Universe International Journal of Interdisciplinary Research
(Peer Reviewed Refereed Journal)

© UIJIR | ISSN (O) – 2582-6417
FEBRUARY 2023 | Vol. 3 Issue 9
www.uijir.com

EMERGING STRATEGIES FOR SKILL DEVELOPMENT AND STANDARDIZATION OF ISO3834 STANDARD BY WELD QUALITY MANAGEMENT (WQM) APPROACH

Author's Name: Mr. Chandran Subramani

Affiliation: Indian Maritime University, Chennai, Tamil Nādu, India.

E-Mail: chandran3000@gmail.com

DOI No. – **08.2020-25662434**

Abstract

Generally, welding professional's to follow various methods of welding processes and quality standards with work procedures in all manufacturing sectors. It needs standardization, study methods, and process procedures reachable to all. It is required to meet global standards and make technological prosperity achievable. It is found that ISO3834 satisfies all standard requirements and we need to follow it. Continuous Training the welding professionals to follow the standards as per ISO3834 in Weld Quality Management (WQM) system framed to confirm the international quality. More focus on problem-solving techniques, Inspection & testing methods, time management, actively participating and involvement in corrective action, and teamwork attitude with interpersonal skills to improve professional core skills, analytic and corrective, high-order thinking, and also abilities to understand international accomplishments. Welding manufacturing sector's, to take the responsibility of increasing with quality standards to implementing welding procedure as per ISO standard requirements. Self-assessment from individual initiative steps and identifying & utilizing opportunities for public-private partnerships where these will add value to meet the skill development. In this research paper, it is proposed many strategies for skills with standardization welding procedure. Once international quality requirements & qualified employee efficiency gets fulfilled, India has the potential to become the global manufacturing hub with emerging technologies.

Keywords: *skill development, welding standards, world-class manufacturing, ISO3834 Standards, Weld quality management. WPS procedure, safety, continual improvement*

INTRODUCTION

Welding is one of the essential and special processes which need special controls to achieve international quality for the satisfaction of the customer. Welding applications forms an essential part of everyday life from bicycles to rockets. Welding can control the result in the worst case of catastrophic failure and loss of life. Controlling welding through a special process is dealt with through ISO3834. It meets the Welding quality requirements for the implementation of overall metal joining sectors. The needed WQM system is to confirm the quality Performance. Establish performance measures for the weld processes, effective involvement and utilization of the proper skills set. It indicates that the adoption of ISO3834 has improved quality & reached the global market with international quality standard procedure. WQM gives knowledge management, pedagogy, and continual improvement.

THE AIM OF THE RESEARCH PAPE

Welding is to construct a localized sustainable, reliable welding quality control with quality assurance. Recommended system based on the standard of combined Skill Development Training & Personal qualification with strategies and a new processes adaptation recommended to constraint all needs. ISO3884 with WQM System which is about frame is recommended by this research paper will increase the

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FEBRUARY 2023 | Vol. 3 Issue 9
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opportunity with improved manufacturing efficiency. To get world class quality procedures & customer satisfaction.

WELDING QUALITY MANAGEMENT (WQM) SOME OF THE IMPORTANT PROPOSALS

New approach moves us to research the factors for learning mindset and aiming to achieve our weld quality management (WQM) systems in this noble participation. Worldwide welding is a multimillion-dollar metal joining technology extensively in the construction of fabrication parts and manufacturing industries, which hampers the development of the sectors. Lack of knowledge and poor welding skills leads to the common welding problems associated with weld part effects current welding procedures. The mutual understanding of responsibility to increase uses the WQM, as a process tool for the implementation of overall weld process comparison with fixed standards. Now this is the right time to analyze of WQM system effects indicates that its adoption has resulted in improved better quality. The twelve steps involved in the process of welding given in Figure no.1 that contributes for the steps involved WQM recommended to frame is given in wheel clock diagram.

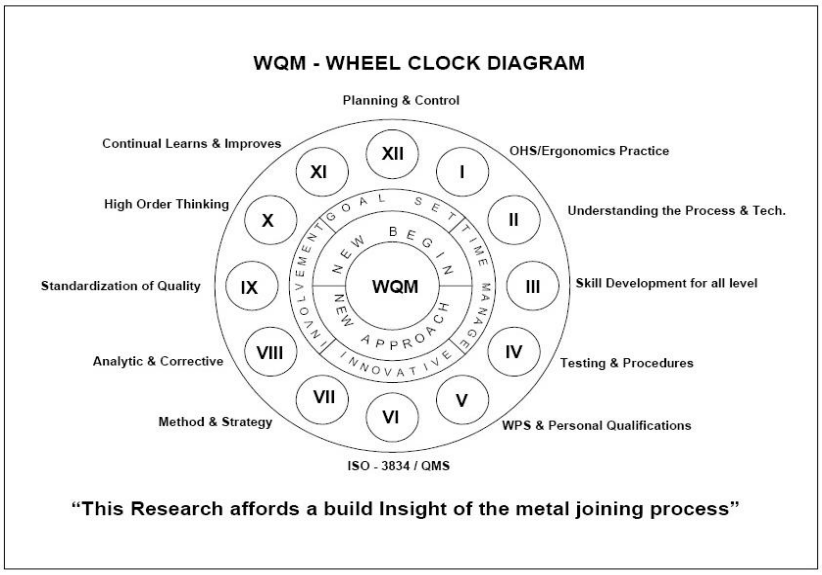

Figure no, 1; Structure of WQM systems,

EMERGING TRENDS IN THE SELECTION OF SKILLS AND JOINING PROCEDURES

International standards (ISO) tested the effective professional skills and practical performance and with that the new model is emerging in the common welding factoring industries to utilize only the Smart Welders / Operators' / Engineers in the near future.

The survey final results shows that GMAW (MIG/MAG/FCAW) welding process is using majorly in Indian industry's (50%) and secondly other SMAW welding process (28.1%), and thirdly GTAW process (15.6%) using, is given in the pie diagram Figure no. 2,

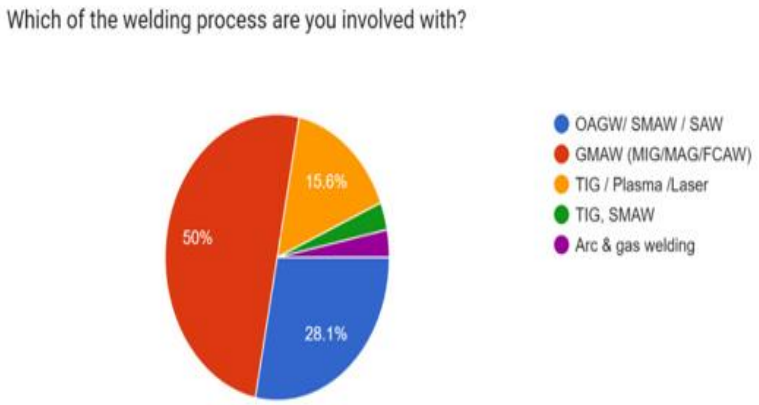

Figure no. 2; Distribution of welding process involved in welding Organization

The survey results shown in below graph Figure no. 03, shows that as per the current industry requirements is effective Skill Development for all levels (65.6%), also Industry expects the Safety improvement (28.1%) and Sustainable Productivity development (28.1%). The manufacturing industry should become readily employable from Manual to Automatic (18.8%). The gap in the current overall welding process start from scratch to visions of welding is found here. A new quality measuring process has to be WQM will develop the voids found to meet the Industry expectations and development in welding technology.

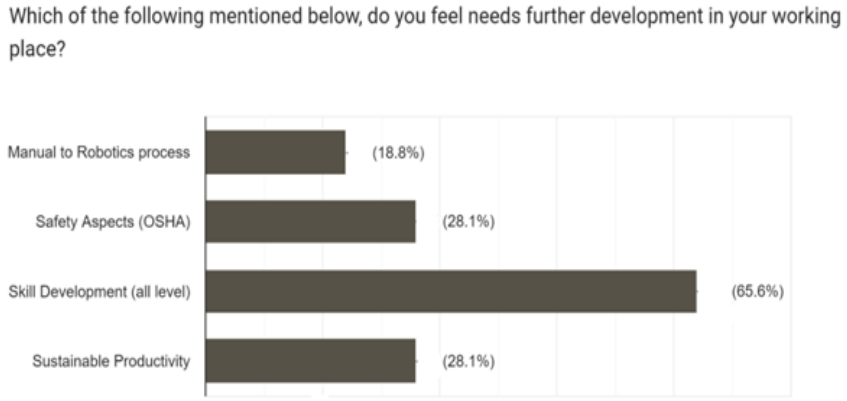

Figure no: 3, Distribution of Workplace analyses and respondent's opinion on needs

ADAPTATION OF GLOBAL QUALITY STANDARDS WITH WELDING SKILL PERFORMANCE

A weld quality management certified welding industry is responsible for quality coordination and requirement to heighten Quality and productivity to affirm world-class manufacturing products only by adopting the best welding practices laid down in ISO3834 standard to enhance business that shares opportunities around the world. A high-profile independent verification system in compliance enables manufacturing sectors to become an authority in welding. By reviewing the common causes for failure and the analysis of weld products and in finding out the problem-solving technique we found a large gap in meeting the expectations. As per the collective survey reports Figure no. 4, pie diagram shows fabrication and construction (62.5%) requires more development and secondly, Heavy Engineering/ Pressure vessels manufacturer (18.8%) and in the Automobiles sectors (12.5%) need further improvements. WQM will more constraint the voids in the above sectors to full fill the quality requirements. Skill development

training need to provide skills in a more efficient manner with global recognization.

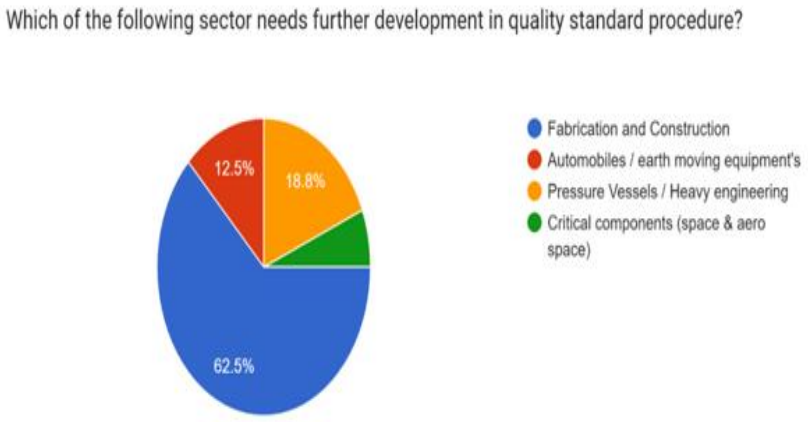

Figure. no. 4, Distribution of Improvement in welding quality practice for further development

UNDERSTANDING OF SYSTEMATIC PROCEDURE AND OBSERVATION

Improvement surveys case studies is based on the visits more than 100 internal audits and careful observation in the welding products in Indian manufacturing organizing/ training institute. The series of recommendations are practical in the future and applicable to welding organizations. This research is related to the research fields of welding quality and knowledge, standard procedures, pedagogy and skill training.

During the survey and research study it is observed that different management sub systems supported by the newly recommended WQM, the industries may utilize the ISO9001; 2015 QMS, ISO45001:2018 – OH&S Management Systems and ISO14001:2015 Environmental management and some other development Systems (TQM, WCM, etc). Some of the companies available for ISO3834 should be integrated to ensure relativity high-quality priority. It is observed initiative steps were well and good but not fulfills the overall systems and requirement for the day-to-day activity like welding production, quality development, personal qualification (Welder, Engineer, Inspector, Designer) etc. Welding coordinating personals also requires strategies for resolutions, to deal with weld quality problems, human factors, and skill training (updated knowledge). Industries follow certain standards here and there, Industries follows different work style and more reworks, rejection found during the visits. The drawbacks should be cleared without bureaucracy to improve mutually the welding ethics and the industries. If they come under one roof of recommended WQM system it cannot be different work styles and can be constraint by sharing knowledge and aligning in one form overall.

Specific objectives for weld quality analysis is to be investigated in the welding planning of the overall process (Weld design, work procedure, process parameters, DT& NDT, inspection etc.), to identify the challenges of the need for safety practice. Recommended effective standards followed by the manufacturing industries as per quality requirement ISO3834 and Quality measures for improvement and development to make the final product of good quality. The final results of welding need challenges in the job skills, standardization welding joint design, raw materials, consumable selection, geometrical dimension, Welding process parameters, controls the heat input, welding methods and technique, calibration for welding machine and equipments, traceability of product operation with weld quality perfection, process implementation through low cost with high productivity, zero less accident. Given

research survey of current weld quality where responsibility should be increased is given in Figure no. 05, Welding coordinators (WC) / management referensentive (31.3%) , Welder/operators (28.1%), shop floor personnel (21.9%), QA & QC (18.8%), We should direct and delegate the increased responsibility authority for decision making through the recommended WQM, overall quality controlled cross checked by it.

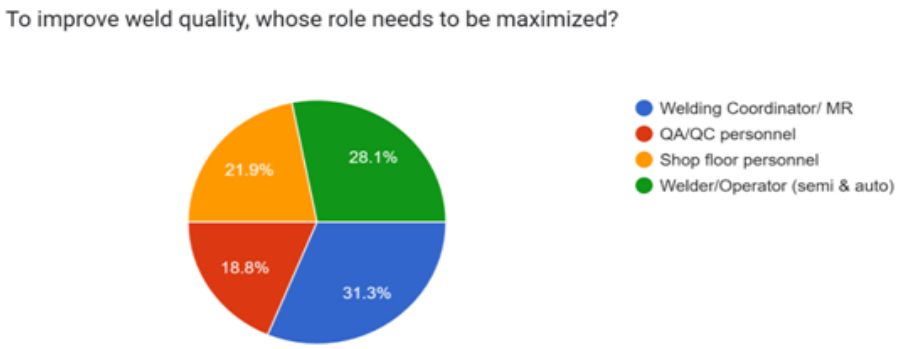

Figure:no. 5: The distribution of welding personnel whose responsibility to be increased.

Practices of respondents on the survey points to respond the opinion on the cause of weld defects/ failure, knowledge of the cause of welded product failure, also practice /preparation they undertake before planning to execute welding design, professional study on the knowledge updating with support from standard requirements. Welder / Operator (As per ISO9606/ISO14732) become an IW Qualification (Plate, Pipe, Fillet), and Welding coordinating personals need (as per ISO14731) valid personal qualification and inspection personnel qualification (IWIP) as per IAB guidelines. WPS/PQR preparation as per the standard (ISO15609 /ISO15614) and quality program should be verified by ISO3834. Very Important observation as per the clause points; "Technical review on sub-contract personal qualification strictly follow WPS procedures, storage handlings, heat treatment, procedure testing and Inspection (QAP/ITP), corrective action, identification and traceability, calibration, quality records. Also recommends the efficient control', validation to increase the responsibility. Most probably the highly skilled above points are not validated as per standards though they are having qualified certificates. It can be constraint through WQM.

CHALLENGES FACED BY THE WELDING SECTOR

Table no.1: Key observation on the issues in various industries and actions needed

Sectors	Key tech needs	Action to be taken
Manufacturing/ Production	Manual to semi-Auto & Robotics', weld jig & fixture modification, multiple wire & Advance Process conversion, To follow the WPS and welding qualification, PPE Safety,	Required Qualified IWCP (as per ISO14731) - IWS/IWT/IWE Welding coordinating personnel, IW welders,
Automobile/ Earthmoving	Penetration percentage to improve, avoid the imperfection, Resistance weld by robotics, Dissimilar joints, thin sheet weld, long rang inspection, WPS and welding qualification,	Required Qualified IWCP (as per ISO14731) - IWS/IWT/IWE welding coordinating personnel, IW Welders,
Construction & Fabrication	joint design development, to improve Fatigue performance, Friction stir weld in steel material, Long rang inspection, manual to semi automatic. thick plate, structural part weld,	Require Qualified IWCP (IWS/IWT/IWE) / IWIP (Level C/S/B) & IWSD (International welding Structural Designer), IW Welders

Marine/ Ship Building	Risk-based maintenance, Corrosion & repair work procedure, DMR Material weld quality improvement, Underwater weld process development & NDT inspection,	Require Qualified IWCP (IWS/IWT/IWE) / IWIP (Level C/S/B) & IWSD (International welding Structural Designer), IW Welders
Oil & Gas / Petro Chemical	Pipe weld automation, Joint design development, Repair work, Special alloy steel, Powder coding, Explosive welding, HT need improvement, PPE safety	Require Qualified IWCP (IWS/IWT/IWE) / IWIP (Level C/S/B) & IWSD (International welding Structural Designer), IW welders.
Research Organization/ Testing lab	To develop the Spin Arc Tech, Multi axle Robotics, Multiple and Hybrid/Tandem conversation, Artificial Intelligence using weld quality, new material composition, Additive Mfg,	To Construct the Welding Hi-tech R&D Institution and To frame Team members: Scientist, Professors, DT&NDT Level III, with IWE/IWIP Engineers, Researchers,
Welding Training Institute / Certification body	Qualifying as per ISO Standards & to confirm the performance through NDT/DT Results, follow the WPSs, Skill Levels evaluation, to improve the Theoretical part, Robotics Program training / PPE aware, Team building,	Require Qualified Trainers/Educators (CWE), required Authorized IIW Assessor /TPI Witness / Certification approval body's /Set Augmented Reality,

IMPROVEMENT IN EFFECTIVENESS AND CASE STUDIES AND SOLUTIONS

Read the Survey reports given below in the pie diagram figure no. 6;

(1) As per the survey reports, current welding industry professional interested for Implement of welding technology with innovation concepts (37.5%). Adapt the current modern welding technology methods [Ref.1], and plan to use different statuary of welding process & inspection. To overcome *"Struggling with old infrastructures (old equipments & facilities and incomplete Automations) and Industry looking financial support through government funded agency/ Infrastructure Development loan from nationalist Banks with low interest rate".*

(2) As per the survey reports, welding professionals interest to study a "Metallurgy knowledge improvement" (28.1%), Skill development training for all levels [Ref.2], with needed welding personnel qualification to the greatest future for all. To overcome, *"Lack of skilled team work found by getting failures in the basic weld joints and no aware of material and consumable specification grades, lack of welding process parameter knowledge",*

(3) Welding professionals interest, international Standard personnel qualification and performance improvement (21.9%). it needs improvement in all the important welding standard [Ref.4] and confirmation of aligning with standard ISO3834. *"Through the newly framed recommendation WQM we can ensure the overall process involved in welding".*

(4) During the survey visit, found insufficient PPE and Lack of knowledge for safety [Ref.3] in the welding industry Safety requirements was not fulfilled. Welding industry to frame the safety & occupational health regulations. To conduct the infinitive steps for the safety awareness with schedule audit and suggestion schemes. To overcome, *"The Lack of guarantees provided to the workers which leads to perform low level in the skills & quality".*

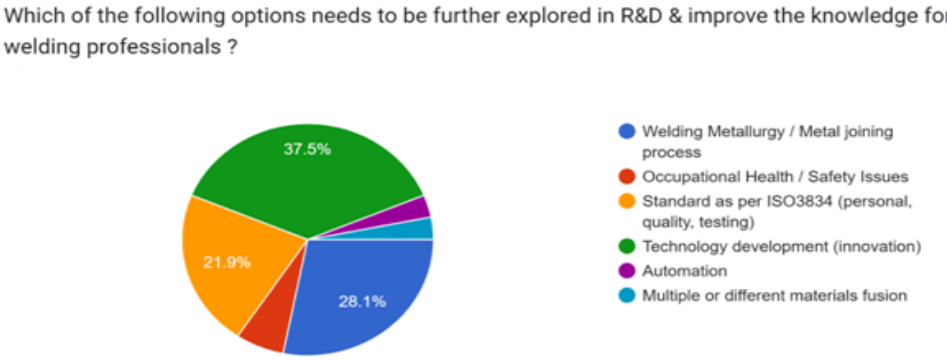

Fig: no.06 Enhancement of Knowledge to Improve the Welding Sectors

Generally Welding person makes the decisions that result in the utilization of the best welding. The need of qualified coordinators to make the earliest and best decision making all levels in aligning with perfect weld procedures and standards. To overcome, *"Found unskilled welding coordinators & shop floor middle level management people (Foreman. Supervisor, line in-charge) struggling in taking decisions in the initial level".*

RECOMMENDATIONS SUGGESTED IN SURVEY REPORTS

During the research survey, it was found that various invalid certificates were issued by unaccredited organizations without IAF approvals. To curb this issue, the certifying agencies/body of ISO9001/ISO3834 needs more governance and standard regulation over issuance of the certificates. Consumables/ raw materials used are not up to industry standards and are not procured by following industry regulations. Management should follow quality and OHS measures as per national & international requirements. It needs an effective implementation of WQM system in practice. Based on the issues observed, the WQM framed is going to be to solve the overall inductive issues in a collective manner with one standard in the all sectors. The twelve steps given in previous Figure no. 1, should cover in WQM & ensure the product quality. As per the below survey, the graph Figure no.7 confirmed the interest to study, special process standard in ISO3834 (48.5%) and Welding code & standard as per ISO for welding inspection & testing procedures (39.4%) mostly.

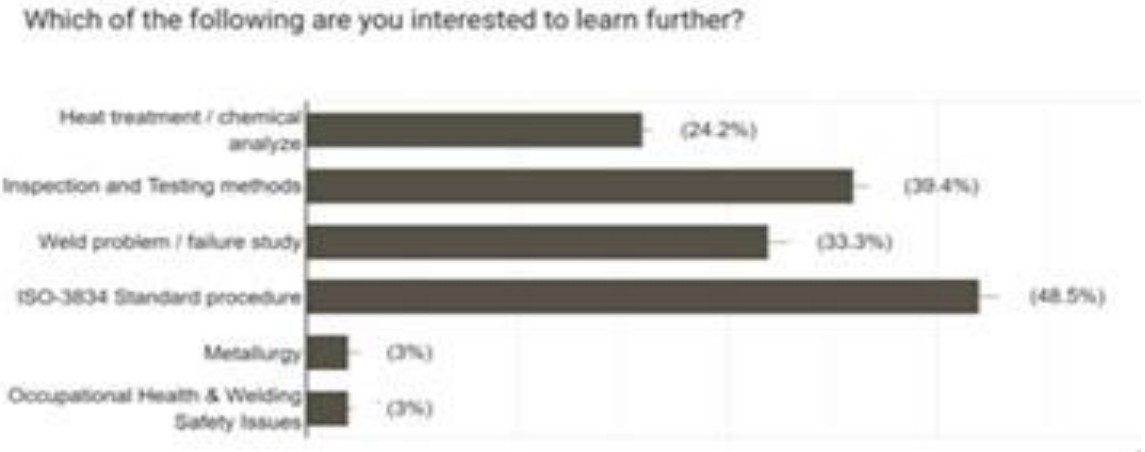

Figure: no.7. Distribution of the Graph, Individual Interest to improve their knowledge,

CONCLUSION

Welding personnel has to take individual responsibility for implementation of new Weld Quality Management (WQM) Systems which support ISO3834 and ensure a secure sustainable supply of the

product to improve quality and provide safe working environment. WQM system recommended by this paper needs to be framed by linking integrated data of various standards and procedures. Welding sectors associated with professional bodies (Ex: IIW-India) with accredited agencies to fulfill the mission of dispersing knowledge. The WQM systematic procedures, implementations are to be followed with proper documentations, by increasing management responsibilities, ensuring quality manufacturing, traceability with corrective action properly and effective work plan. The management & government needs to initiate various Development programs focused in skill development & company certification. ISO3834 Welding Standards needs to be implemented hastily and up to global quality requirements. WQM should take the necessary actions in furthering the need to build qualified personnel's and meet the demands of the global challenges faced by the industry. This research paper affords a building insight of the Overall welding sector and its success.

ABBREVIATIONS

ISO- International organization for standardization, WPS-Welding procedure specification, IAB-International authorization board, IW- International welder, IWCP- International welding coordinating personnel, IWIP- International inspection coordinating personnel, CWE- Certified welding educator, IWSD–International welding structural designer, IAF -International accreditation forum, IIW -Indian institute of welding, OH&S- Occupational health & safety, PPE- Personal Protective Equipment,

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