Automation in the Oil and Gas Industry: Past, Present, Future

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Agenda

- “Automation” of the past
- Current capabilities
- Challenges in the industry for tomorrow
- Promise of tomorrow; Monetizing proven reserves:
  - What does the “control loop” of the future look like?
  - Barriers to achieving our goal
  - Who drives the business?
- Challenge for the next generation of “Automation Experts”
Our Three Roughnecks....

PAST

PRESENT

FUTURE
Three Control Levels of Production Optimization

- **LIFE OF FIELD STORAGE**
- **VALIDATION**
  - **MEASUREMENT**
    - **CONTROL**
      - Closed loop
      - APC/MPC
      - Loop tuning
  - **ACTUATION**
    - **DECISION SUPPORT**
      - **ANALYSIS**
        - Flow assurance
        - Condition Monitoring
        - Well optimization
        - Abnormal Situation Prevention
  - **PLANNING**
    - History matching
    - Well planning
- **PROCESS**
- **STRATEGY**
Automation Control Loop of the Past

- Gathering information
- Interpretation
Final Control of the Past...
The “Control Loops” for Life of Field Production Optimization: Past Practices

- **LIFE OF FIELD STORAGE**
- **VALIDATION**
- **MEASUREMENT**
- **PROCESS**
- **CONTROL**
  - Closed-loop APC/MPC
  - Loop tuning
- **ACTUATION**
- **ANALYSIS**
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- **Value**
- **Time**
**Automation Control of Today…**

- It’s all about Data and Communication!
  - AGA Flow Calculations
  - Historical Databases
  - Event and Alarm Logs
  - Data Security
  - Embedded Communications
  - Spontaneous Report-by-Exception (SRBX)
  - Host Communication
  - Pass-Through Communication
  - Closed-loop PID Control
  - Logic and Sequencing Control
Today, We Can Instrument the Units…But What do We do with the DATA?
**Data and Alarm Overload!**

I wished I knew what was really Important?
The “Control Loops” for Life of Field Production Optimization: Current Practices

- **ACTUATION**
  - Closed loop
  - APC/MPC
  - Loop tuning

- **MEASUREMENT**
  - Flow assurance
  - Condition Monitoring
  - Well optimization
  - Abnormal Situation Prevention

- **VALIDATION**
  - History matching
  - Well planning

- **PROCESS**
  - Months/Years

- **LIFE OF FIELD STORAGE**
  - Days/Weeks

- **ANALYSIS**
  - Value

- **DECISION SUPPORT**
  - Time

- **STRATEGY**
  - Value
Today’s Paradigm: Headwinds for the Oil and Gas Industry

- Retiring Workforce
- Rapid Depletion Rates
- More Complex Projects
- Fewer Specialists
- More Technology
- Large CAPEX Project Costs
Growth Is Driving Investments In Emerging Markets

Which of the following business objectives are driving your decision to do business in Brazil, Russia, India or China?

- Reduce Costs
- Increase Capacity
- Service Existing Customers
- Accessing Highly Skilled Talent

Reach New Customers

90
60
30
0

Source: PricewaterhouseCoopers’ 9th Annual Global CEO Survey.
Emerson Confidential
Mature Markets Need Investment Too

- Aging infrastructure
- Increased regulatory scrutiny
- Lower tolerance for risk
- Energy management
Globally, Business Is More Complex

“The world’s private and public sector leaders believe that a rapid escalation of ‘complexity’ is the biggest challenge confronting them”

Samuel J. Palmisano
Chairman, President and Chief Executive Officer
IBM Corporation

…and CEOs are unprepared to deal with it*

*Source: April 2010, IBM CEO Study
Emerson Confidential
Population Will Increase…
But The Workforce Will Shrink

Change in age-eligible workforce as % of total population

Source: United Nations (UN)

2005 to 2050
The Knowledge Gap – Who will Replace the Retiring Staff…?

“\(\text{The offshore workforce shows significant gaps in the experienced, mid-career range. To some extent this is a symptom of our own success, as personnel developed in the UK are much in demand internationally}\)"

Source: 2012 UKCS Workforce Demographics Report, Oil & Gas UK
“A Dear Child Has Many Names”…
… but the Objectives are the Same!

- **Improve Decision Making** – Accurate real-time field well data to the right people
- **Improve Production and Maintenance Planning** – Accurate real time field well data will help operations and maintenance to determine accurately which wells to shut-in, put on work-over scheduling, etc.
- **Production Optimization** – Real-time field well data will be used to optimize production (adjust gas lift flows, water injection rates, ESP rates, etc.)
- **Improve Safety** – Asset information from diagnostics will improve safety as troubleshooting tasks can be done remotely; operations and maintenance personnel know where to go and with what tools.
- **Improve Availability** – Accurate real time field well data will tell operations the shut-in status of the wells and which wells that should be in production. Quicker actions can be made to reduce downtime.

Deliver information! Not data
Enabling the Most Experienced Staff to Remotely Serve Multiple Oilfield Locations

Morning site-worker meeting being conducted from onshore via video, others watch and by default are aware. Communication is key.

Live video feeds on site. Control system has sent an alert indicating pump cavitation, or seals leaking. Video feed confirms pump cavitation. Safe to dispatch site personnel.

New trainees watching live

Continuous simulation & optimization

Safety

Site crew being instructed how to make repair and are guided by service specialist, via personal video feed and area video feed.

Junior Operators

Senior Operators

Safety

Continuous simulation & optimization

New trainees watching live
Delivering Better Results Through Improvement in Operations

- Reduce cost per BOE
- Knowledge capture & transfer
- Production optimization
- Reservoir optimization
- Reduce unplanned shutdowns
- More efficient drilling

$ $ $
The “Control Loops” for Life of Field Production Optimization: Future

Business Opportunity

- **LIFE OF FIELD STORAGE**
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**Timeframes:**
- Days
- Minutes
- Seconds
Intelligent Field: Optimized Operations Delivers the Manufacturing Execution

Intelligent Enterprise
Optimized Operations

- Well Performance
- Advisory Setpoint
- Production Reconciliation Mass Balance
- Field Level EOR Optimization
- Artificial Lift Optimization
- Well Test Optimization

Business Processes

- Integrated Operations
- Optimized Operations

- Asset Optimization
- Equipment Tracking
- Mobile Worker
- Asset Management

- Oil & Gas Allocation
- Maintenance Management
- Production Planning Scheduling
- Remote IO/RTU

Intelligent Wellhead
Control

- Wireless Transmitters
- Analyzers
- Flow Assurance
- Vibration Monitors
- RTU's & Flow Computers
- Field Instrumentation
- Regulators
- Downhole gauges
- Flow Measurement
- On/off Valves

- ERP Integration
- Reservoir Management
- Maintenance Management
- Oil & Gas Allocation

- Production Cost Acid
- KPI Dashboard
- Production Planning Scheduling
- Remote IO/RTU

Artificial Lift

- Generates “what If” scenarios
- Models the impact of adding wells or new choke settings
- Closed loop control

Well Test

- Manages the test separator scheduling
- Produces well allocation calculations
- Manage wells by exception

Advisory Setpoint

- Calculates the optimum setpoint of the field
- Automates the process of setpoint change
Maximize the Performance of our Financial Investment

• Who will run the show?
  – Traders, p&l owners
  – Our challenge: connect the process to the business opportunity; Deliver on a “Single knob control” to maximize the return of an asset
Oh, no – Not the old People-Process-Technology Story Again...
Challenge for You: Deliver Next Generation of Process Automation

- Your skillset is uniquely qualified to help deliver the next generation of automation:
  - Wireless!
  - Collaborative!
  - Socially Interactive!
  - Digitally Savvy!
  - Fearless! Challenge the slow inertia of change
Remember… Change can be Good!
If I Could Do it all Over Again…

- Find a Mentor to help!
- Choose a career and job that you have passion for…
- Think long term when you take your first roles; larger organizations generally have better development programs
- Do your research before an interview!
- You should be the interviewer, too!
- It not initially about the $$$$