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## Field Testing of Hybrid Choke and Kill Lines

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### Abstract

With the current increase in water depth requirements for offshore drilling, the drilling riser has to overcome more and more severe issues regarding its weight and size. Its architectural optimization is therefore a great challenge for the future developments, especially for the upgrade of small rigs, since the necessary increase in buoyancy will be limited by maximum outside diameter considerations. In order to reduce the riser weight, the hybrid pipe technology, which consists in winding composite material under tension around a metallic core, has been developed to lighten the choke & kill lines. The technology and its advantages were already presented elsewhere [1,2] and the present paper deals with further results of qualification, through field and laboratory testing of C&K lines.

In particular, numerous damages (shock, notch, punching) were created on different specimens to assess their influence on the resistance under internal pressure. As a further step in the qualification, three hybrid C&K lines were field tested on the *Pride Angola* drillship, to evaluate the technology under real drilling conditions.

After the field test, the hybrid pipes were analyzed and burst tests were performed to estimate the potential influence of handling and ageing.

This paper recalls the basis of the technology and describes the different laboratory tests. It finally details the phases of the field test and comments burst tests. The different results are very encouraging regarding the technology itself and show how some issues related to the assembly of the peripheral lines on the riser joint can be improved.

### Introduction

The global trend of increase of oil prices has led the companies to increase their effort for E&P in new deep offshore fields. However, this trend is hindered by the saturation of the offer of the drilling rigs, increasing their daily cost. Therefore, within the next years, new drilling rigs will enter in service, but also upgrades of old ones.

The drilling riser, which can be seen as the submerged part of the wells, is one of the crucial equipment of these new built and upgrade projects. This riser lying on the deck represents a lot of space and weight. In use, it undergoes very high pressure, tension and bending stresses. The increase in water depth requirements has led the current riser technologies close to their limits. This is the reason for developing new technologies that could be applied either on new rigs or for the upgrade of existing rigs.

Conventional low pressure drilling risers are equipped with peripheral safety lines to control and kill the well in case of blow out. The standard full steel Choke & Kill lines, having to withstand high pressure in use, require a great wall thickness and consequently a high weight. In order to reduce this weight which may represent one third of the riser mass, IFP and its partners have developed a hybrid technology combining steel and composite material for 4 ½" ID × 15 ksi Choke & Kill lines. This technology allows a weight reduction of approximately 50 % for the lines.

The benefits of lightening the peripheral lines of the drilling riser are important, for the following reasons:

- For a given specification, the total weight of the riser and its volume decrease respectively of about 20% and 15%, making the storage of the riser easier on the deck or in the hold of the floating rig, and saving a significant amount of buoyancy.
- For a given rig, the use of the technology enables to increase the achievable water depth, mud density or pressure requirements.