

Chemometrics

Application Brief



Apportioning Comingled Oils

Upstream and downstream applications in the oil industry

Summary

The advantages of using a multivariate tool such as Pirouette® are manifold. The combination of gas chromatography and pattern recognition can be a fast and inexpensive means for evaluation of petroleum systems. It is applicable to high water cut wells and can be employed to manage underbalanced drilling. In addition, there should be no lost production due to testing. If desired, these interpretations can be monitored in real time and managed by a centralized expert.

A multivariate pattern recognition technique provides a robust means of calculating relative amounts of each component oil in a mixture. The pure end-members need not be known ahead of time and the interpretation can be fully automated to execute on completion of the gas chromatographic run. The technique also has the ability to identify if a suspected mixed source oil is not a match to the end members.

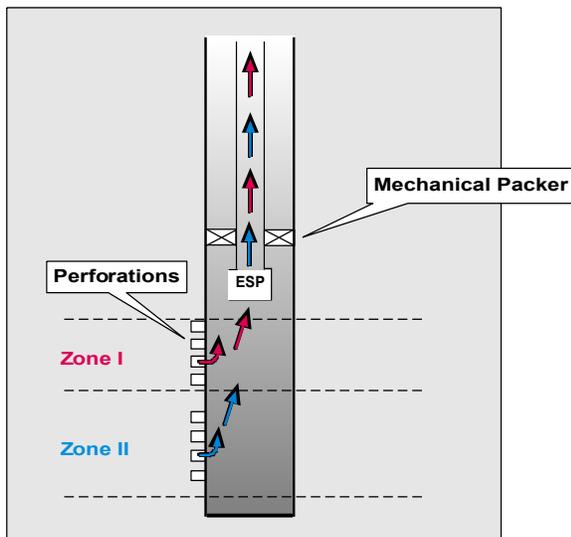


Figure 1. Oil flow and mixing from two reservoirs

We already use gas chromatography to evaluate exploration and production samples for commingled oils caused by stratigraphic leakage and reservoir continuity. The bottleneck is in the interpretation.

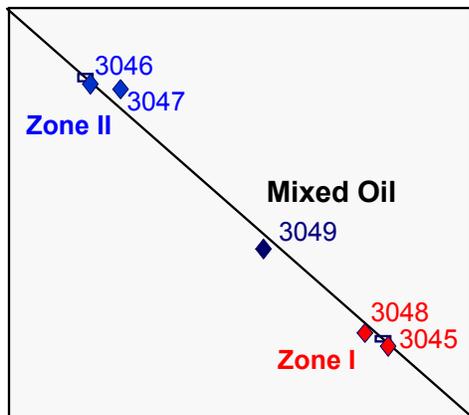


Figure 2. An example of apportioning a mixed source oil

Once the model for a particular setting is built, the processing of newly produced oils can be done in real time without involving a geochemist. Unusual situations are automatically flagged so that an expert can be called in as the situation warrants.

The technology is not limited in the number of sources to be apportioned as seen in the three-component case in Figure 3.

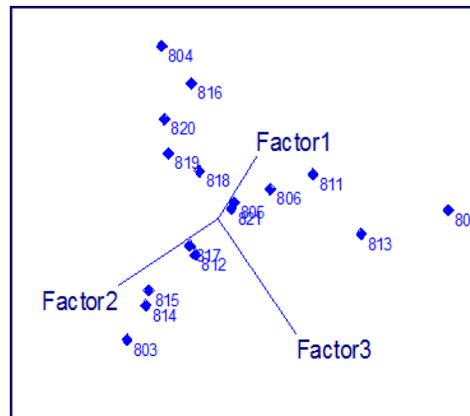


Figure 3. Mixtures of three zones

A variety of application areas have been investigated and the technique is applicable in a series of both upstream and downstream settings:

- Underbalanced drilling
- Multizone well perforations
- Cross flow into different reservoirs
- Tubing, casing, packer leaks
- Gathering centers
- Flowlines
- Backblending
- Storage facilities

Although applied primarily to exploitation issues and management of refinery blending, there are also uses in environmental apportionment to assess contributions to fugitive hydrocarbons in an objective manner.

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