Metal Forming

**Production
Engineering Series**

**Macmillan
Engineering Evaluations**

WMW LEAD IN —

TRANSVERSE FORGING

Erfurt UWQ 80

**300
CLUSTER GEARS
PER HOUR**

**FULLY
AUTOMATIC
PRODUCTION
FOR LEADING
BRITISH MOTOR
MANUFACTURER**

PRODUCTIVITY — that's what you get from the completely new ERFURT UWQ 80 Transverse Forging Machine. Finished symmetrical forgings or 'Use' forgings rolled from cropped bar stock to extremely close tolerances. The machine will produce forgings up to 32" long x $3\frac{3}{8}$ " diameter at really high speeds and with major savings on material costs when compared with the traditional upsetting method.

The example shown is a passenger car Cluster Gear, rolled as a double piece and separated after forging.

TOLERANCES

On Diameter:	0.008"
On Length:	0.020"
On Concentricity:	0.008"

**Also UWQ 40—for forgings up to 16" long x $1\frac{5}{8}$ " diameter.*

**OVER 100,000
GEARS FROM ONE
TOOL AND STILL
GOING STRONG**

Manufacturers:
VEB Kombinat Umformtechnik Erfurt
KB Pressen Und Scherenbau Erfurt
London Office:
Wemex Ltd.,
93/97 New Cavendish Street, W1A 2AR. Tel: 01-637 1222
A Member of the WMW Group of Companies

Sole U.K. Agents:
Erfurt Machinery Ltd.,
Dore House Industrial Estate,
Orgreave Close, Sheffield S13 9NP
Tel: Woodhouse 3697
Telex: 54464

Metal Forming

Edited by John D Beadle

Macmillan Engineering Evaluations

Published by

The Macmillan Press Limited

Technical and Industrial Publishing Unit

Managing Editor William F Waller

AMITPP AsslRefEng

Advertisement Representative Alan Kay

General Manager Barry Gibbs

The Macmillan Press Limited

Brunel Road Basingstoke Hampshire UK

Price £3.50

ISBN 978-1-349-01190-2

ISBN 978-1-349-01188-9 (eBook)

DOI 10.1007/978-1-349-01188-9

© The Macmillan Press Limited 1971

Softcover reprint of the hardcover 1st edition 1971 978-0-333-12542-7

SBN 333 125 428

Foreword

The wide diversity of metal forming techniques currently employed by industry are evaluated and discussed within this volume, which gives comparative data, advantages and disadvantages of these methods. Beginning with the materials themselves – especially some of the newer ones – and continuing with the methods of heating now applied, the book appraises each metal working process in turn. Chapters 3–5 relate the various forging techniques, whilst chapter 6 covers extrusion. Cold heading, spinning and flow turning and the components they produce are the next consideration. The potential of high energy rate forming is now being realised and discussion in chapter 9 centres around explosive forming, including explosive bonding, and its successful application. Powder metallurgy is firmly established and the features of the process are presented in chapter 10; wire manufacture and sheet metal forming are then afforded informative appraisals.

Machining operations, including turning, grinding, milling, drilling, tapping, broaching, boring, electro-chemical machining, *etc*, are individually dealt with and practical information on their use is given (chapters 13–17). Chapters 18–20 discuss in-depth the materials and design of tools and automatic machine control. Applying oscillatory energy to metal working processes and the resultant benefits are featured in the final chapter. Subject coverage is completed with a list of equipment manufacturers and a glossary of terms used in metal working.

Throughout the book the forthcoming metrication of industry has been a consideration and the majority of data are presented in SI units. However, flexibility has also been a factor and a number of non-preferred SI units are used and, occasionally, where it is felt the subject warrants it, British units are used and an SI conversion factor given.

Contents

<i>Chapter</i>	<i>Page</i>	<i>Chapter</i>	<i>Page</i>
1 Forming Materials	7	11 Wire Manufacture	87
D M Lewis <i>MSc FIM</i> Metallurgical Consultant		R G Cosslett <i>BSc(Hons)</i> <i>Technical Services Manager</i> Richard Johnson & Nephew (Steel) Ltd	
2 Heating Methods	13	12 Sheet Metal Forming	95
K A Tearle <i>MITPP AsslRefEng Associate of the</i> <i>Institute of Fuel</i> <i>Editor</i> Industrial Process Heating		E E Michaelis <i>CEng MIMechE</i> <i>Director</i> Pearson Panke Ltd	
3 Open Die Forging	19	13 Turning Operations	105
A Tomlinson <i>AMet(Sheff) FIM</i> <i>Head of Special Products Technology</i> <i>Mechanical Working Department</i> BISRA—The Corporate Laboratories British Steel Corporation		K M Dowell <i>Methods Engineer</i> <i>Production Engineering Department</i> Triumph Motor Co Ltd	
4 Closed Die Forging	27	14 Grinding	115
A Thomas <i>PhD AIM</i> <i>Metallurgist</i> Drop Forging Research Association		E Warburton <i>Development Manager</i> The Churchill Machine Tool Co Ltd	
5 Roll Forming	41	15 Milling	123
J Metcalfe <i>Technical Director</i> <i>Steel Tube Division</i> Tube Investments Ltd		J Selby <i>CEng FIMechE FIProdE</i> Mechanical Engineering Consultant	
6 Extrusion	49	16 Drilling and Tapping	133
J C Ball and J Richardson <i>General Manager and Manufacturing Manager</i> Low Moor Fine Steels Ltd		A L Hickling <i>Technical Manager</i> Middlesex Machine Tool Co Ltd	
7 Cold Heating	59	17 Specialised Cutting Techniques	141
M G L Austin <i>Manufacturing Process Engineer</i> <i>Technology Services</i> GKN Screws & Fasteners Limited		C A Sparkes <i>CEng FIMechE AMCT AMSME</i> <i>Kearns-Richards Division</i> Staveley Machine Tools Ltd	
8 Spinning and Flow Turning	65	18 Tool Material	151
G E White <i>Director & General Manager</i> A. G. Major Ltd and L Gander <i>AIM</i> Southborough Group Ltd		E J Rollinson <i>CEng MIProdE</i> <i>Coromant Division</i> Sandvik U.K. Limited	
9 High Energy Rate Forming	71	19 Tool Design	161
G G Dewsnap <i>CBE CEng FIMechE FIProdE AMCT</i> <i>Director</i> Royal Ordnance Factory <i>Patricroft</i> and W G Middleton <i>CEng FIMechE FIProdE</i> & N M Reed <i>CEng MIMechE MIProdE</i> Royal Ordnance Factory <i>Radway Green</i>		D C Crawford <i>Coromant Division</i> Sandvik U.K. Limited	
10 Powder Metallurgy	79	20 Automatic Machine Control	175
J F Harriman <i>MBE MSc(Eng) CEng FIMechE AFRAeS</i> <i>Group Technical Director</i> Raleigh Industries Limited		M Thorneycroft <i>PhD BSc</i> <i>Research & Development Manager</i> Charles Churchill Limited	
		21 Ultrasonic Techniques	185
		D H Sansome <i>PhD BSc(Eng Hons) MIMechE</i> <i>Reader in Applied Plasticity</i> <i>The Department of Mechanical Engineering</i> The University of Aston in Birmingham	
		Guide to Equipment Manufacturers	189
		E G Semler <i>BSc CEng FIMechE</i>	
		Glossary of Terms	195