

To
RVO

From
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Subject

Public Summary of the TKI project "Plugging wells by enhanced formation ductility"

Project number : TEG0114004

Public summary:

Currently it is discussed controversially if human efforts to seal wells by using other materials than those of the natural hydrocarbon trap, such as cements, polymers and steels, can provide efficient sealing over long time spans after the well has been abandoned. The standard sealing material is cement which has the advantage that it can be placed "easily" in the well and is abundant, but it does not have ideal sealing properties since it shrinks when hardening, is brittle and chemically reactive under downhole conditions.

The TKI project TEG011400 "Plugging wells by enhanced formation ductility" (team members EBN, Total and NAM, lead TNO) is a feasibility study, aimed to reduce P&A costs and to increase long term safety by developing new methods using natural subsurface formation and conditions to create a long-term sealing barrier in abandoned wellbores by either using the natural- or enhancing existing ductile shale properties.

The study identified the potential of natural sealing properties of caprocks and their capability to provide zonal isolation for (parts of) a wellbore, without using materials which are not abundant in the original natural system. In addition potential ductile formations in the Netherlands has been screened and options to stimulate or (re-)activate inactive shales and salts has been investigated.

Natural ductile formation, such as shales and salts can close wellbores in short time spans (hours to days) under certain conditions and first pilot tests showed that they can form an adequate wellbore isolation. The clay mineral "Smectite" plays a key role for increasing the ductility of shales, whereas so-called squeezing salts, like Bischofite, increase the ductility of salts. Generally, higher pressures and temperatures seem to be beneficial for their ductility and the sealing process.

Natural formations are already used for wellbore sealing in e.g. the UK or Norway and induced natural swellable clays, such as smectite-containing bentonites, are used to seal (shallow) wells, e.g. water wells.

For the (field) application (in NL) of natural ductile formations in the context of wellbore sealing, relevant properties of the identified formations need to be further

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investigated (e.g. mineralogy, in situ stress and pressure conditions) and have to be related to their sealing behaviour.

For a global application in the O&G sector further evaluation of the placement and the in-situ sealing performance of mobile formations and bentonites by lab and field tests is needed, which is also essential in order to establish this promising potential sealing methodology in the Netherlands. After an in-depth analysis of potential stimulation techniques, based on the outcomes of the screening provided in this study, most promising options should also be tested on lab and field scale.

Simultaneously, the regulatory framework should be carefully evaluated to ensure a smooth and rapid implementation of this sealing option in Dutch abandonment regulation and industry practices and to ensure a sustainable and safe application of this new sealing method for O&G well abandonment.

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<vnr-ext>

Page

2/2