EuALF 2018

Maximize artificial lift systems reliability due to continuous in-house failure analysis and optimization

Bernd Kometer

Michaela Hoy

Michael Nirtl

Aberdeen, 13. June 2018

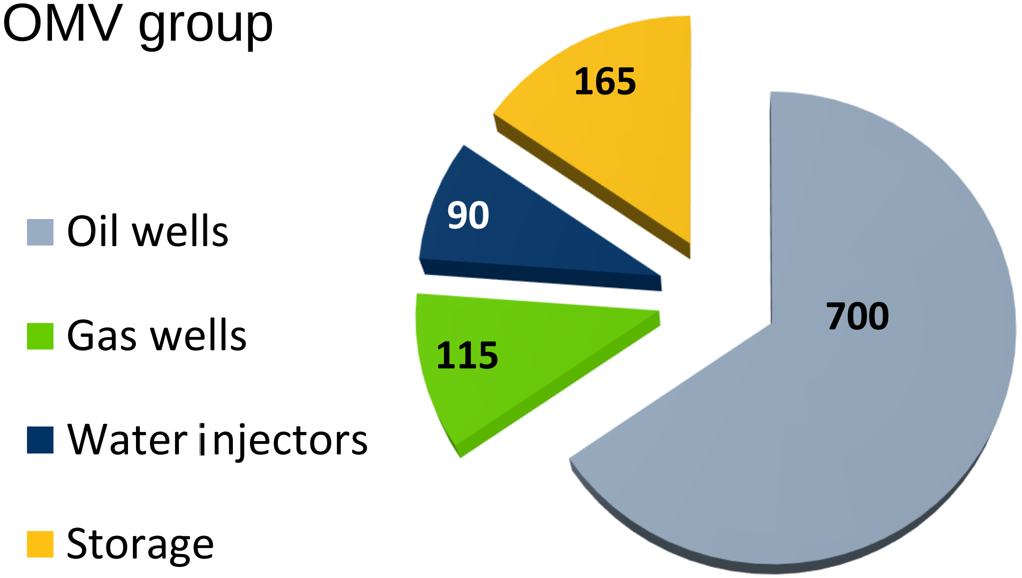
Agenda

- Introduction
  - OMV Austria
  - Artificial lift systems
- Failure analysis
- Optimization
  - Sucker rod pump
  - Electrical submersible pump
- Results
- Summary

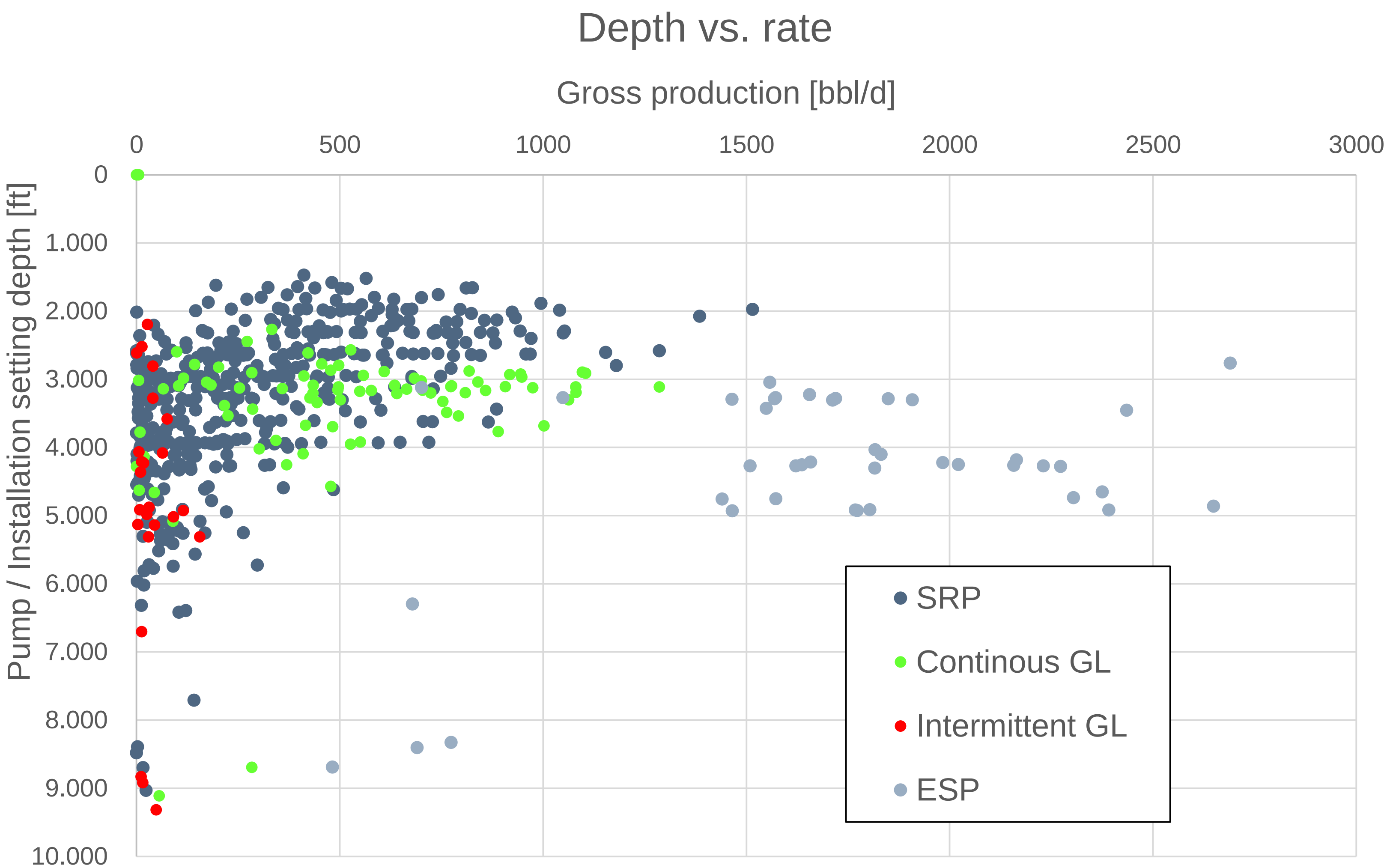
Introduction
OMV Austria

- Production ~28,000 boe/day
- 10% of the Austrian oil and gas demand
- 50 fields
- 600 employees
- Technology center of OMV group

- 120 WI per year

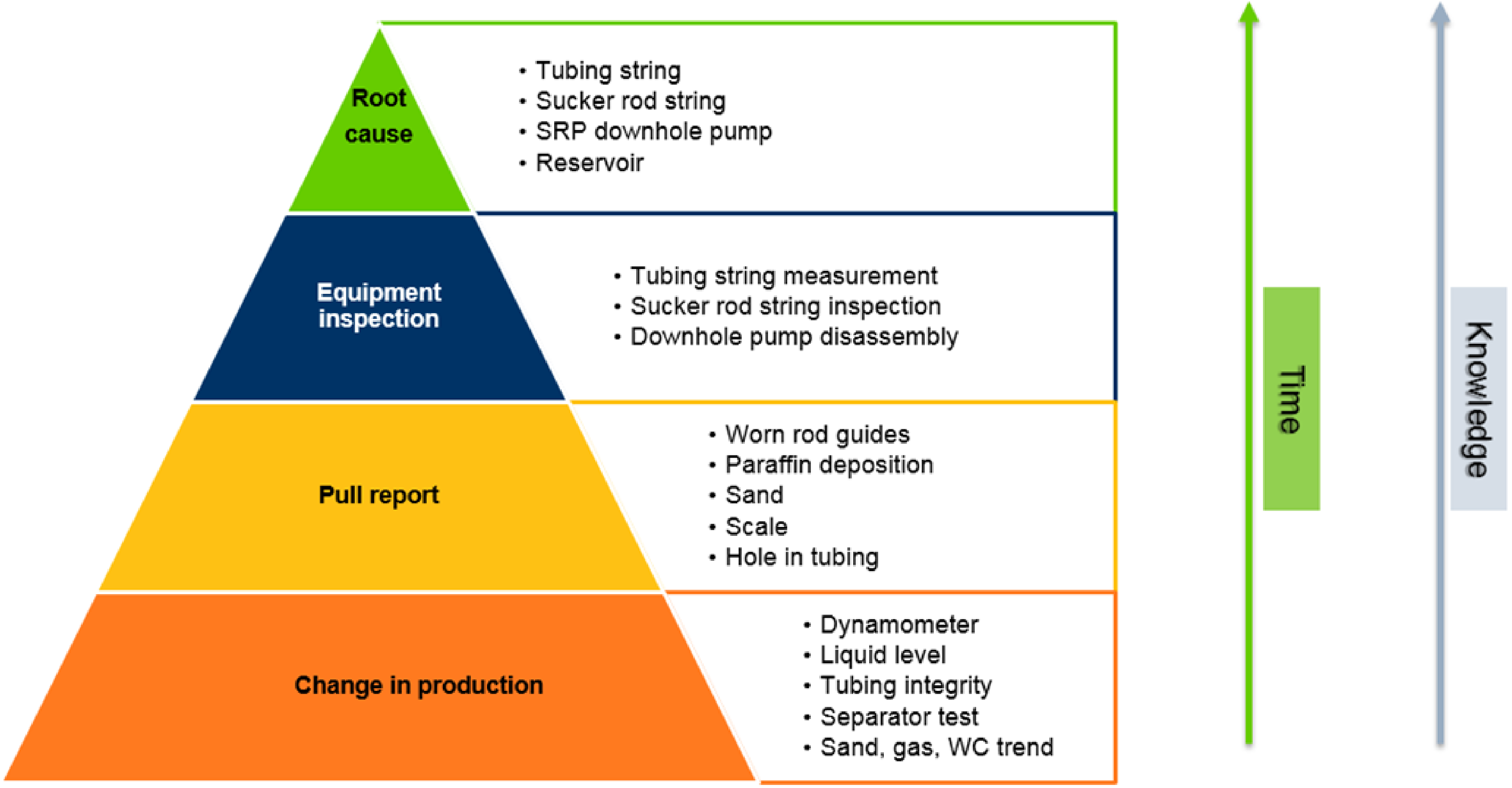


Introduction
Artificial Lift Systems



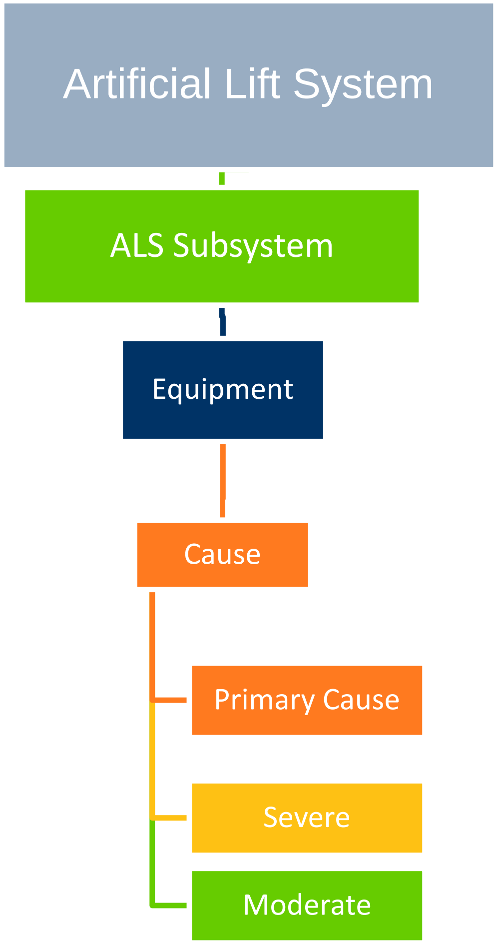
Ref: ISBN 978-3-941721-86-9

Failure Analysis Information

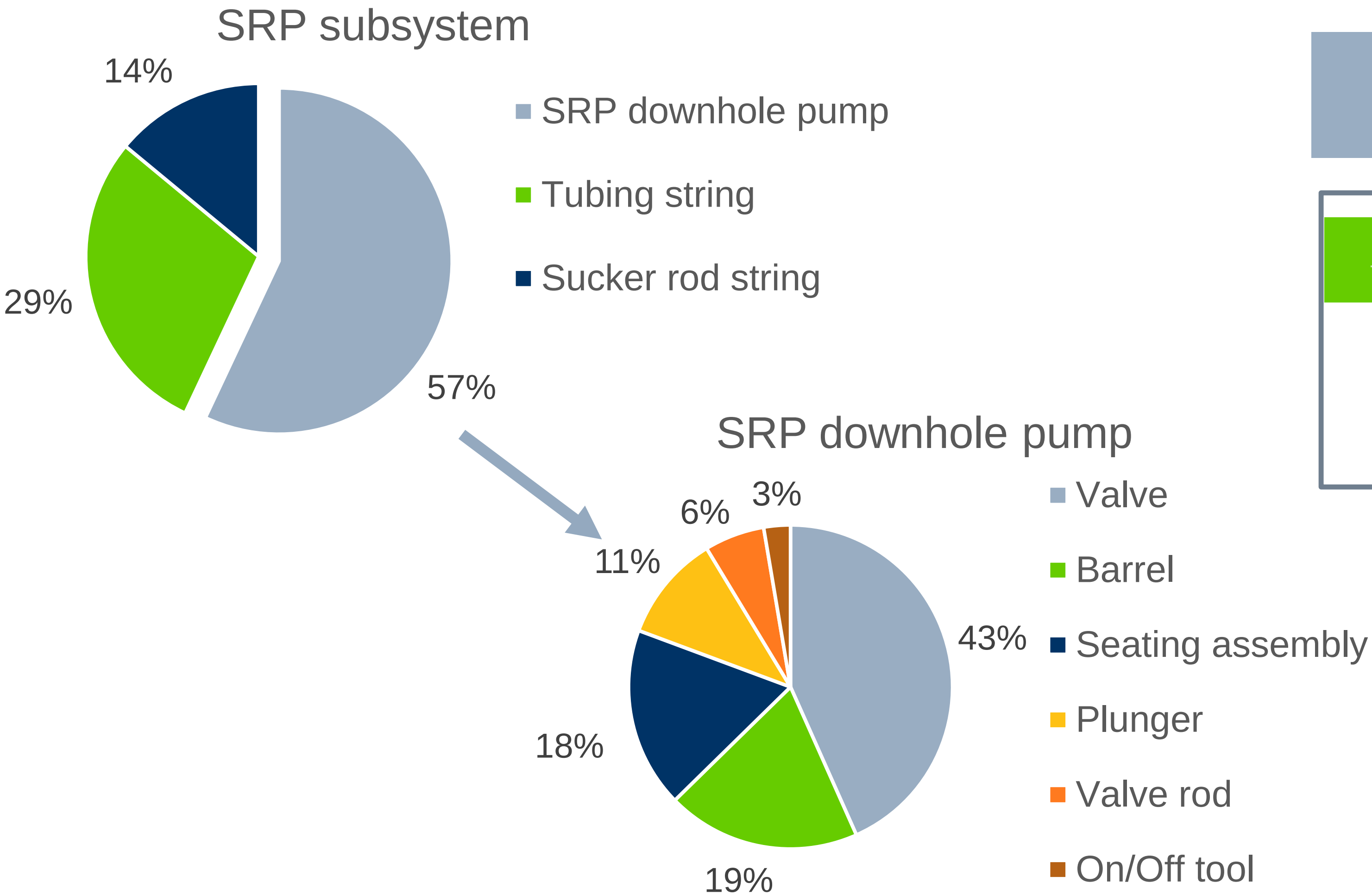


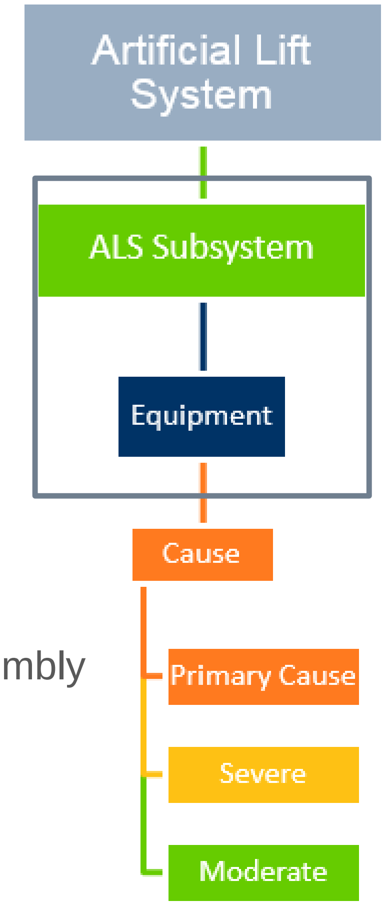
Ref: SPE-190958-MS

Failure Analysis Documentation



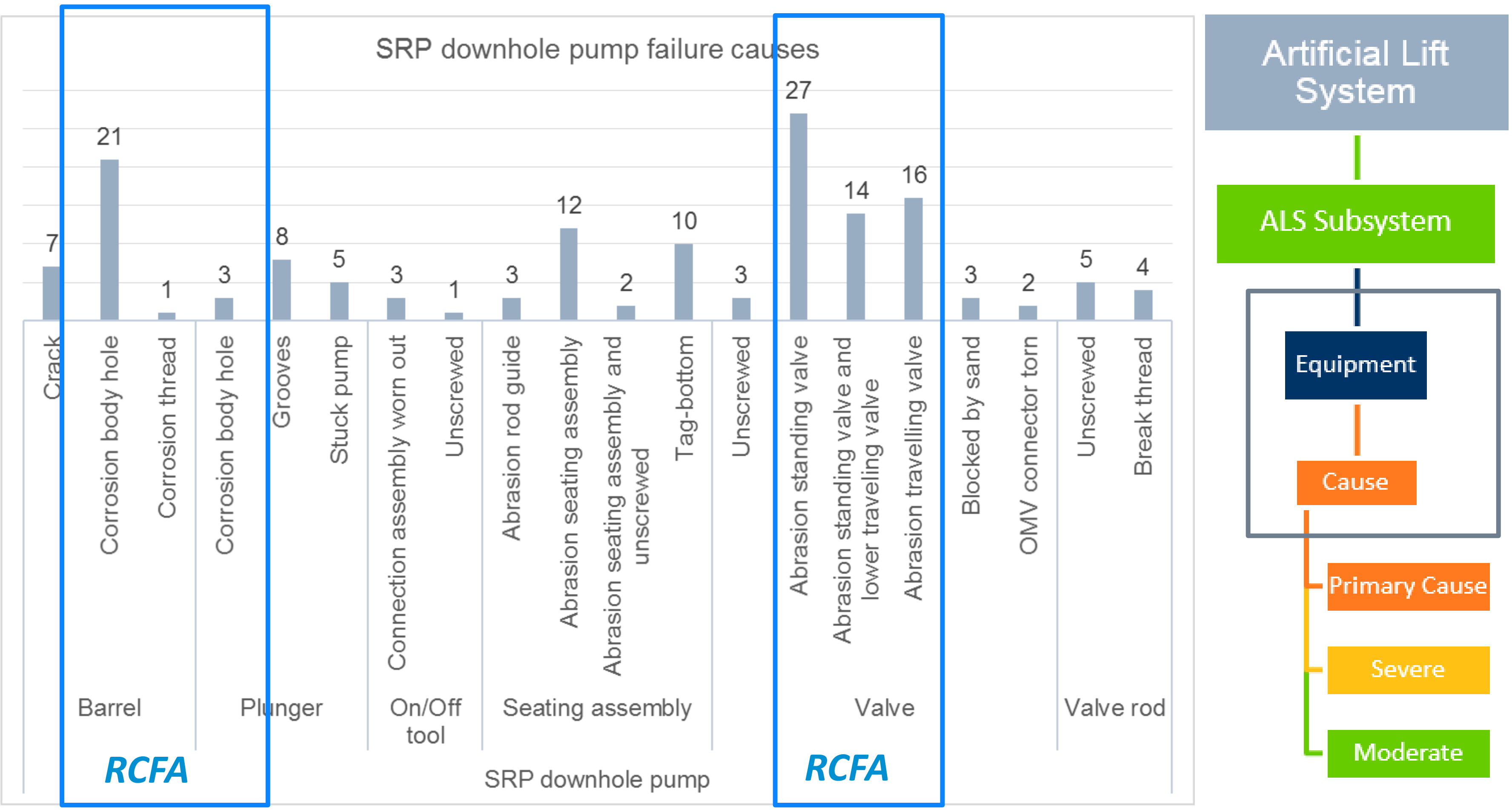
Optimization SRP Equipment





Ref: ISBN 978-3-941721-86-9

Optimization SRP
Equipment and Cause

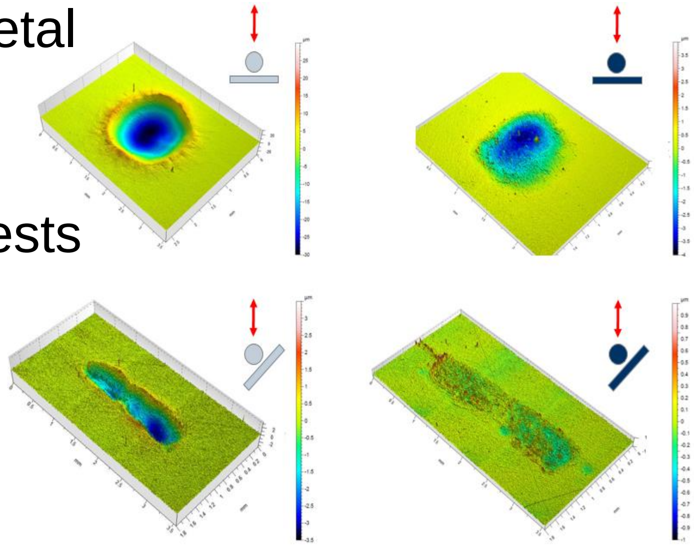


Ref: SPE-190958-MS

Optimization SRP
Root Cause Failure Analysis

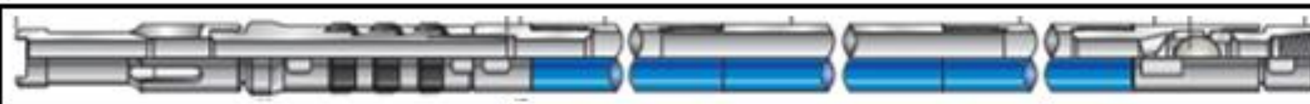
OMV TECH Center & Lab & AC²T research

- Barrel: Honing scratches in chromium layer as starting point for corrosion
- Plunger: Quality and thickness of spray metal coating
- Improved OMV Specification for SRP and quality assurance by factory acceptance tests
- Valve
  - Valve deformation main driver
  - No corrosion detected
  - No erosion by dispersed sand
  - No sand particles embedded



Ref: SPE-190958-MS

Optimization SRP Customization

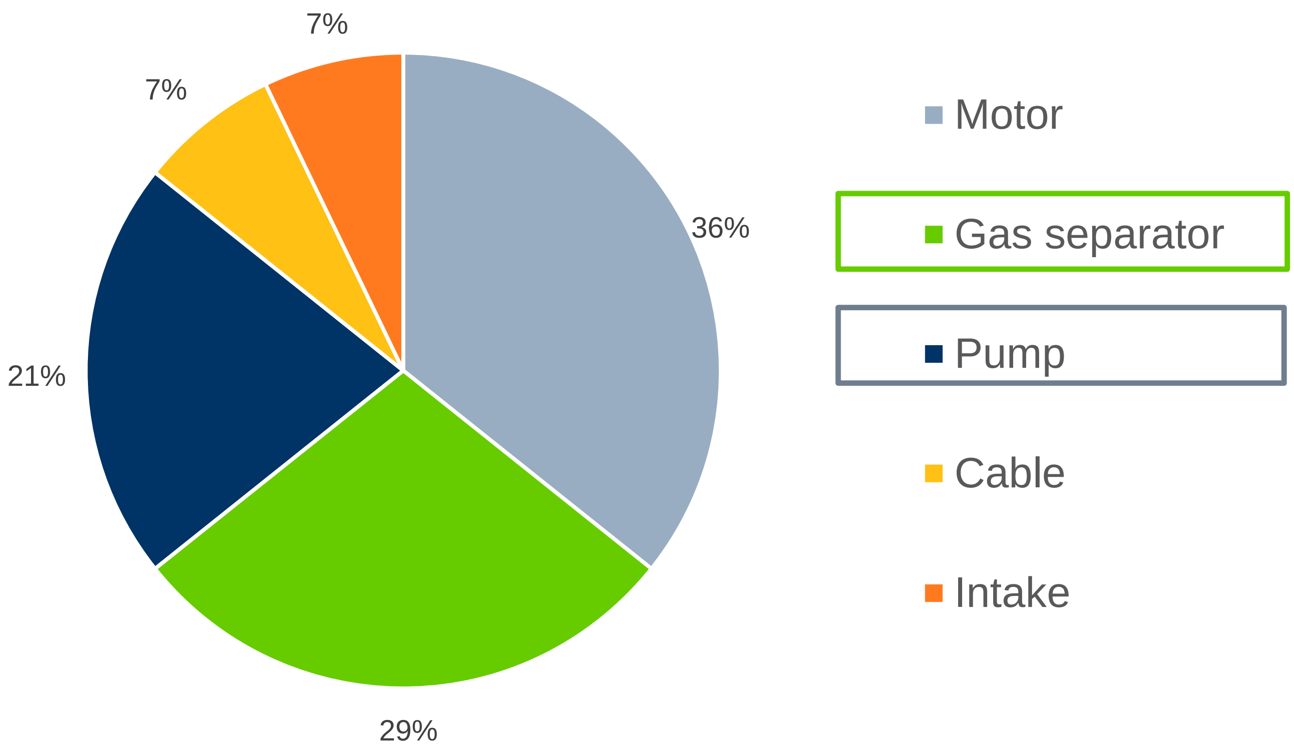
SRP downhole pump				
Equipment	Seating assembly		Barrel	Valve
Failure cause	Abrasion rod guide	Abrasion seating assembly	Corrosion body hole	Blocked by sand
Failure reason	Valve rod movement in deviated well		Corrosion and abrasion	Sand
Solutions	Spiral rod guide to stabilze valve rod		Brass barrel	Full flow cage
				

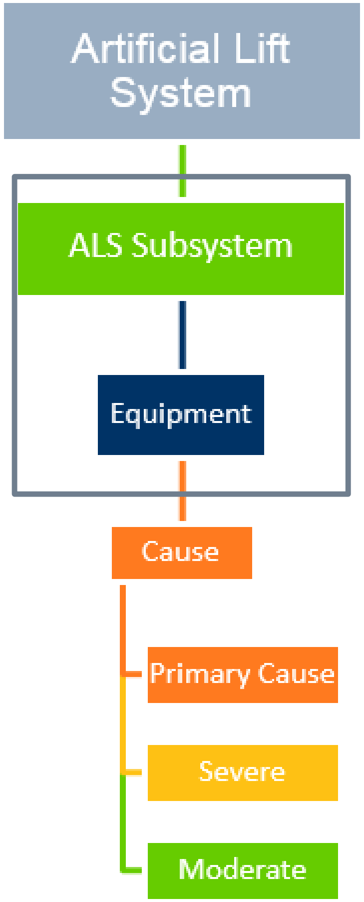
SRP downhole pump			
Equipment	Valve rod	Plunger	Lower travelling valve
Failure cause	Unscrewed	Stuck plunger	Hole in valve cage
Failure reason	Tag bottom	Sand	Gas
Solutions	Collet type valve rod bushing	FARR™ plunger	Gas lock breaker heavy ball and seat
			

Ref: SPE-190958-MS

Optimization ESP
ALS Subsystem

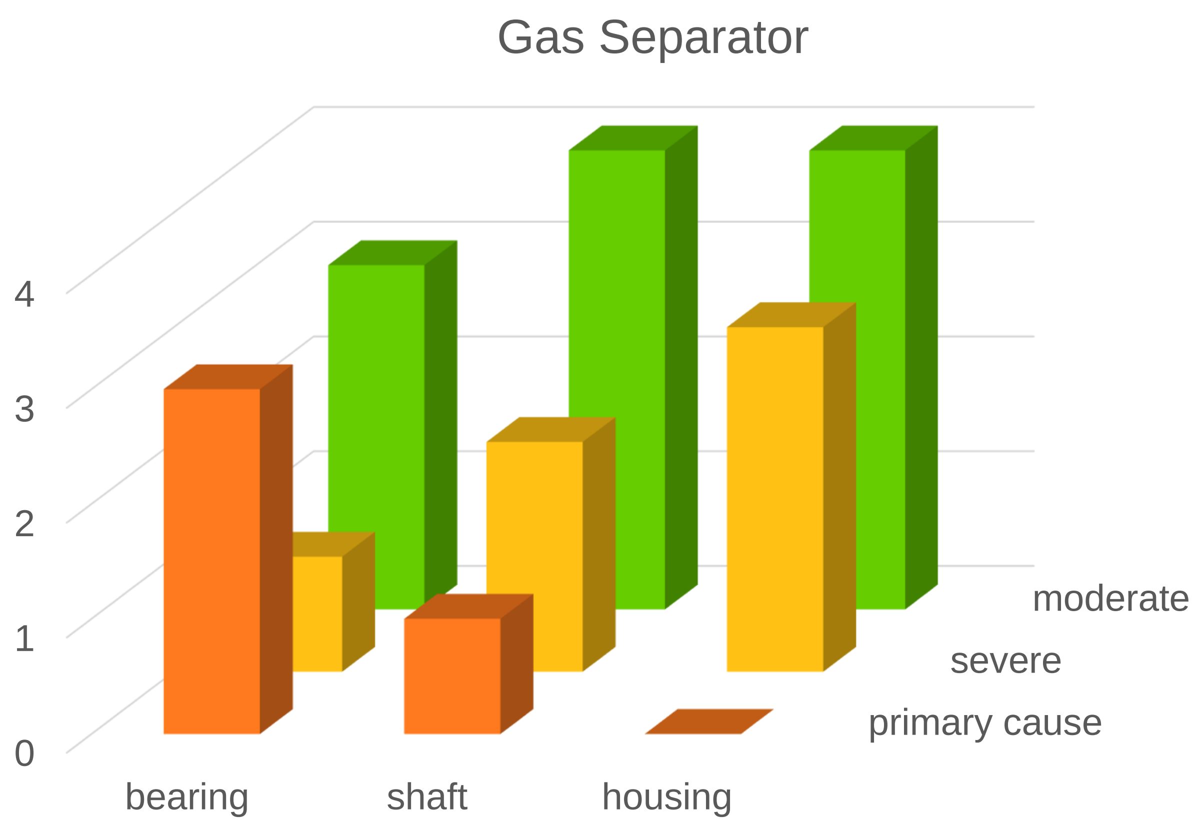
ESP subsystem failure frequency

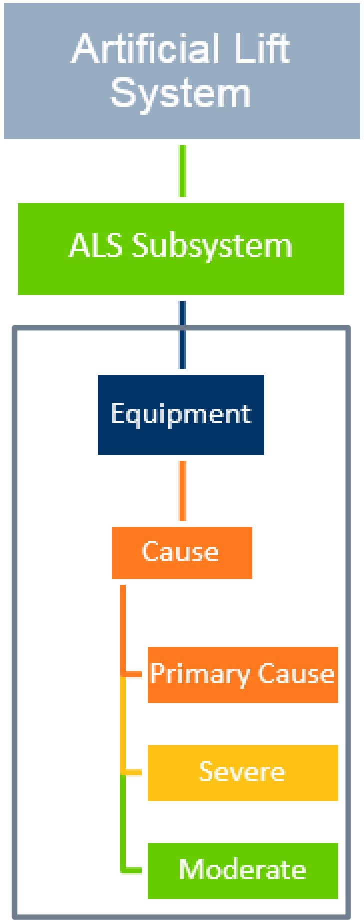




Ref: ISBN 978-3-941721-86-9

Optimization ESP
Equipment and Condition Monitoring

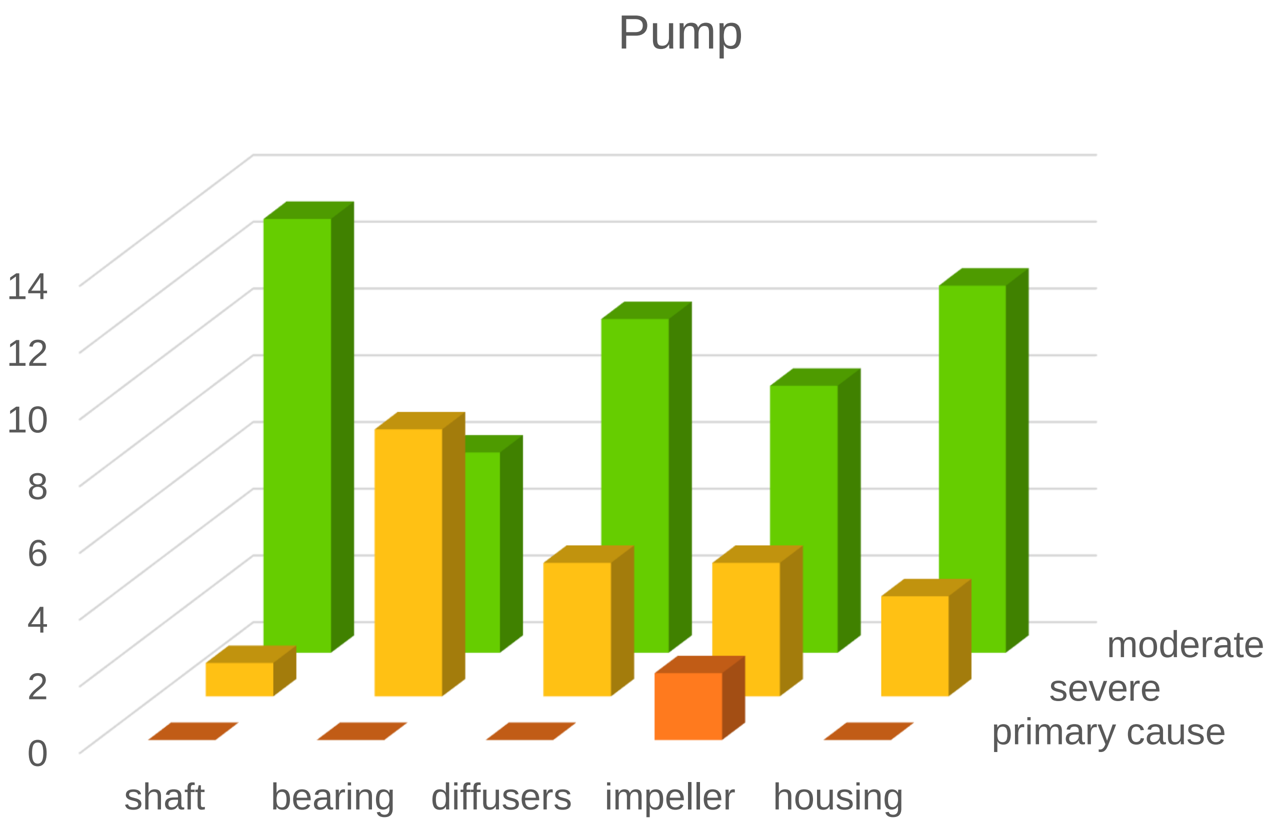


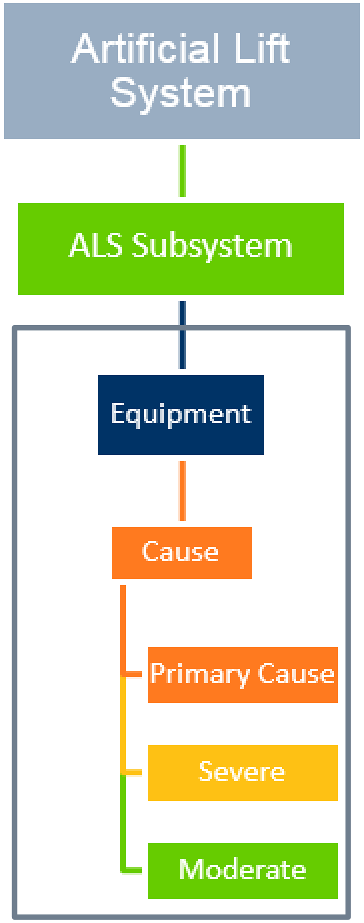


Ref: ISBN 978-3-941721-86-9

Optimization ESP
Gas Separator

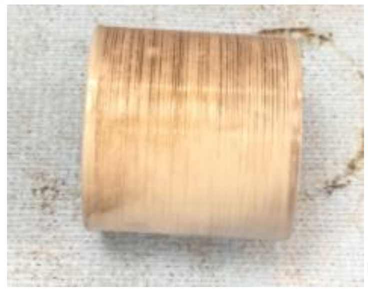
Optimization ESP
Equipment and Condition Monitoring





Ref: ISBN 978-3-941721-86-9

Optimization ESP Pump



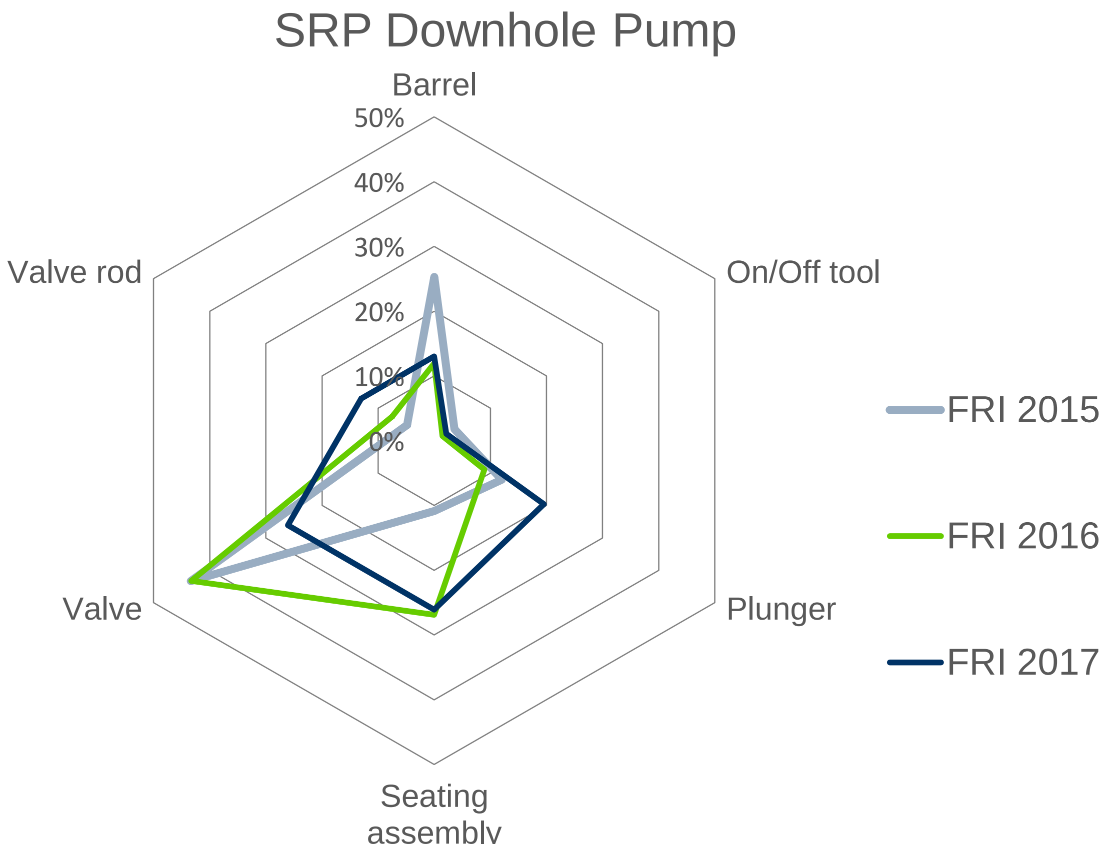
Ref: Schlumberger

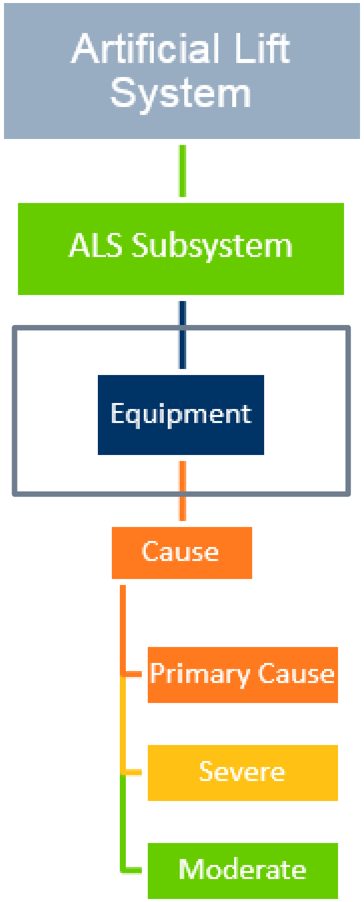
Optimization ESP Customization

- Pump
  - Mixed flow
  - 1 tungsten carbide bearing per ft
  - Compression pumps
- Intake
  - Change from gas separator to intake
  - Tungsten carbide bearings
- Protectors
  - Tandem protector with up to 6 seals
- Motor
  - Single motor
- Cable
  - Lead cable with factory spliced MLE

Ref: Schlumberger

Results
SRP Downhole Pump - Failure Recurrence Index

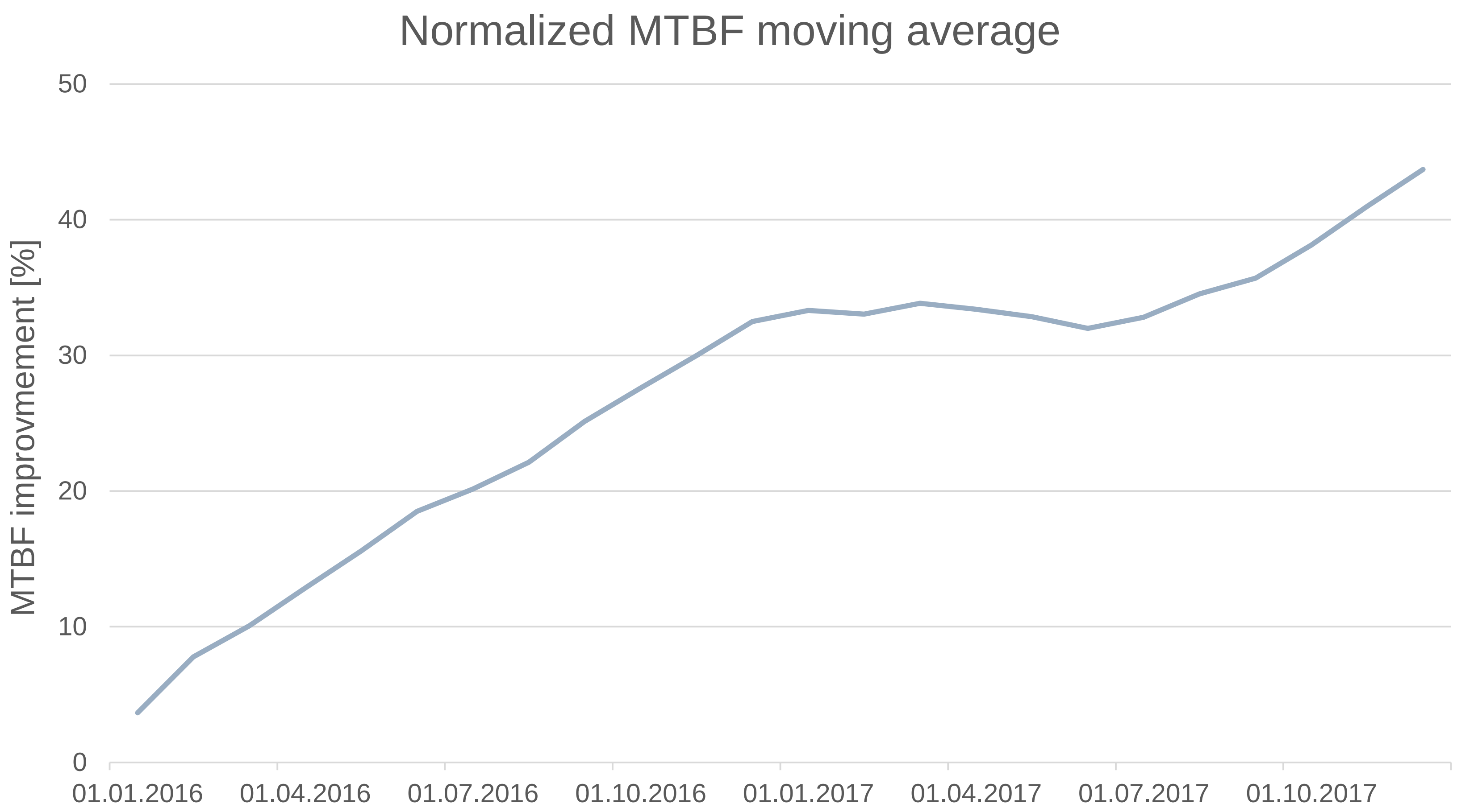




$$Failure\ recurrence\ index = \frac{\sum Equipment\ failures}{\sum ALS\ subsystem\ failures}$$

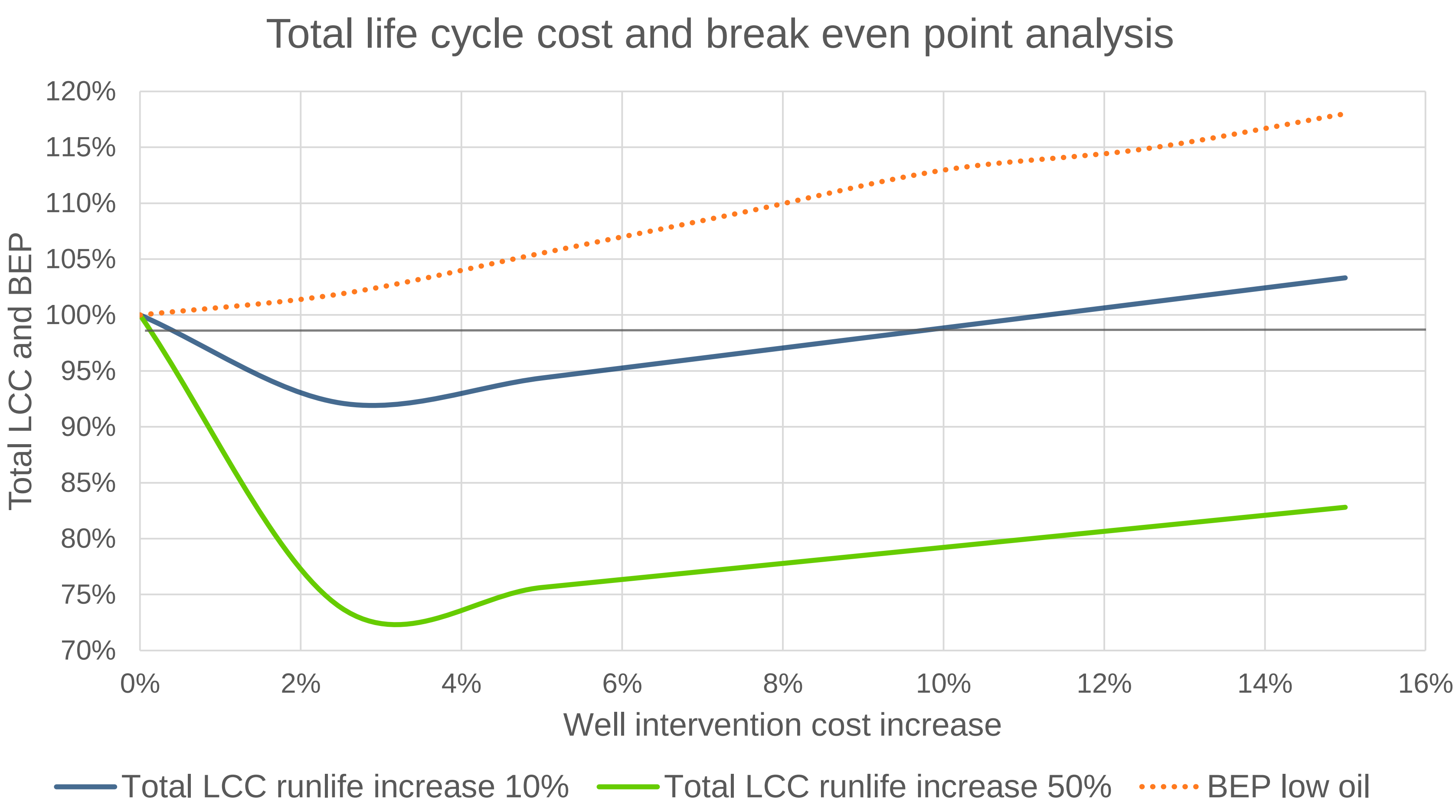
Ref: SPE-190958-MS

Results
SRP - Mean Time Between Failures



Ref: SPE-190958-MS

Results
SRP - Life Cycle Cost



Ref: SPE-190958-MS

Summary

- In-house failure analysis serves as the fundament for continuous artificial lift system optimization
- Quality assurance by factory acceptance tests at the pump manufacturer and laboratory inspection of failed parts ensures high quality of equipment
- Root cause failure analysis is a vital method to mitigate severe and recurring problems
- Economics: Increase of runlife leads to a decreasing amount of well interventions thereby decreasing life cycle costs
- Shift from standardization to customization of equipment for specific well conditions

References

- SPE-190958-MS (August 2018)
- SPE-185770-MS
- ISBN 978-3-941721-86-9
- API RP 11S1
- API 11AX

Legal Disclaimer

This presentation is prepared in order to outline our expression of interest. Nothing in this presentation shall be construed to create any legally binding obligations on any of the parties. Neither party shall be obligated to execute any agreement or otherwise enter into, complete or affect any transaction in relation to this presentation.

All figures and information in this presentation are strictly confidential, they are by no means binding and thus indicative only.

Contact

Bernd Kometer

EATTP-T Production Technology

bernd.kometer@omv.com

OMV Austria Exploration & Production

Protteserstraße 40

2230 Gaenserndorf

Austria

www.omv.com