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## **Required Developments towards Ultra High Pressure and Temperature Subsea Tree System Solutions**

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### **Abstract**

The need for oil and gas in the world wide market does not seem to have an established limit. With the hydrocarbon prices on to-days level and the long term tendencies of a steady average increase, new fields have to be found and produced regardless of existing technology gaps. For the subsea oil and gas production systems, there are many challenges but what seems to be a primary challenge is to provide good solutions for High Pressure, High Temperature reservoir exploitation based on an overview of already discovered potential fields and an evaluation of what might come.

The paper will present a résumé of Aker Solutions previous development in this area exemplified with experiences from testing and operator observations during production start.

Further improvements are required to comply with the extreme pressures and temperatures sought to overcome. The presentation will therefore compile current international standards impact on this development, sorting of material parameters upsetting the progress, nominating materials with high potential and giving an indication on how to qualify these materials for use.

History have shown the importance of combined, cyclic testing with multi parameter variation and even forming and finding the right testing facilities is tedious and costly. An overview of current availability and future needs will be tabled and requirements formed.

To make a practical approach to all the details involved and all the standards impacting the end result, a program to qualify subsea production X-mas trees will be presented with high-light on feed-through solutions for hydraulics, electric and optic power and signal communication. Preliminary and intermediate test results will be presented and outstanding activities summarized.

### **Summary**

### **Introduction**

When newly industrialized and heavily populated countries like China and India really starts to increase their number of motorized viechles there will not be an immediate limit to their need for destilated hydro carbon products. Hence there will be exploration to find new reservoirs in places and under conditions not yet seen today.

Although hydrocarbon reservoirs are found onshore as well as offshore, this presentation will concentrate on offshore field developments and more specifically fields equipped with subsea production equipment. Production equipment is classed by API or ISO. The majority of current subsea completions are designed for Class U (10 Kpsi and 121 °C) and this is the level required for 80 – 90% of all found reservoirs.

High Pressure, High Temperature level is currently considered as above 10 Kpsi. and 150°C.

A number of HPHT discoveries, previously on hold while suitable HPHT technology has been engineered, are now being enquired about, considered for development, contracted and some already delivered.