
Challenges In Welding - Indian Context

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ABSTRACT

The industries related to automobile, railways, ports and ship building, oil gas and refinery, nuclear, power, water supply and sanitation rely heavily on welding for mass production of various types of components. The higher production rates encountered in the mass production have led to very higher degree of automation and mechanization associated with special purpose processes. It is highly essential and important that India becomes a major manufacturing unit to increase the G.D.P. Growth from 9% to 12%. This requires high quality skills in the manufacturing technology which can be ensured with a continued supply of quality manpower. Universally, short supply of welding technologists and welders are being felt. The problem can be minimized through vocational education, training, up gradation of curriculum and public-private partnership. An integrated approach in this line may a good solution to the problem of unemployment and to meet the shortage of manpower in this profession.

Key Words : Welding Education, Training, Automation, Mechanization & Robotics.

INTRODUCTION

India's consumption of crude steel is about 50 MMT and is expected to get increased to 100 MMT by 2020, so one can see the large size of the market and the expected growth. Today, India has technological ability to match foreign competitors and thus we can also expect a large import substitution, especially if quality can be ensured and delivered. Welding is directly related to the overall growth of the Industry and infrastructure.

Automation in welding will result high efficiency in welding products. In view of energy conservation use of Inverter power sources, selection of alternative welding processes and advanced welding processes, use of robotics, adopt newer techniques and welding methods and material will have great impact on quality, energy consumption and productivity.

To retain our competitive advantage and ensure a continued supply of quality manpower, large investment in public

sector Institution of higher learning is needed. Moreover, it is high time, high skill development and vocational schools are opened to private sector and foreign capital.

GROWTH RATE AND ROLE OF WELDING

The role of welding technology for the growth rate of our economy can be elaborated in the background of projection of 11th five year plan for some important and crucial sectors of our development.

Projection of 11th five year plan

By international standards, India has poor Infrastructure for development. It has been realized that unless a substantial growth of infrastructural development is not attained it will be difficult to meet India's targeted GDP growth of 9%. The approach paper of the 11th five year plan envisages that investment in infrastructure would have to raise from Rs. 0.87 million cores in 10th plan to Rs. 2 million cores in the 11th plan to achieve the target.

Steel consumption and weld metal deposits

The National steel policy has envisaged steel production to reach 110 million tones by 2019-20 and it is expected that India's steel capacity would be nearly 293 million tones by 2020.

Welding industry is closely linked with country's steel consumption. Approximately 5 kg of weld metal is required for per ton of steel. Due to automation and machination, the GMAW process using solid and flux coated wires would gain momentum and share of SMAW process will decrease. Share of SMAW will gradually go down from the present 70% to 65% and the share of GMAW will gradually go up from the present 22% to 27% during the next three years. The share of SAW will be around 2% and GTAW and other process will be 1%. The details of the share of welding processes of different countries and share of welding processes in 2006-07 of India has been provided in the Table 1 and Table 2.

The global economy has compelled fabricators to use newer materials of higher strength to reduce cost of materials & fabrication. This has posed challenges to welding consumable manufacturers to develop newer consumables. Welding consumables Industry in India is highly fragmented, with an approximately one third of the total value shared by more than a few hundred manufactures in the unorganized/ small scale sector.

DEVELOPMENT SECTORS EMPLOYED WELDING

The welding industry is closely linked with the infrastructure development particularly with the steel consumption. Some of the important sectors, which are special interest to welding industry, are discussed here.

Power

During 11th plan, the country targets to add 78000 MW to generation capacity. Nine Ultra mega power projects of 4000MW capacities are planned. Some of these power plants will have super critical range of boilers each having a capacity of 650MW or more. Welding industry is being entrusted to develop suitable consumables and welding processes for development of such projects.

Nuclear

The eleventh plan proposals envisages setting up of 8 indigenously designed 700MVe pressurized heavy water reactor and 10 light water reactors of about 1000MVe each based on inputs.

The welding processes employed in fabrication of nuclear components are TIG, pulse GMAW, high power Nd: YAG laser and electron beam welding processes are extensively to be used to obtain high quality welds.

Table 1: Process share application-International scenario

Process	Japan	Europe	USA	India
SMAW	20%	30%	33%	70%
SAW	2%	2%	2%	2%
GMAW/FCAW	70%	60%	55%	20%

Table 2 : Share of welding processes in 2007-07

SMAW	70%
GMAW	20%
SAW	0.7%
GTAW & OTHERS	0.1%

Oil, gas & refinery

Realization of high economic growth aspirations by the country in the coming decades, calls for rapid development of the energy market. Creating sustainable transportation system through cross-country crude oil and petroleum product pipelines in the next few decades with the objective of preserving environment and protecting human health and safety would be a new challenge for the petroleum industry.

Ports & ship building

The Indian ship building is mainly centered around 27 ship yards comprising 8 public sectors, 6 central and 22 state governments. India can grow in the shipbuilding sector if shipbuilding is recognized as a strategic industry. The industry can grow at a rate of 30% and would also be able to achieve a world share of 2.2% and an amount turnover of Rs.18000 cores in the last year of the 11th plan.

Railway

Significant developments are taking place in railways including metro system in our big cities. Construction of dedicated freight corridors is being planned. Consequently, shift is taking place in materials of construction. This would call for massive uses of semiautomatic and automatic welding processes.

Automobile

The Indian automobile industry has grown at a spectacular rate of 17% on an average for last few years. The industry has now attained a turn over of Rs.165000 cores and an investment of Rs.50000 cores. It is felt that a general improvement in availability in trained manpower and good infrastructure is required for the sustainable growth of the industry. The government is envisaging in the eleven five year plan to create a national level specialized education and training institute for automotive sector. The government is confident that the above industry will achieve a target of 75.3 billion US \$ in turnover and 8.57 billion \$ of export by the end of the eleventh plan period.

NEED OF APPROPRIATE TECHNOLOGY

Today there are a large number of joining techniques available including mechanization, automation and versatile welding robots for industrial application and the problem is not how to join but how to select the best method of joining. Whereas bronze-age man simply had to choose between thongs and wedges, a welding engineer today may well find that four or five technologies appear to be equally suitable. Each method has its own attributes and a number of aspects must be evaluated if the final choice is to be sensible. The relative importance of such factors as strength, ease of manufacture, cost, permanency, corrosion resistance and appearance depends very much on the specific application.

Joining techniques which can be incorporated into productions, combining spaced with reproducibility and reliability will be much advantageous which can be controlled or monitored by specialized welding personal.

The following are some of the new developments in welding that have tremendous potential to increase the quality and product ability in industry

- Hot wire narrow gap TIG welding
- Activated TIG welding
- MIAB welding
- High speed narrow groove SAW
- Hybrid laser arc welding
- Wave controlled SAW
- Tandem GMAW
- Double sides FCAW
- Rotating electrode GMAW
- Rotating lead tandem GMAW
- FSW for ship welding

NEED OF APPROPRIATE MATERIALS

In modern manufacturing design engineers are looking forward to materials with best combination of low cost, design flexibility, good machine ability, high strength to weight ratio, good toughness, wear resistance and fatigue strength. Welding of newer material like P91, T91, P92, T92 etc would be widely used for construction of super critical range of suitable boilers for power plant. Development of suitable consumable and welding processes to meet stringent specifications is really a challenge in welding field.

NEED OF APPROPRIATE HUMAN RESOURCES

To retain our competitive advantage and ensure a continued supply of quality manpower it is required to invest in higher learning centers, vocational institutions. To upkeep our knowledge level, one must have thorough understanding of all aspects of the

welding including advance technology. This includes robotic work cell and know-how related programming, robotic arc welding, seam tracking, fixing and many other functions related to robot. The welder may have to work with the welding engineer or supervisor to make changes to weld data, torch angles, electric stick out, starting techniques and other welding related parameters.

PRESENT WELDING SCENARIO

Welding is a part of curriculum in UG courses under mechanical, production and metallurgical engineering. IIT Madras, IIT Bombay, IIT Delhi, IIT Roorkee and some other institutes offers P.G courses in specific areas of welding. The students are getting little exposure to welding technology particularly in advance technology and research and development. No Indian standards or guidelines are available regarding education of welding personal. Some technical institutions (ITI's) giving training for welders has old curriculum and technology.

ACTION REQUIRED

Indian Industry has to survive against the competition from multinational companies from the developed world, so it is the high time to frame out a strategic plan for welding education and training in the country. Immediate action is required to establish a regulatory body that can coordinate the welding technology and training in our country and responsible to provide certificates to the licensed welding engineer and technician. They are also responsible to ascertain the quality and reasons for welding failure.

Welding inspectors should be responsible for

- Interpretation of codes & standards
- Ensuring availability of approved welding procedures

- Witnessing of welder and procedural related test
- Verification of welder approvals, parent metal identity, welding consumables, and preheats and post heat treatment
- Carrying out pre weld, weld & post weld inspection
- Preparation of inspection report

The welding inspector should undergo certified courses on welding inspection. The young generation may be motivated to take welding as a future carrier and in this regard training program and certified welding courses may be conducted by industries and educational institution. Symposium, skill competition, recognitions can be initiated to improve the quality of the welders and professionals.

CONCLUSION

Welding is a developing technology-all the time, new techniques are being devised to meet the needs of new situations and to solve the problems encountered in fabrication. To the casual observer this has lead to a diversity of apparently unrelated practical techniques which rely heavily on craft skill of individual welders. In reality the technology is firmly based on well established scientific concepts & not only technician and engineers but also welders need to understand these if they are to respond to the demands of modern industry.

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