Getting Smarter and Productive with Real Time Surveillance System to Optimize Artificial Lift System and Production Management of Aset-5 PERTAMINA E&P's Mature Field

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Company : PERTAMINA EP Indonesia

What's Next?
SIS Global Forum 2017
September 13–15
Le Palais des Congrès de Paris
Schlumberger

Contents

Executive Summary

- **Currently NKL structure produces ~7,500 BOPD (YTD)**
  - Total area for NKL's block is 33.75 km^2 dan SKL block is 11.02 km2
  - In NKL, 32 out of 90 layers in production with estimated remaining reserves of ~17 mmboe
  - 132 wells drilled, of which only 116 are currently operational with production of ~7,500 BOPD with limitations & constraint coming from its self reservoir condition & the surface environment

- **Production can be increased by 2,500 BOPD with peak production of ~10,000 BOPD**
  - Reservoir: Limit from reservoir is ~11,000 BOPD
  - Wells: Limit can be increased from ~7,500 to 10,000 BOPD by:
    - Drill 6 infill wells, workover 22 gas wells & Well service 12 oil wells
    - Stimulation 8 wells, ***Lifting optimization of 20 wells*** and reactivation 24 wells.
    - Upgrading surface facilities: Loading line, BS upgrading (@NKL, Site B & SKL), NKL gas utilization & upgrading production facilities

- **Further feasibility study is required** to evaluate the possibility and effectiveness of ***real time surveillance system*** implementasi in another lifting method in order to optimize the production of the wells.

Field History & Overview

PERTAMINA EP WORKING AREA

ASSET 1
- RANTAU
- P. SUSU
- LIRIK
- JAMBI
- RAMBA

ASSET 2
- ADERA
- LIMAU
- PRABUMULIH
- PENDOPO

ASSET 3
- SUBANG
- JATIBARANG
- TAMBUN
- PPDM*

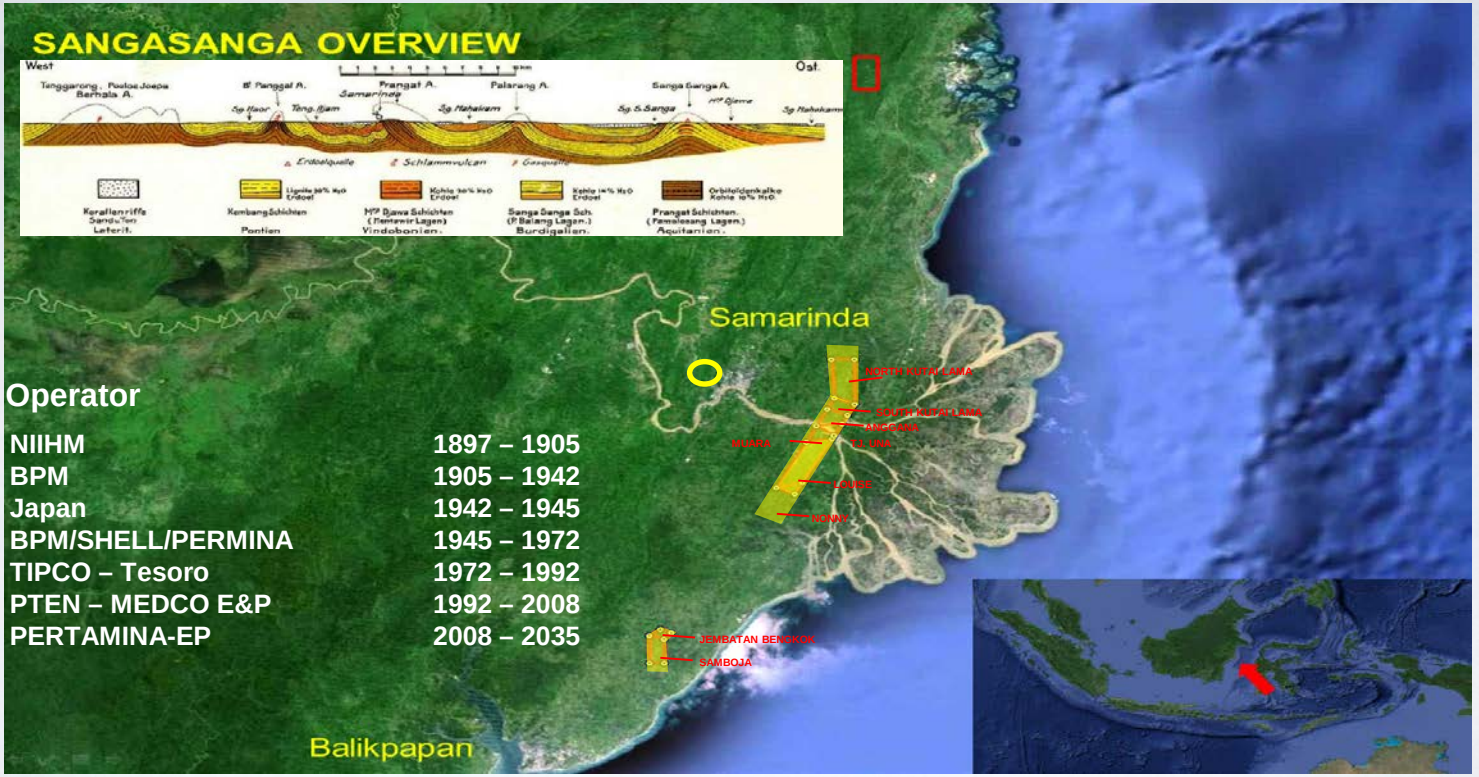
ASSET 4
- CEPU
- PPGJ*
- SUKOWATI*

ASSET 5
- SANGASANGA
- SANGATA
- BUNYU
- TARAKAN
- TANJUNG

PROYEK
- PPDM
- PPGJ
- PPGM
- PAKUGAJAH

PARTNERSHIP
- TAC : 26
- KSO : 18
- UNITISASI : 5

Field History & Overview

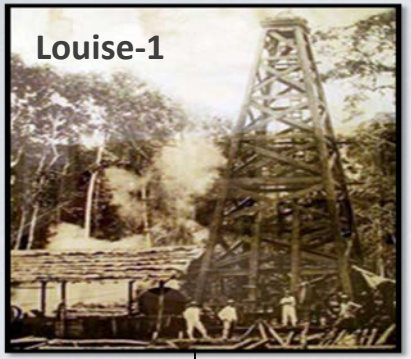


Operator

NIIHM	1897 – 1905
BPM	1905 – 1942
Japan	1942 – 1945
BPM/SHELL/PERMINA	1945 – 1972
TIPCO – Tesoro	1972 – 1992
PTEN – MEDCO E&P	1992 – 2008
PERTAMINA-EP	2008 – 2035

Field History & Overview

Operatorships history



(1897-1905)
Louise -1
Discovered by NIIHM

BPM Operatorships
LSE-2 - 519

(1905-1942)

Take Over by Japan
@ WWII
LSE 520-624

(1942-1945)

(1945-1972)

BPM/Shell/Permina operatorships LSE
625-647

Tesoro/Tipco
Operatorship
SS 816 -943

(1972-1992)

(1992-2008)

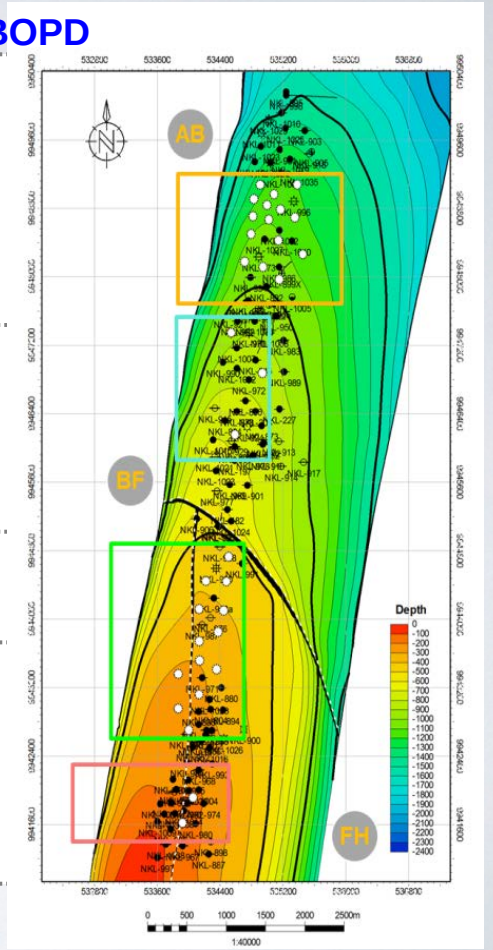
TAC Medco-Pertamina
SS 943 -1009
(2008-present)

Pertamina EP
NNY-1031, LSE-1054 & 1055

Field History & Overview

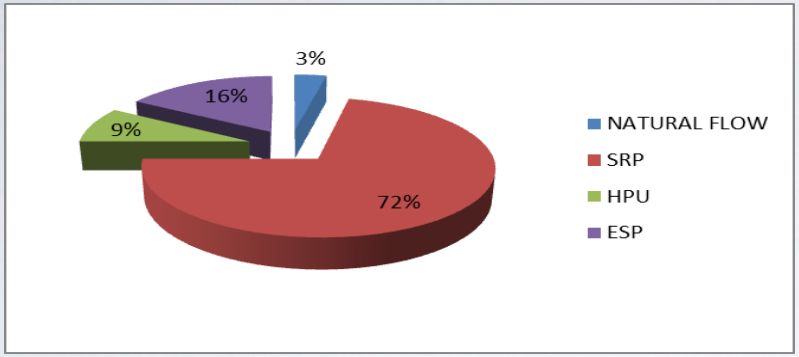
NKL is Asset 5's field with 116 producing wells in 32 layers producing 7,500 BOPD

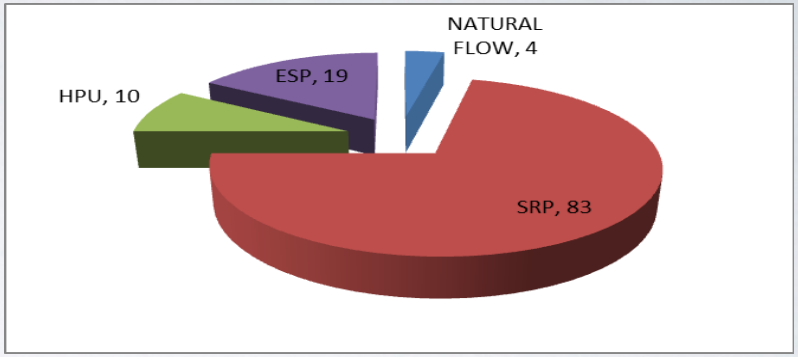
GGR ASPECT – CURRENT CONDITION	O O I P	: 153.82 MMSTB
	E U R	: 44.72 MMSTB
	RECOVERY FACTOR TOTAL	: 29 %
	REMAINING RESERVES	: 11.89 MMSTB (STATUS AS OF 1 JANUARY 2017)
	CUMMULATIVE PRODUCTION	: 32.82 MMSTB (STATUS AS OF 1 JANUARY 2017)
	RECOVERY FACTOR CURRENT	: 21.9 %
	OIL API	: 25 – 39 API
	OIL VISCOSITY	: 0.49 – 1.6 cP
	O G I P	: 123.59 BSCF
	E U R	: 71.02 BSCF
	RECOVERY FACTOR TOTAL	: 57.4 %
	REMAINING RESERVES	: 28.58 BSCF (STATUS AS OF 1 JANUARY 2017)
	CUMMULATIVE PRODUCTION	: 42.44 BSCF (STATUS AS OF 1 JANUARY 2017)
	RECOVERY FACTOR CURRENT	: 34.3 %
	DRIVE MECHANISM	: SOLUTION GAS DRIVE & WATER DRIVE
	TOTAL NUMBERS OF LAYER	: 90 LAYERS
	ACTIVE LAYER	: 32 LAYERS
PRODUCTION– CURRENT CONDITION	TOTAL NUMBERS OF WELLS	: 132
	TOTAL NUMBERS OF PRODUCTION WELL	: 123
	NUMBERS OF OIL WELL	: 116 (4 #NF, 20 #ESP, 83# SRP, 10 #HPU)
	NUMBERS OF GAS WELL	: 2
	TOTAL NUMBERS OF INJEECTION WELL	: 5
	TOTAL NUMBERS OF SUSPENDED WELL	: 82



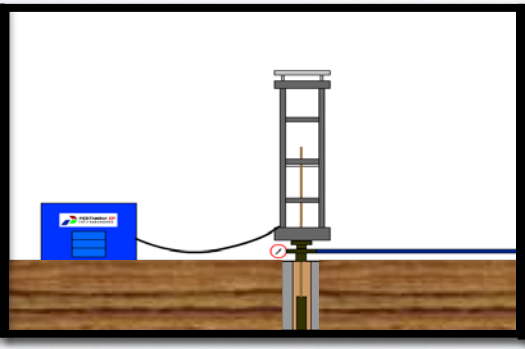
Field History & Overview

Production/Lifting Method

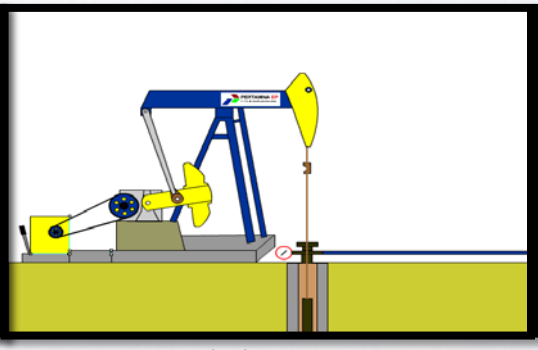




Natural Flow (4)



HPU (10)

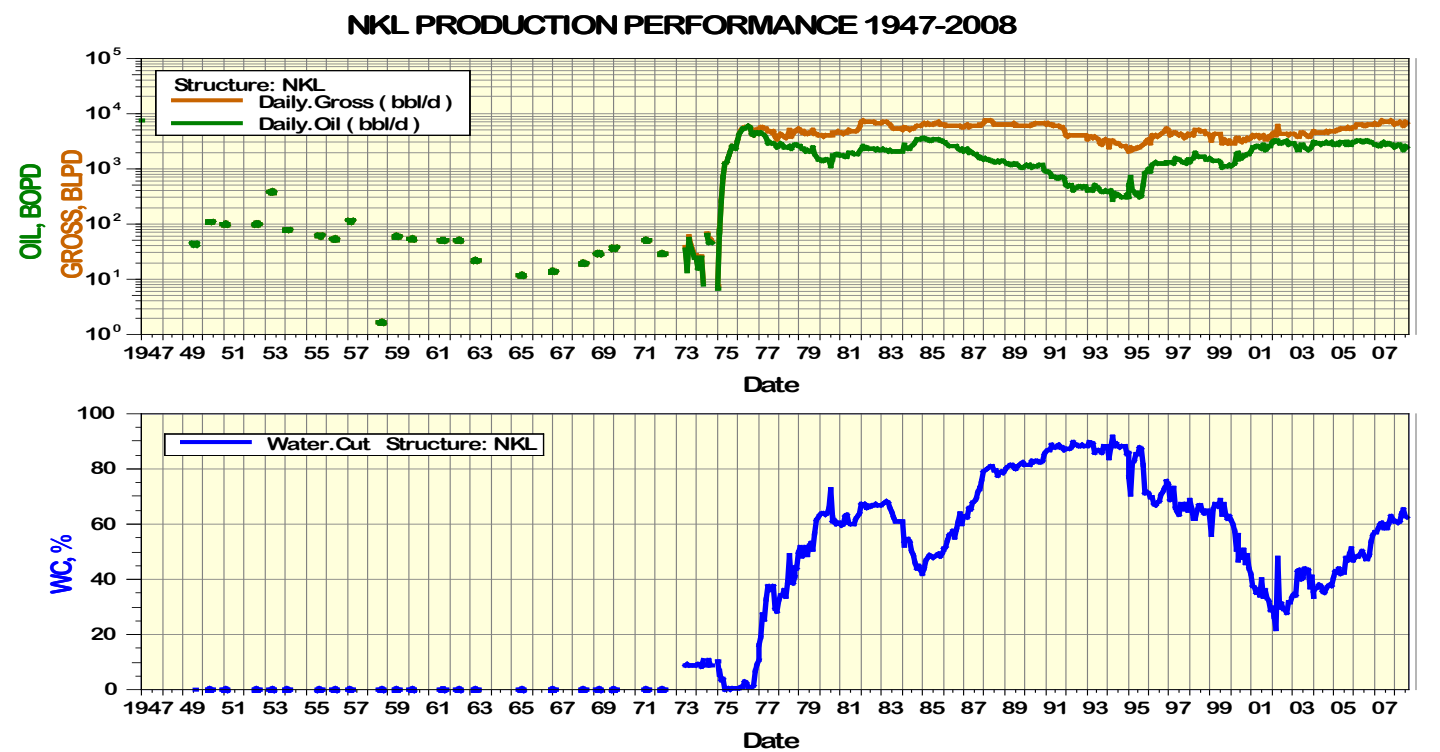


SRP (83)

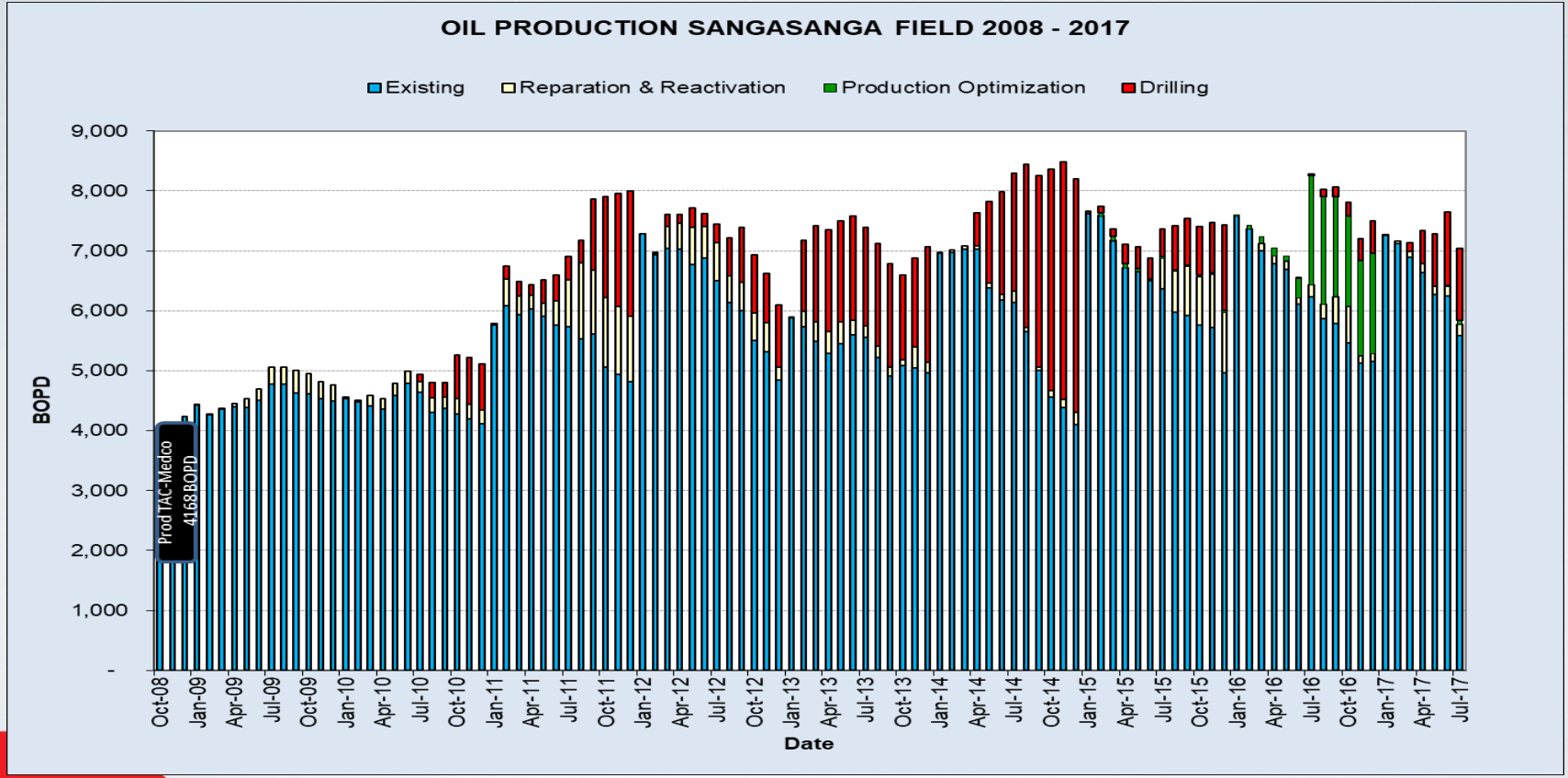
ESP (20)

Field History & Overview

NKL's Production in the early 1976's was as high as 4,600 BOPD compared to current production of approximately ~7,500 BOPD

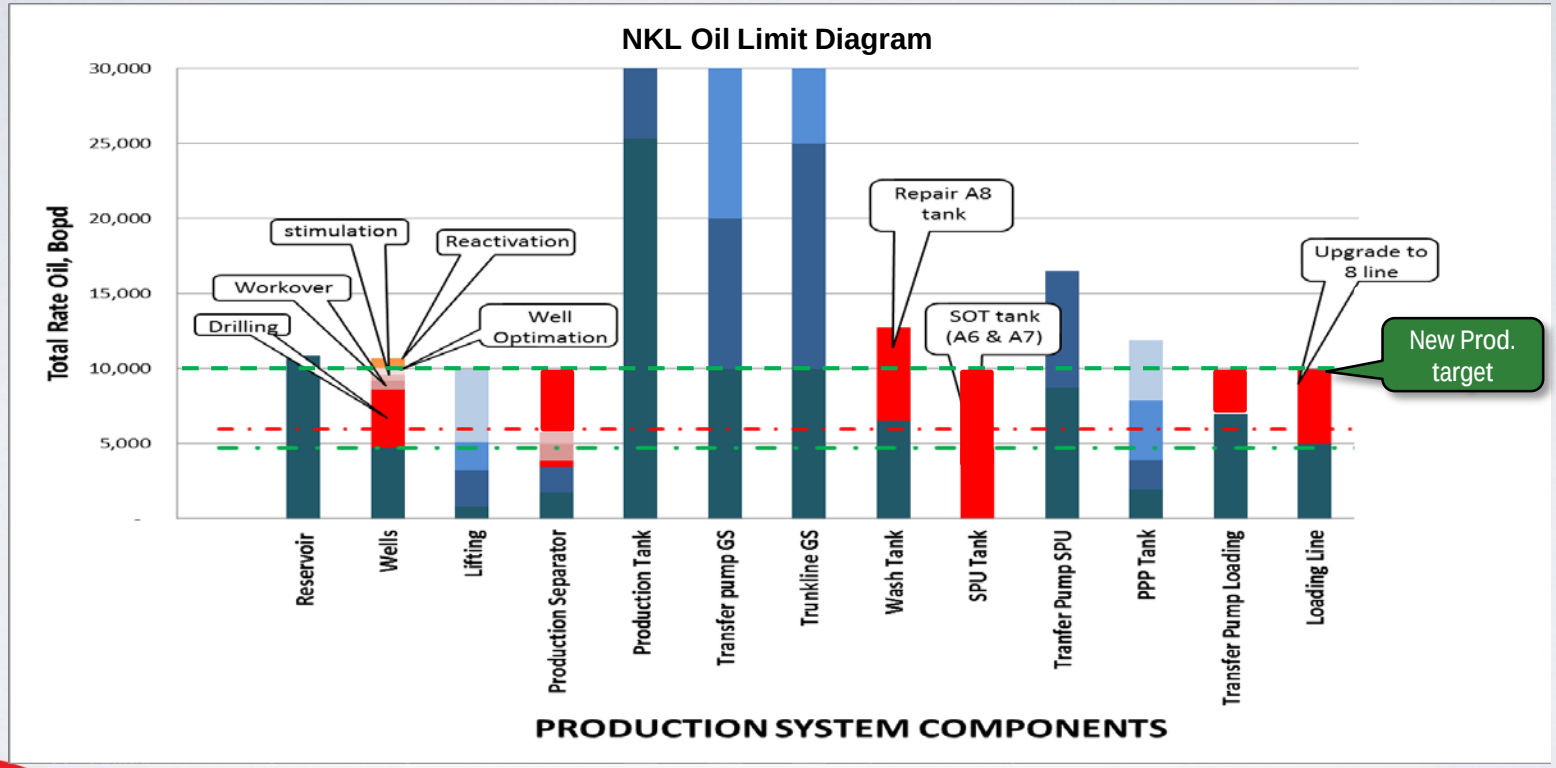


Field History & Overview



Field History & Overview

NKL Field Limit Diagram



Production Optimization Constraint

Mature Field
- High Decline Rate
- High Water cut

Location
- Remote
- Topography (Hills, Rivers)
- Overlapping w/ mining area

- Weather (unpredictable Heavy Rain & wind)

- Limited Hoist/Rig numbers
- Old Surface Prod. facilities

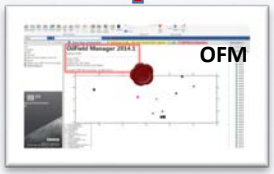
- ✓ Production Target
- ✓ Reduce Low/off
- ✓ Push Decline Prod
- ✓ Reduce Cost

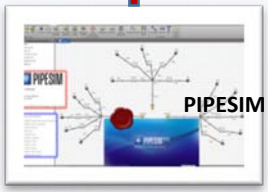
Problem Statement & Analysis

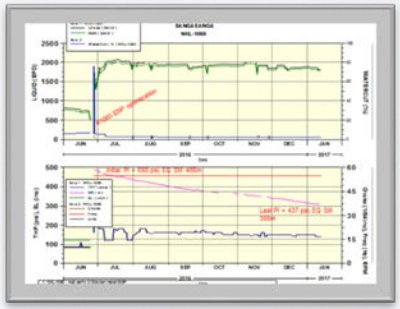
TARGET + CONSTRAINT

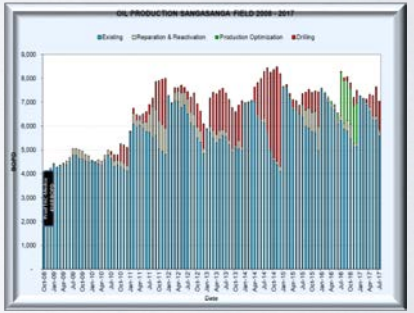
ESP REAL TIME SURVEILLANCE

OPTIMUM PRODUCTION

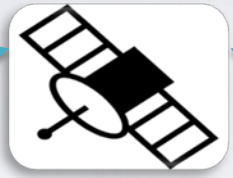






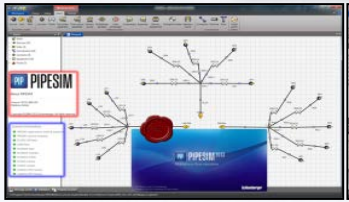


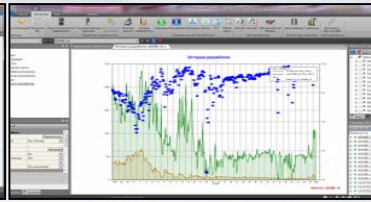
ESP Real Time Surveillance



Data Transmission

- ✓ *REALTIME MONITORING 24/7*
- ✓ *QUICK RESPONSE*
- ✓ *MINIMIZE DOWNTIMES*
- ✓ *OPTIMIZE PRODUCTION FROM OFFICE*





DH Monitoring Gauge:
- Press. (discharge, intake)
- Temp. (intake, motor)
- Vibration
- Leakage

Engineer:
- Control
- Monitor
- Analysis (OFM & PIPESIM)
- Decision

ESP Real Time Surveillance

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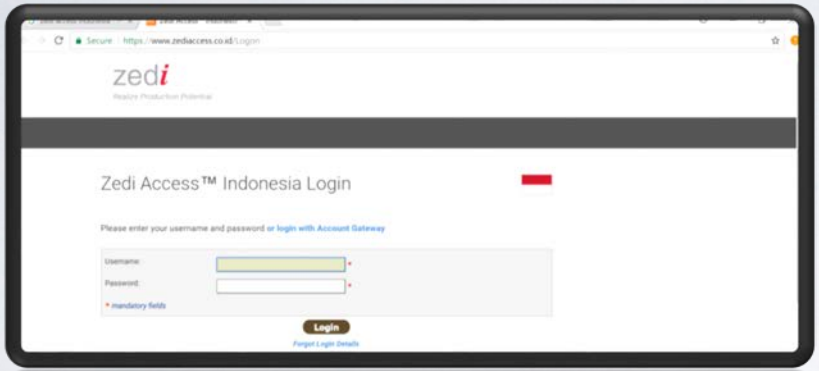

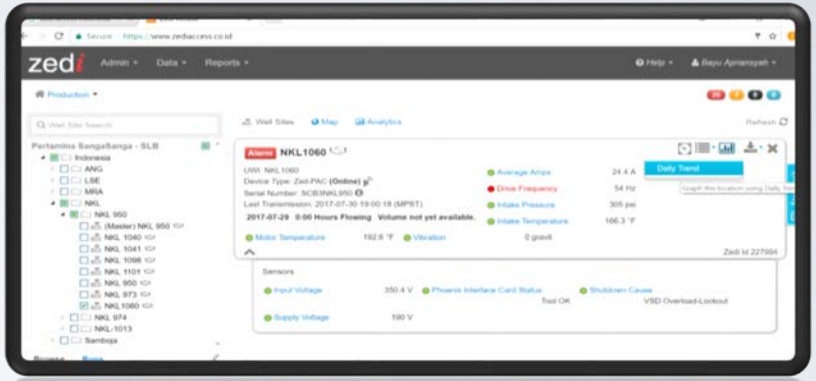

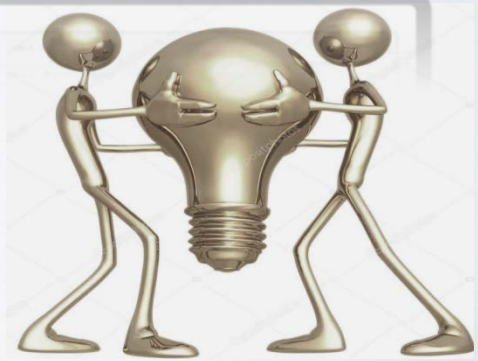

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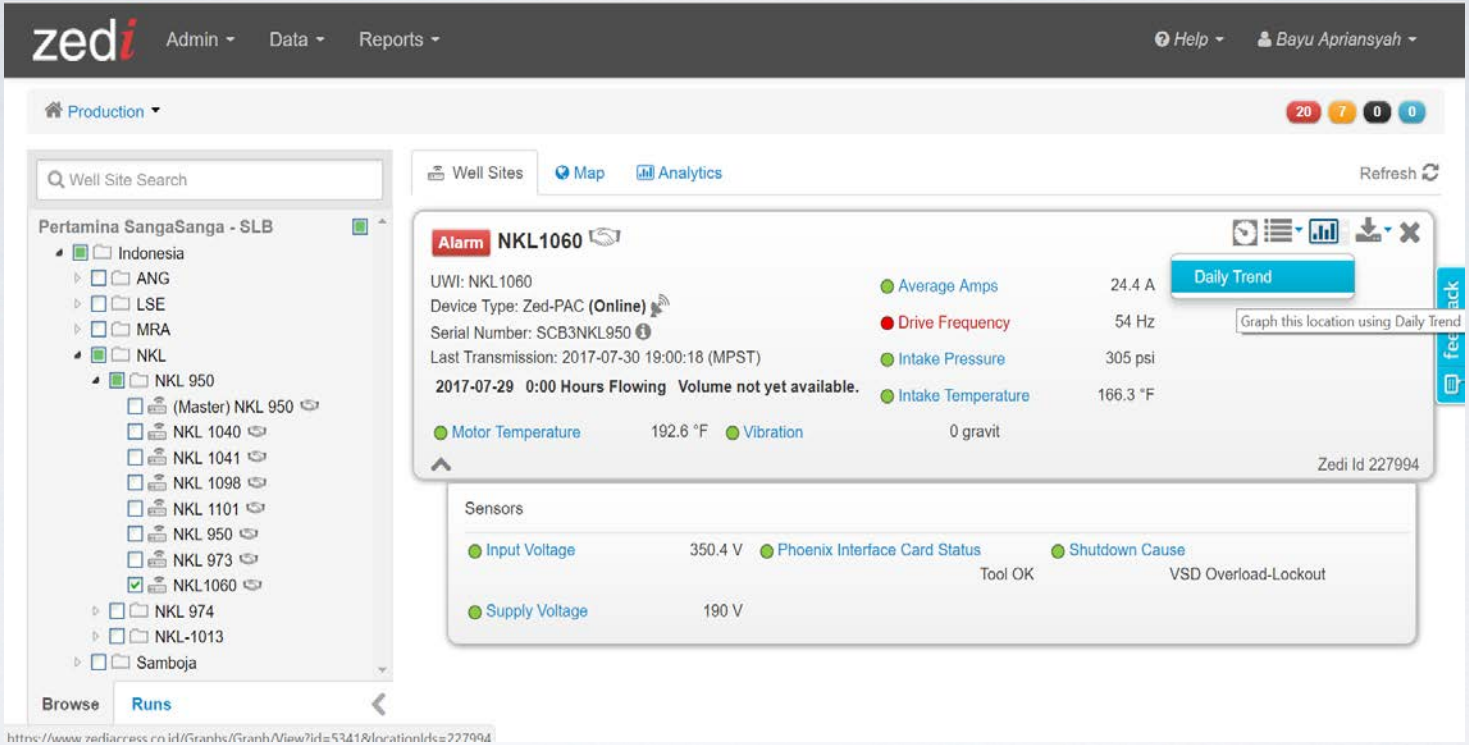
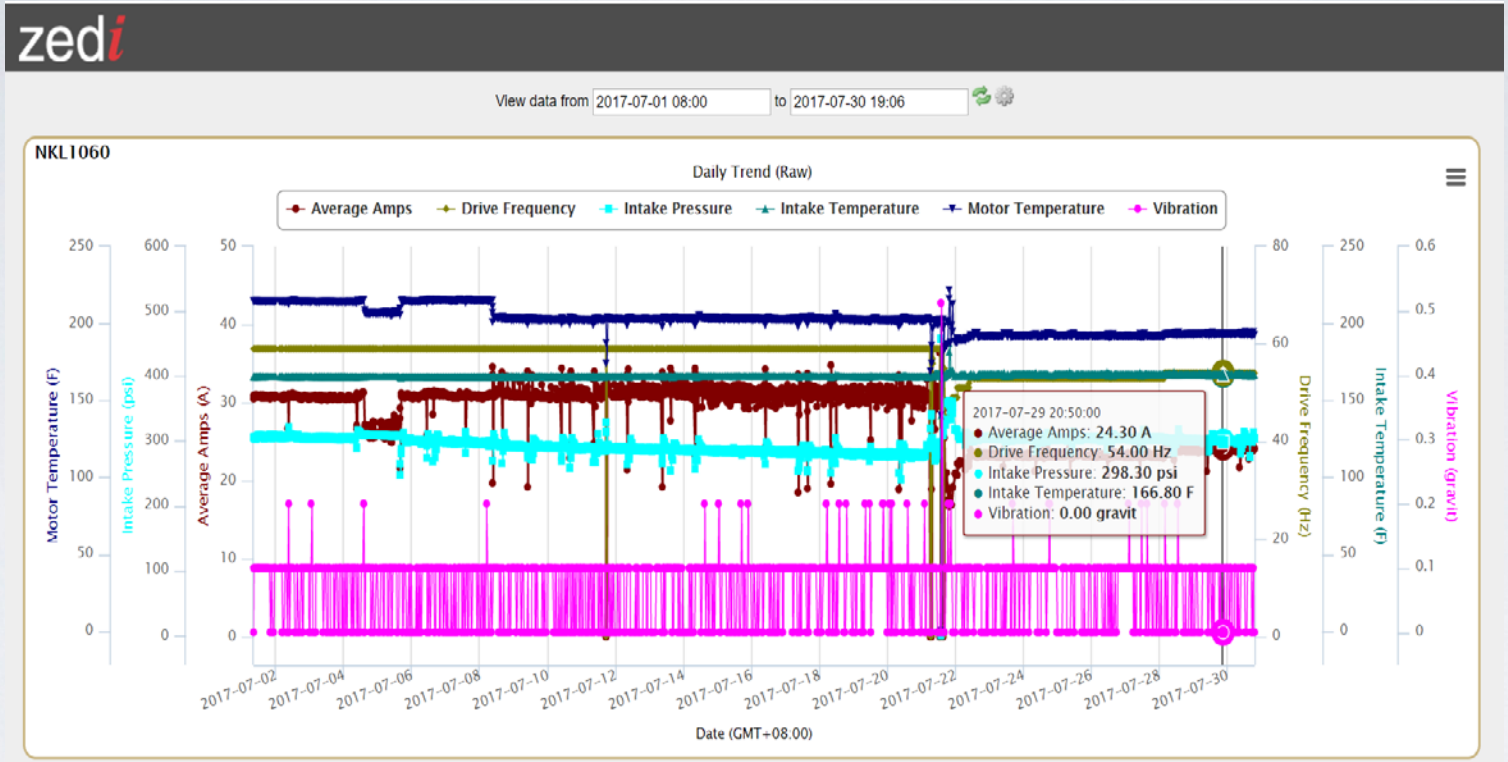


1. Interface of the web page informs ESP parameters at one time
2. Trend line of parameters are shown by clicking daily trend button

ESP Real Time Surveillance



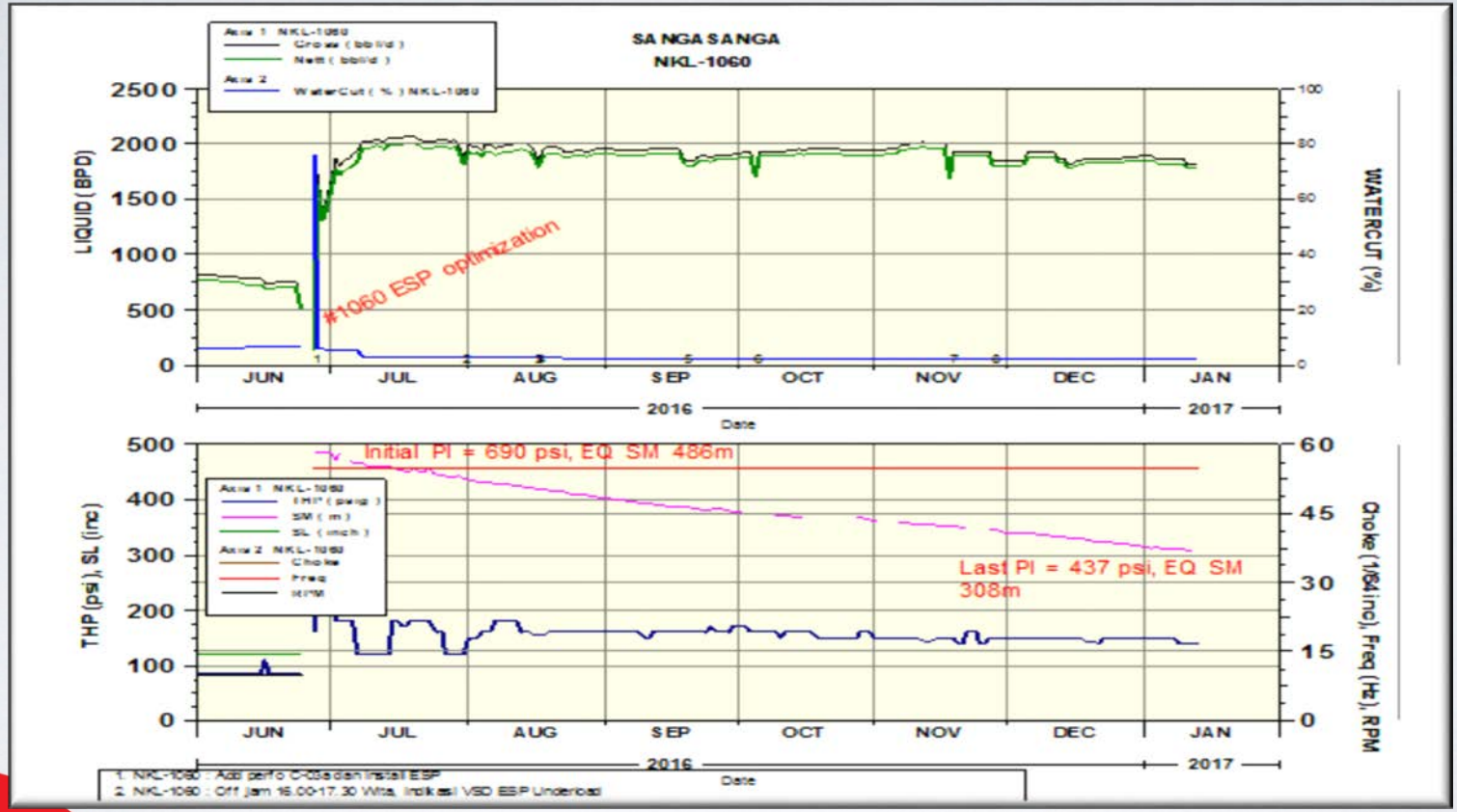
3. The trend line shows ESP parameters such as Intake Pressure, Ampere, Frequency, Temperature, and Vibration
4. Engineers can analyze data to optimize well production

ESP Real Time Surveillance

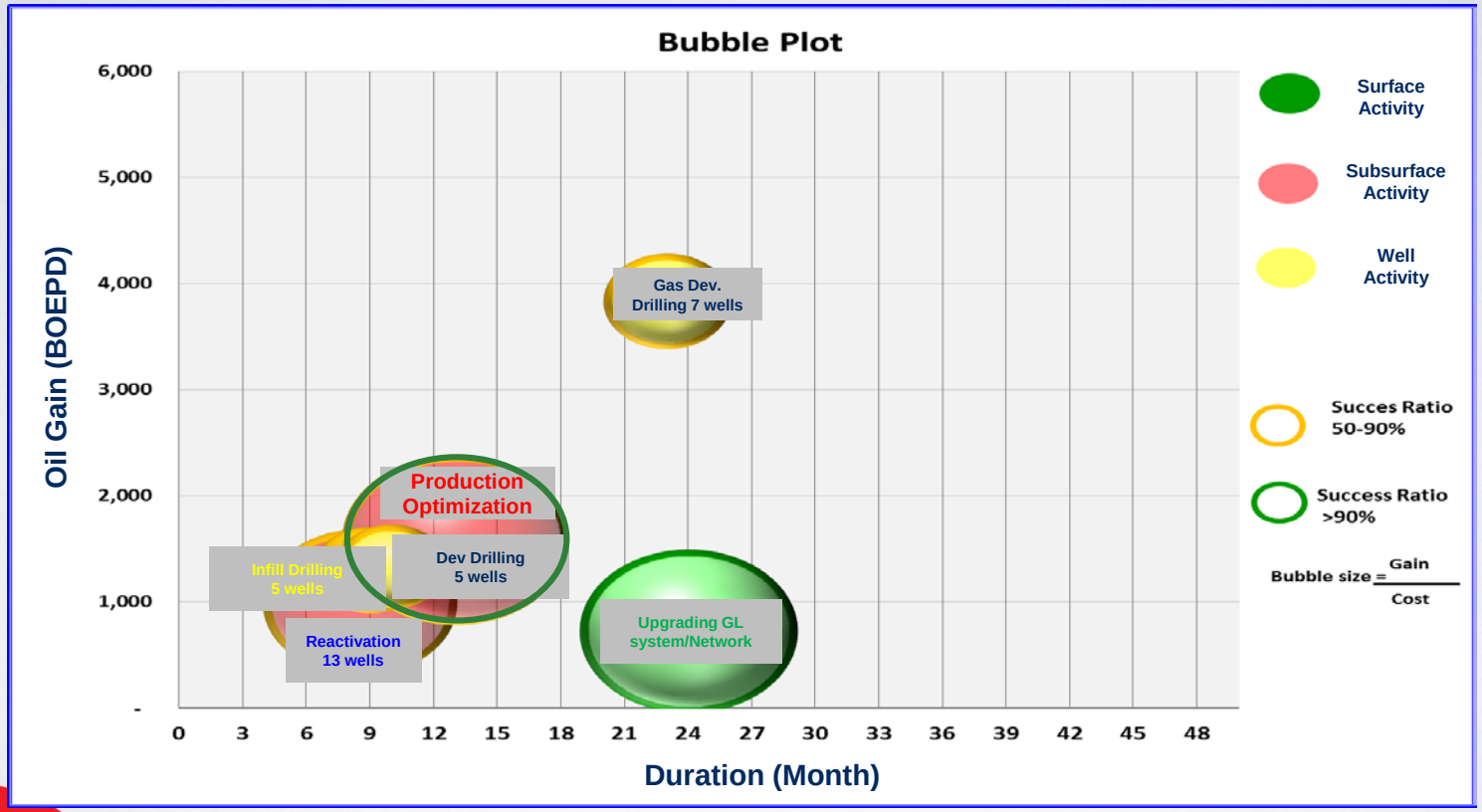
5. When a well shuts down, a notification will sent via email

6. Or when a parameter is out of its normal condition, a notification also sent via email

Poduction Analysis Result



Gain – Cost Analysis Result



Conclusion

ESP Real Time Monitoring implementation in Aseet-5 NKL's Field was success to:

- Decrease Production Decline
- Minimize Downtime (quick response)
- Optimize Mature Field Production to be smarter and more productive field

Suggestion/Challenge:

- Need improvement on reliability of communication system. Sometimes it breaks up in extreme weather (heavy rain, wind, etc.).
- Need further study to implementing the Real Time Monitoring System for another lifting methods instead of ESP only.

PERTAMINA

Thank You

terima kasih