

ANCHOR RETRIEVAL BEST PRACTICE & HOW TO PREVENT DAMAGE



VICTOR REMMERS, PRINCIPAL ENGINEER | DELMAR VRYHOF



- 01 GOMO Procedure
- 02 Real anchor data using GOMO
- 03 Changing retrieving direction forward to backward
- 04 Anchor ART: When things go wrong
- 05 Soft Soil alternative: Installing & Retrieving STEVMANTA®

TOPICS

GOMO PROCEDURE

Appendix 11-A Anchor Handling Systems, Set Up & Handling

Table 4 – Execution

Operational phases			
When pulling an anchor out backwards, the number of phases of the operation is dependent on how deep the anchor is buried.			
Phase 1	Initial dislodgement 15-30 min	1.3–1.5 x WD.	
		Low power	<30% MBL of mooring chain, if it is on the roller.
			100-150Te to allow liquefaction / equalisation beneath fluke.
For an anchor at the mudline, phase 1 successfully executed will often break the anchor out cleanly.			
Phase 2	Second rotation 15-30 min	2-5 x WD.	
		W/wire or chafe chain on roller (higher tensions can be applied).	
		100-150Te to allow liquefaction as anchor rotates.	
Phase 3	Translation	2-5 x WD.	
		W/wire or chafe chain on roller.	
		Higher tension – increase power in 50Te / 5min increments.	

GOMO IN GRAPHICS

- **Phase 1: 100-150Te peak @ 1.3-1.5 x WD, 15min**
- **Phase 2: 100-150Te peak @ 2-5 x WD, 15min**
- **Phase 3: Phase 2 +50Te per 5min until breakout**

Appendix 11-A Anchor Handling Systems, Set Up & Handling

Figure 1 – Initial Rotation [phase 1]

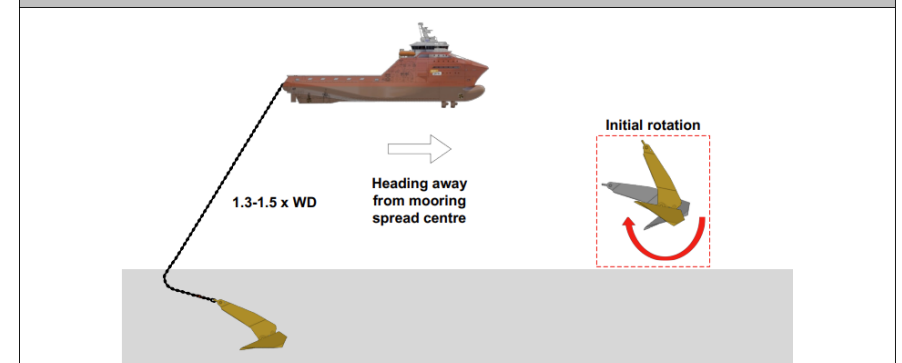


Figure 2 – Second Rotation [phase 2]

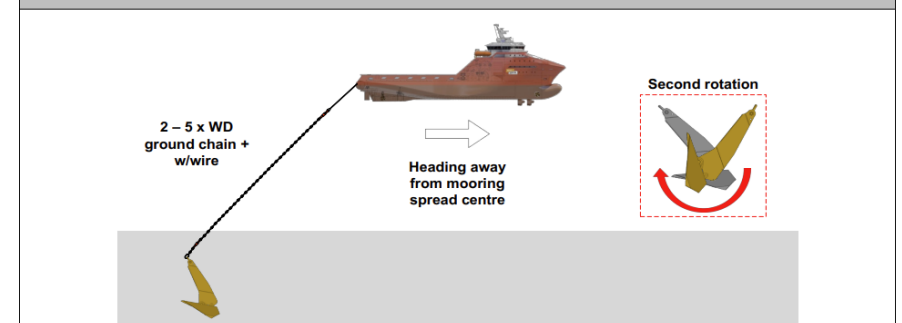
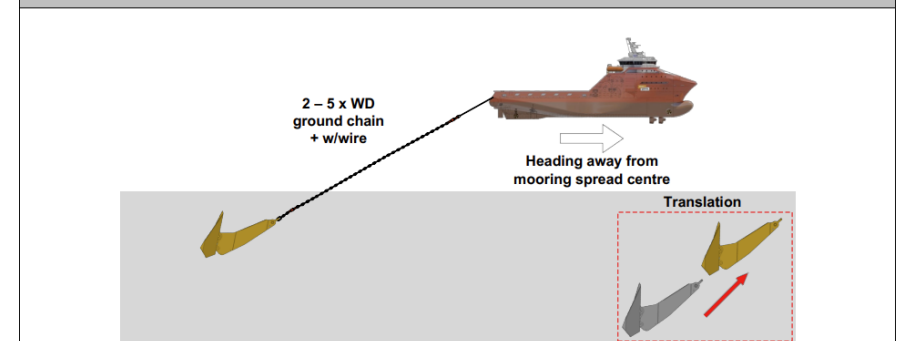
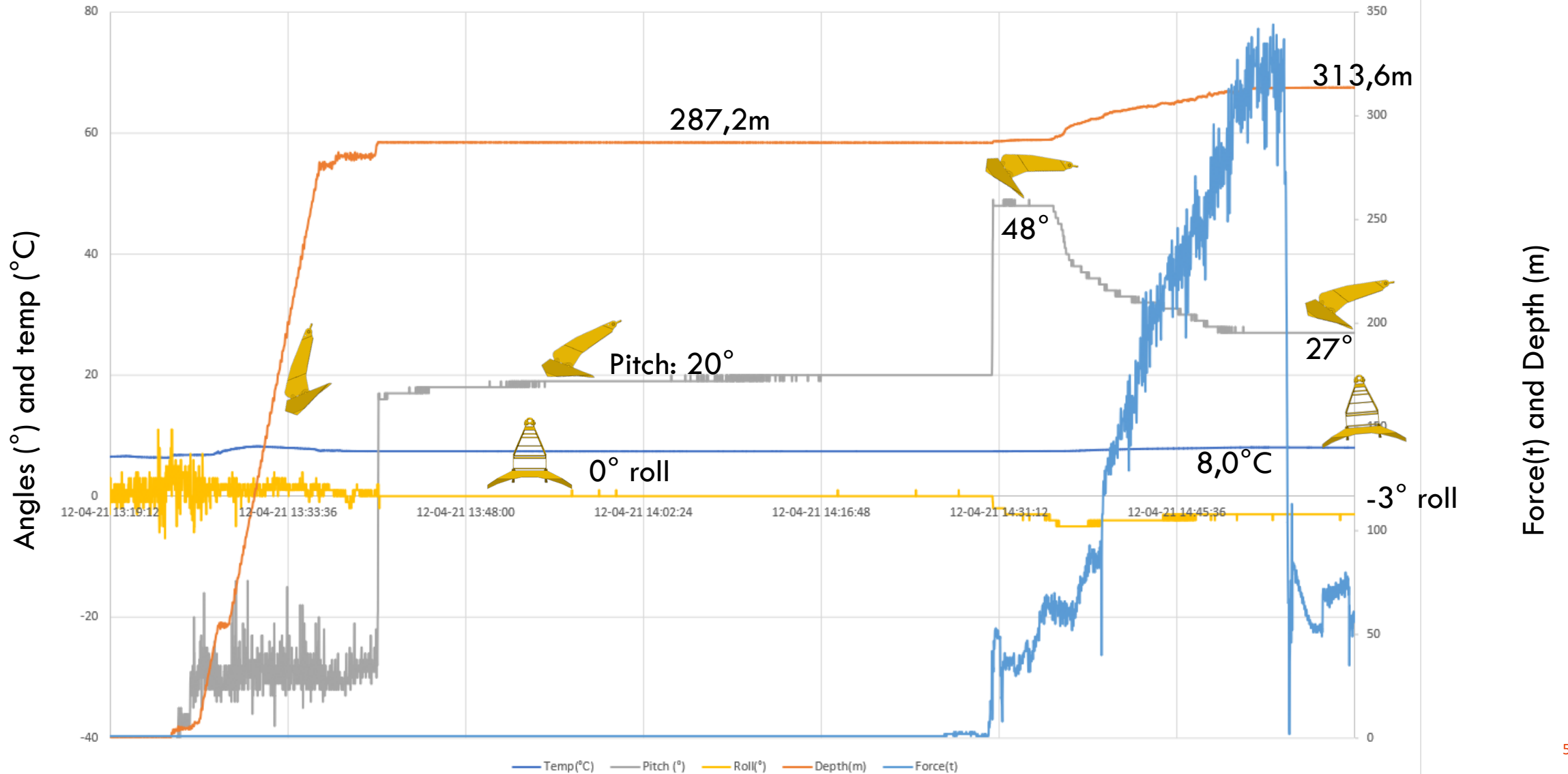


Figure 3 – Translation [phase 3]



STEVPRI[®]Mk6 installation

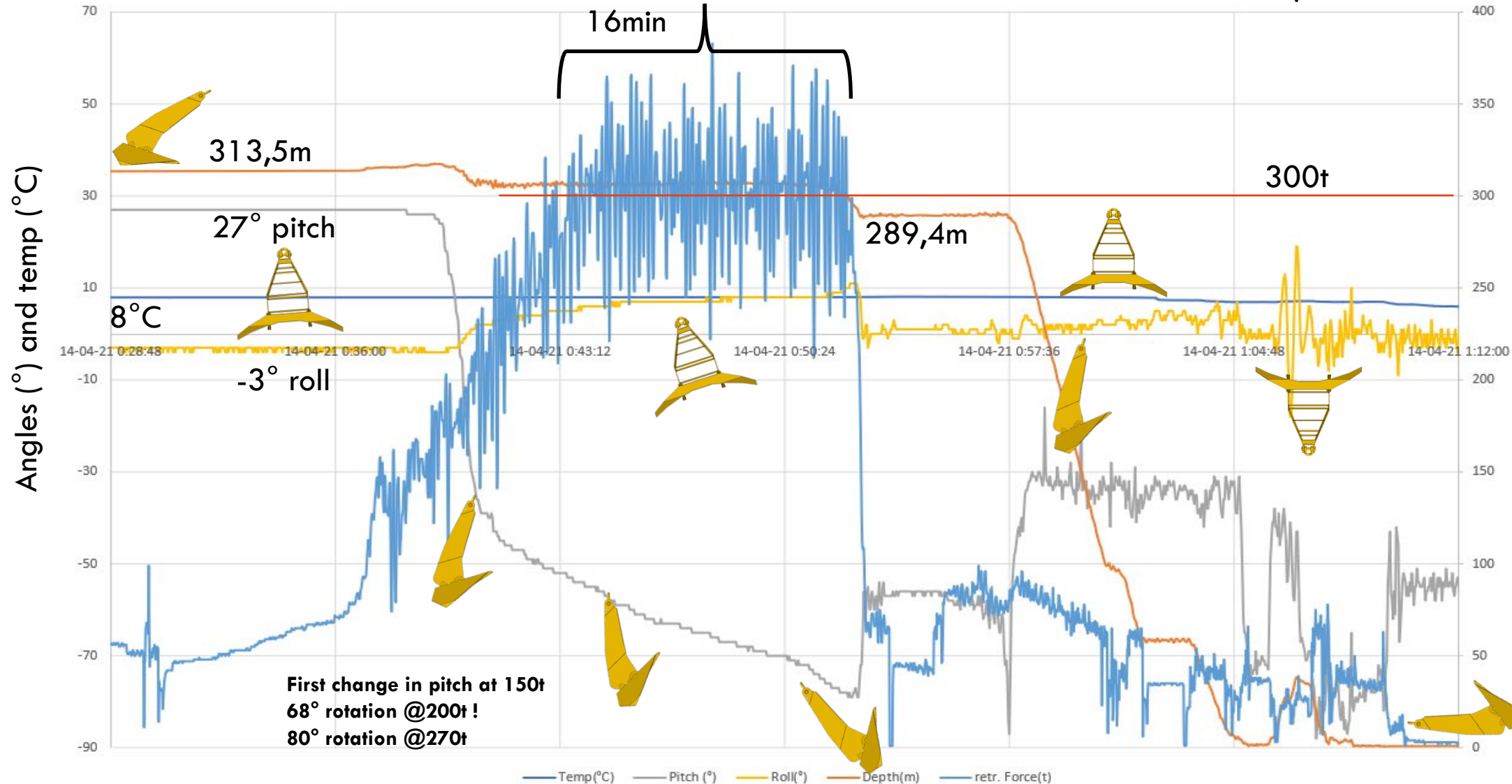
Mk6 Installation Test1



Recovery of STEVPRIS®Mk6

Retrieval mk6 test 1

1,5x WD



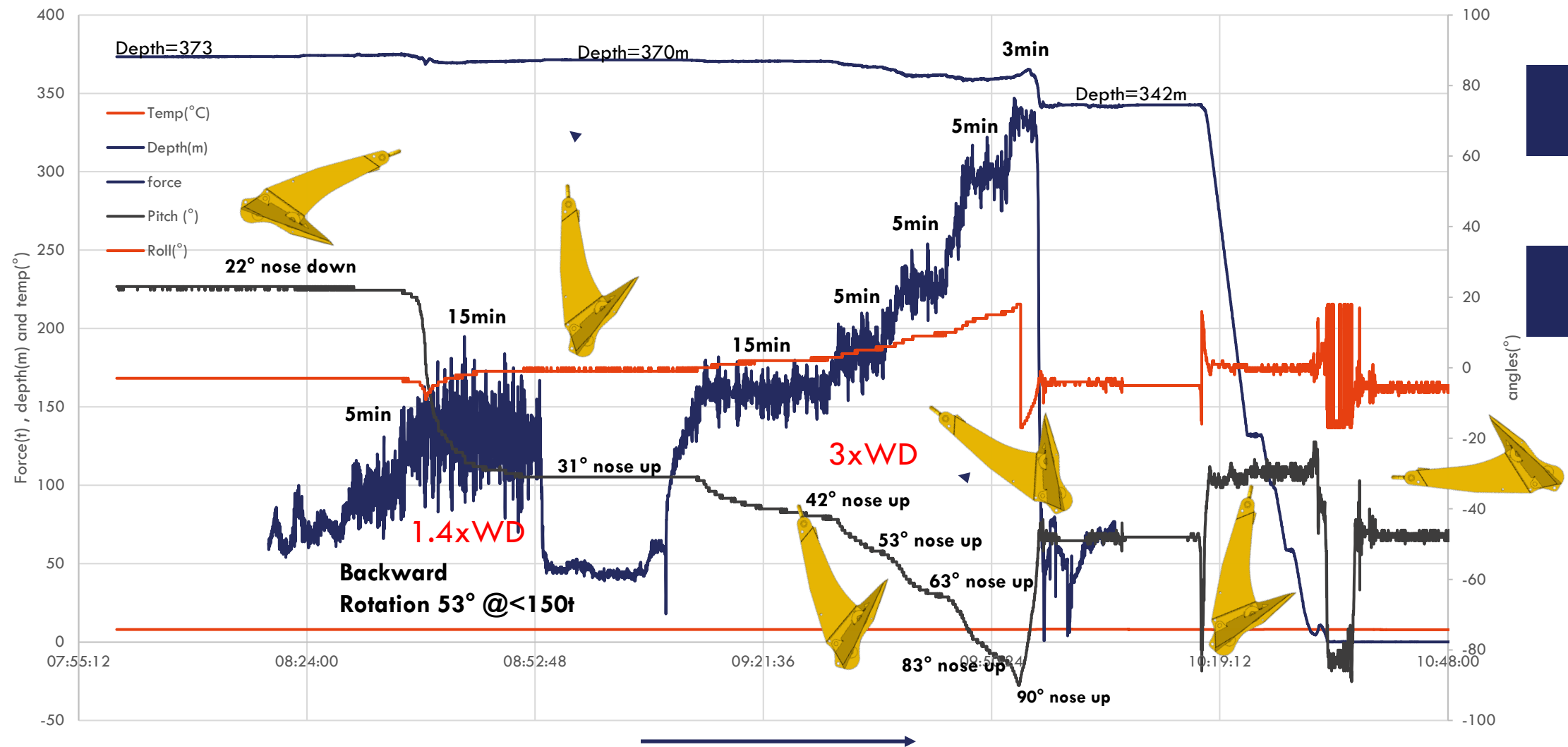
CLAY TANK MODEL VRYHOF R&D

- Retrieval 1.5xWD backward
- Backward rotation shear visible



Added: Pay out line to working wire/chain

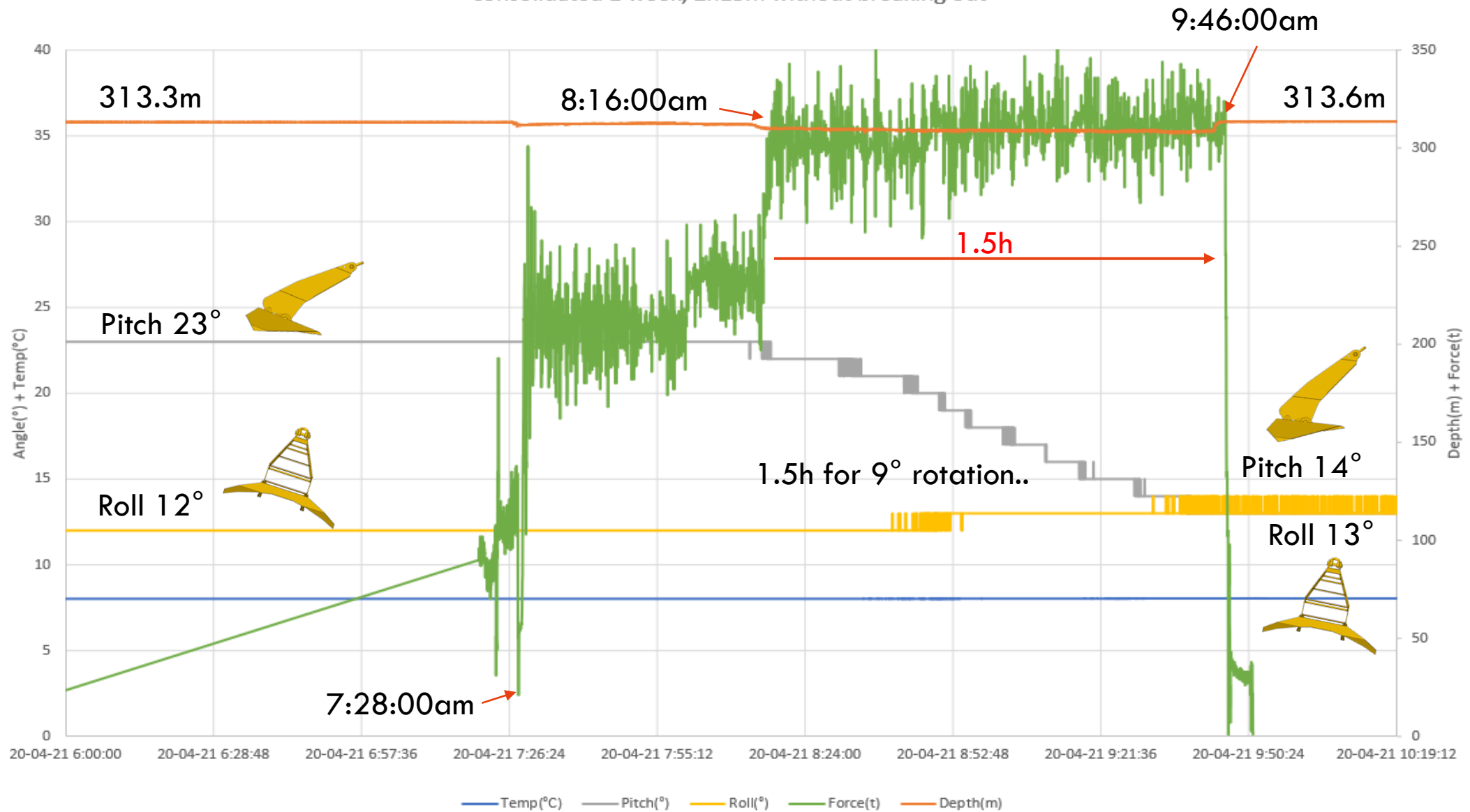
Mk7 v2 retrieval, 1.4 followed by 3xWD backward



Rotation follows 15min + 5min steps quite smoothly, 5min timing looks correct!

Mud angle & forward retrieval.....

Mk6 retrieval 1.2xWD forward
consolidated 1 week, 2h15m without breaking out



Sand angle & shallow embedment:

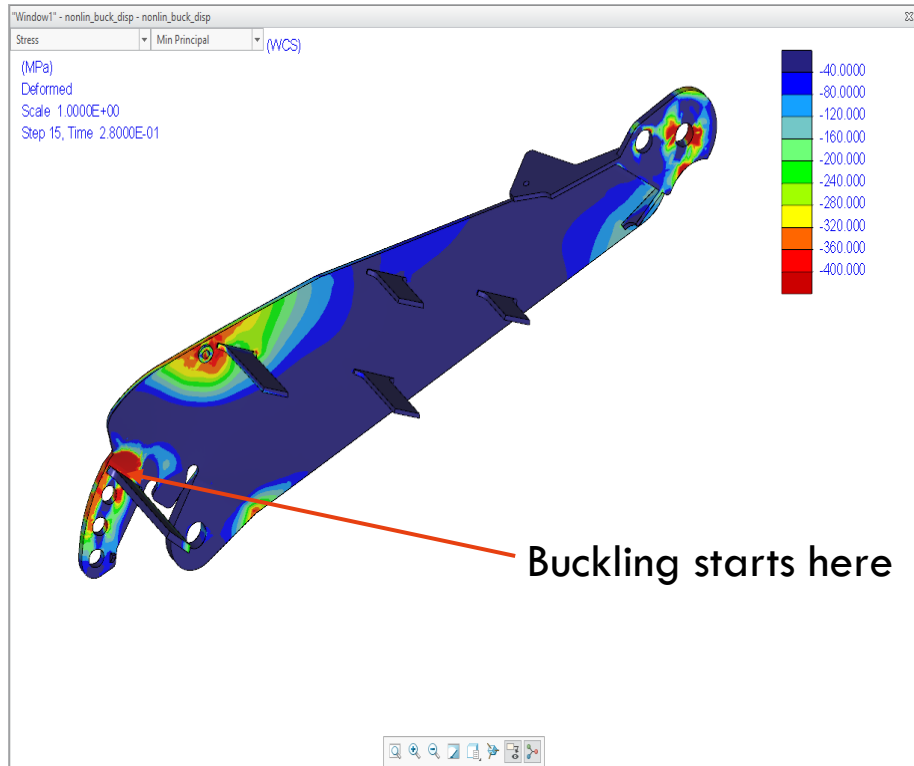
Forward with 2 x WD possibly only pops anchor head & shackle out of soil

Result of switching to backwards NOT noticing shackle & chain are down...

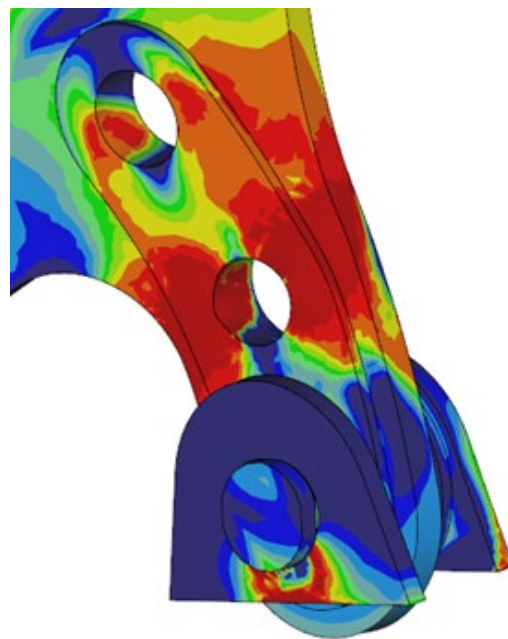
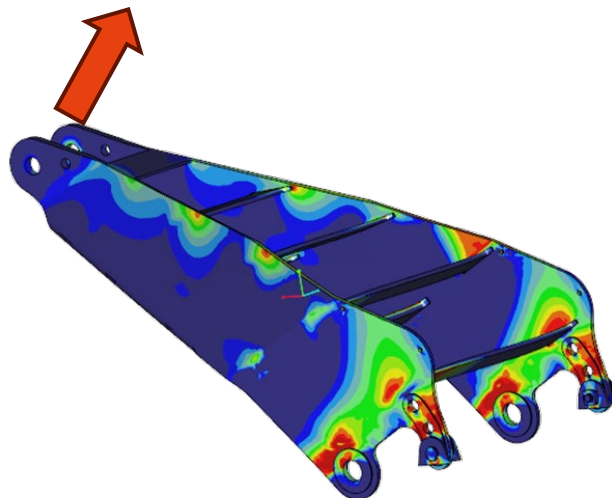
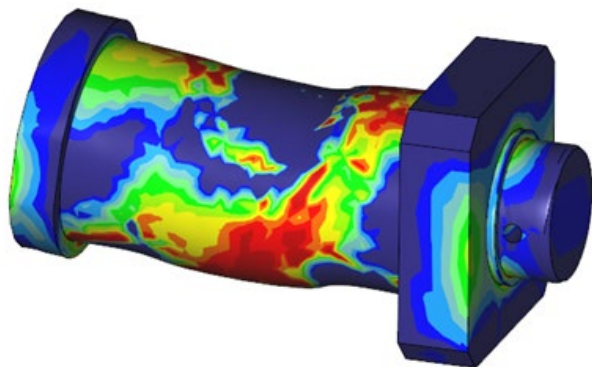


Fluke angle setting 90°....? (15mT STEVSHARK[®]Mk5)

Too much force too quickly
>300ton needed!

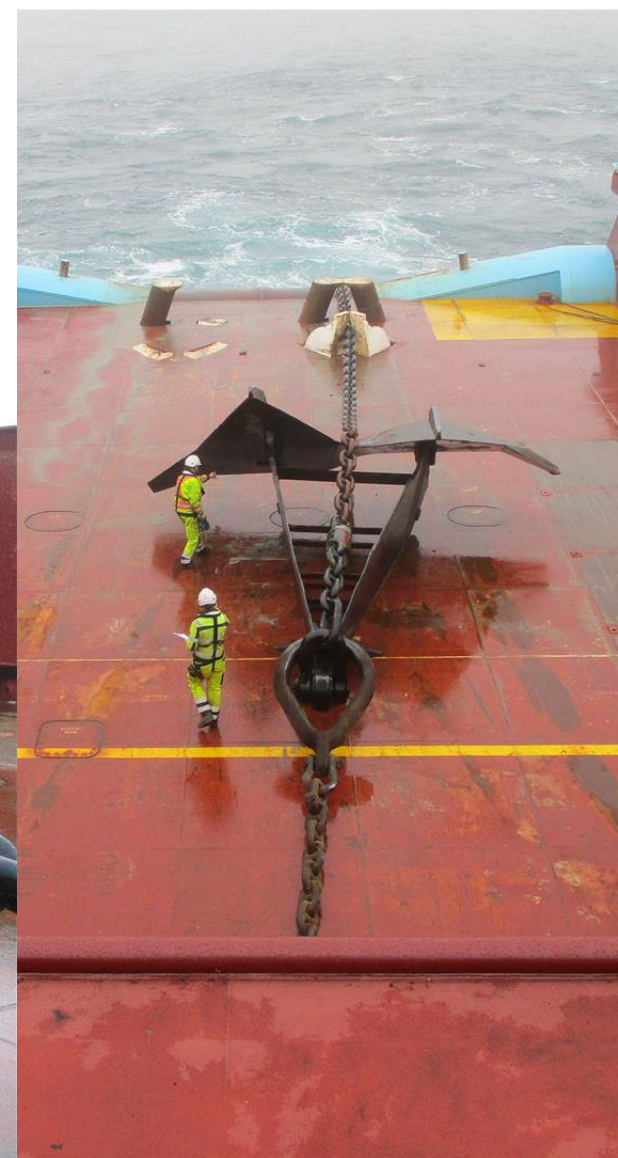


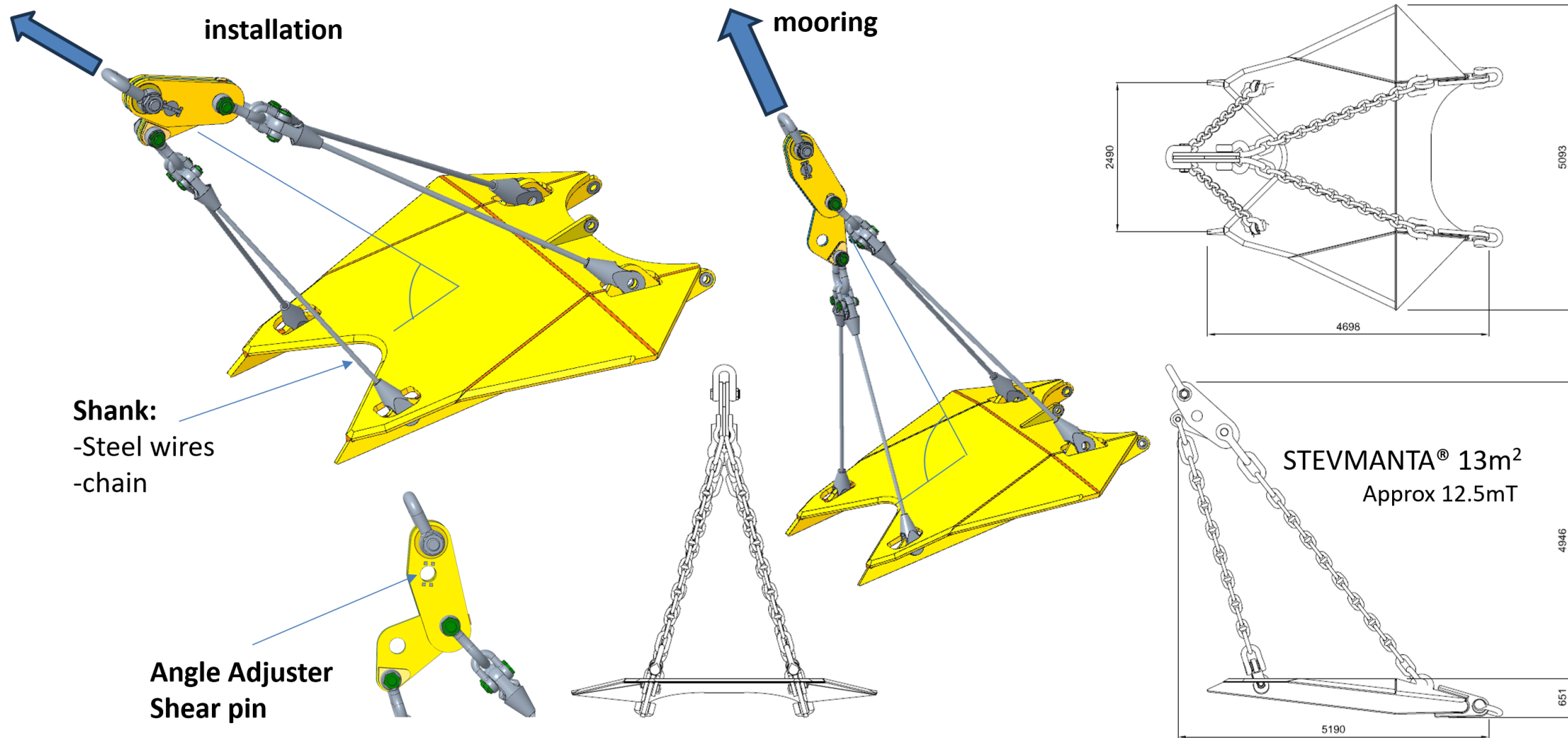
Rear lugs 18mT Mk6
Load >350ton



**Too much tension on mooring
line using chaser.....
STEVPRIS®Mk6**



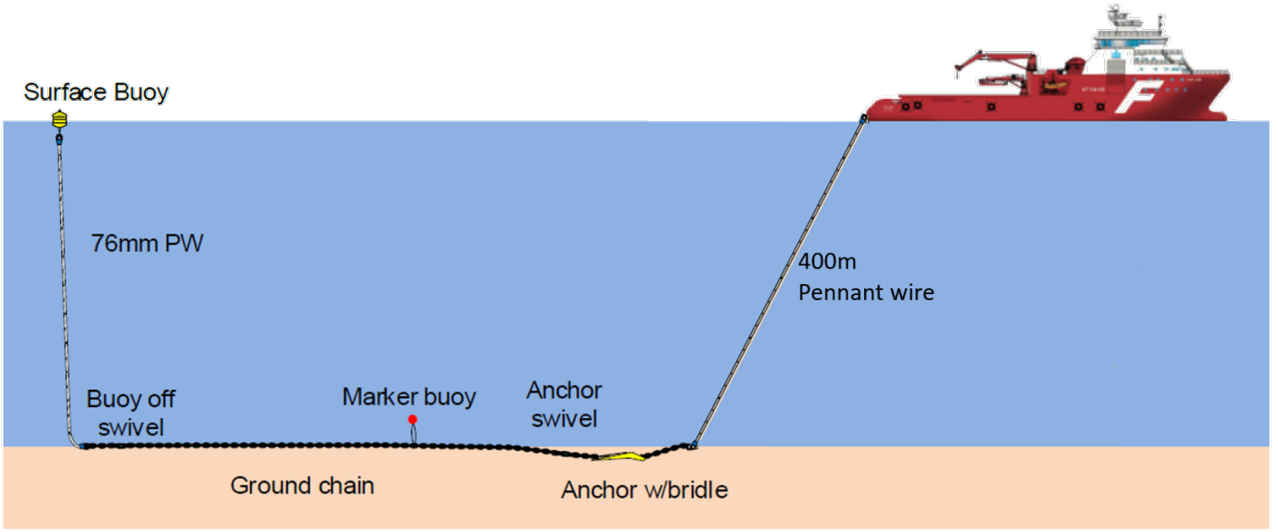
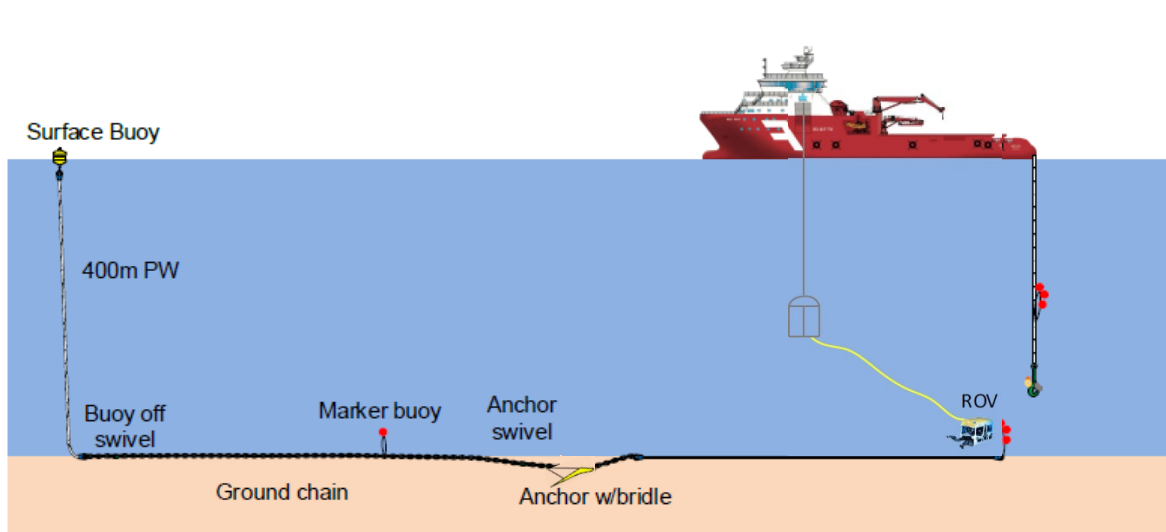
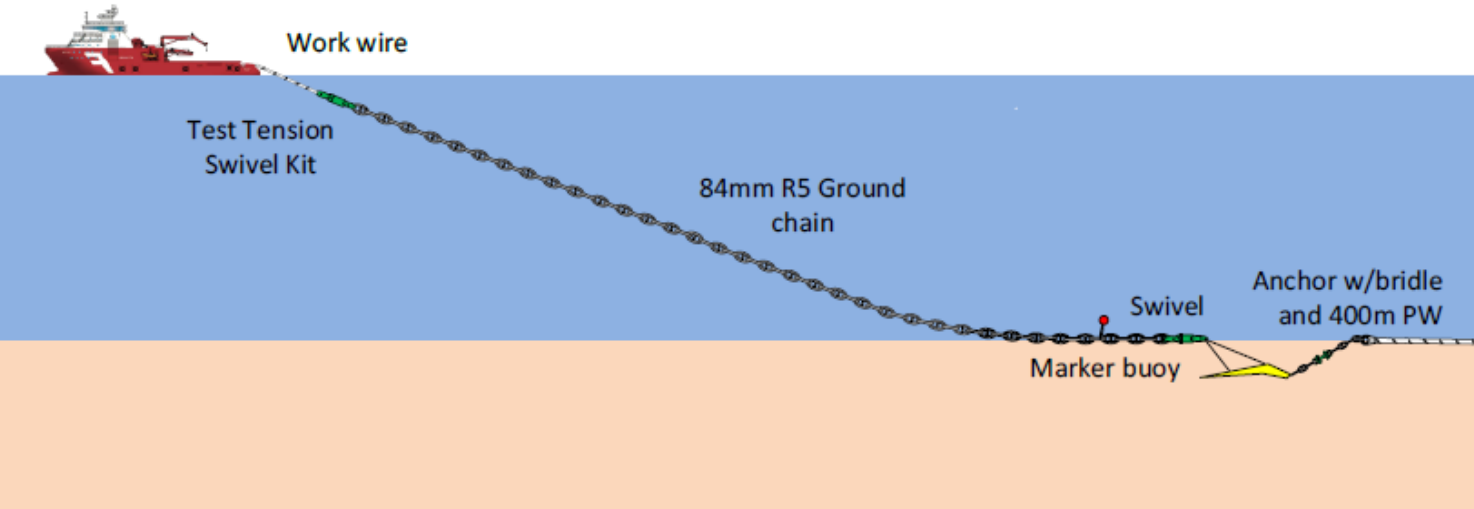
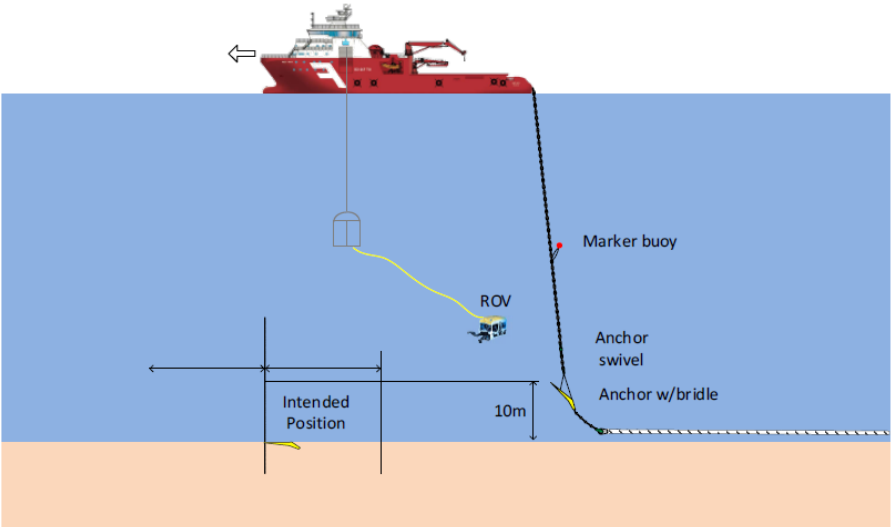




STEVMANTA® FOR SOFT SOIL & LOW RECOVERY FORCES



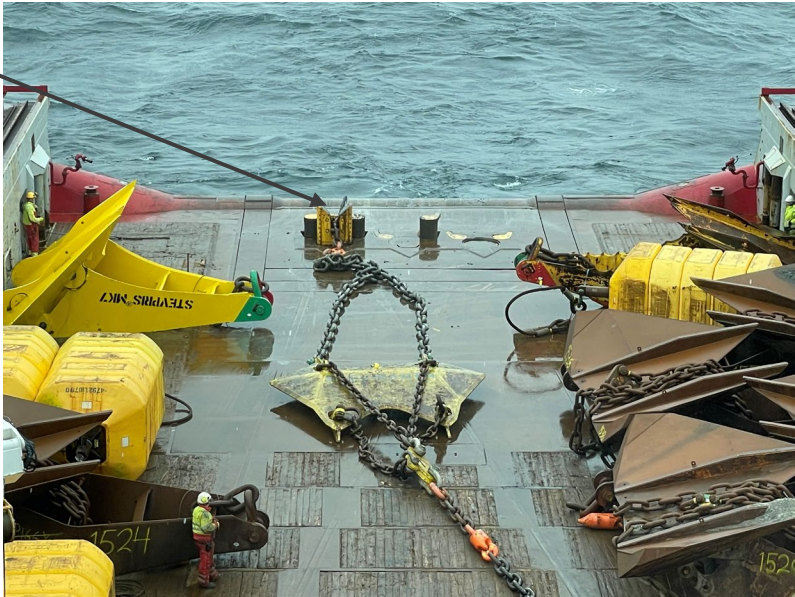
INSTALLATION AND RETRIEVAL SEQUENCE



STEVMANTA® DEPLOYMENT & RECOVERY

Bridle tail first

Deployment

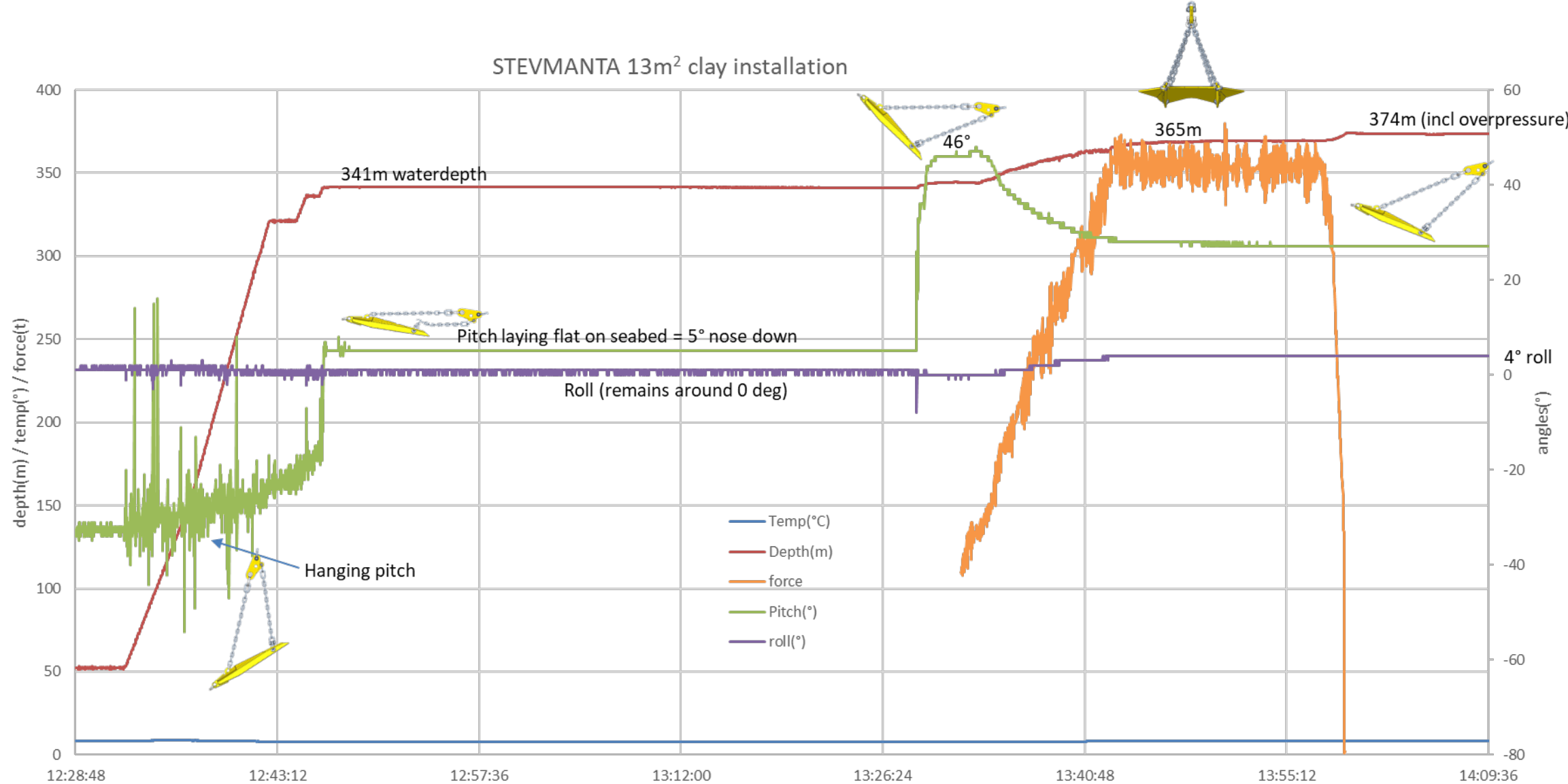


Retrieval by bridle





STEVMANTA® 13M² TEST: INSTALLATION

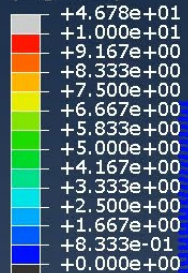


Viewport: 1 ODB: I:/RAID/STEVMANA/Abaqus/STEVMANA_clay_v3.odb

Step: testpull Frame: 219
Total Time: 54.750072

STEVMANA® 13M² TEST: INSTALLATION SIMULATION

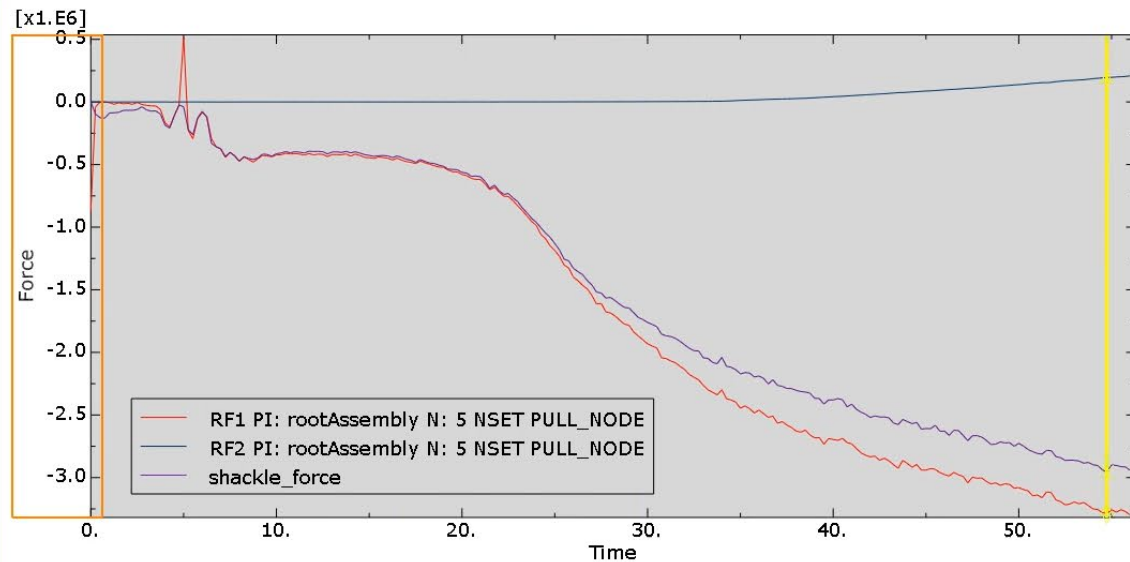
PEEQ
(Avg: 75%)



ODB: STEVMANTA_clay_v3.odb Abaqus/Explicit 2022 Tue Mar 22 09:09:50 W. Europe Standard Time 2022

Step: testpull
Increment 391072: Step Time = 54.75
Primary Var: PEEQ

Viewport: 2 Plot: XYPlot-2

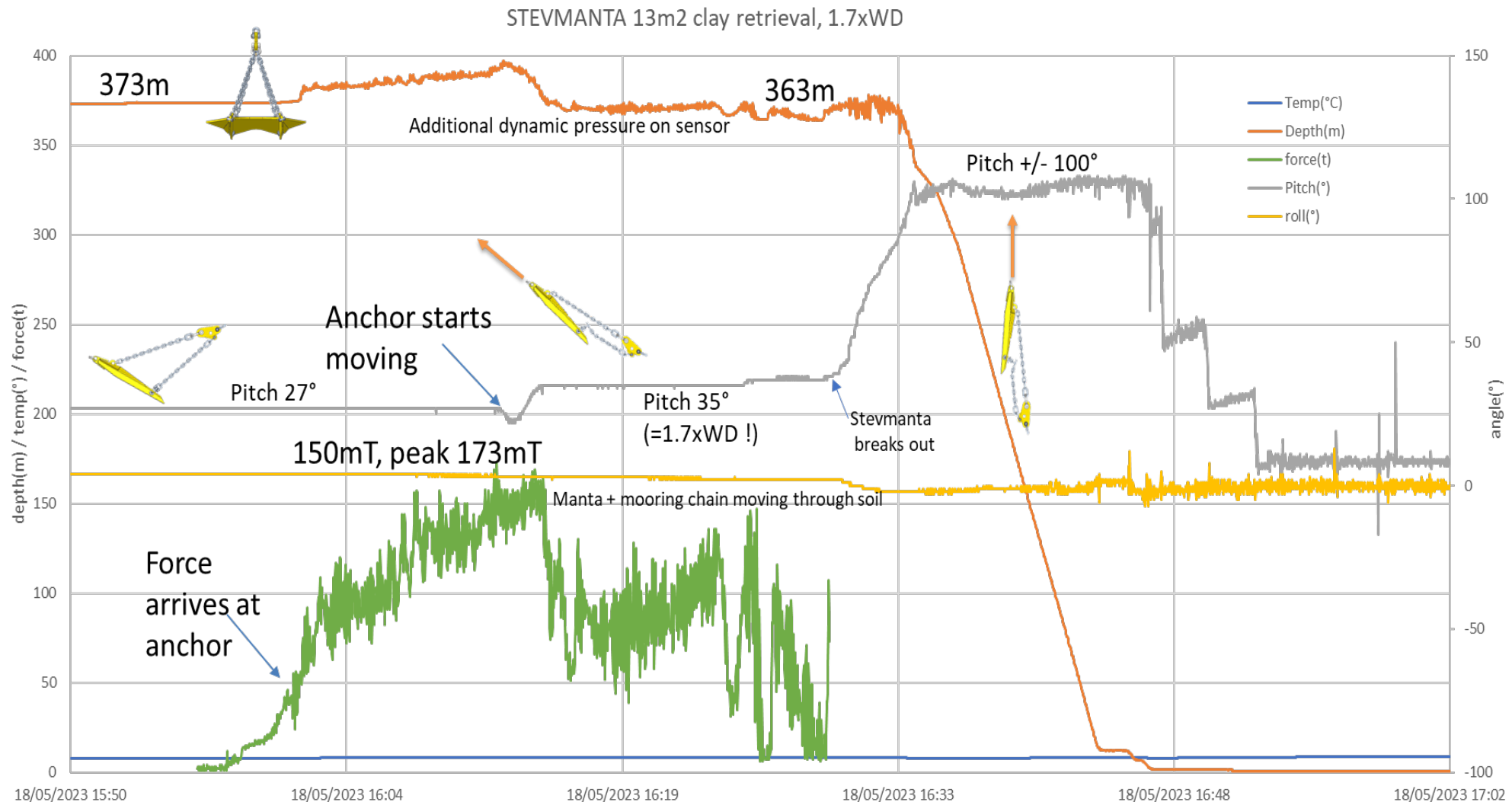


Viewport: 3 ODB: I:/RAID/STEVMANA/Abaqus/STEVMANA_clay_v3.odb

Step: testpull Frame: 219
Total Time: 54.750072

Step: testpull
Increment 391072: Step Time = 54.75
Primary Var: PEEQ

STEV MANTA® 13M² TEST: RETRIEVAL BY PENANT WIRE

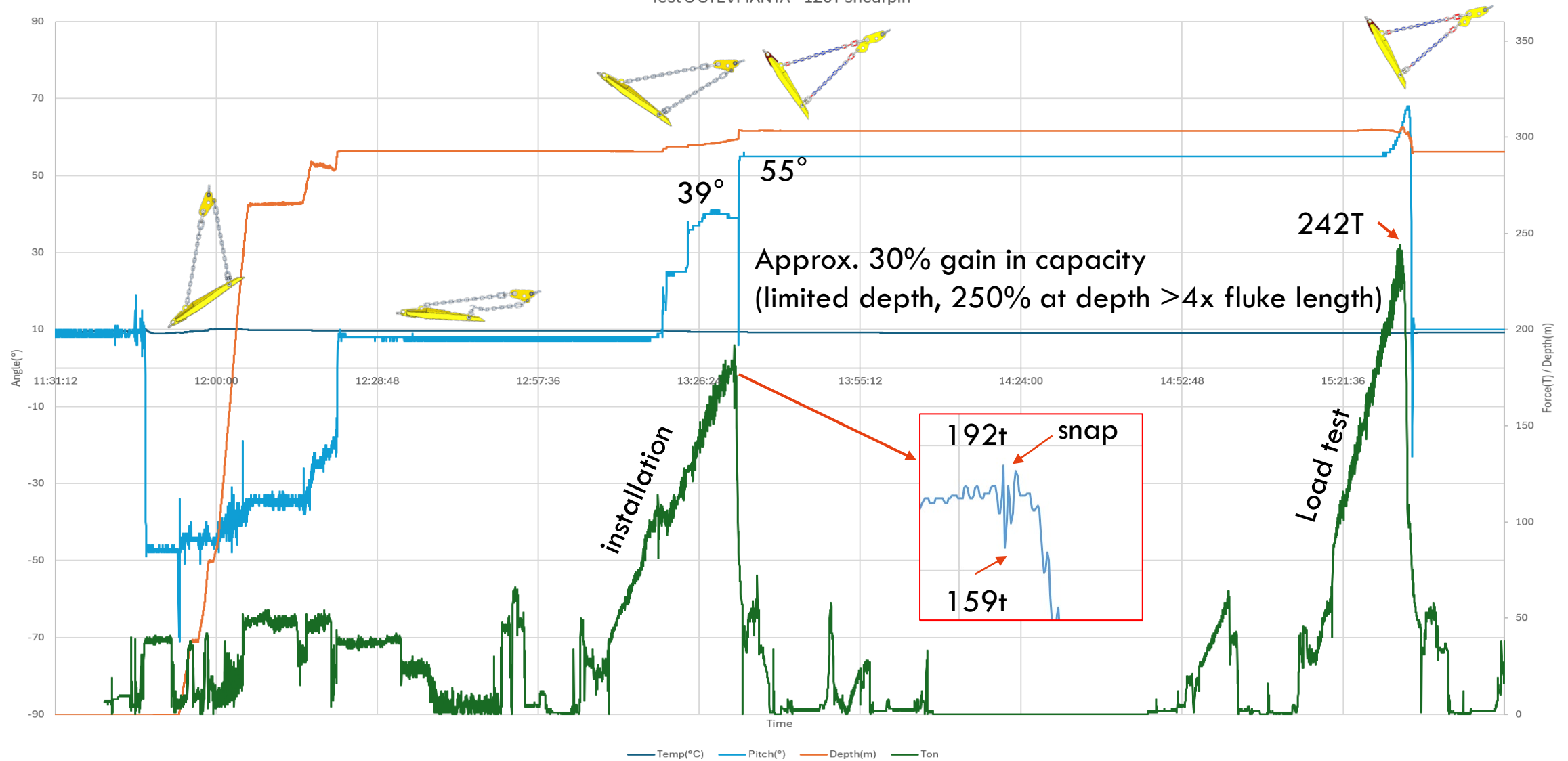


Note: backwards movement will put higher soil pressure on sensor → more depth reported while recovering



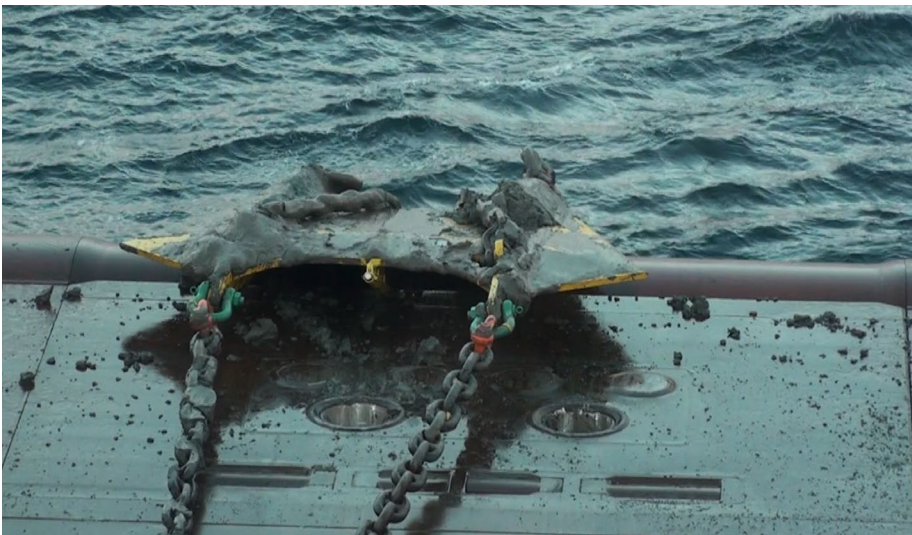
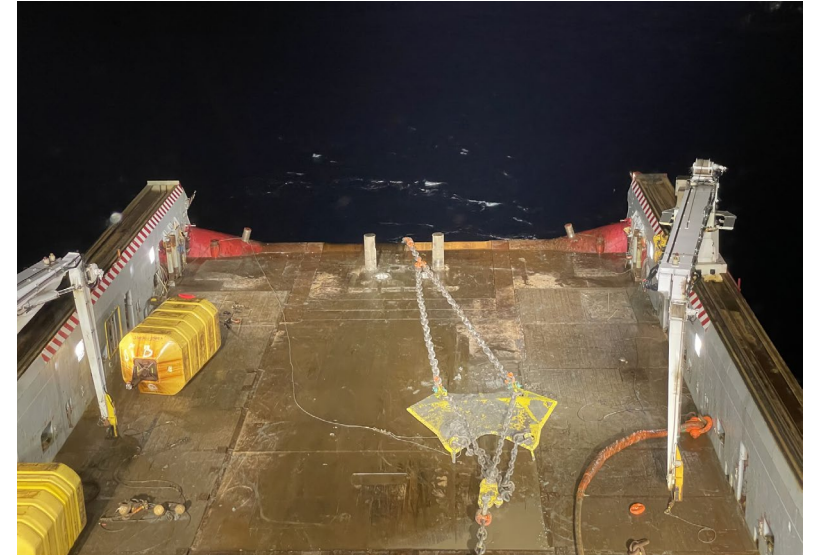
120 T SHEAR PIN TEST

Test 3 STEVMANTA - 120T shearpin



CONCLUSIONS:

- Retrieval forces in line with expectation: approx. 50% of installation tension
- Capacity recorded with shear pin mode is according to predictions
- Now DNV-Digin approved



Star Oddi in here!

ADAPS = special version cNODE mini



Big thanks to Equinor for facilitating tests

VALIDATION INSTALLATION / RECOVERY PROCESS STEVMANTA: 2-MAN INSTALLATION.....

50%: One man recovery



THANK YOU
FOR YOUR
ATTENTION

