

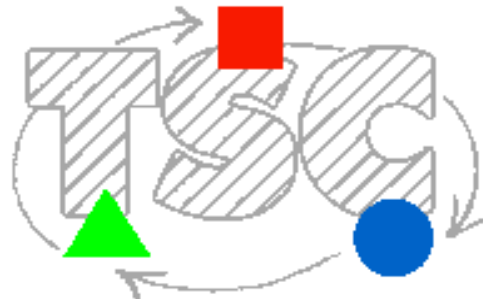
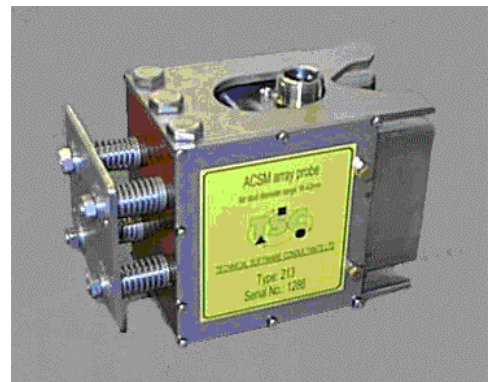
The TSC Underwater *StressProbe* A New Product from TSC for measuring Stress underwater

The TSC *StressProbe* has been developed for measurements of stress in threads, stress in tubular joints, residual stress in welded components (pipes, risers), and residual stress in forgings. In particular special purpose probes have been designed for measuring bolt loads in underwater repair clamps.

Two approaches have been developed so far for threads that either measure stress directly in a loaded thread or, alternatively, determine the stress by comparison between the loaded section and the free end. Both approaches have been successfully tried in laboratory tests and underwater on 34mm and 40mm high strength bolts. The TSC *StressProbe* has now been used for inspection of subsea clamps.

TSC are now in a position to provide the *StressProbe*, or conduct service work, for pipes, risers, tubular welded joints, subsea clamps and FPSO hulls., so that stresses can be measured and reported. *StressProbe* is available for diver use as well as ROV deployment. Stress measurement can be made through coatings (up to 5mm) as the system is non-contacting.

The *StressProbe*, previously known as the "ACSM system", received **TYPE APPROVAL** from **BUREAU VERITAS** in July 1998.

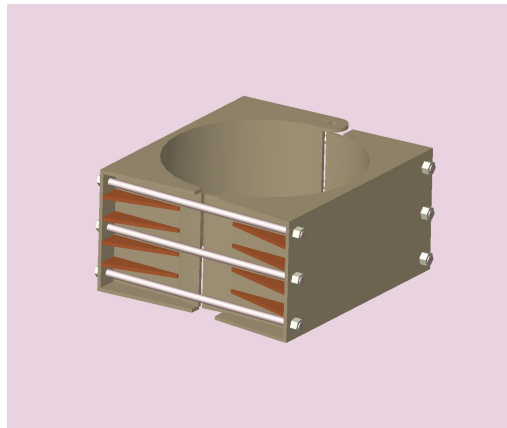


TSC Inspection Systems

The measurement of mechanical stress in a body is important in general terms as it is an indicator of residual strength or possible fatigue damage. In many cases the original stress in a component may change during service. It is important to be able to measure the stress periodically during the service life, or, in some cases, monitor continuously. For repairs, it is also an indicator of whether the repair is effective. This is particularly true of bolted/clamped repairs where bolt tightness is required at all times. In other situations, where clamps are used for restraint or support, bolt tightness is also important. A non-destructive measure of the load (stress) in a component, structure or bolt would be very advantageous and the TSC *StressProbe* can be used for this purpose.

Mechanical stress can influence the magnetic domain distribution in ferro-magnetic metals. This feature, known as piezo-magnetism can be utilised to determine changes in the stress state on the surface of metal. Magnetic permeability changes of this sort can be measured using a.c. field measurement devices. These devices have improved recently to the point where very small changes in permeability and hence stresses are detectable. Thus changes in stress of the order of a few percent of the zero to yield stress range have been measured in the laboratory for structural steels. The very latest a.c. field measurement devices can now be used for non-contacting induced field measurements and this has provided the opportunity of developing the TSC *StressProbe* for use in the service.

In order to exploit this stress measurement capability a new non-contacting probe system has been designed and tested. This system uses multiple induced fields and sensor coils together with materials data and software interpretations based on the theoretical analysis of anisotropic permeability. A completely new, purpose made, stress measurement device, the TSC *StressProbe* is now available for a wide range of applications. The work was partly conducted using a DTI SMART award and was completed in August 1996. It received Millennium Product Status in 1999.



For further information please contact:

Dr Raymond Kare
TSC Inspection Systems
6 Mill Square, Featherstone Road
Milton Keynes, MK12 5RB
Tel: + 44 (0)1908 317444
Fax: + 44 (0)1908 220959
e-mail:
ray@tscinspectionssystems.com
<http://www.tscinspectionssystems.com/>

Paul R. Stevenson, Regional Manager
FMMG Structural Monitoring Division
6100 Hillcroft (77081)
P.O. Box 740010, Houston,
Texas 77274
Phone: + (1) 713-369-5600
Fax: + (1) 713-369-5570
Direct: + (1) 713-369-5594
USA Cell: + (1) 832 434 9442
<mailto:pstevenson@fugro.com>
<http://www.fugro.com/>