Ultra-fast catalysts to speed the development of clean fuels technology

ABB Lummus Global has joined with Symyx Technologies Inc of Santa Clara, California, in a project aimed at discovering a new family of catalysts that will help to significantly reduce sulfur levels in automotive fuels. In the course of the project, care will also be taken to retain the desirable combustion properties of the fuels (eg, the octane number) to ensure that increasingly stringent international emission standards are met.

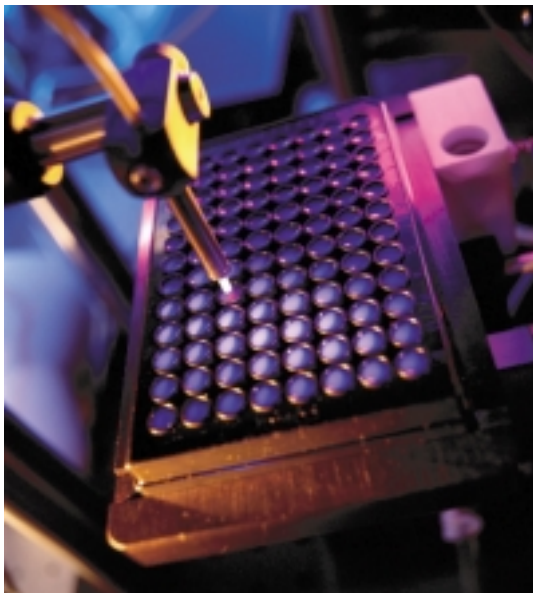
Cutting-edge, high-throughput combinatorial synthesis methodologies, developed by Symyx, and catalyst evaluation techniques are being used in the project. The Symyx methodologies were initially evaluated using a series of well-established catalysts. The results of this evaluation convinced ABB that the new combinatorial approach holds great promise. It was recognized that such an approach considerably enhances the chance of success by allowing

- Ultra-fast parallel synthesis (see figures)
- Testing of large numbers of unique catalyst formulations, eg 100–200 new catalysts per day instead of the 1–2 formulations tested with conventional methods

Consequently, a very large area of potential catalyst compositions can be scanned in a short time.

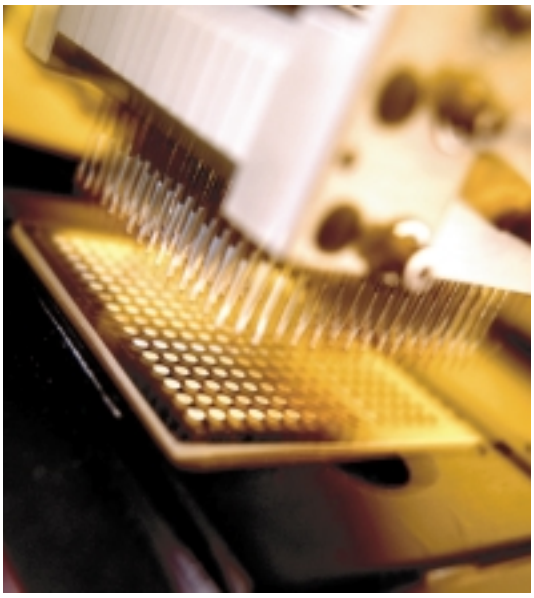
It is worth noting that similar applications have contributed to the discovery of materials for life science, chemicals and electronic applications. The combinatorial catalyst discovery method has meanwhile caught the attention of the scientific catalyst community, and several companies are now working in this particular area.

The project was launched towards the end of 2000. Through the collaboration, Symyx' vast experience with specific robotic instruments, dedicated software and other proprietary intellectual techniques, will be combined with ABB's experience in chemicals and petroleum refining.



Primary screening technology allows rapid measurement of material particle sizes on an array of materials.

Using this automated multi-channel dispensing head, hundreds of catalyst candidates can be synthesized in one go.



R&D

Even though few results have as yet been published, ABB is demonstrating its faith in the combinatorial approach by becoming one of the first companies to employ such techniques for catalyst discovery in the area of ultra-clean fuels.

In the next project phase, the ABB/Symyx team will start experiments during which it expects to evaluate several thousand catalysts. Highlights of the project will be reported on in a forthcoming issue of *ABB Review*.

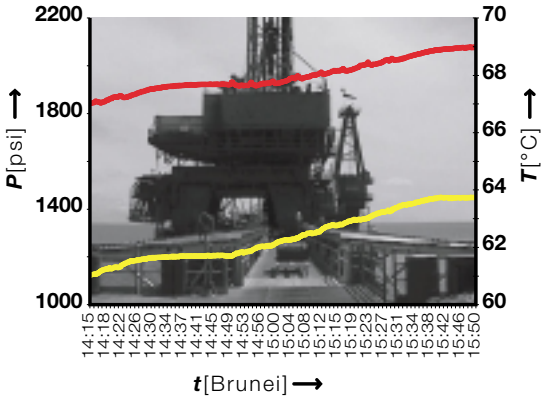
'DOGS' milestone: first installation in a producing well

Accurate and reliable pressure and temperature measurements from a permanently installed downhole gauge (PDG) in a producing well can greatly assist in the optimization of hydrocarbon extraction from the reservoir. In recent years, operators have begun to focus on the reliability of the current generation of electronic PDGs, and this has highlighted the need to develop alternative technologies, especially ones able to accommodate higher-temperature wells. There is clear evidence of a higher gauge mortality rate when electronic devices are subjected to elevated temperatures.

The development of ABB's Downhole Optical Gauge System (DOGS), a type of PDG, reached a major milestone last year with the first installation of the pressure and temperature sensor in a producing well. March 2000 saw DOGS successfully installed in a platform well in Shell Petroleum's Iron Duke field in the South China Sea.

DOGS is the result of a collaboration between ABB Offshore Systems, ABB Kraft and ABB Corporate Research, in a project which applies the benefits of fiber optic technology to problems associated with measuring the pressure and temperature of fluids produced in a harsh downhole environment. The project was initiated as part of ABB's wide-ranging ADMARC (Advanced Downhole Monitoring And Reservoir Control) development program, and has been actively supported by Shell International Exploration and Production BV.

The sensor, which is a passive device, was positioned at a depth of 2000 meters in the well. Broadband light, emitted from a source on the host platform, is transmitted downhole via an optical cable. The sensor reflects two discrete wavelengths of light back to the surface. These discrete wavelengths are dependent on the pressure and temperature applied to the sensor. The reflected wavelengths are received and measured at a topside interrogation unit and the data converted into engineering units for display to the operator. When fully commissioned, the system will relay data directly via a radio and telephone link to Shell offices in the Netherlands.



DOGS™ pressure (*P*) and temperature (*T*) measurements over a period of time (*t*)

ABB believes that DOGS will provide operators with a robust and reliable solution that meets their downhole monitoring requirements. The passive nature of the DOGS sensor, and the fact that it incorporates no micro-electronics makes it ideal for applications in which the fluid temperature is higher than the level tolerated by most competing systems.