

North Aegean  
Petroleum Company E.P.E.

ACTING IN THE NAME AND FOR THE ACCOUNT OF THE JOINT VENTURE:  
DENISON - HELLENIC - WHITE SHIELD - WINTERSHALL

**NAPC**

P. O. Box 1077, GR-65110 Kavala - Greece

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Kavala

12th June 1989

Dear Sirs,

**SUBJECT: LIQUID CASING AND OM SEAL**

To bring you up to date on our specific uses for liquid casing as opposed to workovers in the past, we are using it for two applications.

1. Preventing cross-flow in producing wells.
2. Preventing sticking of the drill-string in high differential conditions.

1. Preventing cross-flow:

As you know our wells are multi-layers and with time we have developed depleted oil zones and supercharged water zones with up to 2500 p.s.i. differential between layers.

In the past we have tried other products to seal off the low pressure oil zones and prevent water cross flow, when wells are shut in without any success.

We currently bullhead about 20 BBLS of viscosified sea water containing 30 lbs/BBL liquid casing into our producing wells until we obtain a formation lock up of about 500 p.s.i. over pumping pressure. We then shut well in, holding 500 p.s.i. excess pressure, and leave the wells for up to ten days before bringing them back to production.

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This is now the normal procedure for shutting down producing wells for surface maintenance.

All wells put back on production have immediately produced the same flow rates as prior to shut in, indicating that no formation damage or blocking occurs, we also do not have to unload cross-flowed water as in the past which is a great benefit.

2. Drill string sticking:

One problem that has plagued us in the past has been high differential pressures when working over a well using weighted muds. We have at least one zone with up to 3000 p.s.i. differential pressure, which has repeatedly stuck down hole tools, due to baryte screen out and compaction around tools, (the last time took 5 1/2 hours of heavy jarring to free a stuck overshot).

We cannot prevent mud-screen and initially due to the configuration of the completions which have to be recovered, we can now work easily through these zones by carrying 5 lbs/BBL liquid casing in the mud and spotting fresh liquid casing pills (1 BBL with 20 lbs/BBL liquid casing concentration) as we work through these zones. We have seen no repeat mud bridging or sticking. We have seen no formation damage although we still use a small acid wash to remove minimal mud damage.

On mid-west we have just had to re-drill the same section, again with up to 3500 p.s.i. differential pressure. The section drilled was just under 200m of 4 1/8" hole with a slick string of 3 1/2" drill collars. Normally nobody in their mind would attempt this, but we had to. We carried 5 lbs/BBL liquid casing in the mud and spotted 1/2 BBL of 20 PPB concentration of liquid casing on connections and although we saw some over-pull while passing the sands on the trip but no sticking. We believe that without liquid casing we would never have been able to drill this section.

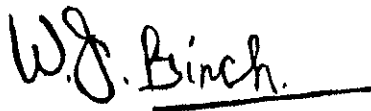
As a final note, there is something you may look into. We have never been able to establish the longevity of liquid casing, but believe it to be about ten days. This is not a problem as it appears that the liquid casing carried in the mud re-seals the perforations after losing about 4 BBLs mud. As you know our wells are extremely sour (62-65% H<sub>2</sub>S) and it may be that the acidity of the formation fluid is degrading the liquid casing which is in contact with it, even though we carry about 2500 ppm of excess biocide in the system.

I think that from these observations and the results of our early pilot testing that liquid casing will break down easily with mild acids, even acetic acid if you have to work with stainless or Duplex steels as we do from time to time.

I will keep you up-dated on any other applications we find for liquid casing.

Our stock levels are getting down to about 500 SXS, so we will instruct Roco, Aberdeen, to collect and ship our usual order of twenty pallets. Please ensure that adequate stock is available ex U.K. at all times.

Yours faithfully

A handwritten signature in black ink that reads "W. J. Birch." The signature is written in a cursive style and is underlined with a single horizontal line.

W. J. Birch  
Drilling Superintendant