

A close-up photograph of water splashing over dark, wet rocks. The water is clear and creates white foam and droplets as it falls. The background is slightly blurred, showing more of the rocky surface.

Remote Water Quality Control

An interesting monitoring and remote water quality control project commissioned by the Emilia-Romagna region and MURST, based on the Movicon Scada system

The Ministry of Science and Technology Research University, in collaboration with the Emilia-Romagna Region have recently financed a continuous monitoring project to control the quality of water subject to pollution of anthropic origin in wells distributed in various areas of the Emilia-Romagna region. The areas in question are located in the districts of Carpi, Correggio and the Parma and Forli provinces. A system capable of continuously gathering and recording data coming from these various areas has been designed for this purpose.

This particularly involved upgrading the SIMAS2 management software to its next version SIMAS3 to enhance control and make data acquisition more accurate with greater detail by basing the system on Scada architecture. The SIMAS3 was technically developed by the Studio TIME Srl, a well established engineering company operating in different sectors (solution providers, industrial machine planners and builders, environmental engineers), in collaboration with LOGIS Srl, a company from Spilamberto, Modena (North Italy) operating in the automation and remote control sectors for years by designing and developing

systems dedicated these purposes. The SIMAS3 system is built with the Movicon supervision software based on the Progea standards.

The monitoring stations

The system has a series of remote units called monitoring stations, which are composed of submerged sensors and surface data reception, recording and transmitter units.

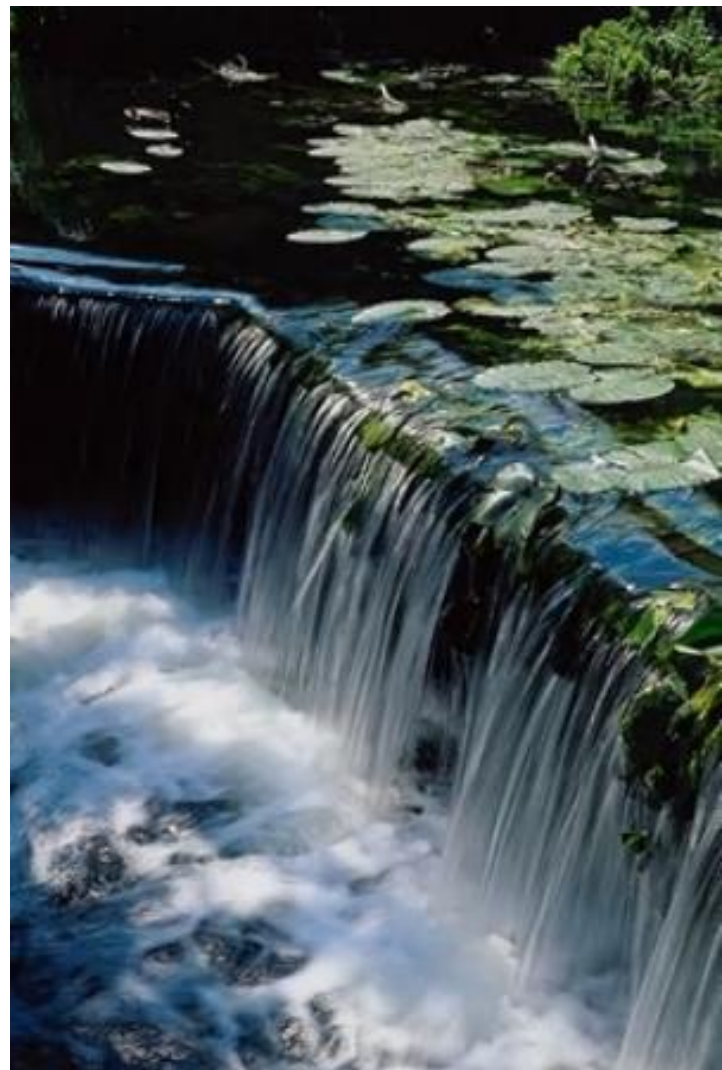
The multi-parametric probes, lowered into the well, include 5 sensors, 3 of which are designated to controlling the water's physical-chemistry characteristics and the remaining two control water temperature and level. The sensors are enclosed in stainless steel and work perfectly in depths up to 200 mts. The probes are connected to an interface (Acquamaster PC) through a RS485 serial port. The main function of this device is to retrieve surface parameters, such as atmospheric pressure and temperature to automatically compensate some of the depth data.

The surface unit is comprised of: power supply, central processing control unit, for managing and recording data and modem for transmitting gathered data to the Movicon control centre through a public GSM telephone lines. All these devices are kept protected in a fiberglass cabinet. LOGIS srl programmed the control unit, which is based on the Z-180 processor, in the C language to dynamically manage data acquisitions, value inputs and internal FIFO memory buffering with buffer batteries. This software permits the monitoring and control station to work independently.

The dynamic data acquisition involves managing additional signals that signal the presence of water and activate a pump for mixing the water before it gets measured. The sampling modes are established by configuration parameters, which can be setup from the control centre or locally by the operator, who can connect with a

laptop PC on location and configure the control unit and download the necessary data.

Each control unit is connected through another serial port to a GSM modem, which, even when using public telephone lines, permits connection to the control centre without using cables. Each control unit manages alarms locally, in order to guarantee efficiency and reliability of the whole remote control system. The alarm types managed are those which alert exceeded thresholds, probes, flat batteries, and no water present. When an alarm occurs the control unit automatically calls the control centre to immediately notify staff of the event.



The control centre

The control center gathers and classifies data relating to the water quality results obtained by the control units.

The control centre is based on a personal computer, which is connected to all the control units through a GSM



Fig. 2
The Logis Srl control centre and technicians

modem, a vital requirement put forward to Studio TIME, who are in the experimental monitoring phase. The control centre is then connected to the appropriate Emilia-Romagna municipal offices.

Communications between the control centre and the control units are bidirectional, meaning that calls can be made by the control centre to control units, or vice-versa, when the control unit automatically calls the centre when an alarm occurs alerting an anomalous situation.

The control centre pc, using the application created with Movicon, has the task to retrieve data from the control units, historically log it on hard disk, and program the control units by remote control, according to the requirements established by the control centre staff operators.

The configuration functions permit the staff to define the following settings for each single control unit:

1. Sampling Parameters
2. Alarm thresholds (min. / max.)
3. Start and End sampling date
4. sampling intervals
5. Pumping times
6. Wash times
7. Connection time

The control center daily activates, according to preset times, connections for reading acquired and buffered values according to the configurations set. Data acquired from the connection is appropriately dealt with, processed and filed on disk in standard ODBC database format where clients decided on using MsAccess for their data format. The filed data is then appropriately classified and processed by the control

centre staff.

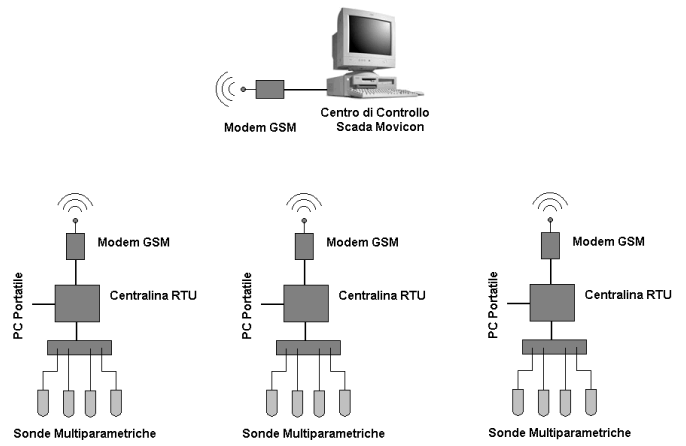
In addition to control unit connection polling, the operator can connect to any remote station at any time, as the Movicon remote control system can establish connection on command to allow instant value reads, control unit configurations, and forced downloading of the value buffer.

Conclusion

Thanks to modern and reliable technology, all the planned targets have been reached even though the project is still in its experimental phase. These achievements will no doubt bring further expansion to the control centres and the monitored areas, with a consequential improved water quality guarantee that the Emilia-Romagna region intend to ensure and protect their inhabitants with.

The biggest advantage obtained was using the Movicon Scada system that, due to its openness and flexibility that distinguishes it from the rest, has permitted the realization of the SIMAS3 system integrating logic with simplicity (internally in VBA, externally in DLL) tailor made by LOGIS Srl to meet all the clients needs.

A great thanks to sig. Bazzani di LOGIS and the Geology staff at Studio TIME.



*Fig. 3
A diagram of remote control system using GSM public network*