Composition of natural gases in onshore and offshore in the Netherlands

TNO makes available the non-confidential part of its database on the compositions of natural gas and gross heating values of the hydrocarbon gases. New distribution maps were created from these compositional data and gross heating values. The data were analysed and interpreted to provide a process-based understanding of the distribution of the different hydrocarbon and non-hydrocarbon gas components. The maps and explanations will be made publicly accessible.

The database

The in-house database contains information compiled over the years from different sources, such as lab reports of analyses of gas samples from in-house, commercial and service company laboratories, and information on gas composition derived from published maps, reports and publications. The database is updated continuously with new information. At present the database contains the analyses of approximately 1400 gas samples from the Netherlands. It provides information on the compositions of natural gas and the calculated gross heating values of the hydrocarbon gases, while more than 170 analyses also include information on the isotopic compositions of hydrocarbons, nitrogen and carbon dioxide. The non-confidential part of this database is available on the internet (www.nlog.nl). This publicly accessible database contains, per data point, the well name, depth, stratigraphic unit, Mol% of the main hydrocarbon components (C1, C2, C3, i-C4, n-C4, i-C5, n-C6, C7 +) and the calculated gross heating values of the hydrocarbon gases.

The maps

New distribution maps were created from the compositional data and gross heating values of the non-confidential database. The different maps display – for the main reservoir units – the distribution of a single hydrocarbon component, the ratio of hydrocarbon components and the distribution of CO2, N2 and H2S. Figure 1 shows an example of a distribution map for the molecular ratio C1/(C1 + C2 + … + C7 +) (in Mol%) observed in the Upper Rotliegend Group. The following approach was used for constructing the map (Figures 1 and 2):
- Data selection based on: availability of surface coordinate data (no compensation for deviation); known reservoir unit; sum of all gas components is > 95 Mol%;
- For each well location, one value for C1/(C1 + C2 + … + C7 +) was used. If more than one analysis was available for the selected reservoir, the average value for each component was used in the calculations;
- Interpolation of data was carried out with the Isatis program based on a variogram with a spherical model (nugget: 0.6, range: 15 km, total sill: 5.0) and a search radius of 300 km;
- Only that part of the map is visualised where the kriging standard deviation is < 2%.

Analysis and interpretation

We compiled a comprehensive overview of the main factors and processes of influence on the present-day composition of hydrocarbons and non-hydrocarbons in natural gas accumulations in the onshore and offshore Netherlands. This overview includes the results of a preliminary analysis and interpretation of the compositional data and the available isotopic compositions of hydrocarbons, nitrogen and carbon dioxide. It will be made available at the website: www.nlog.nl.

Information

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DINO geoscientific database system now available internationally

The DINO database system was created to assist in the many tasks involved in a modern national geological survey. It was developed over a number of years in interaction with internal and external users and then matured as it was used for both data maintenance and provision and for supporting the geoscientific activities, like mapping and modelling, of a national data repository.

DINO’s primary task is that of storing the data transferred from legacy databases, acquired in the field or collected from third parties. In doing so, the main goals are to make public data widely accessible, yet keep confidential data securely and exclusively available to their owners and the authorities that must enforce E&P regulations. The database has numerous other dictates as well. It must facilitate quality control and constrain the data to maintain database consistency, while making the data comply with business requirements. It must also keep large-volume data, conventionally had from tape, available online so as to effect the efficient interpretation of, say, seismic data by allowing the data to be loaded onto a workstation within an hour, typically, instead of a week. Finally, the DINO database system has to provide easy intuitive tools for complex queries and keep datasets available as long as needed for use in projects, with the owner enabled to perform algebraic operations on one or more preselected datasets.

It is also important that data users be able to understand the data model, thus enabling them to devise their own operations on the data. This need resulted in database modules being created for such things as well data, seismic data, vertical electric soundings, cone penetration tests, groundwater and maps. Consequently, future users outside TNO can compose a database system according to the data types they need to manage.

The entire system, built with Java user screen forms, is web-based. To that purpose we developed middle-tier software for all the generic interactions between the object-oriented applications and the relational database tables inside the system. This software also provides a powerful interface for efficient application development and maintenance. We also found innovative solutions to the use of proven technology like Oracle RDBMS. Where needed, data selection is supported by graphical representations of the data. The system also offers geographical representation of monitoring locations, 2D and 3D surveys and other specifics as a visual support for users.

In short, DINO meets the requirements of both the general geoscientific work of national geological surveys and the specific activities, like oil and gas E&P, performed by national data repositories. The Geological Survey of the Netherlands recently decided to also make the system commercially available to the national data repositories of other countries. To this end, it sought a worldwide collaborative involvement in the oil and gas sector with a data services contractor, KADME of Norway. KADME developed Internet access technology for map-based access to the data from anywhere, which seamlessly complements the DINO database system. TNO and KADME now share a joint venture, LERXAS, to commercialise their joint products.

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