



# CORAL 2.0 Technology Replication Thrust Forum Q4 2018

## Lessons Learned: Thru-Tubing Ceramic Screen Applications

30<sup>th</sup> November 2018  
Room 302-303, KL Convention Centre

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Open

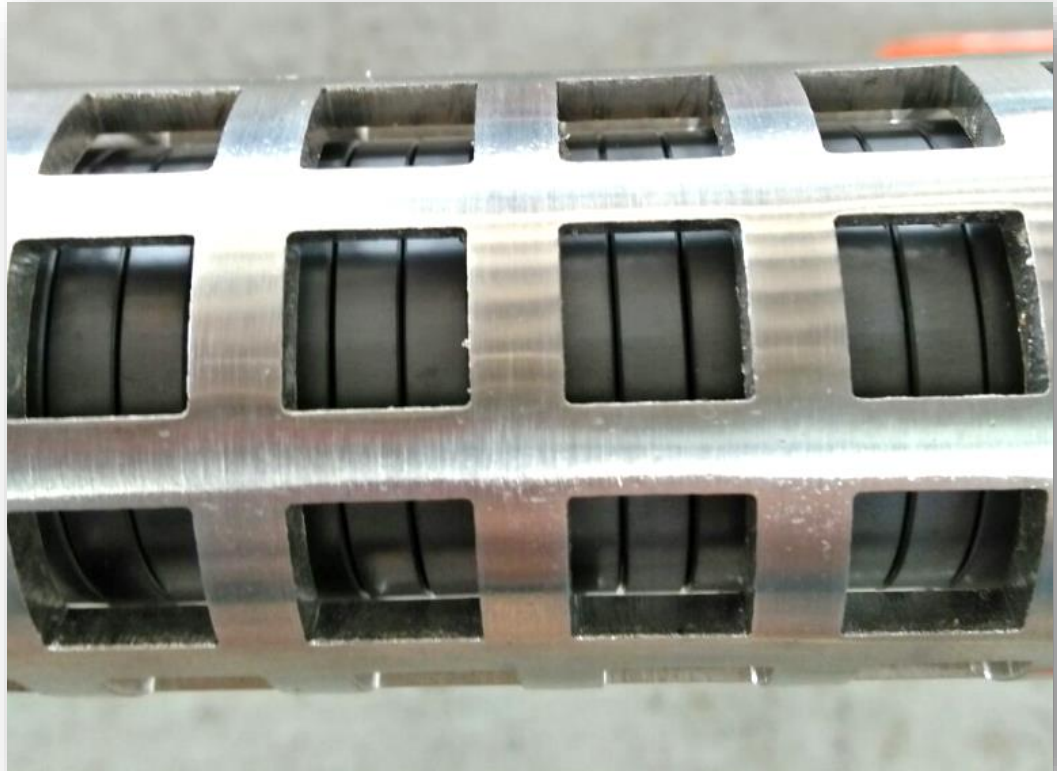
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# Presentation Outline

1. What Is Ceramic Screen?
2. Experiences to Date
3. Summary of Screen Failure Incidents
4. Tear-down Inspections
5. Conclusions & Way Forward

# What Is Ceramic Screen?

- Made of Silicon Carbide (SiC)
- Very high hardness
- Highly erosion resistant



# Experiences to Date

- **Thru-tubing ceramic sand screens (TTCSS) deployed in Samarang, Baronia, Bokor & Shallow Clastic Fields from Oct 2016 to Apr 2018**
  - ❑ To overcome erosion limitations of metallic screens
  - ❑ To reactivate idle wells
- **9 screen integrity failure incidents out of total 19 installations**
- **Investigation team formed → Tear-down inspections in Labuan & follow-up analysis  
→ Screen design improvement efforts on going**
- **Suspension of any further deployment recommended until screen improvement**



# Summary of Screen Failure Incidents

- **Samarang (oil): 1 failure of 2 installations**
  - ❑ Failed during installation process (jarring) in Oct 2016
  - ❑ Replacement screen installed in the same well without jarring in Apr 2017 & well flowing
- **Baronia (oil): 3 failures of 9**
  - ❑ Failed after 6 to 15 months on cum production
  - ❑ 1 LOPC
  - ❑ 1 Fish (3 ceramic screen joints) left in hole
- **Bokor (oil): 1 failure of 4**
  - ❑ Failed from the beginning. Well continued to produce large amount of sand thru portable desander & shut in
- **Shallow Clastic (gas): 2 confirmed failures & 2 not open out of total 4 installations**
  - ❑ The other 2 not open due to high risk of the same failure
  - ❑ 1<sup>st</sup> failed after 62 hrs of flow. 2<sup>nd</sup> after 12 months in hole
  - ❑ Platforms shut down 1 month – Loss about Rm 800 mil



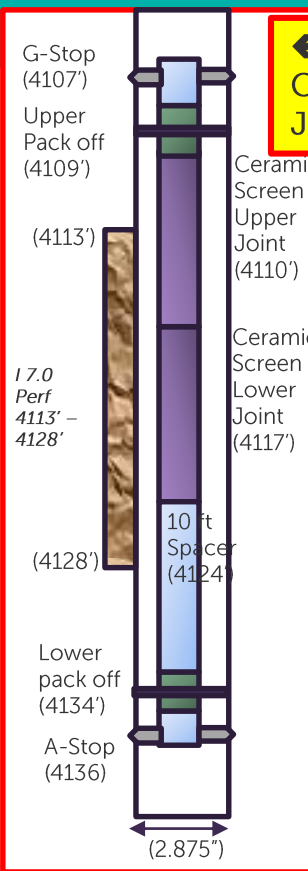
# Samarang F77L – Installed Ceramic Screen Twice

## WELLBORE SCHEMATIC



Well	SMRG F77	Prodn. Casing	9.5/8"
Field	SAMARANG	Prodn. Tubing	3-1/2" x 9.3 Hydril A95
Location	SMRG JT-F	Depth unit	FT.AH.BTHF (57 ft BDF)
Completion Date	27 Mar 1987	Last Job	LS: CP and Tubi Punch 08/08, TOC 13.01.14, Add Perf 28.01.14, GLVC 02.02.14, TTSS 02.02.14, FGS 31.3.15, SGS 07.0.2.5.15, TOC 4/1/2016, TTSS replacement 8.3.16, RVC & take sample 7/4/2016, SCO 8.9.16, TTSS ceramic installed 11/10/16, Retrieved TTSS 28/10/16 SS: RBT LOG 12.09.13, TOC 12.01.14, Add Perf 27.01.14, GLVC 01.02.14, TTSS 02.02.2014, GLVC 18.05.14, SGS 4.5.15, FGS (7/5/2015), Ret TTSS 14.3.16, TTSS Installation 9/4/2016
Well Type	Dual Oil Producer	Remarks	LS: Ceramic TTSS straddle installed across 17.0 however still produce high sand. Well Closed in. Ceramic TTSS retrieved and found damaged. A-Stop left in hole for reference to re-install TTSS. SS: Currently flowing. Recent GLVC changed SPM 1 from IPO to PPO. Ptro remains 301.
Wellhead / X-over type	MC Evoy Dual	Updated by	Uzair Zubbir/Mukrim Hanafi
Max Deviation	37.8 deg @ 5743 ft	Date	28 <sup>th</sup> October 2016

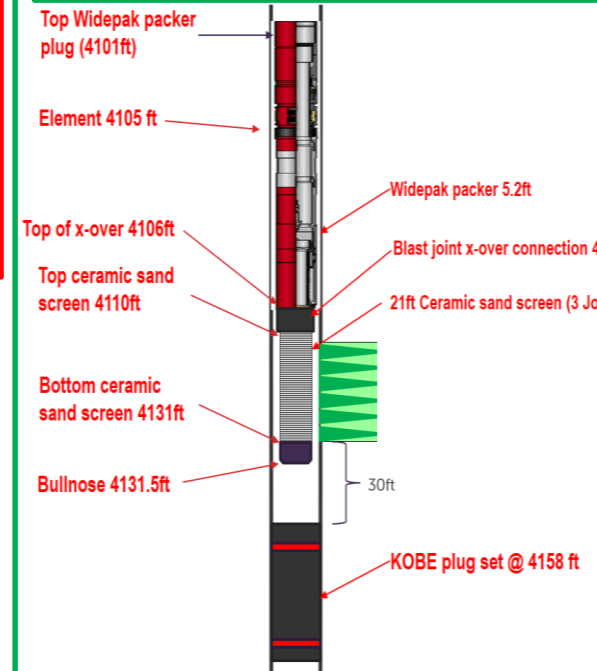
STATUS	MIN ID (IN)	SHORT STRING	DEPTH (FT)	DEPTH (FT)	LONG STRING	MIN ID (IN)	STATUS
B7	2.910 2.812	3.1/2" Flow Coupling 3.1/2" BP-6	399	425	3.1/2" Flow Coupling 3.1/2" BP-6	2.910 2.812	B7
BKR-5 Orifice	2.875 2.875	3.1/2" KBUG 8/64", 301psi 3.1/2" KBUG 12/64"	1058 1848 2382 2388 2390	1176 2001 2702 3304 3885	3.1/2" KBUG 12/64" 3.1/2" KBUG 3.1/2" KBUG 3.1/2" KBUG 3.1/2" KBUG	2.875 2.875 2.875 2.875 2.875	Orifice DK-1 DK-1 DK-1 DK-1
DK-1	2.875	3.1/2" KBUG	2479	3885	3.1/2" KBUG	2.875	DK-1
<b>SGS 4.5.15 Add Perforation 27.01.2014 / New Zones F2.0/3.0</b> <b>F 2.0 (2538-2543 THF, 2595-2600 BDF, 2594.8-2599.8 TVD)</b> <b>F3.0 (2548-2563 THF, 2605-2620 BDF, 2604.8-2619.8 TVD)</b>							
No Plug	2.750	3.1/2" X-Landing Nipple	4148	4143	3.1/2 XO-SSD	2.750	CLOSED
	2.347	3.1/2" Collet & Sleeve	4181	4181	9.5/8" Otis RDH Packer	2.900	CLOSED
	2.313	3.1/2" x 2.7/8" X-Over	4190				
	2.205	2.7/8" XO-SSD	4223				
	2.205	2.7/8" XN-No Go Half Mule Shoe	4257				
		Tubing Punch: 4160'-4164' Cement Retainer: 4002' Baker 9.5/8" D8 Packer w/GP Extension, Size : 194 - 47	4289				
					5.1/2" Wire Wrapped Screen	4.825	
					4.40 SBS 4.40 SBS Baker 9.5/8" DA Packer Size : 194DA60 x 47	2.750	CLOSED
					3.1/2" XO-SSD	2.750	CLOSED
					LOCATOR Tubing Seal Assy.with 7 Seal Units. Size: 80 - 40 3.1/2" x 2.7/8" X-OVER	2.867	
					2.7/8" XO-SSD	2.347	
					2.7/8" XN-NO GO (50° BEVELLED) 4.1/2" WWS	2.313 2.205	CLOSED + plug 29.05.18
					HUD FLOAT COLLAR 9.5/8" CBS SHOE		



← 1<sup>st</sup> installation, Oct 2016 – Ceramic rings shattered due to Jarring during installation

2<sup>nd</sup> installation, Apr 2017

- No jarring. Battery timer set packer
- Still surviving to date Nov 2018 (20 mth). 215 bopd 145 bwpd 0.1 MMscfd in Oct 18

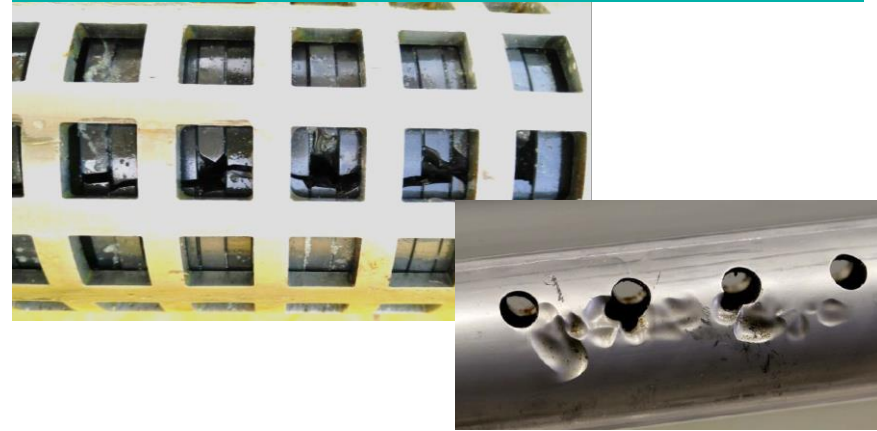


# Samarang F77L – 1<sup>st</sup> installation – Ceramic Screens Shattered

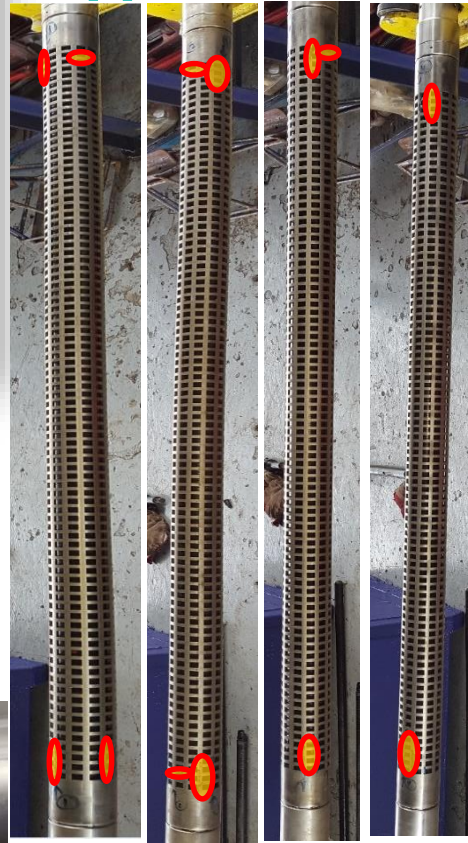
## Choke Body Eroded Open



## Ceramic rings shattered



## Upper Joint



0° 90° 180° 270°

## Lower Joint



0° 90° 180° 270°



# Baronia BN-9S Tear-Down Findings (May 2018)

Hole on upper part of shroud



Base pipe erosion at spring compensator area



Metal seal ring badly eroded



Sections of base pipe fully eroded away





# Baronia BN-67S (June 2018)

- Only a shroud of 1st jt retrieved. Fish – Basepipe & ceramic rings of 1st jt, entire 2nd & 3rd jts



Lock mandrel failure: Double acting spring & 1 key dislodged from lock mandrel body



Empty shroud (base pipe & ceramic rings left in hole)



# Baronia BN-70T (July 2018)



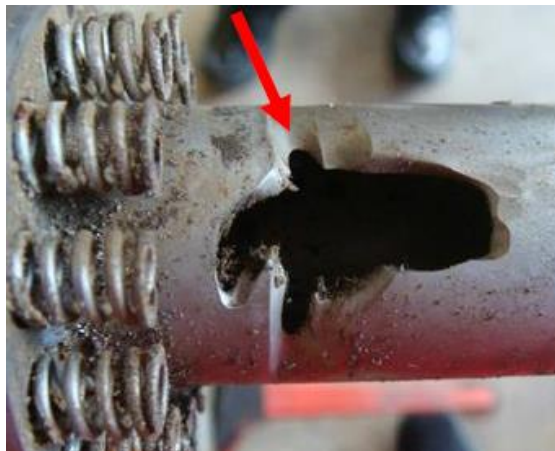
Base pipe almost fully eroded



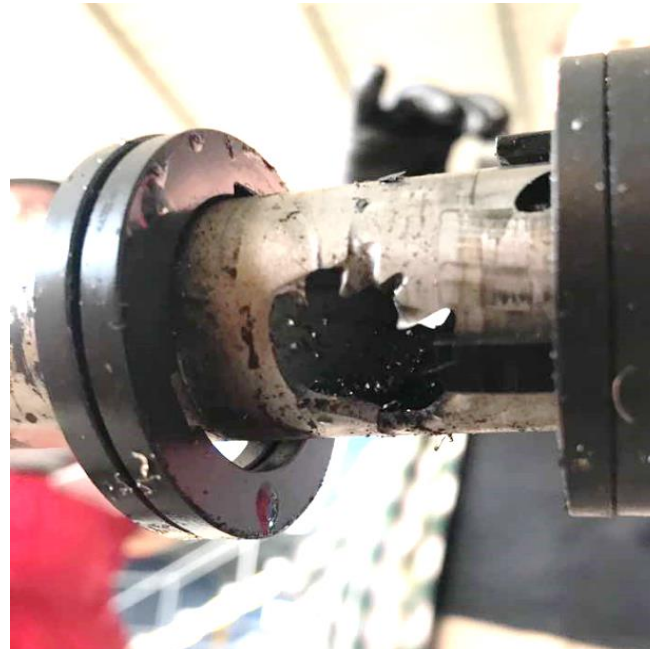
Erosion at box Module #3



Chipped Ceramic



open

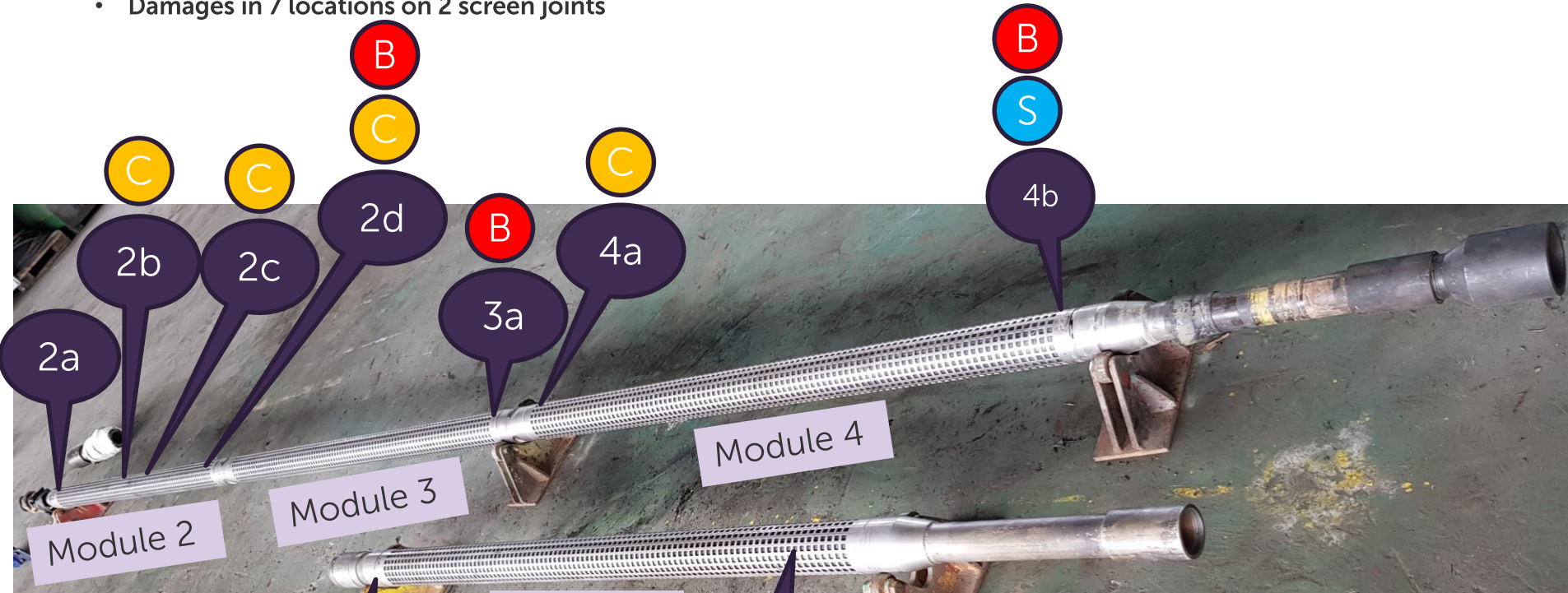


Metal seal ring badly eroded



# Shallow Clastic E11SC-1

- Damages in 7 locations on 2 screen joints



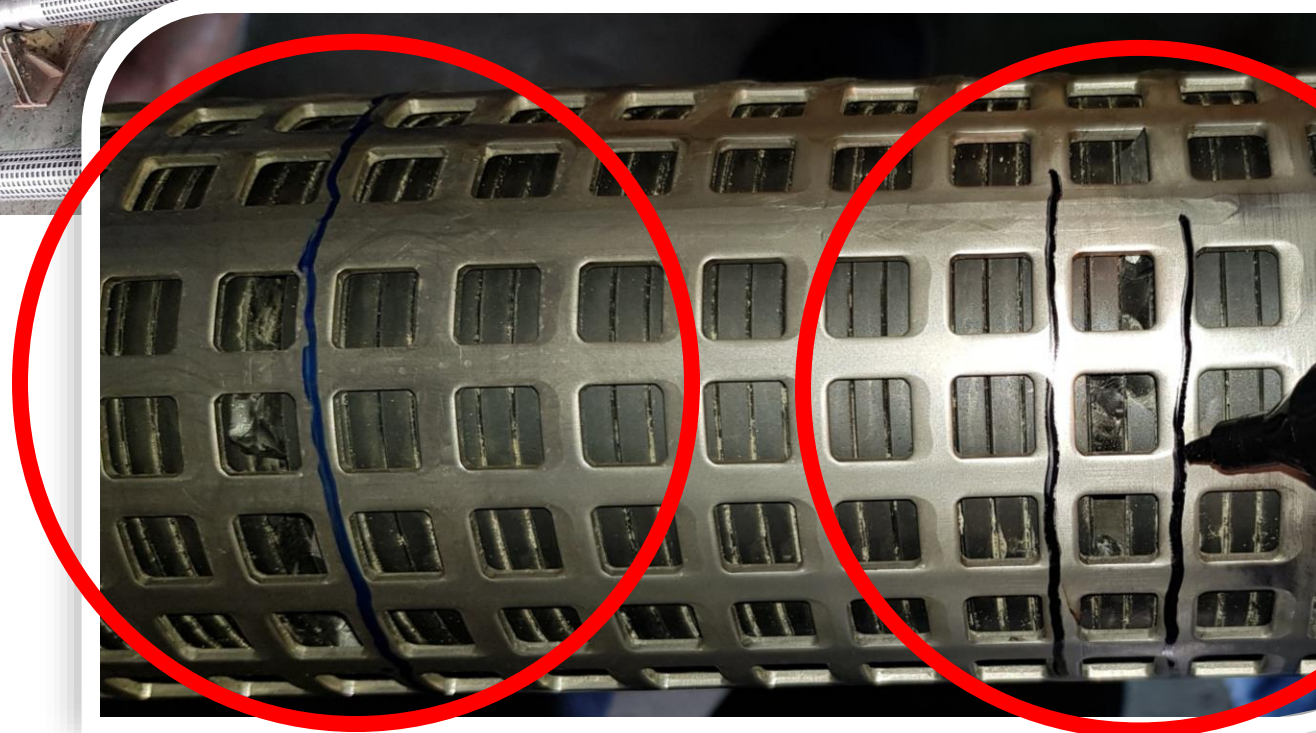
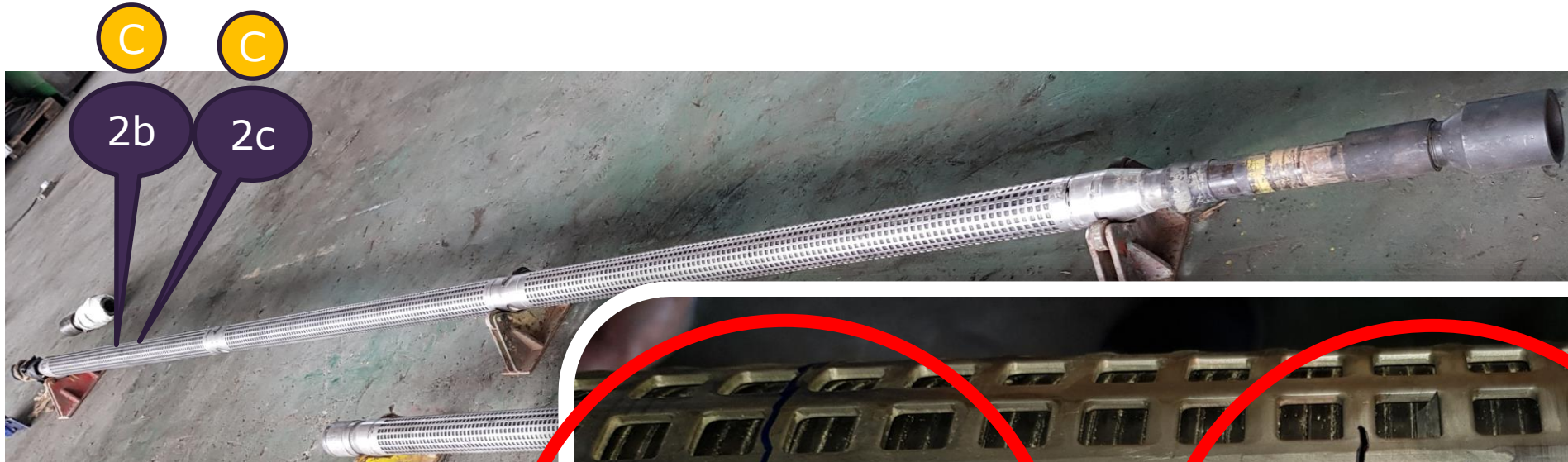
**Legend**

- 1a Location #
- S SS316 Shroud damaged
- C Ceramic ring damaged
- B 13Cr Base pipe damaged

## Location #2b & 2c

External:

- ceramic rings broken at 2 locations in the middle of module 2
- No major erosion on shroud. Only mild

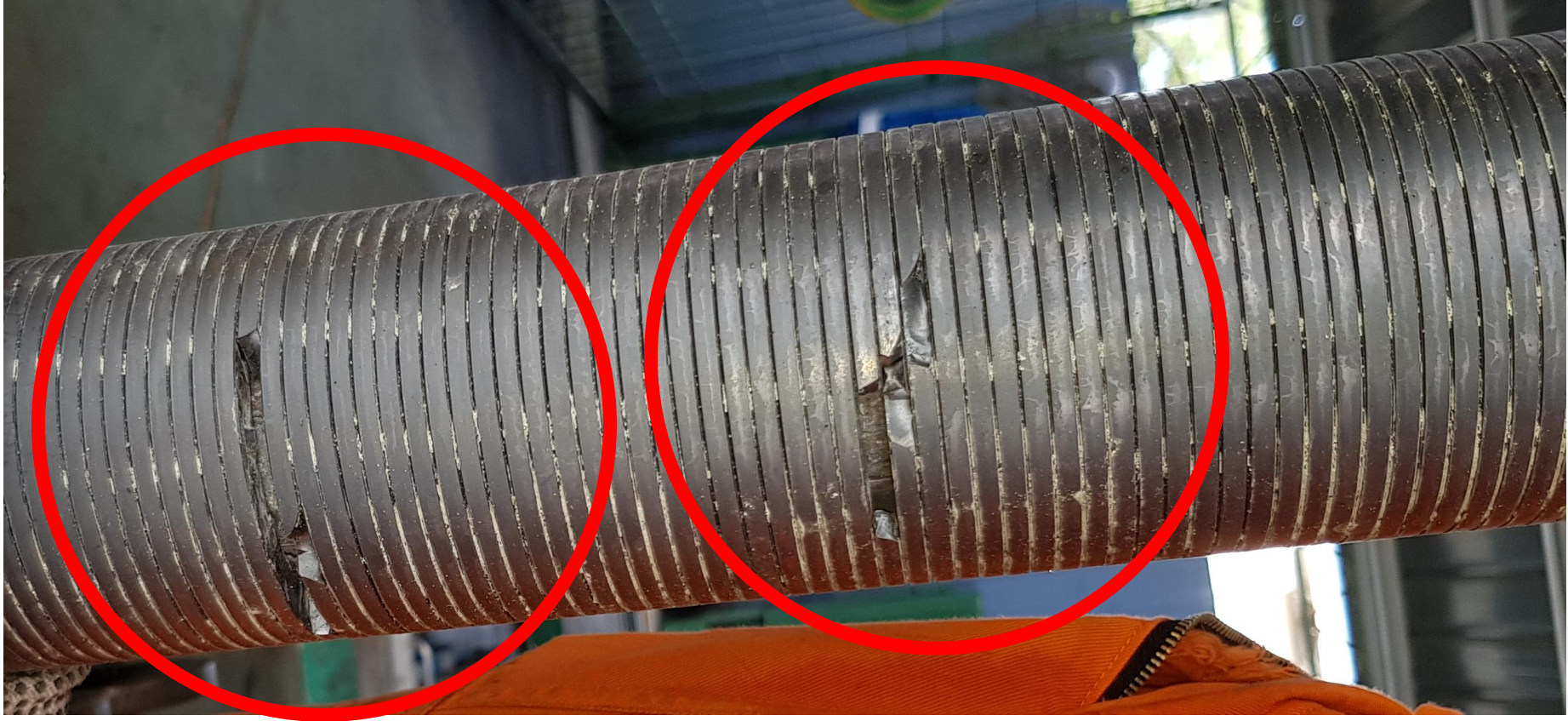


## Location #2b & 2c

External:

- ceramic rings broken
- No major erosion on shroud. Only mild

Close up view after shroud is removed



## Location #2d

B

C

2d

External:

- ceramic rings broken near upper end ring of module 2
- No major erosion on shroud. Only mild



# Location #4b

External:

- Blank portion of shroud severely eroded at multiple points all around near upper end ring of module 4
- Ceramic rings chipped near upper end ring

B

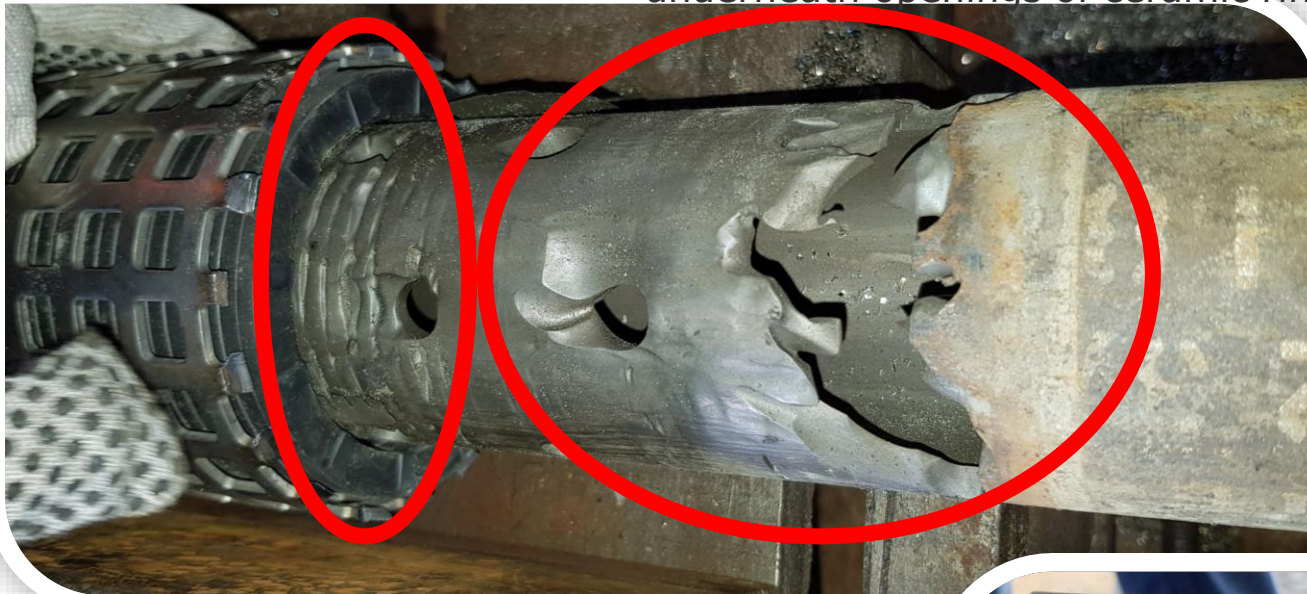
S

4b



## Location #4b

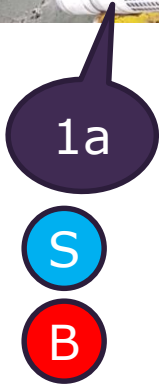
- Severe erosion of base pipe underneath upper end ring of module 4. Material loss almost a half of pipe circumference.
- Circumferential grooves formed on base pipe due to erosion underneath openings of ceramic rings





# Location #1a

Base pipe severely eroded near lower end ring of module 1



# Ceramic Rings Broken



# Conclusions

- Total 19 installations. 10 successes (wells still flowing) & 9 failures so far Nov 1018
- 10 wells successful; still flowing (8 mth up to 20 mth in hole so far). Continuing monitoring.
- 9 failures = 7 confirmed + 2 not planned to open due to high risk (0 - 15 mth on cum prod)
- Ceramic screen = ceramic (rings, end rings) only about 20% & the rest about 80% metal (basepipe, shroud, end caps, pin / box connections, bullnose)
- Metal severely eroded away.
- Ceramic broken in Sallow Clastic gas wells & Samarang well
- Ceramic rings & ceramic end rings were chipped in Baronia oil wells
- Gas wells damaged ceramic screens more quickly (62 hrs prod up to 12 mth in hole)
- Jarring in setting process shattered ceramic rings (Samarang F77L 2nd installation)
- Battery timer set packer approach avoided screen damage (Samarang F77L 2<sup>nd</sup> installation)
- Setting screens across perms tends to build natural sand packing quicker & protect screens
- Setting screens above & away from perms tends to damage screens more quickly
- Setting in nipples w/ lock mandrel: some successful, some still damaged



# Way Forward

- No further installation of ceramic screens until screen improvement
- Avoid jarring to set screens & packers. Gentle & soft setting is needed to avoid damage
- Set screens across perms rather than above
- Screen design improvement efforts on going to minimize erosion on metal
  - ❑ Computational fluid dynamics (CFD), Lab test to confirm CFD analysis results
- Continuing analysis why some failed & some are not in similar conditions
- Search / Develop highly erosion resistant screens
- Share lessons learned & screen performance / long term observations with partners periodically – COLLABORATION is the Way to Go!
- Share Failures, not only Successes. Learning from others' failures can prevent highly costly incidents in our assets. Vice versa.
- TOGETHER & BEYOND! – We can help & benefit each other.



# Thank You



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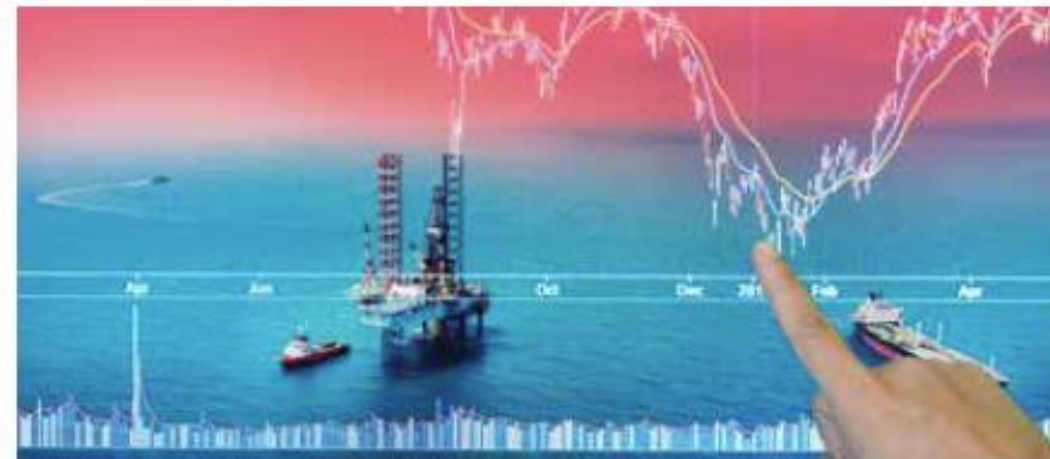
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