



## INTEGRITY MONITORING

### STRAIN MONITORING SYSTEM

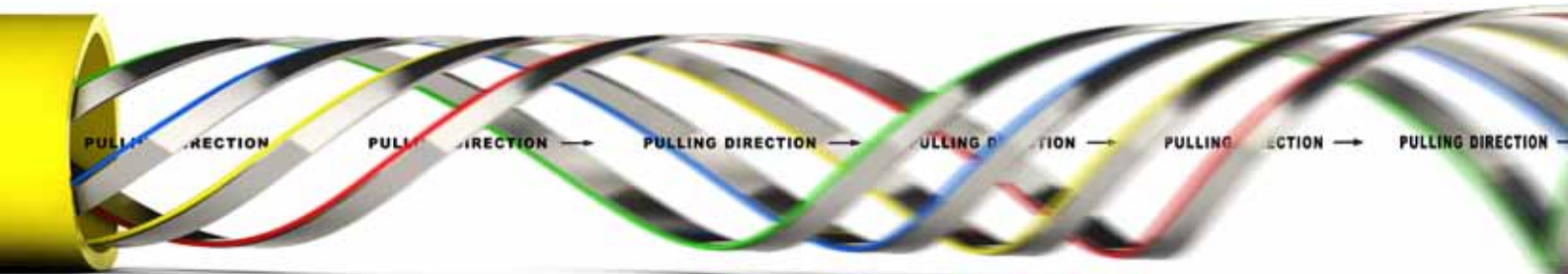
NKT Flexibles is offering the option of including an embedded strain monitoring system with deliveries of flexible risers.

The monitoring system is able to detect the actual strain in tensile armour wires in the instrumented pipe. The monitoring system is based on optical fiber sensors embedded into selected tensile armour wires of the flexible riser.

With the design information of the flexible pipe, the data from the strain monitoring system can be used for assessing the fatigue of the pipe and perform a continuous damage count down.

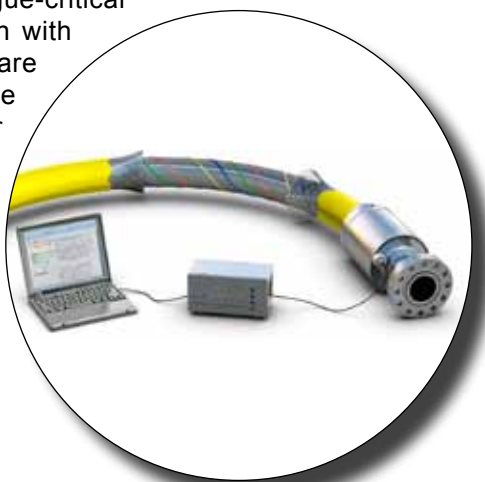
#### STRAIN MONITORING

- *Embedded strain monitoring system*
- *Direct measurement of strain in tensile wires*
- *Continuous collection of strain data*
- *Computation of fatigue damage based on data*



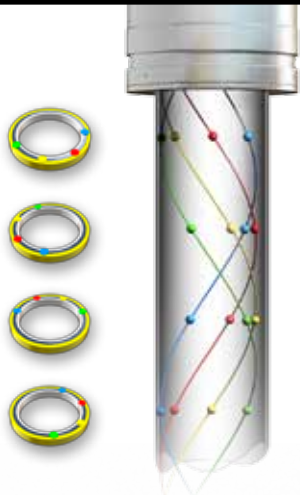
Monitoring the strain with an embedded system enables direct measurements in the most fatigue-critical layer and measurements in the region with greatest fatigue loads. These regions are typically difficult to get access to due to bending stiffeners, I-tubes or other externally clamped accessories.

*Strain sensitive fibers are strained with the tensile armour wire to which they are attached.*



# Strain Monitoring System

Monitored cross sections consist of sensing points on different optical fibers at the same position along the length of the flexible riser.

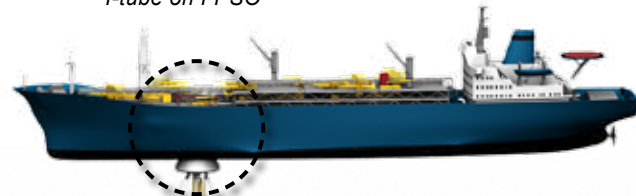


Sensor locations and cross sections towards seabed

Monitoring of selected positions in the flexible riser with the highest level of strain as identified from the detailed system design.



I-tube on FPSO



Fatigue damage assessment can be made continuously based on actual strain measurements.

