



PROCEEDINGS OF INFACON 74

THE FIRST INTERNATIONAL CONGRESS ON FERRO-ALLOYS

Johannesburg, South Africa
22nd—26th April, 1974

Sponsored by
Ferro Alloy Producers' Association of South Africa
National Institute for Metallurgy
South African Institute of Mining and Metallurgy

Edited by HELEN GLEN

Published by
South African Institute of Mining and Metallurgy
Johannesburg
1975

Contents

	<i>Page</i>
PREFACE	5
COMMITTEES	7
FOREWORD	9
OPENING SESSION	
INTRODUCTORY REMARKS Dr R.E. Robinson, Chairman of the INFACON 74 Organizing Committee ..	13
OPENING ADDRESS Dr the Honourable P.G.J. Koornhof, Minister of Mines	15
REPLY TO THE OPENING ADDRESS Dr A.J.A. Roux, Chairman of the Board of Control, National Institute for Metallurgy	19
TECHNICAL SESSIONS	
PLENARY ADDRESS Technical trends in ferrochromium production in Japan, by J. Nasu	23
SECTION 1—BURDEN PREPARATION	
Manufacture and use of prerduced chromium-ore pellets, by Y. Otani and K. Ichikawa	31
Experiences and operational results with a chromium-ore pelletizing plant based on the LEPOL process, by E. Lankes and W. Boehm	39
A new technique of burden preparation for ferro-alloy production, by A. Grieve, R.F. Jennings, P.H. Nelson, and K. Kato	47
CHAIRMAN'S SUMMARY	53
SECTION 2—SPECIFIC PROCESSES	
The production of ferrosilicon powder for heavy-medium separation, by M. Sciarone	57
The reduction of chromite fines with ferrosilicon, by William Bleloch	61
The production of manganese alloys by the sintering process, by W. Naruse	69
Chairman's summary	77
SECTION 3—ELECTRIC SMELTING FURNACES	
PLENARY ADDRESS The production of medium-carbon ferrochromium in a bottom-blowing convert- er, and its application to stainless steel, by H. Franke and G. Duderstadt.....	81
The smelting of 50 per cent ferrosilicon in a large closed electric furnace, by Y. Tada, Y. Hosoi, and T. Yamada	85
A completely closed electric furnace for the production of 75 per cent ferro- silicon, by K. Horibe	91
CHAIRMAN'S SUMMARY	99
PLENARY ADDRESS The optimum utilization of raw materials in manganese smelting, by R.T. Hooper.....	101
The technical development of Amcor Limited, with particular reference to the production of ferro-alloys, by J.J. Coetzee	107

ISBN 0 620 01458 X

PRINTED BY FRIER & MUNRO (PTY) LTD
BENROSE, JOHANNESBURG, SOUTH AFRICA

	The computer control of electric smelting furnaces, by A.G. Arnesen and B. Asphaug	115
	Resistance and heat distribution in a submerged-arc furnace, by J. Westly	121
	An integrated production system for manganese ferro-alloys, by T. Tomioka, M. Misawa, and T. Hanano	129
CHAIRMAN'S SUMMARY		133
	Electric smelting furnaces in Southern Africa, by S.G. King	135
	A comprehensive analysis of the furnace interior for high-carbon ferrochromium, by K. Yamagishi, K. Endo, and J. Saga	143
	A comparison of power-factor correction on submerged-arc furnaces by capacitors in shunt and series, by J. Meintjes	149
CHAIRMAN'S SUMMARY		157
SECTION 4—FUNDAMENTAL ASPECTS		
PLENARY ADDRESS	The chemistry of chromium alloys for the new stainless-steel processes, by R. Björklund and B. Jonsson	161
	The chromothermic reduction of chromite, by E. Cohen and T. Yalcin	167
	Liquidus temperatures and the activities of manganese (II) oxide in slags associated with the production of high-carbon ferromanganese alloys, by G.F. Warren, P.R. Jochens, and D.D. Howat	175
	Crystallization processes in a high-carbon ferrochromium slag, by A. Hayhurst. A laboratory investigation of the smelting mechanisms associated with the production of high-carbon ferrochromium, by R.C. Urquhart, P.R. Jochens, and D.D. Howat	187
CHAIRMAN'S SUMMARY		195
	Slag—metal relations in Metalloids' high-carbon ferromanganese furnaces, by S. Selmer-Olsen	209
	Physicochemical properties of slags in the system $MgO-Al_2O_3-SiO_2$ and their application to the technology of ferro-alloy smelting, by G.H. Johnston, P.R. Jochens, and D.D. Howat	217
	The viscosities and electrical conductivities of slags associated with the production of high-carbon ferromanganese alloys, by L.C. Woollacott, D.D. Howat, and P.R. Jochens	227
CHAIRMAN'S SUMMARY		233
SECTION 5—POLLUTION CONTROL		
PLENARY ADDRESS	The impact of energy availability and pollution-control regulations on the ferro-alloy industry, by W.H. Magruder	237
	Pollution abatement of ferro-alloy furnaces in the United States, by R.A. Person	243
	Pollution problems with electric reduction furnaces in the ferro-alloy industry, by A. Lømo	251
CHAIRMAN'S SUMMARY		259
SECTION 6—APPLICATIONS AND TRENDS		
	Applications of Mamatwan manganese ore, by R.A. Featherstone	263
	The production of ferrosilicon—chromium by the single-stage process, by P.W. Clark	275
	Trends in the ferrochromium market of the Western World, by H.J.R. Way	281
CHAIRMAN'S SUMMARY		293
PANEL DISCUSSION		
	Factors affecting the future of the ferrochromium industry	295
CLOSING SESSION		
CLOSING ADDRESS	Dr R.E. ROBINSON, Chairman of the INFACON 74 Organizing Committee	307
DELEGATES		311
AUTHOR INDEX		319

Preface

The material in this volume appears in the sequence in which it was presented at INFACON 74 — the opening speeches, the papers presented during the technical sessions together with the discussion on them, the proceedings of a panel discussion, and the closing speech. Apart from editorial changes, the papers are in the form in which they were submitted before the Congress. One exception is a paper that, as presented, differed materially from the paper submitted; only the modified paper is reproduced here.

Each of the other papers is followed immediately by any new points the author made during its presentation and by the discussion as recorded by the rapporteur for that particular session. The discussions are recorded in direct speech and, where possible, the rapporteurs have checked difficult or ambiguous points with the authors concerned.

Each technical section, or each session of the longer technical sections, closes with a summary by the chairman of that section or session. These summaries are as recorded by the rapporteurs or as provided by the chairmen.

Following South African practice, the comma is used as the decimal marker, and groups of three digits are separated by spaces. However, a space is not used for numbers consisting of only four digits unless those numbers occur in tabular columns together with numbers of more than four digits. Both the metric and imperial systems of nomenclature and units are used in the papers.

I extend my thanks to Mr L.F. Haughton, who helped with the preliminary editing of the papers and who, as Congress Manager, held a watching brief for the INFACON 74 Organizing Committee. My thanks are also due to the authors, chairmen, and rapporteurs for their cooperation, and to the printers, Messrs Frier & Munro (Pty) Ltd, for their patience during the preparation of this volume.

HELEN GLEN
Editor