

# **THERMAL MANAGEMENT OF CLOSED VOLUME SPACES IN SUBSEA PRODUCTION EQUIPMENT**

**Scott Beall** – Stress Subsea, Inc.  
**Chris McMillan** – Kvaerner Oilfield Products, Inc.  
**Lorents Reinås** – Statoil USA

**2005 SPE Hydrocarbon Economics and Evaluation Symposium**  
**April 3 - 5, 2005, Dallas, Texas**  
**SPE Paper Number 97596**

## **ABSTRACT**

The design of Subsea production equipment for HPHT (15,000 psi / 350 °F) well applications require that HSE design consideration be given towards the management of closed volume spaces of incompressible fluids. A comprehensive thermal analysis of the tree system indicated that several areas could have the potential for pressure build up beyond the design rating of the equipment. For the area of greatest concern, a passive safety device was designed that provides overpressure protection in the event of an unplanned pressure build up. This paper will discuss the methodology of the management of pressure build up in closed volume spaces due to thermal increases, with particular emphasis on the passive safety device used in the Christmas tree system for the Statoil operated Kristin field in the Norwegian North Sea.

Beall, S. McMillan, C., and Reinås, L., (April 2005), "Thermal Management of Closed Volume Spaces in Subsea Production Equipment" (SPE Paper No. 97596), Presented at the 2005 SPE Hydrocarbon Economics and Evaluation Symposium, April 3 - 5, 2005, Dallas, Texas