

BIOLOGICAL WASTEWATER TREATMENT SERIES

VOLUME 3

**WASTE  
STABILISATION  
PONDS**

**Published by IWA Publishing, Alliance House, 12 Caxton Street, London SW1H 0QS, UK**

---

Telephone: +44 (0) 20 7654 5500; Fax: +44 (0) 20 7654 5555; Email: [publications@iwap.co.uk](mailto:publications@iwap.co.uk)  
Website: [www.iwapublishing.com](http://www.iwapublishing.com)

First published 2007

© 2007 IWA Publishing

Copy-edited and typeset by Aptara Inc., New Delhi, India

Printed by Lightning Source

Apart from any fair dealing for the purposes of research or private study, or criticism or review, as permitted under the UK Copyright, Designs and Patents Act (1998), no part of this publication may be reproduced, stored or transmitted in any form or by any means, without the prior permission in writing of the publisher, or, in the case of photographic reproduction, in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK, or in accordance with the terms of licenses issued by the appropriate reproduction rights organization outside the UK. Enquiries concerning reproduction outside the terms stated here should be sent to IWA Publishing at the address printed above.

The publisher makes no representation, expressed or implied, with regard to the accuracy of the information contained in this book and cannot accept any legal responsibility or liability for errors or omissions that may be made.

#### **Disclaimer**

The information provided and the opinions given in this publication are not necessarily those of IWA or of the editors, and should not be acted upon without independent consideration and professional advice. IWA and the editors will not accept responsibility for any loss or damage suffered by any person acting or refraining from acting upon any material contained in this publication.

#### *British Library Cataloguing in Publication Data*

A CIP catalogue record for this book is available from the British Library

#### *Library of Congress Cataloguing-in-Publication Data*

A catalogue record for this book is available from the Library of Congress

ISBN: 1 84339 163 5

ISBN 13: 9781843391630

# Contents

---

<i>Preface</i>	ix
<i>The author</i>	xiii
1 Overview of stabilisation ponds	1
2 Facultative ponds	8
2.1 Introduction	8
2.2 Description of the process	9
2.3 Influence of algae	11
2.4 Influence of environmental conditions	14
2.5 Design criteria	18
2.6 Estimation of the effluent BOD concentration	24
2.7 Pond arrangements	38
2.8 Sludge accumulation	39
2.9 Operational characteristics	40
2.10 Polishing of pond effluents	40
3 System of anaerobic ponds followed by facultative ponds	46
3.1 Introduction	46
3.2 Description of the process	47
3.3 Design criteria for anaerobic ponds	48
3.4 Estimation of the effluent BOD concentration from the anaerobic pond	51
3.5 Design of facultative ponds following anaerobic ponds	53
3.6 Sludge accumulation in anaerobic ponds	53

4	Facultative aerated lagoons	58
4.1	Introduction	58
4.2	Description of the process	58
4.3	Design criteria	59
4.4	Estimation of the effluent BOD concentration	60
4.5	Oxygen requirements	63
4.6	Aeration system	64
4.7	Power requirements	64
4.8	Sludge accumulation	66
5	Complete-mix aerated lagoons followed by sedimentation ponds	70
5.1	Introduction	70
5.2	Description of the process	71
5.3	Design criteria for the complete-mix aerated lagoons	72
5.4	Estimation of the effluent BOD concentration from the aerated lagoon	73
5.5	Oxygen requirements in the aerated lagoon	75
5.6	Power requirements in the aerated lagoon	76
5.7	Design of the sedimentation pond	76
6	Removal of pathogenic organisms	84
6.1	Introduction	84
6.2	Process description	84
6.3	Estimation of the effluent coliform concentration	85
6.4	Quality requirements for the effluent	96
6.5	Design criteria for coliform removal	98
6.6	Removal of helminth eggs	110
7	Nutrient removal in ponds	116
7.1	Nitrogen removal	116
7.2	Phosphorus removal	121
8	Ponds for the post-treatment of the effluent from anaerobic reactors	123
9	Construction of stabilisation ponds	127
9.1	Introduction	127
9.2	Location of the ponds	127
9.3	Deforestation, cleaning and excavation of the soil	129
9.4	Slopes	129
9.5	Bottom of the ponds	132
9.6	Inlet devices	133
9.7	Outlet devices	136
10	Maintenance and operation of stabilisation ponds	138
10.1	Introduction	138
10.2	Operational staff	139
10.3	Inspection, sampling and measurements	139

58	10.4 Operation start-up	139
58	10.5 Operational problems	144
58	11 Management of the sludge from stabilisation ponds	150
59	11.1 Preliminaries	150
60	11.2 Characteristics and distribution of the sludge in stabilisation ponds	151
63	11.3 Removal of sludge from stabilisation ponds	152
64		
64	References	159
66		