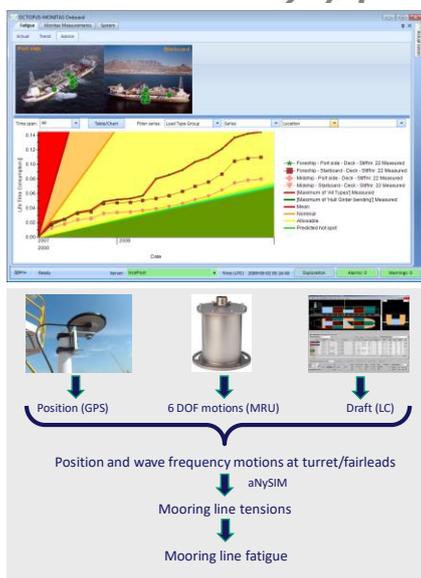




Monimoor user Group

Fatigue integrity assessment of mooring lines with MONITAS and aNySIM

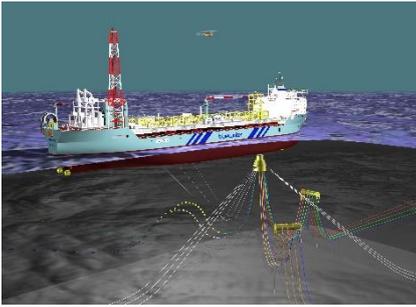
Offshore production units are designed to remain on station for a prolonged period of time. Permanent mooring systems are designed to ensure the station keeping ability of these units. By ensuring station keeping, the mooring systems limit the loads acting on risers and umbilicals and thereby ensures integrity of these vital systems. To manage the integrity of the mooring systems during its service life, the unit is often equipped with expensive structural monitoring systems. In many cases the measurements are used for daily operations but not for long-term fatigue assessment purposes whereas integrity management tools have been developed over the years. This project aims to obtain insight in fatigue accumulation by processing valuable existing measurements of multiple production units with available integrity management tools.



Fatigue integrity assessment with MONITAS

One aspect of the integrity assessment of mooring systems is the fatigue integrity. A monitoring system which manages the fatigue integrity of hulls and moorings of offshore production units is being done by MONITAS. MONITAS is an advanced fatigue integrity monitoring system with dedicated software which advises on the integrity of hull and moorings of floating production units. It also helps the owner to understand the real age of the vessel by monitoring fatigue loading and coupling it back to the design tools. MONITAS not only measures the fatigue by sensors on hull or moorings but also explains why the measured fatigue deviates from design predictions. Differences may originate from different conditions (environmental and loading) assumed during the design process or from simplifications in the fatigue design tool. Using this method all the processing occurs automatically onboard of the floating production unit. The MONITAS system has already been successfully implemented onboard of seven production units: the Glas Dowr FPSO (Bluewater), the USAN FPSO (ExxonMobil), the CLOV FPSO (TOTAL), the Ichthys FPSO (INPEX), the Moho Nord FPU (TOTAL), the Bonga FPSO (SHELL) [1] and the Aoka Mizu FPSO (Bluewater).

In the MONITAS Group project (2013-2020) the system measuring results regarding the floater hulls are being analysed. The system results regarding the moorings are not being analysed within this project.



Organisation:

MARIN will take the lead in this project as User Group manager. Oil companies, FPSO operators, suppliers and classification societies are all invited to join this User Group. Project meetings will take place every six months during the FPSO JIP Week. The project will run for three years.

References:

- [1] Advisory Hull Monitoring System for the Bonga FPSO, Pieter Aalberts et al, OTC 29250, 2019.
- [2] Integrity management of mooring systems, Remco Hageman et al, OTC 29560, 2019.

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Onboard time domain simulation program aNySIM

Performing integrity management on the mooring system to ensure that the system is able to fulfil its function is crucial, but not straightforward. All or most components of the mooring system are submerged and the underwater environment is very challenging to perform inspections or measurements. An alternative way to obtain information on the mooring line tensions is to measure floater motions and use a high-fidelity numerical solver to derive the mooring line tensions. A prototype onboard software, based on the time domain program aNySIM, has already been developed and implemented onboard the Aoka Mizu FPSO from Bluewater [2].

Objective

The project is aiming to further develop the added value of advisory fatigue integrity mooring monitoring systems by in-depth analyses of existing mooring and motion measurements.

Scope of work

The scope of work comprises the mooring fatigue integrity assessment of ten floating production units with the onboard integrity management tools MONITAS and aNySIM. The fatigue will be calculated based on the measured mooring line loads. In addition fatigue will be calculated based on mooring line loads calculated with aNySIM using the measured floater motions as input. A comparison will be made between both assessments. Finally a coupling will be established between MONITAS and aNySIM onboard.

The ten floating production units include the floaters on which a MONITAS system has been installed and comprises both turret moored and spread moored floating production units. Floating production units with the MONITAS system for which mooring line tension measurements are available (since the installation of the unit) include the CLOV FPSO, Ichthys FPSO and Moho Nord FPU.

Participants can bring in data of their own floater (floater characteristics and measurements) which will be processed by the project free of charge. Data interpretation and understanding of the MONITAS/aNySIM results from the various floating production units will be one of the main activities.

Costs

The participation fee for oil companies and contractors for the three years project equals 17,5 kEuro/year. The yearly participation fee for classification societies equals 10 kEuro. Participants who are member of the MONITAS Group receive a reduction of 5 kEuro/year.