



1 *TOS is used for the design of management strategies and the control of flood situations in reservoir systems.*

TOS: OPTIMAL MANAGEMENT FOR RESERVOIR SYSTEMS

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Background

Reservoirs are ecological systems which are highly sensitive to environmental change. There are two types of factor, the quantity and nature of materials and energy entering the water on the one hand, and, on the other, the processes to which the materials and energy are subject within the water.

Risks affecting drinking water as a resource increase with the degree of human use of the catchment area and with the degree of use of the water itself. At the same time, the meteorological and hydrological features have their own strong influence both on the external conditions and on the internal processes within the reservoir.

Over recent years, the significance of these factors has by no means decreased. Global warming is by now an accepted fact and has as its consequence more extreme weather. Recent floods have exceeded all records, as in Asia and North America, as have droughts, as experienced by Africa and Australia.

The unusual weather patterns of the recent period have also affected Central Europe, turning the regular provision of high quality drinking water by reservoirs into a task requiring much more effort than previously.



System solution

A multi-barrier system was in place which comprises

1. reservoir and water course protection,
2. management of a major body of water and
3. a water treatment system.

The proposed system solution offers storage regulation strategies (developed from models and optimised), enabling commercial water management on a daily basis and enables overflow situations to be analysed. It can be incorporated into customised software for an operator, who will then have a direct interface by which to apply the system to the particular network. The optimisation takes into account all directives and regulations for the quality of drinking water (in Germany this is the Trinkwasserverordnung). It also takes into account rules for the management of individual underground watercourses, reservoirs and the relevant quantities to be supplied under local regulations. The following must be available for the optimisation system to work:

- Continuous data on environmental conditions, however rapidly they change
- Rapid computation of the data and speedy decision-making
- Instant, on-the-spot enactment of regulatory decisions

Result

When complex reservoir systems are attempting to fulfil the varied demands upon them, this computerised optimisation is of especial significance. Such storage systems can otherwise defy even experts seeking an approximately optimal strategy on the basis of experience and/or mental modelling. If non-coordinated management of individual reservoirs were taken as the solution, there would be a far less than optimal use of the water available. TOS is a software package which has been developed to resolve all the constraints: the limits set by financial management considerations, weather forecasts (particularly of precipitation) and the computational management figures derived from the models of the particular system are used to calculate the optimal management of the reservoir system

Future prospects

This technology, with its data-processing and automation, opens for the reservoir operator new possibilities of optimal monitoring and management of bodies of water. The future holds further possibilities. By taking into account reservoir protection strategies and water treatment technology the sustainability of reservoirs as regenerative resource will have an ever higher importance for the drinking water supply. It is thus intended that further optimisation programs, systems, models and knowledge bases containing the expertise will be combined as yet another stage of the joint work between the Fraunhofer AST and the ThürTV. The resultant interface will provide operators almost instantly with maximum information to enable supply of water and restoration of quality to be managed.

