



Case Study - Marine  
Four Island Tanker, MuSt System  
Vinashin shipyard (Vietnam), 2007



# Four island tanker, MuSt System



|                        |                                                                                                                                                                                                                                                                     |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aim                    | Main aim of monitoring is the real-time diagnosis of the ship structural behavior, with particular reference to critical points and sections of the ship frame. For this purpose, thresholds of warning and alert are set according to critical deformation values. |
| Location               | Vinashin shipyard (Vietnam)                                                                                                                                                                                                                                         |
| System Integrator      | SMARTEC SA, Pegaso Systems Srl                                                                                                                                                                                                                                      |
| End Customer           | Premuda SpA                                                                                                                                                                                                                                                         |
| Date                   | 2007                                                                                                                                                                                                                                                                |
| Instrumentation        | <ul style="list-style-type: none"><li>• SMARTEC SA and Pegaso Systems Srl</li><li>• Micron Optics, sm125 Optical Sensing Interrogator</li></ul>                                                                                                                     |
| Sensors                | (48) SMARTprofile MuSt Strain sensors                                                                                                                                                                                                                               |
| Software               | SMARTEC DyMon software package                                                                                                                                                                                                                                      |
| FBG Technology Benefit | Long-gage sensors. Use in explosive and corrosive environment.                                                                                                                                                                                                      |



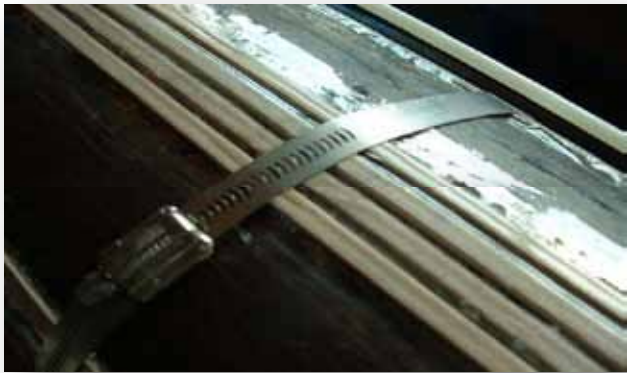
- Oil Tanker
- Strain Monitoring
- Continuous Monitoring
- Water Ballast Tank monitoring



- The “Four Island” ship is an oil tanker (approx. 100'000 DWT) which is now equipped with a ship hull structural monitoring system consisting of 48 fiber optic SMARTprofile MuST sensors expressly developed by Smartec for this new application field. In fact, this is the first fiber optic monitoring system in the world, totally designed and integrated in an operating ship of this size.



SMARTprofile MuST sensor



sm125 Optical Sensing Interrogator





- Results
  - § Real-time diagnosis of onboard security for passengers and cargos. Thresholds of warning and alert are set according to critical deformation values. Data supplied from the monitoring system are used to validate the ship structural model (typically the FEM – Finite Element Model).
  - § Long term analysis: determination of the elastic deformed shape of the ship (by double integration of the curvature functions). Evaluation of the cycles of fatigue induced by the periodic solicitations of the hydro-dynamic motion (effect wave, oscillations). No electrical signal, just optical to avoid any explosion risks due to short circuit.
  - § The main technical requirements for this project is reliability and stability.
  - § Data communication was handled by an on-board storage and satellite link.
  - § The customer is able to determine the analysis of load pattern and fatigue.
  
- Acknowledgements
  - § Premuda SpA (End customer)
  - § Pegaso Systems Srl (Installation)
  - § SMARTEC/ Roctest (System integrator)  
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