

## Strain Monitoring on the fenders of Rotterdam Europort

### *General project information*

Project location: Rotterdam Europort

Date: 2006-2007

### *OBJECTIVE*

The object of the project is Structural Health Monitoring of the fenders at Rotterdam Europort. Figure 5 gives a view on the partly completed quay wall at Rotterdam Europort.



**Figure 5: Partly completed quay wall at Rotterdam Europort**

### *SOLUTION*

FOS&S measures strain on a series of 24 fenders at the Rotterdam Europort. A complete system is installed to measure the strain under water until a dept of 10 meters with a strain range of 1000  $\mu\epsilon$ . The temperature will vary from 0°C until 50°C. Each fender has 2 cylinders above each other and on each cylinder four strain sensors are mounted and some fenders are foreseen of a temperature probe to compensate for temperature changes. In total FOS&S has installed 106 Mountable Strain sensors MS-05 and 15 temperature probes. Figure 6 shows the cylinders of the fenders where the sensors have been installed.



**Figure 6: Strain sensors mounted on a series of 24 fenders**

The mountable strain sensor MS-05 makes use of the internal strain sensitivity of the FBG. The FBG is prestrained inside a ruggedised housing between two anchoring points, which makes it possible to measure both extension and compression (see Figure 7). The mountable strain sensor MS-05 can measure displacements with a resolution of 1  $\mu\epsilon$  and an accuracy of 10  $\mu\epsilon$ . The total displacement range is 5000  $\mu\epsilon$ .

The different Fibre Optic sensors are read out using the FBG Datalogger of FOS&S with 32 channels.



**Figure 7: Mountable Strain sensor MS-05**