

Table of contents

	Preface	I
1	Introduction	1
1.1	Classification of industries	1
1.2	Reference documents, requirements	2
2	Wastewater treatment in the food industry	7
2.1	General overview	7
2.2	Sugar refineries	9
2.2.1	Characterisation of the sector	9
2.2.2	Wastewater volume / composition, plus requirements	11
2.2.3	Wastewater treatment	11
2.2.4	Sugar-processing industry: confectionery	12
2.3	Starch factories	13
2.3.1	Characterisation of the sector	13
2.3.2	Wastewater volume / composition, plus requirements	14
2.3.2.1	Potato starch	14
2.3.2.2	Corn starch	14
2.3.2.3	Wheat starch	15
2.3.3	Wastewater treatment	15
2.4	Edible oil and fat production	16
2.4.1	Characterisation of the sector	16
2.4.2	Wastewater volume / composition, plus requirements	17
2.4.3	Wastewater treatment	19
2.4.4	Modification: transesterification	19
2.5	Potato processing industry	20
2.5.1	Characterisation of the sector	20
2.5.2	Wastewater volume / composition, plus requirements	20
2.5.3	Wastewater treatment	21
2.6	Fruit and vegetable processing industry	22
2.6.1	Characterisation of the sector	22
2.6.2	Wastewater volume / composition, plus requirements	24
2.6.3	Wastewater treatment	25
2.6.4	Fruit juice production	26
2.7	Breweries	27
2.7.1	Characterisation of the sector	27
2.7.2	Wastewater volume / composition, plus requirements	29
2.7.3	Wastewater treatment	29
2.8	Distilleries	31
2.8.1	Characterisation of the sector	31
2.8.2	Wastewater volume / composition, plus requirements	32
2.8.3	Wastewater treatment	33
2.9	Dairy-processing industry	33
2.9.1	Characterisation of the sector	33
2.9.2	Wastewater volume / composition, plus requirements	34
2.9.3	Wastewater treatment	35
2.10	Abattoirs	36
2.10.1	Characterisation of the sector	36
2.10.2	Wastewater volume / composition, plus requirements	37
2.10.3	Wastewater treatment	40

3	Other industries using predominantly organic constituents	43
3.1	Textile industry	43
3.1.1	Characterisation of the sector	43
3.1.2	Wastewater volume / composition, plus requirements	44
3.1.3	Wastewater avoidance / treatment	46
3.2	Wastewater from leather manufacturing	49
3.2.1	Characterisation of the sector	49
3.2.2	Wastewater volume / composition, plus requirements	49
3.2.3	Wastewater treatment	50
3.3	Wastewater from paper and cellulose manufacturing	51
3.3.1	Paper consumption and the paper industry in Germany	51
3.3.2	The use and processing of raw materials	51
3.3.2.1	Cellulose production	52
3.3.2.2	Production of groundwood pulp	52
3.3.2.3	Waste paper processing	52
3.3.2.4	Other additives	52
3.3.3	Description of the paper manufacturing process	53
3.3.4	Water cycles and in-house measures	54
3.3.4.1	Types of water cycle	54
3.3.4.2	Circulation systems and characterisation of water cycles	54
3.3.4.3	Optimising the water cycles: in-house measures	56
3.3.5	Volume and composition of residual wastewater, plus discharge conditions	56
3.3.5.1	Wastewater composition in general	56
3.3.5.2	Wastewater accumulation: evolution of specific wastewater volume	57
3.3.5.3	Grade-specific wastewater composition	58
3.3.5.4	Discharge conditions	58
3.3.6	Wastewater treatment processes	59
3.3.6.1	Mechanical pre-purification / separation of solids	59
3.3.6.2	Biological processes	59
3.3.6.3	Example of two-stage aerobic / aerobic wastewater treatment	60
3.3.6.4	Example of two-stage anaerobic / aerobic wastewater treatment	62
4	Overview of water management in the chemical industry	65
4.1	General overview	65
4.2	Production processes	65
4.3	Wastewater constituents, requirements, and treatment	67
4.3.1	Wastewater constituents and requirements	67
4.3.2	In-house measures	67
4.3.3	Wastewater treatment	68
5	Wastewater treatment in the metal industry	71
5.1	General overview	71
5.2	Wastewater constituents / treatment, plus requirements	72
5.3	Electroplating shops	74
5.3.1	Characterisation of the sector	74
5.3.2	Degreasing	74
5.3.3	Pickling	75
5.3.4	Electrochemical metal deposition	75
5.3.5	Wastewater volume / composition, plus requirements	76
5.3.6	In-house measures to reduce wastewater (according to volume and composition), wastewater treatment	77
6	Overview of wastewater treatment in heavy industry	79
6.1	General overview	79
6.2	Smelting works	79
6.2.1	Iron and steel industry – semi-finished goods plants	79
6.2.1.1	Pig iron extraction	79
6.2.1.2	Steel production	80
6.2.1.3	Steel forming	80
6.2.2	Non-ferrous metal industry	81
6.3	Non-metallic mineral processing	81
6.4	Glass industry	82

6.5	Refineries	83
6.5.1	Petrochemical industry	83
6.5.1.1	Wastewater treatment in the petrochemical industry	83
6.5.2	Mineral oil refineries	83
6.5.2.1	Water demand, wastewater volume and constituents	84
6.5.2.2	In-house measures	85
6.5.2.3	Pre-treatment of wastewater	85
6.5.2.4	Wastewater treatment	85
Bibliography		87
Glossary		95
Index		119