

2.1.3 The TOC test

In the total organic carbon (TOC) test the production of carbon dioxide is measured upon complete oxidation of organic material through combustion at high temperature. The carbon dioxide mass is indicative of the mass of organic carbon initially present in the sample. The equipment for the TOC test is rather sophisticated but it has the advantage of taking only a few minutes, so that it permits virtually on line control. In the case of a known compound ($C_xH_yO_z$) the theoretical TOC value is easily calculated from stoichiometry: as indicated by Eq. (2.1), upon oxidation of 1 mol of $C_xH_yO_z$, i.e. $(12x + y + 16z)$ gram of $C_xH_yO_z$, x moles of CO_2 are formed, so that the TOC is given by $12x$ gram. Hence the theoretical TOC per unit mass is calculated as:

$$TOC_t = 12x/(12x + y + 16z) \quad (2.5)$$

Equation (2.5) has been used to calculate the TOC for the compounds in Table 2.1. It can be noted that the value of the TOC per unit mass varies significantly for different compounds. Table 2.1 also shows the theoretical COD/TOC ratio. This ratio can be calculated from Eqs. (2.2 and 2.5):

$$COD_t/TOC_t = 8 \cdot (4x + y - 2z)/12x = 2/3 \cdot (4 + (y - 2z)/x) \quad (2.6)$$

Table 2.1 shows that the COD/TOC ratio is not constant. This leads to the conclusion that if one parameter is a good indicator for the organic material concentration, the other one is not. In the following section it will be established that the COD is the correct parameter to evaluate the organic material concentration. The TOC can only be used when the composition of the organic material of the waste water will be essentially constant. In those cases an experimental COD/TOC ratio can be determined and the COD concentration may be estimated from the measured TOC value.