

# European Welding Federation - Recent Achievements and Future Challenges

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EWF - European Federation for Welding Joining and Cutting

IAB - International Authorisation Board of IIW

IIW - International Institute of Welding

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## Introduction and background

The importance of welding to the global economy is known to be of significant relevance though estimations of its real impact done on a study conducted in Germany in 2005. This thorough study,, based on collection of data, statistical analysis and modelling, led to results that show that the total added value generated by European joining industry is around 83 Billion Euros per year and estimates that approximately 2 million people work in welding and related technologies.

It is also well known that, if welding is not done properly, catastrophic failure of constructions can occur which create serious damage to people and also represent significant economic losses. Two examples are shown In Figure 1. These were both caused by brittle fracture initiating from a weld defect. Fortunately such occurrences are reduced these days, but mistakes in welding can be costly for other reasons. For example it has been estimated that the cost of repairing an unacceptable weld can cost 5 to 6 times the cost of welding it correctly in the first time.

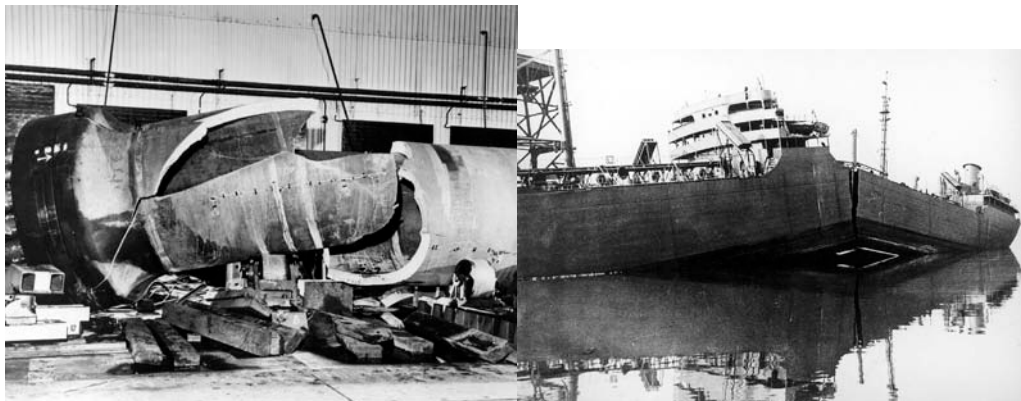




Figure1. Failure of welded structures

One way for a company to show that its welding production and products meets appropriate quality requirements is through the implementation of EN ISO 3834 (formerly EN 729). Revised and updated in 2005, this is the single most important standard regarding the achievement of welding quality. Many EN product standards and EU directives require manufacturers to comply with EN ISO 3834.

EN ISO 3834 is not a quality system standard but it can be used as a very useful tool for fulfilling EN ISO 9001:2000 requirements for special processes when this standard is applied by the manufacture. It can also be used by the manufactures by itself as a way to demonstrate to a third party that the manufacturing of welding products is carried out according to an appropriate quality requirement level.

Whenever a manufacturer refers to compliance with a certain ISO 3834 quality level, it should be sufficient to demonstrate the manufacturer's capabilities are fully adequate for the control of welding activities in relation to the type of product or welding work that is being carried out by the company.

Safety and profit depend on technical control of welding operations. Key staff in all welding related activities needs to have an appropriate level of competence in welding technology and its application. In addition to employing competent and tested welders, manufacturers should ensure that engineers, designers and technicians who deal with welding matters have proven relevant competence. This is increasingly becoming a contract requirement: a trend which is expected to accelerate as new European Directives and European/International Standards for welding come into force. EN ISO 14731 "Welding Coordination – Tasks and Responsibilities" (formerly EN 719) requires people with welding related responsibilities to be able to demonstrate that they are competent to carry out those responsibilities. Furthermore, in order to comply with EN ISO 3834, it is necessary also to comply with EN ISO 14731.

EFW and IIW are two major welding organisations in which international expertise in welding and related technologies is assembled. For nearly 30 years, these organisations have been developing guidance documents and technology exchange mechanisms to support companies seeking to adopt best practice in welding. This has been a monumental effort, culminating in the installation of unique and comprehensive training, qualification and certification systems, applied to both people and companies, harmonised on a world-wide basis.

This paper gives details of the EWF/IIW systems that have been developed and what has been achieved as a result of them. It also outlines the challenges ahead for EWF and how they are being addressed.

## **1 INTERNATIONAL HARMONISATION IN WELDING**

The EWF (European Welding Federation) work on the development of harmonised courses which started in 1980, resulted in the implementation of a series of training and qualification 'guidelines' and in the definition of examination criteria for welding personnel.

In parallel, the IIW (International Institute of Welding) Commission XIV “Education and Training” has dedicated its activity to the exchange of change of know-how in training in welding.

In 1998, EWF and IIW signed the first agreement of co-operation towards the development of a single international system for education and qualification of welding personnel. By use of a single syllabus for each level of training course and a harmonized system for examinations management, the same qualification may be awarded in any country.

EWF has further developed the system towards the certification of specific competence of welding personnel and towards the certification of companies complying with the ISO 3834 requirements. These systems have been implemented in Europe for the last ten years. EWF recently agreed to transfer these systems to IIW. The approval, and start of implementation, of these, the IIW Certification Systems for Welding Personnel and Companies according to ISO 3834, at the international level, began in 2008.

In order to administer the training, qualification and personnel certification system and to develop it still further, the IIW has established the IAB – International Authorisation Board. This organisation has the aim of the effective implementation of the systems in all IIW member countries, by publishing Guidelines for training syllabuses and examinations and implementing the Quality Assurance system controlling the system.

An organisation, recognised by the IIW national member society, is appointed as the Authorised National Body (ANB) for the supervision of the system for training, qualification and certification of personnel in each country. Representatives from these ANBs form the operational management within the IAB, and they nominate and approve Lead Assessors and Peer Assessors who ensure conformity of each ANB to agreed Rules.

ANBs are responsible at the national level for:

- i) The assessment and monitoring of Approved Training Bodies (ATBs).
- ii) The conduct of examinations.
- iii) The assessment of applicants for certification.
- iv) The issue of Diplomas and Certificates.

There are now 39 countries that have joined this system with an Authorised National Body, as follows

Austria		Norway	
Belgium		Poland	
Brazil		Portugal	
Bulgaria		Romania	
Canada		Russia	
China		Serbia	
Croatia		Singapore	

Czech Republic		Slovakia	
Denmark		Slovenia	
Finland		South Africa	
France		Spain	
Germany		Sweden	
Hungary		Switzerland	
India		Thailand	
Indonesia		Turkey	
Italy		Ukraine	
Iran		United Kingdom	
Japan		United States	
Netherlands			

Indonesia, Nigeria, Turkey and United States of America are applicant ANBs.

With regard to the system for the certification of companies according to EN ISO 3834, this is implemented throughout the world also by the IAB appointing an organisation in each country, and the mechanism for this is very similar to that adopted for the ANBs. These National organisations are known as Authorised National Bodies for Company Certification (ANBCCs) and are responsible for ensuring the correct implementation of the companies' certification system, according to the defined rules. In this, the objective is that a certified company at a certain level will have demonstrated they have achieved a minimum level of capability for a specified scope of activity (in compliance of ISO 3834), irrespective of the country in which they have been certified.

The role of the ANBCC in its own country regarding personnel certification includes:

- i) The approval of assessors, and the recording of relevant information.
- ii) The evaluation of the company application.
- iii) The conduct of the on site audit.
- iii) The approval of the company welding coordinators.
- iv) The awarding of the company certificate and the recording of relevant information.

An ANBCC accepts responsibility in its own country for the implementation of the IAB rules covering the above activities.

At the present there is 17 approved ANBCCs, they are: Austria, Croatia, Czech Republic, France, Germany, Hungary, Iran, Italy, Netherlands, Poland, Romania, Slovakia, Slovenia, South Africa, Spain, Ukraine and United Kingdom.

## **2 INTERNATIONAL TRAINING, QUALIFICATION AND CERTIFICATION SYSTEM FOR WELDING PERSONNEL**

### **2.1 The Qualification System and the Personnel Certification System**

The IIW and EWF have operated a harmonised training and qualification system since 1992, offering courses and qualifications for Welding Engineers, Inspectors, Welders and others. These qualifications form the basis of the widely accepted International Diplomas. Certification of welding personnel was addressed by EWF about 15 years ago. A system was developed and its implementation started in Europe in 1995. This system is now being transferred to IIW in order to facilitate global expansion.

This International Training and Qualification system now comprises the following documents:

- Education, Examination and Qualification Guidelines for:
  - Personnel with Responsibility for Welding Coordination (includes the former International/European Welding Engineer – IWE/EWE, International/European Welding Technologist – IWT/EWT, International/European Welding Specialist – IWS/EWS, and International/European Welding Practitioner – IWP/EWP)
  - International/European Welding Inspection Personnel – IWIP/EWIP
  - International/European Welder – IW/EW
  - Distance Learning (covering IWE, IWT, IWS, IWIP)
  - International Welded Structures Designer - IWSD
- Rules and Procedures for the implementation of IIW/EWF Guidelines for the Education, Examination and Qualification of Welding Personnel

The existing Guidelines define the course syllabus, indicating for each subject the objectives, scope and expected results, and the minimum teaching duration in hours assigned to them. Access to the harmonised courses is allowed only to those individuals who possess an appropriate agreed level of general technical education, equivalent but different for each country as these are based on national education systems.

Figure 2 represents the structure of the international professional Qualification System of Welding Personnel managed by the IAB – International Authorisation Board, the body created by IIW with this purpose. The relationship with EWF, and the latter's remaining scope of activities is also shown. It can be seen that an extensive range of welding and welding related courses and qualifications are available. These courses are valuable to manufacturers seeking to ensure that all their staff with welding tasks and responsibilities are properly trained and meet the requirements of ISO 14731.

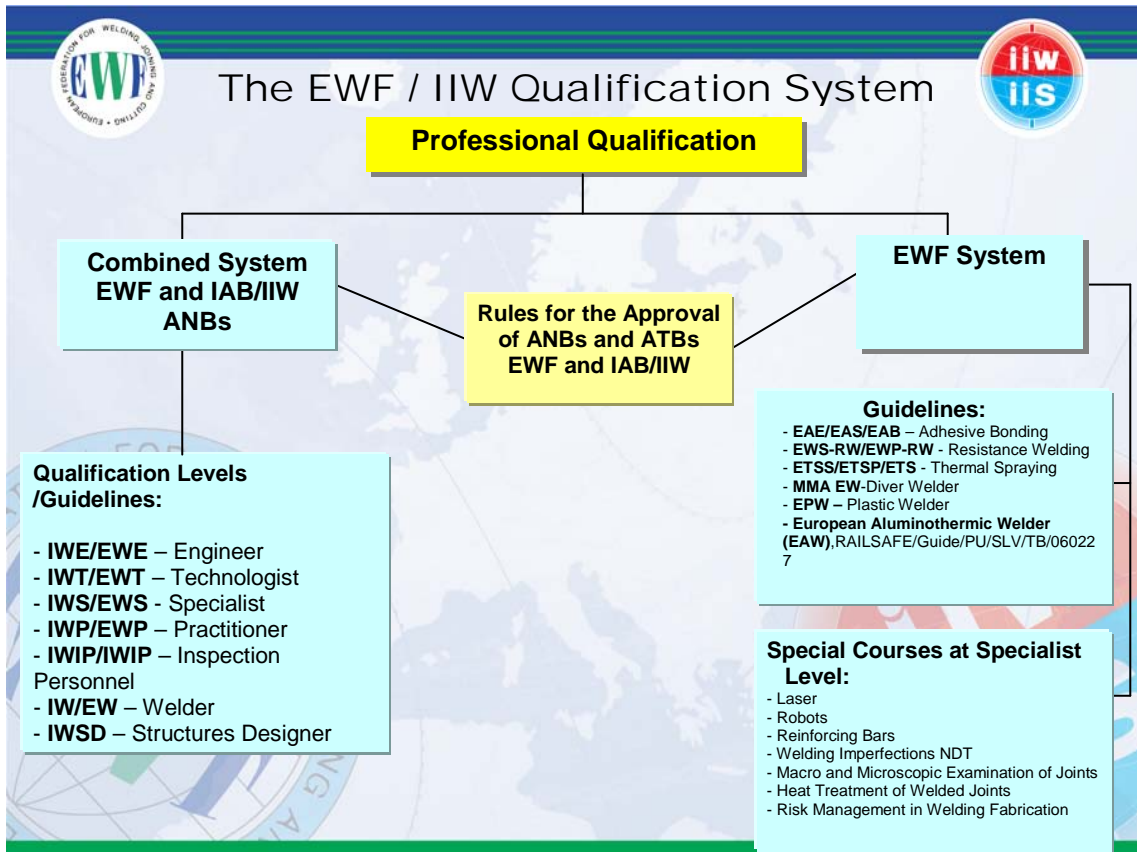


Figure 2. IIW/EWF Training and Qualification system

Figures 3 below gives an overview of the structure of the International System for training and qualification of welding personnel which includes courses for engineers, technologists, specialists, practitioners, welders and inspection personnel. These courses can form a basis for lifelong training and professional promotion for personnel working in welding technology.

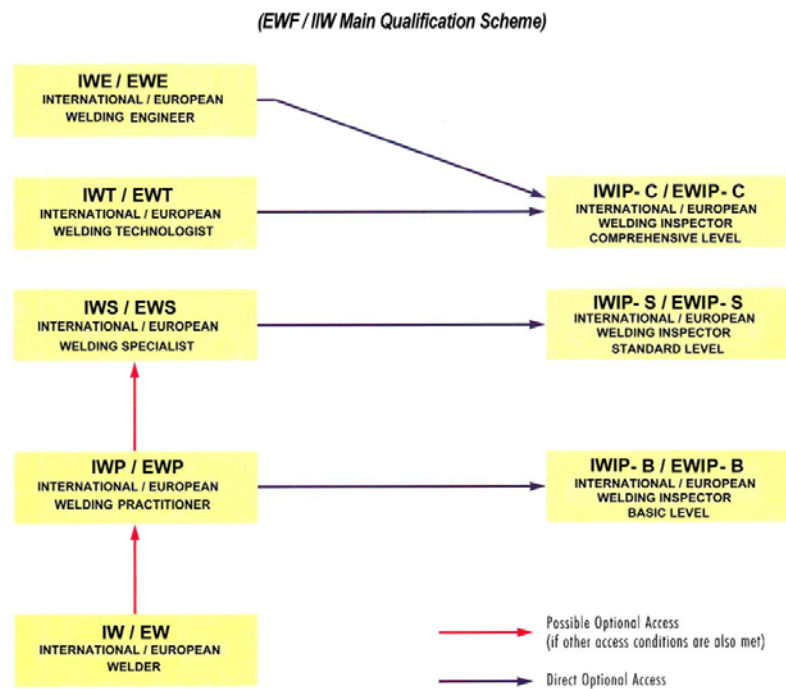


Figure 3. EWF/IIW Guidelines Structure

The EWF/IIW Personnel Certification Scheme provides a simple means by which job capability can be assessed and recognised. It defines the profile of education, knowledge, experience and responsibility required for a range of conventional welding tasks, and provides a professional assessment procedure, see Figure 4 below.

Because Certification is concerned with current competence rather than historical attainment, periodic renewal is required. The scheme provides a convincing way of supporting companies seeking to achieve compliance with EN ISO 14731.

Four levels of certification are available, based on the four EWF/IIW Diplomas: European/International Welding Engineer, Technologist, Specialist and Practitioner. The first three of these qualifications are deemed to satisfy the technical knowledge requirements of EN ISO 14731.



Figure 4. Steps for the Personnel Certification

The ATBs (Authorised Training Bodies) are approved by the national ANBs to implement the IIW training courses aimed at awarding the IIW Qualification Diplomas. This recognition is based on audits conducted by the national ANB, through which it is assured that the ATB has the capabilities to fulfil the requirements defined under the IIW rules, procedures and guidelines.

The harmonised courses are now offered around the world through IIW/IAB. There are more than 600 Authorised Training Bodies approved and supervised by the ANBs for implementing the IIW Qualification courses, which combine both underpinning knowledge and application experience, thereby providing close links with industrial practice. After the main education, special courses for additional learning are offered in many special areas, thus providing a specific education still closer to the job function.

As can be seen from Figures 5 and 6 below, many tens of thousands of Diplomas have been awarded since the systems were introduced; firstly in EWF and subsequently in IIW/IAB.

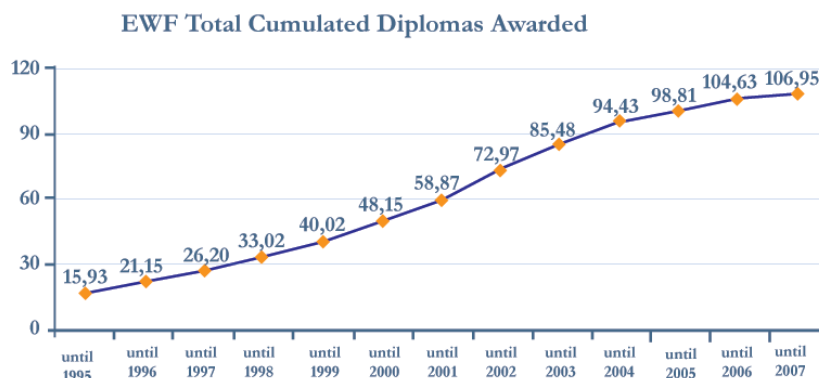


Figure 5. EWF Qualification System Diplomas evolution since 1992

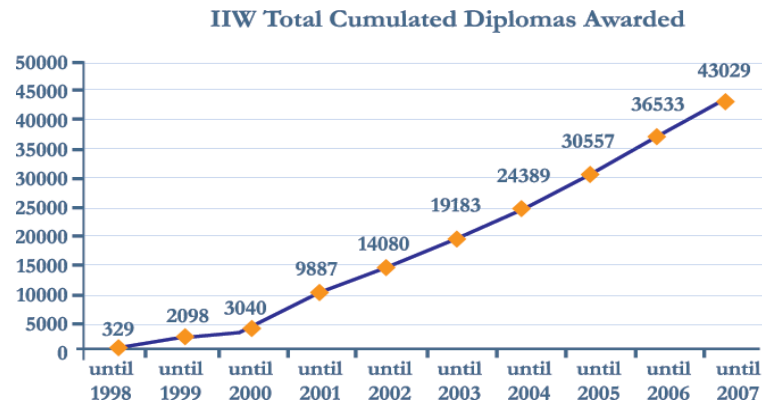


Figure 6. IIW Qualification System Diplomas evolution since 1998

## 2.2 The Manufacturer Certification System

The EWF Companies' Certification System for quality requirements not only provides a way to companies to be certified in compliance with EN ISO 3834, but also leads to the publication of the companies' data on the EWF Database of Certified Companies. This database is only open to companies that were certified under the EWF Certification System. The database can be seen in [www.ewf.be](http://www.ewf.be) under "Certified Companies" and it is possible to make a search either by country or by process (using the process standard identification code according to EN ISO 4063) or by base material (using the materials codification based on the CEN ISO TR 15608). As indicated above this system has now been transferred to IIW and the new IIW Certification System for Companies according to ISO 3834 is starting being implemented in 2008 worldwide.

Due to the developments and needs from the manufacturers regarding the compliance with other systems, the EWF Integrated Manufacturer Certification System has, at present, also the possibility to certify companies according to the EWF Environment Management Scheme (EMS). The EMS was developed with the aim to certify manufacturers of welded products in compliance with ISO 14001. The last pillar of the EWF Integrated Manufacturer Certification Scheme was the approval and implementation of the Health & Safety Management System (SMS) in 2006.

In terms of the EWF Integrated Manufacturer Certification Scheme, it has been decided by EWF that a company wishing to be certified according to requirements of EWF-EMS or EWF-SMS must first of all to be certified according to the EWF certification requirements regarding ISO 3834. Only then it is possible for the company to apply for the certification in the other certification systems.

At the same time EWF has developed specific supplements for the application of EN ISO 3834 to specific products such as: railway vehicles and components, pressure equipment, welded structures, and so on, related to specific EN product standards. The overall vision is shown in Figure 7 below.

Certification Schemes	Main Rules/Requirements	Specific Rules/Requirements
Quality	Scheme for Compliance with EN ISO 3834	Guidance for compliance with specific EN Products Standards, e.g. Railways, Pressure Equipment, Structures
Environment	Scheme for Compliance with EN ISO 14001	Not Applicable
Health & Safety	Scheme for Compliance with Health & Safety	Not Applicable

Figure 7. EWF Integrated Manufacturer Certification Scheme – Holistic View

The relationship between IIW/IAB and EWF with regard to company certification is shown in Figure 8, and the data on the number of certificates issued is shown in Figure 9.

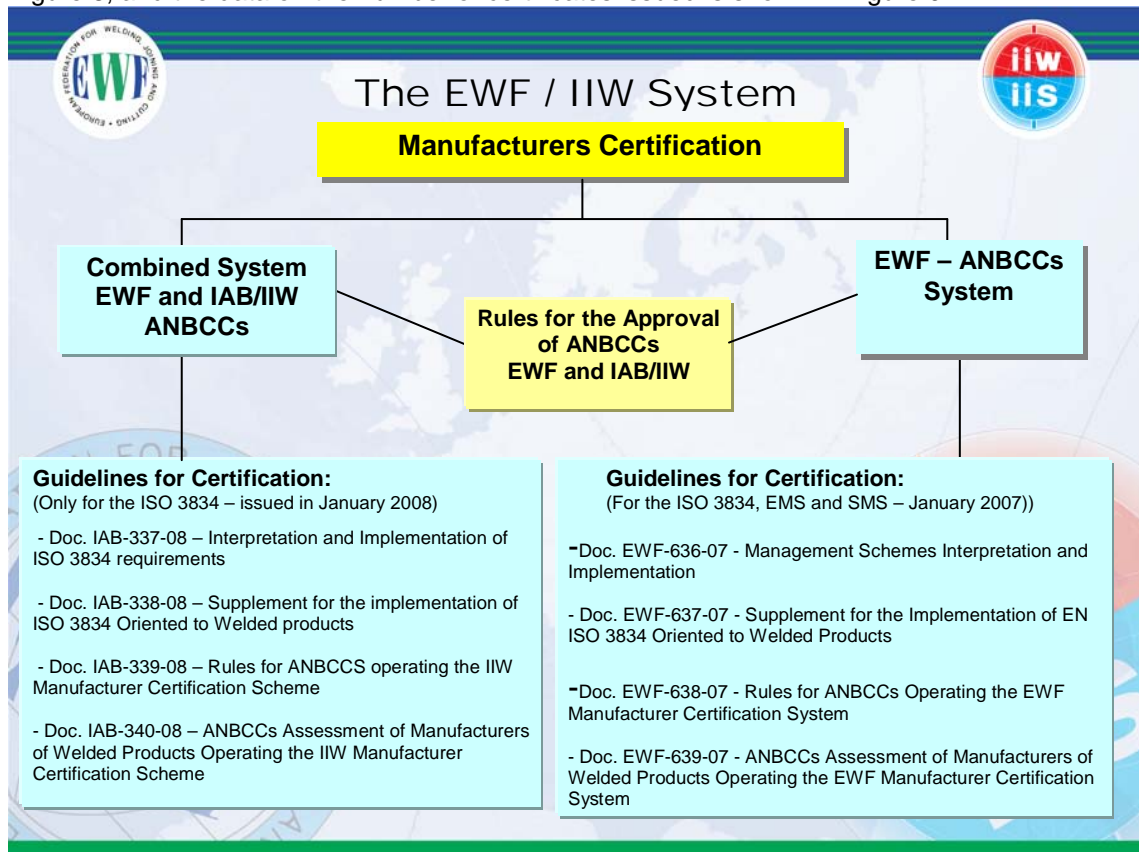
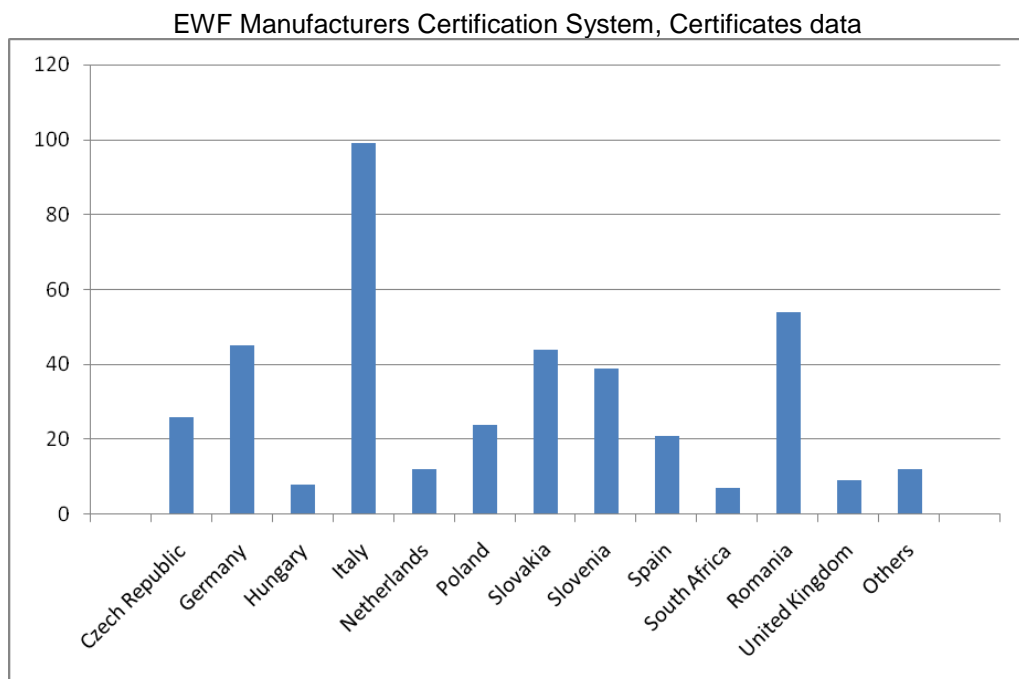


Figure 8. EWF-IIW Manufacturers Certification System



### **3 SHORT TERM CHALLENGES**

The Quality Assurance system put in place and coordinated by the Lead Assessors has proven to be reliable and functional. The detailed guidelines and operational procedures assure the high level of knowhow and performance capabilities of the trainees. The reputation of the IIW system is growing worldwide and more countries are joining the system every year.

The IIW and EWF are aware of the importance of the mobility of labour within the world wide community, which requires the best and most comprehensive harmonisation. Therefore a lot of work has been put on the harmonisation of a standard examination system, to ensure that welding personnel trained in the EWF-IIW/IAB system are examined in a uniform way, so that those gaining a Diploma in any EWF-IIW/IAB Member will have achieved the same minimum standard. This will be obtained by the development and implementation of a EWF-IIW/IAB Harmonised Examination.

To achieve the above mentioned goal, rules and procedures have been approved, and also an Internet Database Software tool has been developed.

The Database Software enables several features, such as: the approval of questions by Teams of International Experts, the translation of the questions into the several Members mother languages, automatic generation of harmonised exams, generation of statistics regarding the questions used on the exams and automatic exams scoring.

The Harmonised Examination System is undergoing trials in all ANBs since mid 2008. Its full implantation is expected to happen in 2009

Examples of other projects being carried out to improve the system include the design of more flexible courses, structured in modules with new paths, based on skills demonstration through exams and practical tests. Work is also going on regarding the introduction of more distance training modules.

A system for Certification of Welders with the final aim to provide a way to assess and recognise job competence for the welder is under development and the related document "EWF Scheme for Certification of Welders, Welding Operators and Brazers" (EWF-Pr-647-0) is being finalised.

The aim of these improvement projects is to respond to market demands: for example reaching more markets and more remote areas, whilst maintaining the recognised quality of the systems.

Furthermore in order to achieve more 'official' EU recognition for the EWF/IIW qualification system, the EWF Secretariat is creating partnerships for Leonardo Projects with the aim of aligning the EWF qualification system (namely for the welder level) with the EQF, the European Qualification Framework Guidelines regarding the ECVET, European Credit for Vocational Education and Training.

### **4 LONGER TERM CHALLENGES**

The transfer of most of the qualification and certification schemes from EWF to IIW has prompted EWF to review and revise its whole strategy. This review began in 2007 with the organisation of four regional strategy consultation group meetings designed to seek the views of all the members of EWF. This was an extremely worthwhile process: the vast majority of members participated actively and there was an overwhelmingly optimistic view about the future of EWF.

In January 2008, the EWF General Assembly approved new Mission and Vision statements to capture the spirit of optimism and enthusiasm that had emerged from the strategy consultation meetings:

#### **EWF's MISSION:**

To provide world class, European focused, value added products and support services to its members and their communities in the field of joining, welding and related technologies \* on an international basis.

## **EWF's VISION:**

To be an essential global network in the field of joining, welding, cutting and related technologies\*, indispensable to members in the achievement of their strategic objectives

*\*cutting, surface treatment, mechanical fastening, adhesive bonding*

The hundreds of ideas, that were identified in the strategy consultation meetings as warranting further attention, were divided into six subject groups and a 'Champion' was appointed to lead each group:

<b>Subject</b>	<b>Champion</b>
Ensure that EWF members' interests are safeguarded in IAB and IIW	Tim Jessop, UK
Develop, maintain, improve and implement systems for Training, Qualification and Certification	Henk Body, NE
EU Directives and Standards	Michel Rousseau, F
Develop, maintain and improve EWF services and products	Klaus Middeldorf, D
EU projects – develop sustainable activity	Dorin Dehelean, RO
Improvement of the image of welding	Robert Vennekens, BE

Each Champion produced an action plan for their subject area and these were discussed further and finalised during 2008. Implementation of the plans will also started during 2008 and will continue during 2009.

It is clear that there is much that EWF can do to add value to its members and significant progress has been made in realigning its activities in order to take EWF forward.

## **5 CONCLUSIONS**

Welding and joining technologies are key to a significant proportion of Europe's manufacturing output.

Welding is a special process that requires careful attention and control in order to avoid problems such as failures and overspend.

Control of welding can only be properly exercised through the implementation of special measures before, during and after production, and through the competence of the people involved. Adoption of an ISO 9001 system alone will not necessarily achieve this.

European standards, in some cases backed by EU Directives; International standards; and client specifications are placing increasing emphasis on the proper control of welding and on the competence of welding personnel.

EN ISO 3834 for companies and EN ISO 14731 for people provide a basis for proper control of welding. Many product standards and client specifications require compliance with these two standards.

The harmonised international EWF/IIW training, qualification and certification systems described in this paper provide manufacturing companies world-wide and their workforce with a convenient, comprehensive and convincing way of demonstrating compliance with EN ISO 3834 and EN ISO 14731. These systems have achieved considerable maturity and recognition, and are being continuously improved.

To companies that make products by welding it is recommended to:

- i) Consider the global market place.
- ii) Get people trained, qualified and certified for maximum competence and recognition.

For a company using welding of metals/plastics or other processes like thermal spraying/ or adhesive bonding, the way to assure the quality of the work is by training, qualifying and certifying its personnel through the EWF/IIW System.

For a worker who wants to acquire skills and to achieve excellence in his profession the recommended goal is to achieve the appropriate EWF/IIW diploma.

- iii) Demonstrate company capability to comply with EN ISO 3834 and EN ISO 14731 by gaining EWF/IIW certification.

By attending to the above points companies will benefit from improved competitiveness in the global market place and from an increased likelihood of trouble-free production and service performance of their products.

EWF has published a new mission and vision to reflect the important role it will play in the future.

EWF is defining a new strategy which will bring added value to its members.