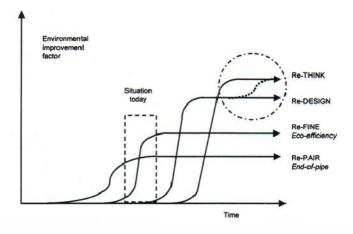
ECOTEXTILE '98 - SUSTAINABLE DEVELOPMENT

edited by
A Richard Horrocks







ECOTEXTILE '98 - SUSTAINABLE DEVELOPMENT

Proceedings of the Conference, Ecotextile '98, The Bolton Moat House, 7&8th April 1998

edited by

A Richard Horrocks
Faculty of Technology
Bolton Institute





WOODHEAD PUBLISHING LIMITED

MEMBERS OF THE ORGANISING COMMITTEE

Christine Wilkinson British Textile Technology Group
Dinah Wharton British Textile Technology Group

Brian Bruce **BTB** Associates David Hill **Bolton Institute** Kiyoko Hay **Bolton Institute** Dr Mohsen Miraftab **Bolton Institute** Dr Mike Hall **Bolton Institute Bolton Institute** Royston Dawber Lesley Winters **Bolton Institute** Margaret Moir **Bolton Institute** Prof Richard Horrocks **Bolton Institute**

Published by Woodhead Publishing Ltd Abington Hall, Abington Cambridge CB21 6AH, England

First published 1999, Woodhead Publishing Ltd

© 1999, Bolton Institute/British Textile Technology Group

The authors have asserted their moral rights

Conditions of sale

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

While a great deal of care has been taken to provide accurate and current information, neither the authors, nor the publisher, nor anyone else associated with this publication, shall be liable for any loss, damage or liability directly or indirectly caused, or alleged to be caused, by this book.

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN-13: 978-1-85573-426-5 ISBN-10: 1-85573-426-5

Printed by Victoire Press, Cambridge, England.

CONTENTS

Section 1: WASTE MINIMISATION

Waste Minimisation Challenges in the UK Textile Industry Sandy Muirhead, ETSU, Harwell, UK	3
The Environment and the Law Victoria Joy, Environmental Consultant, UK	13
Waste Elimination from Textiles Mike Hewson, BTTG, Didsbury, UK	23
Success with Energy Management Mike Hewson, BTTG, Didsbury, UK	33
The Requirements for Waste Water Treatment in the Textile Industry Mike Hewson, BTTG, Didsbury, UK	43
Initial Results from an EU-funded Research Reed Bed Patrick Gaunt, Reuben Gaunt & Son Ltd., UK	51
Minimisation of Formaldehyde Emissions Mike Hall, Richard Horrocks and Dawn Roberts, Bolton Institute, Bolton, UK	63
Saving Waste Makes Money Brian Bruce, BTB Associates, Manchester, UK	71
Section 2: PROCESS OPTIMISATION	
Colour Removal from Effluent and Water Re-use in Courtaulds Textiles Peter Cooper, Courtaulds Textiles, Nottingham, UK	79
Biochemical Treatment of Recalcitrant Dyestuff Effluent John Binkley, Joanne Hargreaves and Gillian Smart, Bolton Institute, Bolton, UK	87
Decolourisation of Textile Waste Water by Photo-oxidation and Its Re-use Ayse Uygur, Marmara University, Istanbul, Turkey	97
Decolorisation of Textile Waste-water by Means of Advanced Oxidation Processes S Ledakowicz, R Maciejewska and J Perkowski, Technical University of Lodz,, Lodz, Poland	105
Novel Applications of Biotechnology in the Textile Industry Gordon Nelson, BTTG, Didsbury, UK	111

Enzymatic Treatment of Man-made Cellulosic Fabrics Jadwiga Sojka Ledakowicz and Aneta Skaskiewicz, Textile Research Institute, Lodz	
Rita Pyc and Edward Galas, Technical University of Lodz, Poland	121
The Optimisation of Processes and the Re-use of Water in the Dyeing of Cotton and Cotton/Polyester Blends Jaime I N Rocha Gomes and Carlos J E Lima, University of Minho,	
Guimaraes, Portugal	129
Urea Reduction in Reactive Dye Printing Miroslav Prasil, Technical University of Liberec, Liberec, Czech Republic	137
Distribution of Fibrous Particles Emitted during Simulated Handling of Basalt Wea Jiri Militky and Vladimir Bajzik, Technical University of Liberec, Liberec, Czech	
Republic	137
Section 3: RECOVERY, RECYCLING & RE-USE	
Recycling for Charity's Sake Andrew Stockwell, OXFAM, UK	151
Research Areas for Upgrading Textile Recycling Hans de Groot and Anton Liuken, TNO Institute of Industrial Technology, Delft, Netherlands	159
An Overview of Activities on Recycling of Fibrous Textile and Carpet Wastes at the Georgia Institute of Technology	
Youjiang Wang, Georgia Institute of Technology, Atlanta, USA	165
Carpet Waste, an Expensive Luxury Mohsen Miraftab and Richard Horrocks, Bolton Institute and Colin Woods,	
Environmental Management Consultants, Manchester, UK	173
Polymer Recycling in Technical Textiles	
Philip Davies and Mohsen Miraftab, Bolton Institute, Bolton, UK	183
Use of Enzymes in Textile Processing and Recycling Potential - Indigo Backstaining during Cellulase Washing	g
Artur Cavaco-Paulo and Rui Campos, University of Minho; and Jose Morgado, CITEVE, Portugal	191
Section 4: NEW PRODUCTS AND PROCESSES	
Section 4. NEW TRODUCTS AND TROCESSES	

Oeko-Tex Labelling of Textiles	
Erich Zippel, Austrian Textile Institute,	Vienna, Austria

Environmentally-Conscious Textile Design: Towards a New Approach Jo Heeley, Manchester Metropolitan University, Manchester, UK	203
Concurrent Product Development and Design for Environment in the UK Textile and Clothing Industry	
Tracey Bhamra, Jo Heeley and David Tyler, Manchester Metropolitan University, Manchester, UK	211
Innovative Knitted Structures from Waste Materials Hilmar Fuchs, Rolf Arnold, Monika Seeger, Anna-Maria Bartl and Evelin Hufnagl, Sachsisches Textile Forschungs Institute, Chemnitz, Germany	219
Novel Vegetable Fibre Geotextile Structures for Soil Reinforcement Martin Pritchard, Subhash Anand and Robert Sarsby, Bolton Institute,	225
Bolton, UK	225
The Potential for Hemp: Locally Produced Organic Textiles Sue Riddlestone, The Ecology Centre, Carshalton, UK	237
Where Now With FR (Flame Retardancy)? Peter Wragg, Schill and Seilacher, UK	247
Section 5: ENVIRONMENTAL IMPACT ANALYSIS	
Life Cycle Analysis: An Aid to Environmental Management as Applied to PET (Polyethylene Terephthalate) Containers	
Vince Matthews, PETCORE (PET Container Recycling Europe), Brussels, Belgium	259
Towards Environmentally Responsible Design in Textiles Kate Fletcher, Chelsea College of Art and Design, London, UK.	271
Impact of Commercial and Environmental Pressures on Dye Use Brian Burdett, BTTG, Didsbury, UK	279
Dyes and Microbes: Colouration or Decolouration? David Wales and Debra Hobson, BTTG, Didsbury, Nicola Willmot, Courtaulds Fibres, Spondon, UK	289
Environmental Consequences of Using Flame Retardant Textiles - A Simple Life Cycle Model Pick and Homeocke, Miles Hall and Dayun Roberts, Rolling Party Rolling Life Ro	207
Richard Horrocks, Mike Hall and Dawn Roberts, Bolton Institute, Bolton, UK	297
The Impact of Environmental Issues on Textile Education Theresa Squires, Manchester Metropolitan University, Manchester, UK	305

PREFACE

The papers in this edited text comprise those presented at the recent international conference **ECOTEXTILE'98**, which was organised jointly by **Bolton Institute** and the **British Textile Technology Group** and took place on 7 & 8th April, 1998 at The Bolton Moat House, Bolton, UK.

The conference received sponsorship and support from Dorma (CV Home Furnishings Ltd.,), Terram Ltd., Courtaulds Textiles, TNO (Netherlands Organisation for Applied Scientific Research), EMPA (European Manufacturers Association) and the (UK) Government Office North West.

The theme of the conference was Sustainable Development and followed on naturally from the earlier conference ECOTEXTILE'95 – Wealth From Waste In Textiles, which was published in 1996 by Woodhead Publishing Ltd as "Recycling Textile and Plastic Waste". This theme follows the realisation in the late 1990s that environmental awareness and practice by industry and commerce lead to financial savings if properly managed. Furthermore, if textile manufacturing processes and products are to be "fully green", then it is essential that both financial and environmental sustainability are achieved. This means that the simple "end-of-pipe" solutions considered and implemented during this last decade of the twentieth century will not be acceptable for the twenty-first century. Both consumer pressures and legislation will force manufacturing industries to become environmentally sustainable, whether they are sited in Europe and the USA or are elsewhere and export into these areas.

The proceedings comprise thirty-six papers, which are divided into the five areas:

- Waste Minimisation
- Process Optimisation
- Recovery, Recycling and Re-use
- New Products and Processes
- Environmental Impact Analysis

and provide sufficient coverage of each for the reader to grasp and understand the current main issues as well as pointing towards future solutions. It is hoped that the content and balance of papers, which include overviews, personal opinion and original research, will go some way to increasing our knowledge of achieving full environmental sustainability of the textile and related industrial sectors.

Richard Horrocks Bolton Institute

July 1998