Artificial Lift R&D Council

# Sucker Rod Connections Reliability Improvement Via Diagnostics of Power Tongs

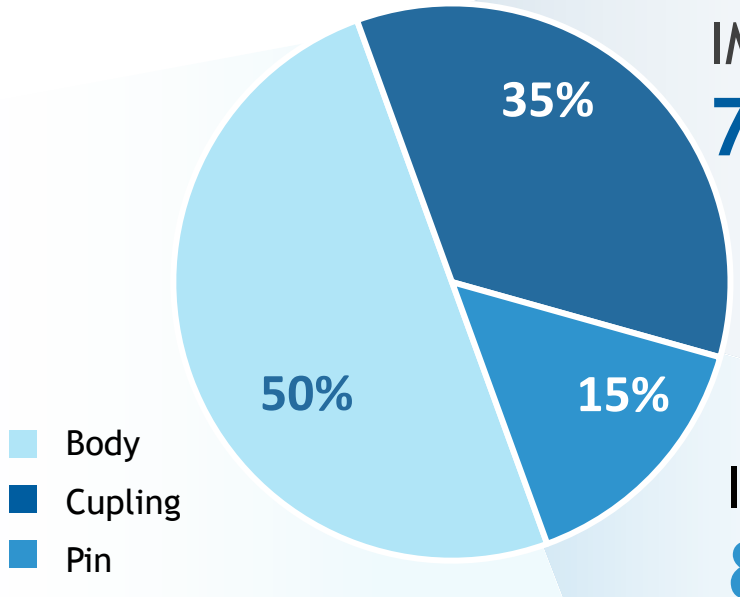
Presenters: Esteban Oliva; Andres Alam; Federico Camara; Liliana Valdebenito

2023 International Sucker Rod Pumping Workshop
Aug 28-31, 2023. Midland TX

# Connection Failures

## Improper make up (IMU)

Typical Fault Zone Statistics




IMU
70%

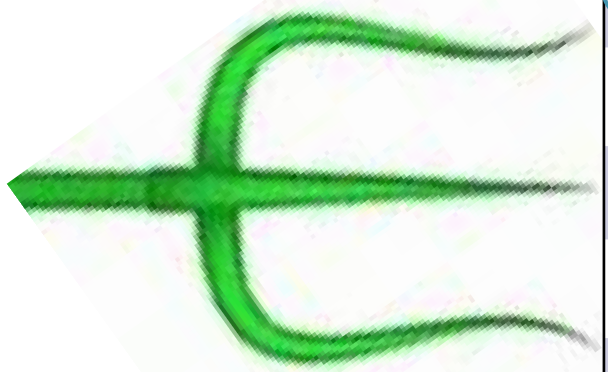
IMU
89%

Failure Statistics for YPF and other operators in Latin America

# Sucker Rod Connection Reliability Trident

SPE-209750 Sucker Rod Connection Failure Reduction Using a Three-Pronged Approach – Anderson, Oliva, Richardson, Mogus

**Three layers of protection against "unhealthy" connections**



**Ongoing** – Started in 2014

| Trident prong |
| --- |
| Rig ops QA/QC (Process control) |
| AND |
| Connection Dry Pin (technology) |
| AND |
| Coupling Prep/Buck-on (process control) |

# Connection Make-up QA/QC

PEOPLE

EQUIPMENT

OPERATING CONDITION

Operations QA/QC

WORK IN PROGRESS

COMING SOON

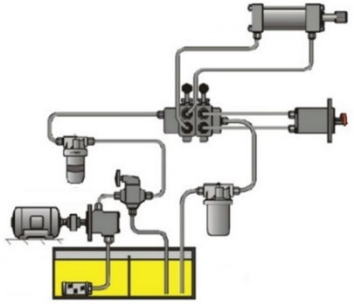
## Tenaris Rods Long Term Plan for Connection Reliability Improvement

- Develop staff skills & competences
- Key equipment performance analysis (rod tongs)
- New technologies for continuous recording in real time

# Hydraulic system To Make-up Rods

**EQUIPMENT**

**WORK IN PROGRESS**



Q + P

Torque

## POWER SOURCE

- T° and viscosity
- Oil Quality
- Motor Capacity
- Maintenance

## HYDRAULIC CIRCUIT

- Efficiency losses
- Circuit Shared with other systems (main drum, rig Jack, floor jacks)
- Fluid Friction in accesories, valves, elbows, crossovers

## POWER TONGS

- Most precise & delicate system in the rig
- Leaks
- Mechanical Wear.
- Gear Ratio
- Operator skills

# Development of a calibration method for Power Tongs

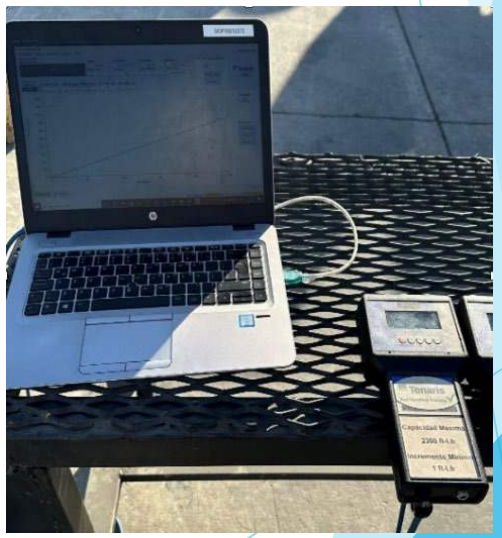
## GOAL: To measure the true make-up torque the power tongs in the rigs deliver to the rod connections

- Robust
- Wrench Square for 1” SR
- Main parameter measured torque over time
- Proprietary software:
  - Data capture
  - Processing and reporting output - immediate

# Development of a calibration method for Power Tongs

- Adapts to all hydraulic power tongs in the industry
- Real Time information of make-up parameters



# Input information

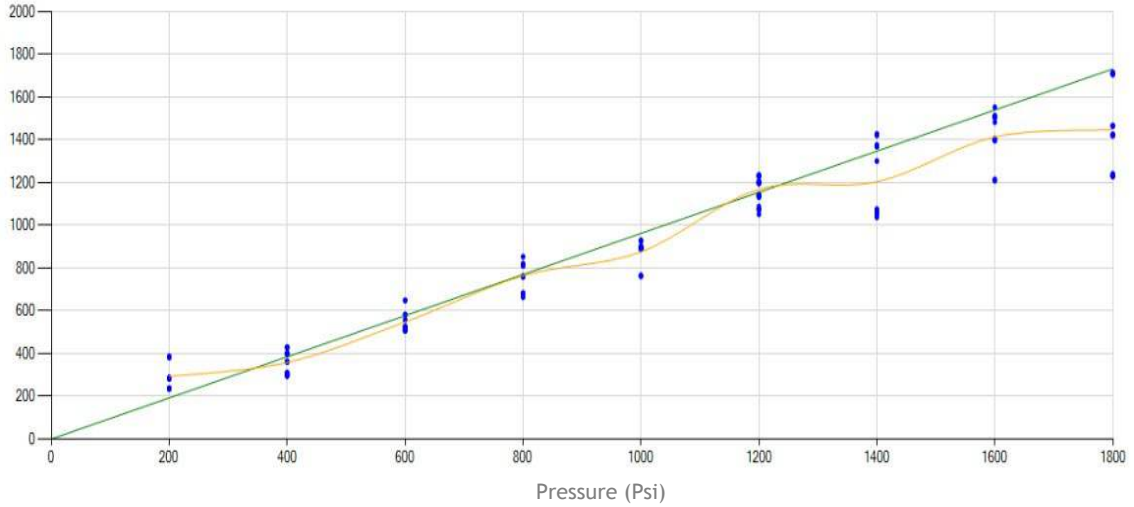
## TS-MUTorq Software

- Manual
- Automatic

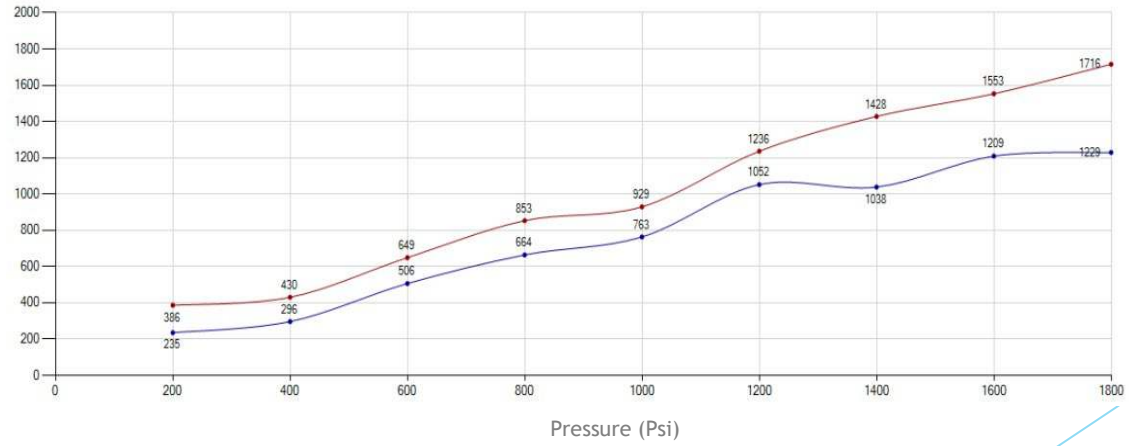
- Tool: Analogic signal
- Software: Sampling rate 50 to 5,000 datapoints per second
- Pressure: Manual fix input
- Libraries loaded:
  - Rod grade and size experimentally characterized by Tenaris
  - Power Tong Torque vs pressure manufacturer charts

# Output Information

**Pressure - Torque and comparison to the manufacturer's curve**




**Minimum and maximum values**



# Output Information

## Connection Make-up Target values

Low torque deviation

High torque deviation

**Maximun Average Torque [lbxft]**

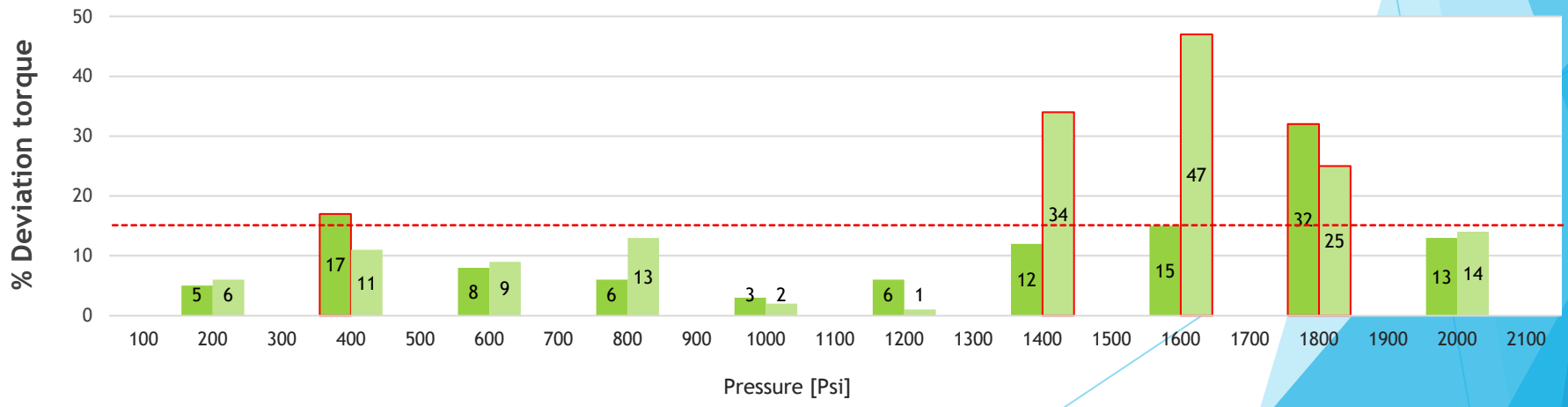
All runs met min torque 1436 lb.ft

| | | | |
|---|---|---|---|
| 1'' D<br>850 | 1'' ACS<br>1000 | 1'' MMS<br>1100 | 1'' AHS<br>1350 |
| 7/8'' D<br>650 | 7/8 ACS<br>800 | 7/8'' MMS<br>900 | 7/8'' AHS<br>1000 |
| 3/4'' D<br>450 | 3/4'' D<br>600 | 3/4'' MMS<br>700 | 3/4'' AHS<br>800 |

Min torque deviation

Max torque deviation

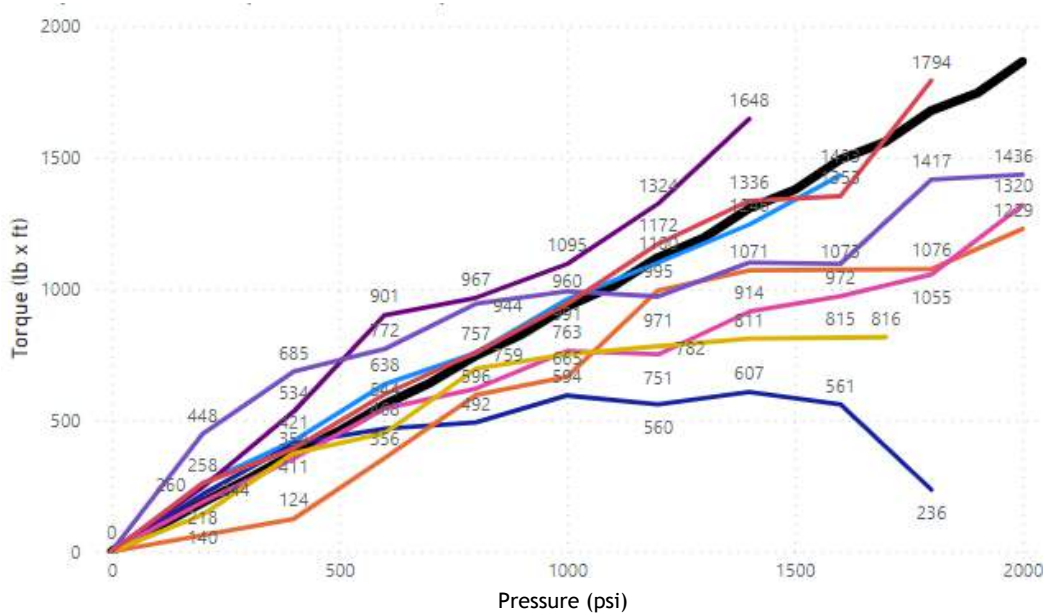
Exceeded % deviation

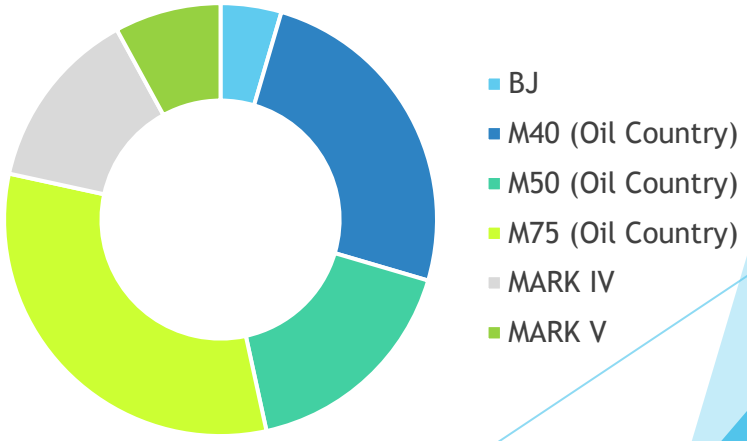


# Data Set Analysis

- Statistical curves – Reduced sample
- 11 months of data collection and análisis
- 36,000 Torque vs Pressure data points to date

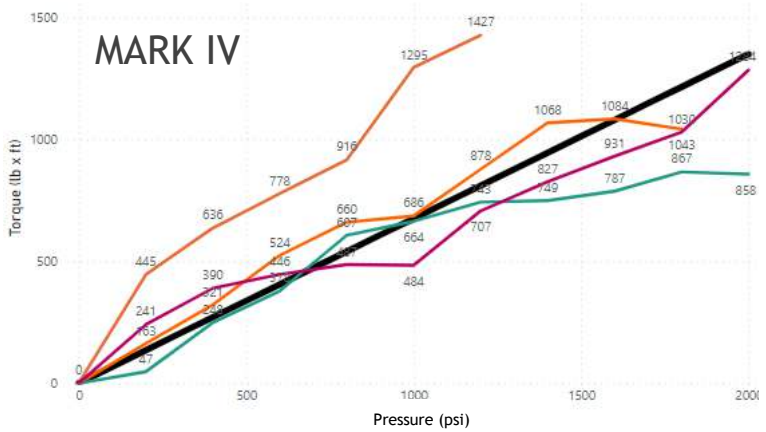
**+60**
Measured
Power Tongs

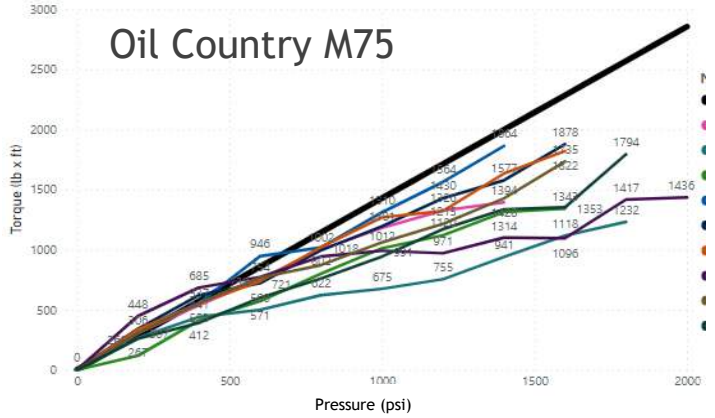


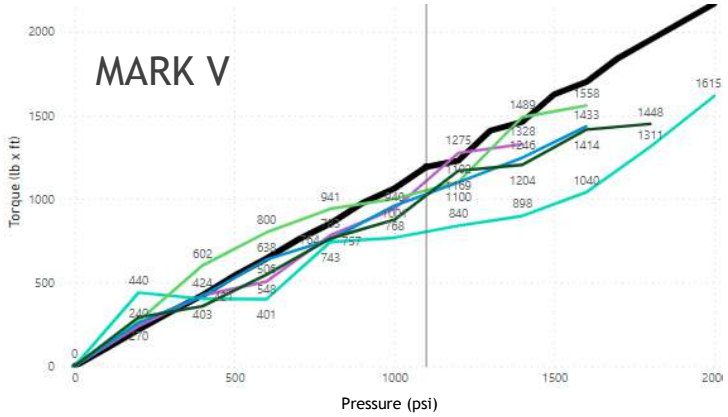



# Results and Analysis in Latin America

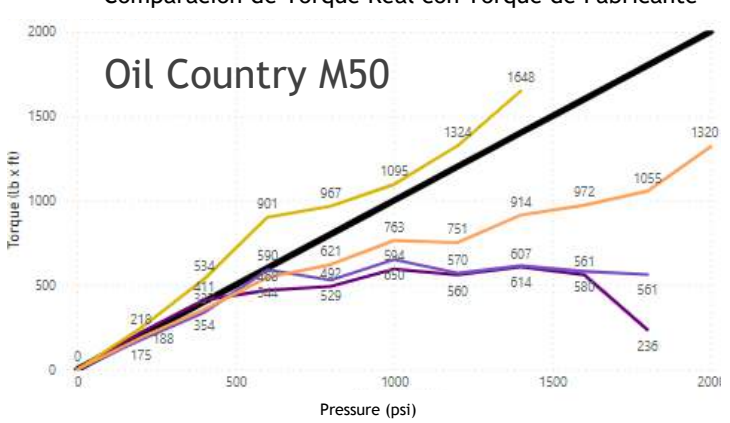
## Data Set Analysis



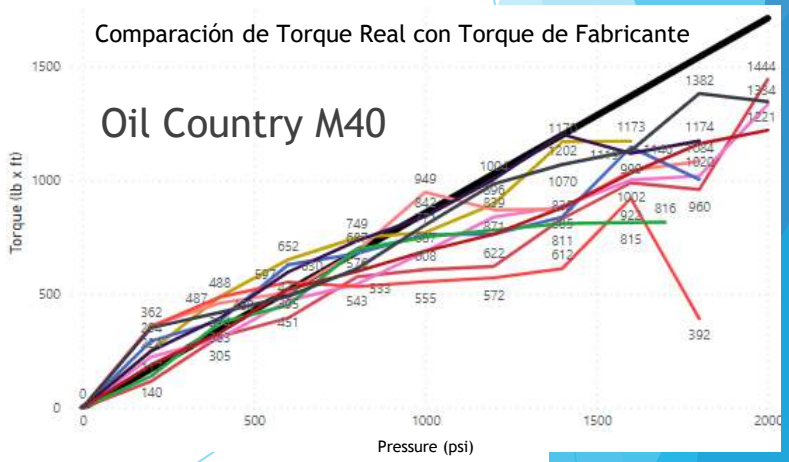




Comparación de Torque Real con Torque de Fabricante

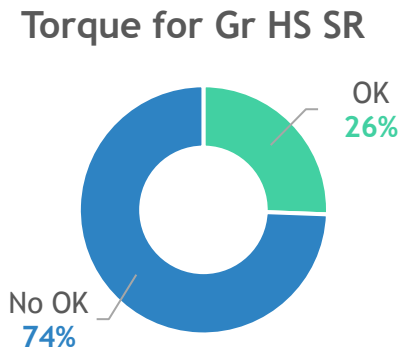


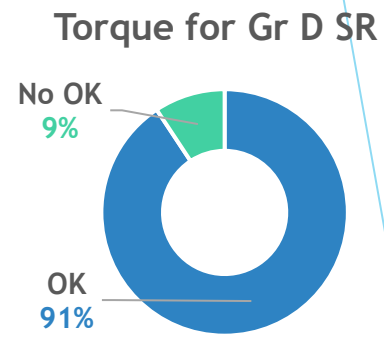

Comparación de Torque Real con Torque de Fabricante

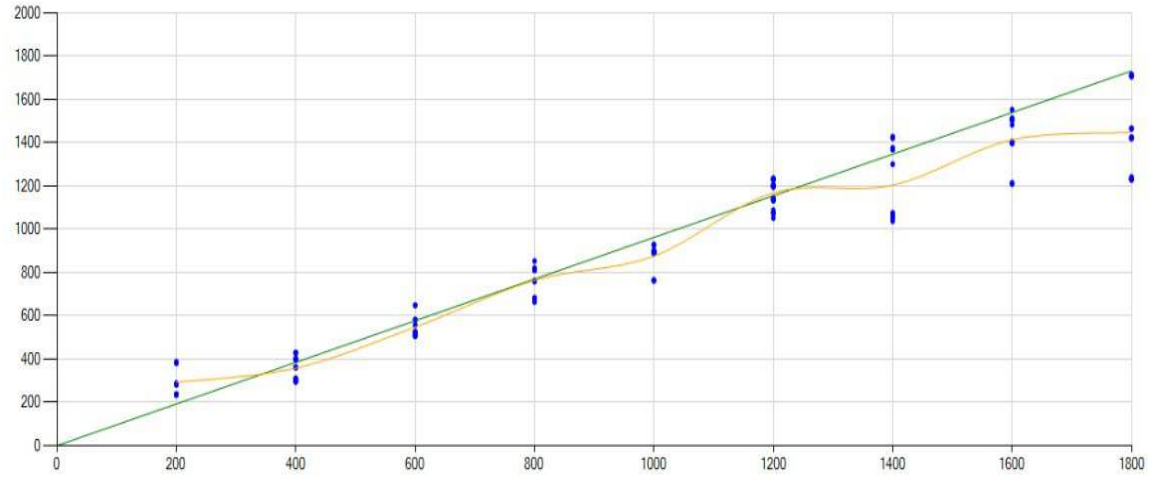


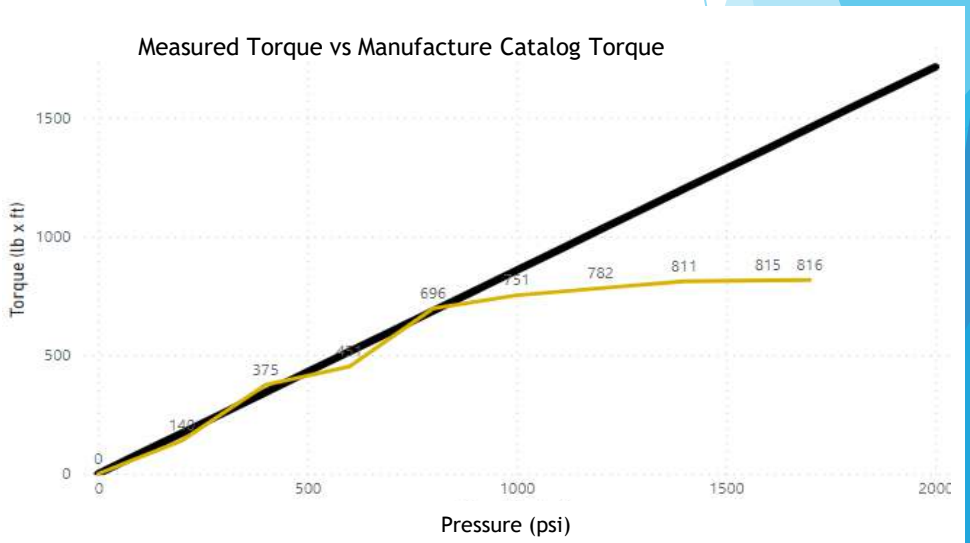
# Results and Analysis in Latin America

- Many tools flatten out at around 800psi until max pressure
- A small % of tools recover their manufacturer spec'd performance
- A large % of tongs struggle to reach required torque for HS connections



# Results and Analysis in Latin America

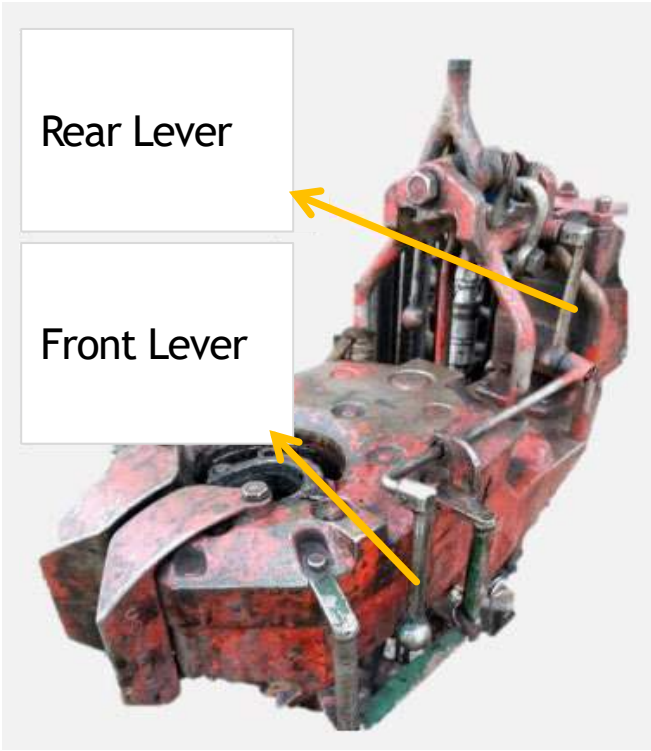
## Specific Findings - examples

### Drive Levers

- Front vs rear levers actuation defficiency
- Up to 50% torque loss

### Ambient Temperature/make-up HS grade:

- Summer, 25°C - 30°C (F), required 1,200psi
- Winter, -2°C (28F), required 1,600psi.



# Opportunity for Improvement

- Oil P&T automatic capture into software
- Under development via BT P&T transducer
- As of today, requires manual data transfer to TS-Torq-Max Software data table
- Customize Analysis output as per operator's needs

- Tong acceptance/rejection criteria
- Regional and operator specific

# New Developments

OPERATING CONDITION

COMMING SOON

**Smart Back-up**

**Hydraulics Advanced Diagnostic**

Break away Torque – Polish Rod torque

# Conclusion

- Ambient conditions, equipment maintenance, operator training, etc, are all important factors that must be understood and properly controlled for rod connection reliability
- This is another step in helping operators:
  - Understand what impacts the reliability of the rods connections
  - Find areas of focus to improve rod connection make-up reliability via QAQC
- Service companies are a vital part of the team, and help greatly in improving connection reliability

# Copyright

- Rights to this presentation are owned by the company(ies) and/or author(s) listed on the title page. By submitting this presentation to the International Sucker Rod Pumping Workshop, they grant to the Workshop, the Artificial Lift Research and Development Council (ALRDC) rights to:
  - Display the presentation at the Workshop.
  - Place it on the www.alrdc.com web site, with access to the site to be as directed by the Workshop Steering Committee.
  - Links to presentations on ALRDC's social media accounts.
  - Place it on an USB/CD for distribution and/or sale as directed by the Workshop Steering Committee.
- Other uses of this presentation are prohibited without the expressed written permission of the company(ies) and/or author(s) who own it and the Workshop Steering Committee.

# Disclaimer

The following disclaimer shall be included as the last page of a Technical Presentation or Continuing Education Course. A similar disclaimer is included on the front page of the International Sucker Rod Pumping Workshop Web Site.

The Artificial Lift Research and Development Council and its officers and trustees, and the International Sucker Rod Pumping Workshop Steering Committee members, and their supporting organizations and companies (here-in-after referred to as the Sponsoring Organizations), and the author(s) of this Technical Presentation or Continuing Education Training Course and their company(ies), provide this presentation and/or training material at the International Sucker Rod Pumping Workshop as is" without any warranty of any kind, express or implied, as to the accuracy of the information or the products or services referred to by any presenter (in so far as such warranties may be excluded under any relevant law) and these members and their companies will not be liable for unlawful actions and any losses or damage that may result from use of any presentation as a consequence of any inaccuracies in, or any omission from, the information which therein may be contained.

The views, opinions, and conclusions expressed in these presentations and/or training materials are those of the author and not necessarily those of the Sponsoring Organizations. The author is solely responsible for the content of the materials.

The Sponsoring Organizations cannot and do not warrant the accuracy of these documents beyond the source documents, although we do make every attempt to work from authoritative sources. The Sponsoring Organizations provide these presentations and/or training materials as a service. The Sponsoring Organizations make no representations or warranties, express or implied, with respect to the presentations and/or training materials, or any part thereof, including any warrantees of title, non-infringement of copyright or patent rights of others, merchantability, or fitness or suitability for any purpose.