ISO 9000 AND WELDING

By

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INTRODUCTION

Gone are the days of conventional inspection and quality control of sorting of sorting out good and bad and concentrating its application only on the shop floor. After realising the fact, that quality of the product has to be built in stages, right from concept to commissioning, with the total involvement of all functions in the organisation, the concept of quality assurance found quite appealing. In the initial stages, the Quality Assurance ment Quality Planning, Quality Audit and Training. The QA programme adopted by many manufacturers based on the applicable product standard had no uniform common base in respect of quality systems. It was in late 1960, that the systems approach to attain consistent quality was emphasized by quality experts, saying "Systems make for Effective Control"

In today's world, the customer wants the supplier to demonstrate with adequate documentary evidence, that the products and services made available are of consistent quality and are produced through the implementation of Sound Quality Management Systems, that stand to logic and common sense. In view of this, ensuring customer satisfaction by understanding the customer's stated and implied need has necessarily to be the primary goal of the organisation. To achieve this, quality should be achieved and maintained at all levels through systems approach.

The concept of assessing supplier's capability, through measuring Quality Management System adopted, has been evolving since the late 1960s. ISO 9000 standards after their introduction in 1987 have had the most tremendous impact on quality parctices, both in the developed and developing countries and they are now the accepted basis for National Quality Systems in more than 70 countries world wide, where quality is emerging as highly effective competitive tool.

What is ISO standards ?

ISO (the international organisation for standardisation) is a world wide federation of National Standard bodies from 100 countries •The mission is to promote the development of standardisation in the world, with a view to facilitate international exchange of goods and services. It develops the standards by consensus, for voluntary implementation in all technical fields except Electrical and Electrotechnical Standards. The job of preparing international standards normally entrusted to Technical Committees and finally adopted/ approved after getting acceptance from 75% of members. One such Technical Committee ISO/TC 176 was engaged in preparing ISO 9000 series of standards, consisting of 5 standards, which was published in 1987 and is being revised to make it more practicable and effective. The ISO 9000 series of international standard, on Quality Management & Quality Assurance prepared on the basis of BS 5750-1979, has had enormous world wide impact since 1987 and more than 70 countries have confirmed their adoptation as National Standards.

The ISO 9000 series of standards stipulate quality system requirements that can be used for Quality Assurance purposes, with a view to ensure consistent quality of products and services. In other words, they specify requirements which determine what elements of quality system have to encompass the QA programme. It should be clearly noted, that the Quality Management System requirements specified are **complementary (not alternative) to the technical requirements stipulated in the product standard** applicable to the industry concerned. Appreciating the fact that the requirements stipulated in these international standards are of Generic nature and independent of any specific industry, the Design and implementation of quality system has to necessarily be influenced by the varying needs of an organisation based on its products, services processes and specific practices employed, with a view to ensure suitability and effectiveness of the quality system.

The concept of ISO standard is quite simple i.e. "Say what you do" and subsequently "Do what you say". That leads every one to achieve perfection i.e. "Doing right first time" - every quality related activity. The philosophy is continuous quality improvement by periodic monitoring on the effectiveness and suitability of quality system and initiating timely preventive/corrective action. Whether one likes it or not the fact is the ISO 9000 series have become the accepted basis of quality system requirements for product conformity

assessment in the global market place. People do say that the adoptation of QMS conforming to ISO 9000 standard is a "passport to export" products and services. It is reported that as many as 45,000 companies world wide have registered as conforming to ISO 9001, ISO 9002 or ISO 9003 till the end of Feb 94 and is increasing daily.

The ISO 9000 (being revised as 9000-1) is a "road map" to the ISO 9000 family. While ISO 9000 standard details the generic guidelines for selection, application and use, ISO 9004 (being revised as 9004-1) gives quality management-quality system elements. The other quality assurance standards viz.

ISO 9001 (20 clauses)

ISO 9002 (18 clauses being revised to 19 clauses)

ISO 9003 (12 clauses being revised to 16 clauses)

specify 3 sets of quality system requirements based on different scope, that can be used for external quality assurance purposes and is viewed as minimum good business practices, need to be adopted by a supplier in any industry/economic sector. The requirements state mainly what the supplier shall accomplish, leaving considerable flexibility on how to implement a system suiting to his industry, scope of work, practices and processes.

ISO Standards

The five core standards are detailed below.

ISO 9000 (900-1) - Quality management and quality assurance standards : Guidelines for selection and use

ISO 9001 - Quality systems - Model for quality assurance in design/development, production, installation and servicing

ISO 9002 - Quality systems - Model for quality assurance in production and installation (servicing)

ISO 9003 - Quality systems - Model for quality assurance in final inspection and test

ISO 9004 (9004-1) - Quality management and quality system elements - Guidelines

Other Standards in the ISO 9000 family (Being revised/likely to be published by the end of 1994) includes the following standards.

Terminology

ISO 8402 - Quality Management & Quality Assurance - Vocabulary

Quality Management and Quality Assurance Standards

ISO 9000-2 : Generic guidelines for application of ISO 9001, 9002 & 9003

ISO 9000-3 : Guidelines for the application of ISO 9001 to the development, supply and maintenance of software

ISO 9000-4 : Guide to dependability programme management

Quality Management and Quality System Elements

ISO 9004-2 : Guidelines for services

ISO 9004-3 : Guidelines for processed materials

ISO 9004-4 : Guidelines for quality improvement

Guidelines for auditing quality systems

ISO 10011-1 : Auditing

ISO 10011-2 : Qualification criteria for quality systems auditors

ISO 10011-3 : Management of Audit programmes

QA requirements for measuring equipment

ISO 10012-1 : Metrological confirmation system for measuring equipment

ISO 10013 : Guidelines for developing quality manual

Welding industry adopting ISO 9000 standards

As stated earlier, any industry requiring to achieve effective and continuous quality/performance improvement has to adopt systems approach i.e. adopting quality system standards. Welding industry can make it faster and easier, as it has been already exposed to systems approach, in the process of complying the requirements of product standards under AWS, ASME, PFI, ANSI, BS, IS etc. Many fabricators who have already obtained product quality symbols or works approval by Third party inspection agency are aware of the Quality Assurance Programme. Further, it is only the question of introspection and accommodating the requirements of applicable ISO standard in the existing quality system/manual to make it more effective.

The industries engaged in the field of welding like welding equipment manufacturers, welding consumable manufacturers and fabricators (structural, pipe, pressure vessel and heat exchanger fabricators) can adopt ISO 9000 standards based on their scope of activity. People who are carrying out design and manufacturing function have to address the requirements of ISO 9001 standard and others who are only fabricating need to address the requirements ISO 9002 standard. However, in both the cases (clause 4.9/4.8) process control need to be addressed in detail as welding and heat treatment is considered as a special process.

What is special process ? Special process is one in which the results of the operation **cannot be fully verified** by subsequent inspection and testing of the product and the processing deficiencies, if any may become apparent only after the product is put to use, like in the case of plating, heat treatment and welding operations. To ensure satisfactory execution of special processes, it is essential to identify the controlling parameters (essential/semi essential variables) that would influence the product quality, decide the exact value or range of operation of each parameter through qualification test (WPS/PQR) and monitor for compliance with documented procedure, during day to day execution. To put it in other words, special processes produce the desired results only when performed a certain way. When the proper way has been determined, it is essential to document it as a process procedure, tested for results and certified as qualified. Similarly, the personnel who perform special processes must be qualified (WPQ) by appropriate training and test to demonstrate their capabilities. It is expected that the qualification of special process personnel be renewed based on time limit, on the job performance and current skills. There is nothing new for most of the fabricators exposed to weld procedure and welder's performance qualification under various codes and standards like AWS D1.1, ASME Sec IX, BS 5500, IS 2825, Society rules etc. Likewise, welding consumable manufacturer (Electrodes and fluxes) need to quality the formulation for each type of electrode and fluxes.

It is to be noted that in fabrication any amount of close in-process supervision does not provide sufficient assurance, as the end product/ service depends on too many interacting factors for the supervisor to exercise comprehensive control. As a consequence, one had to adopt an approach where the controls are set up by

- breaking the job into functional components
- specifying how to do each component/operation of the job through instructions
- identifying interfaces between components/processes
- stipulating sequence of operation enabling smooth work flow and executing operations as per written/qualified procedures
- providing verifiers or checkers
- detecting non-conformities at the right stage and initiating corrective/prevention action

How to proceed for ISO 9000 implementation and certification

First, the top management should decide to adopt a culture of quality management, and making every one in the organisation to recognise and realise the importance of achieving quality, by giving equal importance as the competing interests of production and costs. Attitude towards quality should be in a positive sense and not just a lip service. It would be proper for the management to set up a steering committee by drawing members from each functional group and nominating a Management Representative. Following sequential steps to be taken by the management with a participative approach.

- Decide the quality policy, objectives and commitment to quality and ensure that this is understood, implemented and maintained at all levels in the organisation
- Develop following system decuments detailing the acceptable quality management system to the company. While all the clauses of the applicable standard should be addressed in the Apex Manual, the relevant clauses need be addressed in the departmental manual. It should be noted that one should get a clear idea as to how a specific system operates by referring to the connected documents.
- Apex-Corporate Quality manual (Level I)
- Departmental Operating procedure or Manual for each department/function (Level II)
- Work instructions for each work area (Level III) (absence of which would adversely effect quality)
- Impart training at all levels on quality policy, objective, quality management systems and quality records to be maintained
- Ensure implementation of quality system (Do what has been said in the manual)
- Conduct internal quality audit and based on the audit findings update/revise the quality system to make it more suitable and effective and finally confirm that the system is operating satisfactorily
- Apply for certification and maintain the quality system

It is required for the company to show the evidence of implementation of the quality system by generating quality records relating to both system and contract or product.

Where one goes wrong?

Inspite of having well defined quality system supported by proper proce-

System Records	Contract or product records
Management Review	Contract Review
Assessment of Vendors	Design Verification
Instrument Calibration	Product Identification
Audit Records	Inspection & Testing
Training	Responsibility for Product Release Nonconforming Products corrective Action

dures and work instruction, most of the times it is the **lack of commitment and care free approach** of the individuals leads to nonconformity and finally affects the system and quality of product/ services It is also not proper to expect every company to be an idealistic organisation But somewhere one has to draw a line Any inadvertent slip leading to a minor non-conformity may be improved upon so long there is a clear objective to comply with the system requirements and to improve on a continuous basis, with a view to achieve perfection Few examples of non-conformance are detailed below which are to be avoided by timely action

- substitution of materials without approval from design
- no record of design change request and job is executed before obtaining approval from authorised person

CONTENTS OF ISO 9001, 9002 & 9003

Clause No.	Requirements	ISO 9001	ISO 9002	ISO 9003
0-3	Introduction, Scope, References, Definations			
4	Quality System requirements			
4 1	Management responsibility	\	\	\
4 2	Quality system	\	\	\
4 3	Contract review	\	\	= +
4 4	Design control	\	=	=
4 5	Document control	\	\	\
4 6	Purchasing	\	\	=
4 7	Control of consumer-supplied product	\	\	=+
4 8	Product identification and traceability	\	\	\
4 9	Process control	\	\	=
4 10	Inspection and testing	\	\	\
4 11	Control in inspection measuring and test equipment	\	\	\
4 12	Inspection and test status	\	\	\
4 13	Control of non conforming product	\	\	\
4 14	Corrective and preventive action	\	\	=+
4 15	Handling, Storage, Packaging, Preservation	\	\	\
4 16	Control of quality records	\	\	\
4 17	Internal quality audits	\	\	=+
4 18	Training	\	\	\
4 19	Servicing	\	=+	=
4 20	Statistical techniques	\	\	\
	Total number of systems (1987)	20	18	12
	Total number of systems after revision (1994)	20	19	16

Note
\ Applicable
= Not Applicable
+ Being included in 1994 revision

- unauthorised corrections of drawings, process sheets and procedures
- use of obsolete drawings and documents
- no record of contract review and list of approved vendors.
- welding being carried out without the evidence of qualification of procedure
- essential variables detailed in the WPS not complied with during welding
- engagement of unqualified welder on the job
- no documentation on the clearance of preceeding operation and material identity not maintained
- carrying out NDT without any written procedure
- performing NDT without complying the requirements of the procedure
- performing heat treatment without exercising controls
- use of uncalibrated instruments, gauges, thermocouples etc.
- no record of non-conformance and corrective action noticed during audit.

The answer for all the above lies in effective monitoring of quality system by well planned internal quality audit, analyse audit findings and initiate timely preventive action Person responsible for specific activity should be told to comply with the requirements of procedure or work instructions. Wisdom lies in appreciating the practical difficulty if any, and to modify the quality system that can work effectively in harmony with the product standard

CONCLUSION

The ISO 9000 series of standards, by providing system requirements and guidance without becoming prescriptive, will no doubt enhance the application of QMS in every industry and service sector Needless to mention, that industries associated with welding lide welding consumable/equipment manufacturers and fabricators can gain tremendously by adopting applicable ISO 9000 series standards, in respect of product quality, customer confidence, market reputation and competitive advantage besides cutting down on rework/rejection cost Specifically, fabricators who have already developed and implemented Q.A programme based on the product standard will find it quite easy to address the requirements of ISO standard applicable to their scope of work and obtain certification.

REFERENCES

1) ISO 9000 Forum Special Report by M/s. Ian G. Durand Donald W. Marquardt, James C.Pyle & Robbert W. Peach

2) Quality Progress - Jan. 1994