

**PRODUCTION GEOCHEMISTRY IN NIGERIA:
IMPROVING RESERVOIR MODELS AND FIELD DEVELOPMENT**

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During the last few years a second generation Multi-Dimensional Gas-Chromatography machine (MDGC) for geochemical fingerprinting was successfully installed in SPDC's Production Chemistry laboratories in Warri/Nigeria. The technology, which was originally developed in Shell Research in the early nineties, had never before been implemented in an operational environment. Fingerprinting technology is probably best known for its capability to allocate and monitor co-mingled production. However, the Nigerian government now also legally requires fingerprinting field wide to build a national oil fingerprint database mainly for environmental reasons. With thousands of stacked reservoirs in SPDC's portfolio and an ambitious government policy to encourage companies in Nigeria to preferentially use local expertise, getting geochemical fingerprinting technology into Nigeria was an essential prerequisite to exploit the full potential of this technology. Since then, MDGC fingerprinting has been applied on a large number of field studies on hundreds of samples to:

- Identify connectivity/compartmentalisation in the field
- Identify corrosion problems
- Identify which formations are actively producing and where we may be inadvertently co-mingling without knowing due to mechanical problems
- Identify potential candidates for co-mingled production (surface and subsurface co-mingling)
- Support solving allocation problems
- Provide a better understanding/improve the current reservoir model
- Determine amount of mud-contamination in PVT samples to derive more accurate PVT data
- Identify oils which have similar fingerprints and whose PVT data could therefore be used to substitute oils where such PVT/compositional data are not available

- Identify origin of oils in litigation cases: environmental claims and comply with DPR requirements to provide fingerprints on a field wide base to be part of a national oil fingerprint database
- Reconstruct field-filling history and predict hydrocarbon type in near field prospects

In this paper we report about the technological and logistical challenges to install and maintain complex geochemical technology in a difficult environment. We also present the results of three case histories describing the application of geochemical fingerprinting technology to connectivity, corrosion, allocation and co-mingling problems.