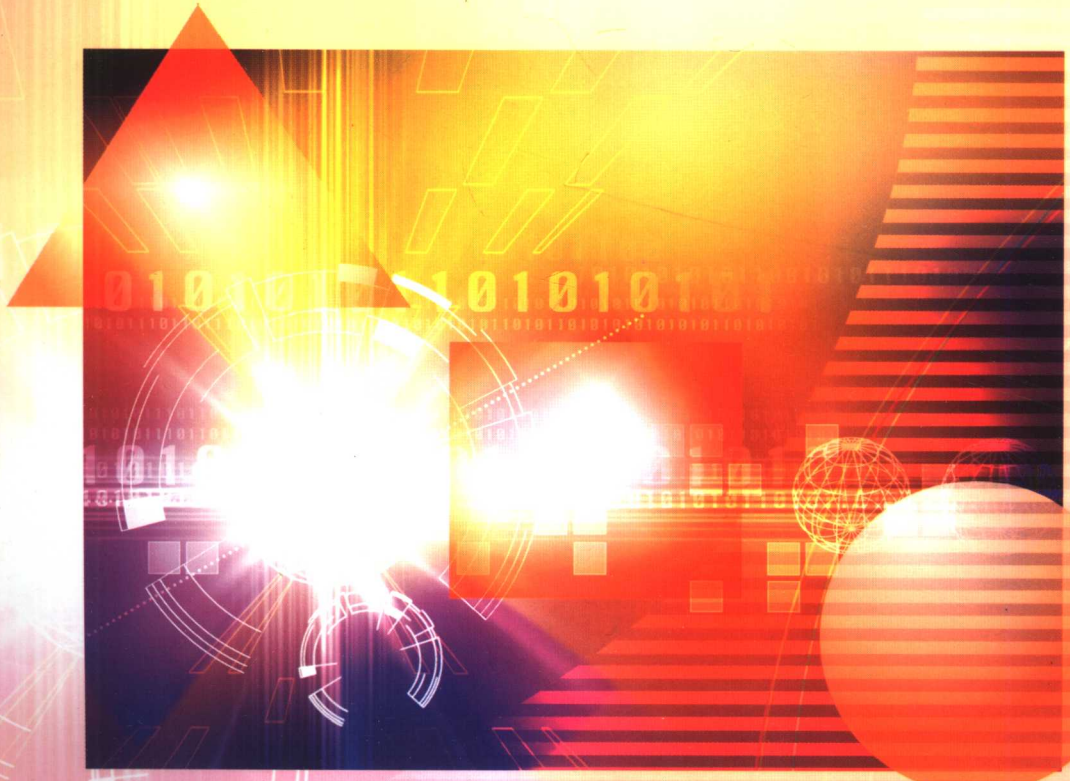
University Teaching Materials

English for Professional Engineers

—Materials Forming and Control Engineering

Xu Guang Zhang Shichang
Pan Chenggang Yan Wenqing



Metallurgical Industry Press

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内 容 简 介

本教材为高等院校材料成型与控制工程专业的专业英语教学用书，全书16章，第1章介绍了我国钢铁工业的总体情况；第2章～第6章为轧制方面的内容，包括轧制的发展历史、轧机的分类、中厚板轧机、热带轧机以及最新的薄带双辊铸造技术等；第7章～第9章为铸造方面的内容，包括金属铸造的工艺过程、材料科学基础和铸造合金的性能、用途等；第10章～第12章为其他金属塑性成型和模具方面的内容，包括金属材料的锻造分类和设备、冲压成型方法、挤压分类及原理等；第13章～第16章为焊接方面的内容，包括焊接过程的分类、焊接原理、手工电弧焊技术及应用和气体保护焊技术及应用等。

本书既可作为高等院校材料成型与控制工程专业的专业英语教学用书，也可作为从事金属材料研究与生产的科技人员的参考书。

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Preface

With the major adjustment in universities, initial major of steel rolling, casting, modeling and welding have been combined to one new major—materials shaping and control engineering. Initial teaching references of professional English for above majors can not be used for combined major. The authors wrote this new reference book for the professional English teaching of combined major of materials shaping and control engineering .

The book was edited and written by Professor Xu Guang, associate professor Zhang Shichang, lectures Pan Chenggang and Yan Wenqing in department of Materials Shaping and Controlling Engineering, Wuhan University of Science and Technology. This book is divided into 16 Chapters. Chapter 1 to Chapter 6 referring to rolling, Chapter 7 to Chapter 9 referring to casting, Chapter 10 to Chapter 12 referring to other methods of metal plastic forming and dies and Chapter 13 to Chapter 16 referring to welding were respectively edited by Dr. Xu Guang, Dr. Zhang Shichang, lecture Pan Chenggang and lecture Yan Wenqing. The book was finalized as a whole by Dr. Xu Guang.

The book was edited and written according to authors' many years teaching practice and experience. The readers of the book include the students and graduate students in this field at universities, and related engineering technologists in the field of materials processing.

Some inappropriateness may exist in the book because of the authors' knowledge. The authors would be grateful if experts and readers could point out the inappropriateness in the book.

Xu Guang
November 2, 2006

前　言

随着我国高等院校专业调整，原有的轧制、铸造、模具、焊接等专业合并为一个新的本科专业——材料成型与控制工程专业，原有的上述各专业专业英语教材已不适应合并后专业的英语教学需求。为了适应合并后的材料成型与控制工程专业英语教学要求，我们编写了本教材。

本教材由武汉科技大学材料成型与控制工程系徐光教授、张诗昌副教授、潘成刚和闫文青讲师共同编著。本书共分16章，其中第1章～第6章由徐光编写，主要涉及轧制方面的内容；第7章～第9章由张诗昌编写，主要涉及铸造方面的内容；第10章～第12章由潘成刚编写，主要涉及其他金属塑性成型和模具方面的内容；第13章～第16章由闫文青编写，主要涉及焊接方面的内容。全书由徐光审定。

本教材是作者根据多年专业英语教学实践和经验编写而成，读者对象为高等院校材料成型与控制工程专业专科、本科生，以及研究生和本领域内工程技术人员。

由于作者水平所限，书中不妥之处在所难免，恳请专家和读者批评指正。

徐　光

2006年11月2日

Contents

1

The Changing Face of China's Steel Trade: a Course for Concern

1.1 Introduction

The development of China's economy and steel industry will play a major role in determining the fortune of the global steel industry in the 21st century.

China has traditionally been a net importer of both finished products and key raw materials, particularly iron ore and scrap. For many companies, the'China effect' was a major contributor to exceptional 2004 results.

Yet, as 2005 draws to a close, the country is emerging as a threat, as reports of its transformation into a net exporter of steel products abound.

This report analyses the ten-year trends in China's steel trade at a strategic level to provide an input into corporate reflection on whether the steel industry in the rest of the world has cause for concern.

Against a background of growing domestic steel capacity—the precise nature and magnitude of which remain worryingly unclear—there have to be real grounds for many producers to be concerned.

1.2 Overview

Between 1994 and 2004, China experienced remarkable economic development, with GDP growing at an annual rate of almost 9%, industrial output rising an average of 11.5% a year since 2000, and Gross Fixed Capital Formation (GFCF) increasing by an average of 15.9% from 2000, as illustrated in Fig.1-1.

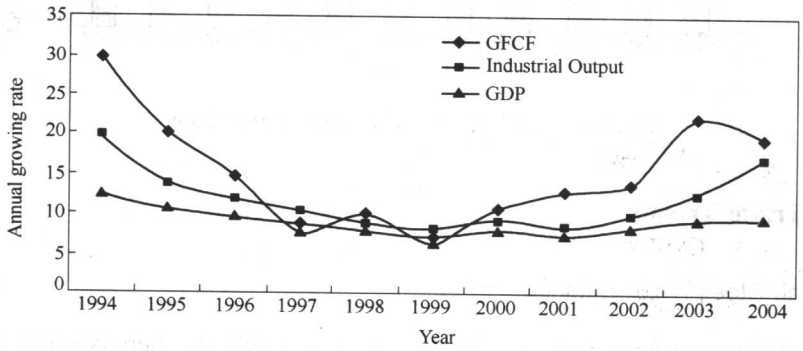

Fig.1-1 China-GDP, GFCF and Industrial Output, 1994—2004

Against this background, domestic finished steel consumption also rose rapidly from some 100 million tonnes in 1994 to 265 million tonnes in 2004, with the majority of this increase seen since 2000. As a consequence, China's share of global steel consumption rose from 17% to 27% over the same ten-year period, as illustrated in Fig. 1-2.

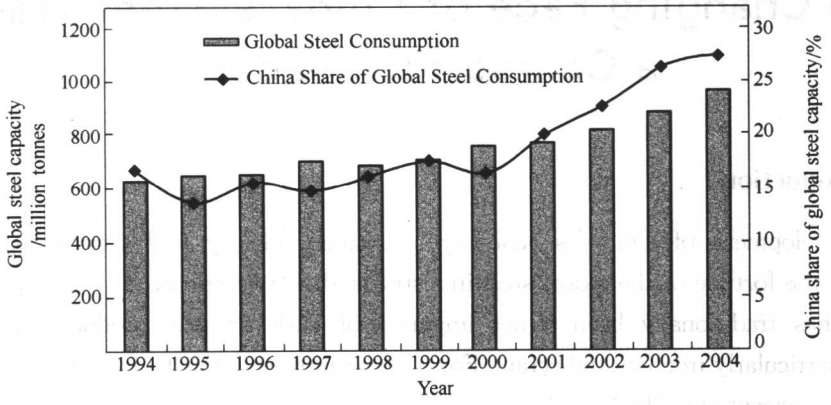

Fig. 1-2 Global steel consumption, 1994—2004

China's liquid steel capacity has mirrored the growth witnessed in consumption, moving some 11% of global capacity in 1994 (106 million tonnes) to 24% of global capacity by 2004 (280 million tonnes), with most of this upturn seen in the three years period starting in 2002, as illustrated in Fig. 1-3.

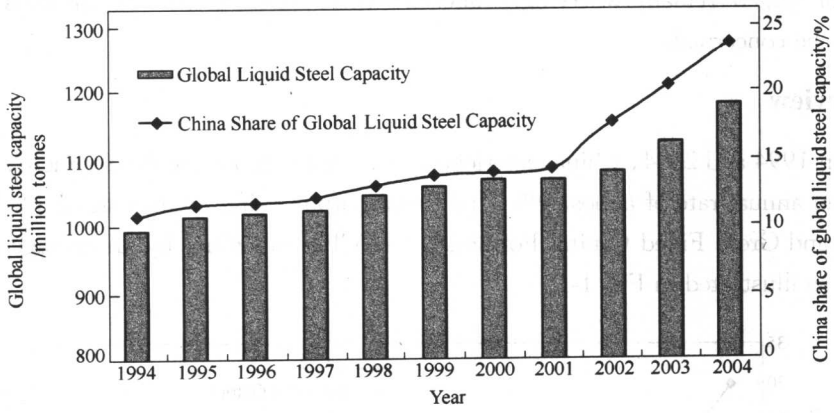

Fig. 1-3 Global liquid steel capacity, 1994—2004

1.3 Steel Trade Trends

1.3.1 Overall Steel Trade Balance

Although China continues to have a finished steel trade deficit, there has been a significant

reduction in its magnitude from 2004, coinciding with the change in domestic steel capacity, as illustrated in Fig. 1-4.

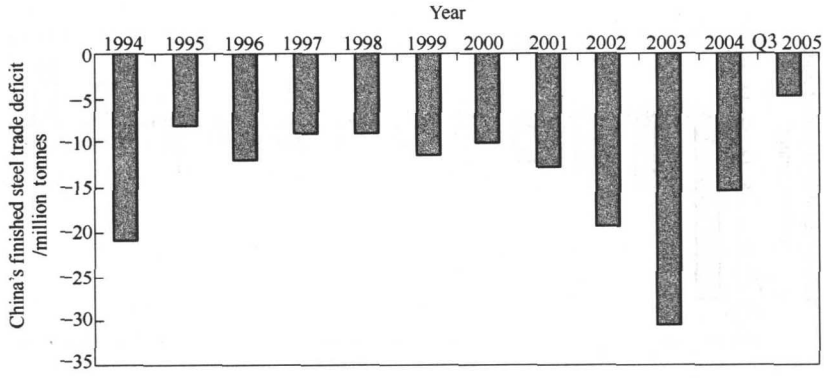

Fig. 1-4 China's finished steel trade balance, 1994—Q3 2005

The development of China's front-end and rolling facilities over the last decade has seen imports' share of consumption from just over 21.7% in 1994 to 11.1% in 2004, as illustrated in Fig. 1-5. This deterioration in market share has been 'disguised' by the rapid growth in China's absolute consumption. As a consequence, imports have, in absolute terms, risen almost 30% from 22.8 million to 29.4 million tonnes.

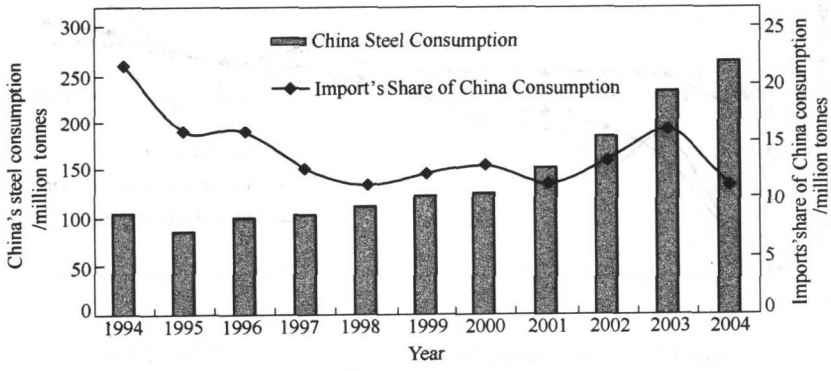

Fig. 1-5 Import's share of China steel consumption, 1994—2004

Whilst imports have grown, China's exports have rocketed, moving from 5.7 million tonnes in 2003 to over 20 million tonnes at the end of September 2005, making it the world's third largest exporter (of finished steel products) as illustrated in Fig. 1-5. Exports are highly focused on the Far East, but sales to North America have quadrupled and the EU25 almost tripled over the same period, albeit from low starting points.

1.3.2 Long Products

China has been a net exporter of long products since 2000, with its positive balance rising

significantly in 2004 to reach 2.81 million tonnes, and continuing in 2005 to reach 4 million tonnes at the end of Q3, as illustrated in Fig. 1-6.

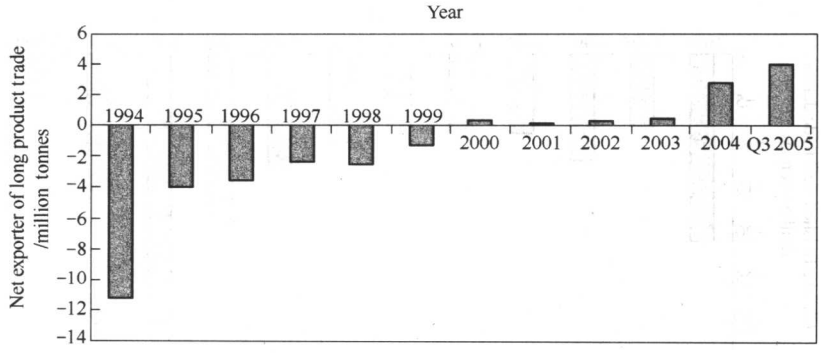

Fig. 1-6 Long product—China's trade balance, 1994—2004

The trade balance in rod , bar and coil has moved significantly between 1994 and 2004 from a deficit of over 4 million tonnes to a surplus of over 1.6 million tonnes, with this growing to almost 2 million tonnes at the end of Q3 2005, as illustrated in Fig. 1-7. Both rebar and the hot rolled bar have followed a similar trend, albeit at slightly lower volumes.

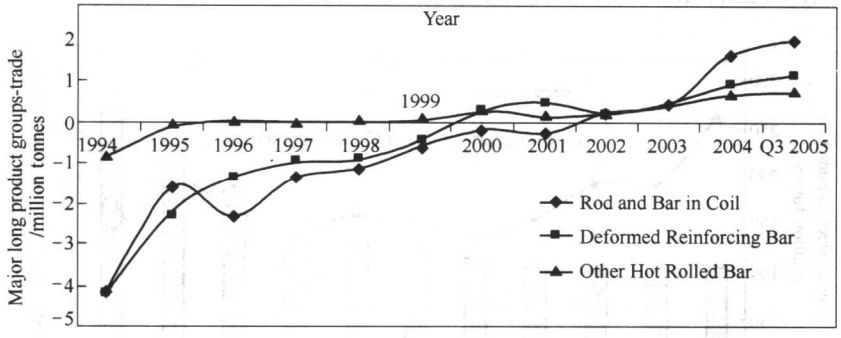

Fig. 1-7 Major long product groups-trade balance, 1994—2004

1.3.3 Flat Products

China continues to run a trade deficit in flat products. However, the downward trend witnessed from 1995 has been reversed since 2003, with the 31.4 million tonnes deficit in this year falling to 19.3 million tonnes in 2004 and 10.6 million tonnes at the end of Q3 2005, as illustrated in Fig. 1-8.

From a product group perspective, hot rolled products have shown the most significant improvement, moving from a deficit of 11.8 million tonnes in 2003 to only 700,000 tonnes at the end of Q3 2005, as illustrated in Fig. 1-9. Cold rolled and coated deficits are still large (5.5 million and

3.5 million tonnes, respectively, at the end of Q3 2005), but nevertheless still reducing.

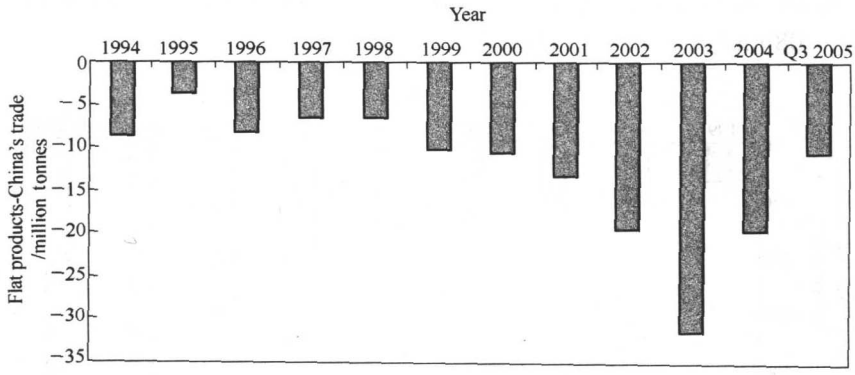

Fig. 1-8 Flat products-China's trade balance, 1994—Q3 2005

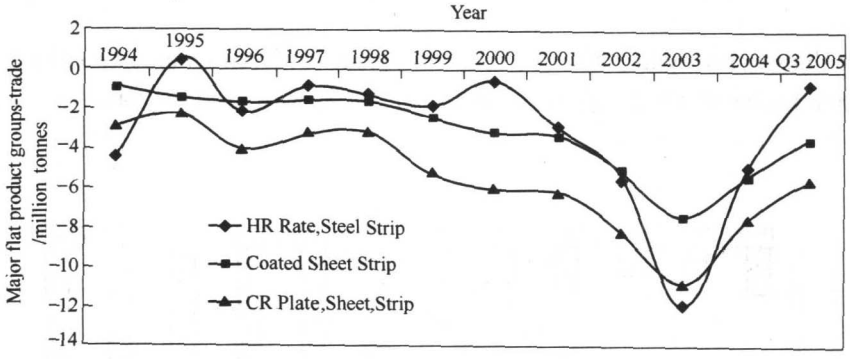

Fig. 1-9 Major flat product groups-trade balance, 1994—Q3 2005

1.3.4 Semis and Raw Materials

After moving into a 5.6 million tonnes trade deficit in semi-finished products in 2001, China has 'recovered' to record a surplus of just over 5 million tonnes at the end of Q3 2005, as illustrated in Fig. 1-10.

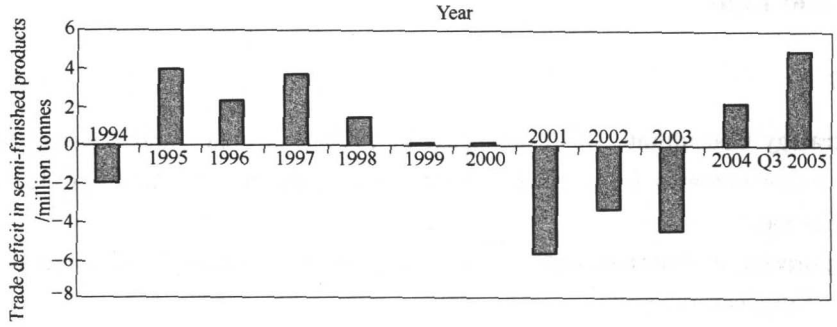

Fig. 1-10 Semi-finished products-China's trade balance, 1994—Q3 2005

With insufficient mineral resources, the country's growing production has seen a continuing deterioration of its, which, by the end of Q3 2005, was almost 200 million tonnes (versus some 208 million tonnes for all of 2004), as illustrated in Fig. 1-11.

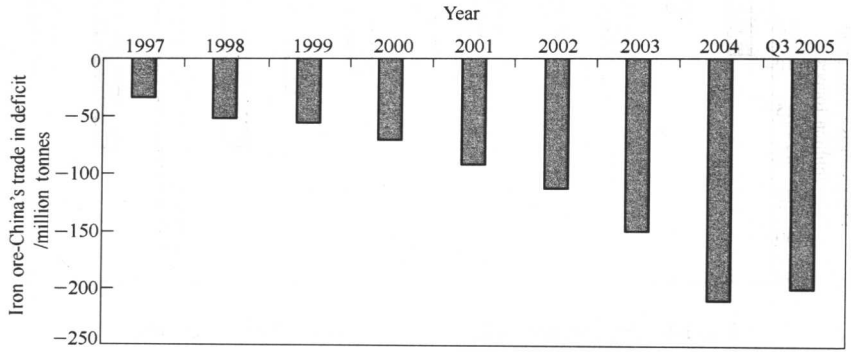

Fig. 1-11 Iron ore-China's trade balance, 1997—Q3 2005

After a slight recovery in 2002, the country's trade deficit in scrap has continued to grow, with the 2004 figure of 10.2 million tonnes likely to be exceeded in 2005, as illustrated in Fig. 1-12.

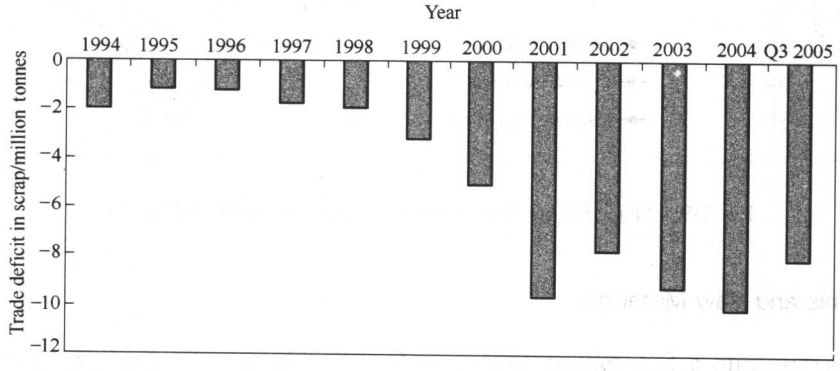

Fig. 1-12 Scrap-China's trade balance, 1997—Q3 2005

1.4 ESC and ISSB

1.4.1 ESC

Euro Strategy Consultants was established in 1993 as a policy and strategy boutique in London and today operates from offices in Brussels, London and Paris and has associates throughout Europe.

"Our approach is **international**, typified by our multinational/multilingual staff and extensive pan-European references."

"We develop **client-specific solutions**, we do not rely on 'off-the-shelf' methodologies,

and adopt a '**best team**' approach, working with internationally recognized specialists to provide our clients with real value added.

1.4.2 ISSB

ISSB is one of the world's leading suppliers of export and import information for steel and raw materials, and has data for 50 of the world's major steel producing and trading countries.

Although the ISSB is primarily funded by the steel producers in the United Kingdom, it has been operating independently for over 35 years. We produce several regular publications, but the majority of our reports are tailored to the specific needs of the customers.

Words and Expressions

ISSB: Iron and Steel Statistics Bureau
a net importer 钢材进口国
finished products 成品材
raw materials 原材料
a net exporter 钢材出口国
domestic finished steel consumption 国内(成品)钢材消耗
global steel consumption 全球(成品)钢材消耗
liquid steel 钢水
upturn 好转
trade deficit (钢材)贸易赤字
coinciding with 符合,一致
front-end 高端(产品)
rolling facilities 轧制设备
deterioration 变坏,恶化
disguise 掩盖
rocket 飞速上升
focused on 集中于
quadruple 使成为四倍
triple 增加三倍
positive balance (贸易)顺差
rod, bar 棒材
rod (圆)棒线材
bar (小型材)型钢
coil 带卷 strip
rebar 螺纹钢
flat products 板带材
downward 下降
cold rolled 冷轧的
coated 镀层的
semi-finished product 半成品
mineral resource 矿资源
iron ore deficit 铁矿石赤字(缺乏)
ESC: Euro Strategy Consultants 欧洲战略咨询公司
Boutique 公司
associates 合作人(伙伴)
multinational/multilingual 多国/多种语言的
off-the-shelf 书架式的
methodology 方法论(学)
best team 最优团队
tailor 制作,整理
client 客户,用户