



# PI System Technology To Drive Pertamina Refinery Oil Accounting

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**Hendro Nugroho Herdijanto**  
**Platto Mutaqin**



# Agenda

- Introduction
- PERTAMINA Overview
- Business Challenge
- The Real-Time Infrastructure
- System architecture - ROAS and process flow
- PI Visualization Suite
- Benefits on PI Visualization Suite
- Conclusion – Key Takeaways

# PERTAMINA's Downstream Supply Chain

## Assets

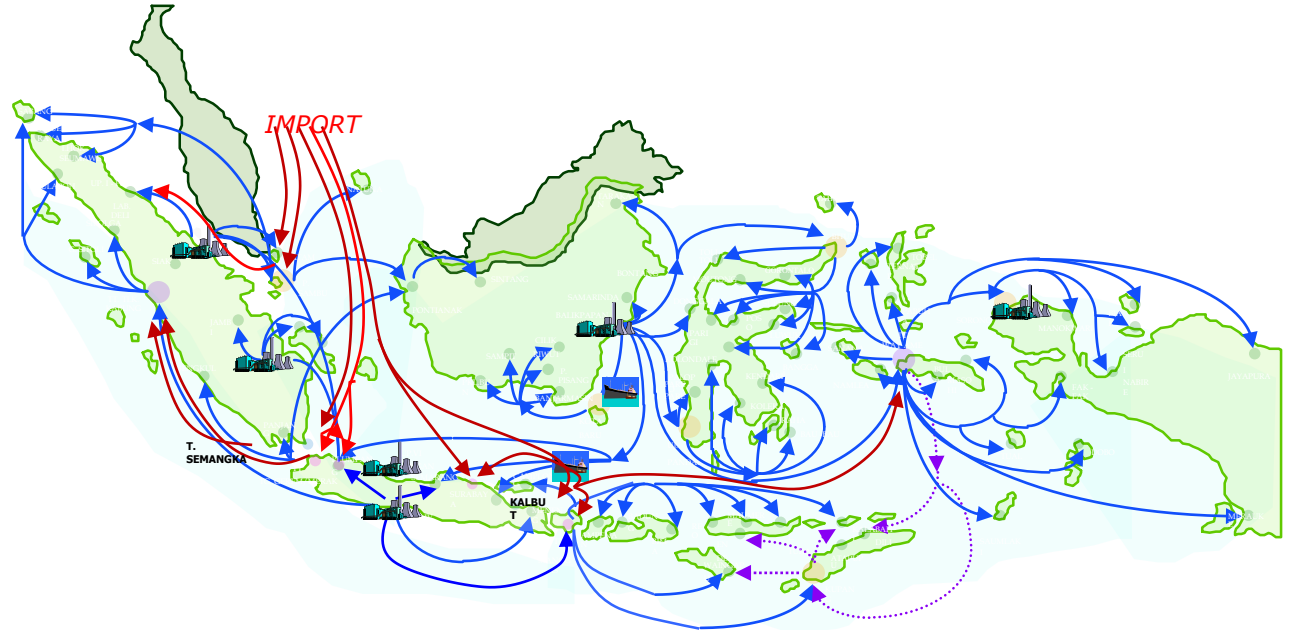
6 Refineries :  
1,034 Million bbl/day

120 + Depots

250 + Vessels

7000 + Fuel Stations

Sales Volume :  
1,200 Mbbbl/day  
(92 % Market Share)



**One of the most complex Downstream Supply Chains in the world**

# Business Challenge

Pertamina is one of the most complex downstream supply chains in the world

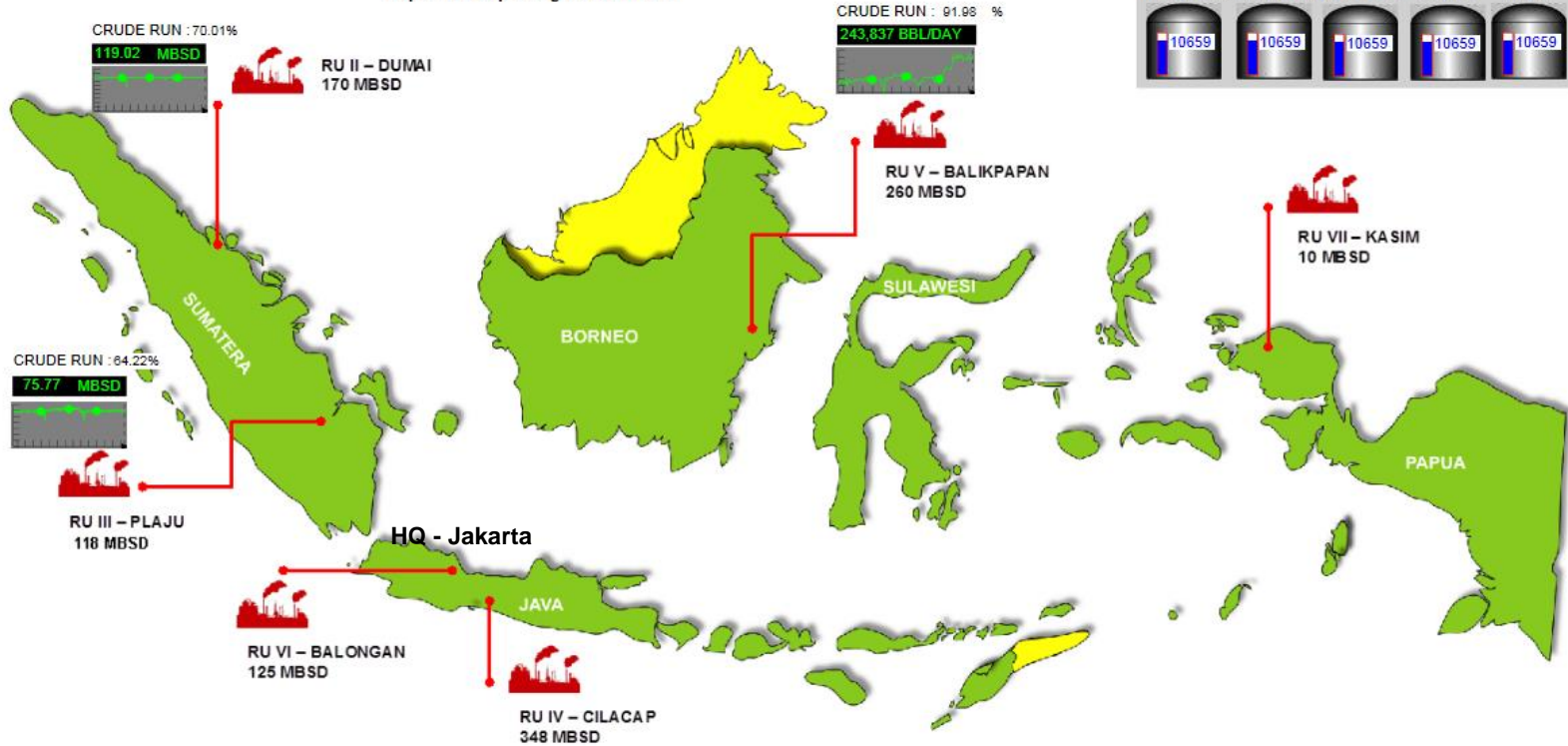
Main business challenge:

- To maintain the balance between security and economics of supply
- To reduce the amount of un accounting loss (material unbalance)

Managing oil calculation from crude intake, internal material balance, demand, loading, discharging and minimum stock is very complex.

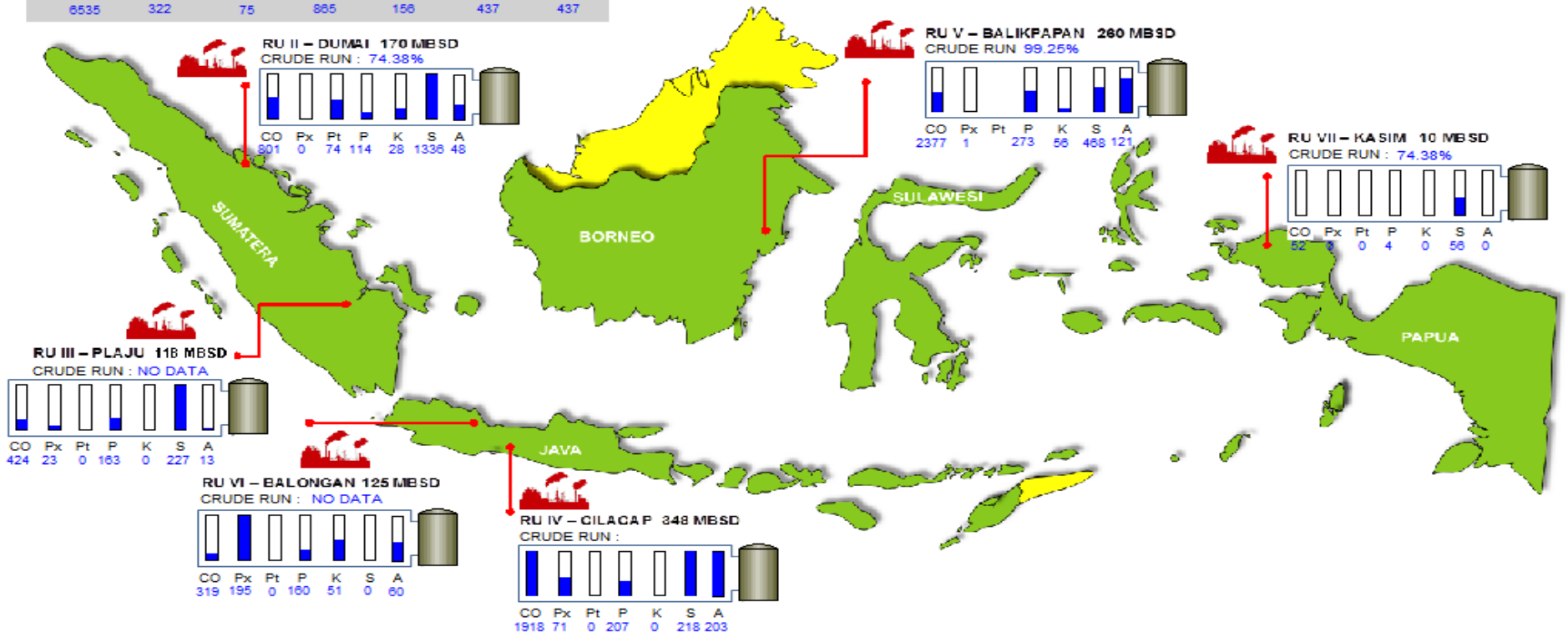
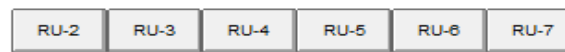
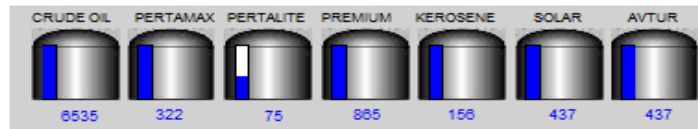
# Real Time Information System – Headquarter Dashboard

Kapasitas terpasang : 1031 MBSD



# Real Time Information System – HQ (another view)

Kapasitas terpasang : 1031 MBSD



# Real Time Display – All Refinery Unit's – 1190 Displays

Search All Displays

Filter by Keywords

- All Displays
- Favorites
- My Displays
- Recent
- RU2 DUMAI >
- RU3 PLAJU >
- RU4 CILACAP >
- RU5 BALIKPAPAN >
- RU6 BALONGAN >
- RU7 KASIM >
- Head Quarter >
- TEST >

All Displays (1190)

**REFINERY UNIT III**  
PERTAMINA/hendro.herdjanto

**MainDashboard**  
PERTAMINA/hendro.herdjanto

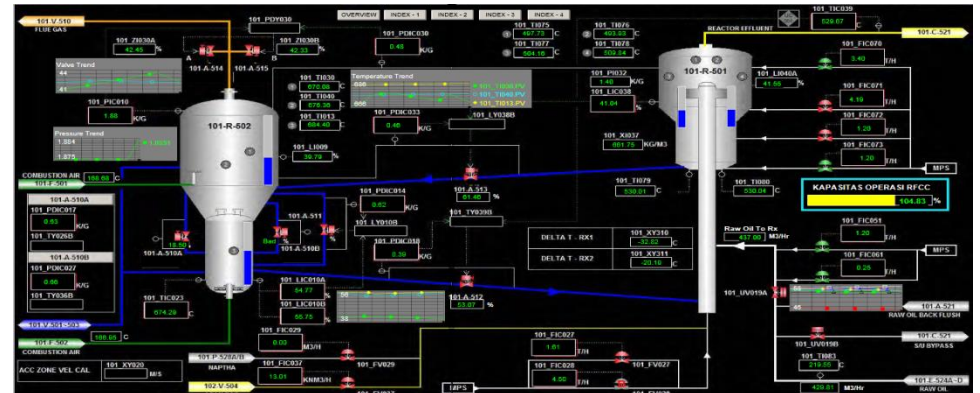
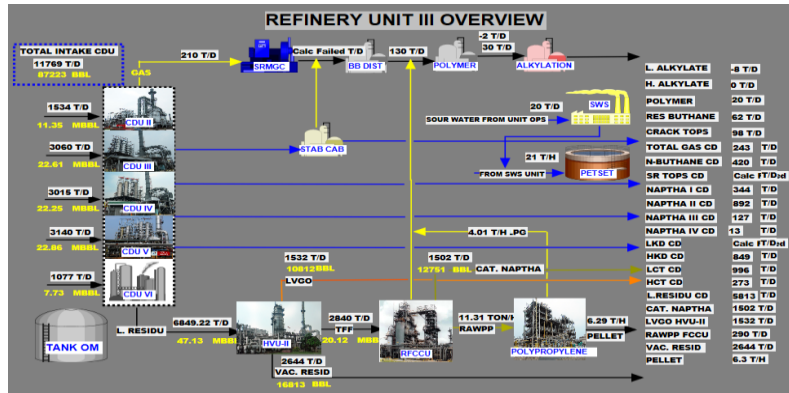
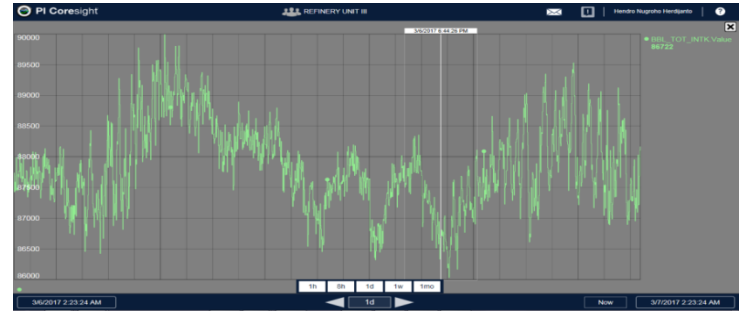
**OVERVIEW**  
PERTAMINA/hendro.herdjanto

**RU II Overview01**  
PERTAMINA/hendro.herdjanto

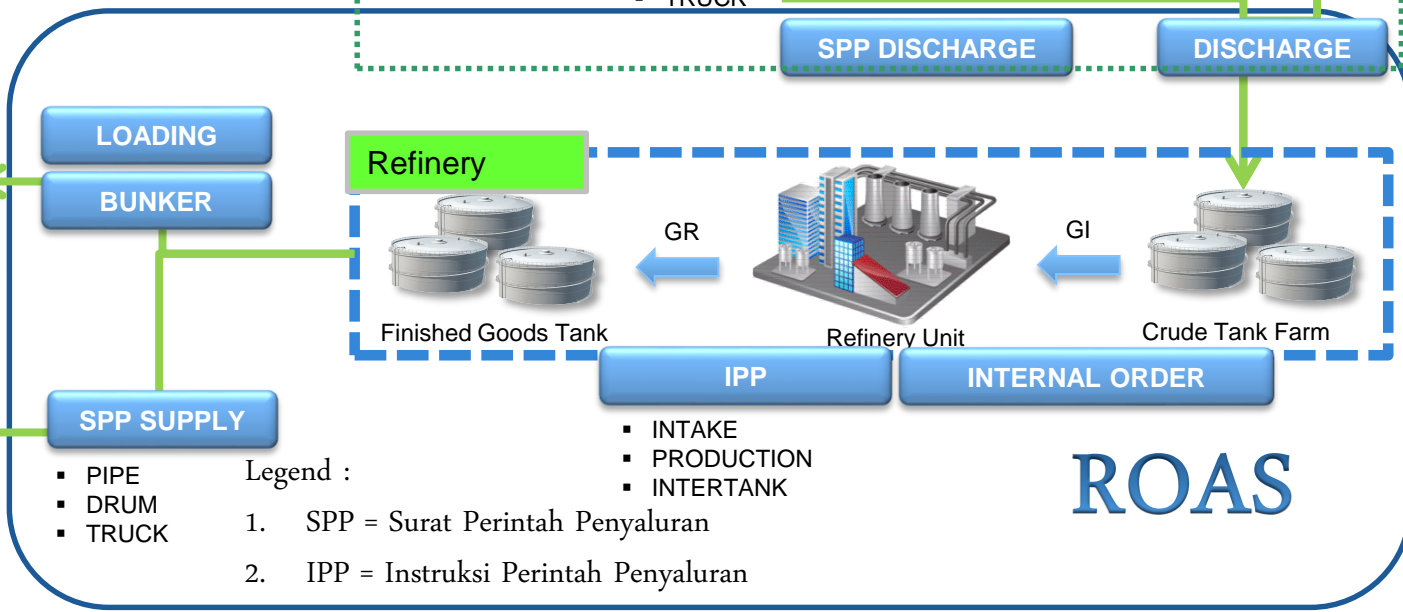
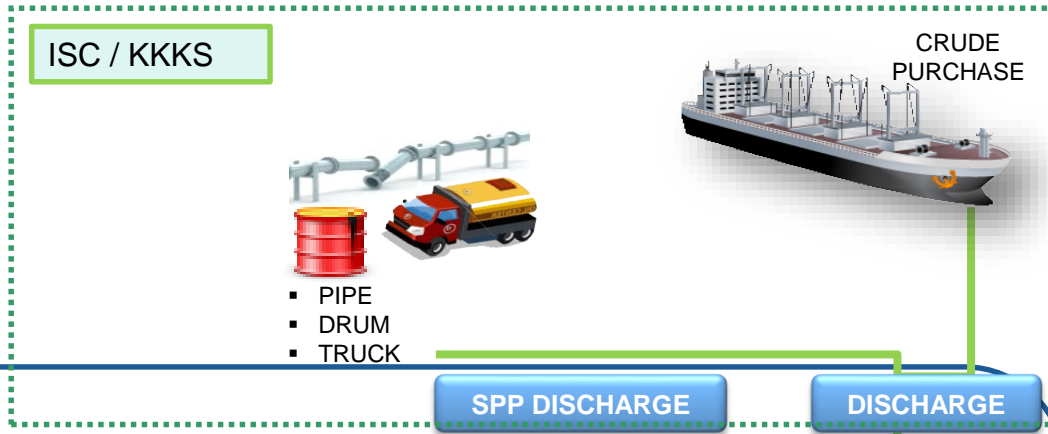
**CRUDE DISTILLATION UNIT 1**  
PERTAMINA/hendro.herdjanto

**OVERALL UP6**  
PERTAMINA/hendro.herdjanto

RU-3	DESIGN	STS (Mar'17)	NOW	UTILIZE	CRUDE RUN
CDU-II	16.2	11	11.24	102.86%	99.66%
CDU-III	30	22.39	22.70	101.38%	
CDU-IV	30	22.5	22.36	100.32%	
CDU-V	30	22.5	22.79	101.31%	
CDU-VI	15	7.5	7.88	105.12%	
HVU-II	53.5	47.38	47.16	89.54%	
FCCU	20.5	19.8	20.02	101.62%	



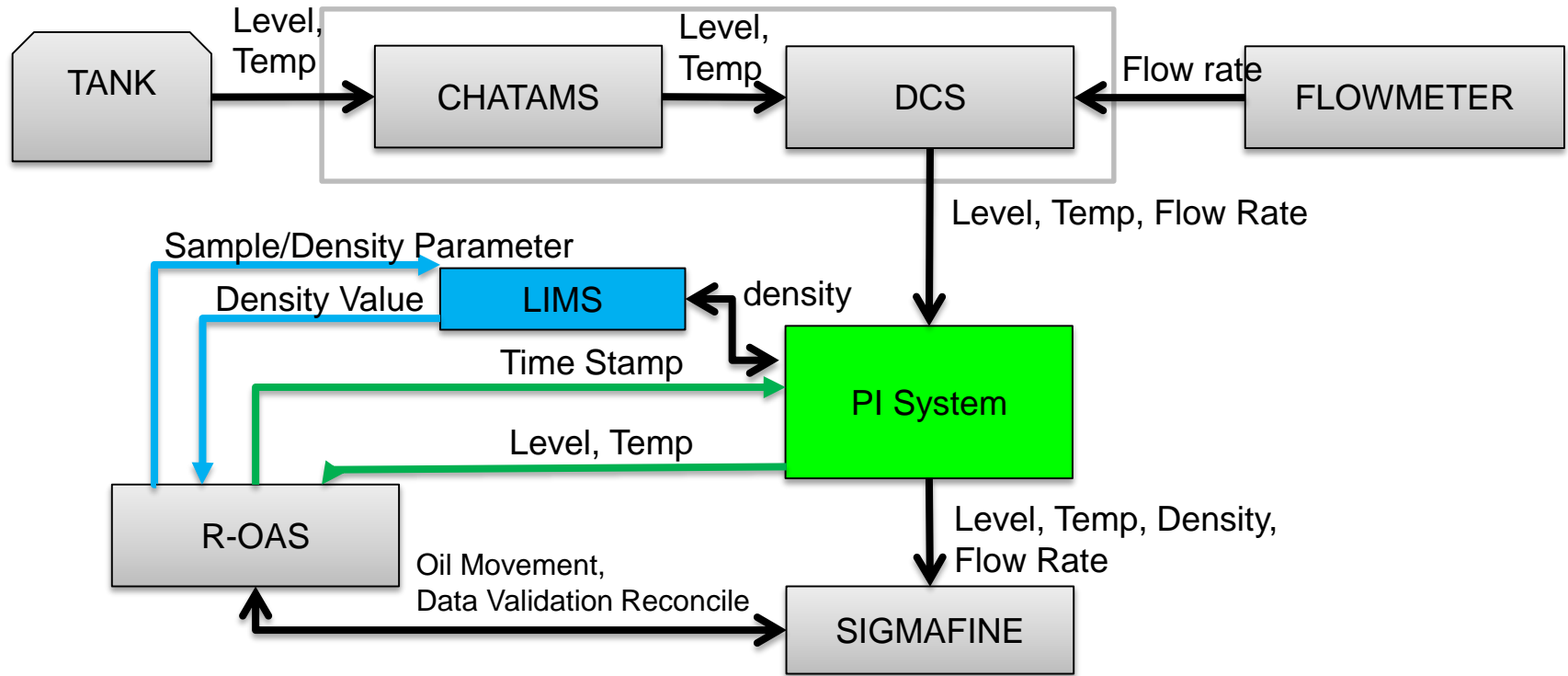
# Refinery Oil Accounting System (ROAS) MAPPING TRANSACTION



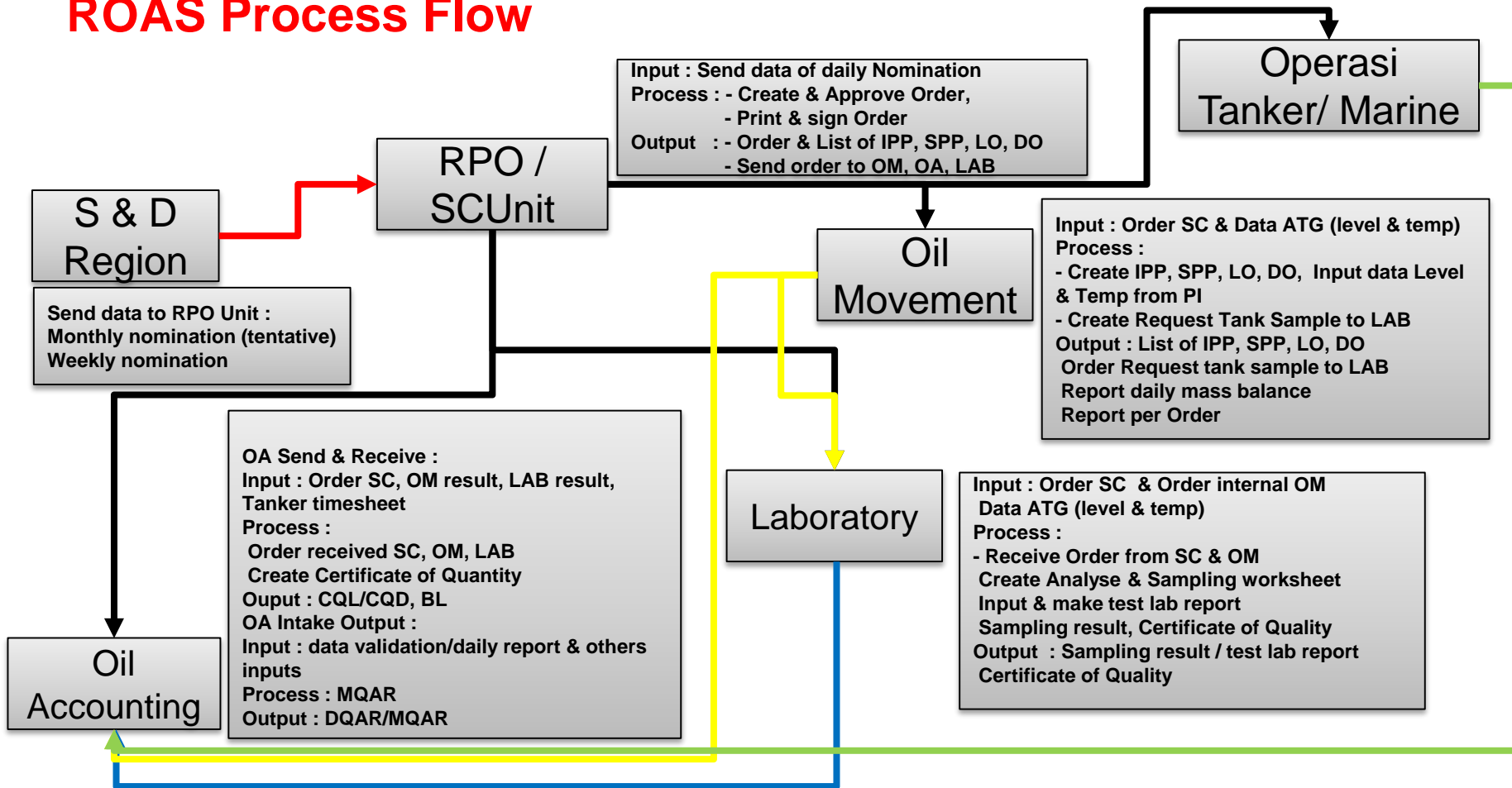
**ROAS**



# R-OAS : Refinery Oil Accounting System

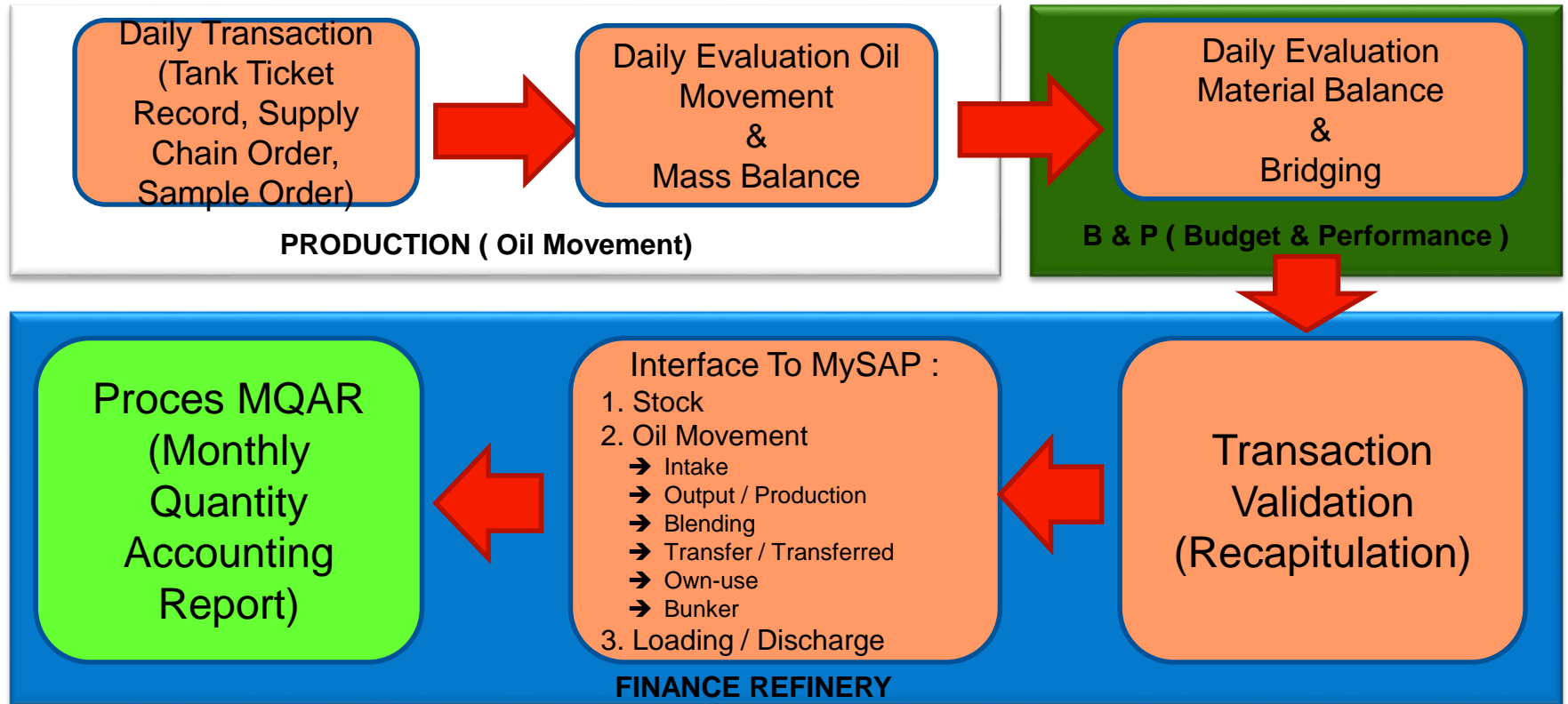


# ROAS Process Flow



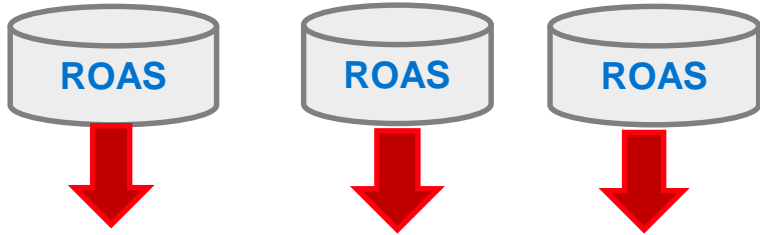
# VALIDATION PROCESS

Daily transaction verification and validation



# INTEGRATED OIL MOVEMENT ACCOUNTING TO SAP

## REFINERY



MQAR

## MARKETING & TRADING



MATERIAL BALANCE

INTERFACE

MATERIAL HYDRO



SALES&DIST



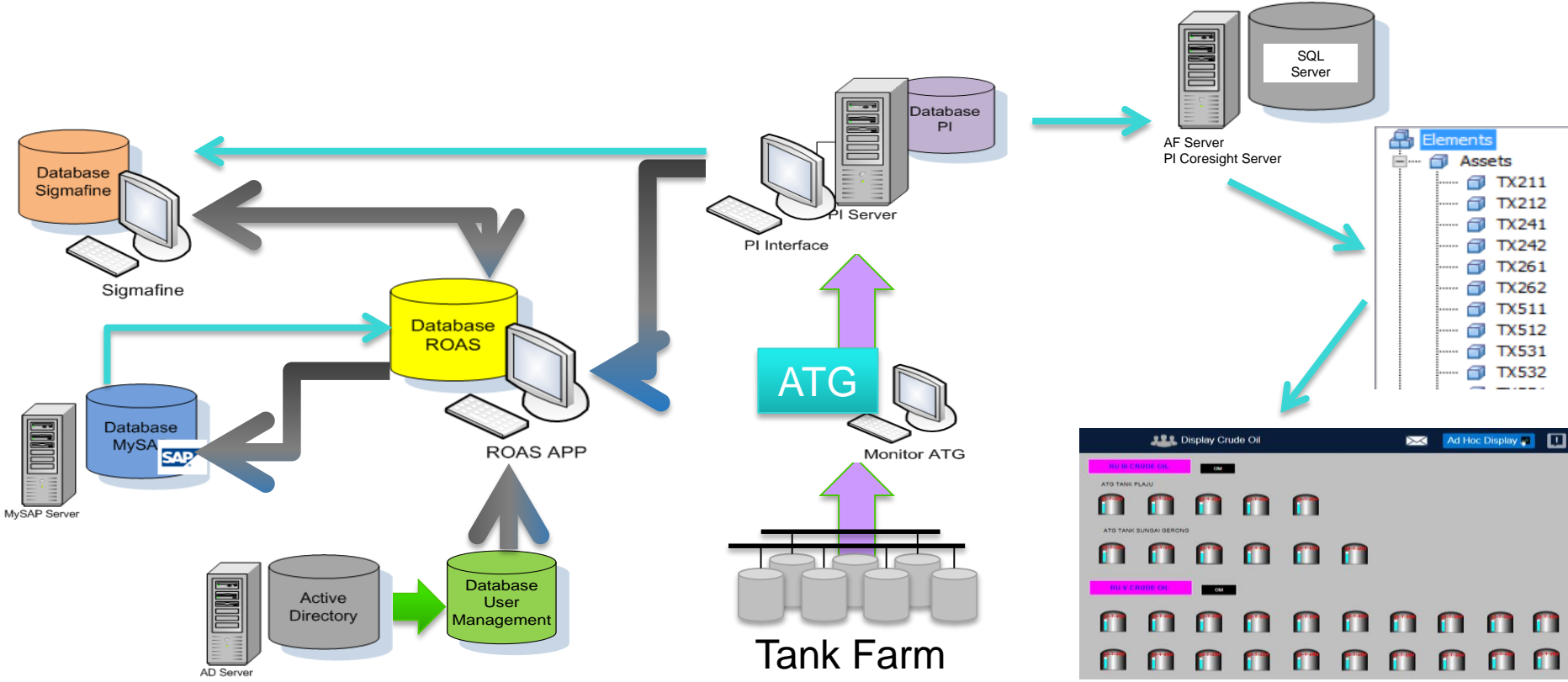
FINANCE



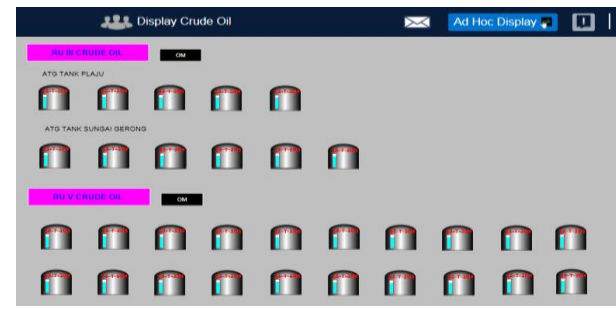
CONTROLLING



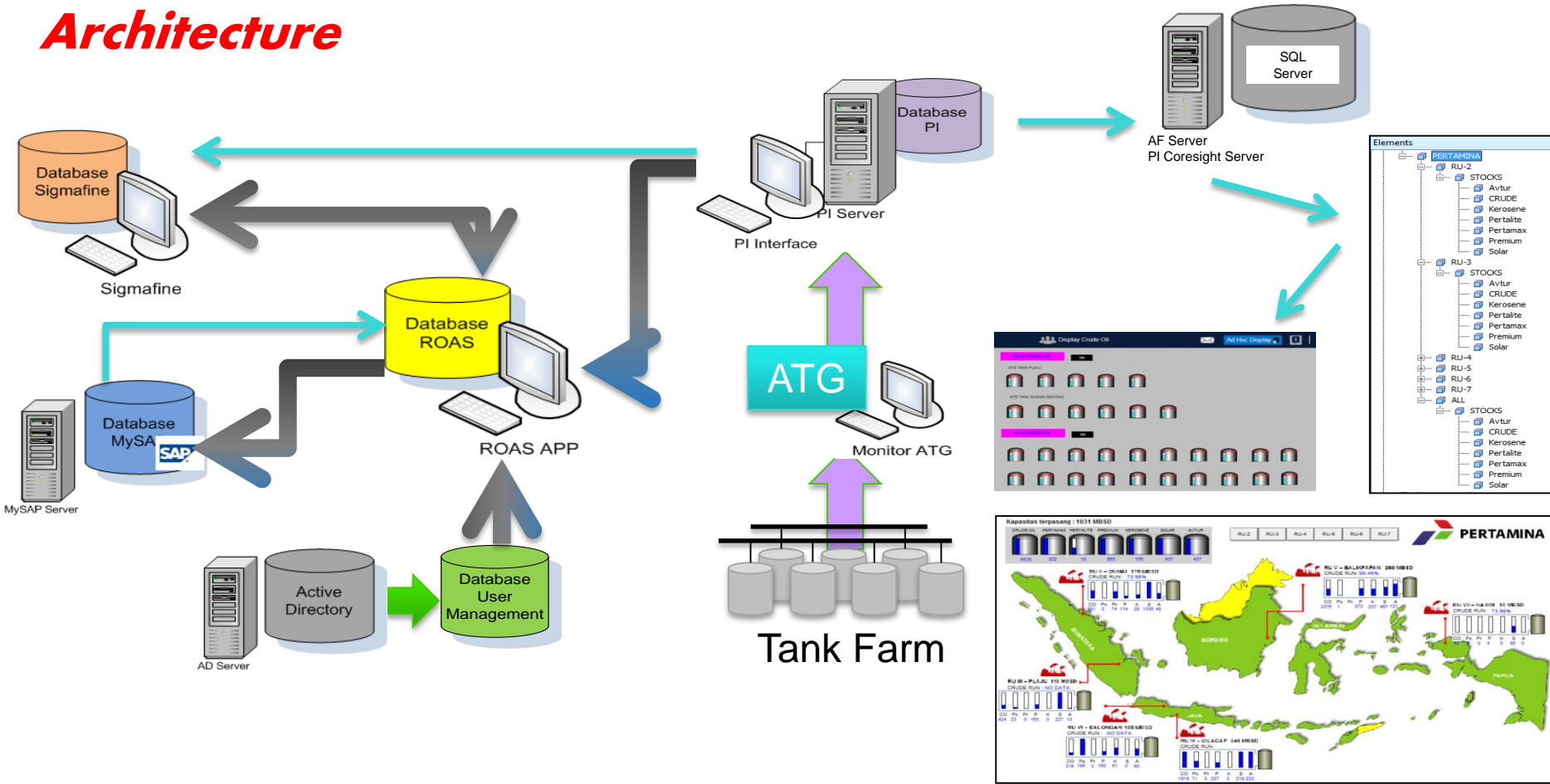
# Architecture



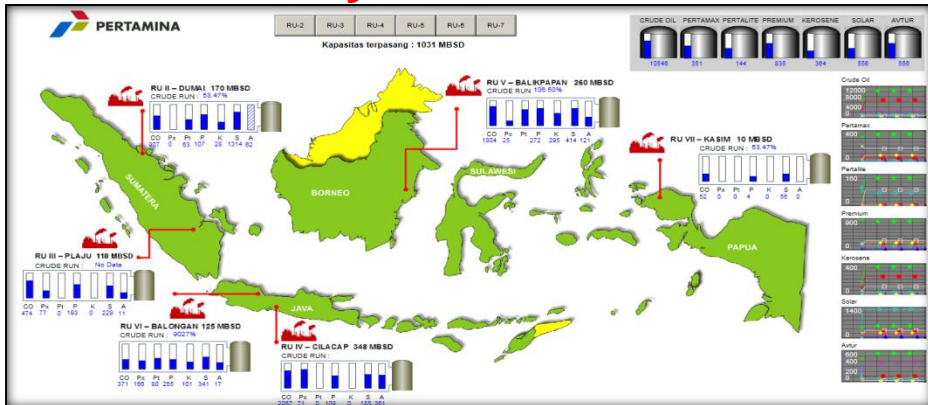
Elements	
Assets	
TX211	
TX212	
TX241	
TX242	
TX261	
TX262	
TX511	
TX512	
TX531	
TX532	



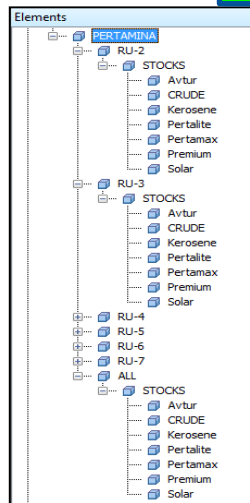
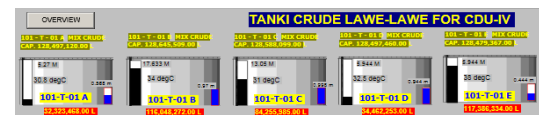
# Architecture



# Tank Inventory Based on ROAS & Real Time

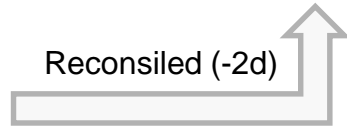


## Real Time

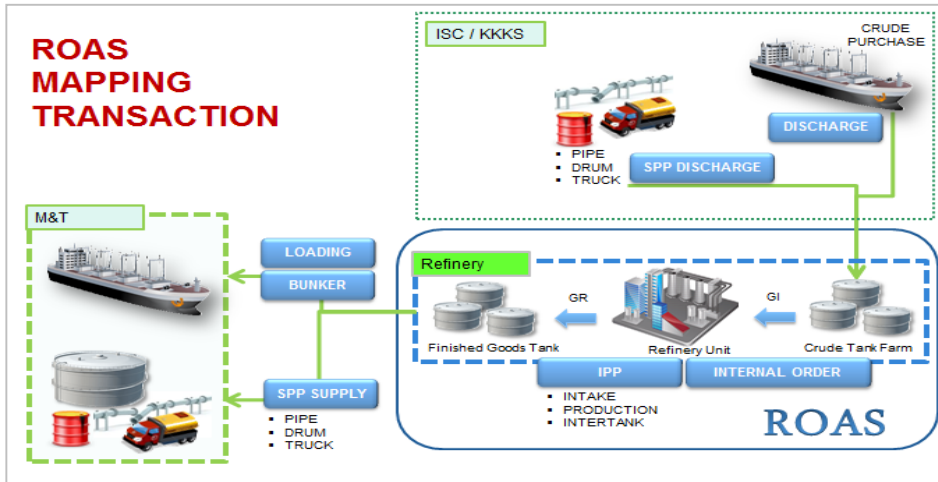


### PI-AF & MANUAL INPUT

Tagname	Value	Results	Value
CRUDE_RU2	800.56	Value written	No events found.
PERTAMAX_RU2	0.00	Value written	No events found.
PERTALITE_RU2	74.24	Value written	No events found.
PREMIUM_RU2	113.99	Value written	No events found.
KEROSENE_RU2	27.60	Value written	No events found.
SOLAR_RU2	1,336.48	Value written	No events found.
AVTUR_RU2	48.47	Value written	No events found.
CRUDE_RU3	424.17	Value written	No events found.
PERTAMAX_RU3	23.37	Value written	No events found.
PERTALITE_RU3	0.00	Value written	No events found.
PREMIUM_RU3	163.17	Value written	No events found.
KEROSENE_RU3	0.00	Value written	No events found.
SOLAR_RU3	227.43	Value written	No events found.
AVTUR_RU3	12.93	Value written	No events found.
CRUDE_RU4	1,918.02	Value written	No events found.
PERTAMAX_RU4	71.49	Value written	No events found.
PERTALITE_RU4	0.00	Value written	No events found.
PREMIUM_RU4	206.88	Value written	No events found.
KEROSENE_RU4	0.00	Value written	No events found.
SOLAR_RU4	218.18	Value written	No events found.
AVTUR_RU4	202.94	Value written	No events found.
CRUDE_RU5	3,021.05	Value written	No events found.
PERTAMAX_RU5	32.33	Value written	No events found.



## Reconciled (-2d)



# Detail Inventory Display – Real Time



## OIL MOVEMENT OVERVIEW

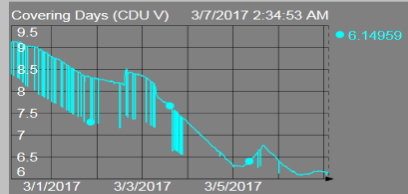
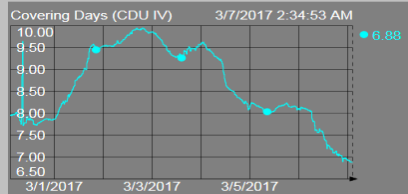
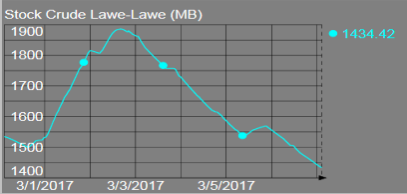
### REFINERY UNIT V

MAIN PAGE

CRUDE OIL	Stock MB	Consumption MB/D	Covering Days
LAWE-LAWE	1,432.16	200.03	6.88
BPN UTARA	326.58		
BPN SELATAN	41.31	60.17	6.15

PRODUCT	Stock MB	PRODUCT	Stock MB
L. NAPHTHA	27.78	KEROSINE	143.84
H. NAPHTHA	77.15	AVTUR	81.20
REFORMATE	101.95	ADO	414.39
HOMC	80.67	LSWR	431.04
PREMIUM	271.66	HVGO	145.52

CRUDE OIL	
NAPHTHA	AVTUR
REF / HOMC	ADO
PREMIUM	LSWR
KEROSINE	HVGO



**AVTUR**  
CAP. 5,496,963.00

Scan Timeout m  
Scan Timeout degC  
**P - 01**

Bad L

5.787 m  
40.7 degC  
0.023 m

2,563,473.00 L

Scan Timeout m  
Scan Timeout degC  
**P - 31**

Bad L

12.078 m  
Shutdown degC  
**P - 32**

Shutdown L

Scan Timeout m  
Scan Timeout degC  
**A - 25**

12.996 m  
37.1 degC  
0 m

10,284,096.00 L

Scan Timeout m  
Scan Timeout degC  
**A - 27**

12.765 m  
33.4 degC  
0 m

10,094,482.00 L

**AVTUR UTARA**

P - 01 = 0.00 MB 0.00 KL  
P - 02 = 13.80 MB 2,194.71 KL  
P - 31 = 0.00 MB 0.00 KL  
P - 32 = 56.03 MB 8,907.52 KL

**81.28 MB 0.00 KL**

**ULLAGE AVTUR**  
With Kero CDU-V **81.28 MB**  
Without Kero CDU-V **120.67**

A - 25 = 61.17 MB KL  
A - 27 = 59.50 MB 0.00 KL

**AVTUR SELATAN**

A - 25 = 61.17 MB KL  
A - 27 = 59.50 MB 0.00 KL

**PERTAMAX**  
CAP. 4,300,815.00

30.5 degC  
0.02 m

5,283,507.00 L

**STOCK PERTAMAX**  
A - 30 = 24.80 MB 3,942.52 KL

**PREMIUM**  
CAP. 1,135,797.00

30.6 degC  
0.02 m

1,135,797.00 L

**STOCK PREMIUM**  
A - 21 = 58.02 MB 9,362.58 KL  
A - 22 = 60.81 MB 9,661.69 KL  
A - 23 = 29.69 MB 4,720.40 KL  
A - 31 = 122.31 MB 19,444.69 KL

**271.66 MB 43,189.35 KL**

**TANKI CRUDE LAWE-LAWE FOR CDU-IV**

101-T-01 A	101-T-01 B	101-T-01 C	101-T-01 D	101-T-01 E
5.27 M 30.5 degC 0.365 m 52,325,468.00 L	17.633 M 34 degC 0.37 m 116,048,272.00 L	13.05 M 31 degC 0.322 m 84,255,985.00 L	8.844 M 32.5 degC 0.344 m 34,462,253.00 L	8.944 M 38 degC 0.444 m 117,586,334.00 L

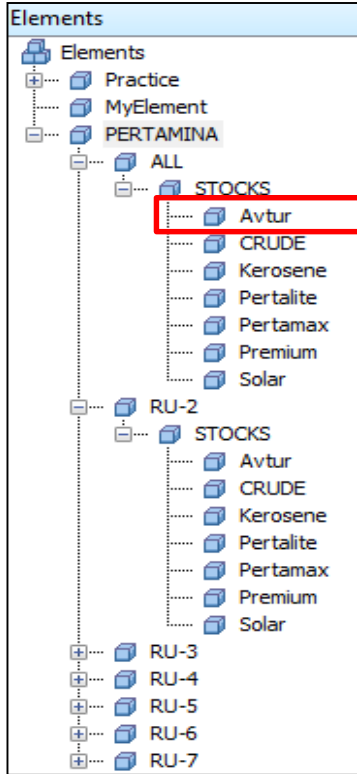
### STOCK ADO/SOLAR-48

WITH O-17 = 414.49 MB 34,408.40 KL  
NOT O-17 = [-11059] No Good Data For Calculation

D-20-07 A = [-11059] No Good Data For Calculation (0.13) cm/Jam  
D-20-07 B = 216.59 MB 34,408.40 KL 0.00 cm/Jam  
D-20-07 C = 104.28 MB 16,540.63 KL 0.00 cm/Jam  
O - 15 = 2.68 MB 426.82 KL 0.00 KL/Jam 0.00 cm/Jam  
O - 16 = 4.65 MB 771.70 KL 93.11 KL/Jam 26.01 cm/Jam  
O - 17 = 28.61 MB 4,549.09 KL



# Asset Management



Avtur

General Child Elements Attributes Ports Analyses Version

Filter

Name	Value
Capacity	0 kbbl
Description	Stock Avtur Pengolahan
Level	60 %
Product	AVTUR
Ullage (day)	2 d
Ullage (Volume)	0 kbbl
Value_MBBL	555.513754844666 kbbl

Name: Value\_MBBL

Description:

Properties: <None>

Categories: Inventory - Stock

Default UOM: thousand barrel

Value Type: Double

Value: 555.513754844666 kbbl

Data Reference: Formula

Settings...

A = \PERTAMINA\RU-2\STOCKS\Avtur\Value\_MBBL; B = \PERTAMINA\RU-3\STOCKS\Avtur\Value\_MBBL; C = \PERTAMINA\RU-4\STOCKS\Avtur\Value\_MBBL; D = \PERTAMINA\RU-5\STOCKS\Avtur\Value\_MBBL; E = \PERTAMINA\RU-6\STOCKS\Avtur\Value\_MBBL; F = \PERTAMINA\RU-7\STOCKS\Avtur\Value\_MBBL; [A + B + C + D + E + F]

## Capabilities :

- Structured
- Categorized (no need Tag Information – 1 RU 7000 tags)
- Manual entry
- Connect to PI Point
- Calculation
- Scheduled Analysis
- Notification e-mail

Element Search

Server: PTMKPDEVPIIPUSAT Connect

Database: PERTAMINA Library

Where Search Root: Specify search root element

Name: crude

Description:

Category: <All>

Template: <All>

Type: Any

Search

Maximum results: 1000 Cancel Search

Search results: The search found 7 Elements matching the search criteria.

Name	Path	Description	Category	Type
CRUDE	PERTAMINA\RU-2\STOCKS\CRUDE	CRUDE RU2		None
CRUDE	PERTAMINA\RU-3\STOCKS\CRUDE	CRUDE RU3		None
CRUDE	PERTAMINA\RU-4\STOCKS\CRUDE	CRUDE RU4		None
CRUDE	PERTAMINA\RU-5\STOCKS\CRUDE	CRUDE RU5		None
CRUDE	PERTAMINA\RU-6\STOCKS\CRUDE	CRUDE RU6		None
CRUDE	PERTAMINA\RU-7\STOCKS\CRUDE	CRUDE RU7		None
CRUDE	PERTAMINA\ALL\STOCKS\CRUDE	CRUDE ALL		None

OK Cancel Reset

# Crude Stock Asset

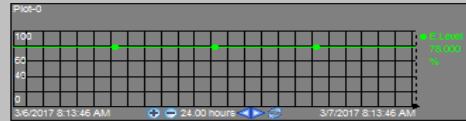
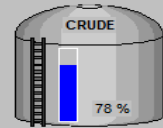
Element Relative Display

Search: crude

Elements of Interest

Group by: Template

Name	Description	Category
CRUDE	CRUDE RU4	
CRUDE	CRUDE RU3	
CRUDE	CRUDE RU2	
CRUDE	CRUDE RU7	
CRUDE	CRUDE RU6	
CRUDE	CRUDE RU5	



Kapasitas 5933.39 kbbl  
Volume 6674.73

Stock CRUDE RUs

**Crude RU-2**

Product: Crude  
Capacity: 1945.2 kbbl  
Current Volume: 906.629 kbbl

**Crude RU-3**

Product: Crude  
Capacity: 1231.08 kbbl  
Current Volume: 474.308 kbbl

**Crude RU-4**

Product: Crude  
Capacity: 3178.4 kbbl  
Current Volume: 2067.40 kbbl

**Crude RU-5**

Product: Crude  
Capacity: 5933.39 kbbl  
Current Volume: 6674.73 kbbl
















**Crude RU-6**

Product: Crude  
Capacity: 2756.31 kbbl  
Current Volume: 370.923 kbbl

**Crude RU-7**

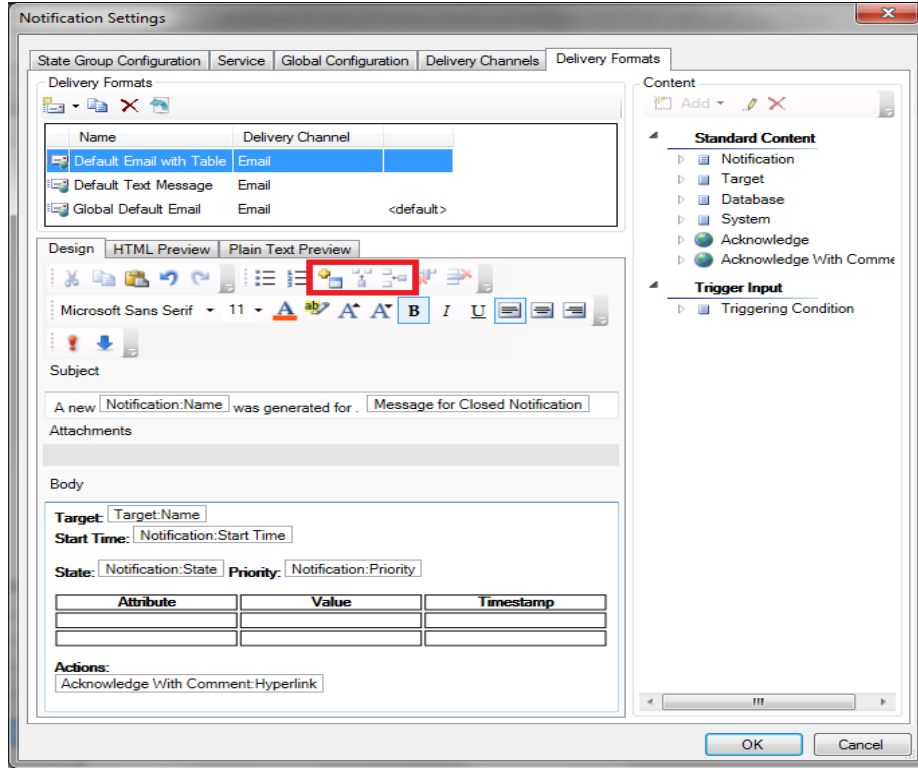
Product: Crude  
Capacity: 83.7 kbbl  
Current Volume: 52.4598 kbbl

# Furnace Asset

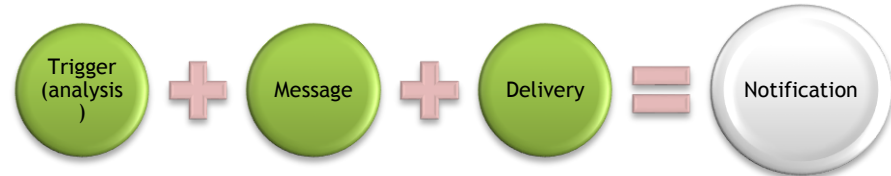
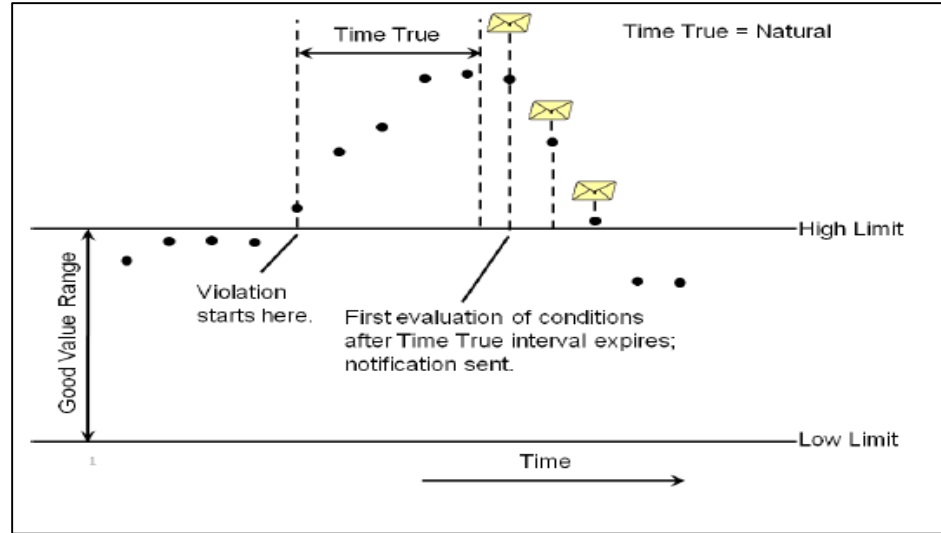
 <p><b>11 - F - 101</b></p> <table border="1"> <thead> <tr> <th></th> <th>AKTUAL</th> <th>DESAIN</th> </tr> </thead> <tbody> <tr><td>BWT</td><td>10.00</td><td>840</td></tr> <tr><td>TWT, Inlet</td><td>20.00</td><td>471</td></tr> <tr><td>TWT, Outlet</td><td>29.00</td><td>533</td></tr> <tr><td>Draft</td><td>31.00</td><td>-2.5</td></tr> <tr><td>O2 Ekses</td><td>6.00</td><td>2.5 - 4.5</td></tr> <tr><td>Efisiensi, %</td><td>8.00</td><td>88.5</td></tr> <tr><td>% WOF</td><td>30.00</td><td>0.85</td></tr> <tr><td>ΔP Steam/FO</td><td>2.00</td><td>2.5 - 3.5</td></tr> </tbody> </table>		AKTUAL	DESAIN	BWT	10.00	840	TWT, Inlet	20.00	471	TWT, Outlet	29.00	533	Draft	31.00	-2.5	O2 Ekses	6.00	2.5 - 4.5	Efisiensi, %	8.00	88.5	% WOF	30.00	0.85	ΔP Steam/FO	2.00	2.5 - 3.5	 <p><b>12 - F - 101</b></p> <table border="1"> <thead> <tr> <th></th> <th>AKTUAL</th> <th>DESAIN</th> </tr> </thead> <tbody> <tr><td>BWT</td><td>41.00</td><td>810</td></tr> <tr><td>TWT, Inlet</td><td>54.00</td><td>587</td></tr> <tr><td>O2 Ekses</td><td>37.00</td><td>2.5 - 4.5</td></tr> <tr><td>Efisiensi, %</td><td>39.00</td><td>66.5</td></tr> <tr><td>% WOF</td><td>80.00</td><td>0.50</td></tr> </tbody> </table>		AKTUAL	DESAIN	BWT	41.00	810	TWT, Inlet	54.00	587	O2 Ekses	37.00	2.5 - 4.5	Efisiensi, %	39.00	66.5	% WOF	80.00	0.50	 <p><b>13 - F - 101</b></p> <table border="1"> <thead> <tr> <th></th> <th>AKTUAL</th> <th>DESAIN</th> </tr> </thead> <tbody> <tr><td>BWT</td><td>65.00</td><td>810</td></tr> <tr><td>TWT, Inlet</td><td>78.00</td><td>587</td></tr> <tr><td>O2 Ekses</td><td>61.00</td><td>2.5 - 4.5</td></tr> <tr><td>Efisiensi, %</td><td>63.00</td><td>66.5</td></tr> <tr><td>% WOF</td><td>80.00</td><td>0.50</td></tr> </tbody> </table>		AKTUAL	DESAIN	BWT	65.00	810	TWT, Inlet	78.00	587	O2 Ekses	61.00	2.5 - 4.5	Efisiensi, %	63.00	66.5	% WOF	80.00	0.50
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# Asset Management – Notification (Early Warning System)

## Notification to e-mail



- Notify only on change in Status: OFF
- Alert to be sent whenever the conditions are evaluated



# PI Visualization Suite



# Benefits on BI Visualization Suite

1. Users in Diverse Roles Require Different Tools to View, Analyze and Deliver Data
2. New Projects have new requirements
3. Share Data with a Large Audience
4. License Compliance
5. No admin headache

# Key Takeaways

1. The real-time infrastructure enabled advanced business integration at PERTAMINA and helped us to monetize our most important asset – our real-time information.
2. Real time situational awareness across the fuels supply chain has significant effects on the bottom line therefore One version of truth of entire supply chain is very important for downstream operations.
3. Maximize the PI System with leveraging AF, Notifications, and PI Visualization Suite to optimize downstream operations.





# Contact Information

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## Questions

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谢谢

Danke

Merci

Gracias

**Thank You**

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Спасибо

Obrigado