French Firms Create Better Ways of Monitoring and Controlling Drinking Water Quality

"We may not have any oil, but we have ideas!" This saying, common in France after the first oil shock in the 1970s and 1980s, has been transformed into tangible reality, particularly in the field of analysis and automation in the water industry.

For Suez Lyonnaise Des Eaux, investment in expert systems is at the heart of developments in the group. With the University of Compiègne and the National Center for Scientific Research, the company has set up a research laboratory in the field of intelligent systems for the water industry. Its basic goal is to develop new computer technologies to reinforce the reliability of plants for the production and supply of water.

"Information technology is going to shake up the way knowledge and expertise is created in companies," Jérôme Monod, president of the group's supervisory board, said. "They will be able to send it without delay and use it better to delegate more initiative and responsibility to the people on the ground."

This system makes it possible to carry out "data fusion," the collection of data from all sensors distributed over a network, as well as storage, validation and conversion into reliable general information. Thanks to its modular software architecture, EM_2S can generate applications suitable for the various technical fields of the water industry.

Another recently developed tool, Detector, is a software package for the detection of leaks in drinking water supply networks. It calculates the forecast of consumption from the normal operation of the network and monitors actual consumption. Detector triggers an alarm if a divergence is noted between the actual and the expected consumption.

Rapid Detection of *E. coli*

The bacteriological monitoring of water supplied by distributors is very difficult to achieve. Standard methods currently require 24 to 72 hours to obtain a result. In collaboration with the Paris Center for Water Research and Monitoring, the French company Saur has developed ColiTrack, an automated sensor for *Escherichia coli,* which is the indicator organism for material of fecal origin as specified in European directives. The principle of this new tool is based on the acidic fermentation of glucose in selective media.

Using this process, one *Escherichia coli* can be detected in 100 mL of water in less than 11 hours. According to Mr. Chuau of Saur, "This reliable and rapid technique meets a significant demand from all those in the water industry needing to provide reliable quality for drinking water supply systems."

The Clip system is one of 31 automation systems and three methods of communication available from WIT.

Software developed uses leading edge concepts such as stochastic modeling and neural networks. These are tools that assist in decision making and in the control of water treatment plants. One of these, Environmental Monitoring and Management Systems (EM_2S), developed within the framework of the European Esprit program, now is included in the standard commercial products of the group.

Molecular Biology Aids Detection

Analytical techniques that use the tools of molecular biology make it possible to detect and identify a bacterium by means of its genetic material, either DNA or RNA.

The Central Laboratory of Anjou Recherche, part of the Vivendi Group, is pursuing several molecular approaches of this type, including fluorescent in-situ hybridization (FISH), developed with the Pasteur Institute within the framework of Aquabiolab.

The identification of a bacterium is established by the in-situ hybridization of a specific sequence of ribosomal RNA with a complementary DNA probe. The sample of water is first filtered to concentrate the microorganisms, then put into contact with the hybridization probes carrying the specific sequence of the bacterium's genetic material. The unhybridize probes are removed for rinsing. The only microbes that remain are those having encountered the complementary sequences. Therefore, they make the bacterium fluorescent. All that remains is to count, with the help of a microscope, the number of fluorescent compounds formed.

The FISH technique makes it possible to obtain results in just four hours. The Pasteur Institute now has developed probes able to target *E. coli, Salmonella, Enterococcus* and *Enterococcus fecalis.*

A Pioneer in Remote Management

The French company WIT made its name in the field of automation by launching the remote management system based on the Minitel. The company offers a whole range of Clip management automation systems capable of being adapted for all architectures.

They can carry out intelligent surveillance of all types of facilities for water and the environment such as water towers. Clip continuously evaluates the levels of reservoirs, triggers an alarm at a certain threshold and communicates with the automated controllers regulating the pumps to verify the state of operation. By remote control from site to site, it orders the starting up or stopping of pumps according to the water level recorded.

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