



Devon ESP Lifecycle Tools: Real-time Analysis

Presented by **Tom Marks and Derek Rush**



About Devon Energy

- A leading independent oil and natural gas producer
- Fortune 500 company
- Included in S&P 500 Index
- Daily Production (Q2 2015)
 - Oil: 270,000 barrels
 - Natural gas liquids (NGLs): 134,000 barrels
 - Natural gas: 1.6 billion cubic feet
- Fortune Best Places to Work 2015 (8 consecutive years)

Quick Overview

- **What is an ESP?**
- **Understanding the need**
 - Problem summary
 - Changing the process
 - Target cost reductions
- **The new process**
 - ESP lifecycle
- **Focus on real-time data**
 - Network and data topology
 - Software demo

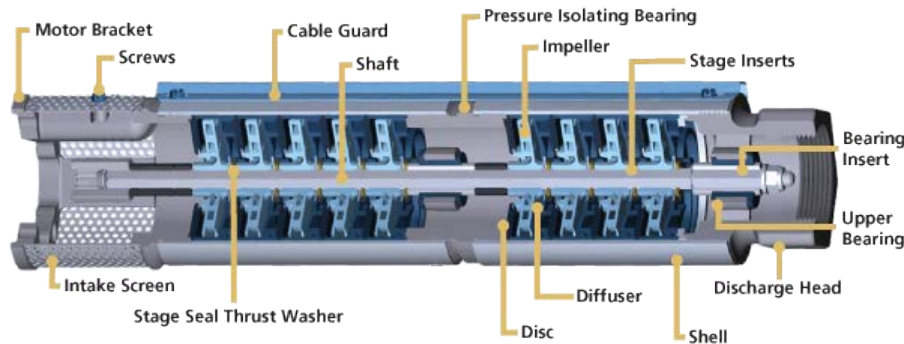




Business Case

What is an ESP?

Understanding the Need



- Form of artificial lift
- Approximately 700 in service
- Often contain 100-400 pump stages stacked
- Used for mid to high liquid volumes (oil / water)

Defining the Problems with ESPs

Understanding the Need

- On average, each ESP will fail 1.5 times per year
- Average \$100,000 equipment replacement cost per incident
- Average \$110,000 in deferred production value per incident
- Approximate cost of ESP failures: **\$221 million per year** (700 ESPs)

Pre-Completion

- Bore too narrow
- DL too severe
- Other geometry problems impeding AL use

Operations

- Wrong Application
- Environmental Factors
- Poor Installation
- Electrical Problems
- Under/Oversized
- Bad Control Parameters

Changing The Process

Understanding the Need

E&SS Production Operations Excellence taking ownership

- Information Gaps – What do we have down-hole?
 - Working with vendors to aggregate all install reports
 - Worked with Wellview team to make “home” for data
 - Working with E&SS engineering data management for long-term
- Changing the way people work
 - Informing about the importance of accurate information
 - Guiding engineers towards best design practices
 - Education on proper operation and troubleshooting methods
 - Analyzing the way the business works- end-to-end
 - Partner with IT to create process-changing lifecycle tools
- Working on identifying pre-completions issues

Targeting Cost Reductions

Understanding the Need

- Goal: Extend life of ESPs by average of 90 days
- Savings exceed \$50 million / year at current economics
- Accomplished through “Operations” changes

Pre-Completion

- Bore too narrow
- DL too severe
- Other geometry problems restricting proper AL selection

Operations

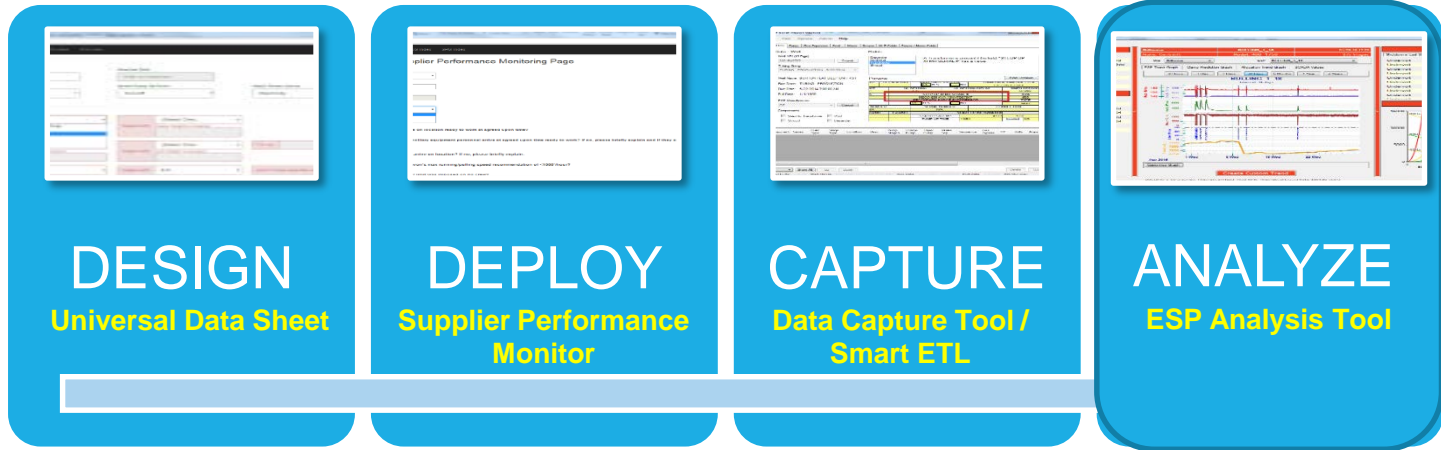
- Wrong Application
- Environmental Factors
- Poor Installation
- Electrical Problems
- Under/Oversized
- Bad Control Parameters



Software Solutions

ESP Lifecycle

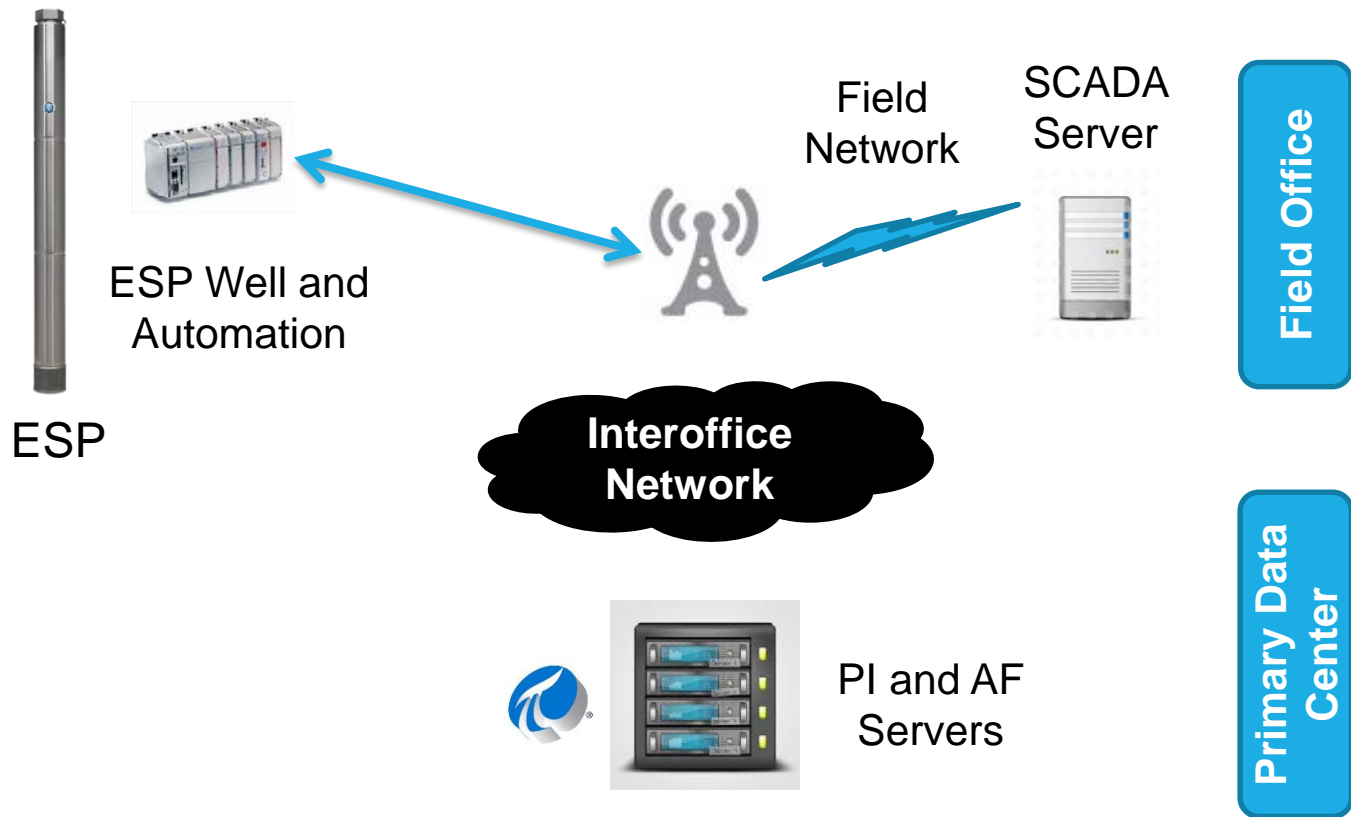
The New Process



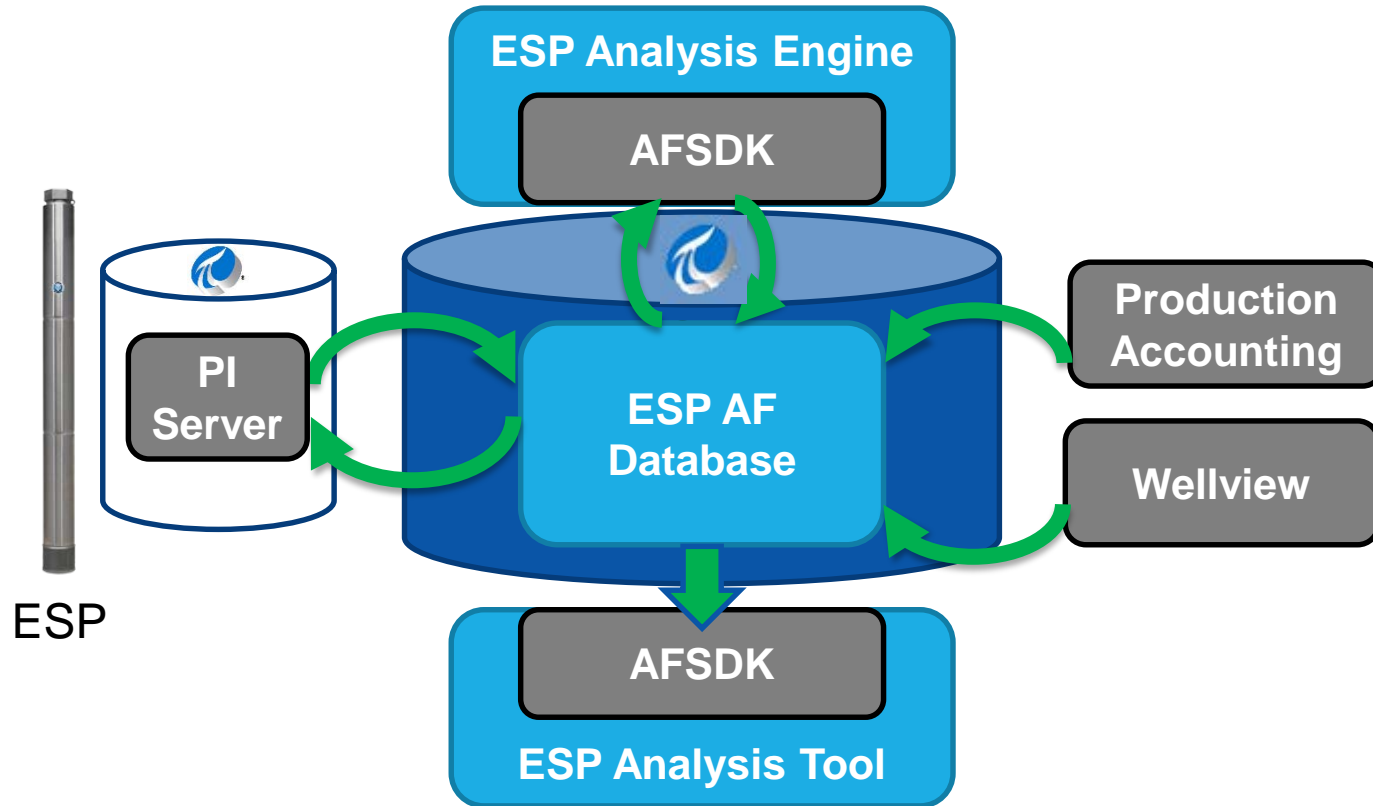
- ESP Lifecycle Tools cover major process steps
- Lifecycle process defined by ESS POE Team
- Applications developed by IT Ops Excellence
- Focus on Real-Time Solution: ESP Analysis Tool

ESP Analysis Tool

Simplified SCADA Architecture



Solution Components and Flow

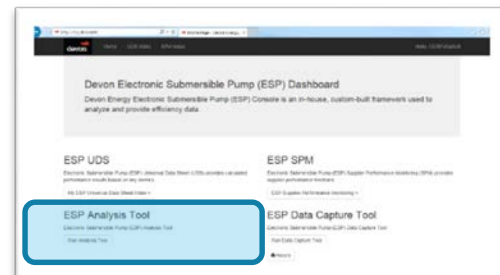


ESP Analysis Tool

Production Operations Excellence

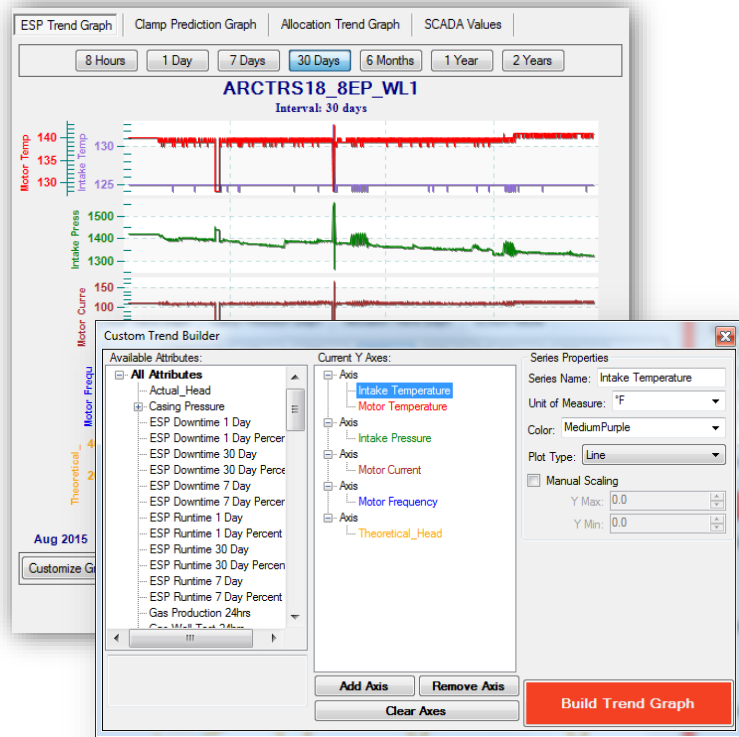
ANALYZE

- Exception-based selection grid allows rapid filtering and sorting of problem wells
- Graphs are highly configurable and FAST
- Design strongly influenced by POE Team's engineering expertise
- Can replace vendor-specific sites and save substantial recurring fees



PI-Enabled Custom Components

Speeding Application Delivery



Real-time Graph

- Custom control based on AFSDK
- Selectable time horizon
- Supports multi-axis and stacked graphs
- Custom cursors

PI-Enabled Custom Components

Speeding Application Delivery

Real-time Snapshot Grid

- Grid with exception-reporting capabilities
- Common across all analysis tools
- Access to all AF properties
- Blacklist-capable
- Powerful logic engine

The screenshot displays the 'Real-time Snapshot Grid' interface, which includes a table of equipment data and a 'Create Custom Filter' dialog box.

Table Data:

Equipment	Output Current (A)	Pump Intake Pressure (psi)	Motor Temp (°F)	Oil Gravity	Runtime Days (d)	Shutdown Count
AGAST127_1EP_WL1	101.0	276.8	162.8	0.0	16.0	3.0
ALDBRA26_8EP_WL1	32.2	1,032.8	176.5	0.0	No Data	3.0
ALDBRA27_1EP_WL1	40.6	791.0	184.8	0.0	No Data	3.0
ANTRES23_2EP_WL1	197.0	234.7	168.7	0.0	0.0	5.0
APCHE25_17EP_WL1	236.0	865.0	164.1	0.0	No Data	No Data
AQULAZ2_13EP_WL1	0.0	213.6	139.4	0.0	4.0	3.0
AQULAZ2_1EP_WL1	34.5	426.1	140.8	0.0	No Data	No Data
BAE27_1EP_WL1	180.0	334.9	163.2	0.0	3.0	3.0
BAE27_2EP_WL1	195.0	440.2	149.1	0.0	3.0	3.0
BFDU_4EP_WL1	25.8	987.0	126.3	0.0	No Data	No Data
BFDU_51EP_WL1	No Data	No Data	No Data	0.0	No Data	No Data
BFDU_52EP_WL1	29.6	700.0	149.0	0.0	No Data	No Data
BFDU_53EP_WL1	26.3	955.0	153.5	0.0	No Data	No Data
BLKJOK1_4EP_WL1	198.0	286.9	162.2	0.0	29.0	10.0
BLLAKE19_1EP_WL1	26.2	1,173.8	167.4	0.0	No Data	3.0
BLLAKE24_1EP_WL1	33.0	0.0	0.0	0.0	No Data	3.0
BLLAKE24_2EP_WL1	0.0	1,170.0	169.0	0.0	No Data	3.0
BLLAKE24_4EP_WL1	45.7	281.8	156.7	0.0	No Data	3.0
BLLTRQ28_7EP_WL1	No Data	3,401.3	150.4	0.0	No Data	25.0
BOOTS15_1EP_WL1	32.7	247.0	157.1	0.0	No Data	No Data
BTLLICE19_5EP_WL1	30.0	100.0	100.0	0.0	0.0	0.0
CDU_110EP_WL1	160.0	387.9	166.7	0.0	12.0	3.0
CDU_116EP_WL1	No Data	No Data	No Data	0.0	No Data	No Data
CDU_119EP_WL1	95.0	246.8	173.1	0.0	13.0	3.0

Create Custom Filter Dialog:

Select Attributes for Advanced Filtering

- Current Grid Attributes
 - Shutdown Count
 - Runtime Days
 - Oil Gravity
 - Motor Temp
 - Pump Intake Pressure
 - Output Current
- None
- A_Diagnostics
- Alarm
- Base
- ESP Downtime
- OpEnv_B
- OpEnv_O
- OpEnv_U
- Operating Position
- Production Gas
- Production Oil

Select Operator: > Attribute Value: 500 UOM: pound force per i

Current Filter Criteria:
[Shutdown Count] > 10
AND [Pump Intake Pressure] > 500

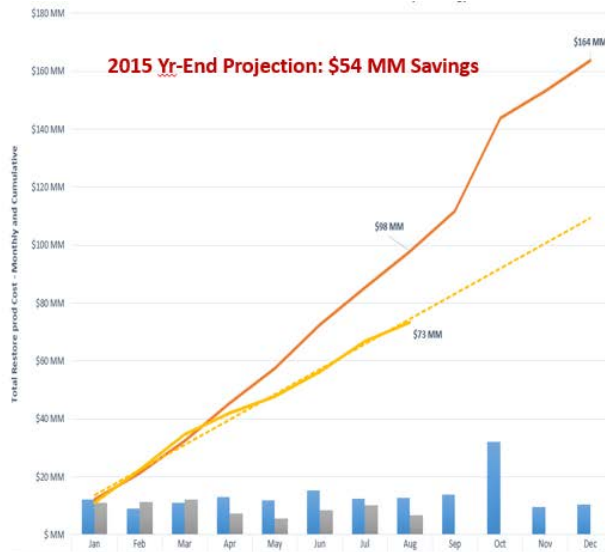
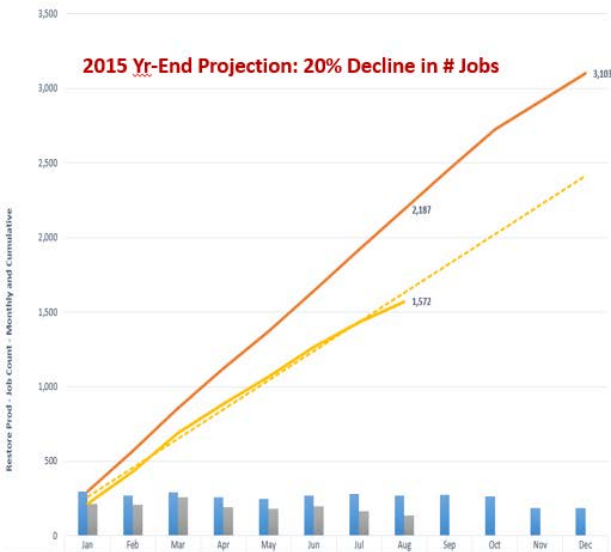
Filter Name: [] Clear Filter Criteria Save Filter Apply Filter



Cumulative Results

Changing The Process

Cumulative Results



- 20% fewer downhole failures
- Projected \$54 million savings by year-end
- Inclusive of all changes- not just software



Software Demonstration



Questions

Please wait for the
microphone before asking
your questions



State your
name & company

Please don't forget to...

Complete the Survey
for this session



The **Power of Data**

DECISION READY IN REAL-TIME

Evaluation Form (Seminar Location - Date)

Name: _____

Company: _____

Email: _____

Quality and content of the presentations

Poor Good Excellent N/A

Welcome	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Journey To Real-Time Operational Intelligence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Power of Connection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tank Level Management System	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the PI System to Aid in Troubleshooting Operational Aspects of Oil and Gas Well Drilling and Completion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unleash your Infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information on the Spot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wrap-up/Seminar Conclusion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Quality and organization of the seminar

Choice of date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time allowed for lunch/breaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Choice of presentations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Break and time allowed for the presentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado