Productivity in Welding

By S V NADKARNI*

How high is the productivity in welding in India today ? Where do we stand in comparison with our counterparts in advanced countries ?

This is an all-embracing question because welding plays a significant role in the majority of engineering fields like hydroelectric installations, thermal and nuclear power stations, wagons, rail-coaches and locomotives, fertilizer plants, oil refineries and ship-building. In fact, productivity in welding determines productivity in engineering industries to a large extent.

Manufacturing costs of engineering goods can be slashed down by making intelligent use of the principles of welding productivity. Engineers in industry must, therefore, show a keener awareness of these principles. This is all the more important in the context of the present drive to increase export of engineering goods and to supply capital equipment to and undertake turn-key jobs in developing countries.

Way back in 1962, the National Productivity Council published a report entitled "Welding Industry in the U.S.A., West Germany and Britain." It was prepared by a team of Indian welding experts after visiting important engineering firms and welding organisations in the three countries and studying their welding processes and techniques. The report made a number of recommendations for improving welding productivity in Indian engineering industries.

One of the recommendations concerned the designer since proper design is a pre-requisite for an economical and efficient job. The designer must so design the job that it will require the minimum amount of weld metal. The designer must compute weld sizes correctly, depending on the load each joint has to carry. The design office must go a step further and prescribe economical welding procedures to go with the blueprint. (Fig. 1)

Good welding designers can be had only after specialised training. Our country lacks facilities for training engineers in this line. The NPC Report made a plea for inclusion of welding technology as a part of the graduate course in engineering and metallurgy. A beginning has been made only recently in this direction by the Indian Institute of Technology, Madras, and this is a happy sign.

In the meantime, engineers in a few large companies and at public sector projects have been getting trained in welding design abroad. They have been doing a good job. But these few shops and projects do not speak for the industry. There is still a lot of bad welding design in the country with the result that the benefits of good welding are not fully realised.

When it comes to the execution of the job, productivity is determined by accurate dimensioning of parts, correct edge preparation, close fit-up and proper alignment. Automatic oxy-cutting machines ensure these steps. And yet most shops in the country use manual oxy-cutting in which defective nozzles and bad

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workmanship cause badly cut edges and bad fit-up. Advanced countries have reached the stage of computer-controlled machines while we in this country still have the most simple types that hardly contribute to productivity.

When it comes to cutting stainless steel, even the most advanced shops have to be content with powder cutting or, where iron powder is not available as frequently happens, they have to resort to the carbon arc-air process. This results in wide and irregular cuts entailing loss of material and very low cutting speeds. Plasma-arc is the modern way of cutting stainless steel and other difficult metals and it is time that suitable equipment is made available indigenously.

Badly cut joints and poor fit-up mean more weld metal than necessary, longer time to execute the job and increased distortion. Highest productivity is ensured when accurately dimensioned components are aligned quickly in a jig or fixture, and the job so fitted is mounted in a positioner or a rotator. The welder can then weld each joint in the most convenient downhand position without the assistance of a helper to fix the parts for him.

The NPC Report describes at great length the use of jigs and fixtures and rotators. These important items are seen only in a few big shops and projects (Fig. 2). Otherwise, in most shops, welders have to kneel on the floor to weld. If a welder welds for five minutes, he rests for the next fifteen minutes to get the next component fitted and tacked on by a helper. The result is very low arc-time.

Other important factors which contribute to high productivity in manual welding and which were stressed in the report are high arc time factor and high deposition rates. High deposition rates are ensured when the welder uses the largest size of electrode and an electrode of the iron powder type. Bad fit-up compels the welder to use an electrode of small size to prevent burn-through. As far as iron powder electrodes are concerned, they have been available in India since the last 15 years but very few shops have accepted them. The main reason for this is that electrode buyers go by the list price and refuse to judge the economics of an electrode on an overall basis.

If only electrode consumers were to buy the most productive electrodes and take steps to use them economically and efficiently instead of buying the least expensive electrodes and allowing them to be used wastefully, a marked improvement in welding productivity would result.

Automatic and semi-automatic processes play an important part in welding productivity. These processes and their modifications to suit various applications were described in the report. The report recommended that steps be taken to popularise submerged-arc welding and carbon-dioxide shielded arc welding in India. Unfortunately, several obstacles have prevented the welding industry from making full use of them.

Machines for these two processes had to be imported until recently and there are severe restrictions on their import. It is only now that semi-automatic

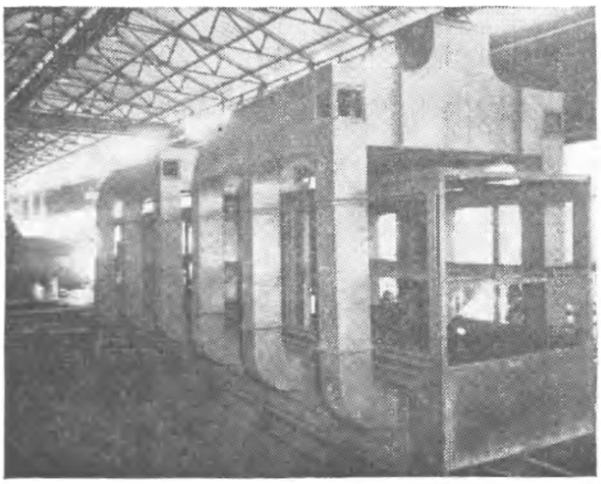

Fig. 1. Welded framework for a furnace. An example of good design and effective use of welding.

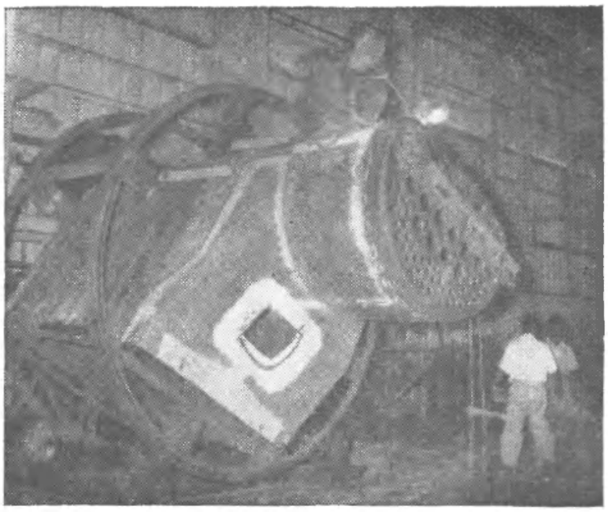

Fig. 2. Rotator for welding loco firebox.

and fully-automatic submerged-arc welding machines are available from local manufacture. Machines alone will not serve the purpose because, for most applications, turning rolls and welding booms are necessary.

A significant step in the submerged-arc welding field has been the availability of agglomerated fluxes which can be used in conjunction with electrode quality steel wire. But important users of this process, especially boiler firms, have felt the need of prefused flux and high-manganese steel wire. It is hoped that these will be available in the near future in adequate quantities.

Regarding CO_2-shielded processes which have become most popular in advanced countries, the equipment has not yet been developed in India. The special quality wire made from deoxidised silicon-manganese steel is not yet freely available in the country. Not only should sufficient quantities of the wire be made available but it should be available at prices which would make the process viable. In the absence of such wire, a large number of imported machines are lying idle.

There is need to launch a vigorous drive to increase productivity in the sphere of welding on the lines suggested in the NPC Report. There are three agencies who could do this :

(1) The National Productivity Council.

(2) The Indian Institute of Welding, and

(3) The Indian Standards Institution.

The ISI have done commendable work in this direction by publishing standards, codes of practice and handbooks. The average shop, however, hardly makes use of these publications. May be, the three could join hands and hold periodical seminars in different industrial regions to achieve this end.