HULL STRESS MONITORING SYSTEM

Electric Sensors’ Solution

For Safe Navigation

Measure Stresses, Torsions, caused by Waves, Cargo Operations and Motions

GME Leader in Measurement and Analysis

Global Maritime Engineering
Recently, the concern for the safe operation of ships has increased with respect to the safety and the life of ships and the prevention of marine pollution in the sea.

The frequent losses of bulk carriers and tankers during the late 1980’s have brought about taking any strategic steps to improve the safety of such ships.

Under the circumstances of these heavy losses, the IMO (International Maritime Organization) approved the recommendation of fitting the hull stress monitoring systems for the improvement in the safety of ships of 20,000 dwt and above, carrying dry cargo in bulk.

HSMSES has been developed for maximum efficiency of vessel operation and safety and provides the real-time information to the ship’s master in the ship during navigating, loading and unloading operation, and also provides an alarm indication if necessary, indicating excessive stress on the hull.

**BENEFITS**

- Prolonged vessel life by reductions of structural damage and fatigue cracking
- Early warning to avoid non-recoverable structural damage
- Cost reduction in repair and maintenance
- Improvement in ship scheduling and optimization of voyage time
- Reduced insurance premiums during vessel’s entire life time
HSMS is a sophisticated system that provides the ship’s master with the real-time information on the status of the ship’s structure during cargo operation in harbour as well as during voyage.

The system monitors the stresses at each location using specially designed strain gauges, and the bow acceleration and the bow slamming pressure.

In addition, the information on the navigational condition and environments is provided from the GPS and the wind indicator etc. This monitored information is displayed on computer screen.

Also, the appropriate alarm signals are provided when the hull conditions exceed the prescribed criteria.

The ship operator should escape the area or reduce the speed or change the heading of the vessel if the alarm goes off.

**MONITOR DISPLAY**

### General Status
Overview screen
- mean, max and min values of gauge signals over last 24 hours
- percentage values to the prescribed criteria values

### Bending Moment
Trend of maximum vertical bending moments
- over last 1~24 hours for both sea and harbor operating condition
- percentage of the prescribed critical values

### Real-time Display
Display of outputs from each sensor
- over last 1~5 minutes

### Real-time Graph Display
Harbour Condition

### Fatigue Analysis Display
Harbour Condition
Cumulated stress cycle counts
- in the whole life of the ship
- rainflow analysis for every 25microstrain interval

### Statistics
Various statistical property
- Maximum +ve and -ve values
- Mean value
- Maximum peak-to-peak values
- Standard deviation
- Root Mean Square values
- Average zero crossing period

### Slaming Analysis Display
Harbour Condition
Trend of slam wave impact
- bow acceleration of 2 node component
- updating every ten(10) seconds
- trend over last 1~24 hours

### Alarm History
- displaying the contents of the alarm when the alarm levels are exceeded in some condition

### Logger Entry display
- acquire a manual entry log of critical data extracted from the ships written log book
TECHNICAL DATA

- **Long Based Strain Gauge**
  - Type: Displacement
  - Measuring Stroke: ± 5mm
  - Measuring length: 2 meters
  - Transducer Linearity: 0.1% FSR
  - Operating Temp.: -25 to 80°C

- **Accelerometer**
  - Type: Servo
  - Measuring Range: ± 2g
  - Frequency Response: 0 to 50 Hz
  - Accuracy: ± 0.2% FSR
  - Operating Temp.: -40 to 85°C

- **Pressure Transducer**
  - Measuring Range: 10Bar
  - Accuracy: ± 0.25% FSR
  - Rated Output: 4-20mA
  - Power: DC10 to 24V

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