

# Drinking water even p

## European drinking water guidelines are now

**G**ermany has implemented the European drinking water guidelines into its national legislature after the European Commission ratified the 'Directive on the quality of water intended for human consumption' on May 28, 2001. After a transition period, this law was adopted on January 1st 2003, in accordance with European law.

### **New: indicator parameter**

The new drinking water directive introduces, for the first time, the category of indicator parameter value specifications. These are not directly linked to health problems but have an indicator function. This list of indicator parameters also includes the TOC value (total organic carbon), for which no limiting value or criterion has been defined, but which can be considered as a cautionary warning for action under unusual circumstances.

### **Oxidizability**

Another indicator parameter included in the list is oxidizability.



A timesaver for large sample numbers: the ASI-V autosampler

This is a measure of the sum of all chemically oxidizable organically bound compounds present in water. With reference to drinking water limiting values, this parameter is no cause for direct health concern but can lead to regermination or undesirable disinfection byproducts. Oxidizability is proportional to the sum of organically bound carbons that are determined as DOC (dissolved organic carbon) or TOC. Oxidizability can therefore be replaced by the TOC parameter. The frequency of deter-

mination of the parameter indicators depends on the volume of water that is produced or released in a water supply area.

### **Copper**

The TOC parameter is also associated with another relevant parameter i.e. copper. In the new drinking water directive, the limiting value for copper is reduced to 2 mg/L. This new limiting value also requires that the newly issued restrictions for the use of copper materials described in DIN 50930-6 be strictly observed. Copper can be applied without any problems in all types of water at a pH value higher than 7.4. In addition to the pH value, the concentration of dissolved organic carbon (DOC) is also significant. In the pH range 7.0 – 7.4 the TOC seems to influence the solubility of copper. The limiting value of the TOC in this pH range is 1.5 mg/L.

### **TOC determination in drinking water**

When examining carbon compounds in drinking water, it is

# urer with TOC

## national law

apparent that the amount of inorganic carbons, such as carbonates and hydrogen carbonates, is much higher than the organic fraction. The organic fraction is only 1% of the total carbons. A TOC determination via the differential method ( $TOC = TC - IC$ ) will not be appropriate in this case, as the calculated TOC value is prone to large statistical errors. According to EN 1484 (instructions for the determination of total organic carbon and dissolved organic carbon), the differential method can only be applied when the TIC value (total inorganic carbon) is smaller than the TOC value.

For drinking water analysis the NPOC method (non purgeable organic carbon) is therefore used. The drinking water sample is first acidified to a pH value of 2. In this way the carbonates and hydrogen carbonates are transformed into carbon dioxide. The  $CO_2$  is then removed via sparging with carrier gas. The amount of volatile and therefore spargeable organic carbon can be disregarded in drinking water. What remains is a solution of non-volatile organic carbon

compounds. These can be oxidized to  $CO_2$  and detected via NDIR.

### TOC-V series

This application can be easily carried out using Shimadzu's TOC-V series. For a large number of samples the ASI-V autosampler, in which the samples are automatically acidified and sparged in the sample vials, is recommended. During TOC measurement of the first sample, the next sample is already being sparged in order to save valuable time. But even when an autosampler is not available, the NPOC method can still be automated. The TOC-V series is equipped with an ISP (integrated sample preparation) module, which consists of an 8-port valve and a syringe with sparging gas connection. In addition to acidification and sparging in the syringe, the ISP also enables automatic dilution. This feature facilitates an extended measuring range, dilution of highly contaminated samples and the preparation of a series of calibration samples from a stock solution. The ISP module can therefore considerably reduce

time-consuming sample handling steps.

The accompanying TOC-Control software offers, in addition to instrument control and data acquisition, numerous functions that greatly simplify quality assurance in TOC analysis. The quality assurance functions use control charts according to criteria of the German „Allgemeine Qualitäts-Sicherung“ (AQS) which regulates quality control. The TOC-Control V software automatically consults these control charts and issues a warning when extraordinary events arise. In addition, simple control samples that initiate various actions (warning message, stopping the analysis runs or reanalysis of the last samples) when limiting values are being exceeded, can be defined in the autosampler.