



OPTI-LIFE is a unique, easy-to-use computer program for prediction of residual strength of hawsers, either single or twin ropes systems, used for SPM's, FPSO's, and shuttle tankers. It can be installed as part of a new installation or can be incorporated into existing load monitoring systems allowing increased flexibility and system cost saving to operators.

The OPTI-LIFE computer program analyses records of tension data logged by other programs and processes the record to display plots of peak tension vs. time, creates histograms of tension ranges, and estimates the residual strength of the rope as it weakens with repeated loading.

SPM hawser strength reduces with time under tension-tension cycling loading due to internal abrasion between strands, axial compression, hysteresis heating and creep. For systems left slack in the water between

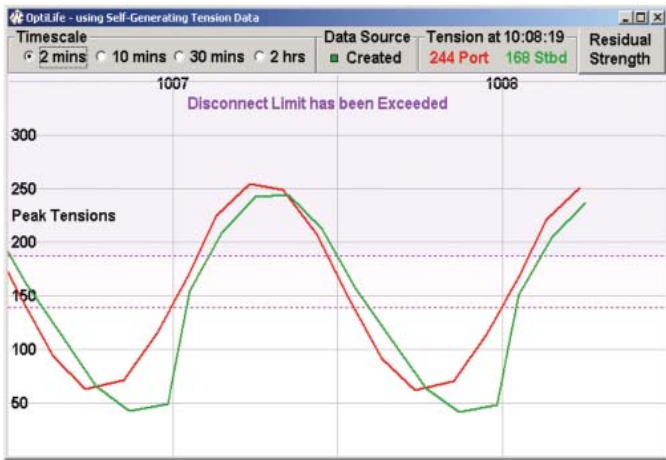
tanker loadings, there is an additional strength loss due to flex fatigue, axial compression and structural realignment of the fibres due to the washing action of the waves.

All data files created by OPTI-LIFE are written to a sub-directory Data. The most important files are the daily summary files which contain the peak and trough tensions obtained from the logged tensions for each rope. Each time the residual strength is calculated separate files are created and store the Histogram shown on the following page. These files contain can be read by a text editor such as NotePad, or imported directly into an Excel spreadsheet.

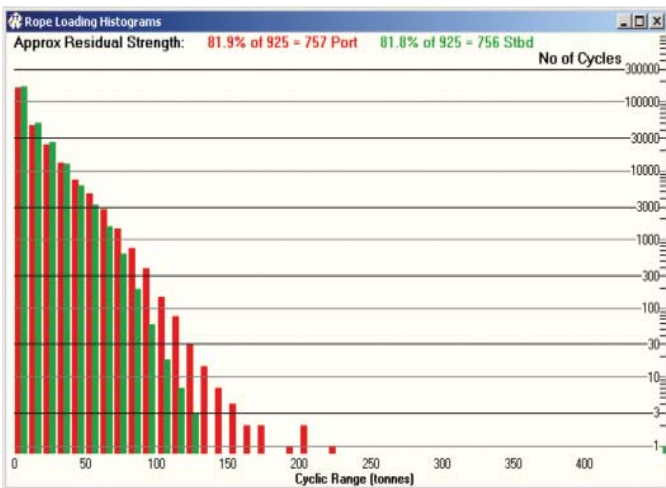
OPTI-LIFE can be run to process tension data directly from the data logger's files or from TCP/IP if the data is already in the required format. If not, then customisation can be carried out to match the specific

configuration of the clients systems.

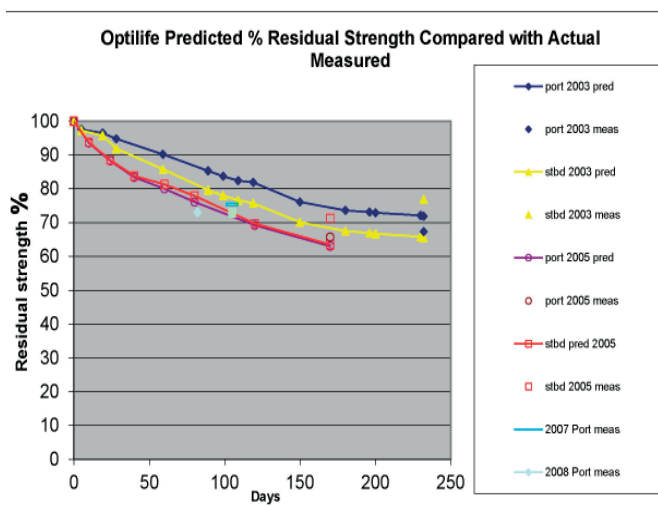
OPTI-LIFE is based on the OCIMF formula which uses two constants A for the slope of the CTF line on a semi-log plot and B, the rate of strength reduction with increasing numbers of cycles. These constants need to be established through a series of yarn tests from used hawsers to measure residual strength. TTI's knowledge of fatigue mechanisms and field operating conditions, backed up with computer modelling using TTI's Fibre Rope Modeller [FRM] software enables calibration of the constants. Alternatively, if sufficient field data from both load data and hawser residual strength exists, TTI can perform an analysis and determine the correct A and B coefficients. Since hawser life is rope material, construction and field specific, there is no other method to ensure an accurate calibrated model as provided by OPTI-LIFE.



This plot is displayed on screen and shows the peak tensions as they occur every few seconds. The user can choose a timescale covering the last 2, 10, 30 or 120 minutes. The data source is displayed next to the timescale options, indicating whether the tensions are taken from the logger (the normal source), or from a stored file data, or is self-created (for testing only). The next box displays the time and current incoming tensions.



This window shows the number of occurrences of each cyclic tension range. (A tension range or increment represents the difference between a peak and the trough immediately preceding it). The cyclic tension range represented by each bar in this histogram represents a band of 10 tonnes. The red (first) bar is for the port hawser and the green (second) bar is for the starboard hawser.



This graph shows the actual measured strengths of hawsers retired from service over a period of 5 years compared to the OPTI-LIFE prediction. The close agreement validates the high accuracy of predication of residual strength right up to final retirement.

The OPTI-LIFE software has now been installed on a number of terminals and is licensed by Tension Technology International. The software is available in multiple Windows formats.

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