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Procedure for Placement of FLUTe NAPL Reactive Cover in Core Samples

Purpose
This simple procedure describes the FLUTe® method of assessment of core for the presence of NAPL in the pore fluids of the core.

The method
The FLUTe NAPL reactive cover material is designed for the mapping of the LNAPL or DNAPL in the pore fluids of geologic materials. The hydrophobic reactive material is designed to wick NAPL pure product only. The pure product will either leach the dye stripes on one side of the fabric into the fabric producing a stain pattern on the unstriped side of the fabric, or if the NAPL does not have solvent characteristics, it will only stain the fabric as either like an oily stain on paper or according to the color of the NAPL. Solvents like TCE will produce a strong stain pattern on the white side of the fabric.

For cores recovered from core barrels, the fabric can either be wrapped on the outside of the core or placed inside the core after it has been slit longitudinally. In either case, the primary concern is to minimize the evaporation of the NAPL before it can be wicked into the fabric. The preferred approach is to split the core quickly and then placing a folded strip of the fabric in the slit and quickly closing the core against the fabric strip. Wrapping the exterior of the core with a strip of polyethylene film helps to clamp the core against the fabric and also prevent evaporation of NAPL in the core to the atmosphere before it can be absorbed. The core does not need to be competent and may be slit while in an exterior plastic sheath.

The folded fabric strip shown in the figure should be twice the width of the core, and when folded should have the color stripes on the outside of the fold. This allows the NAPL to carry the dye from the striped side to the white side of the fabric from each half of the core. The white side of the fabric is later examined for the stain.

The NAPL is wicked very quickly into the fabric and may not require more than a few minutes of exposure to the core. A reasonable exposure time is 10-15 minutes. However some users prefer to leave it clamped together for as long as a hour. The fabric will wick the NAPL as long as it is in contact with the NAPL.

When the exposure time has passed, the core can be unwrapped and the folded strip removed from the core. By unfolding the strip, the normally white side of the strip is then examined for NAPL stains. FLUTe provides a video of the development of a stain to help the recognition of a significant stain (request the video at info@flut.com.

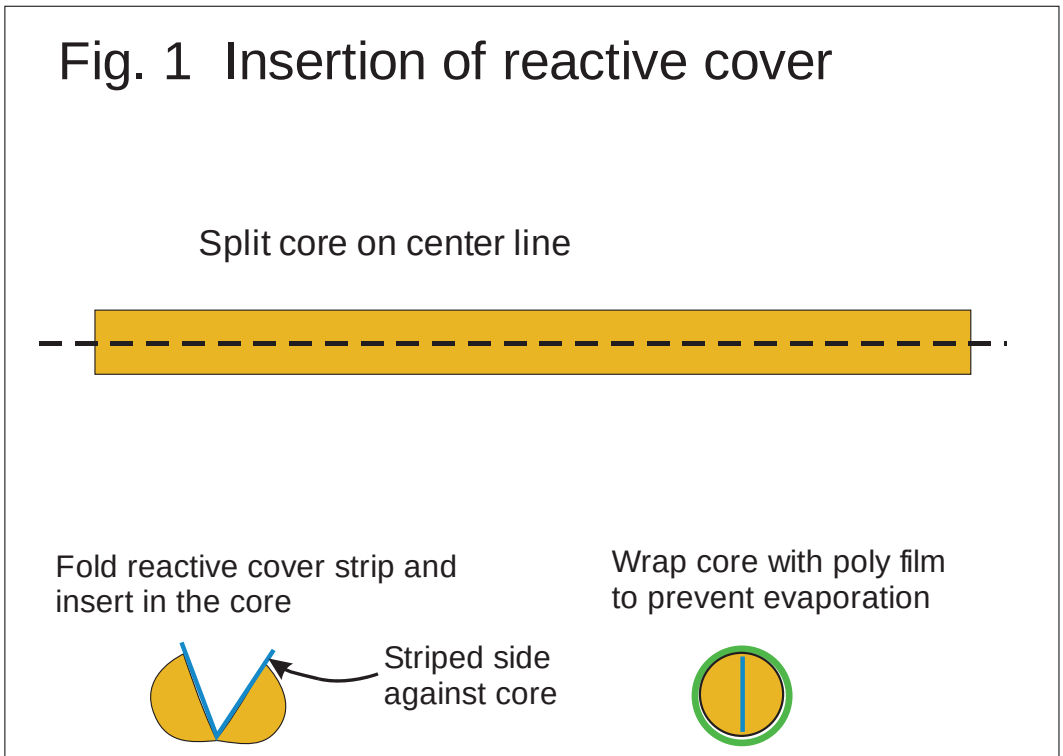
For clear NAPLs, the stain may only be like that of an oil stain on white paper (a translucent off-white appearance). For weak solvents like gasoline, the stain is a transfer of the stripe pattern to the white side. For strong solvents like TCE, the stain is a blotch like a water color application and the stripes are very much distorted and mixed. For coal tar, the stain is usually black to brown spots or streaks. For many NAPLs the dye is also combined with the color of the NAPL, often a brown stain.

This ex-situ technique depends upon the pore fluids being extracted with the core. For sonic core, there is a different technique that uses an exterior cover to contain the core as it is extruded from the core barrel. For a description of that technique, contact FLUTe at www.flut.com.

Preservation of the record

Once the strips are removed from the core, they should be labeled and photographed. The stains are relatively permanent, but due to wicking, any heavily stained strips should not contact other strips or be stored in a manner to contact themselves so as to spread the stains. One simple technique is to lay the strip on a sheet of polyethylene and roll it up. However, the more durable record is the digital photograph.

Fig. 1 Insertion of reactive cover



Stains on covers from direct push holes

Stains on cover in 3” cored hole

Some of the NAPLs and DNAPLs that react with the NAPL FLUTe system

We, and our customers, have tested the following compounds with our NAPL FLUTe reactive cover:

- Motor oil, gear oil, thread cutting oil
- Gasoline
- Diesel fuel
- Creosote
- Chlorobenzene
- Dichlorobenzene
- Trichloroethylene
- Tetrachloroethylene
- Dichloroethane(also called ethylene dichloride)
- Methylene chloride (also dichloromethane)
- Carbon tetrachloride
- Benzene
- Lindane (an insecticide)
- Acetone
- Xylene
- Toluene
- Dowtherm
- PCBs

These compounds all react with the reactive cover, but in somewhat different fashion. The motor oil, gear oil, Dowtherm, PCBs, and thread cutting oils do not leach the dye from one side to the other, but they do wet the cover to a much more translucent state. It looks like oil on paper. Some oily compounds show extensive staining from the color of the compound. That is especially true for creosote.

The other compounds all leach the dye from one side to another producing a blotch of mixed color. The trichloroethylene leaches the dye somewhat more aggressively than the tetrachloroethylene, but it is hard to tell the difference when the cover is retrieved. Acetone, xylene and toluene all evaporate very quickly and may leave a muted stain if the stain is not obtained underground and/or under water. There has been a report of the dye being entirely washed out of the cover by a massive stain, but even then the edges and striped side of the cover show the effect.

The gasoline and diesel fuel leach the dye less aggressively than the other leaching compounds. Consequently, there is extensive wetting of the cover, with wicking for long distances with the fuels, but the dye migration is slower. However, when the cover dries, there is clear evidence that the dye is leached from the from to the back side by these fuels. Gasoline actually bleeds the red dye stripe more than the other two colors.

For more information on the utility of the NAPL FLUTe system, call 1-888-333-2433.