Agenda

What are ConnectedProduction™ Solutions?

Production Automation

Fundamental Solutions

Enabling Technologies

Advanced Analytics and Reasoning
Optimized for rapid value creation – enabled by integrated control and information
ConnectedProduction™ Solutions

- ConnectedProduction™ solutions provide Oil & Gas producers the secure connectivity and scalability that is required to visualized and optimize production from the well head to the point of custody transfer.

- Deployed within an operations environment (on premise), or in the cloud, ConnectedProduction solutions provide a complete set of capabilities, including:
  - Visualization
  - Historical data
  - Data modeling
  - Reasoning and analytics
  - Mobility
  - Open architecture that enables third-party connectivity

- Intelligent assets provide contextualized data within a ConnectedProduction system, and can be any combination of third-party assets and intelligent assets offered by Rockwell Automation
### ConnectedProduction™ Solutions Functional Overview

**Deployed “on-premise” or “in the cloud”**

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<th>Collaboration /Role Based Content</th>
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<td>Workflows</td>
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<td>Turbo Machinery Control</td>
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<td>OEM</td>
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<td>Device Assets</td>
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<tr>
<td>Device Assets</td>
<td>Data Assets</td>
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</tbody>
</table>

- Devices (and third-party systems)
ConnectedProduction™ Solutions
On-Premise Architecture

Simplex (default), redundant and high availability options available
- Industrial Data Center (IDC) E2000
- FactoryTalk® VantagePoint EMI server and client
- FactoryTalk® View server and client
- FactoryTalk® Historian SE
- FactoryTalk® ViewPoint Client
- OPC Server (KEPware and/or RSLinx®)

Well Pad – up to 32 wells

Artificial Lift

Flow

Monitoring

Scalable Architecture

Logix (MTU)

Logix

OptiSIS™

Production Automation

Production Safety

aadvance®

EtherNet/IP

Modbus

OPC Server (KEPware and/or RSLinx®)

Simplex (default), redundant and high availability options available
ConnectedProduction™ Solutions

On-Premise Large Architecture

Simplex (default), redundant and high availability options available

- Industrial Data Center (IDC) E2000
- FactoryTalk® VantagePoint® EMI server and client
- FactoryTalk Historian SE
- Pi-to-Pi connector

Simplex (default), redundant and high availability options available

- Industrial Data Center (IDC) E2000
- FactoryTalk VantagePoint EMI Server and Client
- FactoryTalk View Server and Client
- FactoryTalk H FactoryTalk Historian SE
- FactoryTalk ViewPoint Client
- OPC Server (KEPWare and/or RSLinx®)

On-Premise Architecture (up to 500 assets)

EtherNet/IP

Modbus

Asset

1

n

On-Premise Architecture (up to 500 assets)

EtherNet/IP

Modbus

Asset

Scalable Architecture
ConnectedProduction™ Solutions

Cloud Architecture

Rockwell Automation® Cloud (Microsoft Azure)

Scalable Architecture

Well Pad – up to 30 assets

Artificial Lift

Flow

Monitoring

Logix

Logix (MTU)

RTU

RTU

Production Automation

Production Safety

AADvance®

OptiSIS™
ConnectedProduction™ Solutions?

Security

Hosting & Analytics

LAN, WAN Wireless, Cell Satellite

Field Assets

Off Premise

Integrated Key Management
Isolated Customer Data Storage
Role Based Authentication

On Premise

ISA99 ISA/IEC 62443

Industrial Data Center (IDC) E2000
FTVantagePoint EMI Server & Client
FTView Server & Client
FTHistorian SE
FTViewPoint Client
OPC Server (KEPWare &/or RSLinx)

MPLS
VPN
Cloud Gateway

Geo Locked Authenticated Gateway

MPLS VPN

Cloud Gateway

Collaborative Security
Secure Unidirectional Communications Over Port 443
Integrated Services Router

Secure Bidirectional Communication over Select Ports

ConnectedProduction™ Solutions?

Security

Integrated Key Management
Isolated Customer Data Storage
Role Based Authentication

LAN, WAN Wireless, Cell Satellite

Field Assets

Public

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ConnectedProduction™ Solutions
Visualization, Mobile and web

Scalable HMI Solutions
Scale from single station to multi-client / multi-server systems

- Create custom process graphics, as required
- Customize pre-defined graphics, as required
- Create alarms unique to implementation
- Create reports, per project requirements

FactoryTalk® View SE
- Configure your application from anywhere on the network and easily make changes to a running system with remote, multi-user configuration capability
- Scalable Architecture from single station HMI to multi-client/multi-server system
- Maximize system availability with built-in failure detection and recovery
- Robust client side scripting to extend applications for your specific needs
- Built-in library of over 5000 pre-designed graphical symbols
- Built-in security model, linked to existing IT infrastructure
ConnectedProduction™ Solutions

Workflows

- Define implementation-specific workflows
- Implement, and integrate workflows into Connect Production
- Integrate implementation-specific producers/consumers of workflow data

- Configurable workflows
  - Standard environment, supports custom workflows
  - Facilitates workflow execution (persistence, multiple instances, etc.)
  - Built on off-the-shelf technology
- Designed for any stakeholder
- Capable of acting on data from any data source within the system
- Model driven, configurable workflows support various use cases, for example:
  - Initiated by ERP (SAP)
  - Initiated by User (SOP)
  - Initiated by Event (i.e., process condition)
- Predefined ConnectedProduction™ Activities (building blocks to define customized workflows)
ConnectedProduction™ Solutions

Reasoning

- Define interfaces
- Integrate third-party models
- Define and implement visualization, reports, workflows, etc.

- Open architecture allows for integration of third-party analytics, reasoning, production modeling, etc.
- Can be integrated, via plug-in, directly into the well type model, providing data context
- Preferred connectivity can be achieved by implementing a native data connector
- Can have multiple analytics engines within a system
- Resulting data set can be utilized in:
  - Visualization
  - Workflows
  - Any system with access to model

Third-Party Interface (may have multiple)

API

Model
Plug-in

Data

ConnectedProduction™ Solutions

Reasoning

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Third-Party Interface (may have multiple)

API

Model
Plug-in

Data
**FactoryTalk® AssetCentre**

**Version Control / Source Control**
- Centrally store files – programs, configurations, SOPs, CAD documents, and more
- Automatic version control helps ensure proper file management
- Maintains single master relationships
- Allows for additional users to get a copy while maintaining the master ownership

**Audit Trail**
- Audit / Event messages include logged time, time of occurrence (when), user name (who), device, computer name (where) and action taken (what)
- Scheduled automatic backup of plant-floor asset configuration

**Disaster Recovery**
- Optionally compares the backup configuration against an archived version
- Latest or specific version
- Pinned version
- Create version when difference detected
- Difference report in Event database, and email

- Define implementation-specific assets
- Implement desired asset management features (for example, disaster recovery)
Agenda

What are ConnectedProduction™ Solutions?

Production Automation

Fundamental Solutions

Enabling Technologies

Advanced Analytics and Reasoning
Production Automation
Well Manager Solution

- Scalable Multi-Well Control:
  - ControlLogix® based - for large sites with up to 32 artificial lift wells
  - CompactLogix™ based - for small sites with up to eight artificial lift wells
  - Incorporates Allen-Bradley® Flex™ I/O, PowerFlex® VFD, and OptiLift™ artificial lift technologies

- Configure and Run Artificial Lift and Optimization:
  - Sucker Rod Pump (SRP)
  - Plunger Lift
  - Gas Lift
  - Electric Submersible Pump (ESP)
  - Progressive Cavity Pump (PCP)
  - Natural Flow
  - Black Oil Model, Well Test, Tank Management, and so forth.

- Configure and Run Electronic Flow Metering:
  - Custody Transfer metering for Gas and Liquids
  - Up to 80 flow runs

- EtherNet/IP Production Automation Network:
  - Connects to Modbus field devices and third-party controllers
Production Automation
Well Manager Solution

Oil & Gas applications in Logix configure and run
- Rod Pump Controller
- Plunger Lift
- Gas Lift
- Electric Submersible Pump
- Progressive Cavity Pump
- Natural Flow

- Configure and run HMI applications for artificial lift operations and electronic flow measurement.
## Production Automation
### Intelligent Assets

<table>
<thead>
<tr>
<th>Oil &amp; Gas Extraction</th>
<th>Enhanced Recovery</th>
<th>Power Control</th>
<th>Fiscal Measurement</th>
<th>Treatment &amp; Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wellhead automation</td>
<td>Injection pump controls</td>
<td>LV / MV drives</td>
<td>LACT unit control</td>
<td>Gas treatment and compression</td>
</tr>
<tr>
<td>Natural lift systems</td>
<td>Injection manifolds controls</td>
<td>Electrical control house</td>
<td>Metering and measurement systems</td>
<td>TMC / Compressor control</td>
</tr>
<tr>
<td>Artificial lift systems</td>
<td>Chemical storage</td>
<td>Safety systems</td>
<td>Oil treatment and storage</td>
<td>Oil treatment and storage</td>
</tr>
<tr>
<td>Injection systems</td>
<td>Treating liquids blending</td>
<td>Separation systems</td>
<td>Produced water treatment and storage</td>
<td></td>
</tr>
<tr>
<td>Safety systems</td>
<td>process control</td>
<td>Injection pump controls</td>
<td>Gas compression</td>
<td></td>
</tr>
<tr>
<td>Separation systems</td>
<td>Steam generation</td>
<td>Injection manifolds controls</td>
<td>Injection pump controls</td>
<td></td>
</tr>
</tbody>
</table>

- **Wellhead automation**
- **Natural lift systems**
- **Artificial lift systems**
- **Injection systems**
- **Safety systems**
- **Separation systems**
- **Injection pump controls**
- **Injection manifolds controls**
- **Chemical storage**
- **Treating liquids blending process control**
- **Steam generation**
- **Gas compression**
- **LV / MV drives**
- **Electrical control house**
- **LACT unit control**
- **Metering and measurement systems**
- **Gas treatment and compression**
- **TMC / Compressor control**
- **Oil treatment and storage**
- **Produced water treatment and storage**
Production Automation
SCADA, DOF, Intelligent asset auto discovery

OptiLift™ roadmap of intelligent assets for artificial lift
- OptiLift™-WM (Well Monitoring)
- OptiLift-NF (Natural Lift)
- OptiLift-ESP (Electrical Submersible Pump)
- OptiLift-PCP (Progressive Cavity Pump)
- OptiLift-RPC (Rod Pump Controller)
- OptiLift-GL (Gas Lift)
- OptiLift-PL (Plunger Lift)

1. ConnectedProduction™ services, automatically, detects a new asset
2. User is prompted with “Asset Discovery” wizard
3. User is guided, step by step, to configure:
   - Name
   - Description
   - Location details
4. Asset is available for use
- Engineered to comply with IEC61508/IEC61511 safety manuals.
- SIL3, Fail-Safe or Fault Tolerant hardware configurations
- 50 and 100 I/O sizes available, Universal inputs
- Simple, intuitive, configurable, cause and effect configuration interface
- Configure safety functions – no programming required.
- Available in either safe area (NEMA 4/IP54) or hazardous area (NEMA 4X/IP66) enclosure
- Excellent choice to migrate legacy safety solutions not compliant with IEC61508/IEC61511
- Cost effective process safety solution

<table>
<thead>
<tr>
<th>Function</th>
<th>Equipment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A001</td>
<td>ATB 1452</td>
<td>1oo2</td>
</tr>
<tr>
<td>A001</td>
<td>ATB 1451</td>
<td>1oo2</td>
</tr>
<tr>
<td>A002</td>
<td>ATB 1453</td>
<td>1oo2</td>
</tr>
<tr>
<td>A003</td>
<td>ATB 1454</td>
<td>1oo2</td>
</tr>
<tr>
<td>10901</td>
<td>Detection 1 3/2</td>
<td>1oo2</td>
</tr>
<tr>
<td>10902</td>
<td>Detection 2 3/2</td>
<td>1oo2</td>
</tr>
<tr>
<td>111.1</td>
<td>SV 1 Open</td>
<td>—</td>
</tr>
<tr>
<td>112.1</td>
<td>SV 1 Closed</td>
<td>—</td>
</tr>
<tr>
<td>112.2</td>
<td>SV 2 Open</td>
<td>—</td>
</tr>
<tr>
<td>112.3</td>
<td>SV 2 Closed</td>
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Agenda

What are ConnectedProduction™ Solutions?

Production Automation

Fundamental Solutions

Enabling Technologies

Advanced Analytics and Reasoning
Fundamental Solutions
Artificial Lift Operations

Sucker Rod Pump

Plunger Lift

Natural Flow

Gas Lift

Progressive Cavity Pump (PCP)

Electric Submersible Pump (ESP)
Fundamental Solutions
Artificial Lift Operations

Artificial Lift Optimization Intelligent Assets:
- Rod Pump Control (complete)
- Plunger Lift (in progress)
- Gas Lift
- Natural Flow
- Electric Submersible Pump
- Progressive Cavity Pump

OptiLift™ Packaged Solutions
(Standalone)

ConnectedProduction™ Well Manager
(licensable components)
Features:

- High-performance iRecv RTU Gateway to SCADA System
- Long range iSens wireless pressure and temperature transmitters
- Provides real-time data monitoring and reliable local well shutdown control
- Configurable Alarm Logic for alarming and local control
- Custom Enclosure option
- Solar Power option

RS-232/485 Modbus RTU Slave
Wired I/O Devices (shutin valve, choke, sensors)

<table>
<thead>
<tr>
<th>Analog Logic ID</th>
<th>Left Tag ID</th>
<th>Logic Operation</th>
<th>Right Tag ID</th>
<th>Deadband</th>
<th>Enable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>T3</td>
<td>&gt;</td>
<td>T8</td>
<td>10</td>
<td>X</td>
</tr>
<tr>
<td>A2</td>
<td>T2</td>
<td>&lt;=</td>
<td>T9</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>T5</td>
<td>=</td>
<td>T15</td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td>A4</td>
<td>T1</td>
<td>&gt;=</td>
<td>T9</td>
<td>0</td>
<td>X</td>
</tr>
</tbody>
</table>
Fundamental Solutions

OptiLift™ PL (Plunger Lift)

- Optimizes lifetime of well by mitigating the effects of liquid loading
- Designed for deployment on gas and gas/oil wells
- Can be installed to existing mechanical plunger systems (500,000 gas wells in the U.S.)
- Supports six operating modes
- "Self" learning, adapts / tunes to well conditions
- Protects well during abnormal situations
- Records production data sets at multiple intervals (daily, monthly, lifetime)
- Licensable component of Well Manager
- Designed for interface with ConnectedProduction™ services
- Stand alone OptiLift™-PL, available soon
Fundamental Solutions
OptiLift™ RPC (Rod Pump Controller)

- Supports six modes of operation:
  - Fixed Speed (standalone)
    - Pump off (POC)
    - Time based
    - Manual
  - Variable Speed (Allen-Bradley® Drive, or third-party drive)
    - Pump off (POC)
    - Pump Fillage
    - Manual
- Dynamometer card that is based pump-off control (requires load cell and inclinometer)
- Continuous true load and position monitoring
- Calculated down hole card
- Real time well problem detection and load violations
- Well production performance statistics
- Various pre-designed power options
  - Drive sizes ranging from 25 hp to 125 hp
  - Traditional dynamic braking
  - Energy-efficient Active Front End (IEEE519)

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Fundamental Solutions
Electronic Flow Metering

ProSoft AFC Flow Computer

- **Measurement** of hydrocarbon gases and liquids using currently accepted industry measurement standards
- **Archiving** for each meter run, hourly for two days (up to 35 days optional) and daily for one month (35 records) under default configuration.
- **Process Variables** may be in-chassis analog I/O, distributed I/O, iSens transmitters, or third-party transmitters

rDAC iXMS for solar-powered and remote site flow metering
Agenda

What are ConnectedProduction™ Solutions?
Production Automation
Fundamental Solutions

Enabling Technologies
Advanced Analytics and Reasoning
Enabling Technologies
Allen-Bradley® PLCs and PACs

**Scalable Controller Portfolio**
- Up to 32 artificial lift wells
- Up to 80 flow runs

**Robust Network Infrastructure**
CISCO technology and EtherNet/IP with redundancy options at every level

**Comprehensive Integration**
The broadest range of traditional I/O and intelligent devices
## Enabling Technologies

### Intelligent RTUs

- High performance RTU with PLC-like features
- IEC 61131 programming with ISaGRAF Workbench
- Embedded web server
- Gateway for up to 100 rDAC transmitters
- Embedded web server

### Low-power consumption RTU

- AGA 3, 7, and 8 API 21.1 compliant gas flow metering
- Plug-and-play radio module for telemetry applications
- *Programmable Sleep Interval, and Transmit Interval*

### Specifications

**iXC-2**

- 8-28Vdc, 4 W
- -40°C to 85°C operating temperature
- 800 MHz CPU
- (2) 10/100 Ethernet Ports, (2) RS-485 ports, (2) RS-232 ports, USB host port
- (8) DI sinking, (8) DO sinking, rated 500 mA, (1) DI hardware interrupt
- (8) AI 24-bit (0-5 Vdc, 4-20mA), (2) AO 12 bit (0-5Vdc or 4-20 mA)
- Optional Pluggable Wireless Card (900 MHz and 2.4 GHz)

**rDAC LW**

- 7–30 Vdc, 350 mW continuous, 0.45 mW in sleep mode
- -40°C to 85°C operating temperature
- 32 MHz CPU
- 10/100 Ethernet Port, (2) RS-485 ports, RS-232 port, USB port, I2C port
- 8 AI 24 bit (0-5 Vdc or 0-20 mA), two AO 12 bit (1–5 Vdc or 4–20 mA)
- 8 DI sinking (one DI is HSC), 8 DO solid-state relay rated 350 mA
- 1 RTD input, 12 bit, 100 ohm platinum
- Optional Pluggable Wireless Card (900 MHz and 2.4 GHz)
## Enabling Technologies
### Wireless Transmitters

- Long-range embedded wireless communications
- No external power required
- Configurable Sleep Interval, and Transmit Interval
- Data is pushed to data concentrator

### iSensMV
- Multivariable transmitter that measures absolute and differential pressure, and temperature.
- Seven ranges available with DP to 840" H2O, AP to 1,500 psia.
- 900 MHz or 2.4 GHz radio
- Wired version available.

### iSensGP
- Gauge pressure transmitter.
- Five ranges available, up to 10,000 psi.
- 900 MHz or 2.4 GHz radio

### iSensDP
- Transmitter that measures absolute pressure and differential pressure.
- Five ranges available, up to 3,000" H₂O available.
- 900 MHz or 2.4 GHz radio

### iSensT2
- Temperature transmitter with
  - -17°C to 200°C range (0–392°F)
  - 900 MHz or 2.4 GHz radio

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**Enabling Technologies**

**Wireless Transmitters**

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## Enabling Technologies
### Wireless Data Acquisition RTUs and Gateways

<table>
<thead>
<tr>
<th><strong>iXS8</strong></th>
<th><strong>iSensIO</strong></th>
<th><strong>iRecv</strong></th>
<th><strong>iExtnd</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Configurable sleep Interval</td>
<td>- Configurable sleep Interval</td>
<td>- Wireless gateway/RTU for transmitters and DA RTUs</td>
<td>- Wireless repeater for RTUs, transmitters, and iRecv.</td>
</tr>
<tr>
<td>- Configurable transmit interval</td>
<td>- Configurable transmit interval</td>
<td>- Wireless transmitter to Modbus Gateway</td>
<td>- Used to extend transmission range or to navigate around transmission obstacles.</td>
</tr>
<tr>
<td>(6) AI, 12 bit (0-5Vdc, 4-20 mA)</td>
<td>(3) AI, 12 bit (0-5Vdc, 4-20mA)</td>
<td>7–34.0 Vdc</td>
<td>Supports two radios</td>
</tr>
<tr>
<td>(1) AO, 12 bit (0-5Vdc, 4-20mA)</td>
<td>(1) AO (1-5Vdc, 4-20mA)</td>
<td>(2) DI, (2) DO</td>
<td>(900 MHz or 2.4 GHz).</td>
</tr>
<tr>
<td>(2) DI, (3-24 Vac or Vdc)</td>
<td>(2) DI, (3-24 Vac or Vdc)</td>
<td>(4) AI (0-5Vdc, 4-20mA)</td>
<td></td>
</tr>
<tr>
<td>(1) DI event driven interrupt</td>
<td>(1) DI event driven interrupt</td>
<td>(2) AO (1-5Vdc, 4-20mA)</td>
<td></td>
</tr>
<tr>
<td>(1) AI for battery level</td>
<td>(2) DO</td>
<td>(1) AI for battery level</td>
<td></td>
</tr>
<tr>
<td>(1) AI for temperature</td>
<td>(1) AI for battery level</td>
<td>(1) AI for temperature</td>
<td></td>
</tr>
<tr>
<td>(1) A/D channel for RTD</td>
<td>AI for temperature</td>
<td>(1) RS232/RS485 serial port</td>
<td></td>
</tr>
<tr>
<td>900 MHz or 2.4 GHz radio</td>
<td>900 MHz or 2.4 GHz radio</td>
<td>900 MHz or 2.4 GHz radio</td>
<td></td>
</tr>
</tbody>
</table>

### Enabling Technologies Table

- **iXS8**
  - Configurable sleep interval
  - Configurable transmit interval
  - (6) AI, 12 bit (0-5Vdc, 4-20 mA)
  - (1) AO, 12 bit (0-5Vdc, 4-20mA)
  - (2) DI, (3-24 Vac or Vdc)
  - (1) DI event driven interrupt
  - (1) AI for battery level
  - (1) AI for temperature
  - (1) A/D channel for RTD
  - 900 MHz or 2.4 GHz radio

- **iSensIO**
  - Configurable sleep interval
  - Configurable transmit interval
  - (3) AI, 12 bit (0-5Vdc, 4-20mA)
  - (1) AO (1-5Vdc, 4-20mA)
  - (2) DI, (3-24 Vac or Vdc)
  - (1) DI event driven interrupt
  - (2) DO
  - (1) AI for battery level
  - AI for temperature
  - 900 MHz or 2.4 GHz radio

- **iRecv**
  - Wireless gateway/RTU for transmitters and DA RTUs
  - 7–34.0 Vdc
  - (2) DI, (2) DO
  - (4) AI (0-5Vdc, 4-20mA)
  - (2) AO (1-5Vdc, 4-20mA)
  - (1) AI for battery level
  - (1) AI for temperature
  - (1) RS232/RS485 serial port
  - 900 MHz or 2.4 GHz radio

- **iExtnd**
  - Wireless repeater for RTUs, transmitters, and iRecv.
  - Used to extend transmission range or to navigate around transmission obstacles.
  - Supports two radios
  - (900 MHz or 2.4 GHz).
Agenda

What are ConnectedProduction™ Solutions?

Production Automation

Fundamental Solutions

Enabling Technologies

Advanced Analytics and Reasoning
Advanced Analytics and Reasoning
SCADA, DOF, and RPC analytics

- The OptiLift™ RPC measures surface conditions and calculates down hole conditions, producing surface and downhole cards.
- ConnectedProduction™ RPC analytics, analyzes the condition of the well and pump, which is based on downhole card.
- ConnectedProduction RPC analytics, monitors the shape of the down hole card and identifies:
  - The work that is done by the pump
  - The pump fillage
  - Fluid pound conditions
- Predict probability of failures, by failure mode.
Advanced Analytics and Reasoning
Flow Measurement, Virtual Flow Metering

- Computes three-phase flow (oil, gas and water) based on well configuration, and measured pressures and temperatures
- Produces / generates:
  - Well profile – P, T, flow regimes
  - Well frictional and elevation pressure drops / pressure profile
  - Well temperature profile
  - Well performance curves / parametric
  - Well operating envelope (next phase)
- Provides well performance analysis:
  - Forecasting aid, what-if analysis, and performance improvement
  - Parameter impacts: for example, water-cut, reservoir pressure, and PI
- Enables well test cross-check / validation
- Infers values between well tests, improving production accuracy and providing early problem detection
- Enables “test by exception”, streamlining well test scheduling
- Does not require a three-phase meter
- Works on a broader range of conditions vs. three-phase meter
Thank You

Connect with us.
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