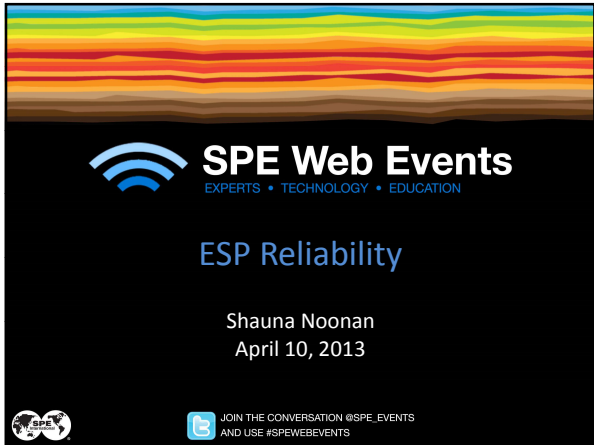
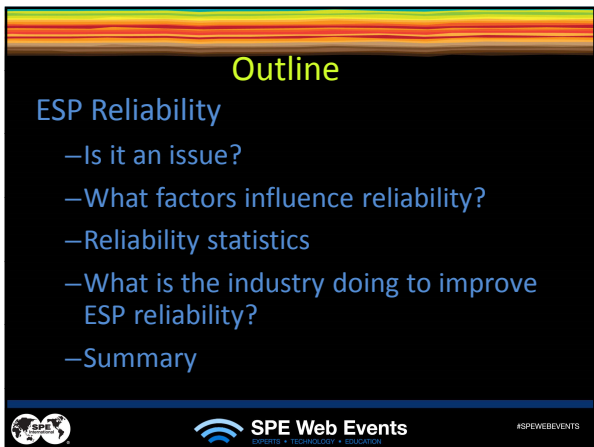








Poll #1: Who is participating in this webinar?

Selection from:

- ESP Manufacturer
- ESP Distributer
- Operating Company
- Academia (including students)
- Other

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Result from Poll #1

#SPEWEBEVENTS

Reliability

“ the ability of a system or component to perform its required functions under stated conditions for a specified period of time”

Source: Wikipedia

#SPEWEBEVENTS

Poll #2:

“How would you rate the reliability of current ESP technology?”

Answers:

- Excellent
- Good
- Average
- Below average
- Very poor

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Result of Poll #2

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Is ESP Reliability an Issue?

- What is the current impact of ESP run life on your economics and what is the \$ value of ESP reliability to you?
- What is the reasonable target run life for your specific application?
- Do you understand the root cause of your ESP failures and are you being limited by existing technology?

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Example #1

- **Problem:** Excessive downtime and ESP failures prompted management to request an investigation and development of new ESP technology.
- **Evaluation:** Most of the ESP failures were caused by sand settling on top of the pump after unplanned shutdowns.
- **Recommendation:** Priority needs to be on reducing shut downs due to surface multiphase pump failures and electrical events.



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Example #2

- **Problem:** In one field an ESP failure was occurring almost daily. The current workover rigs could not handle the volume of interventions and downtime was increasing as a result. Management formed a team to increase ESP run life.
- **Evaluation:** Average ESP run life was 2 years, which is a reasonable target for this application. This field had ~ 800 ESPs, of which an ESP failure each day should have been expected.
- **Recommendation:** Operations need to contract enough workover rigs to handle a 2 year average ESP life.



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Need to know financial implications of
ESP reliability on your operations
(size of the prize)

*This will help to determine target run life and the
amount of effort that must be made to achieve it.*



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Let's be Realistic with Setting Targets

"This year's goal is to increase average run life from 1 year to 2 years."

Reality: On January 1st, if you were to replace all pumps with ones that were more reliable, this goal could not be met by Dec. 31st.

Reality: We would typically replace systems as they failed. The entire population would not be replaced with the better systems until the end of that year.

It may take 3 years or more to achieve this goal.




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Example timeline for introducing a step change in ESP technology to increase reliability for extreme high temperature

2008 or earlier	3Q 2009	Sept 2010	Sept 2012
Design concept	Validation testing of prototype	Prototype field trials	Achieved two years runtime

4+ years from concept to achieving a 2 yr runtime




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Factors that Impact ESP Reliability

(these are just some of the ones we have influence over)

Installation practices

Operating practices

Equipment qualification and testing

Is there anything you can be doing differently right now that will result in improving ESP run life and project economics?

Material

Reliability

Fit for purpose design

Quality of manufacturing

Quality of completion: hole size, deviation, dogleg severity




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Its not only about having the right equipment for the application...

It is also about who is installing and operating it.



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Communication between the enduser and supplier / manufacturer is critical

“ Reliability: the ability of a system or component to perform its **required functions** under **stated conditions** for a **specified period of time**”

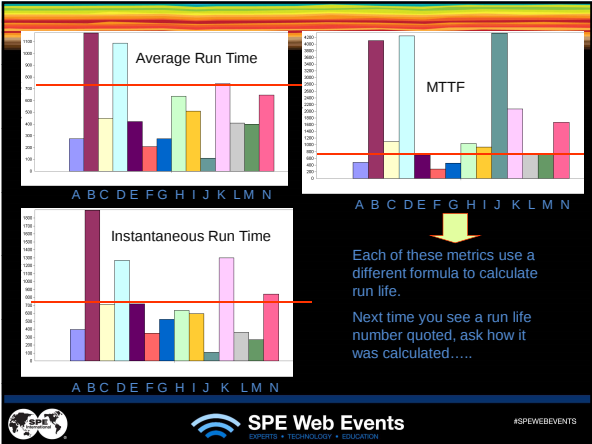
Source: Wikipedia

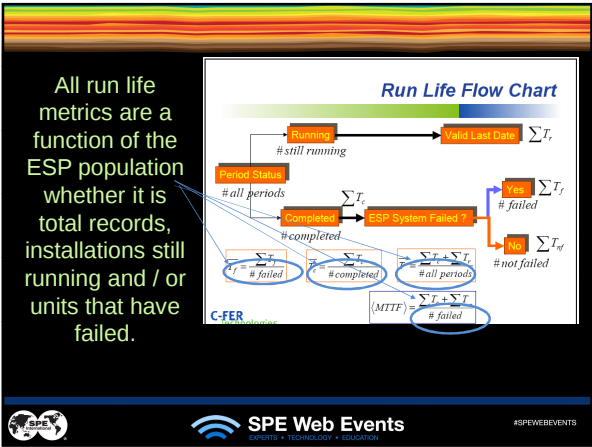
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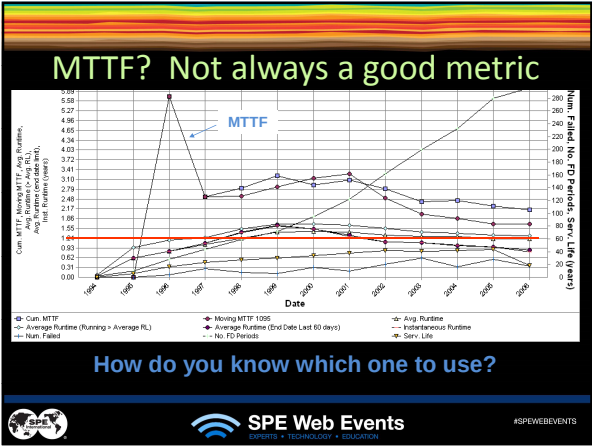
Reliability Statistics

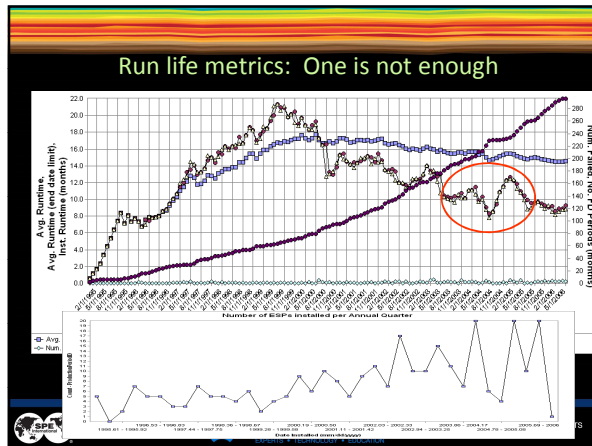


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Interpreting the trends in ESP run life statistics is impossible without understanding your data population.

Its not a matter of knowing "what" your ESP run life metrics are, it is also having the data to be able to answer "why".

If you want to get serious about ESP reliability, you need to get serious about data collection and evaluation.

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What is the ESP Industry Doing Now to Improve Reliability?

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Electric Submersible Pump
Reliability Information and Failure Tracking System

Search

About C-FER

Background

Benefits

Tools

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As of April, 2013, this industry ESP database contains ~ 104,179 records from approximately 750 fields representing 22 operating companies.

For more information www.esprifts.com

Related paper: SPE 148333



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Failure Data Structure

- Reason for Pull
- Failed Item(s)
- Primary Failed Item
- Failure Descriptor(s)
- Failure Cause



Standard
ESP Failure
Nomenclature
Version 4.3

200 Karl Clark Road
Edmonton, Alberta
Canada T6H 1N2
Tel: 780-450-3300
Fax: 780-450-3300
www.cfer.ca

[Document can be downloaded at
www.esprifts.com](http://www.esprifts.com)



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Examples of Poor Failure Cause Documentation

Motor burnt

Shaft broke

Cable shorted

Pump Plugged

Pump NFG



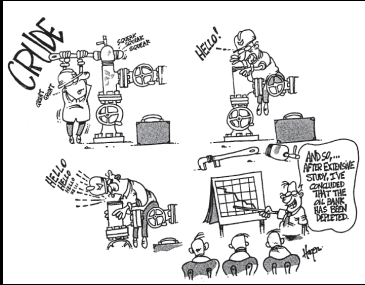
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API Recommended Practices (RPs)

- **11S:** Operation, Maintenance & Troubleshooting of ESP Installations
- **11S1:** ESP Teardown Report
- **11S2:** ESP Testing ← **Pumps**
- **11S3:** ESP Installations
- **11S4:** Sizing & Selection of ESP Installations
- **11S5:** Application & ESP Cable Systems
- **11S6:** Testing of ESP Cable Systems
- **11S7:** Application & Testing of ESP Seal Chamber Sections
- **11S8:** ESP System Vibrations

#SPEWEBEVENTS



How did your ESP manufacturer develop their pump ratings and performance curves?

#SPEWEBEVENTS

Industry Standards for ESPs

ISO 15551-1 ESP Systems

- Draft document is complete and submitted to ISO / OGP for approvals.

#SPEWEBEVENTS

ISO 15551-1

ISO specification for downhole oilfield ESP components that defines requirements for:

- Design verification & validation
- Manufacturing
- Performance ratings
- Functional evaluation

Engineering design of the component, not the application design for a specific well.



#SPEWEBEVENTS

What ESP components are covered in ISO 15551-1?

- centrifugal pumps including gas handling devices,
- discharge heads,
- seal chamber sections,
- bolt-on intake systems,
- mechanical gas separators,
- induction motors,
- MLE, potheads and power cables.
- assembled ESP systems



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What this ISO document is NOT

- It is not a contract with the manufacturer.
- It does not guarantee or become an issue of equipment warranty.
- A manufacturer does not have to be compliant with ISO 15551-1 unless they have agreed upon request of the enduser.
- This is not a document that only has requirements for the manufacturer – there are requirements by the enduser.
- Provisions have been written to handle legacy / existing product lines so that they will meet some part of this standard.



#SPEWEBEVENTS



International Organization for Standardization

International Standard for Downhole ESP Systems (ISO 15551-1) Training Session

Tuesday, April 23 2012
Woodlands Waterway Marriott and Conference Center,
Montgomery Ballroom

Description:
This one day course will prepare both user/purchaser and supplier/manufacturer to use the new International Standard for Downhole ESP equipment when it is published late 2013 / early 2014. We will describe why this standard was developed and review in detail the content covered, provide understanding of content not covered in this standard, and highlight how the requirements impact both the user/purchaser and supplier/manufacturer. We will demonstrate the various ways how to apply this standard, including (but not limited to) equipment purchase, testing, bid specifications and response to tenders.

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Poll Question #3

How well do you think the fundamental science of ESP functionality are understood?
What % of understanding do you think the industry is at?

Answers:

- A. 25%
- B. 50%
- C. 75%
- D. 100%




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The industry is still on the learning curve.

- Pumps
- Gas handlers
- Mechanical Gas Separators
- Seal Sections
- Motors

Steam handling studies may also uncover new information about gas handling capabilities. ISO testing will result in lots of new data collected.

Manufacturers are beginning to test via ISO methods.

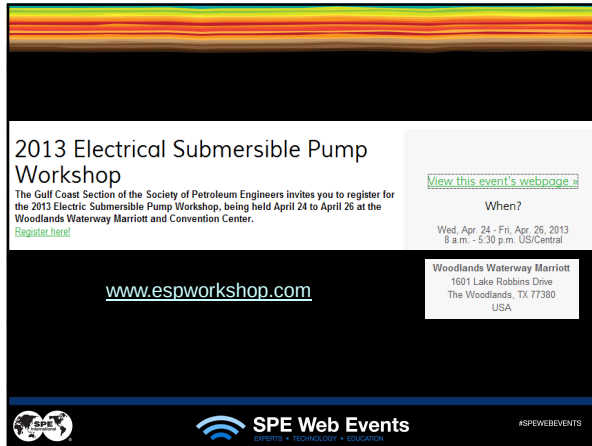
At ESP Workshop, preliminary results from an extensive seal section test program will be presented.

High temperature ESP developments have led to better understanding of ESP internal motor operating conditions.




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2013 Electrical Submersible Pump Workshop

The Gulf Coast Section of the Society of Petroleum Engineers invites you to register for the 2013 Electric Submersible Pump Workshop, being held April 24 to April 26 at the Woodlands Waterway Marriott and Convention Center.

[Register here!](#)

[View this event's webpage!](#)

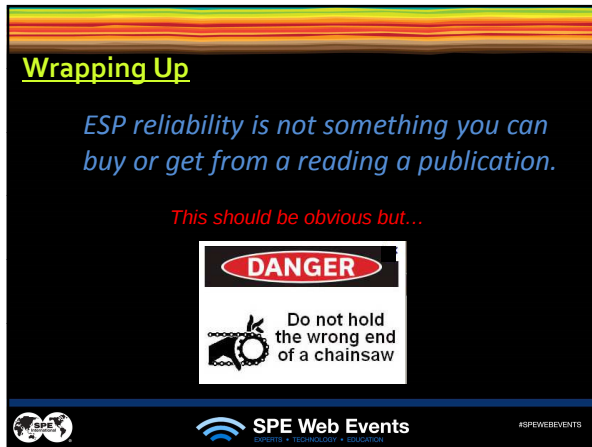
When?
Wed, Apr. 24 - Fri, Apr. 26, 2013
8 a.m. - 5:30 p.m. US/Central

Woodlands Waterway Marriott
1601 Lake Robbins Drive
The Woodlands, TX 77380
USA

www.espworkshop.com

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Wrapping Up

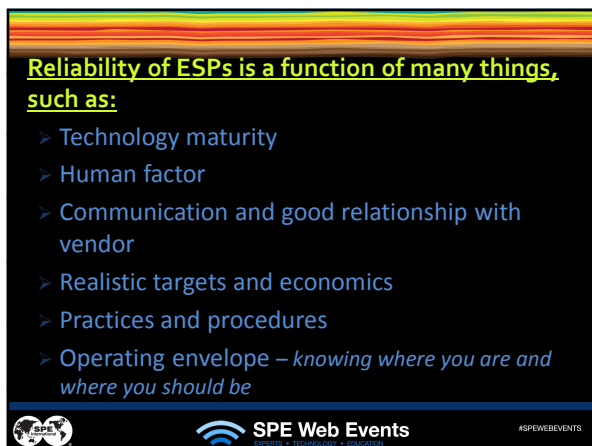
ESP reliability is not something you can buy or get from a reading a publication.

This should be obvious but...



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Reliability of ESPs is a function of many things, such as:

- Technology maturity
- Human factor
- Communication and good relationship with vendor
- Realistic targets and economics
- Practices and procedures
- Operating envelope – knowing where you are and where you should be

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Finally, let's be realistic

Decisions are routinely made by the endusers that negatively impact ESP reliability, such as:

- Design with very little data
- Run replacement equipment based on price
- Select equipment outside of its recommended range to meet production targets.;

Economics may justify other actions over pump reliability

Callout box: If you make decisions that you know will negatively impact your ESP reliability, you need to also adjust your expectations accordingly.

Footer: SPE Web Events EXPERTS • TECHNOLOGY • EDUCATION #SPEWEBEVENTS



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Questions?

Footer: JOIN THE CONVERSATION @SPE_EVENTS #SPEWEBEVENTS
