INFACON 6

Volume 2
CHROMIUM STEEL AND ALLOYS

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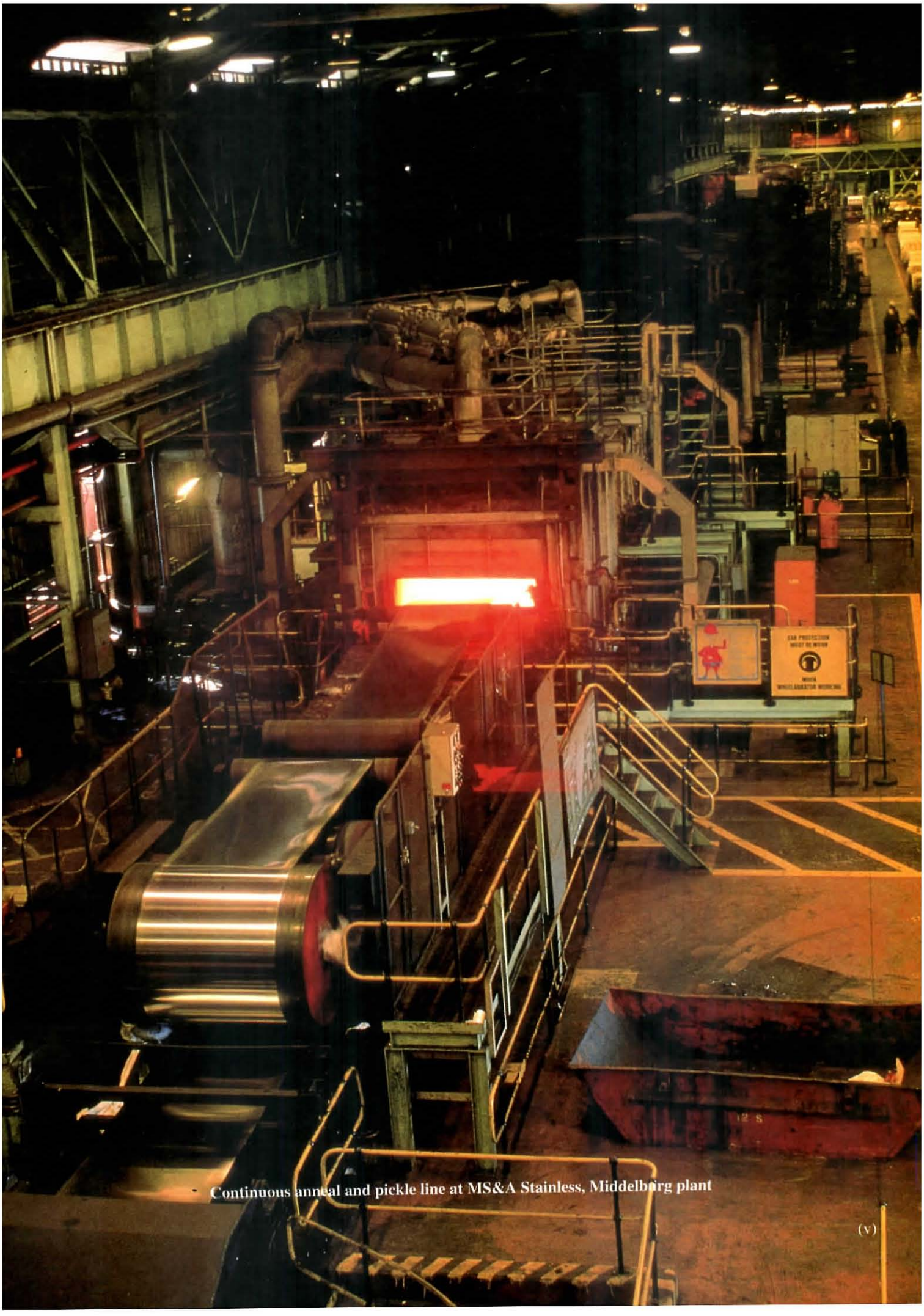

Continuous anneal and pickle line at MS&A Stainless, Middelburg plant

THE SOUTH AFRICAN INSTITUTE OF MINING AND METALLURGY

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INFACON 6

(Incorporating INCSAC 1)

Volume 2

CHROMIUM STEEL AND ALLOYS

Edited by
H. W. GLEN

The conference was organised by
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Volume 1

Preface

I express my sincere thanks to the authors who contributed to the papers published in this volume on chromium and alloy steels, presented at INFACON 6. The kind cooperation and collaboration by many authors from many different countries are highly appreciated.

These Proceedings are the first produced on the SAIMM's new desk-top publishing system. Although this system has many special features, the tight deadlines have resulted in some inconsistencies such as the use sometimes of decimal points, instead of the decimal commas that are standard South African practice. Other examples include the use of *weight per cent* instead of *mass per cent*, and *calories* or *BTUs* instead of *joules*.

I also thank the members of the Programme Committee responsible for the papers in this volume. Their unstinting efforts and hard work made my task easy. Mr Ian Elsdon-Dew, Mr Jack Hewitt, Mr Corrie Scheepers, Prof. Roelf Sandenbergh, and Dr Pete Wedepohl, as well as our Secretaries, Mrs Pam Smith, Mrs Sam Moodley and Mrs Susan Luddick, conducted their tasks in a most professional manner and in good spirit. They deserve much credit. Mrs Claire Kearney likewise handled the production of the volume in a highly professional manner. She and the Secretariat at the SAIMM went well beyond their call of duty, and I express my personal thanks, and also that of the Programme Committee, for their total dedication.

Furthermore, I thank our Editor, Dr Helen Glen, for her major contribution, and Mr Roy Stimson and Mrs Chrissie Buys for the proof-reading. The cooperation of the Programme Committee of INFACON 6, particularly the Chairman, Dr Nic Barcza, is also gratefully acknowledged.

Many referees gave their time in assisting us to refine the papers, and I thank each and every one of them most sincerely for their kind cooperation.

I trust that this collection of papers and the personal interaction at the Congress will assist in the establishment of closer ties between those interested in chromium steels and alloys.

R. J. DIPPENAAR
Chairman: Technical Programme Committee
INCSAC 1, 1992

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Units and Ferroalloy Nomenclature

Throughout this volume, the use of the International Metric System (SI) units has been preferred.

Some of the relevant basic and derived SI units are as follows:

Basic SI units

Quantity	Unit	Symbol
Electric current	ampere	A
Electric potential	voltage	V
Length	metre	m
Mass	kilogram	kg
	ton	1000 kg
Time	second	s
Luminous intensity	candela	cd
Temperature	kelvin	K
Amount of substance	mole	mol

Derived SI units

Quantity	Unit	Symbol	Derivation
Force	newton	N	$kg/m/s^2$
Frequency	hertz	Hz	s^{-1}
Pressure, stress	pascal	Pa	N/m^2
Work, energy, quantity of heat	joule (calorie)	J (cal)†	Nm
Capacitance	farad	F	$m^{-2}kg^{-1}s^4A^2$
Electric potential	volt	V	$m^2kg\ s^{-1}A^{-1}$
Impedance	ohm	Ω	$m^2kg\ s^{-1}A^{-2}$
Conductance	siemens	S	$m^{-2}kg^{-1}s^3A^2$
Power	watt	W	$m^2kg\ s^{-1}$
Quantity of electricity	coulomb	C	SA
Weight	newton	N	$m\ kg\ s^{-2}$
Restarting	ohm. metre	Ωm	
Resistance	ohm	Ω	
Temperature	(centigrade)	°C	
	(kelvin)	K	
Flow	(gas, liquids)	Nm^3	
where N means normal (i.e. STP)			
Feedrate	(solids)	kg/h or kg/min	
Annual production rate or capacity		Kt/a	
Emissivity		E	
Mean particle size		d_{50}	
Atmosphere		atm	

† (1 cal = 4,1818J)

Since is is not practical to use only the basic and derived units of the accepted system, their decimal multiples and submultiples are formed by adding prefixes to the units. The prefixes are shown in the table below:

Multiples, Prefixes and Symbols

Factor by which the unit is multiplied	Prefix	Symbol
10^9	giga	G
10^6	mega	M
10^3	kilo	k
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p

Abbreviations/Nomenclature related to Ferroalloys

Chromium alloys	FeCr	ferrochromium
	ChCr	charge chromium
	HCFeCr	high carbon ferrochromium
	FeCrSi or CrSi	ferrochromium silicide or silico chrome
Manganese alloys	FeMn	ferromanganese
	HCFeMn	high carbon ferromanganese
	FeMnSi or MnSi	ferromanganese silicide or silico manganese
Silicon alloys	FeSi, Si	ferrosilicon, silicon
	CaSi	calcium silicide
Minor ferroalloys	FeV	ferrovanadium
(examples)	FeTi	ferrotitanium
	FeB	ferroboron
Carbide	CaCr	calcium carbide