California’s Oilfield Technology Delivers Safe, Reliable, Native Production

Ester Brawley – September 2018
SUBSURFACE INNOVATIONS
INCREASED FOCUS & PRECISION

- Data Analytics
  - Implemented excel based tool that employs machine learning techniques to quickly screen hundreds of wellbores and selects the best maintenance jobs

- Advanced SCADA Systems Reduce Well Downtime and Subsequent Maintenance

- Reservoir Modeling
  - Streamline monitoring (StreamSim 3DSL Simulator)
    - Helps optimize the waterflood
    - Reduced downtime, reduced facility wear & tear, reduced capital investment

- Geologic modeling
  - Seismic reprocessing
    - Improving image resolution of the 1995 Seismic data
    - Help us identify trapped oil deposits within the oil-bearing reservoir

Maintains and Increases Production Within Small Geographical Footprint
This Process Identified Trapped Oil Deposits in a 100 Year Old Field

Compartmentalization in the oil-bearing reservoir

AVO Volume, Poisson Ratio

Trapped oil deposits are visible and are future drilling candidates
Maintain and Increase Production Within a Small Footprint
Blend Into Surroundings and Community
CRC PROPERTIES ALLOW WILDLIFE TO THRIVE
Maintain and Increase Production with Small Geographic Footprint

- CRC leases, owns, and operates areas of land in Ventura County
- The most common way land is used is for creating a well pad – a small area that has been cleared for equipment to install an oil well(s).
- <5% of the land has equipment or has been cleared for a Well Pad.
- So little land is used by CRC that most is left untouched.
- Native plants flourish and wildlife roam freely
SAFETY SYSTEM
AUTOMATION UPGRADES
SAFETY SYSTEM AUTOMATION UPGRADES

• Supervisory Control & Data Acquisition (SCADA) system that is combined with powerful application knowledge for our 24/7 Operations Staff.
• Advanced system diagnostics that are easily interpreted by Operations for response
• Exception processing and reporting significantly reduces the effort required to find and address anomalies.
• In addition to improved well and surface facility performance, this technology is utilized to provide emergency shutdown of our wells
• Minimize nuisance trips while achieving high standard of safety shutdowns.
• Two Independent SCADA Systems – Basic Process Control PLC and Emergency PLC
SAFETY SYSTEM AUTOMATION UPGRADES

• System Architecture: Block Diagram
SAFETY SYSTEM AUTOMATION UPGRADES

• Emergency PLC Features
  - Integrated Control & Safety Capable
  - IEC 61508 Certified (International Safety Standard)
  - TUV Rheinland - International Certification Agency
  - Redundant Systems
  - Integrated Redundant Safety Network Technology
  - Diagnostics of Network Integrity is alarmed to Operator
  - Safety functions to detect and handle errors are included in CPU, I/O and Network
  - Fire & Gas detectors have internal fault detection.
  - Event logging stores fault, gas check, calibration, and alarm event history.
STREAMLINE AND IMPROVE HSE PROCESSES
STREAMLINE AND IMPROVE HSE PROCESSES

• CRC is actively and aggressively transitioning all of our HSE processes to Mobile Apps

• Add value to Operations in their role as the owners of our Safety and Risk programs.

• Collection of real time data allows targeted messaging, initiatives and real-time feedback.

• Prevent or mitigate safety and environmental incidents

• Provide checklists for HSE processes, safe work practices, SPCC, and other inspections - such as well handovers.
Safety Toolbox

- Safety Observations (SBO)
- Stop Work Authority (SWA)
- Noted Field Condition
- Internal Assessment
- Safety Meeting
- Drills
Environmental Toolbox

- HSE Toolbox CRC
- SPCC
- SWPPP
- Odor Management / Response
- FLIR Observations / Fugitive Emissions
- Waste Management
- Flare Ignition Log
Incident Reporting

- Recordable
- First-Aid
- Property Damage
- Vehicle Accident
- Fire
- Near Miss
DECREASE EMISSIONS
Optical Gas Imaging (OGI) Technology

- FLIR® cameras and OGI technology allow CRC to use a handheld camera with a sensor capable of detecting and visually displaying minor gas leaks for intervention by operators.

- A single oil basin has over 100,000 components that must be checked for leaks on a regular basis.

- With this optical gas imaging camera, CRC inspectors can check thousands of components from a distance and find and repair potential gas leaks quickly.

- Helps CRC to maintain a leak-free environment.
Certified Ultra-Low Emissions Burner (CEB) Flare

- CRC makes advances in reducing emissions each year
- One application utilized is a Certified Ultra-Low Emissions Burner (CEB) Flares which reduces emissions by approximately 50% compared to a typical flare.
MECHANICAL INTEGRITY
Mechanical Integrity

• The ability to inspect pipelines is affected by the pipeline route or configuration, materials of construction and surface access.

• Complex inspection challenges in Southern California may include elevation changes, varying depth of cover, internal coatings and changes in diameter.

• Operating environments such as harbors, roadways and construction areas affect access for inspections and may give rise to third-party line strikes.

• CRC’s Mechanical Integrity team evaluates new techniques to inspect inaccessible pipelines.

• Examples include:
  • progressive pigging
  • ultrasonic and magnetic flux leakage smart pigs
  • dual diameter in-line inspections

• The MI team’s inspection techniques and data analysis help to detect anomalies, prioritize maintenance and set operating conditions to prevent and mitigate incidents.
INNOVATION & TECHNOLOGY ALLOW CRC TO MAINTAIN AND INCREASE SOCALLY RESPONSIBLE NATIVE CALIFORNIA PRODUCTION