RESEARCH CENTRE SEIBERSDORF

DRINKING-WATER MONITORING SYSTEM

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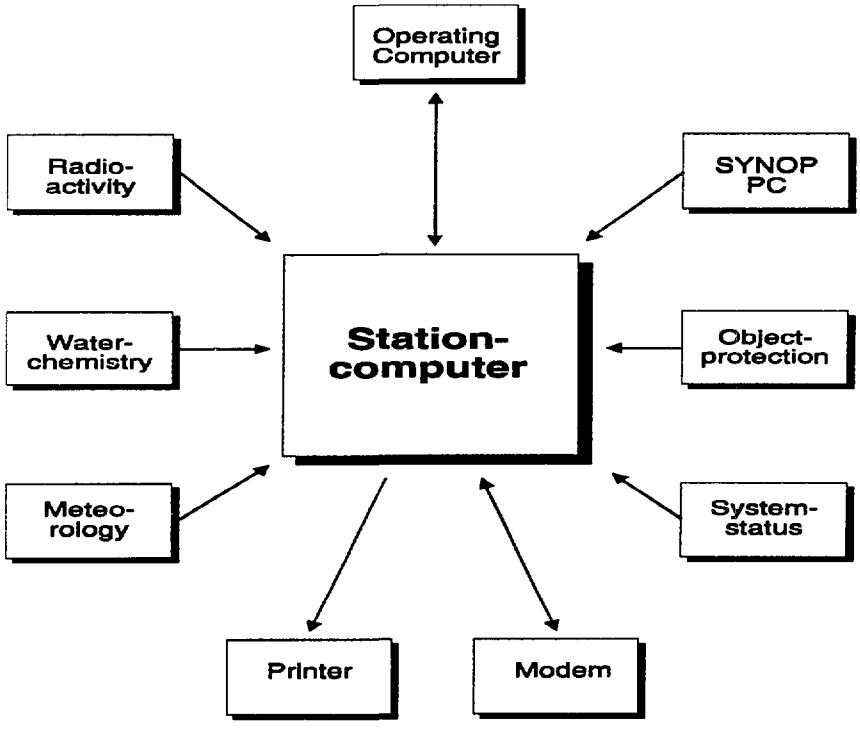
Drinking water, one of the most valuable gifts of nature, guarantees high quality of life. A measuring device for determining the quality of drinking water has been developed at the Austrian Research Centre Seibersdorf. The following summary provides an overview of the local measuring stations and the central evaluation of supraregional data. Sensors (measuring range, resolution etc.) are not described in detail since they must be adapted to the specific operation of a network. The possibility of comprehensive data logging in a modular system configuration is explained.

The data-logging system for monitoring the quality of drinking water developed by Seibersdorf is based on the experience acquired with environmental measuring networks set up for the Austrian provinces of Upper Austria, Carinthia and for a coal-fired power plant (measurement of emissions and immissions).

The measuring stations of these early-warning and safety systems consist of autonomous subsystems for measuring radioactivity in air and water and evaluating the chemical parameters of drinking water. Station computers are responsible for the measurements and status signals of the subsystems, the collection of meteorological elements, as well as for safety monitoring. The resulting data are temporarily stored and communicated to subcentrals or the host via telephone (permanent lines) or radiotransmission.



Block diagram of station computers and periphery

Equipment and Sensors of Measuring Stations

* **Subsystems for measuring radioactivity**

  - air sensor
  - water sensor

* **Subsystems for measuring chemical parameters**

  - ph-value
  - conductivity
  - oxygen
  - water temperature
  - spectral absorption coefficient
  - turbidity
  - total organic carbon

* **Subsystems for measuring meteorological elements**

  - air temperature
  - relative humidity
  - dewpoint
  - precipitation signal
  - precipitation volume
  - wind direction
  - wind speed
  - duration of sunshine
  - global radiation
  - air pressure

* **Safety monitoring**

  - e.g. monitoring electricity supply, pump control etc.

* **Station computers**

The station computers - autarchic, modular VME computer systems - collect, process and archive the measured data and status information. In particular, they fulfill the following tasks:

  - collection of binary and analog information
  - information processing
  - calibration of sensors
  - calculation of mean values
  - data archiving
  - data transmission between station computers and host computer
  - command processing
  - operating functions
  - generating alarm signals (if set values are exceeded)
  - data and parameter storage, protected against mains-failure.

Operation is through a personal computer (operating computer, service PC) which is mask-oriented and menu-controlled. Measurement data are expressed in graphs and tables. A printer may be connected to the operating computer to record the measured data.

Thanks to the temporary saving of measured values in the long-term storage (ring buffer for 120 hours) of the station computers, data that have already been transmitted to the subcentral computer (central unit) or have been lost can be reconstructed by calling for them again from the measuring station.

Battery-buffered static CMOS-RAMs are used to store the data. The program modules are stored in flash-PROMs, the parameter lists and the changed tables or station data in CMOS-RAM.

On account of the modular nature of the software, extensions are possible and new requirements can be met. When updating the software only the application software is changed.

The flash-PROMs allow the easy introduction of new program versions. No module need be removed from the station computer.

Realtime and Synchronization:

The station computer is equipped with a battery-buffered realtime clock having a calendar function that is set or synchronized on site or from the host.

Network Monitoring:

The software of the station computer allows the continuous autonomous, fully automatic operation of the measuring station.

The application is written in a more sophisticated programming language. Program parts in machine language are only applied where quick computing and hardware proximity are indispensable.

Mains failures longer than the stand-by period of the emergency generator are recognized on the station status plate after the current supply has been resumed and registered by the computer. After the electricity supply has been resumed, the computer automatically begins the program with a warm start. All measured data are stored in the battery-buffered RAM and are not lost during an extended mains failure.

Restart Function:

The station is restarted automatically after power supply has been resumed. When activating impulses are missing (= faulty software and hardware) a "watch-dog switch" that needs to be activated cyclically by the software produces a reset signal. The reset incites the CPU to a new start of the system. Watch dog faults are registered.

*** Operating computer**

- communication with the station computer for operating and maintaining the measuring station
- interface to additional external storage and output devices (floppy disk, printer etc.)
- visualization of the results of measurements

*** Host computer**

- system management of software architecture
- collection of off-line data
- menu operation
- calculation of values
- alarm signals and threshhold value control
- communication with additional system units (displays, pager service, evaluation units of other services etc.)
- data protection
- data archiving
- preparation of protocols and reports
- management of auxiliary programs (software tools)

*** Data transmission to subcentral or to host**

- connection of telecommunication facilities for telephone and radiotransmission as well as satellite

*** Synop input for metereological sight observations**

Summary

The block diagram illustrates the tasks of the subsystems and points out the possibilities of connecting measuring devices. In accordance with the clients' wishes (e.g. relevant laws) the appropriate measuring devices (sensors) must be chosen and included in the system as a whole by means of the comprehensive interfaces.

Austrian Research Centre Seibersdorf
Österreichisches Forschungszentrum Seibersdorf Ges.m.b.H.
Division of Instrumentation and Information Technology
Department of Electronics

SEIBERSDORF

A-2444 Seibersdorf, Austria Phone +43-2254-780-2800 Fax +43-2254-74060