

Field experience with a novel pipe protection and monitoring system for large offshore pipeline construction projects

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Contents

- NordStream: Logistics and construction of a very long subsea gas pipeline
- Requirements for a pipe protection system
- A new concept for pipe protection
- The pipe protection system
- Experience to date



1. NordStream: Logistics and construction

- length of 2x 1'220 km
- subsea natural gas pipeline
- Unique challenges beyond those encountered with onshore projects or shorter offshore pipelines.



weight coating plants



trans-shipments



marshalling yards

BALTIC SEA LOGISTICS

- for the excellent design and handling of these challenges, the NordStream logistics team received the German Logistics Award (“Deutscher Logistikpreis”).
- to allow pipe storage at large outdoor yards over 2+ years, a pipe protection system was needed.
- the system had to provide physical protection as well as security guarding / alerting in or near real-time.



2. Requirements for a pipe protection system

Requirements:

- 209'000 concrete pipe joints of 48" diameter
- pipe manufacturing commenced 2 years before concrete coating was started up



- for load-out, the pipe joints need to
1. Clean on the inside, free of dirt, excessive amounts of water, animals, etc.;
 2. Free of corrosion on the cutbacks (uncoated areas) at both pipe ends;
 3. Free of defects caused by mechanical damage (or from fire) during storage;
 4. Individually marked and identifiable close to real-time
- NEEDED: A „NO SURPRISE SOLUTION“!

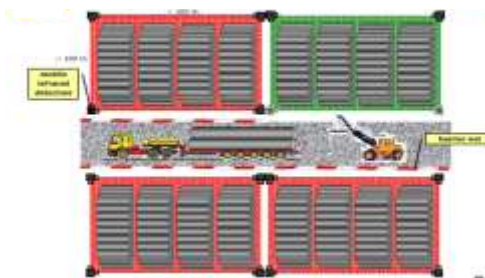


3. A new concept for pipe protection

- Pipes needed to be clean and defect-free at load-out (“no surprises”).
- Load-out cycle time very high (time available per pipe joint very short).

■ Alternatives:

1. area protection concept



necessary

- fencing and safe-guarding
- corrosion protection of pipe ends
- full cleaning of pipes prior to load-out

2. final check-out system

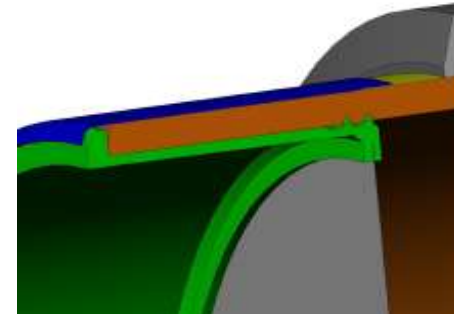


Figure 7: Inspection tool with a Laser System

necessary

- non destructive internal surface test
- corrosion protection of pipe ends
- full cleaning of pipes prior to load-out

3. pipe protection with end caps, RFID chips, and wireless sensor network



APPROVED as:

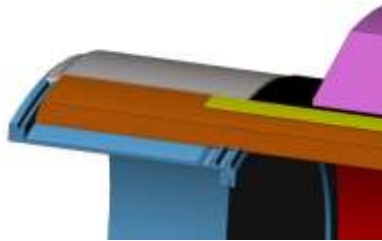
“all in one” solution



4. The pipe protection system



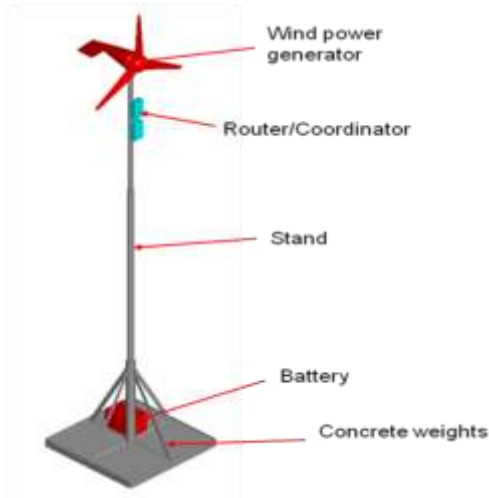
Inner Cap with membrane



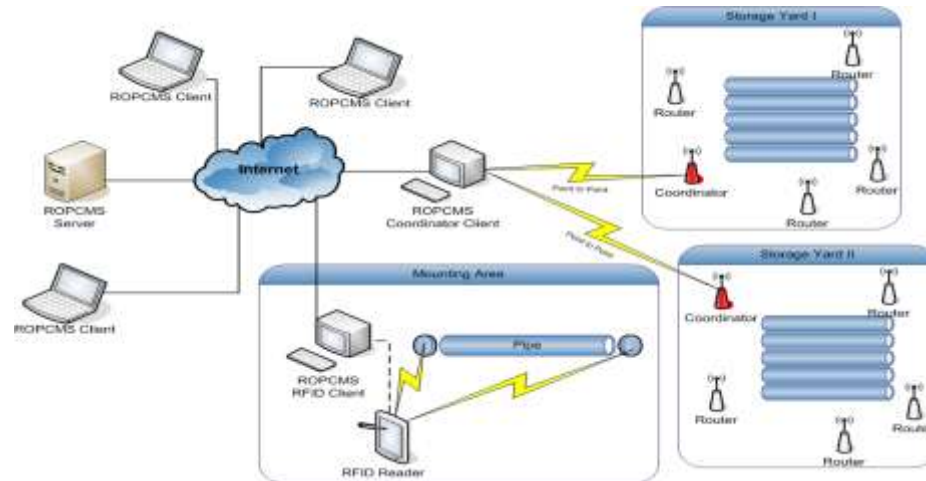
Inner Cap / Outer Cap assembly with zip lock



Inner Cap / Outer Cap assembly with spreader bar



router / receiver



ROPCMS control system



5. Experience to date

- The system has proven its viability through three very cold and rough winters.
- Re-use of the pipe caps on the second NordStream string was completed successfully and all pipe caps have now been removed after pipe laying was finished.
- All mechanical and electronic systems have fulfilled their functions:
 - automated mounting and demounting
 - E-boxes
 - transceivers
 - control center
- Alarms have reliably been raised in the respective situations
- RoPlasthan high performance elastomers have provided sturdy internal pipe protection as well as highly efficient protection of inner and outer pipe cutbacks.



→ Cost savings for the operator. -->Who can afford NOT to use this system? <--



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Thank you for your attention!



The authors like to thank NordStream AG, Zug for contributions and photos contained in this presentation.

