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Checklist: better welds, higher productivity

A step-by-step assessment of design, manufacturing, and quality control procedures can help you get costs back in line

by JACK R. BARCKHOFF, *welding consultant, Barckhoff and Associates, Inc.*

If welding is a major part of your manufacturing operations, you may be ready for the systems approach treatment. Especially valuable for companies with limited welding expertise, such programs offer a disciplined, systematic analysis, planning and implementation procedure which ensures that you use good weld design practices, select the right welding process, and meet high quality standards in welded products.

Your company may need the systems-approach cure if you recognize two symptoms. Number one: your product design, manufacturing, and quality assurance people are shaky about weld design, process and procedure selection, and inspection methods. Number two (usually the result of number one): Your welders work with little supervision and decide for themselves matters of design, process and procedure selection, and quality control. The continuing outcome of both ills can be quite costly in wasted materials, low productivity, and greater odds of product liability losses.

Consider, then, a systematic attack to improve weld quality and productivity. It might go something like this:

Phase I — Program Goals and Resources

Objective: Establish management goals and resources.

Setting goals: State the goal. Example: Reduce welding department costs by \$500,000 annually. Define the scope and objectives needed to arrive at the desired results for weld quality and productivity. Form a plan and assign data-gathering tasks in preparation for the implementation phase. Set a schedule when the goal is clear and you are ready to initiate your program.

Estimate resources: Determine existing resources in the company (manpower, capital, equipment, facilities). Will additional resources be available?

Phase II — Information Gathering

Objective: Gather and analyze data.

Welding department: Observe, record, and evaluate activities at each weld station. Analyze and evaluate processes, procedures, equipment, fixtures and positioners, parts input and surface condition, and fit-up. Evaluate welding operator capabilities. Study flow of material through the department and work station. Review blueprints to identify good and bad practices.

Other departments: Study methods by which design, manufacturing, and industrial engineering departments relay information to the production floor. Evaluate communications systems used to coordinate design, manufacturing, and quality assurance to be certain that final parts reproduce those in the prototype.

General: Interview department managers for their complaints, problems, and ideas for improving quality and productivity.

Phase III — Program Systems Planning and Consolidation

Objective: Build plan and select best path to meet management's goal or goals.

Clarify goal: Restate goal to be sure it continues to be understandable. Alter original plans if necessary to meet management's desired results.

Evaluate ideas: Evaluate ideas for improvement. Estimate cost savings. Brainstorm and pool ideas for implementation.

Consolidate recommendations: Prepare plan for improving productivity and quality. Write report and get top management endorsement for implementing the plan.

Phase IV — Prepare Personnel for Implementation

Objective: Begin education program to teach latest welding technology. Prepare personnel for implementation and control steps.

Outside sources: Encourage personnel to attend university and vocational/technical classes, and to enroll in correspondence courses. Participate in activities of professional societies; attend their meetings and seminars. Attend seminars conducted at suppliers' plants. Subscribe to trade magazines. Obtain training films. Buy textbooks on welding; maintain a welding library.

In-plant training: For instructors, look in-house and to local universities, vocational-technical schools, welding suppliers, and consultants. Training clinics might cover (for *design engineers*): What the design engineer should know about arc welding. Materials selection for welding. Welding symbols and their application. Primary joint requirements and their design. Calculated weld sizes and cost of overwelding. Product and fixture design as related to welding. Distortion control. (for *manufacturing and industrial engineers*): What the manufacturing and indus-

trial engineer should know about arc welding. Process and electrode selection. Equipment selection. Importance of procedure control. Ideas for cutting costs without capital investment. Measurement of welding time. How to study welding operations to gain control of the work station. How to make the operator successful. Estimating weld costs. (for *quality assurance personnel*): What the quality control inspector should know about arc welding. Role of the inspector. Nondestructive and destructive testing methods. Weld defects and their causes. How welds are tested. Importance of weld procedure for quality assurance. Weld symbols. Use of the fillet gage. (for *welding supervisors*): Importance of procedure control. Process selection. Process problems and their solution. Welding symbols. Use of the weld fillet gage. (for *welders*): Importance of welding procedures. Welding symbols. Use of the fillet gage. Overwelding. Process problems and their cures. Process techniques. Equipment troubleshooting.

Phase V — Implementation

Objective: Implement program to achieve desired cost-saving, productivity, and quality goals.

Set up methods called for in plan: Implement program at all work levels. Prepare company welding handbook. Build welding mock-up.

The company welding handbook acts as the authority on standards, guidelines, and control methods. It gives essential information not listed on blueprints. It might include sections on inspection standards and procedures, design and manufacturing engineering practices, welding symbols, operator techniques, welding problems and solutions, equipment maintenance to be performed by plant engineering and the operator, and welding procedures by process and joint design.

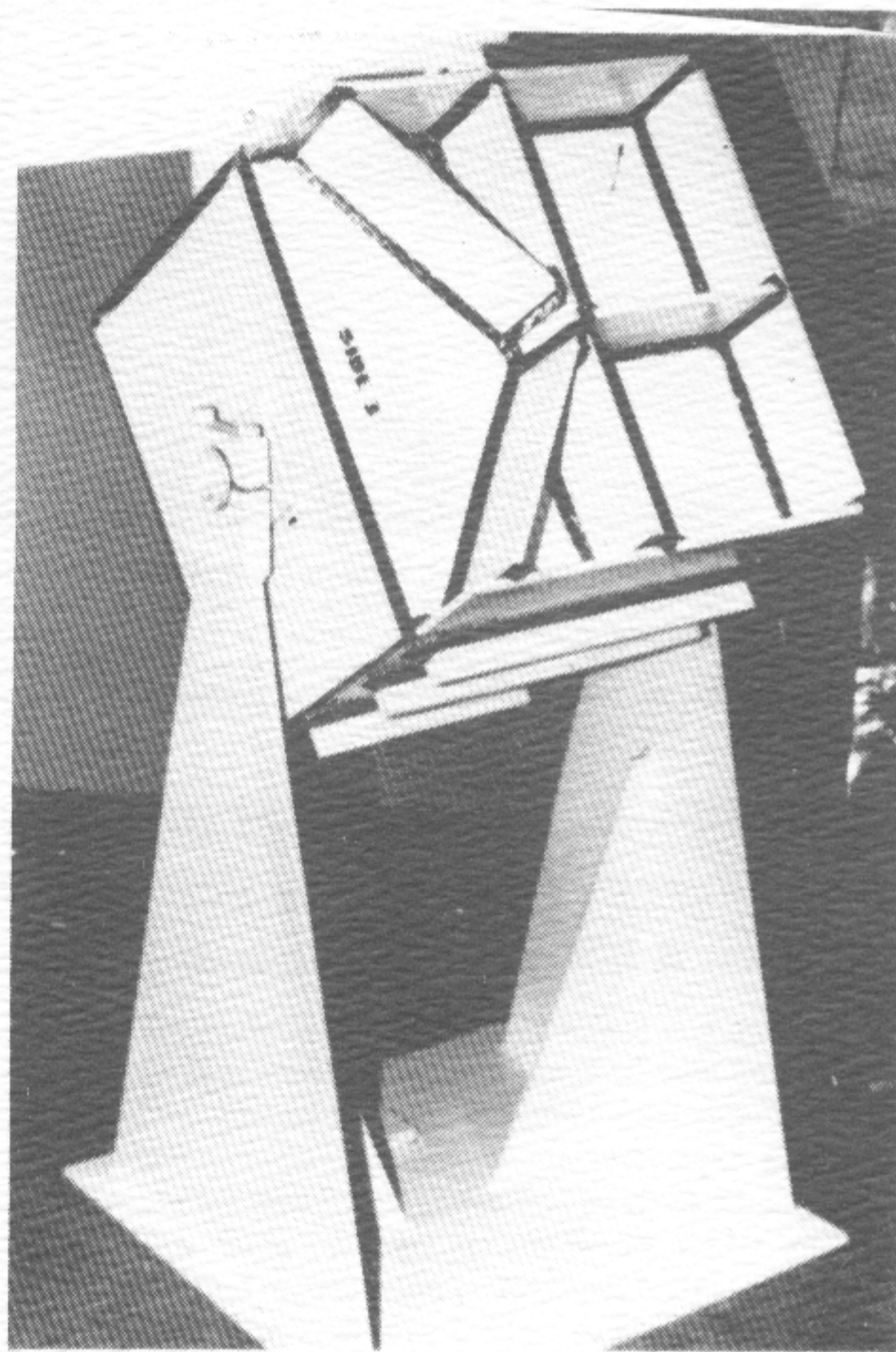
The mock-up serves as an indicator of acceptable quality for every weld, particularly proper size and position. Keep it in the welding shop where it is handy to welding inspector, supervisor, and operator.

Making it work

During the follow-up phase, the monitoring methods and procedures begin working to assure control, quality, and quantity. Control returns to management; the operator is relieved of engineering decisions (a responsibility he probably did not want) and, instead, is given standards, guidelines, and performance goals that he helped establish.

Caution: Companies sometimes fail in ambitious programs for improving quality and productivity because they do not emphasize action as much as planning. You need the commitment of top management and staff and line personnel. Don't let things happen; make them work.

Backing of top management is essential because decisions concerning manpower, capital, equipment, facilities, and budgets will be needed. Also, you'll need management support to help get the program through those periods when resistance to change and demands on departments for extra effort, manpower, money, time, and resources are greatest — usually during startup. Since the program will seek to change work habits and



Welding mock-up depicts every weld in the product, serves as good quality assurance device. Keep it handy to welder, supervisor, and inspector.

increase the amount of control, you can expect some objection. However, the plan will provide the atmosphere which encourages problem-solving and development of individual abilities through responsibilities and reward.

Pick a leader

To be most effective, a system approach should be headed by an administrator whose prime responsibility and authority is to make the plan work. The administrator must have direct communications with all managers. Give him a welding task team, a group of people involved in welding (from design to quality control), each with a strong commitment to the plan. If properly directed and motivated, the team can recommend policies, manufacturing procedures, and guidelines that are compatible with all departments, thus ensuring a cooperative attitude.

Measurement of program success will be at the work station. If the plan is working, your welders — all of them qualified according to your plan — become aware that they can consistently produce a product that meets quality and productivity standards that are spelled out. ■



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