

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

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Executive Summary

- **Currently NKL structure produces ~7,500 BOPD (YTD)**
 - Total area for NKL's block is 33.75 km² 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.

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

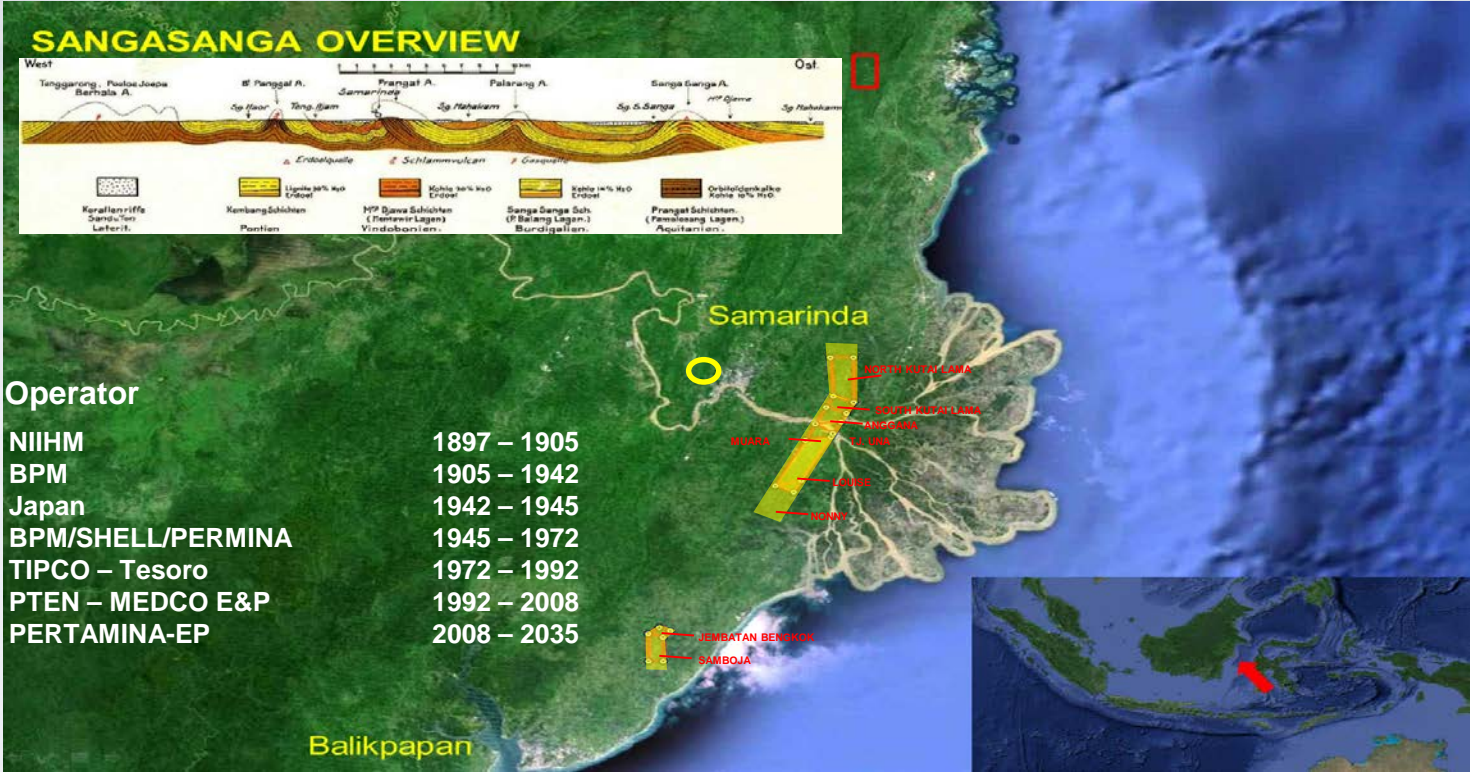
PROYEK

- PPDM
- PPGJ
- PPGM
- PAKUGAJAH

PARTNERSHIP

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

Field History & Overview



Field History & Overview

Operatorships history

Louise-1

Take Over by Japan
@ WWII
LSE 520-624

Tesoro/Tipco
Operatorship
SS 816 -943



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

(1905-1942)

(1945-1972)

(1992-2008)

(1897-1905)
Louise -1
Discovered by NIIHM

(1942-1945)

(1972-1992)



BPM Operatorships
LSE-2 - 519



BPM/Shell/Permina operatorships LSE
625-647



Pertamina EP
NNY-1031, LSE-1054 & 1055

Field History & Overview

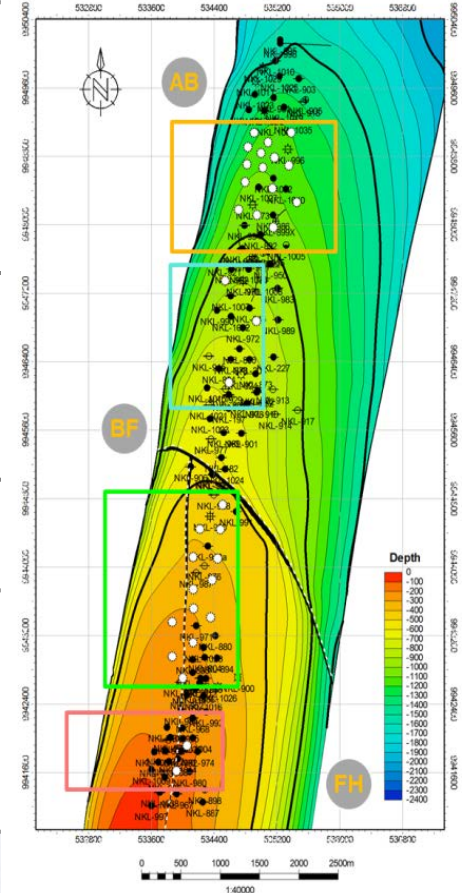
NKL is Asset 5's field with 116 producing wells in 32 layers producing 7,500 BOPD

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

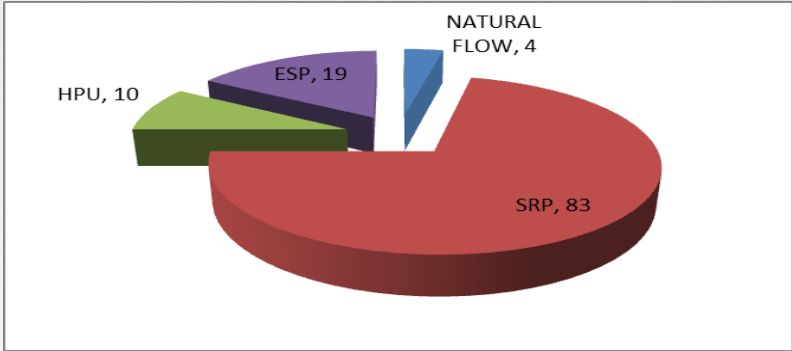
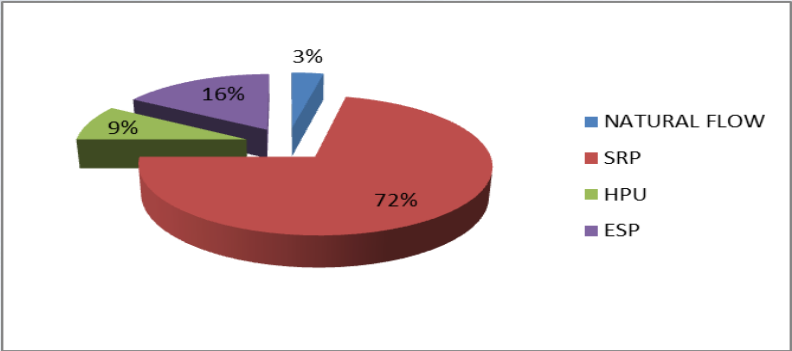
PRODUCTION – CURRENT CONDITION

▪ 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 INJECTION WELL	: 5
▪ TOTAL NUMBERS OF SUSPENDED WELL	: 82

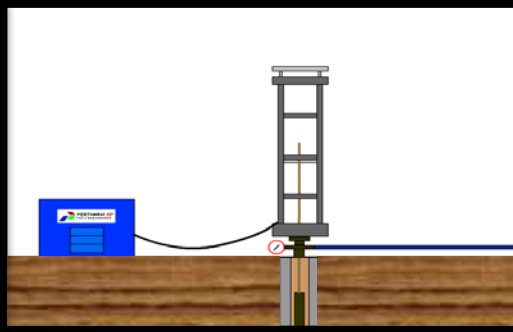


Field History & Overview

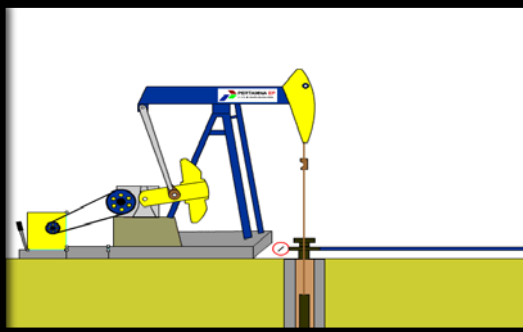
Production/Lifting Method



Natural Flow (4)



HPU (10)



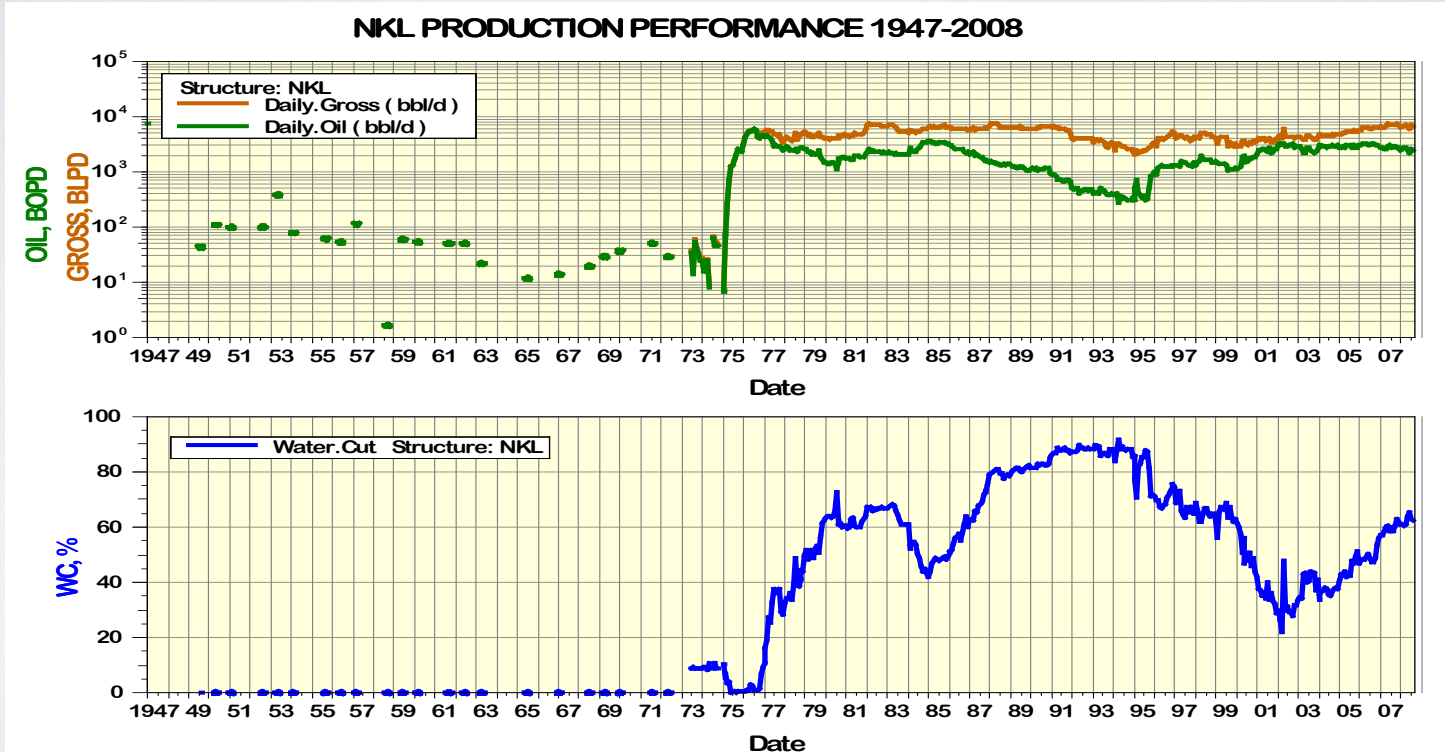
SRP (83)



ESP (20)

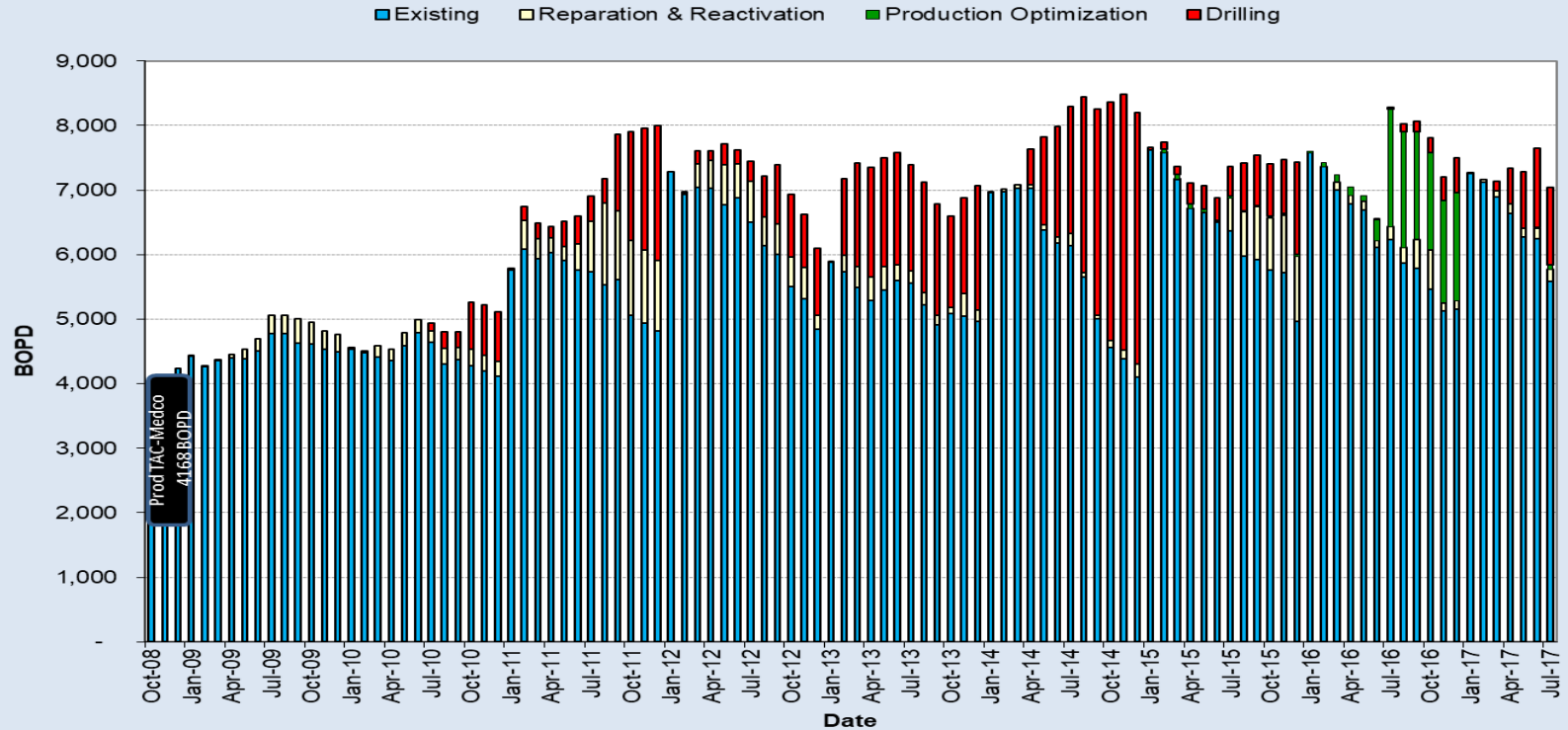
Field History & Overview

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



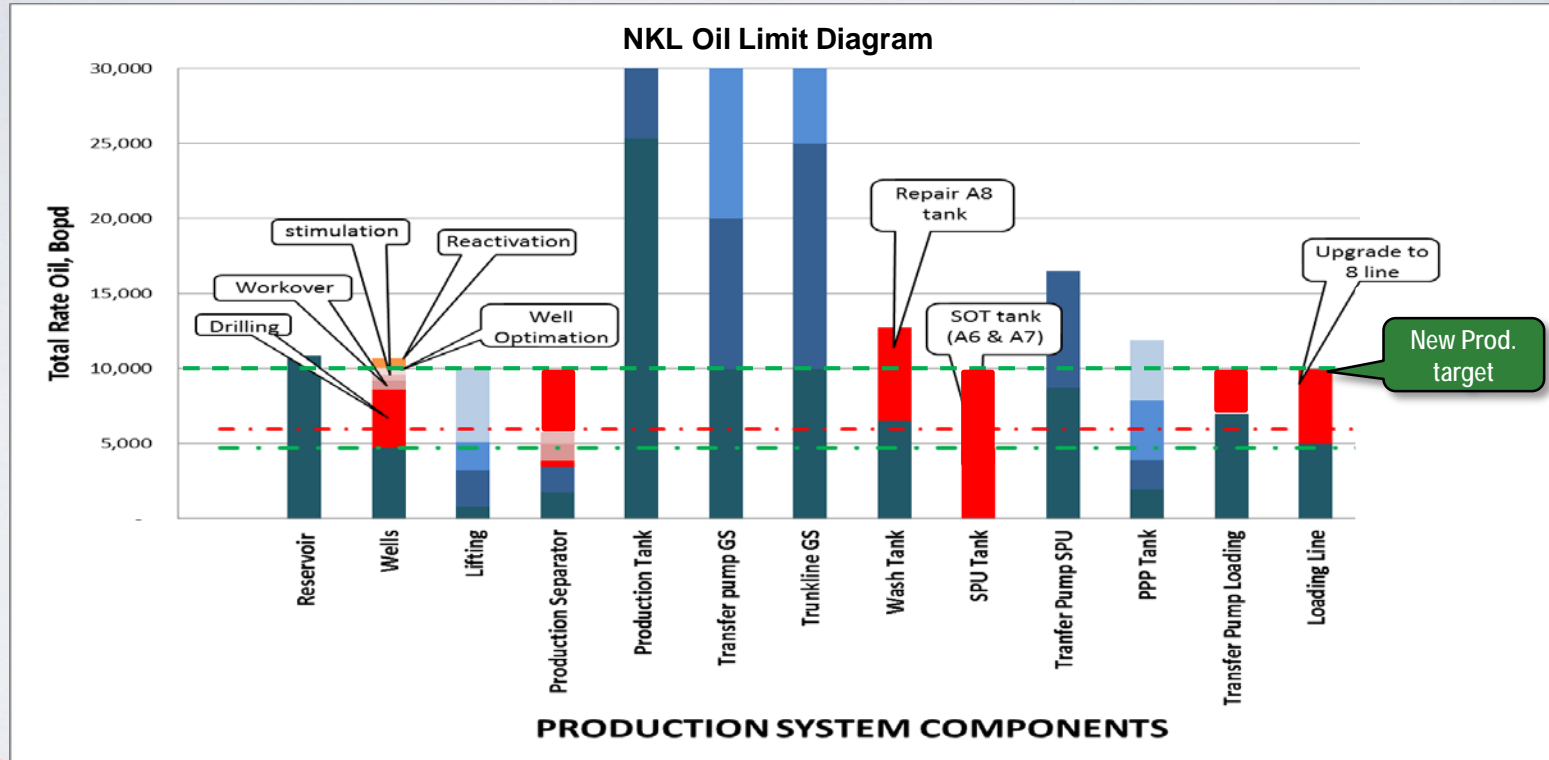
Field History & Overview

OIL PRODUCTION SANGASANGA FIELD 2008 - 2017



Field History & Overview

NKL Field Limit Diagram



Production Optimization Constraint

Mature Field

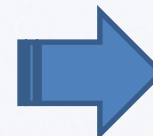
- High Decline Rate
- High Water cut

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



IDEA/SOLUTION

ESP REAL TIME SURVEILLANCE

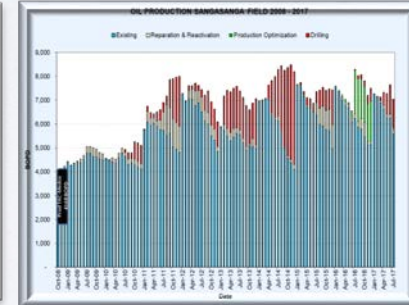
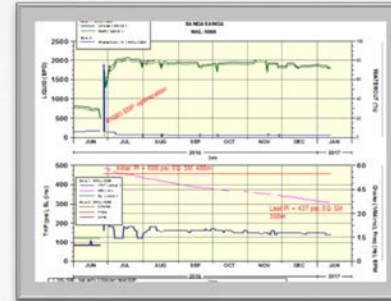
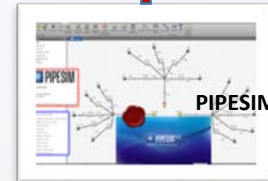


OPTIMUM PRODUCTION

Production Optimization Constraint

- Mature Field**
 - High Decline Rate
 - High Water cut
- Location**
 - Remote
 - Topography (Hills, Rivers)
 - Overlapping w/ mining area
- Weather (Heavy Rain, wind / unpredictable)**
- Limited Hoist/Rig numbers**
- Old Surface Prod. facilities**

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



ESP Real Time Surveillance



Data Transmission

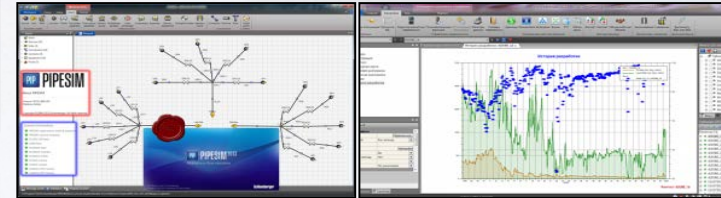


- ✓ *REALTIME MONITORING 24/7*
- ✓ *QUICK RESPONSE*
- ✓ *MINIMIZE DOWNTIMES*
- ✓ *OPTIMIZE PRODUCTION FROM OFFICE*



DH Monitoring Gauge:

- Press. (discharge, intake)
- Temp. (intake, motor)
- Vibration
- Leakage

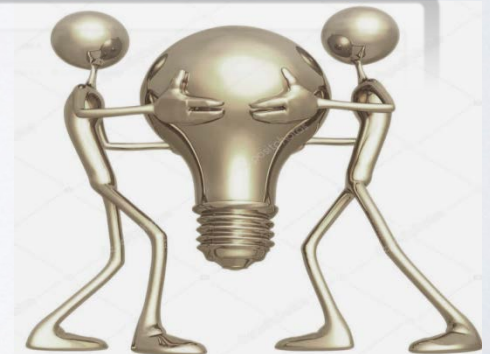
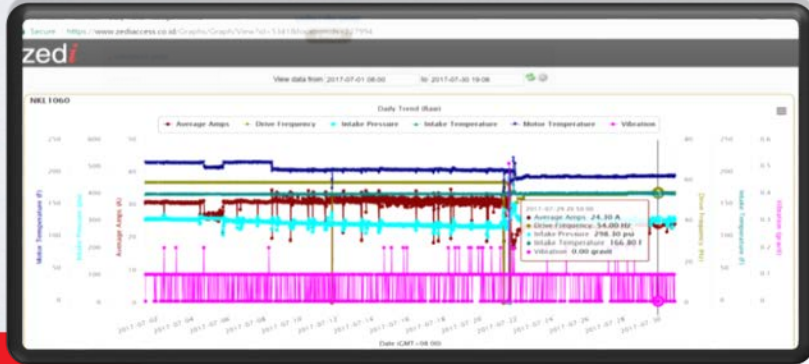
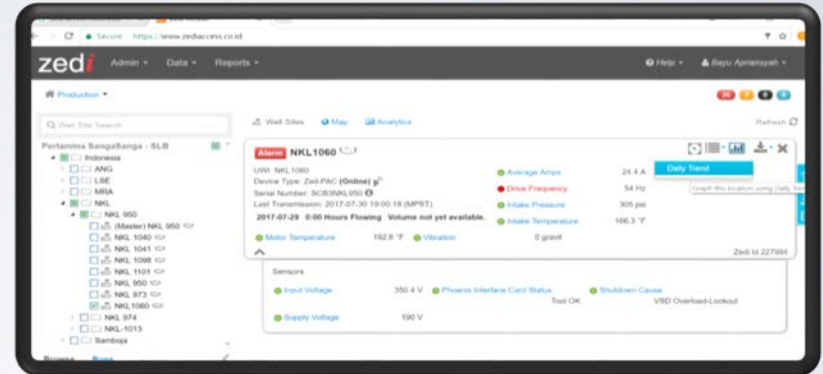
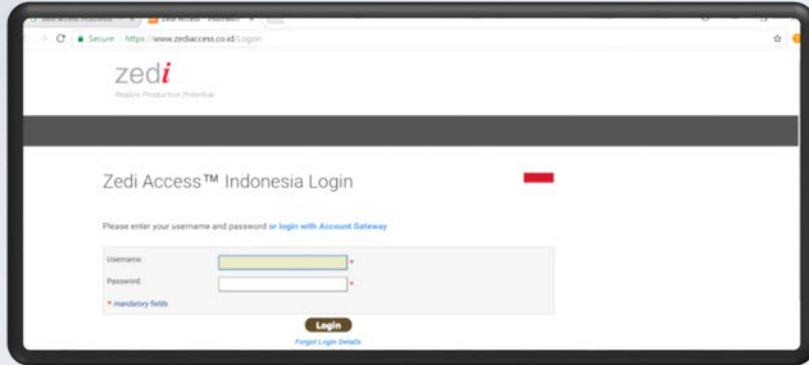


Engineer:

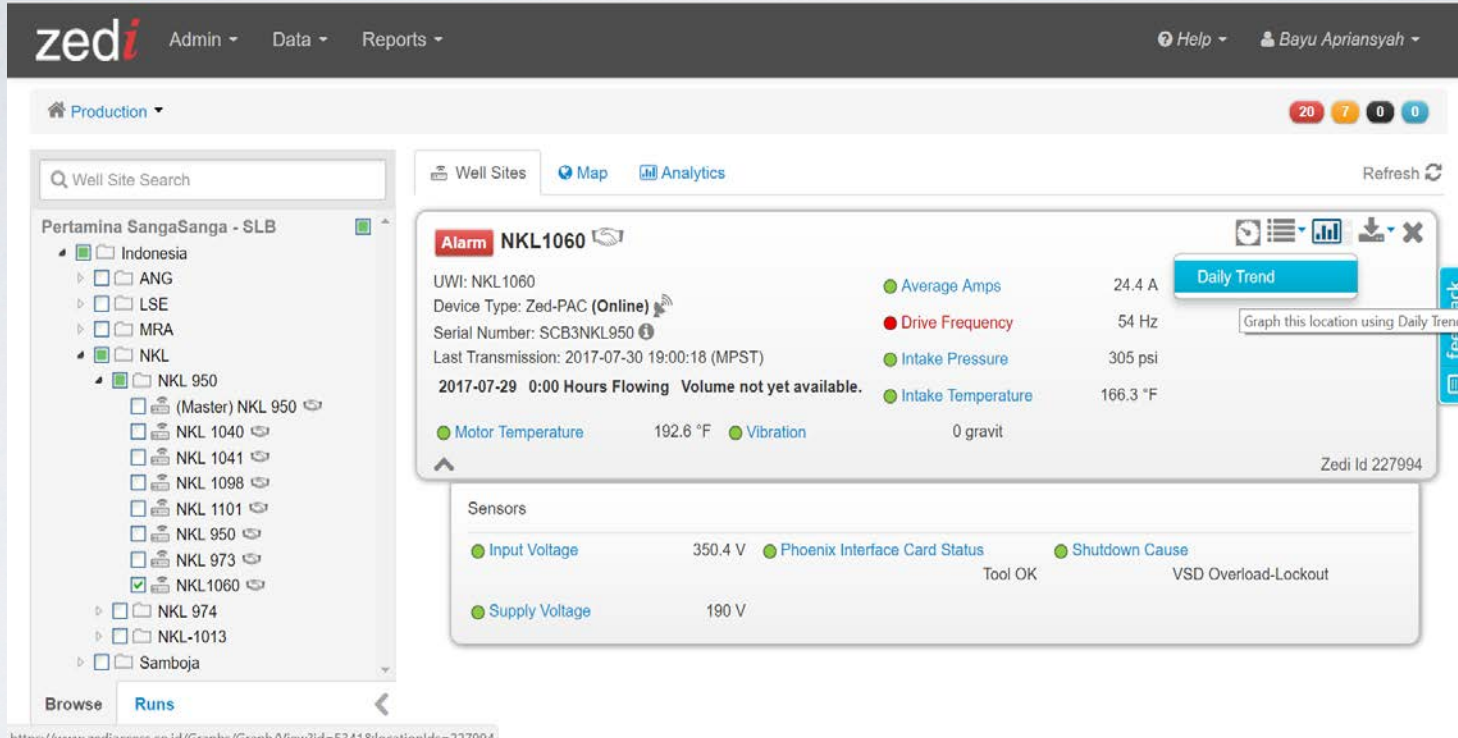
- Control
- Monitor
- Analysis (OFM & PIPESIM)
- Decision

ESP Real Time Surveillance

zedi



ESP Real Time Surveillance



zedi Admin Data Reports Help Bayu Apriansyah

Production 20 7 0 0

Well Site Search

Pertamina SangaSanga - SLB

- Indonesia
 - ANG
 - LSE
 - MRA
 - NKL
 - NKL 950
 - (Master) NKL 950
 - NKL 1040
 - NKL 1041
 - NKL 1098
 - NKL 1101
 - NKL 950
 - NKL 973
 - NKL1060
 - NKL 974
 - NKL-1013
 - Samboja

Well Sites Map Analytics Refresh

Alarm NKL1060

UWI: NKL1060
Device Type: Zed-PAC (Online)
Serial Number: SCB3NKL950
Last Transmission: 2017-07-30 19:00:18 (MPST)

2017-07-29 0:00 Hours Flowing Volume not yet available.

Average Amps	24.4 A
Drive Frequency	54 Hz
Intake Pressure	305 psi
Intake Temperature	166.3 °F
Motor Temperature	192.6 °F
Vibration	0 gravit

Daily Trend
Graph this location using Daily Trend

Zedi Id 227994

Sensors

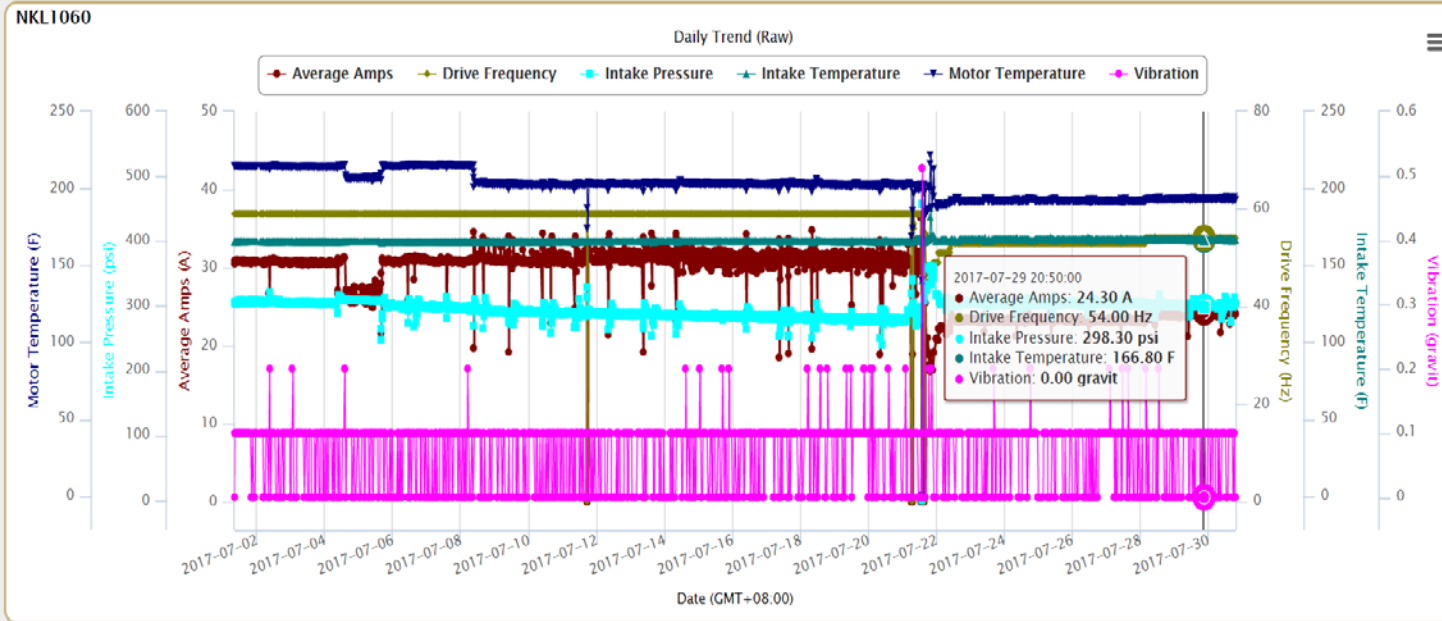
Input Voltage	350.4 V	Phoenix Interface Card Status	Shutdown Cause
Supply Voltage	190 V	Tool OK	VSD Overload-Lockout

https://www.zediprocess.com/id/graph/graph/View?site=5341&locationId=227994

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

zedi

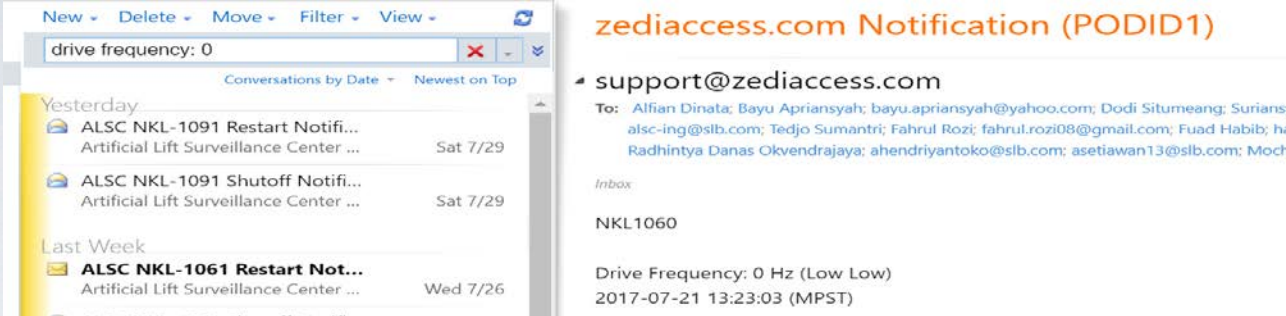
View data from 2017-07-01 08:00 to 2017-07-30 19:06



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



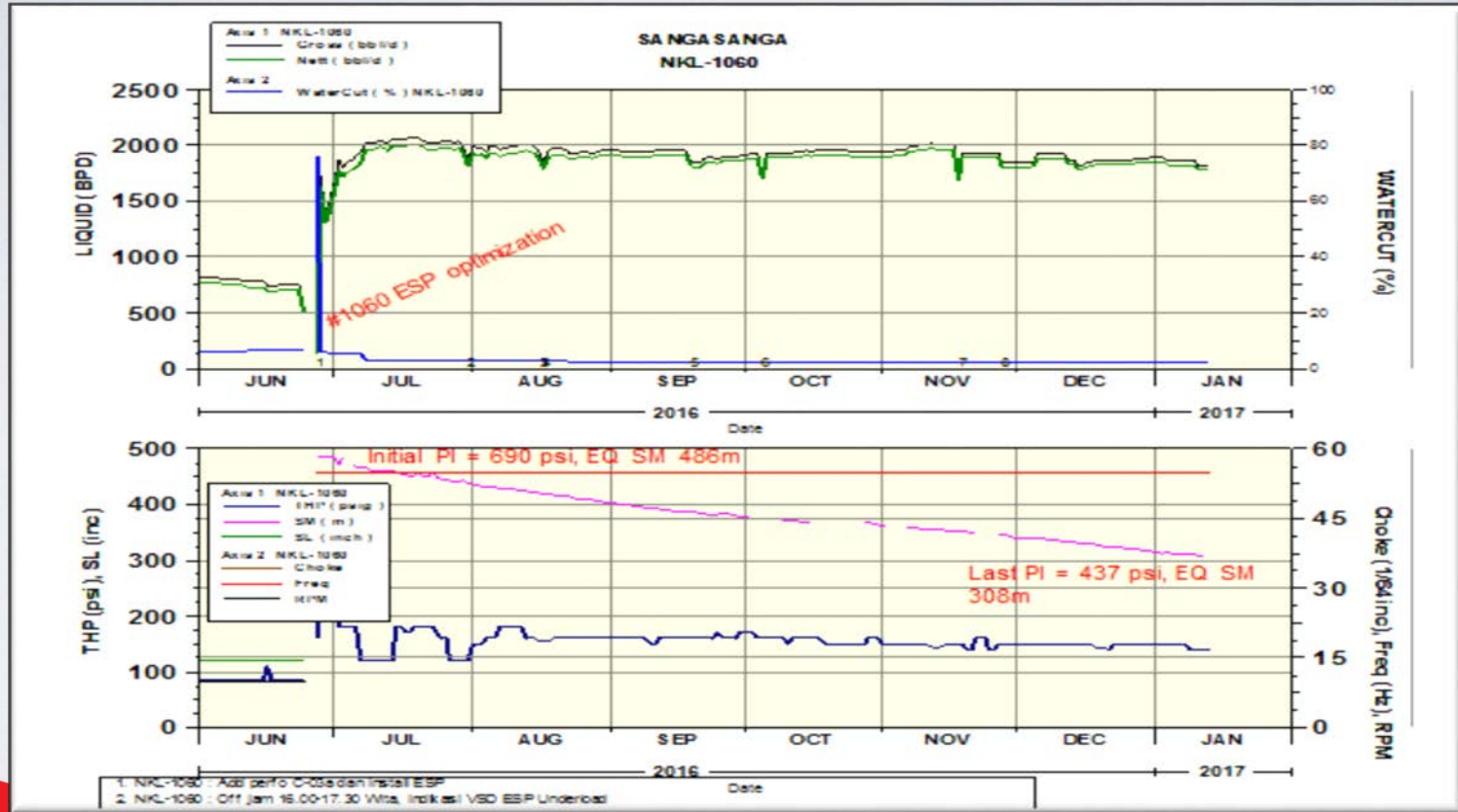
The screenshot shows an email client interface. On the left, a list of emails is visible, including "ALSC NKL-1091 Restart Notifi..." and "ALSC NKL-1091 Shutoff Notifi...". The main pane displays an email from "support@zediaccess.com" with the subject "zediaccess.com Notification (PODID1)". The email content includes the recipient list, the well ID "NKL1060", and the notification details: "Drive Frequency: 0 Hz (Low Low)" and "2017-07-21 13:23:03 (MPST)".

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

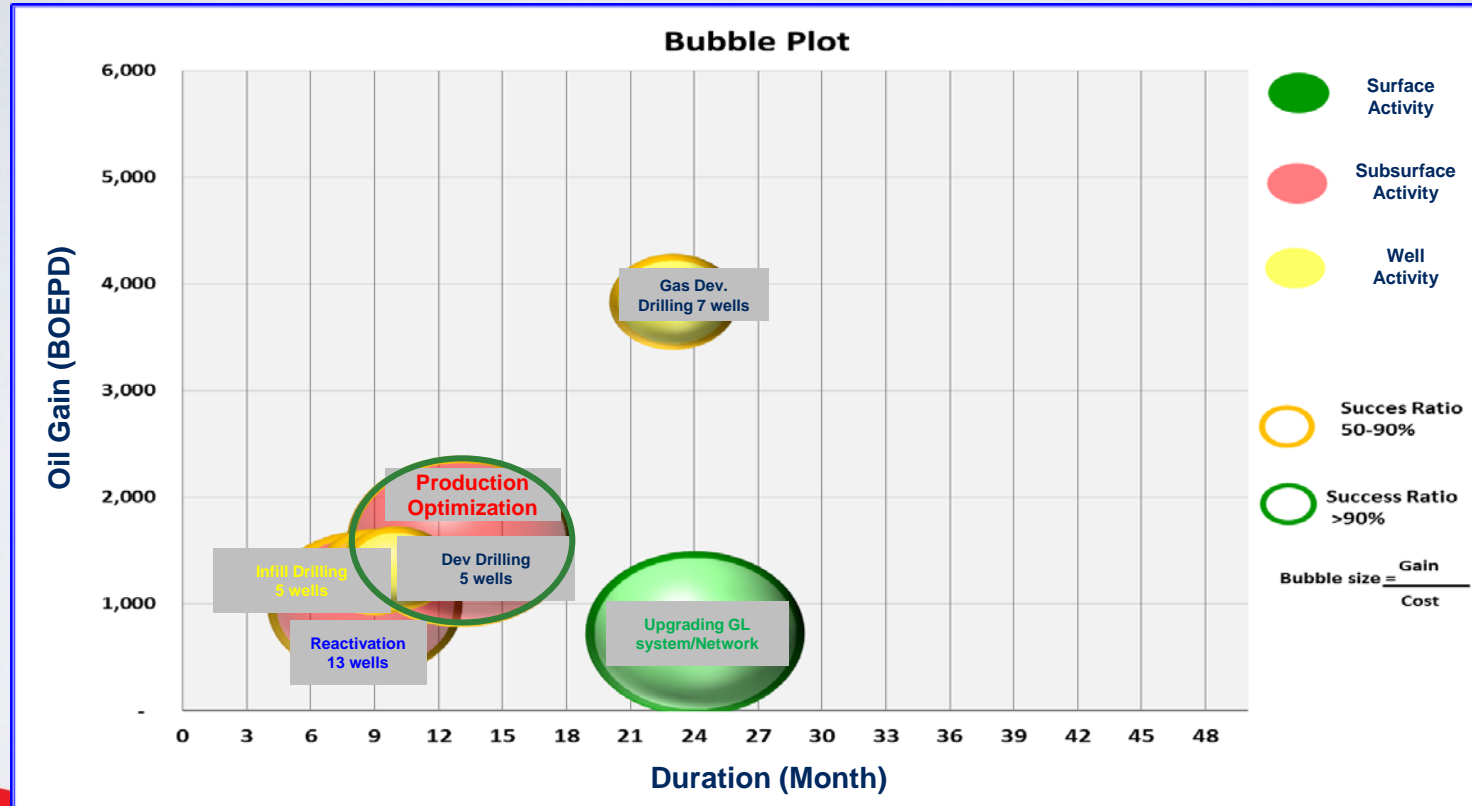


The screenshot shows an email client interface. On the left, a list of emails is visible, including "IATMI Training : 'WELL INT...'", "TKO/TKI PE", "Job Order BHP Static dan Flo...", "Pengaduan Gangguan Laya...", and "Job Order KR-250-2 Proqram ...". The main pane displays an email from "support@zediaccess.com" with the subject "zediaccess.com Notification (PODID1)". The email content includes the recipient list, the well ID "NKL 1041", and the notification details: "Motor Temperature: 190.9 *F (High)" and "2017-07-26 11:35:31 (MPST)".

Production Analysis Result



Gain – Cost Analysis Result



ESP Real Time Monitoring implementation in Aset-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.

Thank You
terima kasih

