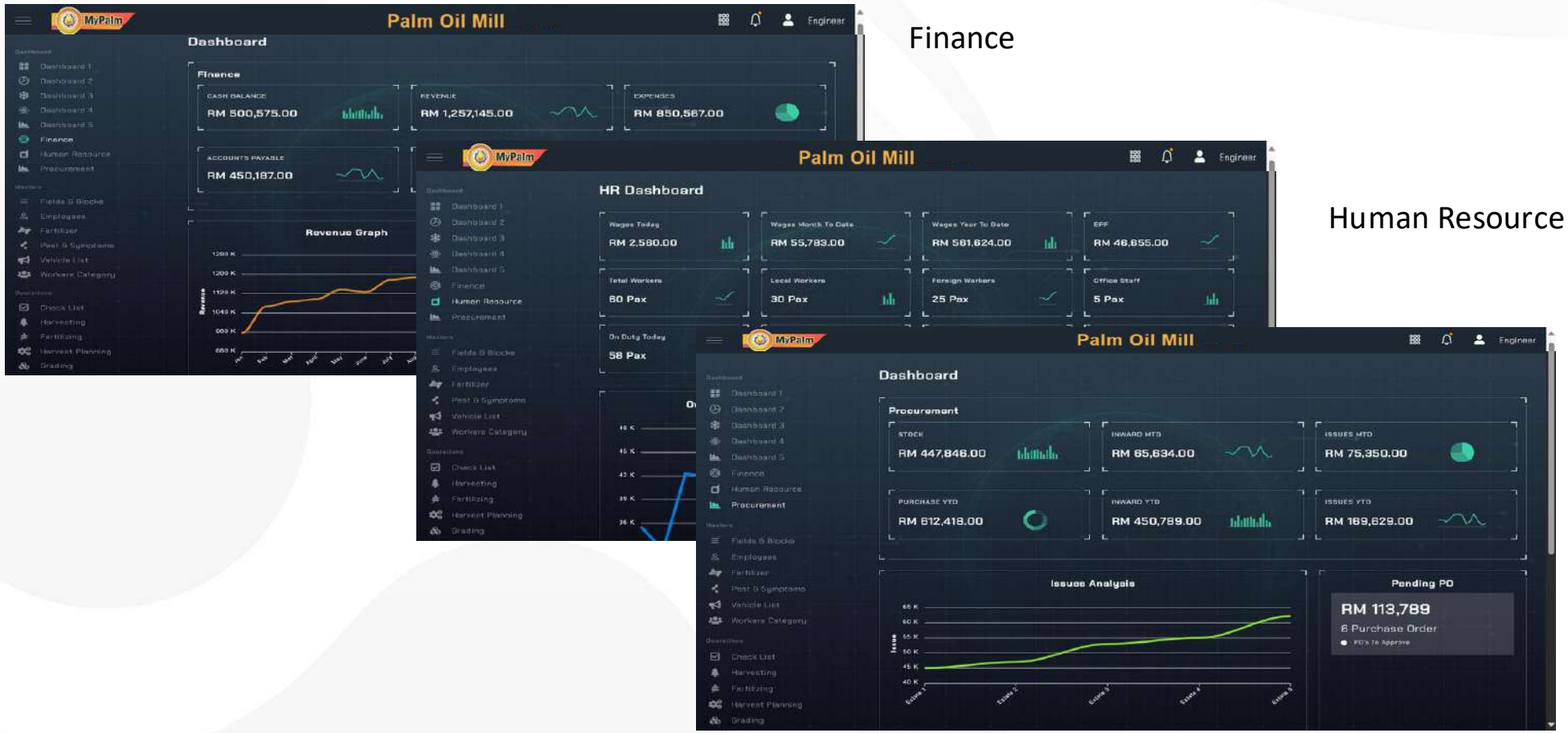
KEY HIGHLIGHT 18: CLARIFICATION STATION – FLOW MONITORING

Linkage to Weighbridge to Calculate OER (%)

KEY HIGHLIGHT 19: CLARIFICATION STATION - MILL FINAL SLUDGE DETECTION AND ALERT



KEY HIGHLIGHT 20: INTEGRATION BETWEEN OPERATION, MAINTENANCE AND ADMINISTRATION



Finance

Human Resource

Store & Procurement

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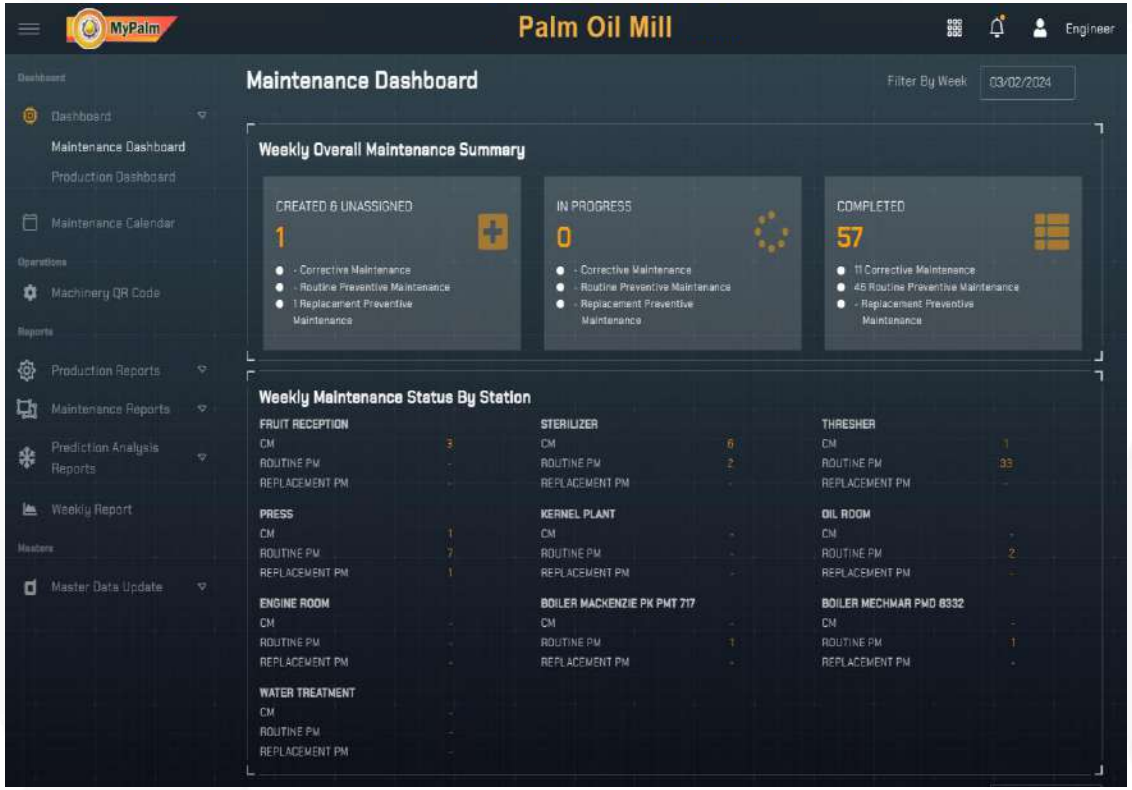
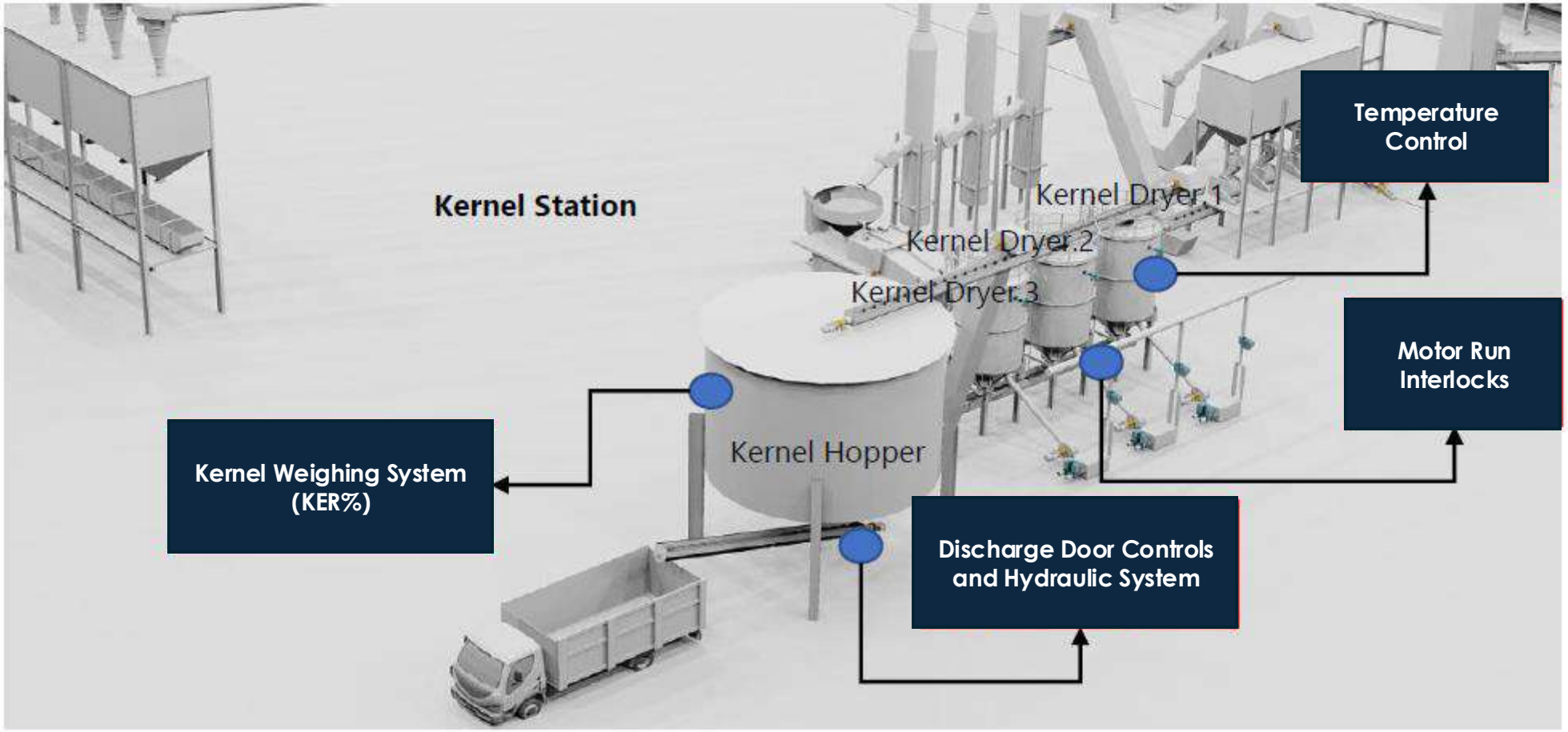
KEY HIGHLIGHT 21: QR CODE LINKED AI PREDICTIVE MAINTENANCE



KEY HIGHLIGHT 22: INTEGRATED KERNEL STATION AUTOMATION & AI CONTROL



KEY HIGHLIGHT 23: KERNEL STATION CONTROL POINTS

Steam Valve and Temperature Transmitter

Kernel Dryer Temperature Control

Silo Hopper Sliding Door Control

Kernel Dryer Level Control

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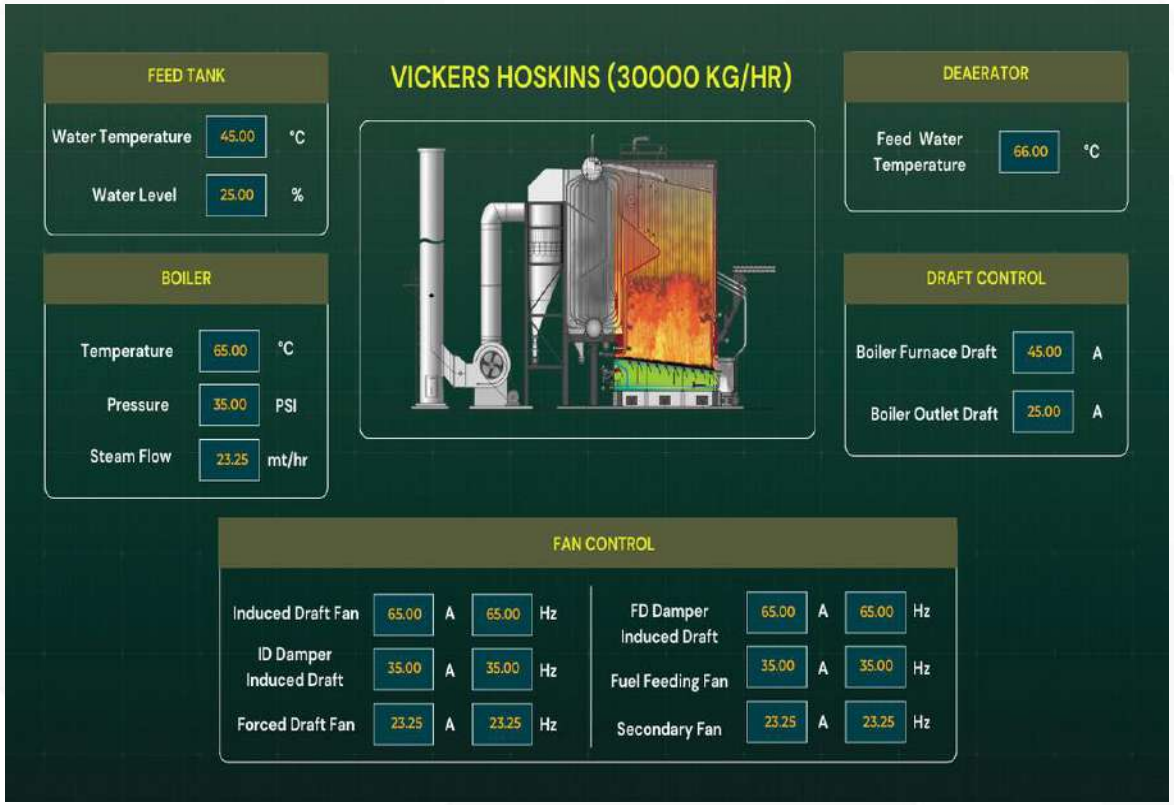
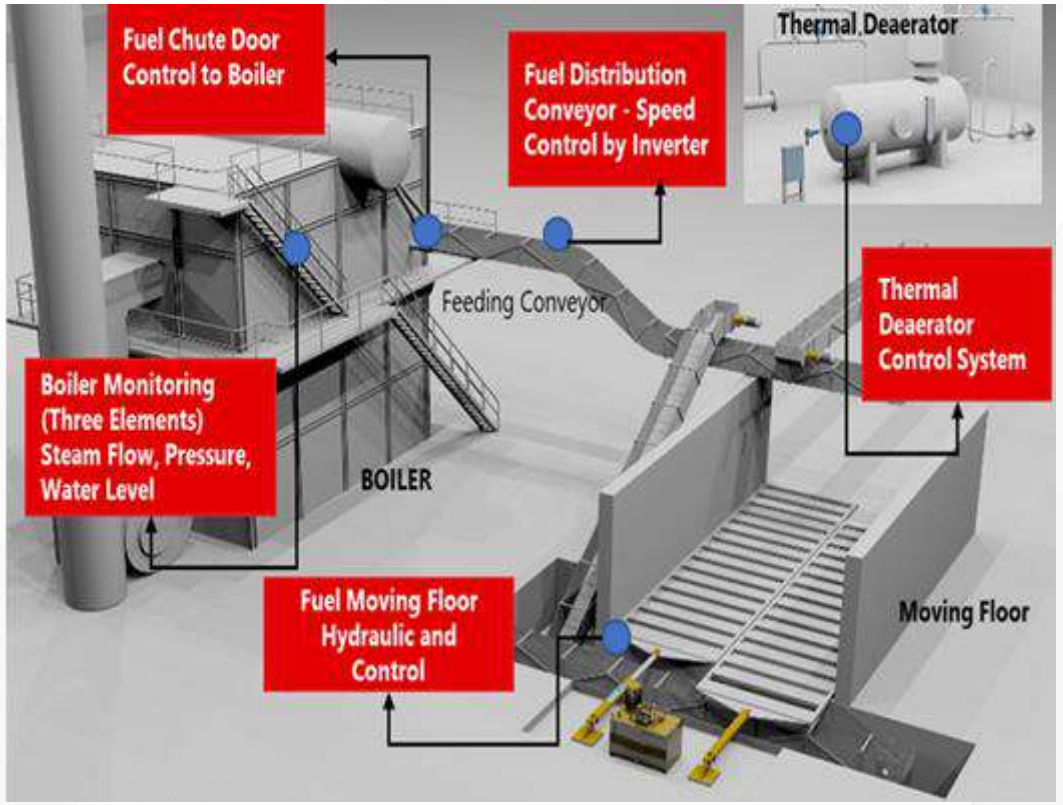
KEY HIGHLIGHT 24: INTEGRATED BOILER STATION DATA COLLECTION





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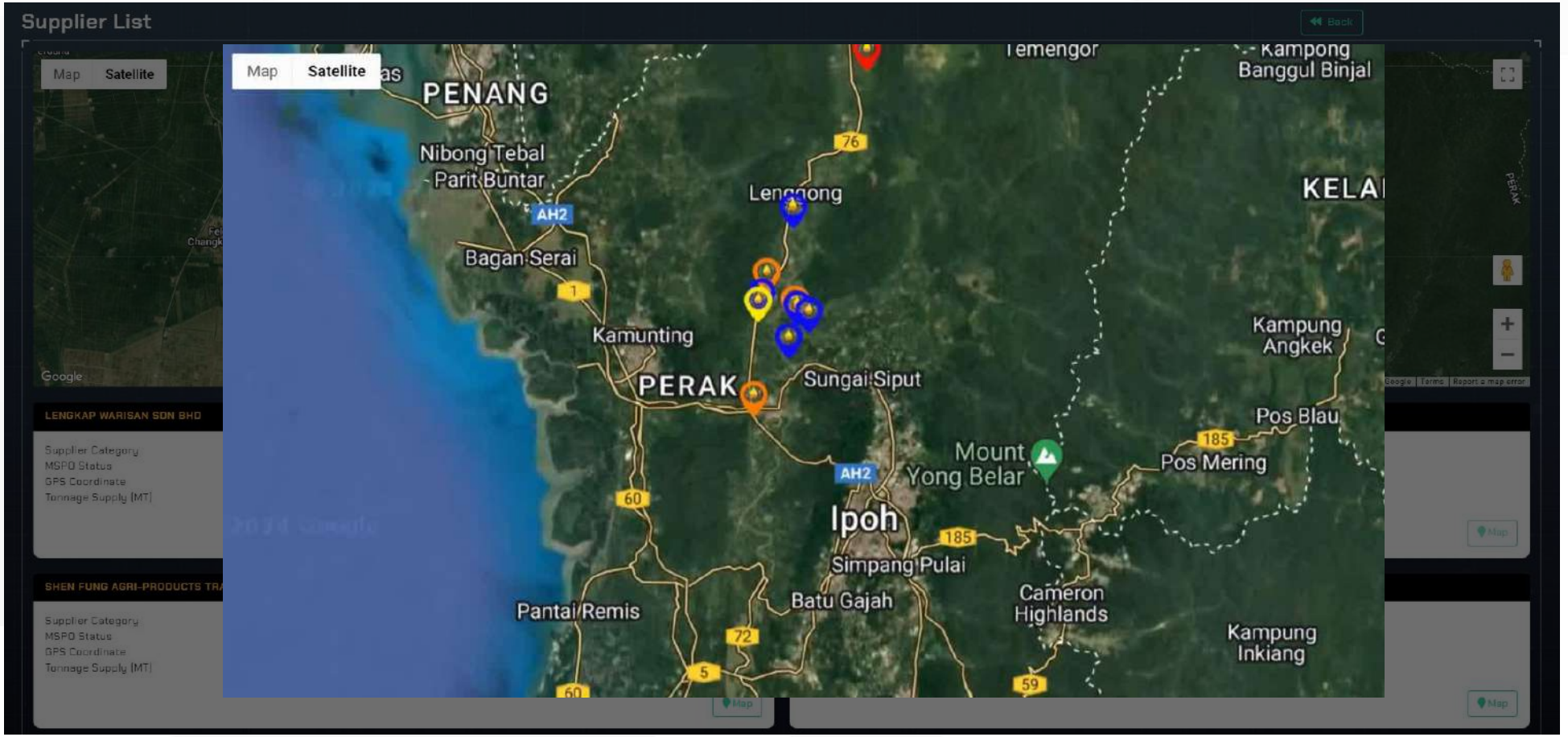
KEY HIGHLIGHT 25: LABORATORY MODULE (INTEGRATED WITH SPECFIT)

- Seamless Integration with SpecFIT to enable:
  - ✅ Loss tracking cross-check
  - ✅ Quality parameter validation
- Ensures data consistency and improves accuracy in production & quality reporting

FINE.INSTRUMENT TECHNOLOGY

KEY HIGHLIGHT 26: AI SAFETY MONITORING

KEY HIGHLIGHT 27: SUPPLY CHAIN TRACEABILITY (EUDR COMPLIANT)



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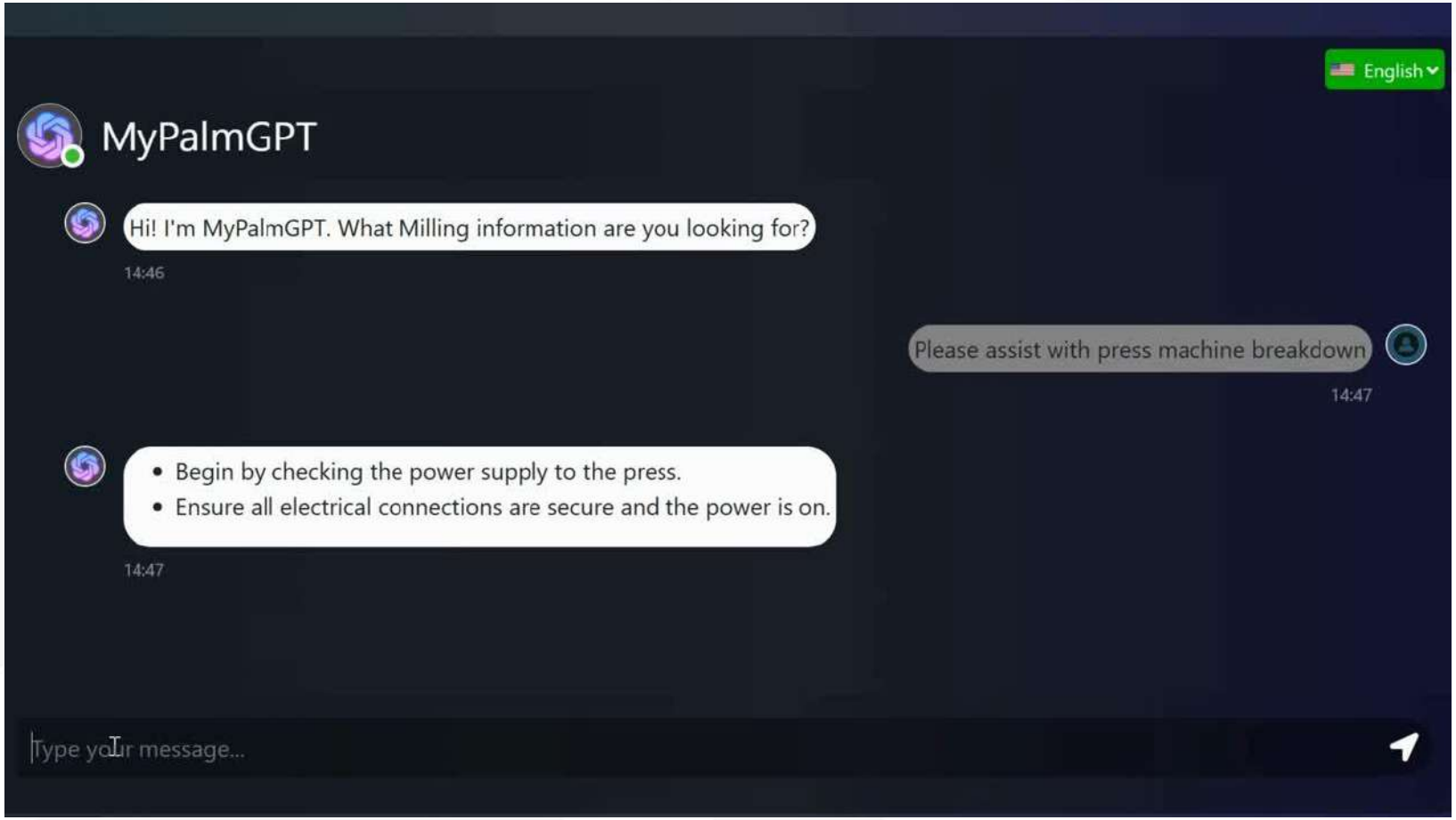
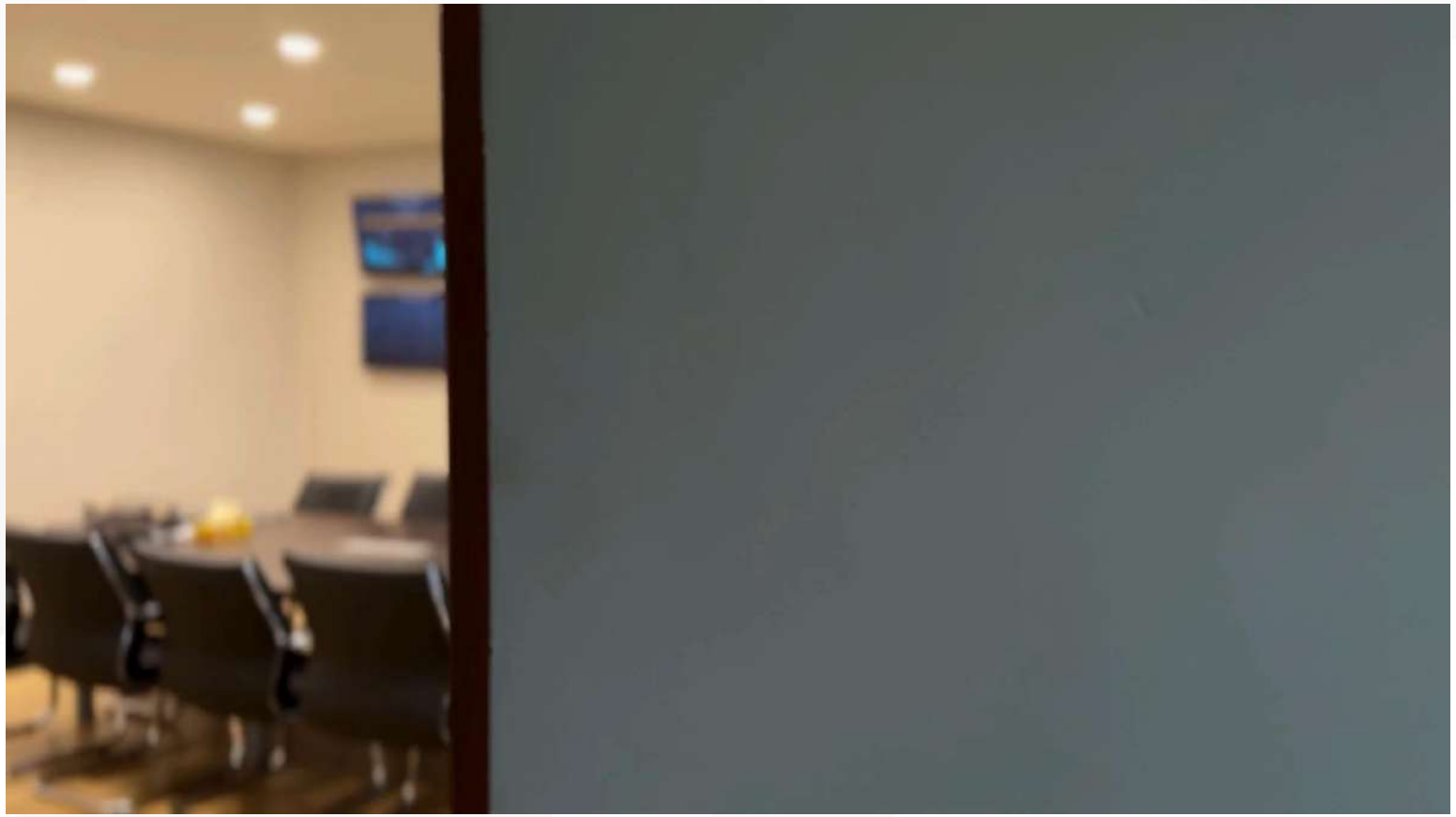
KEY HIGHLIGHT 28: MyPalm GPT (AI MILLING ASSISTANT)



KEY HIGHLIGHT 29: AI CONTROL ROOM

KEY HIGHLIGHT 31: PALM OIL MILL MEETING ROOM WITH CLOUD BASED DASHBOARDS



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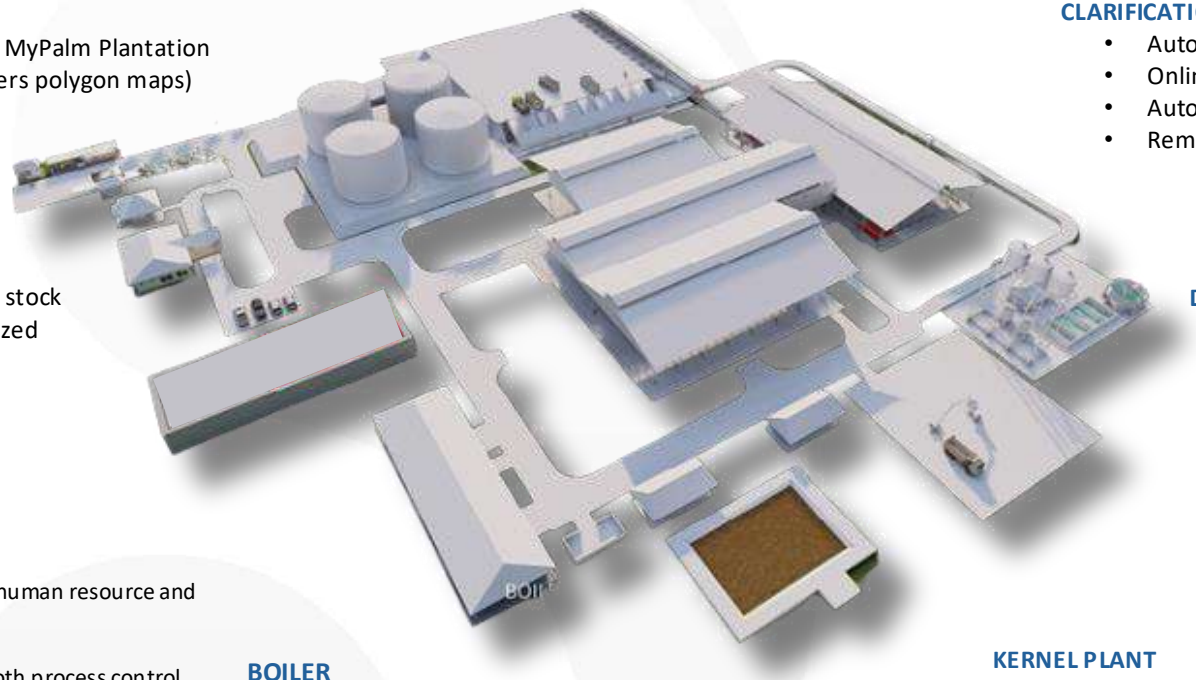
ADOPTION OF AI IN PALM OIL MILLING

FFB RAMP & WEIGHBRIDGE
- Automatic opening and closing of ramp door
- Online FFB analysis
- Supply chain traceability (linked via MyPalm Plantation and MyPalm Dealer with smallholders polygon maps)
- Remote monitoring via MyPalm

STERILIZER
- Auto selection of cooking recipes based on FFB quality
- Online USB analysis
- Automated feeding control using AI-Based camera
- Remote monitoring via MyPalm

CLARIFICATION
- Automated level and temperature control
- Online VCT underflow oil losses monitoring
- Automated oil skimming in VCT
- Remote monitoring via MyPalm



CPO STORAGE TANK
- Automatic tank gauging system to monitor stock
- Real-time notifications to detect unauthorized movements
- Instant OER calculation using flowmeters
- Remote monitoring via MyPalm

DIGESTER & PRESS
- Automated level and temperature control
- Water dilution control
- Real-time prediction of mesocarp fibre oil loss
- Remote monitoring via MyPalm

DATA ROOM
- Integration between operation, finance, human resource and weighbridge data
- Real-time reports
- AI-based decision making to ensure smooth process control
- MyPalmGPT features to assist production and maintenance team

BOILER
- Real-time boiler and turbine data monitoring
- Auto boiler fuel control
- Remote monitoring via MyPalm

KERNEL PLANT
- Kernel bunker and kernel silo level monitoring
- Temperature control
- Remote monitoring via MyPalm

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ACHIEVEMENT OF AI-BASED SMART PALM OIL MILL

(Implemented Starting From August 2024)

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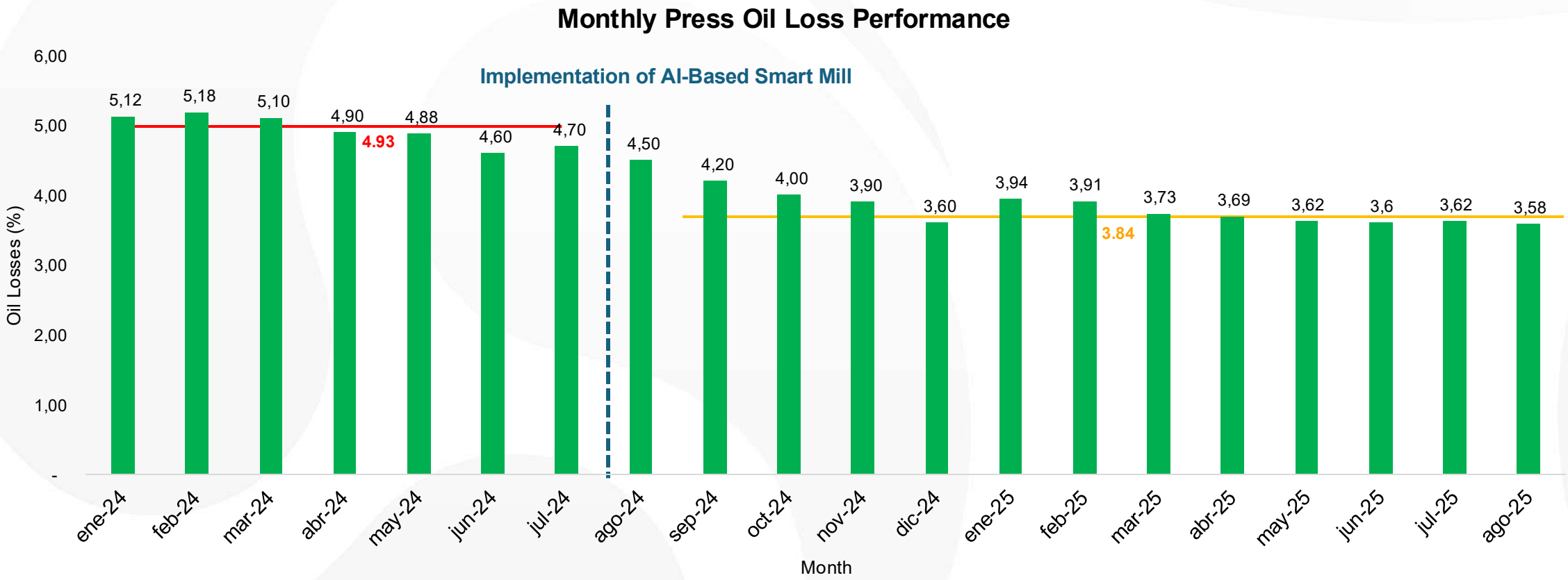
SIGNIFICANT REDUCTION IN MESOCARP OIL LOSS



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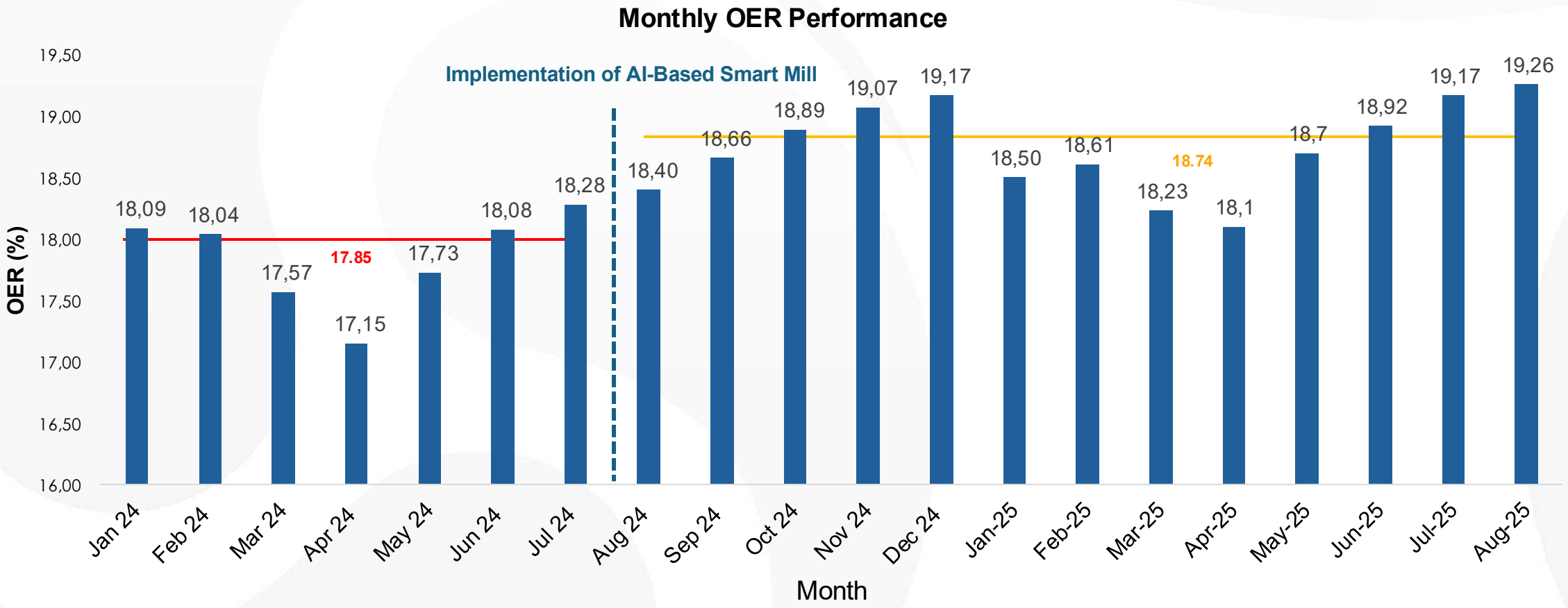
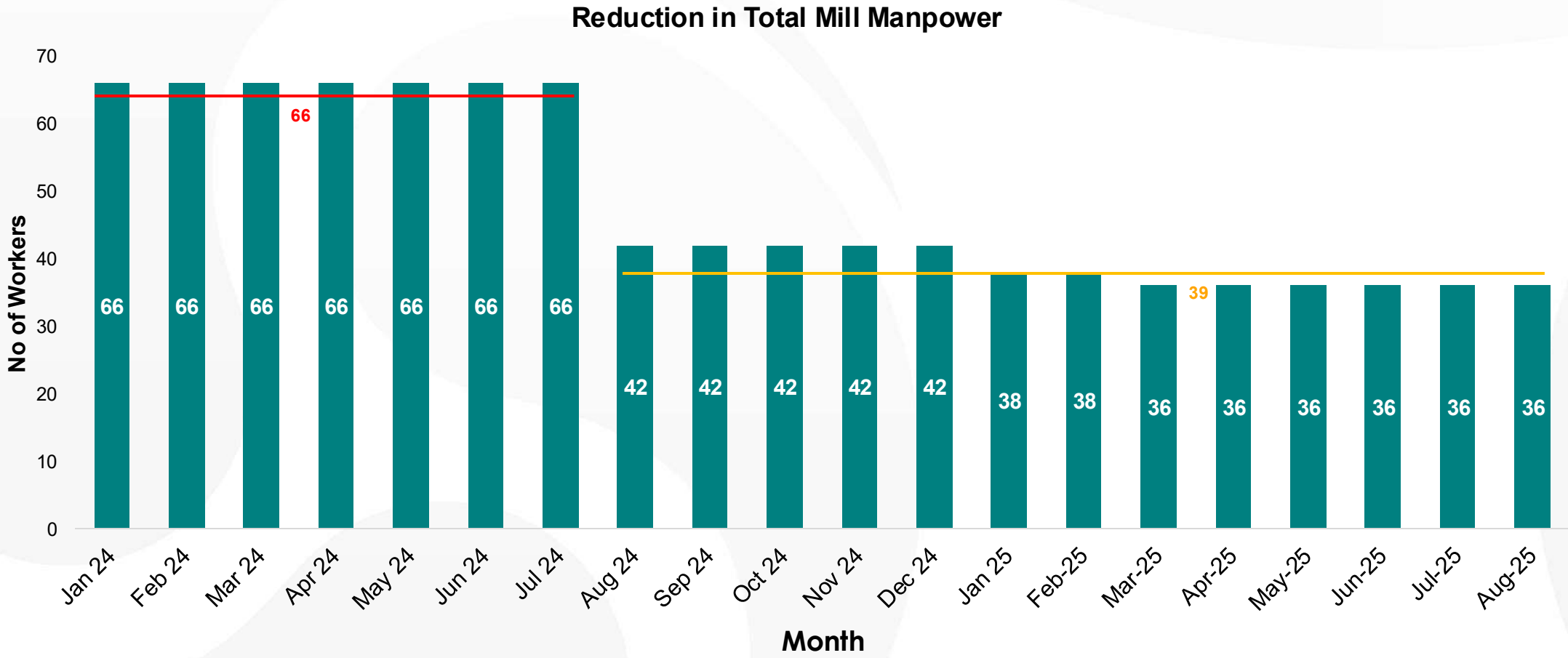
INCREASE IN OIL EXTRACTION RATE (OER)



REDUCTION IN TOTAL MILL MANPOWER



45 % LABOUR REDUCTION

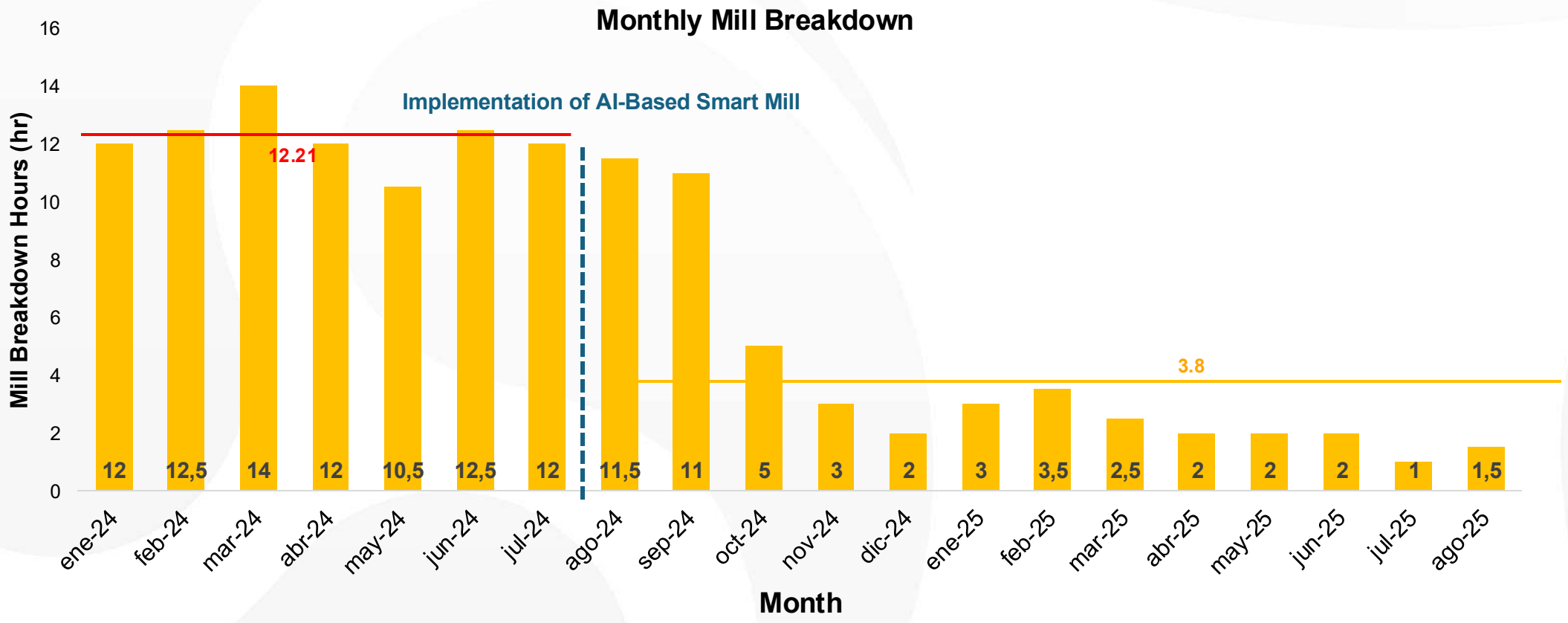
Before Labour Reduction

NO	STATION	NUMBER OF WORKERS
1	RAMP/GRADING	5
2	LABORATORY	3
3	OFFICE	12
4	ENGINEER	2
5	STORE	2
6	WORKSHOP	12
7	ELECTRICAL	3
8	SUPERVISOR	2
9	MANDOR	2
10	VS STATION	4
11	EB PRESS STATION	2
12	PRESS STATION	2
13	OIL ROOM	4
14	KERNEL PLANT STATION	2
15	BOILER STATION	4
16	GENERAL WORKER	4
17	EFFLUENT	1
TOTAL		**66**

After Labour Reduction

NO	STATION	NUMBER OF WORKERS
1	RAMP/GRADING	4
2	LABORATORY	2
3	OFFICE	10
4	ENGINEER	2
5	STORE	2
6	WORKSHOP	8
7	ELECTRICAL	2
8	SUPERVISOR	0
9	MANDOR	0
10	VS STATION	2
11	EB PRESS STATION	0
12	PRESS STATION	0
13	OIL ROOM	0
14	KERNEL PLANT STATION	0
15	BOILER STATION	4
16	GENERAL WORKER	0
17	EFFLUENT	0
TOTAL		**36**

MONTHLY MILL BREAKDOWN PERFORMANCE



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COST BENEFIT ANALYSIS FOR PALM OIL MILL

A. ANNUAL GAIN FROM MESOCARP OIL LOSS REDUCTION (45 MT MILL)

PRESS MESOCARP OIL LOSS REDUCTIONS RESULTING IN ADDITIONAL OIL EXTRACTION RATE

MILL OIL LOSS BEFORE AI SMART PALM OIL MILL SYSTEM WAS 4.70%
4.70 x 13% = 0.611%

WITH AI SMART PALM OIL MILL SYSTEM, THE CURRENT MILL OIL LOSS REDUCED UP TO 3.9%
3.9 x 13% = 0.507%
0.611% - 0.507% = 0.104% (ADDITIONAL OER)

ASSUMING MILL PROCESSES 30,000 MT FFB PER MONTH
30,000 MT x 0.104% = 30 MT EXTRA CPO PRODUCED

30 MT x RM 4150 (CPO PRICE) = RM 124,500 PER MONTH ≈ **RM 1,494,000 PER YEAR**

B. ANNUAL GAIN THROUGH 5% MILL DOWNTIME REDUCTION (45 MT MILL)

MILL RUNNING HOURS PER YEAR : **4,992 HOURS**

RECORDED DOWNTIME IN 2023 (5% FROM MILL RUNNING HOURS) : **250 HOURS**

AVERAGE OIL EXTRACTION RATE : **18.74 %**

CPO PRICE : **RM 4,150.00**

HOURS SAVED TURNED INTO PRODUCTION	→	**EXTRA CPO PRODUCED ON PRODUCTION**	→	**GAIN FROM EXTRA CPO PRODUCED**
250 HOURS X 5% = **12.5 HOURS**		12.5 HOURS X 45 MT/HR X 18.74% = **105.41 MT**		105.41 MT X RM 4150.00 = **RM 426,245.50**

ANNUAL GAIN FROM REDUCING MILL DOWN TIME 5% = RM 437,462 PER YEAR

C. OVERHEAD COST REDDUCTION (FOR 30 MANPOWER REDUCED)

Cost Type	Cost Per Employee (RM)	Monthly Cost (RM)	Annual Savings (RM)
Salary	3,800.00	83,600.00	1,003,200.00
Permit & Levy	2,200.00	-	17,600.00
Fomema	500.00	-	11,000.00
Insurance	200.00	-	4,400.00
Accommodation	125.00	2,750.00	33,000,00
Medical	500.00	-	11,000.00
Total			**RM 1,080,200.00**

TOTAL SAVINGS AFTER IMPLEMENTATION OF AI-BASED SMART PALM OIL MILL

Savings Type	Amount (RM)
A. Oil Extraction Revenue	**1,494,000.00**
B. Manpower Savings	**1,080,200.00**
C. Breakdown & Downtime Savings	**437,462.00**
Total	**RM 3,011,662.00 (USD 717,318.86)**

21º CONFERENCIA INTERNACIONAL SOBRE PALMA DE ACEITE
21st International Oil Palm Conference

The Honorable Minister of Plantations & Commodities, Malaysia (YB Datuk Seri Johari Ghani) in parliament.

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THANK YOU

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CON EL APOYO DEL FONDO DE FOMENTO PALMERO