

# KUWAIT 3<sup>RD</sup> FLOW MEASUREMENT TECHNOLOGY CONFERENCE

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HILTON KUWAIT RESORT , AL DORRA BALLROOM

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# Babu Raman

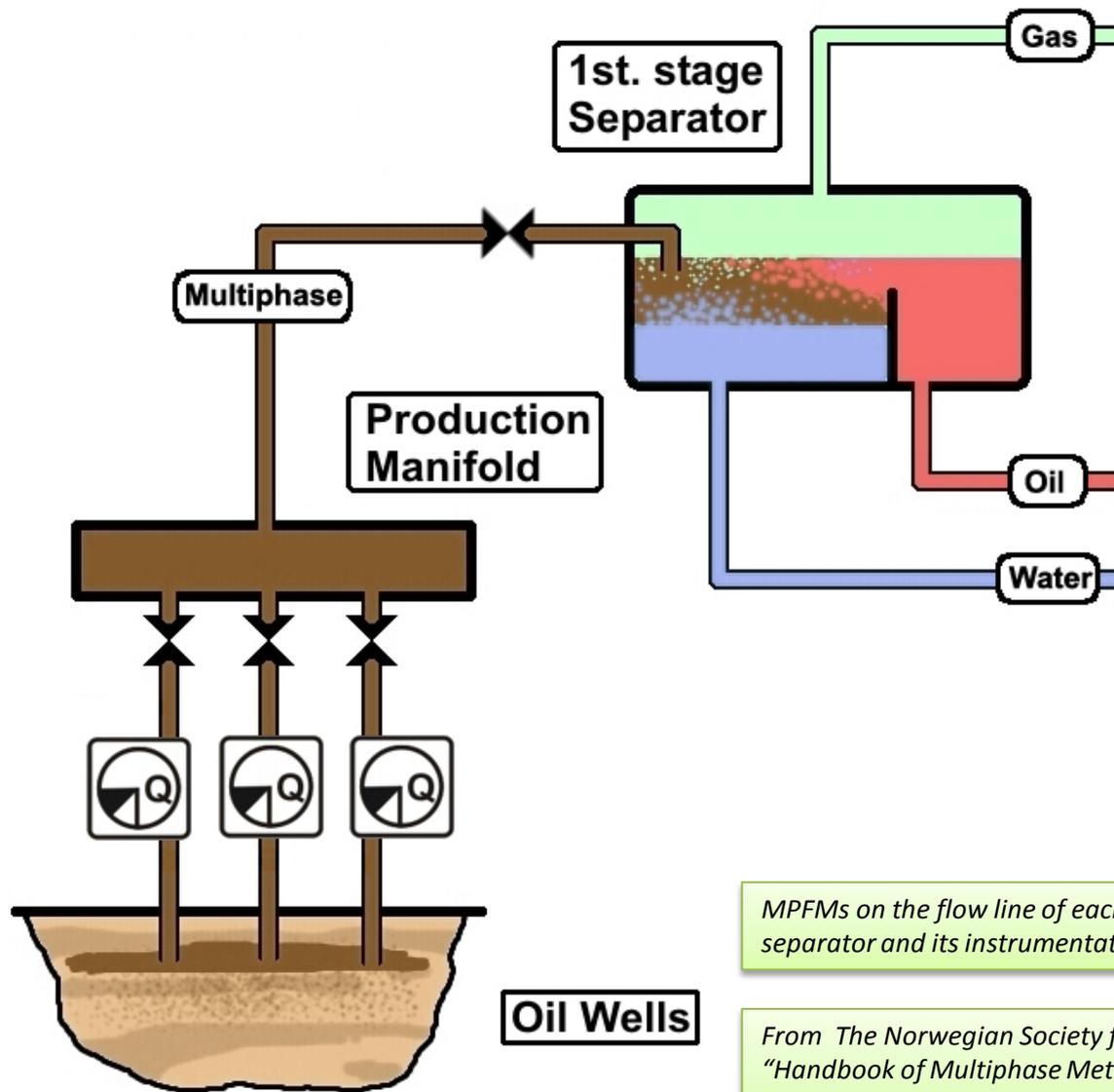
## Technical Sales Manager, Weatherford

Cost Effective Real Time Production Optimization with Well Head Water Cut Meters

# Outline

- Background
- Cost effective alternate practice
- NIR Technology
  - Benefits
- Case study
- conclusion

# Preference: MPFM at each well site



*MPFMs on the flow line of each well replacing test separator and its instrumentation*

*From The Norwegian Society for Oil and Gas Measurement, "Handbook of Multiphase Metering Rev 2", published by NFOGM, 2005*



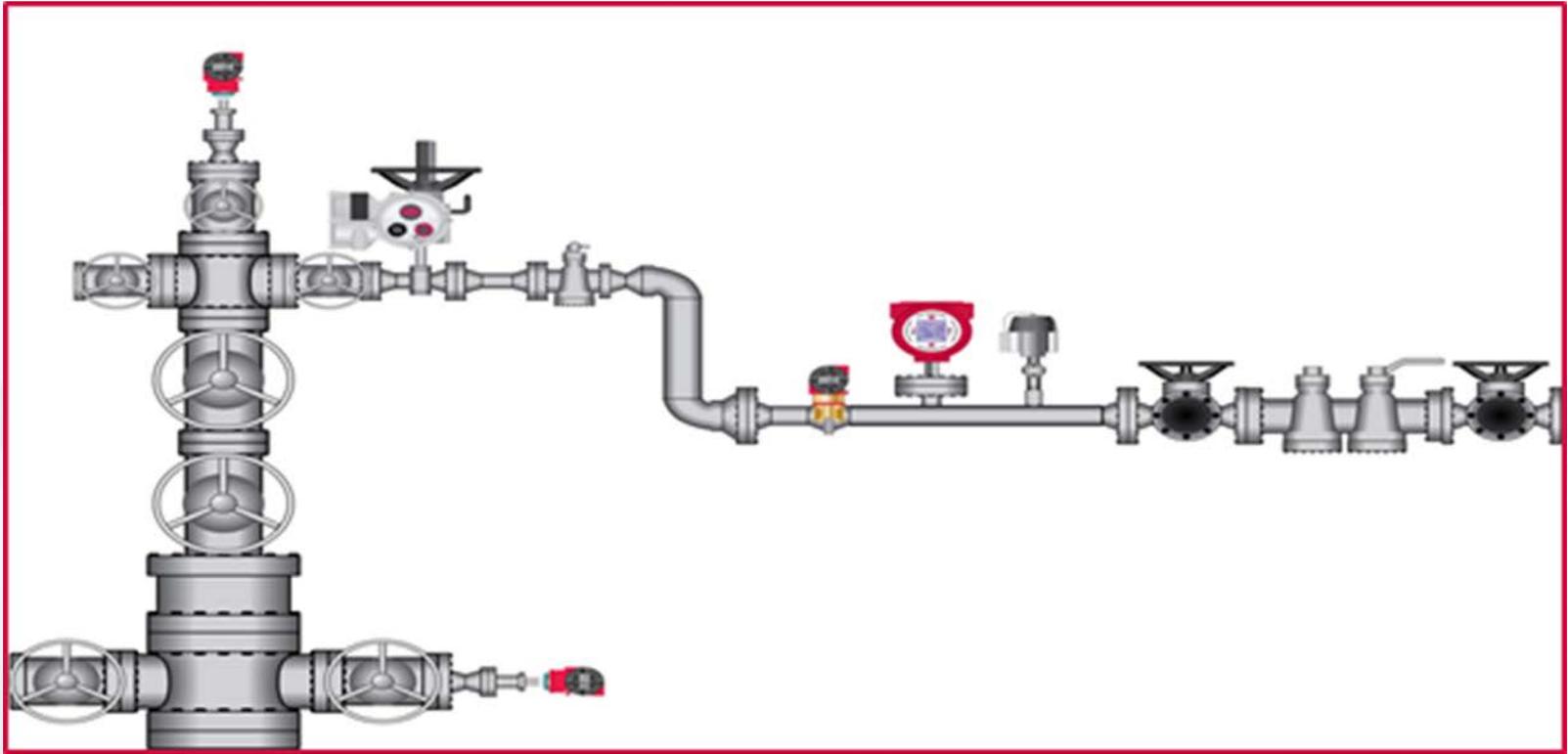
# Challenges

- Economics
- Solutions incorporated with nuclear source
- PVT dependency and reading reliability
- Higher Opex

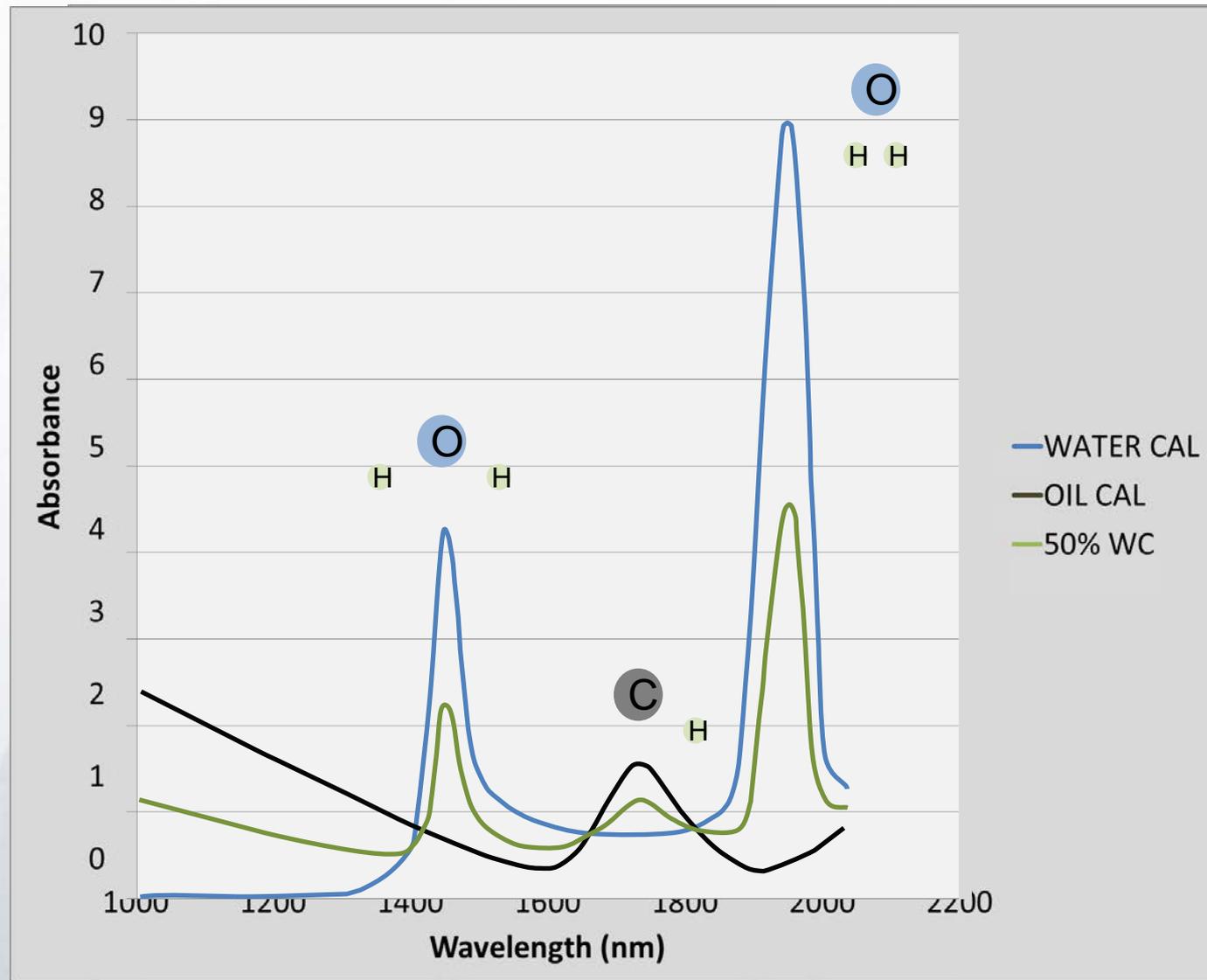
# Low cost effective alternative

- Continuous wellhead water cut measurement with pressure and temperature
- Real time wellhead water cut measurement to spot anomalies
- Virtual metering capabilities

# Alternative practice

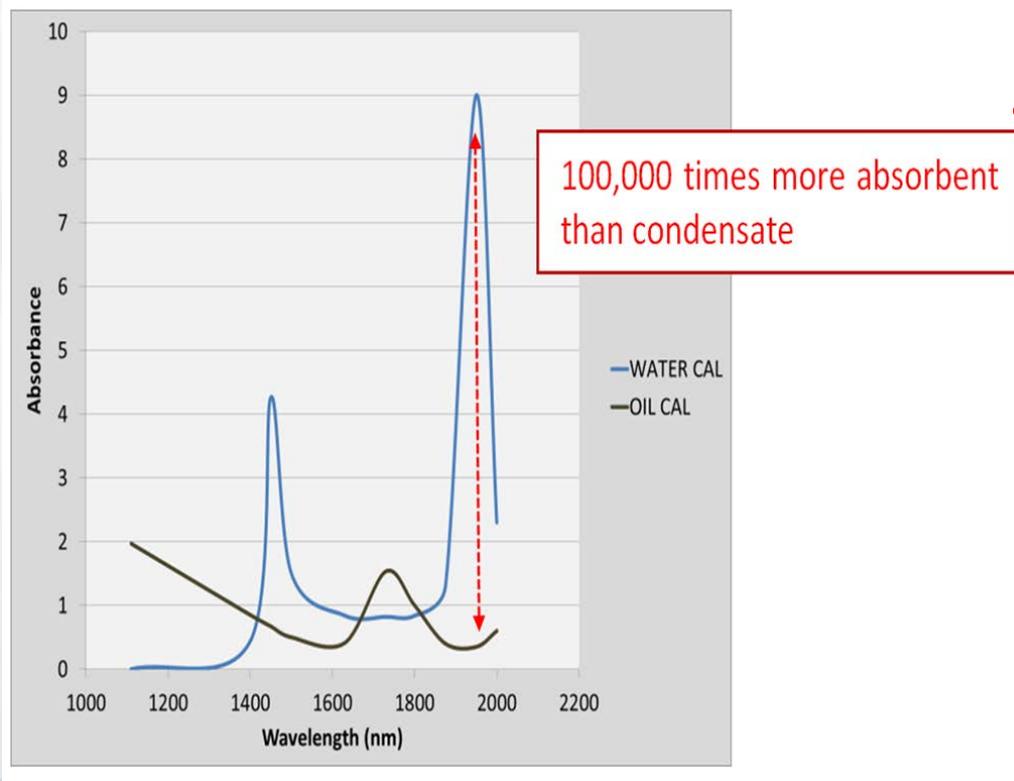


# NRmeter - How It Works



# Near Infrared Absorption

- Much higher sensitivity to water than dielectric based techniques (e.g. Microwave) or dual energy gamma



- 1% of water (by volume) results in a 14% reduction in transmission at 1950nm....higher water sensitivity than any other technique

# Benefits - Additional features



- Slug detection
- In addition to water cut, Measures Methanol concentration in water



# Why Infrared?

- Not affected by salinity/water chemistry
- Not affected by gas bubbles
- No PVT or any additional information requirements
- Does not need separate measure of GVF to correct reading
- Extremely sensitive to water
- Red Eye MP can measure water cuts at up to 99.9% GVF
- Superior technology for heavy oil
- Easy calibration. Two points; 100% oil, 100% water
- Slug detection and MEG concentration measurement to optimize injection

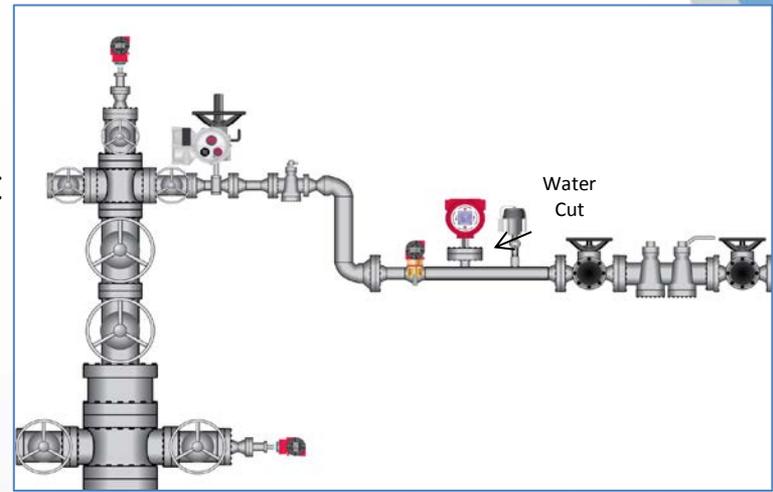
# Case Study - Well head WC measurement

## Objectives

- Monitor water cut from Individual wells real time
- Provide daily average / instantaneous water cut values for each well

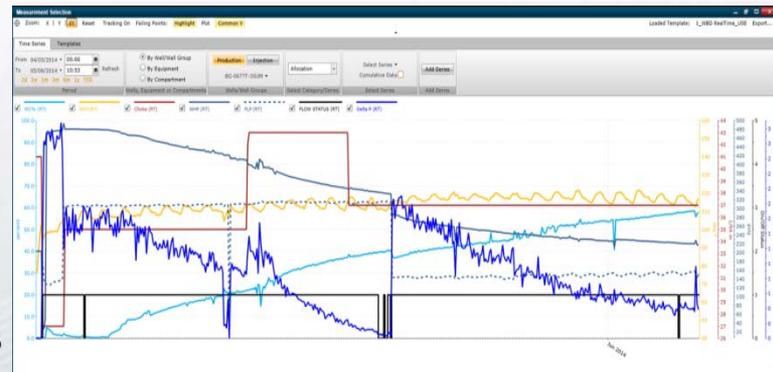
## Equipment

- NIR water cut meter
- Pressure and temperature Transmitters

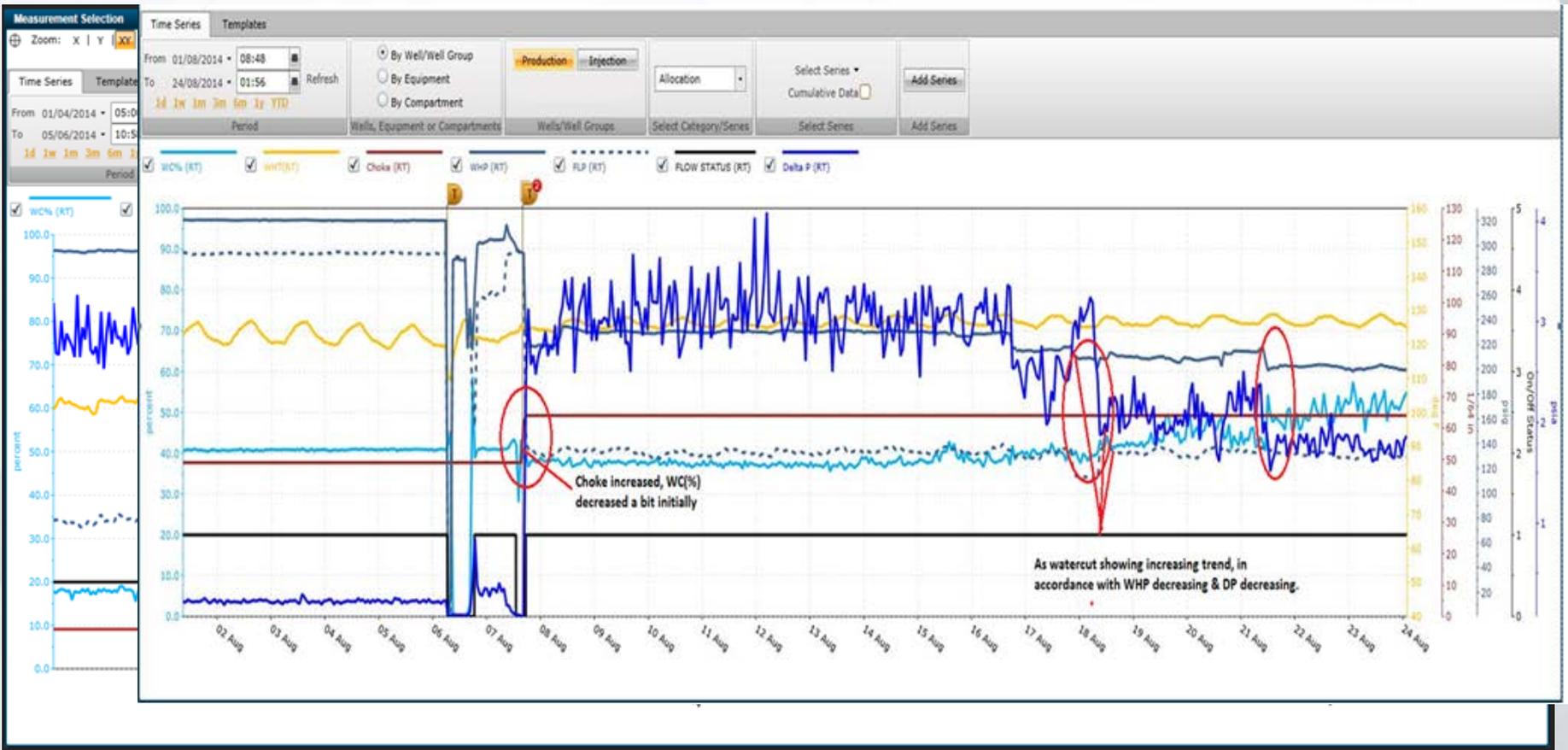


## Value & Results

- Monitor well performance and performed timely intervention
- Increased production through well optimization
- Could perform virtual metering through models and reduce well testing frequency
- Efficient reservoir management, reduced water production



# Water-Cut Meter Applications – Well Head

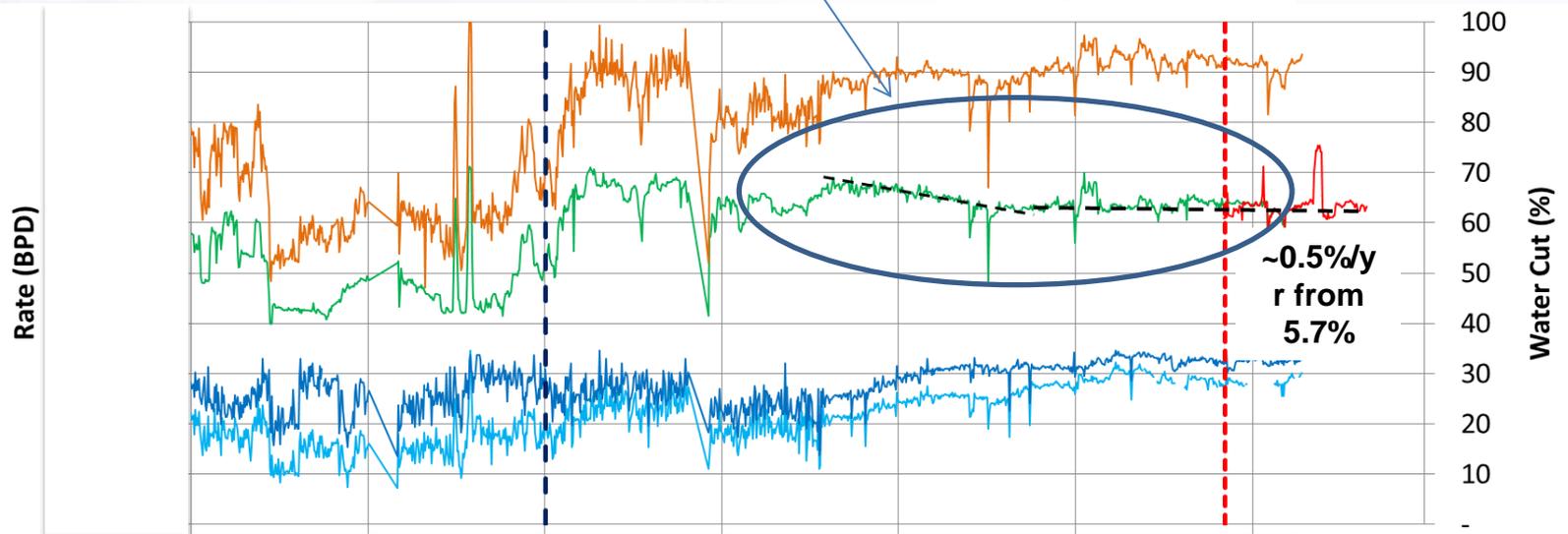


# IAM Results of DOF Project

**\$\$ Reduced Decline \$\$**

**Sustainable stable higher rates**

High variability and lower rate



— Oil Rate (GC) — Water Rate — Liquid Rate — Oil Rate (i-Do) — Water Cut - - - Pilot Start - - - i-Do Start



# Real Time Water Cut - Benefits



## Production Optimization

- Real time water cut information helps insure maximum production by revealing upsets and negative trends as soon as they occur.
- Reservoir management
- Real time water cut improves well model accuracy

## Capex & Opex saving

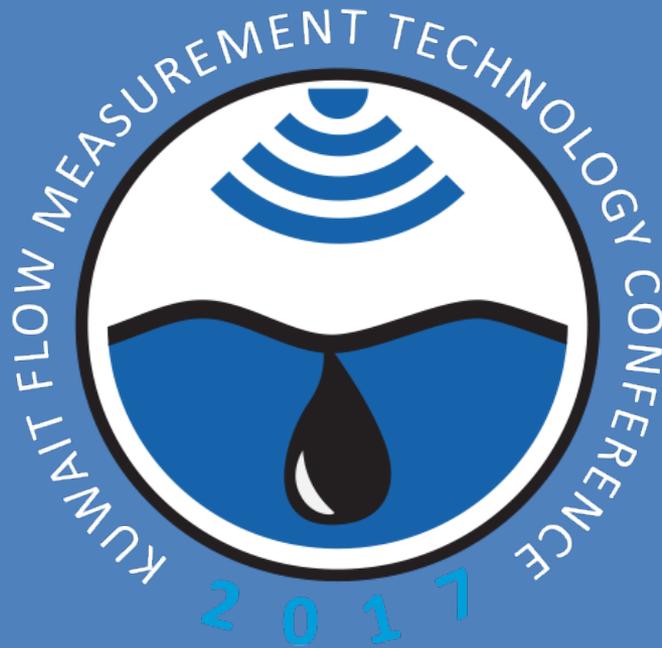
- Continuous well surveillance of temperature, pressure and water cut can reduce the need for frequent well tests

## HSE

- Avoids HSE and accuracy challenges associated with hand sampling

Benefits outweigh the costs





Thanks for Attention