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Microseismic pilot study in the Netherlands

During the second half of 2001 ABB Offshore Systems' Reservoir Geoscience group in Cornwall, United Kingdom, completed a microearthquake (microseismic) monitoring pilot study for the Dutch gas company NAM (Nederlandse Aardolie Maatschappij BV). The pilot study was conducted in a North-East Netherlands gas field that lies in a region historically known for possible production-related seismic activity, some of which has been felt on the surface.

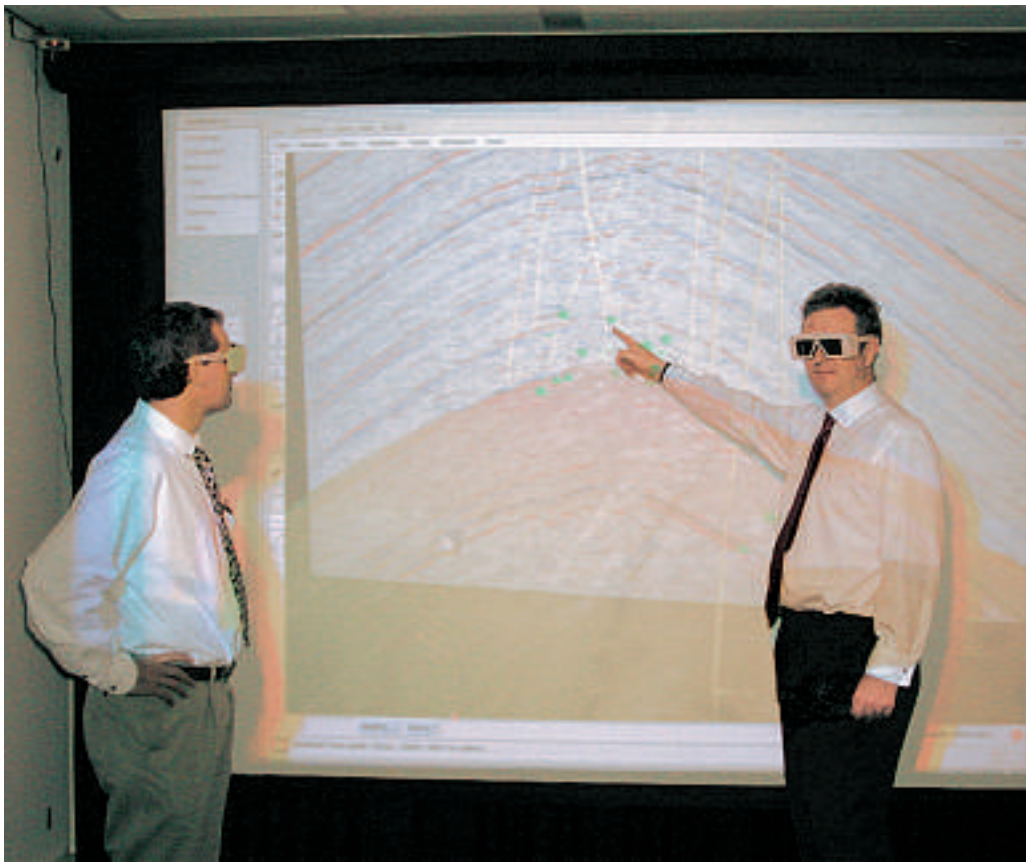
The pilot study was highly successful and met NAM's key project objectives, which were:

- Obtain proof-of-concept of the technology for North Netherlands gas fields.
- Obtain a high-quality data set enabling NAM to gain experience in interpretation of this new form of reservoir information.
- Help identify reservoir compartments and connectivity that can control the productivity of each well, but are below the resolution of conventional seismic techniques.

The measurements were made using a borehole seismic tool provided by Compagnie Générale de Géophysique (CGG) that had been previously qualified at the ABB deep borehole test facility in Cornwall. Besides the data processing and interpretation, ABB undertook the data acquisition using a system operated remotely from the UK via an Internet link.

The culmination of the project was an interactive data interpretation workshop in a NAM 3D-visualization suite (photo) involving experts from ABB, NAM and Shell Exploration and Production Technology and Research (SepTAR), The Hague.

Further trials are planned for later this year.



Microseismic monitoring provides valuable reservoir information. It can help companies identify connectivity between reservoir compartments, enabling them to control productivity better.

TUD-1: An exciting, new ultra-large pore catalyst

Catalyst design has become a sophisticated, 'high-tech' science. Specific catalyst formulations, for example, are often governed by the reactions they are required to control. Moreover, catalysts are often customized to fit the physical requirements of certain molecules.

In hydrocarbon processing – eg, in refining and petrochemical applications – scientists have, over the last fifteen years, been studying ultra-large pore materials, so-called 'mesoporous materials'. These materials, comparable to zeolites (important catalysts in the refining and petrochemicals industries), are mainly silicates or aluminosilicates having large specific surface areas and well-controlled porosity. They differ from 'traditional' zeolites in that their pores are much bigger. Mesoporous materials are of great interest to scientists because of their potential for upgrading low-value, heavy, bottom-of-the-barrel molecules into high-value, premium transportation fuels, petrochemicals and specialty lubricants. Scientists have been working on controlling their shape and size, and on improving understanding of their catalytic function. Since it involves several different disciplines, this research is of interest both to industry and to biologists and physicists. The key to the successful formation of mesopores is careful matching of the type of template molecule with the temperature regime used.

Recently, scientists at the Dutch Technical University of Delft, in collaboration with ABB researchers in the USA and Germany, have discovered and patented a new class of meso-porous materials known as 'TUD-1'. The scientists chose a bulky organonitrogen compound as the template molecule. By mixing the template, a proprietary silica source, and water at various temperatures a homogeneous gel was obtained. Hydrothermal treatment of this material changed its structure from amorphous to meso-structured. Finally, TUD-1 was obtained as a white

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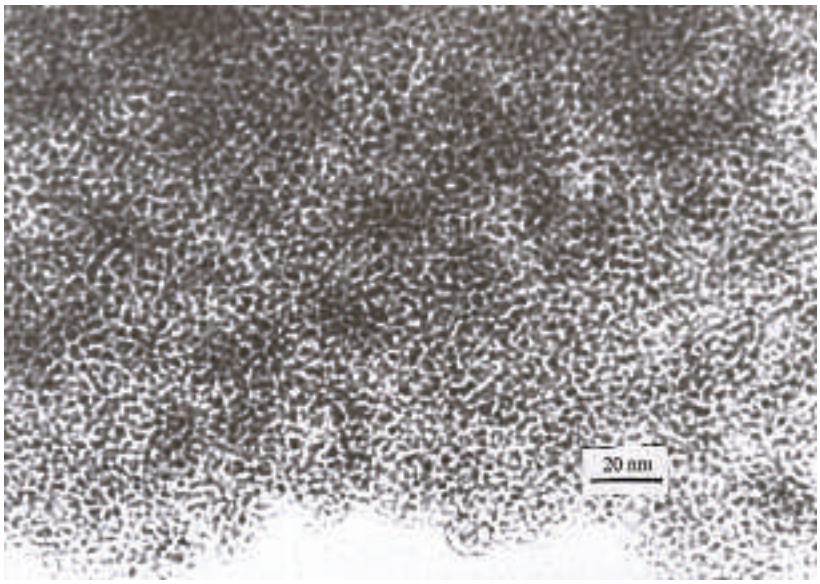

TUD-1 is a new class of mesoporous material with a random, three-dimensional, interconnecting pore structure.

mesoporous solid by the removal of the template. The scientists discovered that they could control the mesopore size distributions by altering the reactant composition and the preparation variables. For example, the pore sizes can be tuned from 25 to 250 Å and the surface areas from 400 to 1000m^2g^{-1}.

Using a novel imaging technique not unlike that used to study the human body, the Delft researchers showed that TUD-1 (photo) has a random, three-dimensional, interconnecting pore structure. This is in contrast to other important mesoporous materials, for example MCM-41, that have only a one-dimensional structure. Moreover, three-dimensional catalysts have higher accessibility (leading to higher activity) and better aging stability than one- or two-dimensional catalysts. The uniqueness that this imaging technique proved was critical in obtaining broad-based patent coverage. The catalyst has already been prepared with several diverse formulations and has shown promise for several classes of reactions used to make chemical intermediates, specialty chemicals and automotive fuels. Clearly, this is just the 'tip of the iceberg' with regard to its catalytic applications.

This university collaboration is just one example of the ongoing projects ABB is undertaking together with world-class universities in Europe, Asia and the USA. Our strategic university alliances enable us to broaden our research base and secure an entry into many leading-edge projects, eg in the areas of nanotechnology, automation and mathematical modeling. Besides enabling ABB to tap into many new research areas, they provide us with an avenue for meeting and recruiting top-flight scientists.

Wireless control in the automotive industry

ABB, Ericsson and Volvo are cooperating on future solutions for wireless communication in industry

In the future, signal wire failure will be a thing of the past, thanks in no small part to ongoing work at ABB. At the start of 2002, a pilot wireless spot-welding robot was installed at the Volvo car production site in Olofström, Sweden. The objective of this installation is to test and investigate the possibility of replacing signal cables

between the robot's control cabinet and tooling with the wireless communication technology called Bluetooth.

Industrial robots play a key role in modern, fully automated production plants, and the factory in Olofström has more than 500 in production. The robots are fitted with different types of tools, for example a gripper, a glue gun and welding equipment. The power and control signals for the robots are transmitted via a swivel, which has to be maintained regularly to minimize production downtime. According to Ove Jösok, Volvo's control system specialist, "A large number of signals are necessary to ensure absolute reliability and secure the highest production quality. At the moment, these signals are connected over different cables and bus systems. In the Olofström factory we have about 70,000 wired signals (I/Os), and sooner or later cable failure will result in a production stop."

Jösok says that the great advantage of changing from wired to wireless communication is the reduction in installation costs, plus the fact that a much simpler swivel can be used. This is backed up by Volvo car-body chief, Anders Granberg, who adds, "Other benefits are increased lifetime availability and flexibility, while maintenance costs are also lower."

"We expect the pilot installation to show that the Bluetooth technology can be used in harsh industrial environments, and that wireless technology can be utilized even when time is the critical factor", says Harry Frank, Director of the ABB Corporate Research Center in Sweden. "Our researchers are also working on wireless power supplies for the Bluetooth modules. The technology exists for this and it is within the realms of possibility".

Snorre Kjesbu, ABB's wireless communication program manager, believes that this kind of project stimulates customers' interest in addition to allowing ideas and concepts to be tested in real applications. He adds that a lot of experience of wireless communication in an industrial environment has been gained during the project and that ABB is really optimistic about this technology's future potential.

Participants in the pilot project are the wireless team at ABB Corporate Research in Norway and Sweden, ABB in Olofstroem, Ericsson and Volvo.

Photo courtesy of Volvo cars

Bluetooth is a technology standard for wireless communication, introduced by Ericsson, Nokia, IBM, Intel and Toshiba. It is based on advanced radio technology that makes low-cost, short-distance communication possible between cell phones and mobile computers.

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The microseismic events and, despite their name, the ultra-large pore catalysts described in our R&D Digest articles represent the smaller end of research activities at ABB. At the somewhat larger end we have this 200 kilowatts AC transformer.