CONTENTS

Preface ix

P. HARREMOÆS: Upgrading our inherited urban water systems 1

B. ROSÉN and S. MORLING: A systematic approach to optimal upgrading of water and waste water treatment plants 9

B. ROSÉN, A. ULLMAN and N. RAGNARSSON: Upgrading for nitrogen removal, using a combination of SBR (sequencing batch reactor) technique and unloading of existing biological stage 17

A. MALMQVIST, L. GUNNARSON and C. TORSTENSON: Lab and pilot-scale tests as tools for upgrading: comparison with full-scale results 25

B. BJÖRLENIUS and L.-G. REINIUS: Use of on-line data to evaluate the activity in the biological stage at a wastewater treatment plant 33

P. CAULET, B. BUJON, J. P. PHILIPPE, F. LEFEVRE and J. M. AUDIC: Upgrading of wastewater treatment plants for nitrogen removal: industrial application of an automated aeration management based on ORP evolution analysis 41

J. R. MÜLLER and KH. KRAUTH: Wastewater flow management to maximise the capacity of sewage treatment plants 49

D. E. THORNBERG, M. NIELSEN and J. ERIKSSON: Upgrading of Borås wastewater treatment plant based on intelligent process and operation control 57


T. HEDHERG, J. DAHLQVIST, D. KARLSSON and L.-O. SÖRMAN: Development of an air removal system for dissolved air flotation 81

H. BUISSON, P. COTE, M. PRADERIE and H. PAILLARD: The use of immersed membranes for upgrading wastewater treatment plants 89

Z. WANG: Application of biofilm kinetics to the sulfur/lime packed bed reactor for autotrophic denitrification of groundwater 97
Contents

A. M. INGALLINELLA, L. M. STECCA and M. WEGELIN: Up-flow roughing filtration: rehabilitation of a water treatment plant in Tarata, Bolivia 105


T. HEDBERG and T. A. WAHLBERG: Upgrading of waterworks with a new biooxidation process for removal of manganese and iron 121

C. HERNEBRING, L. OHLSSON, M. ANDREASSON and L.-G. GUSTAFSSON: Interaction between the treatment plant and the sewer system in Halmstad: integrated upgrading based on real time control 127


U. GRABBE, C. F. SEYFRIED and K.-H. ROSENWINKEL: Upgrading of waste water treatment plants by cloth-filtration using an improved type of filter-cloth 143

D. SCHREFF and P. A. WILDERER: Nitrogen removal in multi-stage wastewater treatment plants by using a modified post-denitrification system 151

A. ÆSØY, H. ØDEGAARD, M. HÆGH, F. RISLÅ and G. BENTZEN: Upgrading wastewater treatment plants by the use of biofilm carriers, oxygen addition and pre-treatment in the sewer network 159

N. MÜLLER: Implementing biofilm carriers into activated sludge process — 15 years of experience 167

B. ANDERSSON, H. ASPEGREN, U. NYBERG, J. LA COUR JENSEN and H. ØDEGAARD: Increasing the capacity of an extended nutrient removal plant by using different techniques 175

P. BALMER, L. EKFJORDEN, D. LUMLEY and A. MATTSSON: Upgrading for nitrogen removal under severe site restrictions 185

L. JONSSON: Experiences of nitrogen and phosphorus removal in deep-bed filters at Henriksdal sewage works in Stockholm 193

J. SØRENSEN, J. ANDERSEN, K. ANDREASEN and K. HALD: Experience with the upgrading of 14 treatment plants to N & P removal in the municipality of Aarhus 201

M. C. M. VAN LOOSDRECHT, F. A. BRANDSE and A. C. DE VRIES: Upgrading of waste water treatment processes for integrated nutrient removal — the BCFS® process 209

E. CHOI, D. RHU, Z. YUN and E. LEE: Temperature effects on biological nutrient removal system with weak municipal wastewater 219

S. HASSELBLAD and S. HALLIN: Intermittent addition of external carbon to enhance denitrification in activated sludge 227

B. BELER BAYKAL: Clinoptilolite and multipurpose filters for upgrading effluent ammonia quality under peak loads 235


Keyword index 259