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"WQM Imperative Approach to the Welding process in the Recent Innovative effects of Skill up gradation and Initiate to enhance the Employment through Professional Skills in 21st Century in the field of Defense Manufacturing & Marine Sector; Up-Skilling".

Mr. Chandran Subramani (IWT, CWI, NDT Level II, ISO9001/ISO3834 QMS)
Indian Maritime University, ECR, Chennai - 600119, Tamil Nadu, India.
Corresponding Author Email: *chandran3000@gmail.com* / Cell: +91 8838558281 / 9940172211,

Keywords

Up-skilling, fabrication welding, craftsman training, skill development, quality Implementation, weld technique, Joining process, ISO3834, weld procedure, safety,

Abstract

The Defense manufacturing industry and marine sectors is a strategically important sector in India. The observation determined the extent in which up-skilling fabrication welding in the craftsman's training institute for employment in the 21st century workplace. The findings of this data study showed that responded well up-skilling equip fabrication welding for upcoming employment. A general lack of weld knowledge in metal joining technology, amongst the concerned personnel, can lead not only to uneconomic production but also to catastrophic failure of structure welders/ fabricators /welding engineer to meet demands of the manufacturing industry facing global challenges. The research s therefore recommends that up-skilling of fabrication welding trade craftsman should be permanent in training institutes to have employable skill in the present day defense manufacturing with marine sectors. Weld Quality Management (WQM) - new System 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 welding industry. This research, affords a building insight of the Defense manufacturing & marine sectors and its success and "welding in the world".

1.0 Introduction: The integral scope of training institute is basically in the acquisition of welding skills in engineering and technology. Training bodies provide the employees with adequate skill training and vocational competencies needed in various disciplines. Indians

Economic development and give skill training and import the necessary skills to individual personnel and can be self reliant economically. Training institutes are responsible for the qualified training and preparation of trade craftsman's for the marine sector and technology development of the country. Trade Technical wings to train and assign the craftsman's in shipbuilding construction, and a few other special material to fabricate the welding is a permanent joining of two material (similar/dissimilar) through localized coalescence resulting homogeneous bonding from a suitable combination, as per process parameter, methods, technique, edge preparation, pre heating and final result was acceptance of qualified welded joints as per international standard requirements fulfilling. A wide range of welding process and technology has been developed. Welding personnel's are required to make stronger joints for defense welded components and repairing the metal parts for a massive range of ship building and repair work to the regular maintenance activity and critical metal structures while fabricating the heavy metals.

1.1 Review of technological development in India; Modern & new India is more focused on welding science & technology, India has established itself among the most emerging science & technological economics around the world. India is now currently working hard on nurturing its talents by implementing numerous skill enhancing initiatives for youngsters to use India based technical support, monetary incentives given by the government. Indian Government has established two Defense manufacturing Industrial Corridors in Uttar Pradesh and Tamil Nadu. India has around 194 defense tech startups building innovative technical solutions to empower and support the country's defense efforts. India is one of the strongest military forces (Navy & Army) in the world and holds a place of strategic importance for the Indian government. The top three largest market segments of the Indian defense sector are military fixed wing, naval vessels and surface combatants, and missile defense systems. India has the largest youngest population in the world in the age bracket of 5-24 years with 580 million people, presenting a huge opportunity in the fabrication welding & manufacturing sector. In October 2021, the NSDC launched the largest 'Impact Bond' in India with a US$ 14.4 million fund, to help 50,000 youngsters in the country acquire skills necessary for employment. Pushing for 'Aatmanirbhar Bharat', the Ministry of Defense has signed nearly 180 private contracts (vendors) with the Indian industry between June 2014 and December 2019, worth approximately $25.8 billion. India is extensively establishing itself as on emerging leader in industrialization and Engineering Technology. India is looking to outcome all the technological challenges arising inside the country. In September 2019, DRDO formulated the "DRDO Policy and Procedures for Transfer of Technology" and DRDO is taking these efforts to next level to transform India into a hub of advanced defense technologies developing state of the art defense equipment and systems. Government policies, such as 'Make in India', 'Start-up India', 'Stand up India', 'Skill India' and 'Atmanirbhar Bharat' have paved new opportunities & promoting through professional skill manner with To adopt the new technological movements.

However, to sustain the 21st century demands of the Defense & shipping industry the need for up-skilling involves training candidate for a role and keeping them in the same roles, rather than fundamentally changing and updating their professions, in the words of the researchers up skilling simply mean updating the one with new updated skill in the other to be relevant in the workplace, work modules or world-up-works, stated that obviously up-skilling is the process of advancing in the acquisition of sellable skills needed in the workplace. Up-skilling the process

of learning new skills of welding teaching with the most potential and offering them all the skill training they need to make the industry profitable.

1.2 Importance of "Welding in Nation Building": New modern welding techniques are employed in the fabrication of numerous products such as ships, bridges, buildings, pipes lines, automobiles, aircrafts, missiles, spacecrafts, and human implants and so on [1]

Welding has made it possible for shipping/ Defense manufacturers to meet the design demands of strength-to-weight ratios. The exploration of space would not have been possible without the development and innovation of modern welding techniques and methods. From the very beginning of manufacture of wheel, swords to the early bicycle and today's aerospace vehicles, metallurgy and welding bond (Joining) has been playing a very important role. One cannot possibly think of fabrication of any structure or product requiring joining of two or more components without the use of welding. Over the years there has been a phenomenal development and innovation in the field of metallurgy and welding technology necessitated due to development of new materials and sophisticated structures. For example, the space shuttle's construction requires quality and reliability of the highest order. It is now possible to predict and control the weld quality using simulation tools and sensor-based on-line weld monitoring techniques [11]. The engineering science and manufacturing technology of welding is a fusion of knowledge of chemistry, physics, mathematics, and several fields of engineering including mechanical. Etc. There are also skill training & maritime training wings (Skill training Institutes / Testing centers / Assessing Body's / Qualified Surveyor/ Experts) in India where all three levels of training are imparted in a modular pattern with scope to move up the levels. In addition to these opportunities, there are Professional Societies, which also conduct training and education programs to meet the demand for welding Personnel's. In this paper various options are discussed.

1.3 Metal joining process development: Welding involves multiple techniques suited to different applications and materials [2]. The most common welding processes include:

- Gas welding and Brazing
- Resistance welding (RW)
- Shielded metal arc welding (SMAW/MMAW)
- Gas metal arc welding (GMAW – MIG/MAG)
- Gas tungsten arc welding (GTAW)
- Flux-cored arc welding (FCAW)

Also advance welding process in Sub-merged arc welding (SAW), Laser welding (LW), and Electron beam welding (EBW), underwater welding (UW), and Resistance welding RW).

2.0 Maritime sector skill development implementation requirements:

The skills needed in today's world of works are becoming increasingly complex. This is a result of rapid technological development and advancement in the world of work, lack of fabrication welding skill knowledge and not updated procedure standards implemented in the workplace. Skill acquisition varies on nature and complexity according to the trade involved.

2.1 Challenges faced in fabrication welding in ship repair and construction: Previously the Indian marine / Defense manufacturing sectors are used to source special steel plates from overseas suppliers but now from Indian steel industry. To understand the details pertaining to the new welding procedural aspect like joint design, selection of suitable consumable, pre heating temperature, number of weld layer and heat input is essential as they can influence the properties of weld mend. The welding of this material with suitable consumable as became necessary. To develop the Ra-materials and joining consumable for the welding high strength and also establish the process procedure to set desired properties.

Military contractors require metal products like nickel-aluminum bronze, Beryllium copper and copper-nickel for these and related applications [7], Under water welding & repair

work specialist, which include aircraft components, anti-missile defense items, space & aero space hardware's, launcher unit, rockets, missile guidance equipment, fabricated communications and satellite and other highly specialized welded components,

2.2 Various grades of materials performing welding process: Since every metal has various melting points and cell structures [4], they have better compatibility with some techniques than others. Following material are used in different joining process and used:

STEEL and STAINLESS STEEL ALLOY: most suitable welding process recommended SMAW, DC-TIG, MIG, FCAW, Resistance welding process: Iron-based metals such as steel and SS (stainless steel) are likely to work with the highest number of techniques compared with others. Low carbon mild steel was one of the most wieldable metals available. Its composition includes low amounts of elements that can decrease the risk of a failed weld.

ALUMINUM and ALUMINUM ALLOY; most suitable welding process recommended SMAW, AC-TIG, MIG welding process Grades of aluminum that fall in the 1XXX and 6XXX series undergoes select welding techniques. 1XXX series aluminum does not require much extra effort during the welding process, use proper welding operations and filler material.

TITANIUM & ALLOY; most suitable welding process recommended DC-TIG, when a welder protects titanium from oxidation, they can use it to achieve sturdy and long-lasting results. Titanium requires full coverage from a shielding gas to provide a high level of weld integrity.

CAST IRON & CI ALLOY; most suitable welding process recommended SMAW welding process Cast iron shows more difficulty during the Joining process than the metals such as steel or aluminum. High carbon content in it requires careful preheating and heating methods that provide gradual temperature changes.

COPPER AND BRASS ALLOY; most suitable welding process recommended DC-TIG welding process Copper and brass have high corrosion resistance that makes them useful for a variety of welding applications.

MAGNESIUM ALLOY; most suitable welding process recommended AC-TIG process a magnesium alloy has similar properties to aluminum (Al).

Note: Before welding, using above all type of grade materials to ensure the welding procedure specification (WPS) and confirm to the International standards requirements with acceptance.

2.3 Quality Improvement plan for joining process: Based on the findings vocational trade craftsman through with Instructor/ Trainers construct vast model performed better with conventional teaching methods [6], Recommendation were made per training to get the findings of the special process with private partnership. Also theoretical and good training to achieve the Qualified Joints to make the stronger the country and economic growth.

3.0 Case study observation #01:

"*DMR249A Defense grade steel plate used fabrication welding for submarine construction";* DMR249A steel is a low carbon and micro alloyed grade of steel with stringent toughness requirements at sub zero temperature [8]. Plates used to indigenously build anti submarine warfare (ASW) corvette. SAIL Company Developed this special grade steel for Indian navy in collaborated with Defense Metallurgical Research Lab (India). DMR 249A defense high quality steel used for naval ships (Anti submarine warfare).

3.1 Chemical Composition DMR249A Steel: The Chemical composition of the steel on ladle analysis, when analyzed in accordance with IS228, Shell conform to the requirement given;

Table – 01

Plate Thick	C	Si	Mn	Cr	Ni	Cu	Si
mm	Max %	Max %	Max %	Max %	Max %	Max %	Max %
10-50	0.08 - 0.11	0.15-0.40	1.15-1.65	0.30 max	0.65- 1.05	0.30 max	0.15- 0.40

3.2 Tensile test; shall be done in accordance with ASTM STD A370 the test specimen shall be taken transverse to the rolling directions from the from end at the middle – third width of the plates (BW- Test coupon) Mechanical Properties of DMR-249A Steel indicated below

Table-02

Yield strength (MPa)	Tensile strength (MPa)	CVN Valves (Joules)	Elongation (%) (GL 5.65)
390 (Min)	510 – 690	78 (at -60° C) Min	20.0 (Min)

3.3 Tensile test date of DMR249A: Low alloy steel welded coupon testing experimental result: Below indicated

Table no: 04

S.No	Material	Tensile Strength (MPa)	Yield Strength(MPa)	% Elongation
1	BASE METAL	605.49	400	39.06
2	SMAW	652.67	430	45.93
3	GTAW	550.67	410	31.33

3.4 Bend test experimental observation: Bent test shall be done as per IS1599, the test specimens shall be taken transverse to the rolling direction from the front end, at the middle – third width of plate the frequency of bend test shall be two samples per plate (BW).

3.5 Impact test Experimental result: Charpy V-notch impact test shall be carried out as per ASTM A370 and ASTM E23. The notch root line of the specimen is perpendicular to the plane of rolling. The test specimen taken parallel to the rolling direction from the front end at the middle third width of the plates (BW). The frequency of impact test shall be free sample for the each plate tested; the impact test temperature shall be -60 degree Celsius.

3.6 The impact energy is determined as the average value of test results; this average value shall comply with the specified minimum and in no case below 75% of the specified minimum value i.e. 59 J. For onsite repairs of ship body and hulls are manually welded.

4.0 Case study observation #02; *"Armor AR550 Special grade steel plate welding using Defense sector"*; Abrasion resistant (AR) steel plate is a high-carbon alloy steel plate. It offers a unique combination of wear resistance, crack tolerance and work performance. HB 550 BHN Plate offer surprising properties such as it increases the surface life of goods by its wear resistance in tough environmental condition. Welded by conventional manual processes.

4.1 AR Steel Plate Advantages:

Common uses for AR plate include conveyors, buckets, dump liners, construction attachments, grates, body armor and ballistic plates (and as targets at shooting ranges). Chemical Composition AR 550 Steel: indicated below

Table no: 05:

Plate Thick	C	Si	Mn	Cr	Ni	Mo	B
mm	Max %	Max %	Max %	Max %	Max %	Max %	Max %
10-50	0.37	0.50	1.30	1.14	1.40	0.60	0.004

4.3 Mechanical Properties for AR 550 High Tensile Plate: indicated below

Table no: 06

Hardness [HBW], guarantee	Impact toughness, typical 20 mm	Yield strength	Tensile strength,	Elongation	Carbon equivalents, typical
550 [+/- 25]	30 J/-40C, 22 Ft-Ib -40F	1400 N/mm^2, 220 ksi	1700 N/mm^2, 265 ksi	7 %	CEV= 0.72 / CET= 0.48

4.4 Features for AR 550 plate represents the following properties: - Offers extended life surface, High productivity in challenging environments Abrasion-resistant quality, Durability, Sturdy nature. Requires low maintenance cost, Crack safety. The benefits of using wear-resistant plate steel in applications involved in good impact ratings and sliding contact are immense.

4.5 Tested Experimental result: As per Parent material using armor 550 (ISO TR 15608,Gr.3), welded test coupon in Butt weld joint (12mm plate) using GMAW Process, shielding gases 98% Argon and 2% Oxygen. Visual weld quality acceptance based recommended Test evaluation: Macro Examination as per ISO 15614-1/ ISO 17639/ EN ISO 5817, Brinell hardness survey (HBW) as per 1500, Part-1; 2019,

5.0 Case study observation #03; *"Cast Armor IT90 Special grade steel plate for fabrication welding in armored fighting vehicles":* IT-90 cast armor plate fabrication welding using consumable 18/8 stainless steel, it is 18% chromium & 8% nickel, making it very resistant to corrosion & oxidation.

Also highly durable & easy to fabricated, in case where stainless steel is to be welded, stainless steel 304L grade is prepared as it offers more resistance / corrosion. Consumable of suitable Filler wire 18/8 stainless steel has superior corrosion resistance but shows sign of corrosion when exposed to chlorides it would not be a good choice for marine applications.

5.1 The military & defense industry condition: Depends on the production of custom sheet metal fabrication, such as parts and components, for armored vehicles and offensive weaponry. Due to the preciseness needed for these units to operate in high-efficiency situations, the "fabrication" or forming of metals must be completed to exact requirements prescribed by government entities and defense contractors. Designing and fabricating components for the defense industry is a high-risk endeavor

5.2 Common applications; 18/8 steel is commonly used to make marine appliances and marine parts, 18/8 stainless steel is an outstanding metal for applications used like: Auto trim and molding. Truck bodies. Exhaust manifolds. Critical products. However, aside from these two, it may also contain traces of carbon, nitrogen, molybdenum, manganese, silicon, sulfur, phosphorus, and copper in different amounts, depending on the intended application. It is corrosion-resistant, non-magnetic, heat-resistant, formable, and less electrically and thermally conductive than carbon steel. Both are considered high-quality materials, 304 stainless steel is generally stronger due to its additional components. This added strength makes 304 ideal for use in applications that require high resistance to corrosion, heat, and impact. Ultimately, the choice between 18-8 and 304 stainless steel will depend on the specific needs and requirements. Make sure you thoroughly research all materials involved before beginning any construction projects.

5.3 Selection of welding consumable: IT90 Cast Armor plate to use, 18/8 stainless steel is strong, wieldable, ductile, and easy to fabricate. In addition, it can be polished to have attractive and useful surface finishes, which is why it is the most popular type of stainless steel used in a wide range of applications. With yield strength of about 200 MPa, it can be made soft enough to be easily formed into different joint shapes, below indicated filler wire composition

Table no-06

	Composition	Pros	Cons
18/10 Stainless Steel	• Chromium – 16% • Molybdenum – 2% • Nickel – 10%	• Strongest commonly used grade of stainless steel • Highly anti-corrosive • Resistant to pitting	• Vulnerable to saltwater corrosion • Requires special tools for machining • Most expensive
18/8 Stainless Steel	• Chromium – 18% • Nickel – 8%	• Stronger than many milder steels • Resistant to most corrosion • Less sensitive to heat than other types of steel	• Vulnerable to water and salt water over time • Not as durable as 18/10 • More expensive than 18/0
18/0 Stainless Steel	• Chromium – 18% • Nickel – 0%	• Good quality for the price • Good for everyday flatware • Dishwasher safe	• Least durable • Avoid heating or applying force to 18/0 steel • Most vulnerable to corrosion

Category of stainless steel will depend on the specific needs and requirements. Make sure you thoroughly research all materials involved before beginning any construction projects.

6.0 Research observation for underwater welding technology:

Established a standard as per AWS D3.6M.2017 [11], this code for welding structures/ components under the surface of water, if including dry and wet environment applications are extended offshore structures, submerged marine pipelines, underwater port facilities and nuclear power plant components. Five Methods for underwater welding are covered in this specification requirements following: (i) Dry welding at one atmosphere (ii) Dry welding in a habitat, (iii) Dry chamber welding, (iv) Dry spot welding, (v) Wet welding.

Principal of weld joining processes to used GMAWs, SMAWs, GTAW, FCAW, and PAW. Also using different type of NDT inspection instrument. Welding operation to support diving mode. A type of diving requiring specific equipments, work procedures and safety techniques (SCUBA, Surface-supplied air, mixed gas saturation diving, etc). All type of rules and regulation for critical weld process like environment for critical weld process [11] like environmental data collections, joint design, process parameter, special consumables, diving procedure etc.

6.1 Challenges and future scope of underwater welding technology:

- Automation of the weld process and advance inspection equipments (NDT/DT),
- Friction and laser welding process optimization and advance welding Technology,
- Special type of welding machines and consumables development (filler/ gases)
- Under water work safety PPE & safe work environment / communication INSTR,

7.0 Methodology using new system in weld quality management (WQM);

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: The Indian Institute of welding (IIW-India - National body) / International Institute of welding (iiw - International body) with accredited agencies to fulfill the mission of dispersing knowledge. Once international quality requirements & qualified employee efficiency gets fulfilled, India has the potential to become the global manufacturing hub with emerging technologies. The management (Manufacturer) and government (NSDC) needs to initiate various Development programs focused in skill development & qualification certification.

ISO3834 Welding Standards needs to be implemented hastily and up to global quality requirements [12]. 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.

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 [12].

International standards (ISO) recommended the effective professional skills and performance and with that the new model is emerging in the

common welding factoring industries to utilize only the Skill Welders / machine Operators' / welding Engineers in the near future and upcoming years. A weld quality management system to promote the welding industry is responsible for quality coordination and requirement to international Quality norms and good 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 [12]. 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. ISO3834 Welding Standards needs to be implemented hastily and up to global quality requirements, below indicated weld quality management system

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8.0 Collective Data Analysis (Solution thing):

Major issues Lack of proper professional skill & uncompleted Education for specialist in welding area, To creator emphasis should be given to proper welders skill training (International welders qualification) and education update for welding coordinators as per International code & standard procedure and Education update - Up skilling (International certificates in IWE, IWT, IWS, IWP and International Welder Certificate As per ISO Standards)

Welding professional deal with day to day in Activity of metals & alloys of various grade, sizes and shapes, control the machine parameters, process standards, joint preparation, problem solving techniques, quality and design confirmation, also to follow the testing standard and final result satisfactory level conditions and welding coordinators to monitoring the weld quality continual improvements. Everyone must ensure the job responsibility and to involve the weld quality management systems recommendations [12]. Up to now all over world weld quality not achieve the 100 percentage. Skill levels evaluation (as per Matrix) not plan to conducted proper assessment & up skilling support. This solution study increases in Effectiveness; Efficiency and Quality productivity will result from a full scale optimization.

8.1 Key observation on the issues in various area and actions needed; Indicated

Chart no. 1:

Sectors	Key tech needs	Action to be taken
Heavy Engg. Construction & Fabrication	To be develop the Joint design, to improve Fatigue performance, Friction stir / Laser welder, Long rang inspection, manual to semi automatic. thick plate and structural part,	Require Qualified IWCP (IWS/IWT/IWE) / IWIP inspectors & IWSD (International welding Structural Designer), IW Welders
Marine/ Ship Building	Risk-based maintenance, Corrosion & repair work procedure, alloy Material weld quality improvement, Underwater weld technique & NDT, ISO Code & Standard implementation	Require Qualified IWCP (IWS/IWT/IWE) / IWIP Inspectors& IWSD (International welding Structural Designer), IW Welders
Oil & Gas / Petro Chemical	Pipe weld automation, Joint design, Repair work, Special alloy steel, Powder coding, NDT, Explosive welding, HT need improvement, PPE	Require Qualified IWCP (IWS/IWT/IWE) / IWIP Inspectors& IWSD (International welding Structural Designer), IW welders.
Research Organization/ Testing lab	To develop the Spin Arc Tech, Multi axle Robotics, welding metallurgy, Multiple and Hybrid/ Tandem conversation, Artificial Intelligence using weld, new material composition, New Additive Mfg / 3D & 5D Tech.	To Construct the Welding Hi-tech R&D Institution and To frame Team members: Scientist, Professors, DT&NDT Level III, with IWE/IWIP, Post doctorate Researchers team,
Welding Training Institute / Certification body	follow the WPSs /To confirm the performance through NDT/DT Results with Qualifying as per ISO Standards, Skill Levels evaluation, improve the Theoretical part, Robotics Tech, PPE & QA/QC awareness, WQM with Team building,	Require Qualified Trainers/ IWS Educators, Authorized Assessor / Examining body's / Augmented Reality setup, NDT Level-3 Co. Expert & specialist training support

Note: Up skilling with professional knowledge will only lead WQM Systems implementations.

9.0 Technical discussion with process approach for "new joining technique";

Global trends are giving good thrust in the Defense fabricated product and metal joining industries to redesign and rediscover their methods of manufacturing. The industries are racing to develop innovative materials and methods to maximize efficiency. Further, to increase efficiency of the equipment, various new optimized designs of new combination of materials are being implemented as never before. Lightweight concept vehicles are being strongly advertised and is forcing the use of materials like aluminum, fiber plastics, stronger materials, newly developed plastic and bi-metallic materials throughout the vehicle - frames, panels, structures, engine transmission, interiors and exteriors. Plastic materials including fiber reinforced plastics, combination of metal and plastic are the first choices for weight reduction [2], however, this may lead to issues and challenges for welding the dissimilar materials. These processes may demand advanced welding technologies like joining metal to metal parts or plastic to plastic parts or metal to metal components. Already numerous SMEs have upgraded and are capable of CO2 Laser welding, and few units are equipped with ultrasonic welding machines and other advanced technology machines. This up-gradation is not enough, not only for meeting the future challenges but also to meet the quality requirements [8]

Availability of skilled manpower is a challenge being faced across the globe is the major issue behind the high automation and embracing the latest welding technologies in all major sectors and industries. Besides this, though the initial investment is higher in implementation of new technologies; more productive latest welding techniques and associated processes like controlled welding; smart feedback and correcting devices etc. are helping manufacturers to increase their efficiency and adoptability.

10.0 Technical discussion with process approach for "Laser Beam Welding technologies of different methods like Gas lasers"

Electron Beam Welding and Friction Welding technologies like Friction Stir welding, Linear Stir Welding and Inertia Stir Welding; and Ultrasonic Welding can be used for dissimilar metals also very effectively. These latest welding technologies are ecologically - friendly and energy efficient. Further there are various joining methods for joining dissimilar metals; Metals to Plastics; Plastics to plastics. With discovery of new materials, new designs and new processes, the future of the welding industry lies in the adoption of these welding techniques in the fabrication and developing the skills [9].

Though the initial investment is involved, increase in the productivity of the welding processes and lack of alternate methods may enable quick return of their investments. To adopt the latest welding technologies as a way forward. Need to adopt these new technologies to support by trainings and support in services.[3]

11.0 The Context of this Research Study and collective of sources:

Employability skills development has been a major discourse in literature over the past years, this is because it constitutes a vital ingredient in the development of a nation at large, functionality in the world of work requires ability to demonstrate overtly employability skills that have overtime have been acquired while in the skill training institute. From the foregoing, employability skills refers to the professional skills, theoretical knowledge and Attitude needed to get a career and to do well in that job, which in turn will well in that job, which in turn will imply positive outcomes both for an individual and for his or her organization.

Skill only makes the right individual to gain, maintain and employment fabrication welding trainee are to be equipped and prepared for the world of work this study therefore dwelt on welding and metal joining work with fabrication professional posses the needed employability's skills necessary for national and international employment and self-reliance in these areas (defense manufacturing and maritime). This study appraised fabrication and welding training institutes (IIW approved training sectors) in south India. Specifically aimed to determine weld quality management systems (WQM) new system, improved and skilled workforce, survey / Collective data's using questionnaire/ face to face to collect the data from a sample that has been welding industries, engineering forum, manufacturer, company owners, entrepreneur, MSME companies, research scientists and teaching professionals.

12.0 Final Conclusion and Recommendations:

Defense Industry capabilities and new Startups among the world community. The trajectory of 'Make in India' is looking good and India is poised to become a defense manufacturing base. We believe that to establish our defense products as a brand, we need to work collectively. The Indian Defense manufacturing & marine Industry will grow at a good pace and achieve its goals, with ethics. Welding employability skills, professional studies on fabrication welding sectors revealed that the craftsman to specialist of skill work lacked the needed skills, to function effectively in the world of work; based on the finding of this study the following recommendations were suggested:

- ✓ To provide the professional skill development training and to create the Employability skill improvement with proper Assessment to be conduct as per International standard requirements through Assessing body guidance. To implementing Government and private partnership skill development program on regular basic, not for ritual CSR Scheme.
- ✓ Require the skill training with welding education to all level, to be improve the all necessary area, to learn basic metallurgy of materials composition, characterization, application, behavior, joining design, process parameters, WPS with test procedures, weld Quality development, engineering physics & calculation, also Human resources handling and smooth coordination, well knowledge in safety ergonomics, Etc. [1]
- ✓ To develop the team for weld quality management system to be aggressive and to be lunching the special process as per international standard requirement ISO3834 Norms and to create the weld quality with code & standard awareness campaign. Create the awareness and campaign for defense and marine industry involvement and Government funded support. To increase the woman's in engineering from rural area with wide motivation to crate the big social awareness to "Gender Equality & Equity".
- ✓ Also support from shipping and defense manufacturing organization effort only achieve the target of Indian government shipping ministry proposal in the maritime India mission 2030 aims to increase women in the sector to 2-3%. Develop the weld process though sustainable development goal in Power source development, scrap dispatch, pollution control, process development and new innovation of skill training practice (welding virtual simulator/immersive level of training) To initiate the technological development center (R&D) and professional skill development for all level category's. To support the unemployed and rural employment scheme.
- ✓ The Government must take all necessary steps to support the defense manufacturing sector Performance of the defense manufacturing and maritime industry over the past 15 years leaves a lot to be desired. It identifies the reasons for this, which is most of all. It discusses various initiatives taken by India Government to reform and revitalize its defense Industry which have produced few tangible results.
- ✓ In addition to changes in special materials, welding equipment and consumable for joining processes have experienced many technological improvements. Take a look at fabrication welding today - at the major challenges and how best to meet them. After examining these skill challenges, we can take a peek over the horizon at how Defense sector manufacturing and ship construction industry doing fabrication welding is likely to evolve.

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, AWS – American welding society, ASTM - American society for testing and materials, IS – Bureau of Indian Standards.

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References

1. Malakondaiah G, in International Conference on Metals and Alloys.
2. S. Mallike, B.S. Minz, B. Mishra, Material Science Forum. 710(2012), 149.
3. R. Pamnani, Trans Indian Inst Metals 70 (2017), 49.
4. TWI GSP No. 5663, An Evaluation of the A-TIG Welding Process (1994).
5. J. Cwiek, K. Nikiforov, Corros. Sci., 40(2004), 831.
6. H.Y. Liou, R. I. Shieh, F. I. Wei, S. C. Wang, Corrosion, 49 (1993), 389.
7. Maritime welding Hand Book; welding processes for repair maintenance on board,
8. Research paper ICRAMMCE 2017; IOP Publishing
9. Skill development & education options in welding technology in India, Gouranga lal data, chancellor, K.L University, Guntur pin: 522502, India. ISPN: 978-3-642-36691-8
10. Agarwal, Skill development in India, International engineering Technology Management,
11. International standard As per Underwater Welding Code. AWS D36M-2017
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