



Measuring system warns of high water (flooding) via SMS or transmits saved measuring data to a PC

Autonomous measuring systems with remote transmission (GSM)

Marcel Gautschi, 3/2004

A need for autonomously-operating measuring systems has existed for some time now, but these could only be realized to date through the use of stationary data loggers to be read out locally. The data acquired was, in the main, no longer current and merely offered a retrospective view of the situation. Utilization of the mobile telephone network now allows the virtual linking of widely-spread measuring systems at a single location and timely evaluation of the data gained. The following article explains the principle involved.

Professional measuring engineering profits greatly from components and technology originally developed to handle the large quantities involved in the case of consumer products. A contemporary example is the use of the mobile telecommunications network for data transmission. The GSM reception umbrella (Global System for Mobile communication) is so advanced and prices for telephone modules and call charges so cheap, that this very often represents the least expensive and simplest solution for measuring values transmission where de-centralized and completely isolated measuring point are involved. There are more than a few applications where the cost of suitable cable alone is more expensive than a complete measuring system with GSM transmission.

Transmission of data via GSM has an advantage over systems which use conventional radio transmission networks, namely that the range is unlimited once a connection with the base station of a mobile telecommunications provider is established. The data is initially transmitted by mobile telephone and then, if required, further by land network or satellite to anywhere in the world. This can also occur by fax or e-mail. This approach enables the installation of measuring systems on another continent and the reading out and evaluation of data from here.

Measuring data in the GSM network

Anything is possible, from simple SMS (Short Message Service) to a GPRS link (Global Packet Radio Service) in the internet with FTP upload (File Transfer Protocol) onto a web server. Selection of the most suitable transmission form occurs during planning of an application and is based on parameters such as data volume, transmission interval, costs, etc.

Transmission of data by SMS is currently unbeatable where the sending of small data volumes at low costs is involved. A prepaid card can be used here and up to 160 characters sent with each transmission. This option even dispenses with monthly charges. Data links from the GSM module to a PC with a modem connection can even be established with the prepaid card. Most providers permit this connection without any special contracts or agreements and no additional charges.

The two types of data transmission mentioned are the simplest to realize under practical circumstances, as very little must be done on the receiving end. A normal mobile phone suffices on which measuring data can be viewed or read out via PC, or a PC with modem which receives the data.

Example of water level measuring

Monitoring of ground water levels or the surface level of lakes and rivers is, in the true sense of the word, an extensive task. It is accomplished by a variety of state bodies, but also private water and energy providers. Keller AG für Druckmesstechnik has for this reason developed a modular GSM module attachment for level measurement for its data loggers. Selection of locations for its use is practically unlimited. Such measure-

ments were previously realized manually utilizing the sounder. A tube with a diameter of 2" buried in the ground was sufficient for this purpose. However, measuring frequency was heavily dependent on the accessibility of measuring points and prevailing weather conditions.

The diameter of the GSM-1 module mentioned has been selected to allow its insertion in the so-called sounding pipe, thus enabling the equipping of existing measuring points with a measuring system. Most remote measuring points, chosen on the basis of geographical or hydrographically needs, do not have an electrical power supply. A battery-powered system with a long service life is therefore required. But the list of requirements does not stop there. The measuring equipment must resist water and damp and withstand short-term submerging (flooding). It should also be protected against theft and vandalism.

Technology in detail

The GSM-1 module electronics and battery are waterproof and located in a non-corrosive steel housing with an outer diameter of 48 mm. The antenna outlet and the interface for measuring system configuration are located in the upper part (fitted in a lockable sounding pipe closure cap with an antenna for a 2" tube for attachment purposes). The water level measuring probe or data logger is screwed on in a modular assembly at the lower end.

A battery service life of over 5 years can be achieved, depending on ambient conditions and the configuration involved. The GSM module is only activated when needed (i.e. to call up incoming SMS by control command, transmit SMS or establish a data link). Up to 3'000 SMS or 400 data links can be realized with a battery set.

Optimizing service life and costs

Several water level values measured and saved in the GSM-1 within a fixed time period can be sent with a single SMS. Critical events can be simultaneously detected and signals sent as an SMS alarm (overly rapid changes in water level, exceeding of or drops below levels).



GSM-1 sends an alarm signal to a mobile telephone or an evaluation system

An option for periodic transmission of system information with current water levels, battery capacity and other details to responsible system personnel can also be selected. The content of all SMS can be freely selected and varied to suit customer wishes (text, measuring channels, resolution of measuring values, etc.). A data link for reading out measuring data saved in the integrated data logger can be realized periodically or triggered with a control command sent by SMS. The connected data logger can even be reconfigured during this if required.



GSM-1 from KELLER with water level probe

Use during flooding or high water

GSM-1 modules installed along a river supply the Flood Information System Terrestris (Flint) with data on the current risk situation. The modules also send their water level data to an evaluation system (PC). Flint transmits warning messages immediately by SMS to registered users if certain warning levels are reached. People who risk being affected by flooding or high water can register themselves with this service in a database which can be accessed on an internet site. The users simply give their mobile phone numbers and can select the high water warning level or risk situation from a catalogue at which they wish to receive a warning by SMS.

A spatial comparison can also occur (e.g. by postal code or other specified parameters).

--> (<http://www.terrestris.de/infosysteme/flint.html>)

Data can also be sent to a web server by SMS in this manner. The server contains other registered information (e.g. the geographical location of individual measuring points on a map). Any authorized user can follow measuring results in the internet from anywhere in the world through a simple mouse click. They can be graphically processed, an advantages which puts the final nail in the coffin of numerical tables or measurements in individual folders.

Autonomous measuring systems with remote transmission via mobile telephone networks finally make a series of measuring values which can only be recorded de-centrally available in an inexpensive manner. The description given here of how the GSM-1 module described can be utilized for measuring water levels demonstrates that long-term monitoring of a series of not only environmentally-relevant measurement variables is now conceivable.

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