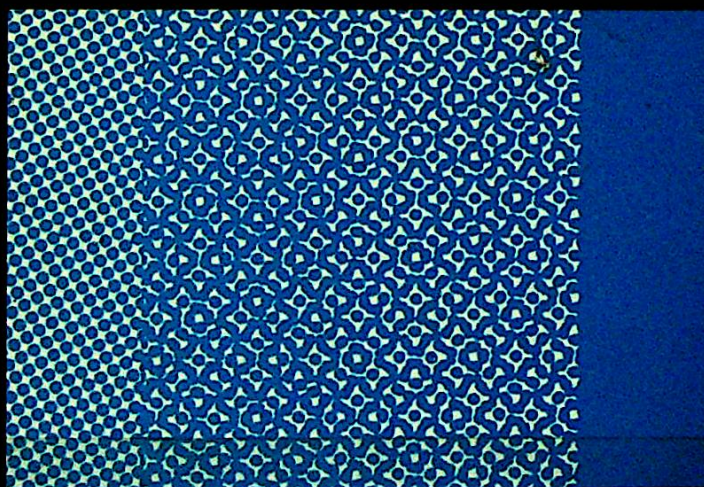


Pira guide series

Colour control in lithography

Kelvin Tritton



* S K N 0 0 1 5 6 7 *



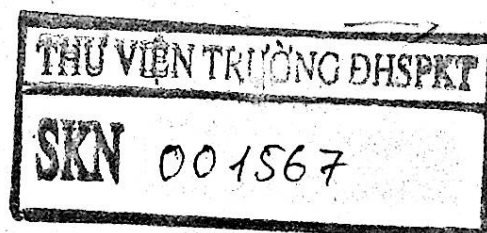
Pira Guide Series

Colour control in lithography

Kelvin Tritton

Principal consultant, Pira International

Pira International



Contents

Acknowledgements	xiii
Preface	xv
Chapter 1 Fundamentals of colour and colour vision	1
Colour and light	1
The physical nature of light and colour	2
The effect of gloss	4
Colour vision and perception	5
Physiological processes in colour perception	8
Adaptation — colour constancy	10
Metamerism	10
Colour vision testing	12
Colour aptitude testing	13
Viewing conditions	13
Chapter 2 Colour definition and measurement	15
Defining colours	15
Hue, lightness and chroma	15
Munsell colour system	16
Colour definition by physical sample	17
Defining colour by measurement	18
Spectral reflectance	19
CIE colour standards	21
Standard illuminants	22
The CIE standard observer	23
Tristimulus values	25

Chromaticity values	27
CIELAB and CIELUV colour solids	31
Colour differences	34
CIELCh	36
CMC colour difference	37
Colour measuring instruments	37
 Chapter 3 Density and densitometers	 41
What is density?	41
Why a logarithmic scale?	42
Principle of measurement	46
Wet and dry density	46
The polarization filter	48
Density measurement of coloured inks	50
Density does not measure colour	52
What else can the densitometer measure?	54
Using the densitometer	54
Calibration and maintenance	54
The measuring surface	55
Density absolute or minus paper	55
Other types of instrument	56
 Chapter 4 Colour reproduction principles	 59
Additive colour mixture	59
Subtractive colour mixture	60
Inks for colour reproduction	63
Colour correction	67
Grey balance and tone reproduction	69
Grey balance	70
Tone reproduction	70
The black printer	71
UCR and GCR	72
 Chapter 5 Colour reproduction as a total system	 75
A systematic approach	76
The original	77
The print characteristic	78

Image construction stages	78
Specifications and controls	79
Chapter 6 The print characteristic	83
Print characteristic definition	84
Print characteristic attributes	84
Substrate	85
Primary colour hue	88
Secondary and tertiary colour hues	89
Tone transfer	89
Grey balance	90
Print characteristic specification	91
Standard print specification	92
Chapter 7 Measurement of the print characteristic	93
Print control strips	93
Position of control strip on sheet	95
Which control strip?	95
Ink colour and film thickness elements	95
Trapping elements	96
Grey balance elements	97
Register targets	97
Tone transfer control elements	98
Microlines	98
Shadow and highlight dots	99
Star target (variable line thickness)	99
Variable dot size elements	100
Coarse and fine screen halftones	101
Tone patches for density measurement	102
Slur and doubling elements	103
Star target	104
Concentric circles	104
Line tint areas	105
Dot area measurement	106
Murray–Davies equation	107
Yule–Nielsen equation	108
Dot gain	109

Additive colour mixture
Subtractive colour mixture
Commonly used print control strips
GATF colour hexagon
Effect of plate exposure on tone transfer
Effect of dot gain on colour balance
Effect of change in colour sequence

Also in the Pira guide series

Total quality management by *Ken Holmes* covers every aspect of TQM from its business relevance, through organization of quality improvement and systems to planning the change to TQM. Using examples from the paper and printing industries, this book provides a unique source of information and guidance. A5, hardback, £40

Colour reproduction in the printing industry by *Anthony Mortimer* has become a standard text. Widely used as a training manual as well as a ready source of reference, it presents a readable and thorough view of reproduction principles and practices. A5, hardback, £40

Management information systems for printers by *John Birkenshaw* provides a much needed practical introduction to MI systems. It explains what an MI system can do for your company and how to go about choosing the most appropriate system. It also provides an approach to cost justifying an MI system, examines the information that a system can produce and suggests ways of analysing this view to improving business. A5, hardback, £40

Wastepaper by *Kate Cathie* and *David Guest* offers an introduction to the issues surrounding the collection and use of wastepaper and its processing. It analyses and explains current worldwide trends in wastepaper usage and discusses the potential for increased utilization of this raw material. A5, hardback, £40

Print Management by *Derek Porter* provides a comprehensive overview of the management of print, explaining all aspects of this important area. Coverage includes organization of the printing company, print marketing and sales, human resources, printing technology, the law and finance. A number of case studies help the reader to apply this information. A5, hardback, £45

Printing inks – formulation principles and quality control testing procedures by *Ronald E Todd* is an authoritative source of information on printing inks and related materials. It discusses the factors that affect formulation; the purpose of the ingredients and how the environment affects their choice. All aspects of quality control are examined, including BS 5750, total quality management and various testing procedures. A5, hardback, £45

Pira International — working with companies in packaging, paper, printing and publishing to improve their profitability through the delivery of innovative business solutions.



Registered office: Randalls Road, Leatherhead,
Surrey, KT22 7RU, UK
Tel: (code UK +44) (0) 1372 802080
Fax: (code UK +44) (0) 1372 802079
E-mail: publications@pira.co.uk
<http://www.pira.co.uk/>
Registered number: 252163 England
(Limited liability)

ISBN 1-85802-036-0



9 781858 020365