Step Up Welding Productivity . . . Through Management Control

How a vital–but often wasteful–function can become a profit center through training rather than capital investment

Welding is one of the most lucrative yet untapped profit activities in industry, and the railroads' involvement in this situation is no exception.

That applies to craft-type maintenance welding or the higher capacity production welding that is common in railroad shops or car fabrication facilities.

In many cases, however, welding productivity could be improved with little or no capital investment if management would closely assess the four important functions of weld design, weld processing (manufacturing/industrial engineering), weld production, and weld quality assurance. Once these are understood and investigated, productivity of the average welding operation has the potential for improvement by 20% to 40%.

Since labor and overhead make up approximately 85% of the welding dollars spent, these areas require focused attention. First to be identified are the productivity improvements that can be achieved, after which a plan to improve weld quality must be developed.

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Control Weld Metal Volume

In more practical terms improved productivity comes down to reducing weld metal volume which, since it is proportional, will automatically reduce welding arc time. This is possible through more efficiently determining the type of joint and the size of the weld required and then controlling it to that size (Fig. 1). A 20% reduction in weld metal volume, for example, can save $5,000 to $10,000 for every 10,000 lbs. of electrodes purchased, depending on the welding process used. Other savings possible, using a $25.00 labor and overhead rate and 240 eight-hour working days a year:

—With 10 welding stations as an example, by improving the time during which the arc is actually struck by only one percent, $4,800 can be saved in one year. A 10% improvement can save $48,000 a year.

—Overwelding or overdesigning a $\frac{3}{16}$-in. fillet by only $\frac{1}{16}$-in. will require an additional 78% arc time and more deposited weld metal than is necessary. Prevention of such overwelding can save about $7,000 per welding operator per year. (See Fig. 2.)

—Increasing and controlling welding current by 50 amperes with a given process can save $8,000 in arc time per welding operator per year.

—Increasing electrode diameter by one size and controlling optimum current for a given process can also save about $8,000 per welding operator per year.

Such savings are the types that can be made without extensive capital expenditures. They involve more efficient use of machines and materials already in use. Many will still apply even when newer and more highly productive systems are added to speed the welding task.

Accordingly, the most important part of an entire approach to problems of productivity can be a willingness to take an objective inventory of existing procedures. This is not an easy job, for it involves the question of what should be looked for. It can be in the work sequences. It can be in the jigs and fixtures, or with the workmanship itself. While welders may be able to get their workmanship past an inspector's careful scrutiny, they could become even better at their jobs through improved training or retraining.

Four Productivity Lags

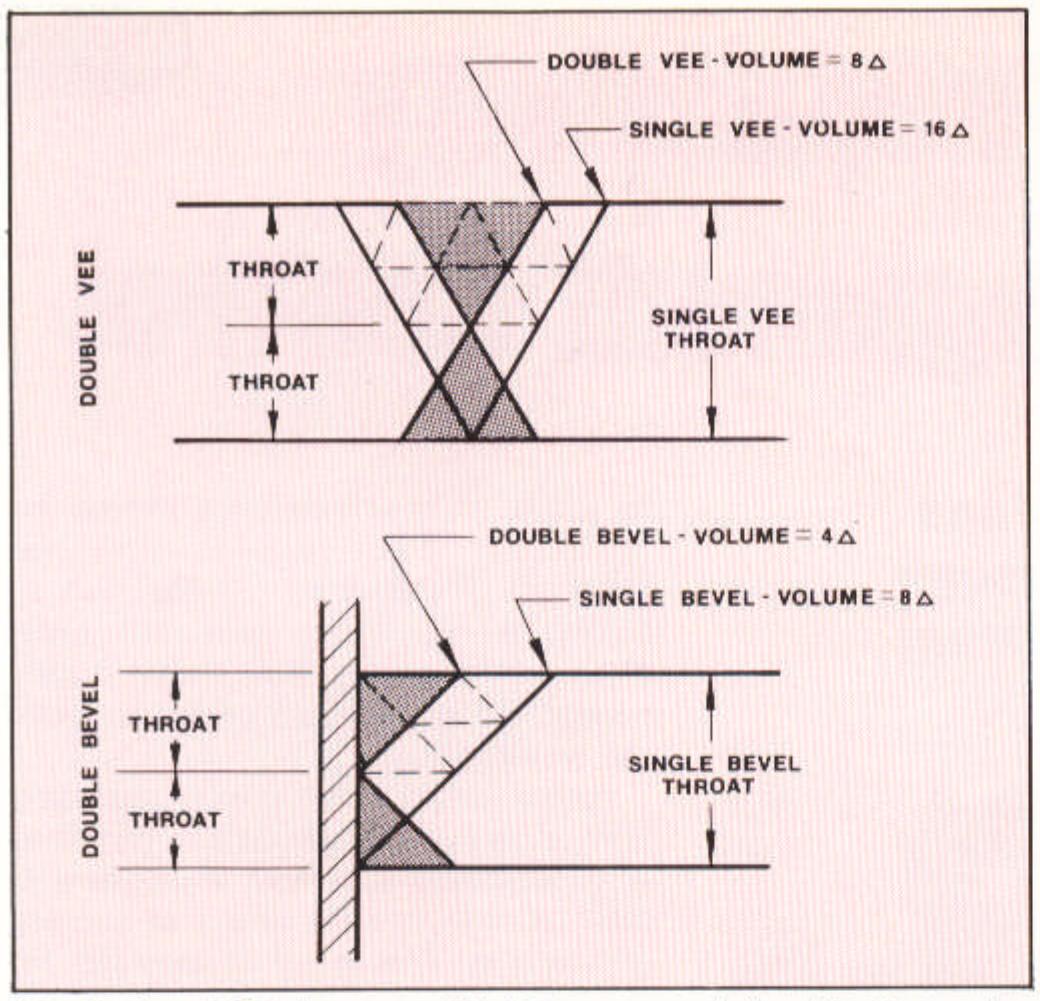
All of these savings have been proven out after verifying their effectiveness in industry after industry involved in production and maintenance welding. Such savings would also apply to the welding operations of railroads, carbuilders, private car lines, and car repair shops. There are four productivity lags that are common to all operations:

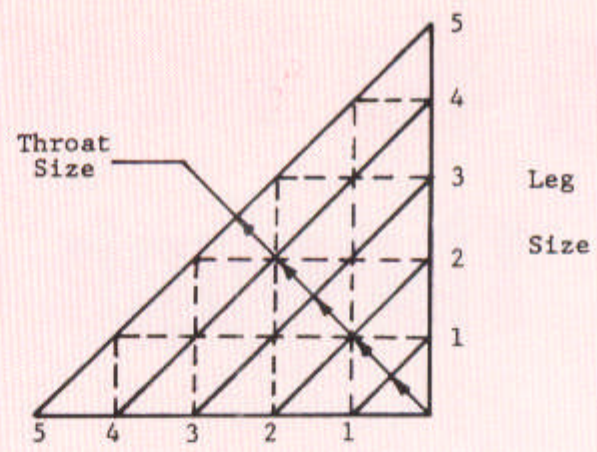
1. Many welding operations are loosely controlled by management, usually being left to the welding operator's own supervision.
2. The average company inadvertently "designs away" welding profits. The idea that "a weld is a weld is a weld," at its worst, yields a welding procedure that has a good chance of causing premature failure. On the other hand, there need not, in most cases, be overly designed weldments.
3. Actual technology in use at many welding operations is 20 to 30 years behind the state of the art. The day of the shielded arc electrode as a high production process is long past. And although the semiautomatic and automatic wire welding machine has become commonplace in railroad shops, its full advantages remain unused.
4. Even where there is an awareness that both the productivity and quality of welding can be improved, there is seldom an in-house capability for correction and control.

For guidance in reappraising a railroad welding operation, the five ob-

Five Do's for Shortening Weld-Cycle Time

1. Do reduce weld-metal volume.
2. Do reduce welding-arc time.
3. Do cut back on rejects in the form of scrap and rework.
4. Do decrease actual work effort through emphasis on "working smarter, not harder."
5. Do cut motion and delay time through workstation planning and control.





RATIO OF:			
SIZE	VOLUME	ARC TIME	STRENGTH
1	1	1	1
2	4	4	2
3	9	9	3
4	16	16	4
5	25	25	5

(Fig. 1 above) Single groove/double groove relationship. Improving productivity means reducing metal volume in the weld joint. (Fig. 2 right) Fillet size/volume/strength relationship. Note high increase of weld metal and arc time vs. fillet strength relationship due to weldment over-designing. Prevention could save up to $7,000/operator

jectives or "Do's," listed on page 63 can reduce welding-cycle time right from the onset of any such review (see box). Further, such "Do's" can continue benefitting any welding operation as it becomes more attuned to productivity and control.

As stated, improved welding procedures begin with a detailed evaluation of existing weld design, processing, production, and quality assurance. Next, a plan or approach that applies the five Do's should be laid out, followed by preparing personnel in each critical function for implementation and control. Such a training program should apply not just for the welders but for supervisors and quality control backup personnel as well. Inherent also are monitoring and auditing the new program, first to be sure that it is effective, and second that it be assured of continuance. Those involved must be taught to measure and to *control* the functions.

Finally, reporting is necessary. Reports are needed to measure progress and also to set the stage for the next day's activity rather than just take the work as it comes.

Problem-Solving Atmosphere

Too complex? After all, much of a successful welding operation has been characterized by the work of those with so much native mechanical ability that when you get the right person for the job he will do the "Do's" by second nature. However, the savings listed at the beginning of this article are real dollars generated only by that very type of craftsman. Since the program will seek to change bad work habits and step up control in an effort to increase the number of such craftsmen, there could be some objection. That disappears, however, when the plan begins to provide an atmosphere that encourages problem-solving and the development of individual abilities through responsibilities and rewards.

By the same token, the success of such a program will be proved out at the workstation. If the plan is working, the welders, all qualified according to the plan, will be aware that they can consistently produce a better product that meets the productivity and quality standards spelled out in the program.

Future articles will discuss in detail each of the five Do's, with specific examples of how they can be used effectively and how each relates to the others. ■

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Barckhoff and Associates, Inc., is a Minneapolis-based welding engineering consulting and training firm, working in the four function areas of Product Design, Processing, Production, and Quality Assurance, to assist their clients in increasing welding productivity and improving weld quality.

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