

连续铸钢专题技术讲座

现代连铸理论与实践

CONCAST
Dr. M. WOLF

中国金属学会连续铸钢学会

CONTINUOUS CASTING ASSOCIATION
OF THE
METALS SOCIETY OF CHINA

"CONTINUOUS CASTING OF ALLOY STEELS"
LECTURE ON OCTOBER 6 TO 11, 1986
IN BEIJING

BY



0157677

DR. MANFRED M. WOLF
CONCAST SERVICE UNION AG
ZURICH, SWITZERLAND

TF 777/9

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现代连铸理论与实践

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欢迎沃尔夫博士来华讲学

我高兴地代表中国金属学会连续铸钢学会和到会的同事们，热烈欢迎国际知名的连铸技术专家、康卡斯特公司的沃尔夫博士，来北京进行连铸技术（特别是合金钢连铸方面）的重要讲学。

最近几年连铸技术在我国得到了迅速的发展。建设和投产了一大批新的连铸机，某些原有的连铸机也在进行现代化的技术改造。虽然连铸坯的产量不断增加，但是连铸比仍然较低，1985年仅为10.7%。因此，“七五”计划期间，在发展连铸上我们还须作更大的努力。

当前，合金钢连铸技术也是我们急需发展的另一个重要领域。

康卡斯特集团是国际上很有名的连铸公司，与我国连铸界早就建立了良好的关系。武汉钢铁公司第二炼钢厂从康卡斯特公司引进的板坯连铸机，最近几年生产情况很好。三台单流的板坯连铸机在1985年生产了1,600,000吨板坯，自1985年3月起即实现了全连铸，这是我国第一个实现全连铸的炼钢厂。

首钢将建设两台八流的康卡斯特小方坯连铸机。这是继武钢之后又一个重要的连铸机建设项目。我希望这两台八流的康卡斯特小方坯连铸机获得成功。

我深信，进行技术交流是加深双方了解和促进中国金属学会连续铸钢学会和康卡斯特集团之间的友谊和合作的重要方法。

中国金属学会连续铸钢学会理事长

北京钢铁设计研究总院副总工程师

周 曙

1986年9月

Welcome Dr. M.Wolf to deliver lectures on continuous casting technology in China

ZHOU SHU **

I am pleased to extend, on behalf of Continuous Casting Association of Chinese Society of Metals and my colleagues attending this lecture, warm welcome to Dr. M.Wolf, the well-known worldwide continuous casting technology expert from CONCAST SERVICE UNION AG, to present very important lecture on continuous casting technology in Beijing, especially on the alloy steel continuous casting field.

The continuous casting industry has been developed more and more rapidly in recent years in China. A lot of new casters have been built and put into operation. Some existing casters are being revamped and modernized with up-to-date technologies. The continuous casting production is increasing rapidly in China, nevertheless the continuous casting ratio is still low, only 10.7% in 1985. Therefore, we need to make much effort during the Seventh Five-Year-Plan Period.

Today, the alloy steel continuous casting technology is another most important field which needs urgent development in China.

CONCAST GROUP is the most famous continuous casting company worldwide. We have already established good relationship between both sides. In recent years CONCAST slab casters in

Wuhan Steel Complex have got excellent productive result. Three single strand slab casters have produced 1.6 million tons of slab in 1985. Since March 1985 its continuous casting ratio has reached 100%. This is the 1st 100% CC-ratio steel works in China.

I am very glad that Shougang will build two 8-strand CONCAST billet casters. It is one of the important project in China after Wuhan slab casters. I hope that the 8-strand CONCAST billet casters in Shougang will get success.

I believe that the exchange of ideas and technical informations is one of important ways to deepen the understanding and to promote the friendly relationship and cooperation between CONCAST GROUP and CONTINUOUS CASTING ASSOCIATION OF THE CHINESE SOCIETY OF METALS.

**** Chairman, Continuous Casting Association of
the Chinese Society of Metals**

**Deputy Chief Engineer, Senior Engineer,
Beijing Central Engineering and Research
Incorporation of Iron and Steel Industry**

前 言

我很荣幸而且非常愉快地作为CONCAST集团的代表向大家作学术报告。在连铸发展初期，人们就对合金钢连铸很有兴趣。因为它把提高收得率的优点与钢的合金含量直接联系起来。因此，现年92岁高龄的CONCAST的奠基者欧文·罗西先生，在1947年首创的最早的连铸机上，就致力于不锈钢的生产研究。

自从那时起，CONCAST集团在发展连铸，尤其在发展合金钢连铸方面一直赋予很大的努力。本次学术报告会介绍有关研究结果，并作为技术转让和学术交流的方式帮助中国从事合金钢生产的同行们。

我们还希望这次讲学能进一步加强CONCAST集团同中国炼钢工作者间的友谊。为此，我们非常感谢中国金属学会连续铸钢学会理事史宸兴先生为筹备这次讲学活动所做的工作。同时也希望本次学术活动的成果能为我们共同的利益服务。

技术咨询部 副主任

Manfred M. 沃尔夫博士

1986年8月于苏黎世

Foreword

It is my great honor and pleasure to lecture as a representative of the CONCAST Group to this distinguished audience. Continuous casting of alloy steels has been a main interest in the early pioneering days already since the value of yield savings is directly related to the alloy content of steels. Thus, the very first caster initiated in 1947 by Irving Rossi - the 97 years old founder of CONCAST - was devoted to stainless steels.

Ever since, the CONCAST Group has made great endeavors in the development of continuous casting with a major emphasis on alloy steels. Pertinent results shall be reviewed in the present lecture, as a means of technology transfer and information exchange in support of our colleagues engaged in China's alloy steel manufacture.

Apart from its technical task, this lecture is also intended to further the friendship between China's steelmaking industry and the CONCAST Group. We thus would like to extend special thanks to Mr. Shi Chenxing as Director of the Continuous Casting Association who had organized this present lecture. Its contribution is hoped to serve our mutual benefits!

With best wishes,



Dr. Manfred M. Wolf
Vice-Director,
Technological Consulting

Zurich, August 1986

编 译 说 明

应中国金属学会的邀请,康卡斯特公司连铸专家Dr.Manfred M. Wolf于1986年10月6日至11日来华讲学。

这本《现代连铸理论与实践》是根据讲课教材编译的。它反映了康卡斯特连铸集团连铸技术的发展现状及一些最新的研究成果,是一本以合金钢连铸为主题的较系统的连铸技术教材,也是一本可供广大连铸生产、科研、设计及教育工作者阅读的参考书。

本书的编译及讲学活动的筹备工作是在冶金部和中国金属学会的领导和关怀下进行的,也得到各兄弟单位及热心连铸工作的同志的广泛支持。特别是衡阳有色冶金机械厂、大连重型机器厂及西安冶金机械厂对这次学术活动给予了资助,我们在此表示感谢。

中国金属学会连续铸钢学会组织了本书的编译和出版工作。全书由陈增琪、杨建新、葛志祺、史宸兴、曹广畴同志负责总审校及编辑出版工作。

这本书的翻译、审校、编辑、校对、印刷等全部工作是在30多天的时间完成的。由于时间紧、工作量大、参加人员多、水平又有限,因此在翻译和校对质量上,在编辑和排印质量上,都还存在不少缺点和不妥当的地方。为此,诚恳欢迎读者批评指正,以便更好地为广大连铸工作者服务。

中国金属学会连续铸钢学会

1986年9月

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第一部分 连铸凝固控制

一、连铸凝固控制概论

从最终产品性能考虑，连铸是所有浇注方法中最好的一种。这就要求对凝固过程进行深入的理解，而这方面在近几年来已取得很大的进展¹。（可参阅W. Kurz, D. J. Fisher: “Fundamentals of Solidification”, Trans. Tech. Publ., Aederman-nsdorf 1984.）

特别是在浇注合金钢时，应注意不同的钢类特有的凝固特征。

本书第二篇文章阐明了连铸凝固控制的一个基本准则。相应的相图附于第三篇文章内。

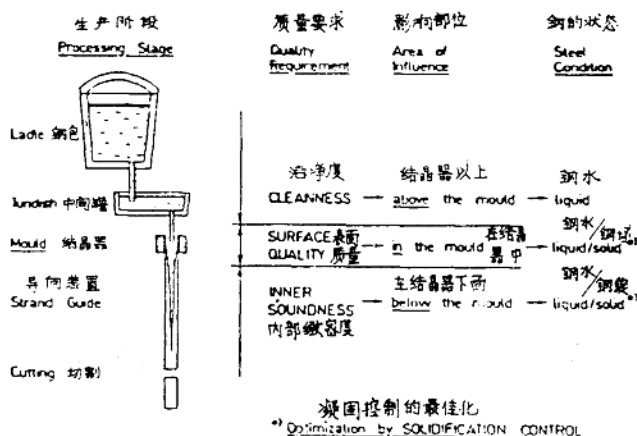


图 1-1 产品质量对连铸各个工艺生产环节的要求

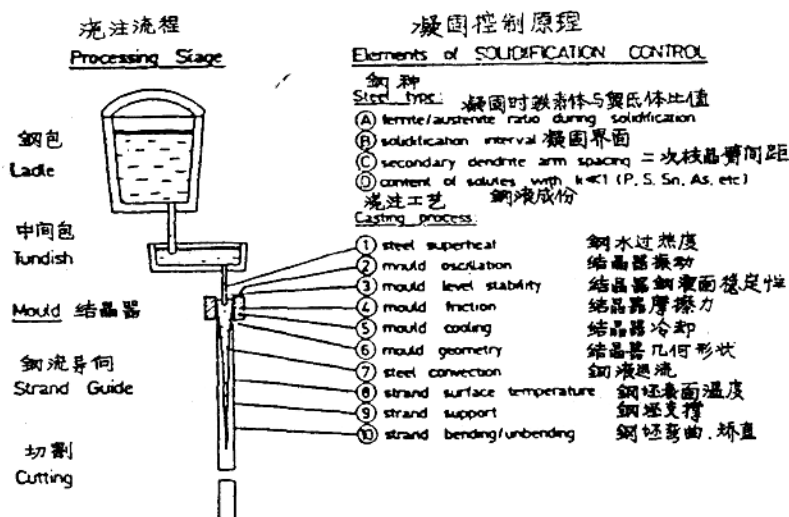


图 1-2 连铸中的凝固控制环节