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EVRlock QB1-HT Field Trial

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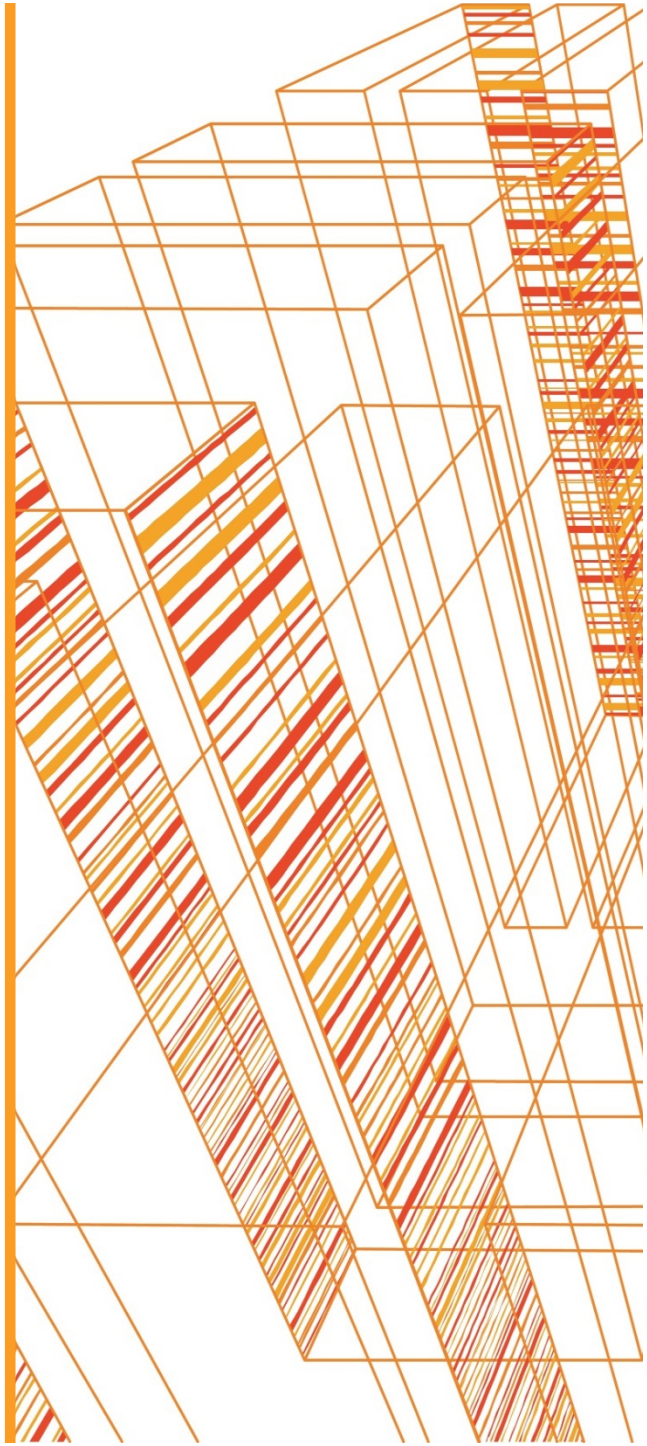

Contents

Background

EVRAZ performs multiple “make-and-break” trials on the *mill pin* and the *mill side* of the coupling during the EVRlock QB1-HT connection qualification process at our manufacturing locations. While these trials do test the connections’ ability to resist galling under ideal conditions, they do not account for less than idea conditions sometimes encountered during make-up of the “field side” of the connection.

This trial replicated most of the known deviations from ideal running conditions seen during normal field operations. EVRAZ believes it is imperative that full scale testing be performed with the pipe hanging vertically in the derrick to provide real world data on connection make-up performance.

Trials

Purpose

These trials enhanced the EVRAZ knowledge base of how changes in essential variables affect the EVRlock QB1-HT connections' ability to successfully make-up in the field. The trials also enhanced the EVRlock QB1-HT running procedure and provided additional information on troubleshooting make-up challenges that occur from time to time.

Practices Trialed

1. Occurrence of stab damage on pin and coupling threads associated with thread phase positions
2. Effects of angular misalignment between the two joints during connection makeup
3. Effects of over-torquing the connection

Detailed Description of Trial Process

1. Thread Phase Engagement

We have occasionally received reports of thread galling on EVRlock QB2, which has the same thread form as EVRlock QB1-HT, during make-up. The random occurrence of this condition may be related to how the threads align and mate during stabbing. It is surmised that a few thread crests are displaced and damaged when they are coincidently aligned at an undetermined engagement phase position. This trial was performed to determine the validity of this hypothesis.

We first attempted to determine the position of minimum flank contact prior to starting by referencing the EVRlock QB1-HT drawing. If this was not possible, we determined the position by aligning the starting point of the pin and coupling threads, then continued to work around the circumference. Protocol was:

1. Stab the connection in a “normal manner”
2. Lift out pin and inspect for damage
3. Repeat 1 and 2 again (if no damage, rotate 1/8 turn and repeat until 360° was tested)

Detailed Description of Trial Process (cont.)

2. Vertical Alignment

Alignment is likely the single biggest variable encountered in the field. We developed a series of situations that reproduced the two types of high torque conditions typically seen.

- Align pipe over stump (hanging free in the derrick)
- Make power tight
- Breakout and inspect
- Misalign pipe by 1 pipe diameter
- Repeat
- Misalign pipe by 2 pipe diameters
- Repeat

3. Over Torque of Connection

- Make-up the connection using torque value that is 25% above the nominal value
- Break out the connection
- Inspect the pin and coupling for obvious damage
- Repeat two additional times

Equipment

1. WinCatt (or other torque monitoring process)
2. Digital inclinometer (Bosch DNM 60 L Professional or other such devise)
3. Digital IR (3M 1100)
4. 10 joints (+ 2) of 7" x 26# EVRlock QB1-HT
5. 4 Liters of Green Seal Supreme + “bottle style” dope brush
6. Checklist of tasks to be performed
7. Procedure
8. Witness connection performance during makeup.

Ensign 112E – July 2013 EVRlock QB1-HT Field Trials

1. Thread Phase Engagement

Stab Cycle Number	Observations After Lift Out		Comments
	Pin End	Coupling	
Pipe 2 - Cycle 1	3" long very minor scuff on two thread crests	Corresponding scuff and removal of phosphate	
Cycle 2	No change	No change	
Pipe 3 Cycle 1	Some minor whiskers appearing	Some minor rolling of the stab side of the flanks	
Cycle 2	A few more whiskers	More rolling	
Cycle 3	No change	No change	Starting thread slightly deformed
Pipe 4 Cycle 1	More whiskers	More rolling	Started with pin on the coupling face
Cycle 2	Some rolling on the stab flank	No change	Started with pin on the coupling face
Cycle 3	More rolling on the stab flank	No change	Started with pin on the coupling face
Disposition	**Still serviceable with hand dressing**	**Still serviceable after the removal of the loose material**	**Last three stab cycles are considered "extreme "operation**

Comments:

- This test confirmed there is no need to back-spin the connection prior to make-up.
- Only minor damage from the thread phase was confirmed.

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2. Vertical Alignment

Alignment Condition	Stab Process	Temperate Rise at Power Tight	Observations Upon Break Out
#5 Good (< 1/8 pipe diameter misalignment)	With guide and slow	+ 8°F	Normal scuffing of phosphate
# 5-1 One pipe diameter	Pushed into position (with guide and slow)	+ 10°F	Normal scuffing of phosphate, very minor upturned edges on non-full crested threads
# 6 Two pipe diameters	Pushed into position (with guide and slow)	+ 112°F	Moderate to severe galling (the galling was very evident on the WinCatt). The vertical misalignment was very noticeable

Comments:

- Alignment of the pipe prior to stabbing and make-up plays a very important role in determining the success rate of connection make-ups.
- Connections that are reasonably aligned combined with thread compound applied in an appropriate manner will provide good serviceability.


Misalignment

Ensign 112E – July 2013 EVRlock QB1 HT Field Trials (cont.)

3. Over-torque Condition

- 7”, 26# QB1 HT connection optimal torque is 15,000 ft/lbs, (with a window of 13,500-16,500 ft/lbs)
- 15,000 + 25% = 18,750 ft/lbs
- Makeup connection using 18,750 ft/lbs at 15 rpm
- Note: The field running services tong was only able to generate torque in the 18,350 to 18,450 ft/lbs range

	Pin End Condition	Coupling End Condition
PIN 7		
# 1	Feather edge on starting thread rolled in; some rolling of black crested threads	Scuffing of phosphate with very minor flank rolling
#2	No change	Minor rolling of load flank
PIN 8		
# 1	Some rolling of black crested threads	Scuffing of phosphate with very minor flank rolling
#2	No change	No change
PIN 9		
# 1	Some rolling of black crested threads	Scuffing of phosphate with very minor flank rolling
#2	Minor ‘bat ears” on two BCT	No change

Supplemental testing was done at the driller’s request to determine the effects on a connection if the pipe was dragged up the v-doors without a pin protector.

PIN 10		
Prior to stab	A small “ding” < 20mm long was seen on the first thread	
Breakout	“Bat ears” on black crested threads	Minor scuffing of phosphate

COUPLING END AFTER 3 STAB CYCLES WITH NO THREAD COMPOUND

PIN END AFTER 3 STAB CYCLES WITH NO THREAD COMPOUND

OVER-TORQUE - PIN 7 AFTER BREAK OUT

Observations and Recommendations

1. The need to “back spin” the connection prior to makeup is neither required or recommended.
2. Pipe alignment over the stump of should exhibit < 0.5 pipe diameters of lateral misalignment prior to being pushed into the stab position.
3. The use of a stabbing guide is recommended because more damage was noted when the pin was “face stabbed” on the coupling than when it was “kicked in.”
4. The connection exhibits good resistance to moderate changes in make-up torque; therefore, computer-based torque monitoring may not be required once data from the first three to four strings is reviewed and analyzed.
5. Green Seal Supreme thread compound has met all expectations for field serviceability on EVRlock QB1-HT connections and appears to provide good resistance to galling.