

COMPOSITE REPAIR SPECIALIST



- **TYPE OF DEFECT :** Dent defect in subsea environment with **ZERO VISIBILITY**
- **PIPE DETAILS :** **36" OD – operating temp. 25°C – max. op. pressure 362 psi**
- **LOCATION :** **Qua Iboe Terminal – Offshore Nigeria (BOP)**
- **3X PRODUCT :** **REINFORCEKIT 4D SUBSEA (R4D-S)**

OVERVIEW

The objective of the repair performed in September 2016 by 3X ENGINEERING and its local distributor SAVIC was to **reinforce a damaged subsea pipe section over 2.5 meter length, due to dent defect (13,1 % dented depth) situated at 16 meter depth with zero visibility.**

SCOPE OF WORK

- After Finite Elements Analysis (FEA), 50 composite layers of **REINFORCEKIT 4D SUBSEA (R4D-S)** product have been determined to perform the reinforcement designed for 5 years.

- Underwater, several preliminary operations (sediments excavation, removal of concrete and existing coating, marking of the surface to be wrapped) have been performed before the essential step of surface preparation (grit blasting) to get a good surface roughness (60µ minimum surface profile).

- 3X wrapping reinforcement has been performed following several stages :

1/ A foot print of the dent has been done in order to manufacture appropriate composite rigid plate.

2/ Primer (P3X32) application on the defect, using a dispensing gun, to provide a good adhesion of the composite materials.

3/ Five rigid composite plates recovered with F3XSS filler positioned over the dent and strongly fixed with ratchet belts during curing time of 3 hours (*illustration picture*).

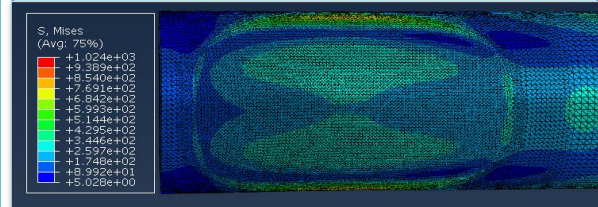
4/ Kevlar® tape pre-impregnated with R3X1050-S resin (using special 3X device called BOBIPREG) wrapped around the pipe. 82 Kevlar® rolls were necessary to cover the dent with the appropriate thickness composite needed.

5/ Finally, a neoprene soft cover has been applied to protect the repair from shells and other sea elements.

RESULTS

Divers and 3X were working together to repeat each steps of the implementation **with ZERO VISIBILITY.**

Zero injury, schedule respected and repair design controlled conclude this job. A special thanks to client representatives and ADS team (divers) for their precious help to complete this project successfully in the best conditions.



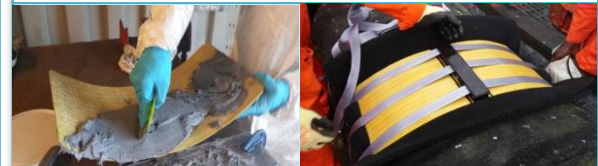
Design of the repair by Finite Element Analysis.



Deck view of the vessel and divers screen control.



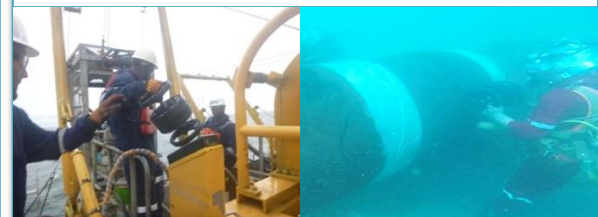
Composite plate manufacture on the foot print of the dented area & primer application (training picture).



Composite plates preparation with filler on the back & strapped on the pipe with ratchet (onboard picture for training).



Mixing of the resin and tape impregnation using BOBIPREG (3X specific tool) to avoid lack of resin.



3X divers wrapping tool sent on a basket for divers & divers composite application (ILLUSTRATING PICTURE ONLY).