PETRONAS - Integrated Asset Monitoring and Optimization

Abdelmadjid Aissani & Timur Tashkenbaev

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Outlines

- PETRONAS Overview and Vision
- Message from PETRONAS Management
- Business challenge and Solution
- PI System Application in PETRONAS
- PI System Implementation details
- Way forward: PI-AF and PI Vision
- Demo
- Results and business impact

Company Overview

Petroleum Nasional Berhad (PETRONAS) is Malaysia's fully integrated oil & gas multinational with proven capabilities in a broad spectrum of the petroleum chain value.

Establish in August 17, 1974, PETRONAS vision is to be a Leading Oil and Gas Multinational of Choice

PETRONAS mission statement are

- We are a business entity
- Petroleum is our core business
- Our primary responsibility is to develop and add value to this national resource
- Our objective is to contribute to the well-being of the people and the nation

Message from PETRONAS

Head Petroleum Engineering
Maxim Vorobiev

"To remain competitive, digital solutions in Petroleum Engineering isn't one of the options, it's the only option…"

Head Technical Advisory
Anwar Husen Akbar Ali

" Past Success Does Not Guarantee Future Success…… Combining People, Technology and Process via Digital Technology "

Head Integrated Operations
Shaharuddin Hamid Mustapha

" Maximizing Value from data driven organization "

Head Pen Malaysia Resource Mgmt
Shahrizal Shahari

" The requirement of pace, value and risk in decision making is crucial. Moving towards digital will make these integrated as ONE and improve efficiency "

Custodian (Production Technology)
Bahrom B Madon

" Data Integration, Workflow automation and Standardization of processes is essential for deployment of digital solution "

Mgr (Resource-SKZ), Sabah
Eadie Azahar B Rosland

" PI system enables to maximize the oil recovery from the field by improving the efficiency in well surveillance and enable to trigger the well problems and as well as provides safe operation envelopes "

Head (Petroleum Asset Excellence)
Md Zarin B Md Zainuri

"PI provides us an endless creativity to automate and customize our in-house technical solutions through the established IO environment"

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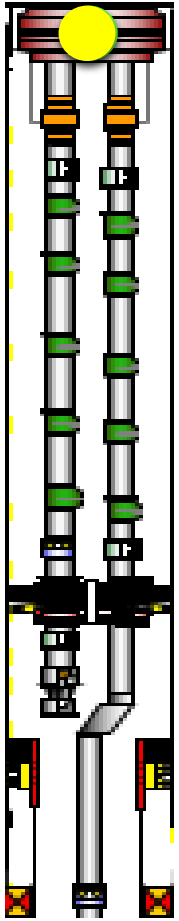
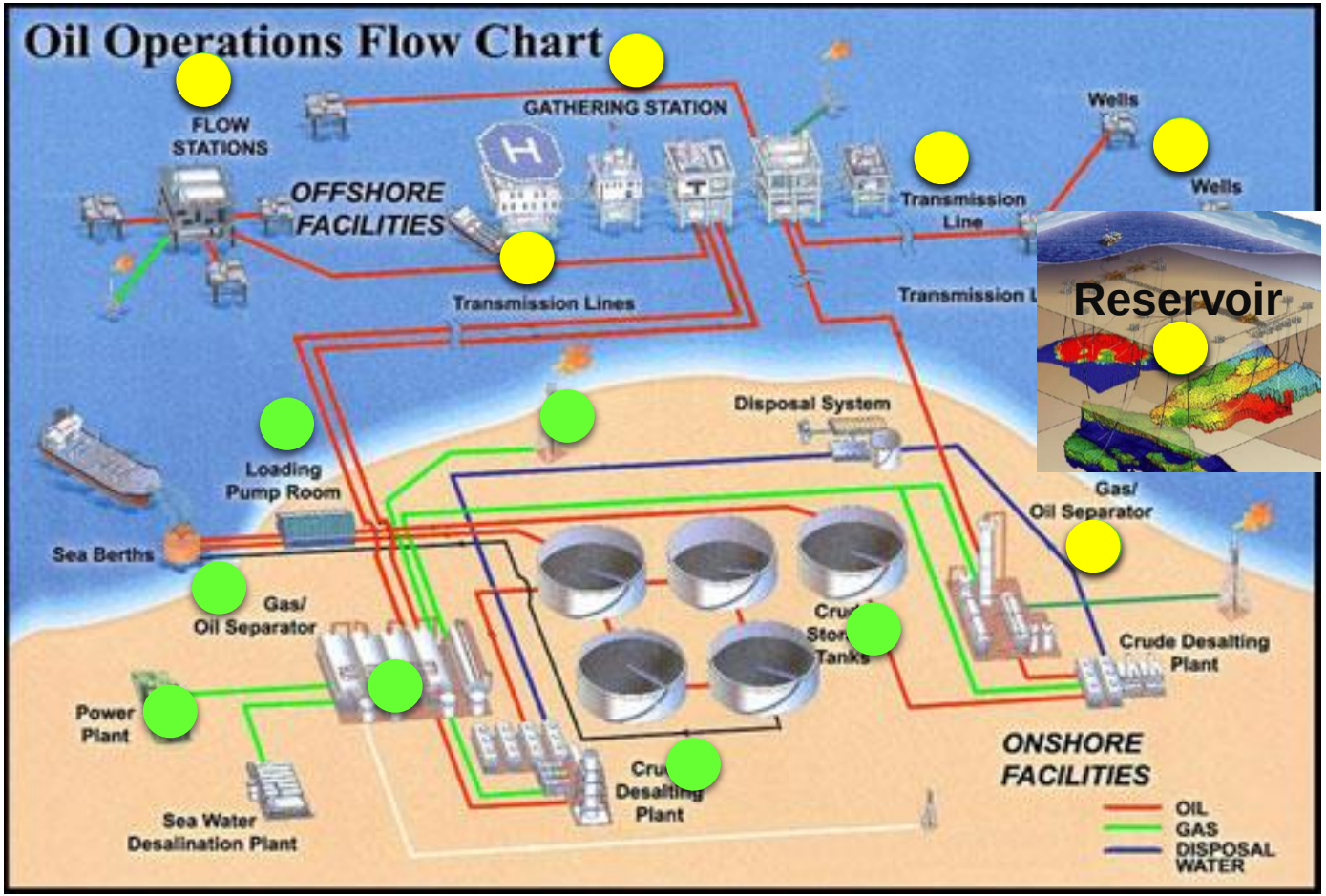


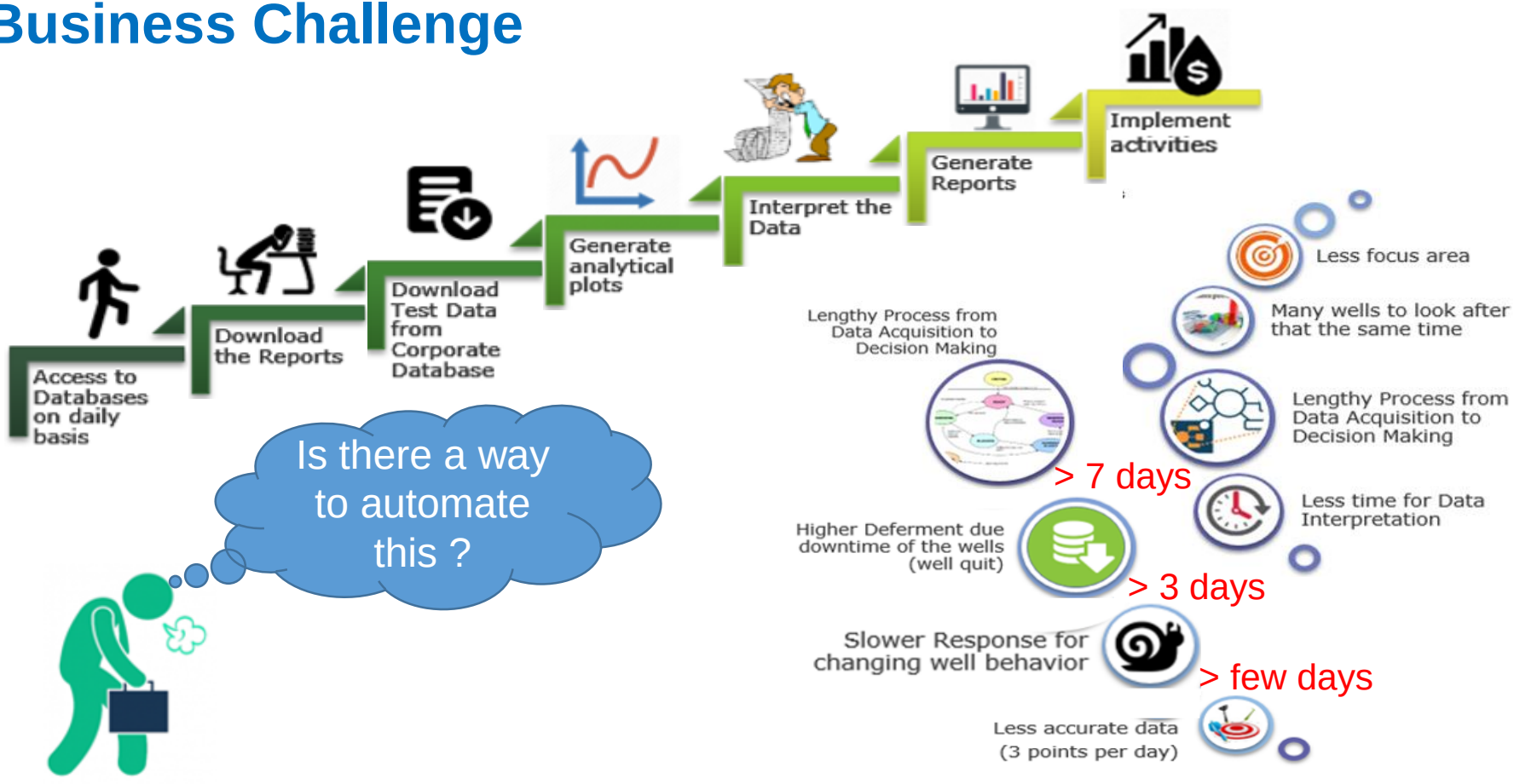


Facilities

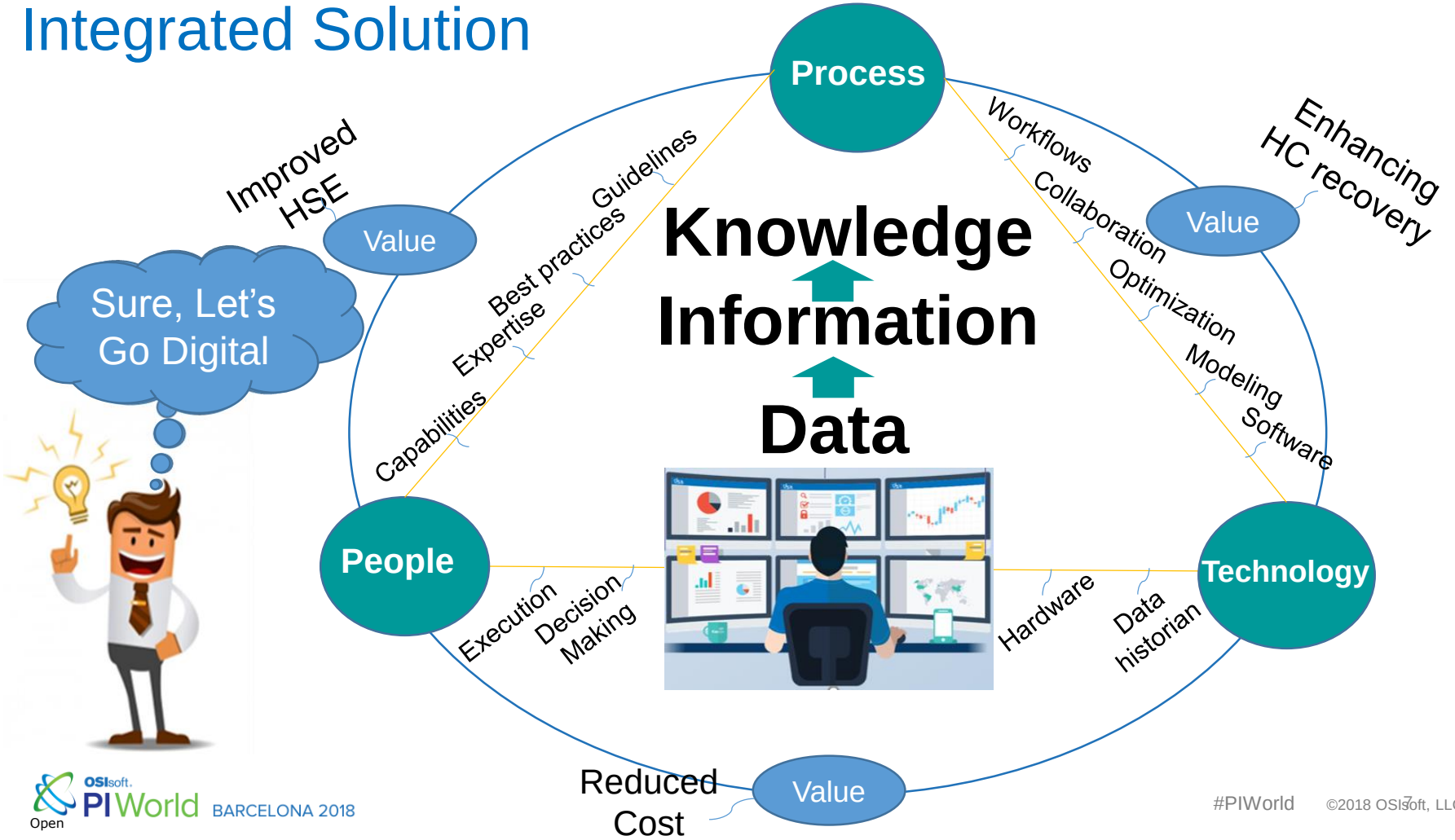
Wells

Reservoir

Business Challenge



Integrated Solution



How to make it happen ?

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PI System Implementation in PETRONAS

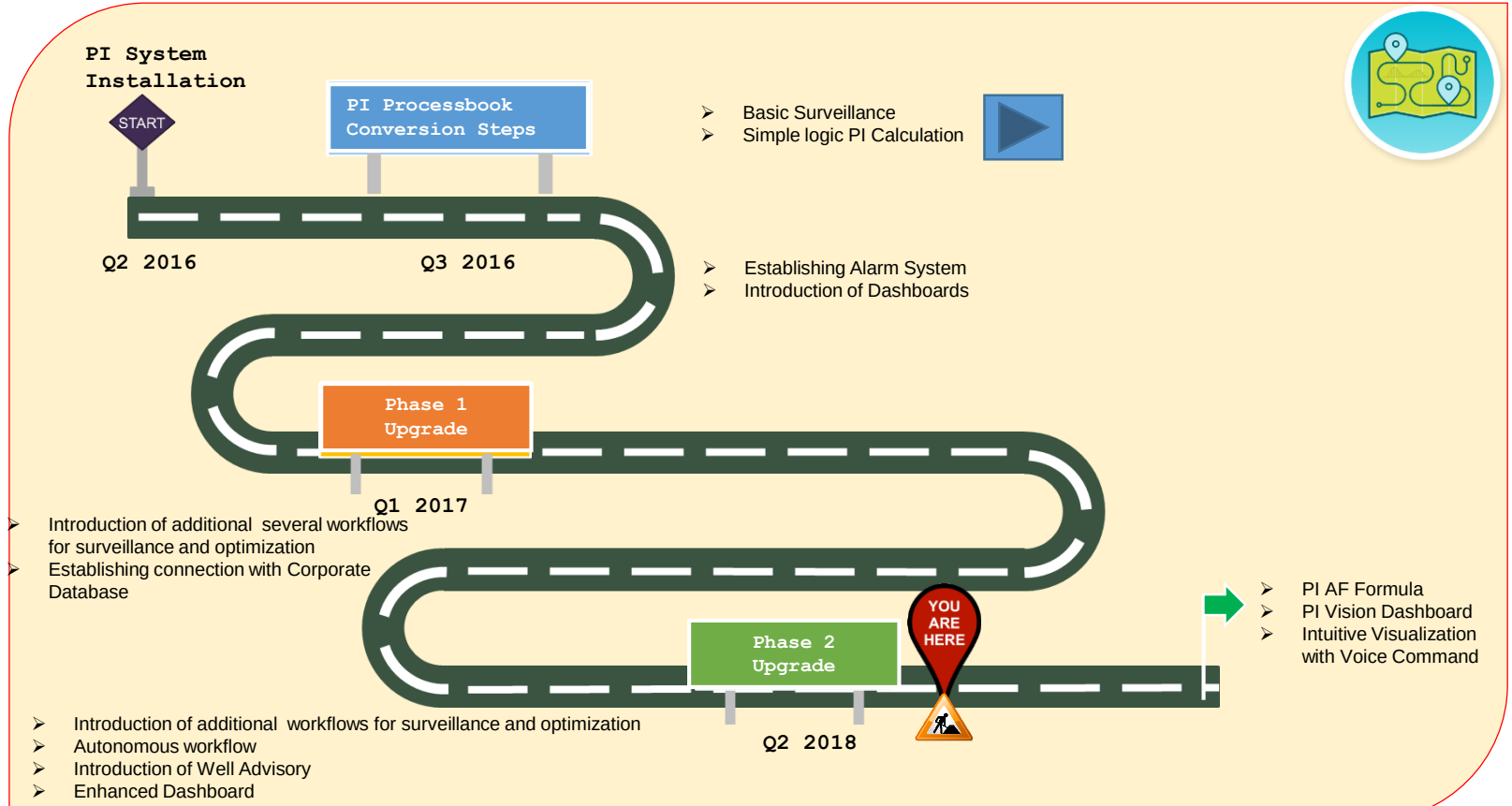
25 Assets have implemented in Upstream PETRONAS

Malaysian Asset

International Assets

Open

ROADMAP of Transformation Journey



Solution Architecture

PI ProcessBook

6 **Informed Decisions**

Monitoring & Surveillance	Analysis & Diagnostic	Action & Optimization

5 **Visualization**

4 **Workflows & Integration**

Business Process Automation Engine — Analysis Engines — Optimization Engines

3 **Applications**

2 **Data Basis**

Historians

1 **Data Sources**

Real Time

Next …

PI Vision

Notifications

Event Frames

Asset Analytics

Asset Framework

Data Archive

Solution Components

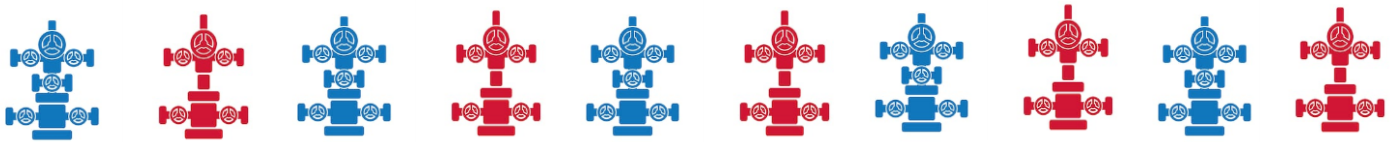


Overall Overview

Platform by Platform view

Action & optimization

Opportunity Summary



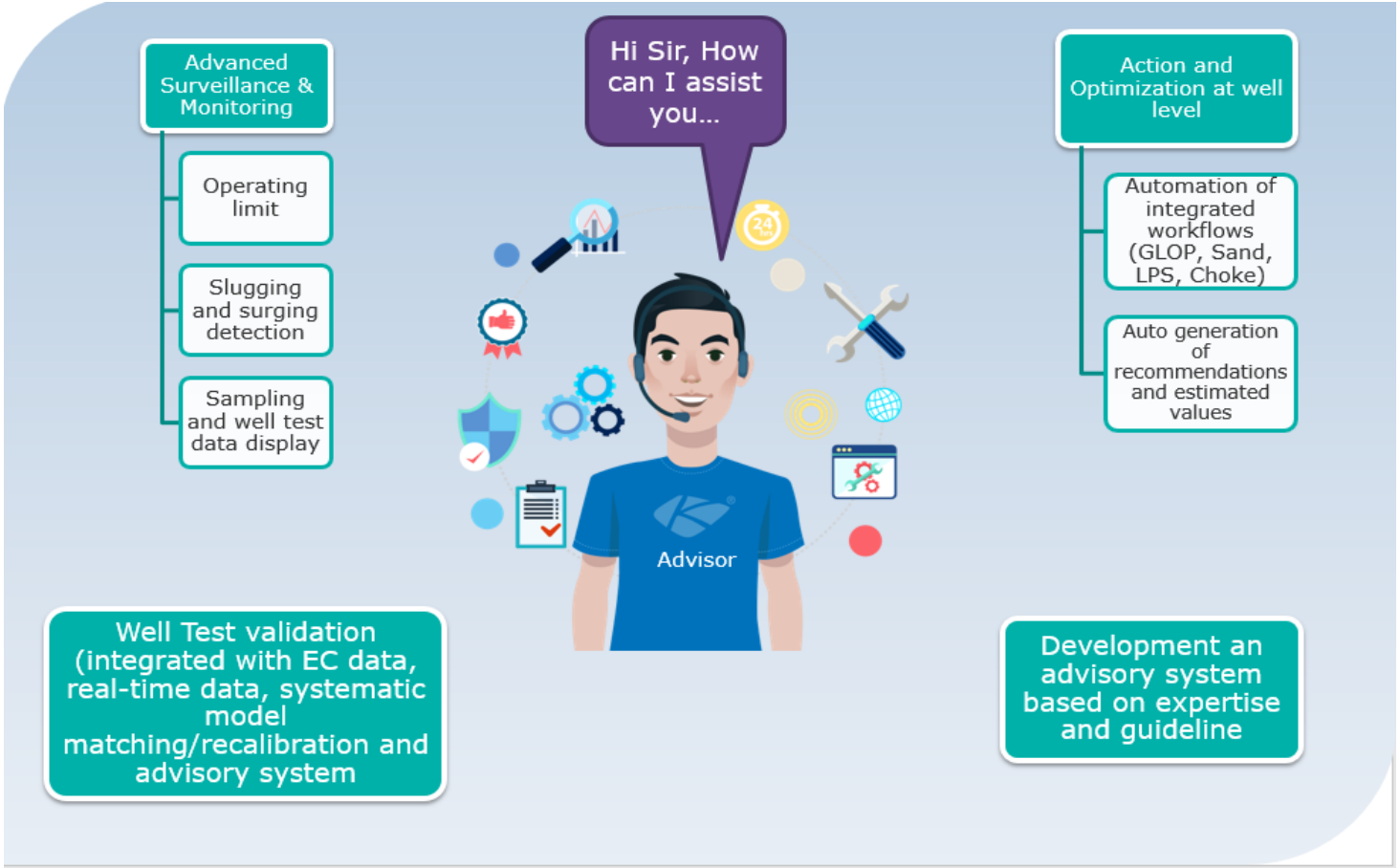
Surveillance & Monitoring

Well test validation & Model update

Gas Lift diagnostic

Action & optimization

Integrated Workflows and Features



Business Values

Surveillance and Monitoring

- Quick identification of issues, well behavior underperforming wells, downtime
- Quick analysis, troubleshooting and actions
- Reduce downtime

Well Test Validation dashboard

- Improve the efficiency/accuracy of well test validation
- Standardize procedure and workflow
- Systematic well model update

Gas Lift Diagnostic dashboard

- Continuous monitoring of total/dual string
- Quick identification of underperforming gas lifted wells.
- Fast corrective actions

Action and Optimization dashboard

- Real time optimization
- Auto generation of recommendation (opportunities) such as Optimization (bean up, GLOP, GLVC), Flow assurance and integrity (sand erosion, choke performance) and debottlenecking (LPS condidate, Backpressure identification)
- Auto check of compliance (Sampling frequency)

Advisory System

- Uses expertise, knowledge and guidelines
- Develop capabilities.
- Help for decision making

Way forward: PI-AF and PI Vision

Digital Solutions: Plug and Play Concept

Current Stage

PI ProcessBook

Engine

+ VB
+ Technical Software
+ Corporate Database
+ Automated Workflows
+ Dashboard View

Future Stage

PI ProcessBook

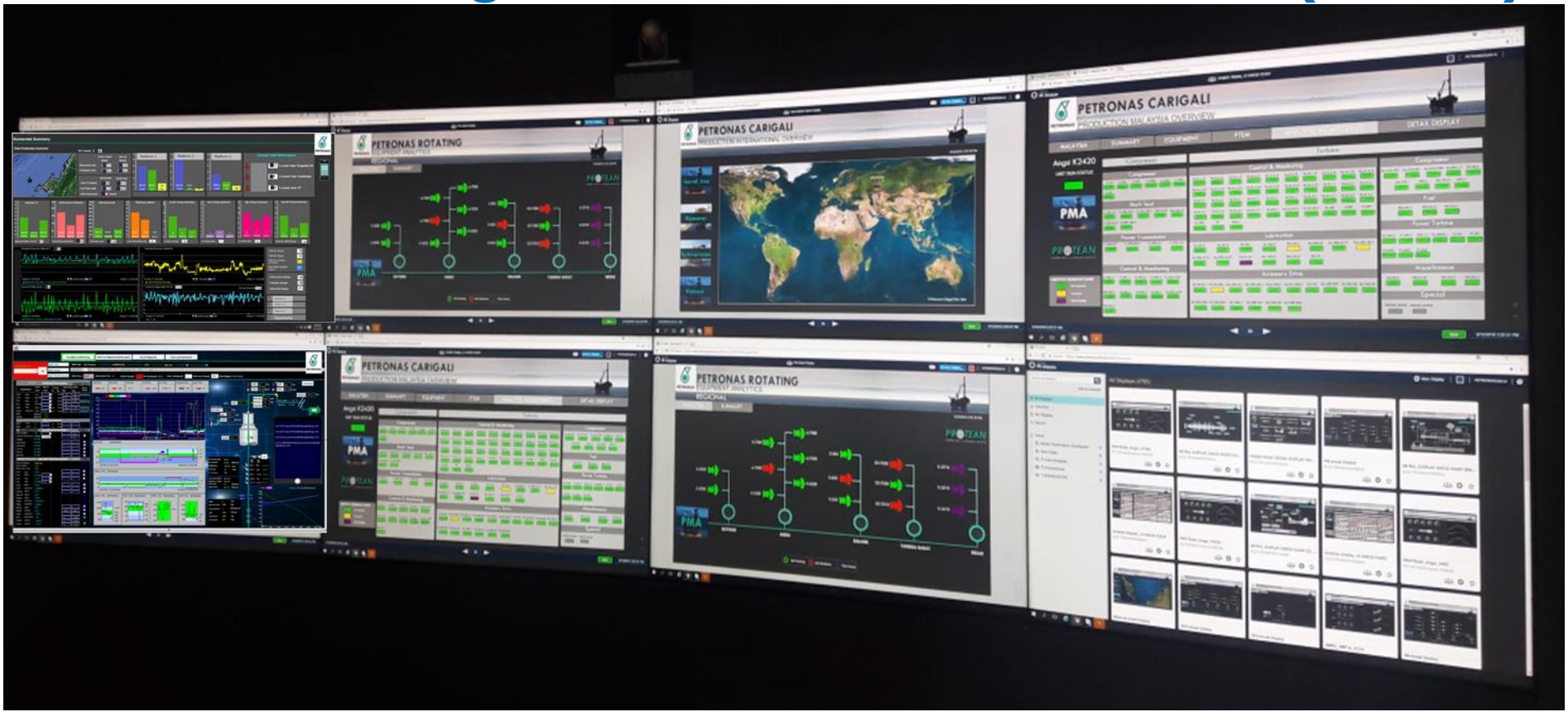
PI AF

PI Vision

Engine

+ PI AF formula
+ Technical Software
+ Corporate Database
+ Automated Workflows
+ PI Vision Dashboard

PETRONAS Digital Collaboration Center (PDCC)



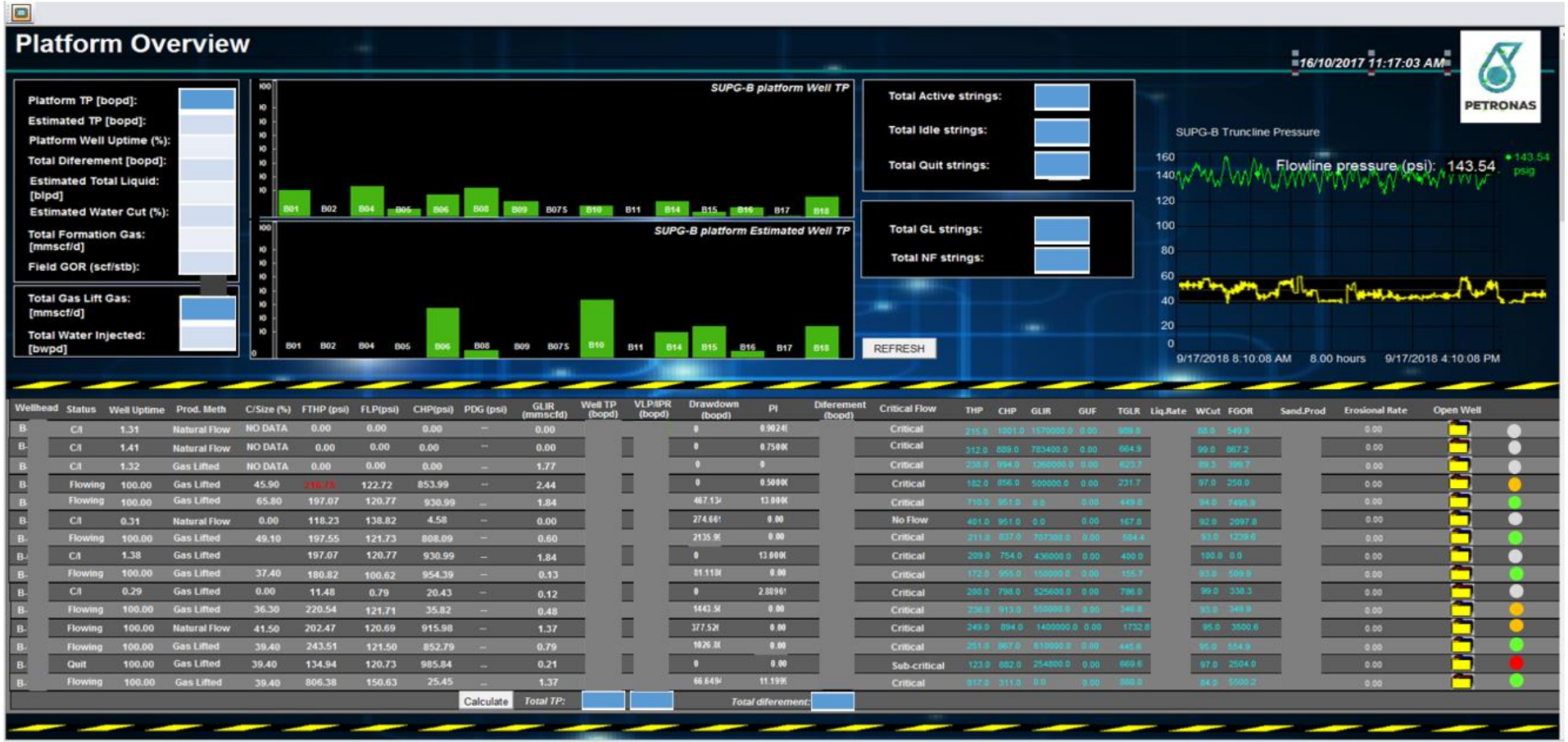
DEMO

PI_Plug and Play

Field Level- Asset Overview

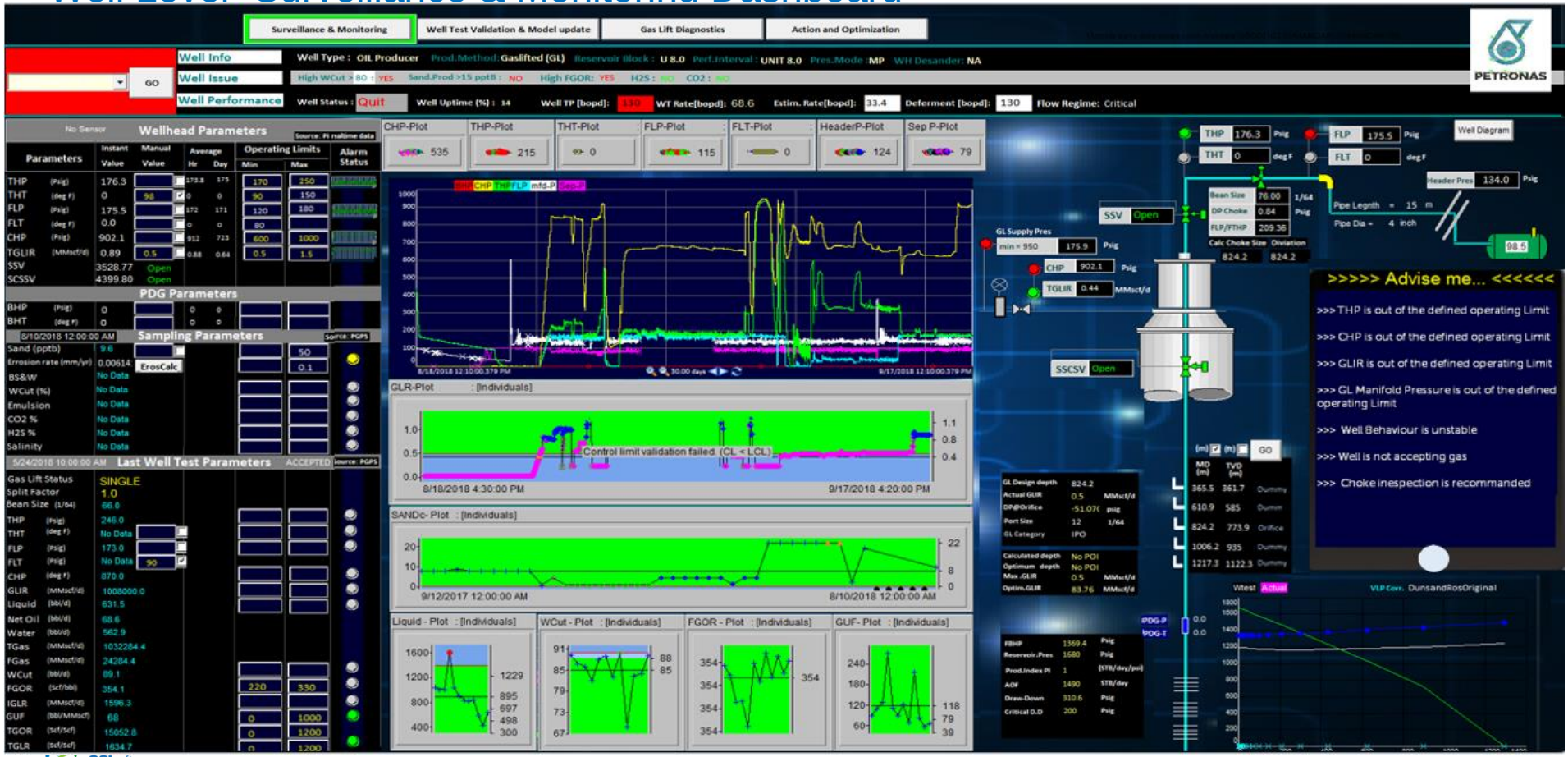
Field Level- Asset Overview

Field Level- Platform Overview



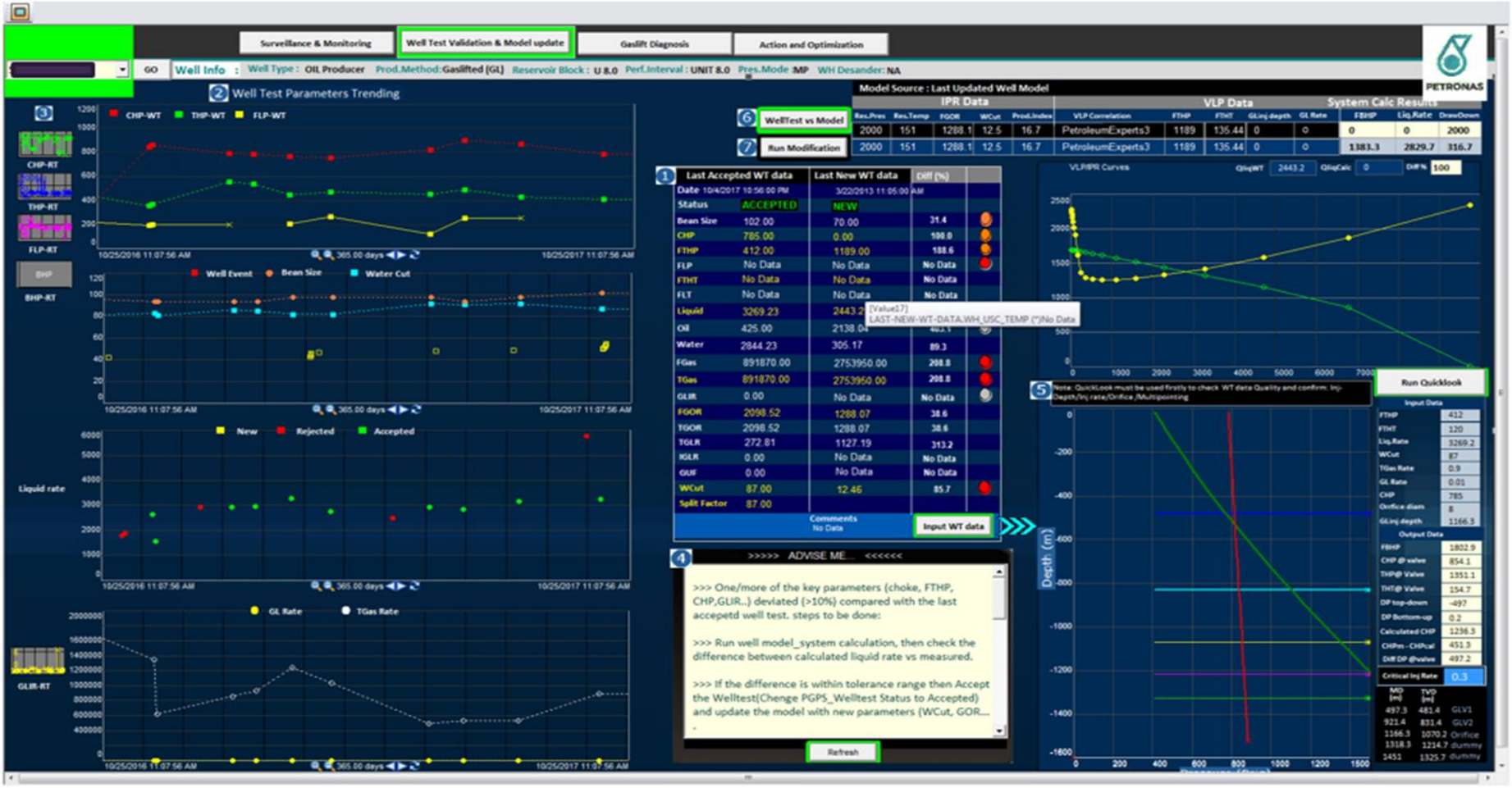
Wellhead	Status	Well Uptime	Prod. Meth	C/Size (%)	FTHP (psi)	FLP(psi)	CHP(psi)	PDG (psi)	GLIR (mmscfd)	Well TP (bopd)	VLP/IPR (bopd)	Drawdown (bopd)	PI	Diferement (bopd)	Critical Flow	THP	CHP	GLIR	GUF	TGLR	Liq.Rate	WCut	FGOR	Sand.Prod	Erosional Rate	Open Well
B-	C/I	1.31	Natural Flow	NO DATA	0.00	0.00	0.00	--	0.00			0	0.9024		Critical	215.0	1001.0	1579000.0	0.00	989.8		88.0	549.9		0.00	
B-	C/I	1.41	Natural Flow	NO DATA	0.00	0.00	0.00	--	0.00			0	0.7500		Critical	312.0	889.0	783400.0	0.00	664.9		99.0	867.2		0.00	
B-	C/I	1.32	Gas Lifted	NO DATA	0.00	0.00	0.00	--	1.77			0	0		Critical	238.0	994.0	1260000.0	0.00	623.7		89.3	399.7		0.00	
B-	Flowing	100.00	Gas Lifted	45.90	210.75	122.72	853.99	--	2.44			0	0.5000		Critical	182.0	856.0	500000.0	0.00	231.7		97.0	250.0		0.00	
B-	Flowing	100.00	Gas Lifted	65.80	197.07	120.77	930.99	--	1.84			467.13	13.000		Critical	719.0	951.0	0.0	0.00	449.8		94.0	7495.9		0.00	
B-	C/I	0.31	Natural Flow	0.00	118.23	138.82	4.58	--	0.00			274.661	0.00		No Flow	401.0	951.0	0.0	0.00	167.8		92.0	2097.8		0.00	
B-	Flowing	100.00	Gas Lifted	49.10	197.55	121.73	808.09	--	0.60			2135.9	0.00		Critical	211.0	837.0	707300.0	0.00	504.4		93.0	1239.6		0.00	
B-	C/I	1.38	Gas Lifted		197.07	120.77	930.99	--	1.84			0	13.000		Critical	209.0	754.0	436000.0	0.00	400.0		100.0	0.0		0.00	
B-	Flowing	100.00	Gas Lifted	37.40	180.82	100.62	954.39	--	0.13			81.118	0.00		Critical	172.0	955.0	150000.0	0.00	155.7		93.0	509.9		0.00	
B-	C/I	0.29	Gas Lifted	0.00	11.48	0.79	20.43	--	0.12			0	2.8896		Critical	200.0	798.0	525600.0	0.00	786.0		99.0	338.3		0.00	
B-	Flowing	100.00	Gas Lifted	36.30	220.54	121.71	35.82	--	0.48			1443.5	0.00		Critical	236.0	913.0	550000.0	0.00	346.8		93.0	349.9		0.00	
B-	Flowing	100.00	Natural Flow	41.50	202.47	120.69	915.98	--	1.37			377.52	0.00		Critical	249.0	894.0	1400000.0	0.00	1732.8		95.0	3500.6		0.00	
B-	Flowing	100.00	Gas Lifted	39.40	243.51	121.50	852.79	--	0.79			1026.8	0.00		Critical	251.0	867.0	610000.0	0.00	445.6		95.0	554.9		0.00	
B-	Quit	100.00	Gas Lifted	39.40	134.94	120.73	985.84	--	0.21			0	0.00		Sub-critical	123.0	882.0	254800.0	0.00	669.6		97.0	2504.0		0.00	
B-	Flowing	100.00	Gas Lifted	39.40	806.38	150.63	25.45	--	1.37			66.649	11.199		Critical	817.0	311.0	0.0	0.00	880.0		84.9	5500.2		0.00	

Well Level- Surveillance & Monitoring Dashboard

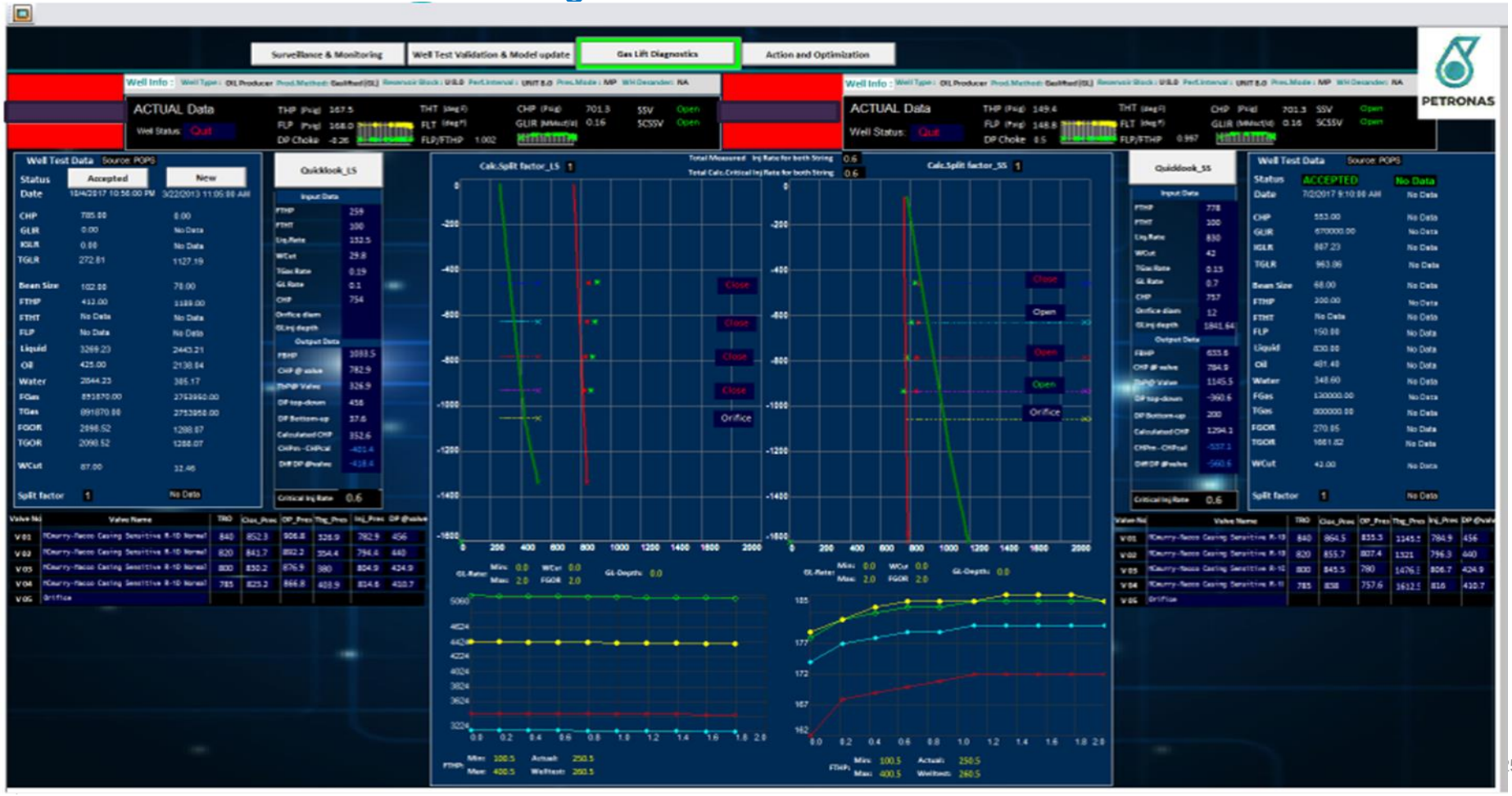


Well Level- Surveillance & Monitoring Dashboard

Well Level- Well Test Validation & Model Update



Well Level- Dual Gas Lift Diagnostic dashboard

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Surveillance & Monitoring
Well Test Validation & Model update
Gas Lift Diagnostics
Action and Optimization
Optimization & recommendations
PETRONAS
Well Info
Well Performance:
Well Status : Flowing
Well Uptime [%] :
Well TP [bopd]: 350
WT Rate[bopd]: 257
Estim. Rate[bopd]: 336.6
Deferment [bopd]: 20
Optmization Results
Activities
Status/Action
Target
increment bbl
GLOP
Not Optimized
Optimised
GL System
Healthy
Healthy
Bean-Change
Bean Up
THP
170
60
GL-Adjust
Decrease GL rate
GLIR
0.6
0
GLVC
deepening GL
Depth
1523
150
GL Orifice
Change orifice size
Orifice
16
70
FGS/Tracer
FGS Recommaned
Integration & Flow Assurance
Sand_Action
continue monitoring
Sand_Sampling
take sand samples
Weekly
04
debottlenecking
LPS Condidate
Divert to LPS
THP
60
100
Optimize
Approve
Last Well Test Data
ACCEPTED
Gas Lift Status
DUAL
Split Factor
1.00
Source PGPS
Date
CHP
GLIR
KSLR
GUF
GL Prot Size
Bean Size
FTHP
FTHT
FLP
FLT
Liquid
Oil
Water
FGas
TGas
FGOR
TGOR
TGLR
WCut
IPR Data
Manual Calculation
VLP Data
System Calc Results
System calculation
18 %
Res.Pres
Res.Temp
FGOR
WCut
Prod.Index
VLP Correlation
FTHP
FTHT
GLInj depth
GL Rate
FBHP
Liq.Rate
Draw-Down
AOF
1600
139
354
73.9
2
DunsandRosOriginal
206.5
110
1246.19
1
895.6
1289.8
704.4
4980.6
GL Sensitivity
GL_Rate :
FTHP :
Liq.Rate (bbl/d)
GLInj.rate (MMscf /d)
Valve depth sensitivity
Valve01
Valve02
Valve03
Valve04
Valve05
VLP/IPR Curves
Pressure (psig)
Liq.Rate (bbl/d)
Res_Pres Senstivity
Input WTdata
Quickook
Input Data
Output Data
Depth (m)
Pressure (psig)
DP1 = 504
DP2 = 426
DP3 = 367
DP4 = 305
DP5 = 134
Close
Inj-Possible
Dummy
Critical Inj Rate
0.62

Conclusion

- PI ProcessBook is more than just trending and alarms.
- PI System is a powerful tool used in digital field.
- Moving to PIAF and PI Vision is vital, which will bring enormous benefit in terms of process standardization, real time data integration and visualization
- Integrated Asset optimization using PI System shows a tangible value in terms of production gain, reduce deferment and cost, as well as improve on decision making

PETRONAS

Integrated Asset Monitoring and Optimization with OSIsoft PI

CHALLENGE

- Very little utilization from the user of the full capability of the PI system, limited to only display some trends in individual manner.
- With a large amount of data at high frequency, searching relevant information is quite complex and time consuming, complicating the decision making process
- Slow troubleshooting, analysis and reporting reduced productivity and cost the company significant money.

SOLUTION

- PI System was used as platform to develop a solution which integrate real time data, data from different sources (EC, LIMS, SQL Server…) and software (nodal analysis, erosion…).
- Advanced well surveillance with an advisory system based on guidelines and operating envelop was developed.
- Work process was converted to automated workflows run on Real-time basis and provide the engineers a tool for diagnosis and optimization.

RESULTS

- Accessing data to troubleshoot problems and generate opportunities on realtime basis
- Platform operators and on-shore engineers can collaborate to troubleshoot problems using the same Interface.
- Optimization and daignisis workflows run on real-time basis, generating opportunities and value.
- The Solution will be used in PDCC (PETRONAS Digital Collaboration Center)

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Questions?

Please wait for the **microphone**

State your **name & company**

Please rate this session in the mobile app!