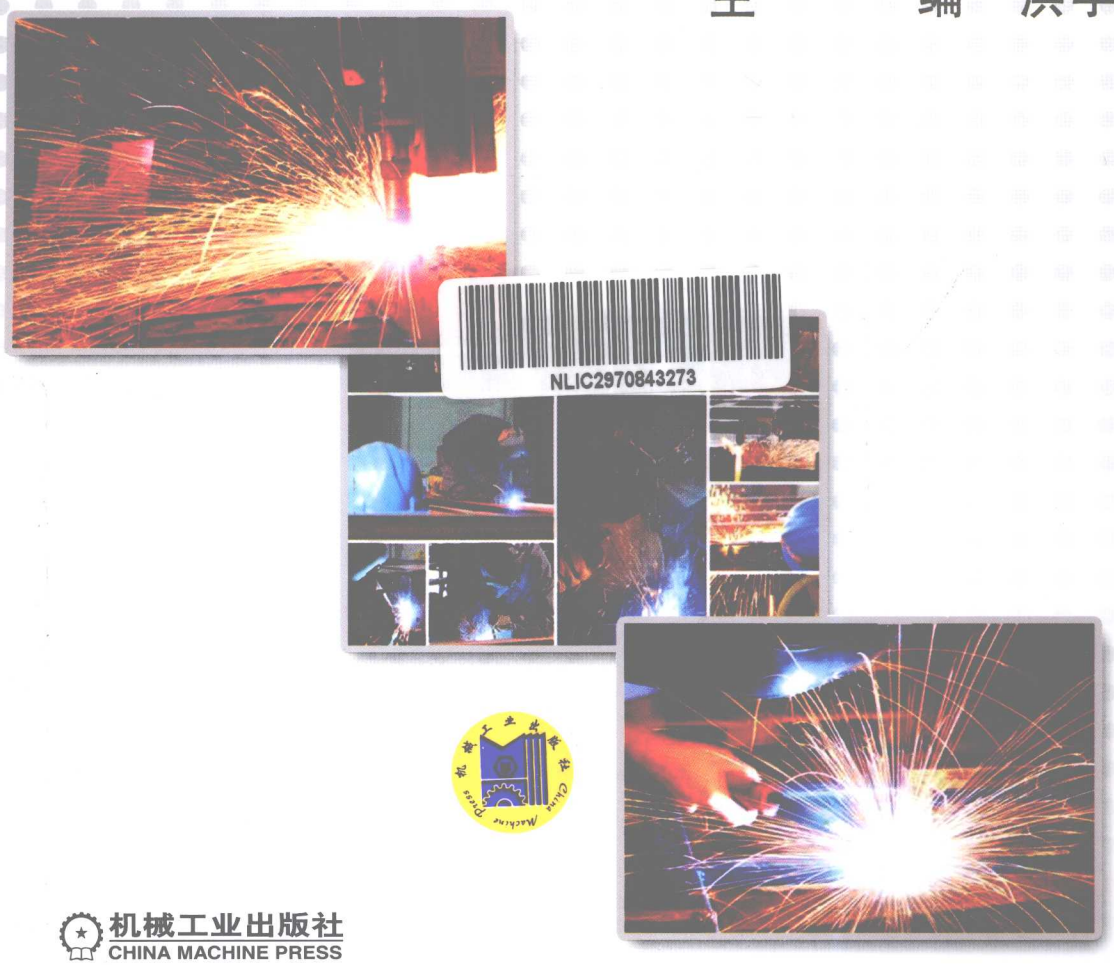
全国高等职业教育专业英语系列规划教材

焊接专业英语

丛书总主编　沈言锦
主　　编　洪宇翔



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本书是按照高等职业教育机电专业规范、培养方案和课程教学大纲的要求，采用模块式结构和开放型体系编写而成的。全书共分为焊接篇和机械篇两部分，每部分又包括6个单元，内容不但包括常见的焊接技术，还涵盖了传统的机械制造专业方面的知识。

本书内容全面、精炼，选材新颖，篇幅和难度适中，努力使英语学习寓于趣味性、娱乐性之中，使得学生在课堂学习和课后自学都不会觉得枯燥乏味。每单元的课文后都附有新单词和短语的解释、重点和难点句子的注释及课后习题，并在书后附录中提供了全部课文的中文翻译和词汇表，方便教学。

本书旨在提高学生的专业英语阅读能力，帮助学生掌握焊接专业常用的英语词汇并了解焊接领域的最新技术应用。本书可作为高等职业院校机电类专业英语的教学用书，还可作为相关工程技术人员的参考用书。

为方便教学，本书配备电子课件等教学资源。凡选用本书作为教材的教师均可登录机械工业出版社教材服务网 www. cmpedu. com 免费下载。如有问题请致信 cmpgaozhi@ sina. com，或致电 010-88379375 联系营销人员。

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前　言

随着我国新型工业化进程的不断推进以及新技术、新工艺的推陈出新，作为制造业核心技术之一的焊接已经从一种传统的热加工技艺发展成为集材料、冶金、结构、力学、电子等多门类学科为一体的工程工艺学科，而市场对于高技术焊接人才的需求也日益迫切。为了适应新形势的需要，更为了切合及推动高等职业院校焊接专业的教学发展，我们组织了多名长期在一线从事教学工作、经验丰富的老师及有多年企业工作背景的高级工程人员共同编写了本书。

本书是按照高等职业教育机电类专业规范、焊接专业的培养方案和课程教学大纲的要求，采用模块式结构和开放型体系编写而成的。全书共分为焊接篇和机械篇两部分，每部分又包括6个单元，内容不但包括常见的焊接技术，还涵盖了传统的机械制造专业方面的知识。

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本书由湘潭大学的洪宇翔担任主编，湖南大学的吴远志、株洲职业技术学院的王志洪担任副主编，参加编写的还有湖南化工职业技术学院的唐文斌、株洲起重设备厂的熊丙卫。淮海工学院的贺毅强进行了全书审校工作，并提出了许多宝贵的意见，在此表示衷心的感谢。

由于编者水平有限，书中疏漏和错误之处在所难免，恳请广大读者批评指正。

编　者

Contents

Part I Welding

Unit 1

Text

What Is Welding?

It is generally known that welding is the joining of two or more surfaces (usually metals, but not always) so that the material of one mixes to gather with that of the other to produce a homogeneous union.[1] In order to obtain a joint in welding metals, there must be a sufficient combination of proximity and activity between the molecules of the materials to be welded so that they can form common, metallic crystals. The range of combinations of proximity and activity is so great that joint may be produced only by temperature, without any external pressure, or only by pressure, without the application of heat.

Since most metal surfaces tend to become unclean at raised temperatures, great attention must be given to methods for preventing oxidation and other contamination in order to obtain high-quality welds.[2]

Other factors that must be taken into account in welding are the metallurgical effects that result from the heating and cooling which accompany most welding processes.

To obtain satisfactory welds, then, it is necessary to have the following: a) a satisfactory heat and/or pressure source; b) a means of protecting or cleaning the metal.

According to the source of energy used for heating the metals and the state of the metal at the place being welded, all existing welding processes may be classified into two broad systems: fusion processes and pressure processes.[3] In the case of the first system, only heat is employed, and in that of the second system, both pressure and heat are used. In both systems various welding methods have been developed.

New Words and Phrases

weld [weld] *vt.* 焊接 *n.* 焊接，焊缝
surfaces ['sə:fis] *n.* 面，表面，外观，外表 *a.* 表面的，外观的
homogeneous [ˌhɔmə'dʒi:niəs] *a.* 同种的，同质的

sufficient [sə'fiʃənt] *a.* 足够的，充分的
metallic [mi'tælik] *a.* 金属的，含（或产）金属的，金属制的
crystal ['kristl] *n.* 水晶，水晶饰品，晶质玻璃 *a.* 水晶的，水晶制的，水晶般的，透明的
oxidation [ˌɔksi'deiʃən] *n.* 氧化（作用）
metallurgical [ˌmetə'lə:dʒikl] *a.* 冶金的，冶金术的，冶金学的

Notes

[1] It is generally known that welding is the joining of two or more surfaces (usually metals, but not always) so that the material of one mixes to gather with that of the other to produce a homogeneous union.

众所周知，焊接是把两个或两个以上的（物体）表面（通常是金属，但也有非金属的）连接起来，使得一个表面的材料与另一表面的材料混合在一起而形成均匀的连接。

[2] Since most metal surfaces tend to become unclean at raised temperatures, great attention must be given to methods for preventing oxidation and other contamination in order to obtain high-quality welds.

由于在温度升高的情况下多数金属表面往往会变得不干净，因此必须十分注意设法防止氧化和其他杂质，以便获得高质量的焊缝。

[3] According to the source of energy used for heating the metals and the state of the metal at the place being welded, all existing welding processes may be classified into two broad systems: fusion processes and pressure processes.

根据加热金属所使用的能源以及根据被焊接处的金属状况，现有的一切焊接方法可分为两大类：熔焊和压焊。

Exercises

Answer the following questions according to the text.

1. What's welding?
2. Why shall we say that the welding technology embraces a wide area?

Translating Skills

科技英语翻译方法与技巧——专业术语的翻译

随着社会的进步和科技的发展，新的发明创造不断涌现，随之就出现了描述这些事

物的新术语。在科技英语翻译中，常常碰到如何把这类术语译成适当汉语的问题。通常有以下约定俗成的方法。

一、意译法

意译法就是对原词所表达的具体事物和概念进行仔细推敲，以准确译出该词的科学概念。这种译法最为普遍，在可能的情况下，专业术语应采用意译法。

一般来说，有3类专业词语采用此译法：

1）合成词。由两个或两个以上的词构成的复合词。例如：

machine tool	机械工具
circular shaft	圆轴
machine maintenance	设备维护
cross section	横截面

2）多义词。旧词转译，通过赋旧词以新意而获得新术语。例如：

critical	挑剔的、苛求的、（物理中）临界的——精确的
monitor	班长——监听（视）器
key	钥匙——关键

3）派生词。在原有词根上加前缀或后缀构成新术语。例如：

histogram	柱状图
benchmark	基准
hacksaw	（手工）钢锯
craftspeople	工匠，手艺人

二、音译法

音译法就是根据英语单词的发音译成与原词大致相同的汉字。采用音译法的专业技术术语主要有两类：

1）计量单位的词。例如：

calorie	卡路里（热量单位）
hertz	赫兹（频率单位）
joule	焦耳（功的单位）
inch	英寸（长度单位）
meter	米（长度单位）
newton	牛顿（力的单位）

2）某些新发明的材料或产品的名称（尤其是在最初时）。例如：

nylon	尼龙
sonar	声呐
morphine	吗啡

一般来说，音译比意译容易，但不如意译能够明确地表达新术语的含义。因此，有些音译经过一段时间后又被意译词所取代，或者同时使用。例如：

conbine	康拜因——联合收割机

laser	莱塞——激光
vitamin	维他命——维生素

三、形译法

英语常用字母的形象来为形状相似的物体命名。翻译这类术语时，一般采用形译法。常用的形译法又分为下列两种情况：

1）选用能够表达原字母形象的汉语词来译。例如：

T-square	丁字尺
I-column	工字柱

2）保留原字母不译，在该字母后加“形”字，这一译法更为普遍。例如：

U-tube	U 形管
T-joint	T 形接头

四、意音结合译法

在音译之后加上一个可以表示类别的词，或者把原词的一部分音译，另一部分意译。

1）有些词意译为主，在词首或词尾加上表意的词。例如：

logic	逻辑电路
Dural	杜拉铝（制造飞机的铝合金）
nida	尼达青铜

2）由前缀加入计量单位构成的复合词，计量单位采用音译。例如：

kilowatt	千瓦
decibel	分贝
millimeter	毫米

3）某些复合词采用意音结合译。例如：

motorcycle	摩托车
radar-man	雷达手
logic-oriented	逻辑定向的

4）有些由人名构成的术语，人名音译，其余部分意译。例如：

Ohm's law	欧姆定律
Curie point	居里点
Monel metal	蒙乃尔合金

在人们熟悉了这类术语后，往往只记得人名的第一节音译，后加“氏”字译出。例如：

Babbit metal	巴氏合金
Brinell hardness	布氏硬度

五、直译法

在科技文献中，商标、牌号、型号等表示特定意义的字母均可不译，直接使用原文，只译普通单词。例如：

B-52 bomber	B-52 型轰炸机
Pokayoke approach	Pokayoke 方法

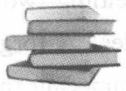
几点注意事项：

1）专业术语的翻译应注意规范化，凡约定俗成的译名，不要随意改动。例如：Boeing 777 即波音 777 属于音译与直译相结合，业界已普遍认可。

2）有的专业术语的几个译名在不同场合具有不同的专业意义，在翻译时一定不能搞错。例如，drawing 可以有如下意思：绘图，绘制曲线；拉深；拔长；拉拔。在翻译时必须根据句子前后的意思明确此处应有的含义，准确翻译。

3）同一篇文章或同一本书中，专业术语的译名必须前后统一，这特别适用于那些有几个通用译名专业术语，否则就可能引起误解。

Reading Material



Soldering and Welding

There are a number of methods of joining metal articles together, depending on the type of metal and the strength of the joint that is required.

Soldering and Brazing

Soldering gives a satisfactory joint for light articles of steel, copper or brass, but the strength of soldered joint is rather less than a joint which is brazed, riveted or welded. These methods of joining metal are normally adopted for strong permanent joint. Soldering is the process of joining two metals by a third metal to be applied in the molten state. Solder consists of tin and lead, while bismuth and cadmium are often included to lower the melting point. One of most important operations in soldering is that of cleaning surfaces to be joined, this may be done by some acid cleaner. Although the oxides are removed by the cleaning operation, a new oxide coating forms immediately after cleaning, thus is preventing the solder to unite with the surface of the metal. Flux is used to remove and prevent oxidation of the metal surface to be soldered, allowing the solder to flow freely and unite with the metal. Zinc chloride is the best flux to use for soldering most ferrous and non-ferrous metals, for soldering aluminum stearine acid or Vaseline is to be used as fluxes. The soldering copper is a piece of copper attached to a steel rod having a handle. Soldering coppers are made in different lengths, forms and weights. The quality of soldering depends to a great degree on the form and size of the soldering copper. Two parts may be perfectly soldered only when the surfaces to be joined have absorbed enough heat to keep solder melted for some time.

In some cases it may be necessary to connect metal surfaces by means of hard zinc solder which fuses at high temperature. This kind of soldering is called brazing.

Welding

Welding is the joining of two metal pieces by softening with heat and then pressing, hammering, or fusing them together. Many parts of machines, automobiles, airplanes, ships, bridges, and buildings are welded.

Oxyacetylene welding is the heating of two pieces of metal with a flame that burns a mixture of oxygen and acetylene gas. The oxygen and acetylene gas are kept in two separate steel tanks from which they flow to a torch; there the two gases mix and then pass into the flame. It is the hottest flame known for ordinary use; its temperature is about 6,300 degrees Fahrenheit. The oxyacetylene flame may be used to cut iron and steel. Electric of the welding is the heating of two pieces of metal to be welded by electricity. This heat is the hottest that can be obtained for engineering purposes; it is about 7,232 degrees Fahrenheit. The ends are thus melted together, making a welded joint. Spot welding is welding two pieces of metal in spots with electricity and is done with a machine called spot welder. A forged weld is made by softening the ends of two metal pieces in furnace and then hammering them together.

New Words and Phrases

solder [ˈsɔldə] *n.* 钎料，焊锡 *v.* （锡）焊，焊接
soldering [ˈsɔldəriŋ] *n.* 锡焊，软钎焊
brass [brɑːs] *n.* 黄铜，黄铜制品
braze [breiz] *vt.* 用铜-锌合金焊接
brazing [breiziŋ] *n.* 铜焊（接），硬钎焊
join [dʒɔin] *vt.* 连接，结合
joint [dʒɔint] *n.* 接缝，接合处
copper [ˈkɔpə] *n.* 铜，铜币，铜制物 *a.* 铜的
rivet [ˈrivit] *n.* 铆钉 *vt.* 铆，铆接
molten [ˈməultən] *a.* 融化的，熔融的
bismuth [ˈbizməθ] *n.* 铋
cadmium [ˈkædmiəm] *n.* 镉
acid [ˈæsid] *n.* 酸 *a.* 酸的，酸味的
oxide [ˈɔksaid] *n.* 氧化物
coat [kəut] *vt.* 涂上
coating [ˈkəutiŋ] *n.* 涂层
flux [flʌks] *n.* 焊剂，助焊剂
zinc [ziŋk] *n.* 锌
chloride [ˈklɔːraid] *n.* 氯化物
ferrous [ˈferəs] *a.* 含铁的，铁的

aluminum [əˈljuːminəm] *n.* 铝
stearine ['stiːərin] *n.* [化] 硬脂，硬脂酸
Vaseline ['væsiliːn] *n.* [化] 石油冻，矿脂，凡士林（商品名）
fuse [fjuːz] *v.* 熔（化），熔合 *n.* 熔丝
soften ['sɔfən] *v.* 使软化，使柔和，变软弱
oxyacetylene [ˌɔksiəˈsetiliːn] *a.* [化] 氧乙炔的
acetylene [əˈsetiliːn] *n.* [化] 乙炔
tank [tæŋk] *n.* （盛液体或气体的）大容器，槽，罐，坦克
torch [tɔːtʃ] *n.* 火炬，火把，[机] 气炬，吹管
furnace ['fəːnis] *n.* 炉子，熔炉，[冶] 鼓风炉，高炉
acid cleaner 酸洗液
oxide coating 氧化膜
zinc chloride 氯化锌
soldering copper 纯铜烙铁
steel tank 钢制储气瓶
soldering iron 焊铁，烙铁
ferrous and non-ferrous metal 黑色金属和有色金属

Unit 2

Text

General Characteristics of the Welding Arc

The electric arc is the heat source for a variety of the most important welding processes, possibly because it is an easily produced high-intensity source. It is, however, much more than just a source of heat. If required it can be arranged to transfer molten metal from the electrode to the work. It is also possible to use an arc simultaneously to supply heat and remove surface films — an important advantage where welding is done in the absence of fluxes.

Within the envelope of the arc weld pool a whole range of complex gas-slag-metal reactions and other metallurgical changes take place.

An arc is an electric discharge between two electrodes which takes place through ionized gas known as "plasma". [1] The pace between the electrodes can be divided into three regions: a central region in which there is a uniform potential gradient and two regions adjacent to the electrodes in which the cooling effect of the electrodes results in a rapid drop in potential. These two regions are the anode and cathode fall according to the direction of current flow. The length of the central region or arc column is influenced by the arc length but, where an arc is shortened to the extreme, the influence of the electrodes may dominate the entire arc gap. With a high-current arc at atmospheric pressure, extremely high temperatures, from 5000 to 50000 K, can exist in the axis of the arc column. From this central core the temperatures drop rapidly to the outer layers of the arc plasma and in a given atmosphere both the temperature and diameter of the central core depend on the current passed by the arc. Because most of the current is carried in this central channel and is influenced by its temperature and diameter, the relationship between arc current and potential is not according to Ohm's law but takes the non-linear。 When the current is increased from a low value, the channel is enlarged and its temperature raised so that the potential drops to the minimum. In this part of the curve the arc is said to have a negative characteristic. The curve then remains flat or slightly rising until high currents are reached.

Welding arcs are generally operated in this high-current region so there is a tendency to a marked radial temperature gradient which combined with the influence of the magnetic field created by the flow of current through the arc itself exerts a constricting effect on the arc column — the pinch effect. The welding arc is also distinguished by its geometry which is invariably of the point-to-plane type. The spread of current from the electrode point to workpiece (plane) results in an axial component of the pinch effect and as the force is always from the

point to the plane regardless of the direction of current flow; the ionized gas in the column is set in motion. As the force is proportional to I^2 it is be expected that the movement of hot ionized gas plasma jet would become of increasing significance as the welding current is raised. The actual velocity of the jet is difficult to measure, but may be in the region of 10^5-10^6mm/s. With AC the arc force build up and decays with the current, but since it is independent of polarity the arc force pulses at twice mains frequency. Motion in the arc column implies a circulation of gas and it is known that entrainment of gas occurs in the region of the arc root on the electrode.

The behavior just described is a generalization bases on the arc root being large in the plate than the electrode and the assumption by the arc of its well-known bell shape. In fact, the forces at work within the arc are greatly influenced by the behavior of the arc roots and the type of emission taking place there. This is dependent on the composition of the electrodes and the gaseous atmosphere in which the arc operates.

New Words and Phrases

simultaneously [saiməl'teimiəsli] *ad.* 同时地
discharge [dis'tʃɑ:dʒ] *n.* 放电
ionized ['aiənaizd] *v.* 使电离，离子化
gradient ['greidiənt] *a.* 倾斜的 *n.* 梯度，倾斜度
anode ['ænəud] *n.* 阳极
cathode ['kæθəud] *n.* 阴极
decay [di'kei] *vi.* 衰减，衰退
emission [i'miʃən] *n.* 发射
pinch effect 收缩效应

Notes

[1] An arc is an electric discharge between two electrodes which takes place through ionized gas known as "plasma".

电弧就是在两电极之间发生的一种放电现象，电离的气体称为"等离子体"。

Exercises

Translate the following words into English.

1. 定位焊　2. 单面焊
3. 多层焊　4. 角焊

5. 打底焊　6. 环缝焊接

Translating Skills 

科技英语翻译方法与技巧——词义的确定

一、词义的选择

英语中有很多词汇本身是多义的，并且英语词汇和汉语词汇大多不是一一对应的，有些词汇在不同专业领域中有不同的含义，所以词义的选择应根据词的类别、搭配，联系上下文，结合专业知识来确定。

1）ferrous metals 容易译为“含铁的金属”，正确的译法为“黑色金属”；nonferrous metals 容易译为“不含铁的金属”，正确译法为“有色金属”。

2）The process of smelting consists of heating the ore in a blast furnace with coke and limestone, and reducing it to metal.

reduce 一词使用最多的词义是“减少、缩小”，在此，结合上下文应译为“还原”。

冶炼过程包括把铁矿石同焦炭和石灰石装入高炉加热，并使它还原成金属。

3）The metal which remains is pig iron, and consists of approximately 93 percent iron, 5 percent carbon, and 2 percent impurities.

联系上下文，结合专业知识，pig iron 应译为“生铁”。

留下的金属就是生铁，生铁中含有约 93% 的铁，5% 的碳和 2% 的杂质。

二、词义的引申

1）The classification of metal forming methods intentionally leaves open the question of whether a process is carried out without preheating.

open 一词原义是“打开的、敞开的、公开的”，在此应引申为“未解决的”。

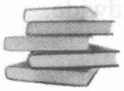
这种金属成形方法的分类并没有解决成形过程是否需要进行预热的问题。

2）Material should be bent across the grain at least up to 45°, especially for sharp bends, so as to avoid cracking of the material.

grain 一词原义为“颗粒、纹理”，在此应将“纹理”之意引申为轧制方向。

弯曲方向与板料的轧制方向至少成 45°角，特别是弯曲半径很小的情况下，以避免板料破裂。

Reading Material



Welding in the Century of Information Technology

During the last three decades of the technical and technological evolution in welding, extensive engineering efforts are focused on the mechanization and automation of the various welding processes efforts in industry. Human, economic and quality aspects are obviously the major factors which encourage especially the rapid growth of the welding automation area. Through the years meanwhile manual welding fabrication has been replaced successfully in many industrial areas by automated production processes.

However some of the major problems in welding automation are still existing which the manual welder copes with by co-ordination of his eyes, hearing and hands together with his knowledge of the process and its control. Therefore, since years research and development are stimulated to improve welding automation concepts by introduction of advanced technical approaches.

From the beginning of the 70s the increasing impact of microelectronics and computer technology on welding engineering changed these approaches toward welding automation substantially. The microcomputer was born and information technology stared to grow up to one of the fastest developing and most influential areas of industrial activities.

At the same time first robot welders had been introduces to the car industry to release human welders from the hard working conditions in the field of resistance spot welding. Due to the special requirements of torch motion and path accuracy it took some time for robot arc welding to appear on the scene. Robotics was on the way to become one of the major links in the chain of industrial automation. The working conditions of the personnel associated to the robot stations changed more or less to programming and supervisory activities. Higher qualification was required. This includes technological knowledge of the process as well as experience how to operate a robot welder successfully. Education and training become of increasing importance to assure a successful introduction of advanced technologies into welding and welding automation.

Besides the evolution in robot welding, the rapid progress in microelectronics and information technology influenced welding engineering as well as the design of welding equipment and machinery considerably. They offered new perspectives and advantages in the control of the welding process itself.

Approaches towards manless control, adjustment, measurement and diagnostics emerged by the impact of information technology.

The demands for appropriate sensor systems capable of rapid process data acquisition led