Digitizing the future oil field

1. Sensors
   Sensors on the rig detect abnormal temperature

2. Integrated operations center (IOC)
   IOC engineer receives alert and performs diagnosis via interactive 3D model

3a. Surveillance drones
   Drones investigate the off-shore rig and share photos/live videos in real-time

3b. Real-time request oilfield services (OFS)
   IOC identifies required services and issues service request to OFS vendors; best bid is accepted in real-time

4. Real-time analytics
   Predictive data analytics determine maintenance needs based on surveillance data; integrated supply chain orders parts

5. Smart devices
   Engineers receive alerts and incident details on their smart watches/mobile devices and prepare for service

6. 3D printers
   Parts and tools required to fix the issue are printed in real-time using 3D printers

7. Delivery drones
   On-shore drones deliver parts from the warehouse to the off-shore rig

8. Tablet/Smart glasses
   Engineers utilize virtual models on tablets and augmented reality data on smart glasses to perform maintenance

Drones investigate the off-shore rig and share photos/live videos in real-time

Surveillance drones

Real-time analytics

3D printers
Digital in midstream

1. Digital asset management
SCADA system detects a leakage on the pipeline. Sensors are used to monitor the pipelines and machines in real-time.

2. Integrated control room
ICR technician receives alert and performs diagnostics. Issue is isolated and maintenance schedules and reviewed to plan optimal repair window.

3. Biometric monitoring/GIS
Wearable devices monitor field workers' location, safety and job status.

4. Drones/PIGs*
Drones and/or PIGS investigate the leak and share real-time data and video.

5. Analytics/simulations
AI users surveillance and flow data to perform work simulations and impact analysis to determine optimal work prioritization and workforce allocation.

6. Smart devices
Engineers receive alerts and incident details on their smart watches/mobile devices and prepare for service.

7. Digital workforce management
An engineer initially scheduled for planned maintenance is re-assigned to higher priority leak repair job.

8. Dynamic inventory management
Dynamic inventory management supports logistical decisions to optimize the sourcing of repair parts based on the availability and leads-times in case of unplanned events.

9. Smart trucks
Parts are delivered by GPS/sensor enabled trucks to support real-time tracking and coordination of activities.

10. Tablets/smart glasses
Engineers utilize guided workflows on tablets and augmented reality data on smart glasses to perform maintenance while collaborating with remote specialists in real-time.

Minimizing human intervention
ICRs, utilizing rules based parameters, will support automated operations with minimal human staffing. Digital Technologies will lead to automation of trivial tasks, allowing operators to focus on decision making.

Digital workforce
A truly digital operating model requires increased investment in staff who are capable of creating, working and using multi-dimensional data models, simulation tools, and machine learning algorithms.

Network optimization
Applying the digital model, with integrated Operational, Financial and Commercial data allows the entire system to be optimized for availability and throughput to meet commitments and obligations.

Predictive maintenance
Artificial intelligence can be used to monitor large amounts of sensor data produced throughout the system to predict maintenance needs and significantly reduce the number of unplanned events.

*PIGs = Pipeline Inspection Gauge