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(54) Title: HORIZONTAL SUBSEA TREE PRESSURE COMPENSATED PLUG

(57) Abstract

A pressure compensated plug for use with subsea trees is described in which a reservoir of compressible fluid is located from a cavity within a horizontal tree (10) whereby allowing temperature induced volume changes to be absorbed by the compressible fluid without resulting in significant increase in pressure. This is achieved by providing a pressure compensation apparatus (80) in the cavity, the apparatus comprising a housing (82) with a floating piston (86) in a chamber (84). The lower face (96) of the chamber is exposed to compressible fluid in the form of an inert gas, such as nitrogen, which is pre-charged at the surface to the appropriate hydrostatic pressure of the seabed. The volume of gas trapped between the lower piston face and the lower face of the cylinder forms the gas reservoir (94). A compensation cylinder can be attached to the upper section of the lower plug (70) and run and retrieved at the same time as the plug, thereby reducing the number of intervention runs. When the lower plug (70) is set and the cavity isolated, any volume change in the liquid due to temperature increase when the well is producing is compensated by the movement of the piston (86) and subsequent expansion and compression of the inert gas, thus maintaining the cavity pressure at approximately the hydrostatic pressure. This has the result that any pressure increase is limited or obviated and pressure within the tree is within the design pressure of the cap or tree minimising the likelihood of any damage to the plugs or the tree.

