

DC power and Fiber Optic webinar

23rd March 2020

Host: SUTPlus

Presented by ronan.michel@asn.com

Answers from presenter to the participant questions

ML

May I ask what is the maximum depth of the reservoir for PRN / seismic monitoring? What sort of data is being measured?

PRM is specific topic about seismic. Permanent Reservoir Monitoring system gives the best imaging since the sensors are not move between 2 shooting campaigns. Differences between 2 images are only due to the reservoir shifts, with blur or noise. PRM is mandatory for pre-salt reservoir that are most difficult reservoirs to image.

RW

Can 4G or 5G replace FO link between offshore assets?

[ASN] 4G and 5G does not bring the fiber capacity, are limited by line of sight where fiber can run for 1000's of km, and offer limited capacity (at long distance). Best solution is to connect the platform with fiber and then offer 4G and 5G from the platform to people, processes on the platform, as well as nearby vessels

Anonymous

What % of power loss would you expect over a 4000km HVDC cable?

[ASN] DC/FO power loss is 100W per km. I guess you refer to the 4000 km HV DC hundreds of megawatt power interconnector being studied from Australia to Singapore. This quantity of power is beyond the scope of DC/FO. The principle stays the same that a long distance system is only practically feasible with DC.

NH

So, how quickly can vessels be deployed to make a repair?

Providing that a maintenance contract is in place, maintenance vessel a ready to sail within 24 hours. E.g for Calais, north of France in charge of North Sea and East Atlantic.

ML

How are the location of the damaged cable identified and retrieved to the ship for repair?

[ASN]: The DC/FO is resilient to a shunt fault (typically an aggression by a trawler) which means that the wells are still energize until the cable is depowered during the time of cable joint onboard the maintenance vessel.

First the DAS can listen to the cable and prevent the aggression. Ultimately, it would ear the hit. The location can be found from the voltage readings at the topside power feeding equipment and from Optical Time Domain Reflectometry on the fiber

FV

What is the maximum distance for this system? How far can you energize the system?

[ASN]: 300 km typically or more, not limited by DC/FO system but by Oil and Gas flow assurance

RC

What's the length we could have for a FOC without the need of amplifiers?

[ASN]: ASN has sold a 440 km unrepeated system. The cable transmission drops with the distance. Then repeated system is required.

Anonymous

Is there attenuation or reduction in reliability as a result of introducing branching units?

[ASN]: In telco systems some Branching Unit are active for power and coms and have a MTTF. In DC/FO there is no reduction of the reliability because of the Y-splices, since the Y-splice are passive.

RG

Is there any experience with a DC drive electrified subsea development that does not have hydraulics?

[ASN]: Hello Richard, DC/FO is agnostic to the type of actuator being connected. It feeds the Subsea Control Module that feeds the actuator(s). Most actuators are equipped with a battery pack for failsafe operation, or the tree/template itself will be equipped with a battery back. DC/FO can also feed the small subsea Hydraulic Pressure Unit that may be required until operators trust the full-electric downhole safety valves.

Every DC/FO system being contracted, deployed or under deployment today (J.Castberg, Breidablikk, Northern Lights) is ready for connecting All-Electrical trees.

DC

Can you describe your experience with the use of FO circulators in the subsea environment for optimizing DAS distance performance?

[ASN]: Hello Don,

The frequency at which a DAS fiber length can be interrogated is a function of the length of the fiber and speed of light in glass (~200 000 km per second). The length to be interrogate may be e.g the well completion itself and not the connecting umbilical + the well. Optical circulators may be inserted in e.g. flying leads from the DC/FO node to the well. We can discuss other optimizations as a private discussion.

Anonymous

What would you say is the key advantage in using DC/FO vs. traditional umbilicals?

[ASN] Those who speak the best of the key advantages of DC/FO are Equinor themselves. I copied their slides in my slides 14 and 15:

Technical

1. Increased step-out distance
2. Increased control system power
3. Independent operation and failure mode of each node and low voltage outlet
 - ▶ A pre-requisite to start Development in 2012
4. Earth fault tolerant
5. Standardized solution and interfaces, verified system suppliers (4 off)
6. Compatible with existing and future technologies (e.g. UIDs, PRM and all-electric). can be daisy-chained (connected in series)
7. Simplified repairs or upgrades where winter seasons can be utilized
8. The power part of the DC/FO cable may also be used for some emergency power purposes

Value

1. Reduced CAPEX and OPEX plus increased availability (verification needed in each project)
2. Simplified tie-back of new prospects without pre-investments in cables
3. Simplified implementation of UIDs without pre-investments in cables
4. Reduced use of J-tubes, riser slots (smaller turret) and reduced topsides footprint
5. Simplified static umbilical distribution (less umbilical length) since more subsea structures can be daisy-chained (connected in series)
6. Simplified control system / umbilical design and deliveries
7. Introduction of Telecom vessels

SS

Could you please give any examples where this has been applied alongside subsea battery applications?

[ASN] For example, for chemical storage, DC/FO may trickle charge large battery packs. The battery then energizes, for a short time, some "large" subsea pump for MEG chemical needed only at start-up or at shutdown of the production. During nominal operations, some Low Dosage Hydrate Inhibitor may be injected by a small pump within DC/FO capabilities.

If continuous injection of large chemical volume is required, then high volume would need to be stored and then probably a dedicated chemical line is preferable to local subsea storage.

ML

What is the significance of DC interoperability with SPS vendor? Maybe some application example?

[ASN] Hello Manfred,

The SPS vendors were invited by Equinor. Each vendor brought their Subsea Routing Module and Subsea Control Module to test for electrical static, dynamic, and fault conditions. The tests were performed at the AC and the DC interface. Since DC/FO node and equipment are standardized for every project, no extra interoperability (I-FAT) test has since been required by the contracting project teams. That is a significant benefit for risk and project plan of work.

JE

What is the mean time to failure of the DC/DC converter subsea?

[ASN] Hello James.

Equinor came to ASN because they could not find from their legacy suppliers, the field proven reliability they were needing and with equipment not meeting the promises MTTF (SCM failure, umbilical isolation failure, umbilical termination failures, connector failures, etc...). You may understand that these MTTF numbers are under NDA. ASN has been installing 5000 telecom repeaters in every ocean down to 8000m water and has track record of high-reliability.

Please contact me for more information at ronan.michel@asn.com

Anonymous

How many wells per node can be controlled/monitored typically?

Typically, a DC/FO node is landed in a template or in a manifold and can connect 6 wells and also offer power to some other demanding application such as a subsea docking station for Underwater Intervention Drone.

DH

You state that 150 km is the installed maximum length to date (DCFO), what is the theoretical limit for remote step out of a field from onshore?

[ASN] Hello David

I said the limitation of a step-out today is the flow assurance in the pipelines. The longest step-out could be for gas or CO2 transport. Yet the longest being studied is 200 km, for CO2.

Another limitation is the optical modem from SPS, but ASN can propose some solutions.

DC/FO can deliver power in excess of 300 km and even much more. Should you have a business case, ASN will be pleased to propose a solution.

EB

is the jointing technology of these cables also based on Universal Jointing?

[ASN] Hello Eckard

The UJ joint is for single conductor cables. The DC/FO is a double conductor cable, and the jointing technology is based on ASN joint.

FRdP

What manufacturers are developing chemicals subsea storage and when is it expected to be available?

[ASN] Hello Fernando,

I can only disclose Google search answer. The large SPS and EPCI are proposing solutions Aker, Technip, etc...

TM

Are you considering increasing the power at each node to more 4 x 2,5kW?

[ASN]: Hello Tom

Some DC/FO outputs may be bundled to provide more than 2,5 kW. Should you have a case, please drop me a private question at ronan.michel@asn.com