Cost Saving Application Ideas For Cutting And Welding

Bug-O Systems

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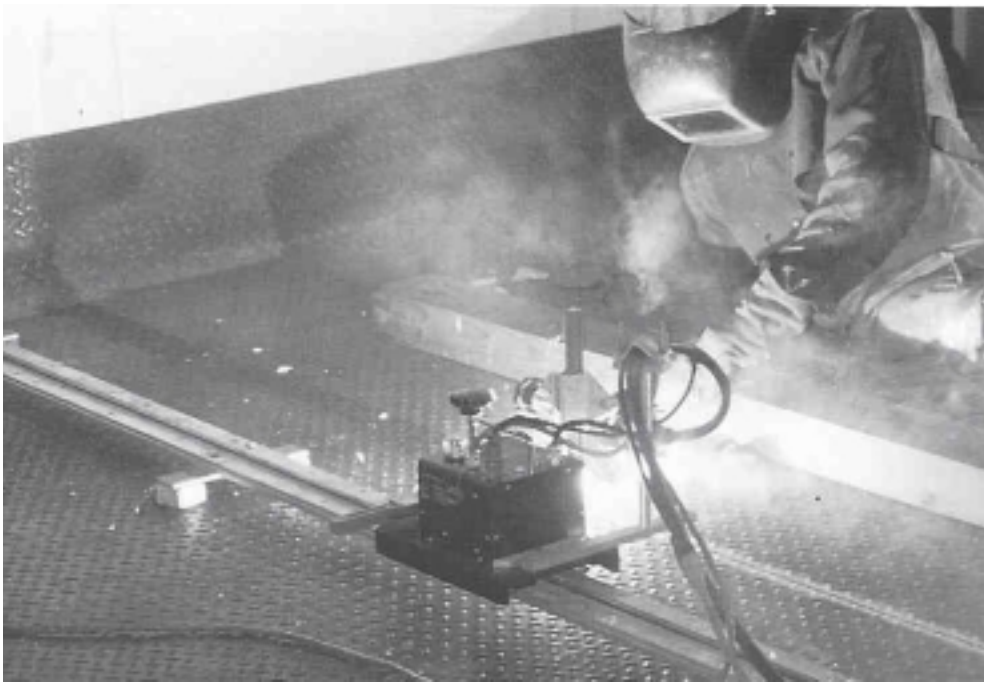
Plate Fabrication / Tanks

DC III Provides Fast Travel Speed With High Deposition!



Our company contracted to seam weld 3/16 “ (4.76 mm) diamond plate for a blast freezer floor system. The diamond plate was laid on top of 9” (228.6 mm) freezer insulation, and the seams to be welded, were protected from the insulation by 1/8" (3.17 mm) masonite. We had approxomately 2 miles of welding with minimal deck warpage to accomplish in 4 weeks. We had to put the weld down and not burn up the insulation. Hand welding would have been too costly and too hot for the masomte and insulation.

After talking with welding suppliers and other welding outfits, we decided to use a Bug-O Systems DC III with a pendant control and weld start switch to increase our welding production time.

With the DC III set up we were able to have a fast travel speed and a high deposition rate of weld. Deck warpage was kept to a minimum and no damage occurred to the foam insulation. The job was completed in the time frame allowed with good weld appearance and very little operator fatigue. Using the DC III setup, we were able to weld 85% of the time as opposed to a 40% operating factor when welded by hand.

EQUIPMENT:

Bug-0 Systems DC III with pendant control and weld start switch, 4-8' (2.37 m) sections of rigid rail, 2-4' (1.11 m) sections of rigid rail, magnets and an LN-9 set up for.068 wire.

Increased Productivity!

We had a project for a desalination plant. We had started welding with a semiautomatic welding process for the carbon steel joints and CU-NI plate. The joints were placed between a carbon steel flange box and CU-NI plate of tube sheet collar.

We were using AWS ERNiCU-7 MIG wire and developed many prob- lems because it is impossible to get a nice weld with the semiautomatic process. The main problems on this weld were bad bead appearance and excessive spatter. To solve these problems in the most economical way, a Speed Weaver II was used.

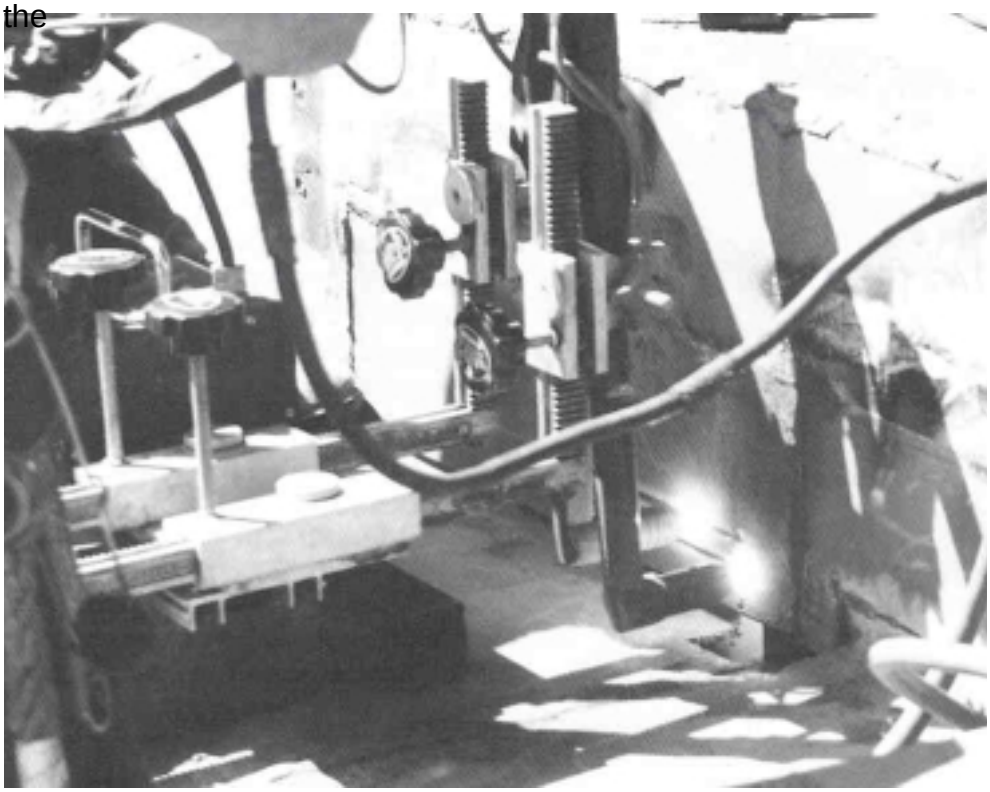
With the semiautomatic welding process, it took 140 man hours to weld one sheet of CU-NI plate to the flange box. Using the Speed Weaver II, we can weld in less than 60 man hours. This means that productivity increases 233%.

EQUIPMENT:

Bug-O Systems Speed Weaver II, automatic cutting carriage, semiautomatic wire feeder.

DC Welding Kit Applies A Continuous Fillet Weld And Repairs A Stadium.

The company contracted repairs to a stadium with severe salt water corrosion problems. Positive slope for drainage had to be introduced to 21,645 feet of 4" (102 mm) plate seats. Existing construction is individual seat bottomstbacks with a 2" (50 mm) return at the back edge to lap the seat above. Plans called for removal of a backside stitch weld, and removal of a strip at each seat front to accommodate the introduced slope. The back of the new lap required a continuous fillet weld, and the owner desired the



front of the joint to be welded with a very large contour, which necessitated 3 passes (64,935 inches).

The intent was to shed water quickly, stop any capillary action and provide a positive base for subsequent sandblasting and paint. In many cases, the 4" (102 mm) plate at the lap was heavily corroded with a 3/8 " (9.5 mm) gap between plates. This gap was filled with rust flakes, corrosion, trash, or water.

The concern was using oxy/acetylene cutting due to the difficulty of bridging the gap, cutting two pieces at once, blowback onto personnel and high gas cost at our location.

We elected to remove the entire corroded bottom plate edge including existing stitch welds by teaming up high-capacity plasma cutters with a Bug-O Systems tractor mounted on a 45' (1371 m) Bug-O rail. The tractor carried the plasma torch heads in tandem, cutting out a coupon of the desired depth of adjustment. This depth varied between 1/2" (12.7 mm) and 2 1/2" (64 mm) depending on the degree of existing positive or negative slope. Adjustment to suit the condition of each seat took just seconds with the Bug-O double torch cutting attachments.

We mounted the Bug-O rail on a light tube truss x 45' (1371 m) which prevented cut straightness variations by spanning existing seat highs and lows. The truss also allowed speedy jumping to the next seat. An operator adjusted torch standoff to suit existing wavy seatback variations. The adjustment knobs are easily accessible and simple to operate.

The entire removal of the coupon of corroded, previously welded material saved the owner several hundred thousand dollars in weldable material replacement costs. The savings in oxygen and acetylene was estimated at $450,000.00. Our personnel were not subjected to blowback from the various material spaces and types. The Bug-O plasma combination plowed through a multitude of differing conditions without slowdowns to adjust for different thickness and contamination types.

We ordered 3 handheld plasma torches per setup. The third torch was used in a conventional hand torch mode until it was needed as a backup for the pair held by the Bug-O. The switch was rapid and no time lost on the main cutting operation. We used 2 complete setups with excellent results.

EQUIPMENT:

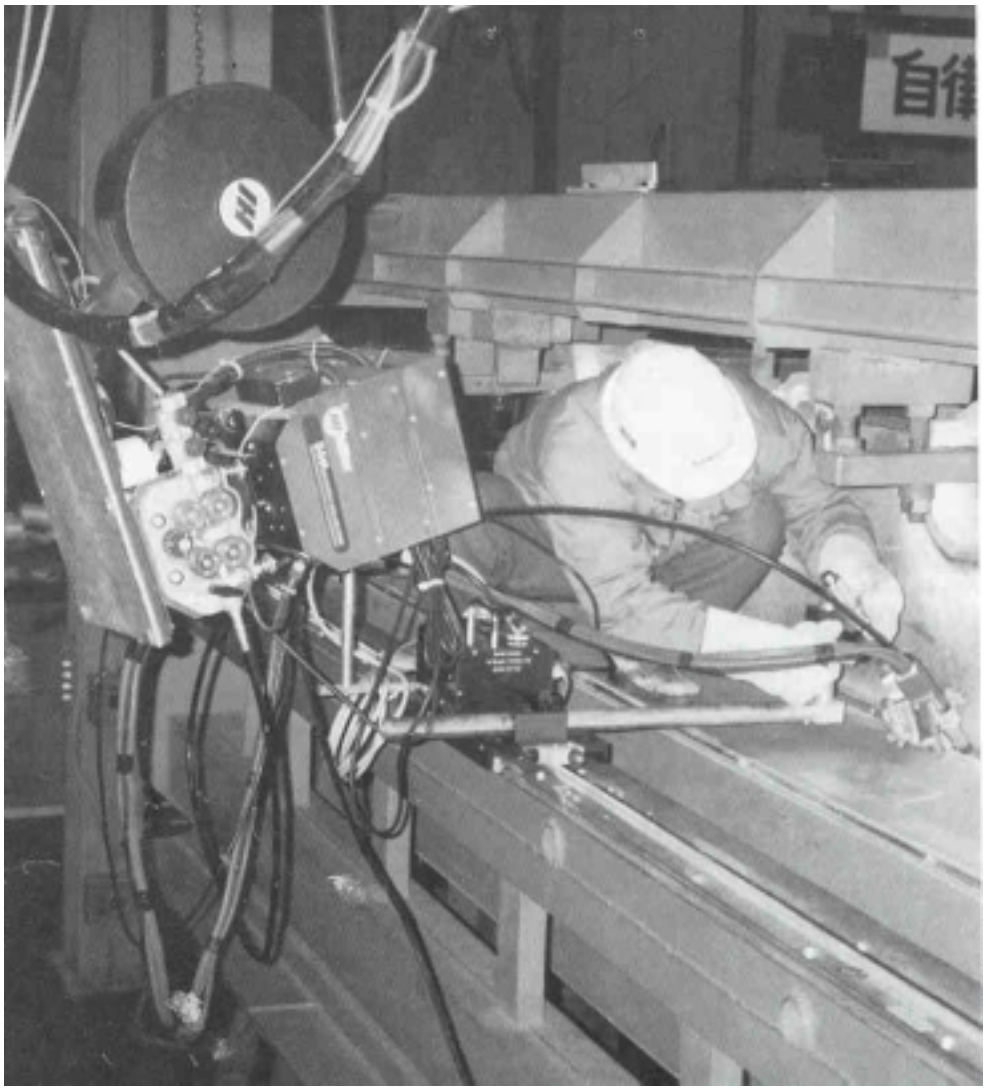
Bug-O Systems DC Welding Kit, 45' (1371 m) rail, double torch welding kit, 2 Miller Spectrum 1500 DC plasma cutters, Miller DC- 600 power units, 45" (1143 mm) tube truss.

Steering Function Solves Welding Problem And Increases Production!

The company was doing most of their welding applications by hand and as a result were having problems welding large aluminum weldments. They were not happy with the productivity or quality of the work they were doing. It was also becom- ing more difficult to find and keep skilled welders. They purchased a Bug-O Systems Remote Steering Weaver Kit and Comer Follower.

Initially, the machine was used to make straight welds using the Comer Follower. The Remote Steering Weaver was then used on large fillets. The steering function on the machine enabled them to track the seam as the machine ran. As a result, production increased by 210%, and savings are estimated at more than $26,000 a year.

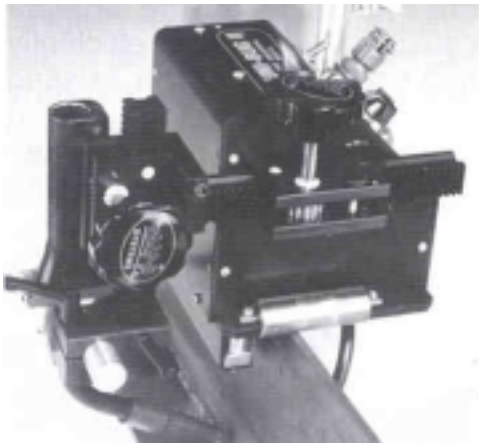
EQUIPMENT:
Bug-O Systems Remote Steering Weaver, Corner Follower, Heavy Duty Racking Group, DC IV.



A Powerful UNI-BUG

The UNI-BUG II is more powerful and versatile than its predecessor, the UNI-BUG, but still bundled in a small package. The UNI-BUG 11 has the capability of running on material up to 2" (50 mm) thick, and our patented design enables the machine to run directly on the workpiece in virtually any position. The UNI-BUG II will travel at speeds of 4-75 ipm (102-1905 mmlin) and has a 50 lb. (22.7 kg) load capacity. The UNI-BUG II is lightweight and portable, weighing only 14 lbs. (6.5 kg).

An example of UNI-BUG II versatility is the machine's ability to run on a straight line and continue running nonstop down to a 6" (153 mm) radius cutting or welding inside or out. A special feature, presently being designed for use on the UNI-BUG II, is a module that will enable the machine to be modified for skipwelding.

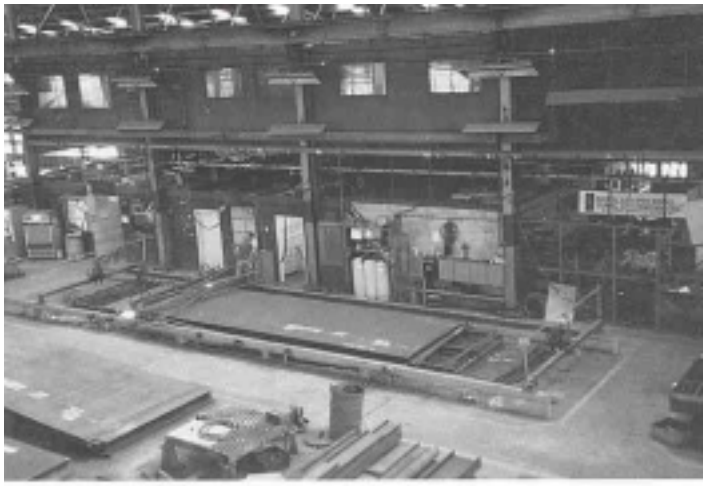


MUG-O Eliminates Layout Time And Cuts Material Handling!

The Capital City Iron Works in Richmond, Virginia had a large number of shell plates that they had to cut. Previously, they had been using a friction drive cutting machine to do the job. On the first pass, they would make a straight cut and would follow that with a bevel cut on the subsequent pass. By doing so, they discovered that they were spending too much time in the layout depart- ment and were handling the steel more than they wanted.

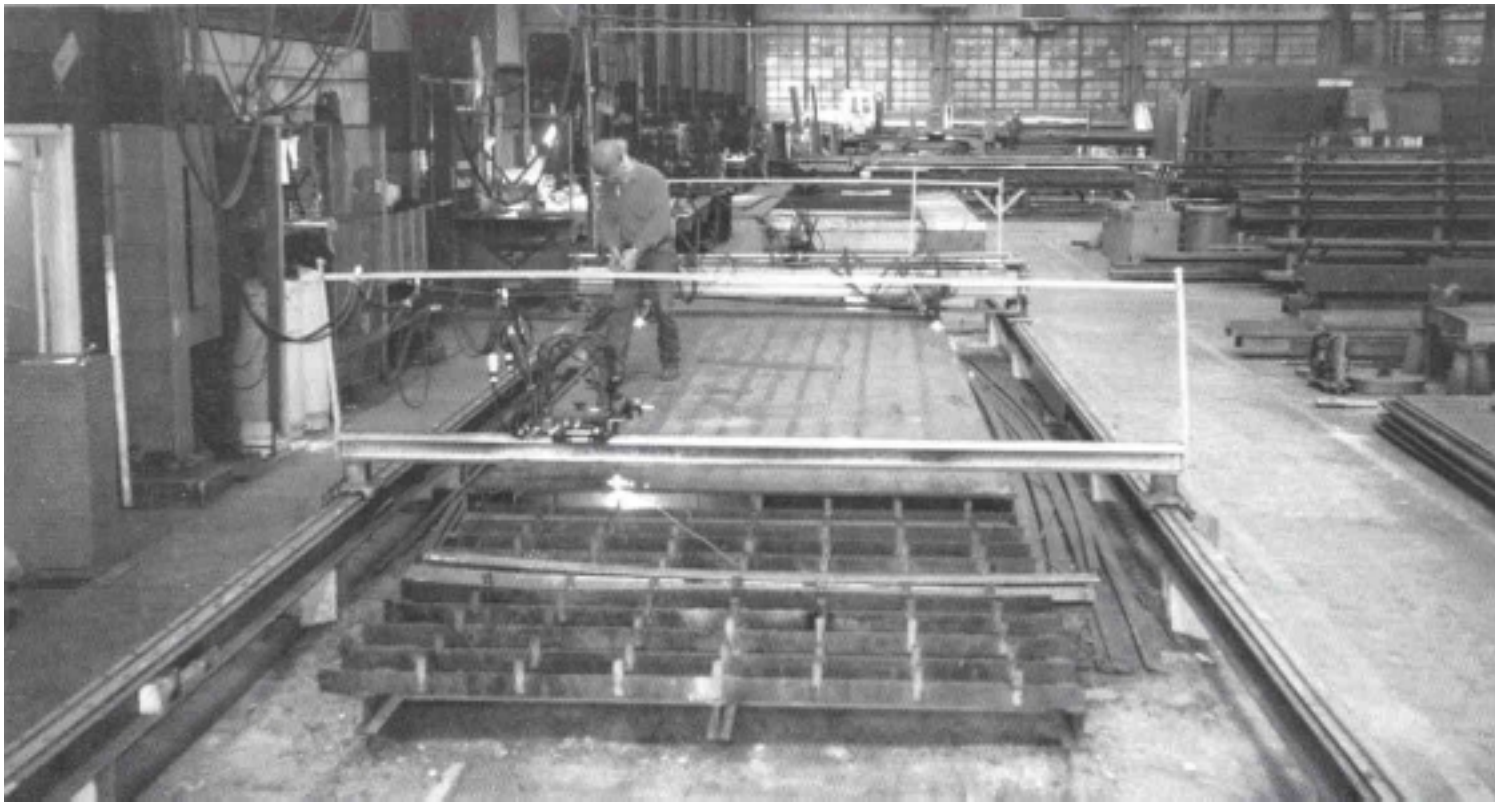
Their solution, was to purchase a MUG-O, which is a multiple torch, gantry-type machine, designed for plate stripping, edge preparation, cross-cutting and camber cutting. By using the MUG-O, all layout was eliminated, except for measuring and setting stops on the first plate. The operator makes the cut and bevel in the same pass by using two torches. A third torch is used to bum the plate to the proper width.

By using the MUG-O, Capital City was able to save a substantial amount of time. The job required only one operator and it enabled them to deliver the finished shell plates sooner to the customer.



EQUIPMENT:

Bug-O Systems MUG-O multiple torch machine with floating torch mounts, MUG-O end trimmer.



GO-FER III Cuts Turnaround Time!

The company has a welding lab and one of the main purposes for the lab is a place for conducting welder training and qualification. They needed a method of preparing welder qualification test and practice plates. Most of the welder qualification tests are made on 3/8" or 1" (9.5 or 25.4 mm) thick plates. These plates are initially received from the fabrication department with 22/21 bevels milled in the plates. After these plates are welded, test samples are cut out for bending. One problem was how to decrease the welding sample turn around time and reduce the amount of scrap plate produced. The other problem was that there is a very limited amount of space in the welding lab. .

The GO-FER III was purchased to use for flame cutting bend test samples out of the test plates and to re-bevel practice test pieces. Using this piece of equipment greatly decreased the turn around time for test sample preparation. Test samples can be prepared right in the welding lab instead of sending the parts to a machine shop. The greatest cost savings came from being able to re-use practice test plates as many as three additional times. This produces about a 60-70% savings in the amount of material used. The other nice feature of this unit is that it is light and portable. This allows the cutting table to be used for other purposes and to store the unit in the lab office when it is not in use.

In addition to performing the tasks for which the GO-FER III was originally purchased, we are finding other applications. For example, the machine was used for cutting long strips out of rectangular tubing to make extra strong non-standard channel for some material handling carts. The machine is easy to use and setup for a variety of applications.

EQUIPMENT:
Bug-O Systems GO-FER III with an oxy-proplene cutting torch.

Increased Productivity!

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EQUIPMENT:
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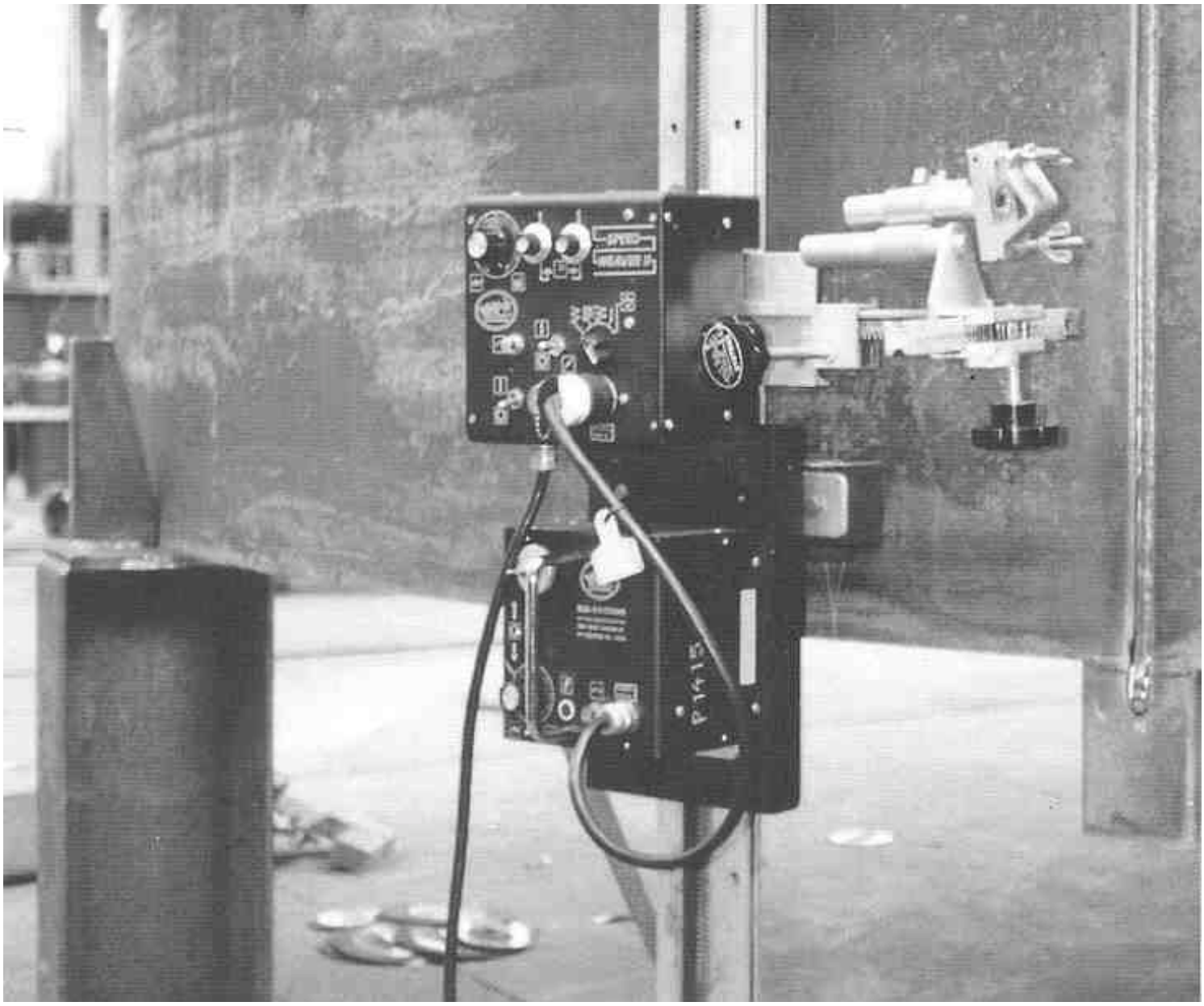
Speed Weaver II / DC IV System Is The Solution To Reducing Expense!



Purchasing a BUG-O SYSTEMS Speed Weaver II / DC TV made it possible to reduce the capital outlay for expensive turning rolls (rotators).

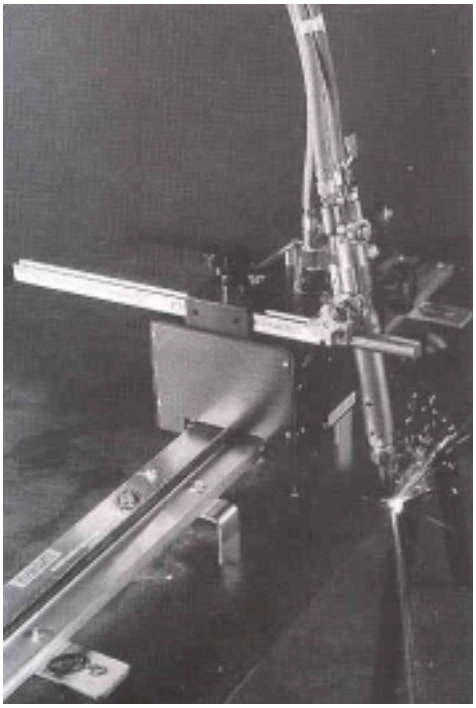
The Speed Weaver II is a light-weight easy to use machine for automatic weld weaving. It is a precision solid-state linear weaver with built-in weld contact control. The machine can produce any of the commonly used weld weave patterns. A semiautomatic welding gun can be mounted on it to make fully automatic welds.

The Speed Weaver II mounted on a DC IV Tractor, the basic drive for many BUG-0 SYSTEMS machines having a positive rack and pinion drive plus a wide range of speed control, was used for welding longitudinal joints on 19.68' (6 m) diameter strakes (strake thicknesses range 1" (25 mm), 1 7/16" (28 mm), and 1 3/16" (30 mm) in a vertical up application, eliminated the need for rotators and costly handling equipment. Please note that this particular project required the purchase of three work centers of rotators (3 drive rotators and 9 idler rotators). To purchase a further drive and idler to facilitate a conventional method of longitudinal welding would have wasted capital and workshop space.

EQUIPMENT:

BUG-O SYSTEMS Speed Weaver II mounted on a DC IV Drive.

The GO-FER III H.S. - Faster Setup Time and Better Cuts!



Pape Brothers Inc. in Eugene Oregon had a friction drive cutting machine that finally wore out. Replacement parts were difficult to get and the machine wouldn't travel fast enough to use their new plasma cutting machine. Besides, setup time was taking too long. It was determined that a new machine should be purchased. Pape Brothers priced three machines and tried out two, one of which was the GOF-ER III H.S. This was the machine finally chosen to do thejob, because it gave the most versatility and was the best buy for the money. The machine is quick to set up and does a nice cutting job.

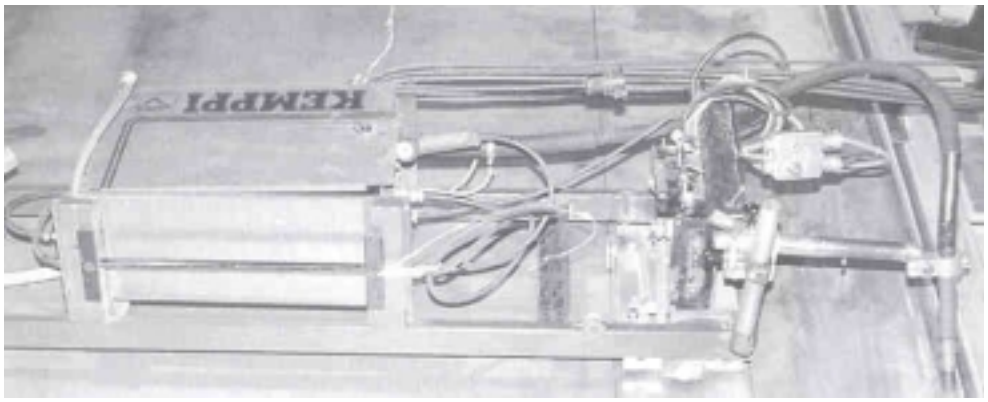
When they purchased the GOF-ER, Bug-O Systems gave them a good price on a package deal, which allowed them to buy extra sections of rail, plus a circle cutter.

With the GOF-ER, Pape Brothers has been able to use their plasma cutter on lighter gauge steel and it has produced faster, high quality cuts than they were able to make before. The GO-FER has turned out to be adaptable for so many types of applications, the company feels that it will be an asset in contributing to the future growth of the company.

EQUIPMENT:

BUG-O SYSTEMS High Speed GO-FER III H.S. Circle Cutter,
4' rail, 8' rail

Mechanized Welding



We needed a machine for mechanized MIG welding. The weld joint is a 16 in long curve with a radius of 20 in. Weld type is fillet welding, 7-20 beads, and the materials are stainless steel and aluminum. High requirements were put on speed control and tracking ability. The machine should carry a weight of 50 kg (wire feeder and spool) at stable speed, and it should be easily removed and assembled onto another workpiece.

The total length of the joint to be welded within this project is 118,000 m, the number of products is 120, and the duration of the project is 2 years.

Demonstrations involving existing BUG-O applications and various welding tractors did not lead to satisfying solutions. We decided to develop our own "SPW BUG-O tractor" application.

The machine that we developed can be used as a normal welding tractor at downhand welding (without necessary guides), or at vertical welding with the addition of extra supports. The machine worked fine on a workpiece with 5000 mm radius. By adding accessories the BUG-O Skutter can be turned into the "SPW BUG-O tractor" and vice-versa in 30 minutes.

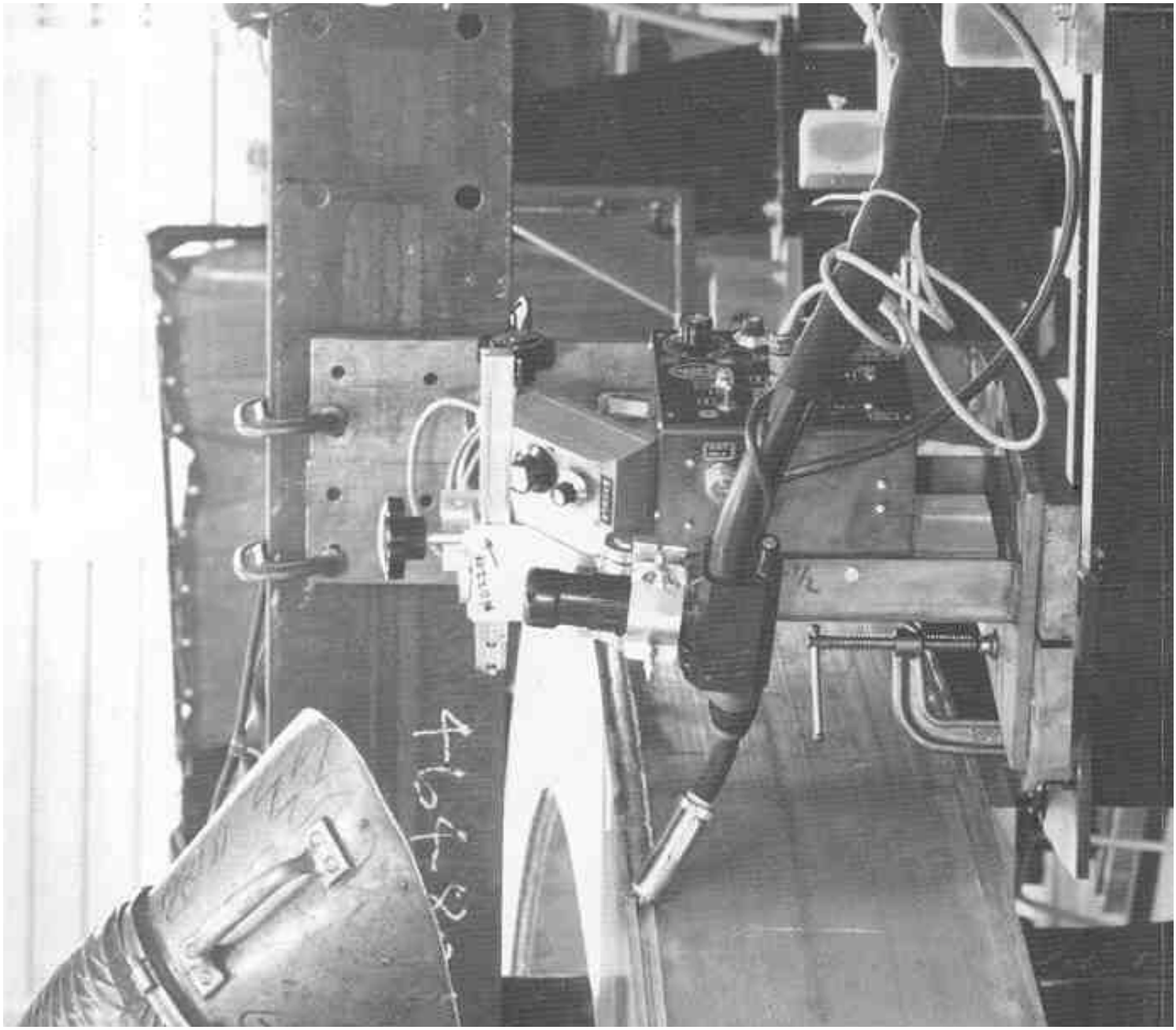
We have welded about 20,000 m with 4 "SPW BUG-O's" and they have worked perfectly.

Savings in investment of about $75,000 by using our BUG-O Skutters instead of purchasing 4 new welding tractors. Savings in working hours are difficult to estimate because we have not tried any other applications for this job. In our opinion this kind of accessory improved the BUG-O Skutters' flexibility. They might be a good optional extra for BUG-O Skutter users.

EQUIPMENT:

4 pcs. BUG-O Skutter,
4 pcs. "SPW BUG-O" accessory kits,
4 pcs. Transporter bodies

No Time For Leaks, Distortion Or Inconsistent Bead Size.



The problem was to weld an Aluminum Cyrostat that was 50 feet in diameter. Our time was limited. The Cyrostat had to be as leak free as possible on the first pass so that any additional repair work needed to achieve a vacuum would be held to a minimum.

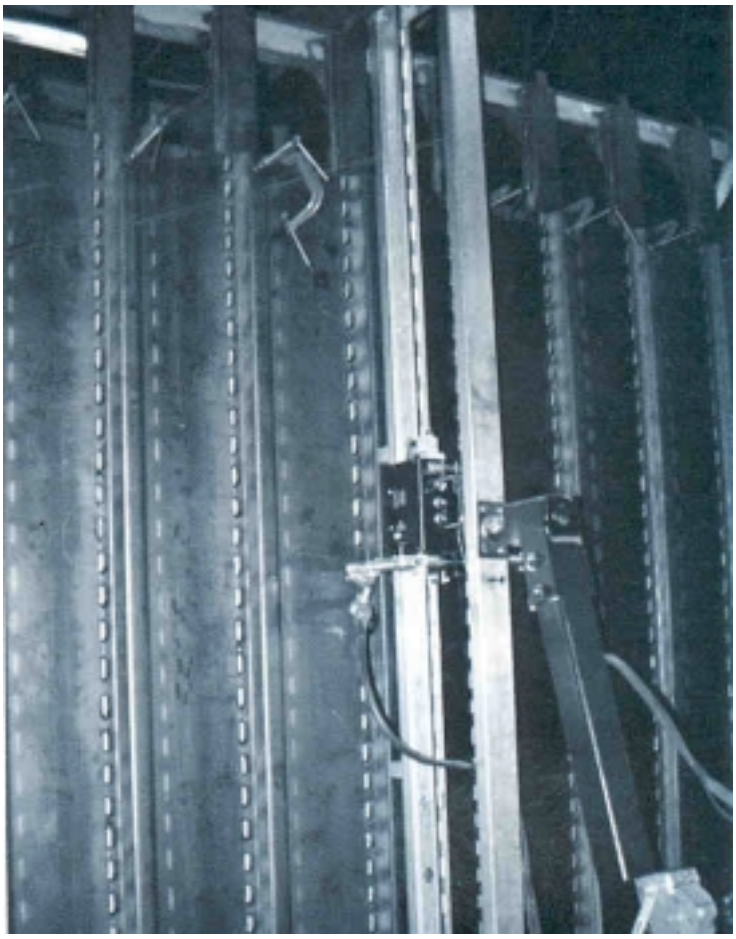
One assembly, that had been welded manually, required 3-1/2 weeks to complete and the results were poor. There were numerous leaks, it took 3 passes to fill and the inconsistent bead size affected distortion.

To solve these problems, a turn table with a platform mounted on it, originally used to machine and wind coil, was put to work in the welding process.

A GMAW with a BUG-O Speed Weaver was set up on the end of the platform. This setup would weld the joint in one pass and produce good bead consistency and size.

The results of this setup were excellent. The weld was completed in one week, and the weld sequence could be carefully controlled. There was virtually no distortion. The ring is 00.032 TI.R., there were only 3 vacuum leaks which minimized repair time.

UNIVERSAL SKIP WELDER saves time and produces smooth even welds



This company wanted to be able to join several sheets of 14-gouge steel quickly and eff iciently. At the same time, it was necessary to achieve minimal warpage and create a structurally and cosmetically acceptable joint.

They attached a pulse-spray mig welder to a BUG-O UNIVERSAL SKIP WELDER and the accompanying track system.They could attach the UNIVERSAL SKIP WELDER to a jig fixture, mounted on a framework, which holds the 14-gauge steel sheets in the proper position for assembly.

The UNIVERSAL SKIP WELDER allowed them to preset the equipment to achieve a weld-2" skip-2" pattern. The pulse-spray method of welding, combined with the high travel speed capabilities of the UNIVERSAL SKIP WELDER, enabled them to weld much quicker than by hand. This eliminated the problems of warping and also reduced the time spent welding. The result was a quick tight joint, with smooth evenly spaced structurally sound welds.

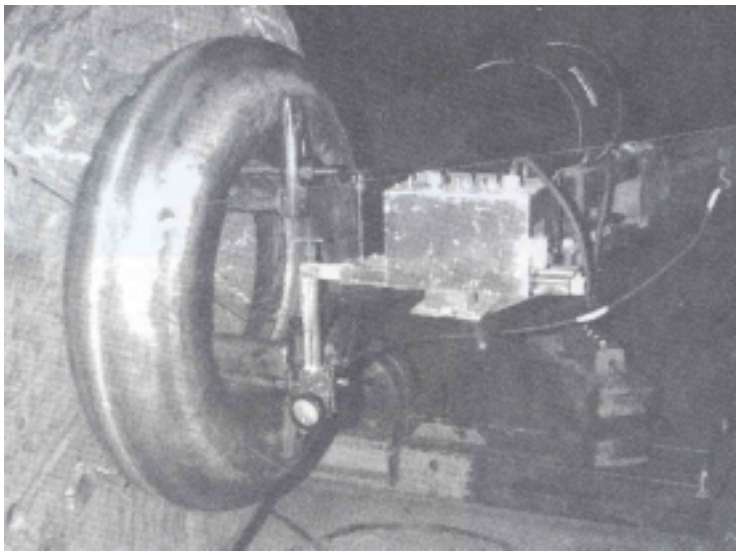
EQUIPIMENT:

BUG-5080 UNIVERSALSKIP WELDER and 1O’ (3 m) of track, BUG-2975 Cable Mounting Assembly, BUG-5160 Heavy Duty Racker Welding Group, BUG-5188 Torch Holder Assembly, Miller XMT 300 power supply S52 feeder with optimal control and burn back.

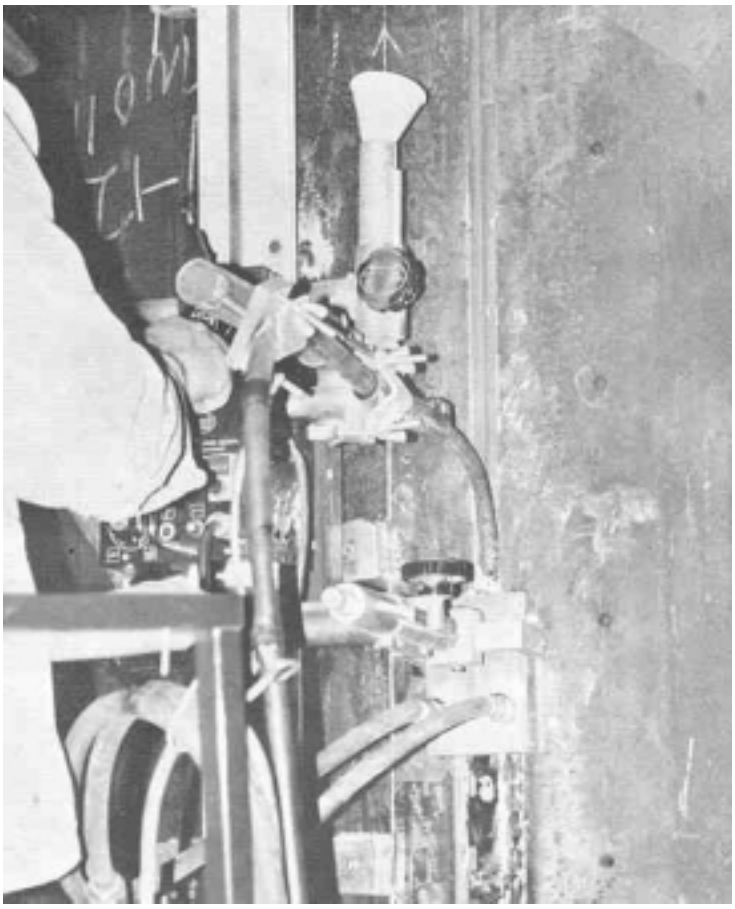
SPEED WEAVER REDUCES COSTS BY 60%

We weld return bins for the heat treating industry which are made out of stainless steel. Normally they are TIG welded by hand with stainless wire. The problem was that the quality of the weld was very poor and inconsistent, requiring a lot of rework and touch-up.

We mechanized the process with a BUG-O Speed Weaver mounted on a manipulator arm. The return bin was mounted on a positioner underneath it. The weaver, positioner and manipulator were rewired into a central control box so that all controls would be at one location. We used the TIG welding process with cold wire (.045) feed. In order to feed the wire into the TIG arc, we designed our own sleeve and nozzle, and mounted it on the speed weaver. The weaver was painted black to reduce reflection.



Automated Electroslag Welding Increases Production.



Close-up of the BUG-O-VERT making the weld.

The company had a contract to manufacture steel mill ladels. They were hoping to be able to weld them in the vertical position in order to minimize material handling. The welds could not be made from one side of the ladle because of distortion. Material thickness was 1-3/8" (35 mm) with a 1" (25 mm) square butt joint.

The solution was to purchase a BUG-O-VERT and use the electrosiag process, which has little or no smoke—it's easy to use and requires a minimal amount of training. The customer used a standard BUG-O VERT and made special water-cooled copper shoes and back-up bars.

The company was able to achieve a very high deposition rate—27 lbs. (12.2 kg.) an hour and achieved outstanding results. They were able to make 14 ft. (4.27 m) non-stop vertical welds in 2-1/2 hours running time with no distortion. The welds were 100% x-ray perfect. By using the electrosiag process they were able to achieve four times the weld deposition rate over semiautomatic flux-cored wire and twice the rate of sub arc. Cost-savings per seam was calculated to be 17 hours with the electrosiag process versus using a CO_2 flux-cored process.

EQUIPMENT:

BUG-O-VERT, BUG-O rail and magnets, 3/32" EM 1 2K wire and granulated neutral flux. Special water-cooled copper shoes, back-up bars and fixturing made by the customer.

The BUG-O-VERT being used in the electroslag process.

FOLDING MUG-O PAYS FOR ITSELF IN 12 MONTHS

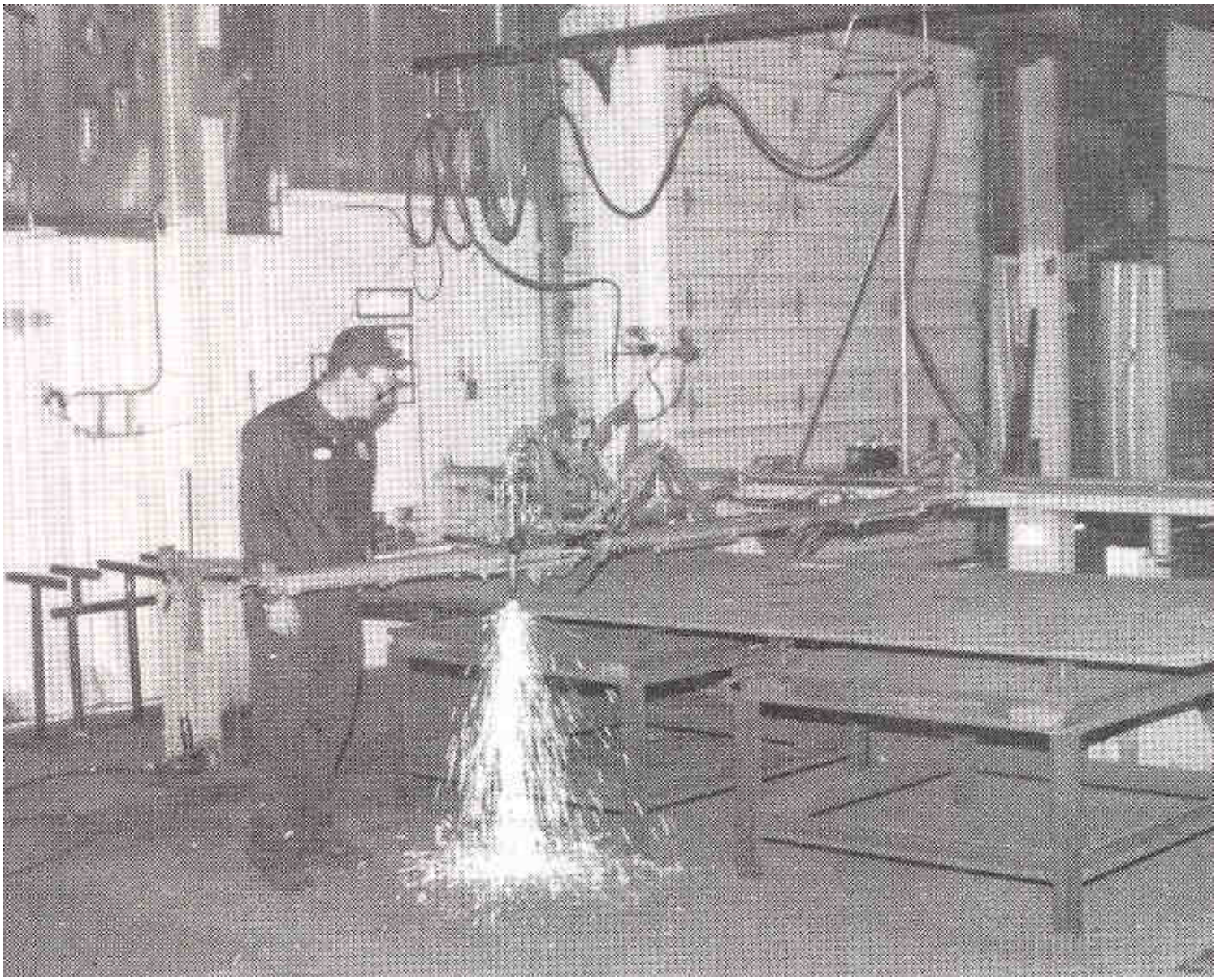
The problem was to cut and bevel large pieces of plate which could be up to 18 f t. (5 m) in length. Previous to mechanization the plate was cut straight with a friction drive and then beveled with a mechanical beveler which required a lot of time. There was also a problem in having to continually move and flip the plate.

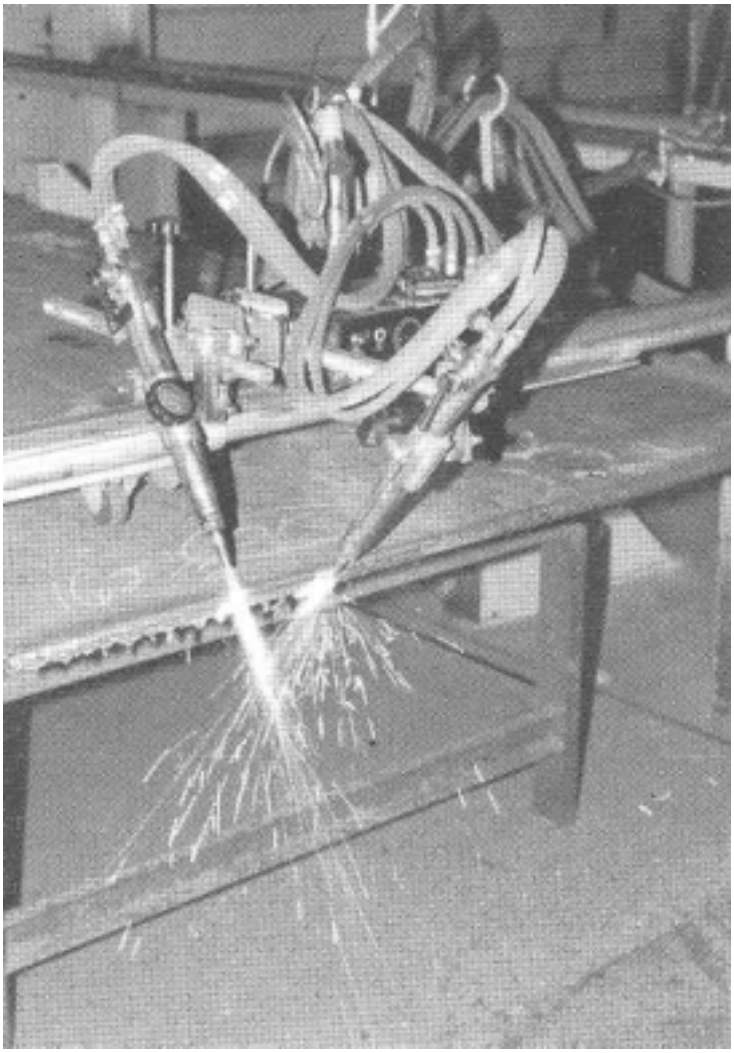
The solution was to install a Folding MUG-O with a DC II cross drive. The main drive on the machine has a remote pendant control on it so both the longitudinal and horizontal cuts can be made by the operator from one position. We built a burning table with adjustable stops for the different sizes of plate and positioned the Folding MUG-0 next to it. A special fixture we built enables us to run the Folding MUG-O off the plate so we can bevel the back end of it.

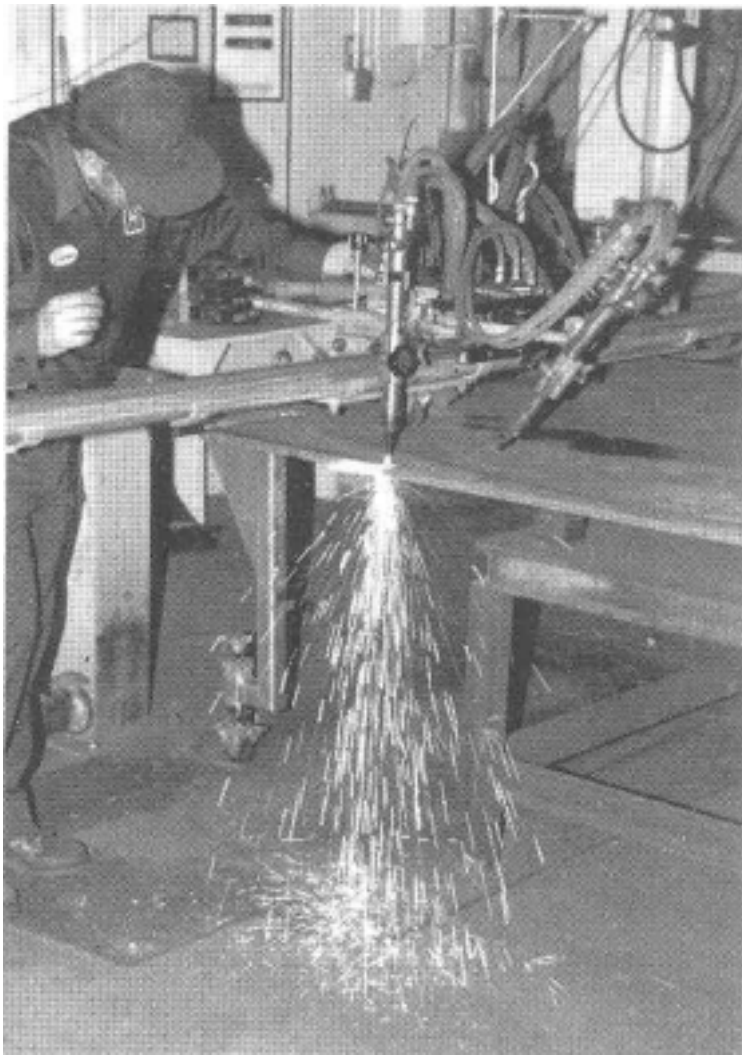
We saved one-half hour per plate, for a cost savings of $7,342 annually, along with a reduction in rework. The purchase of the Folding MUG-O and the design of special fixtures also allowed us to trim, square and double bevel more accurately.

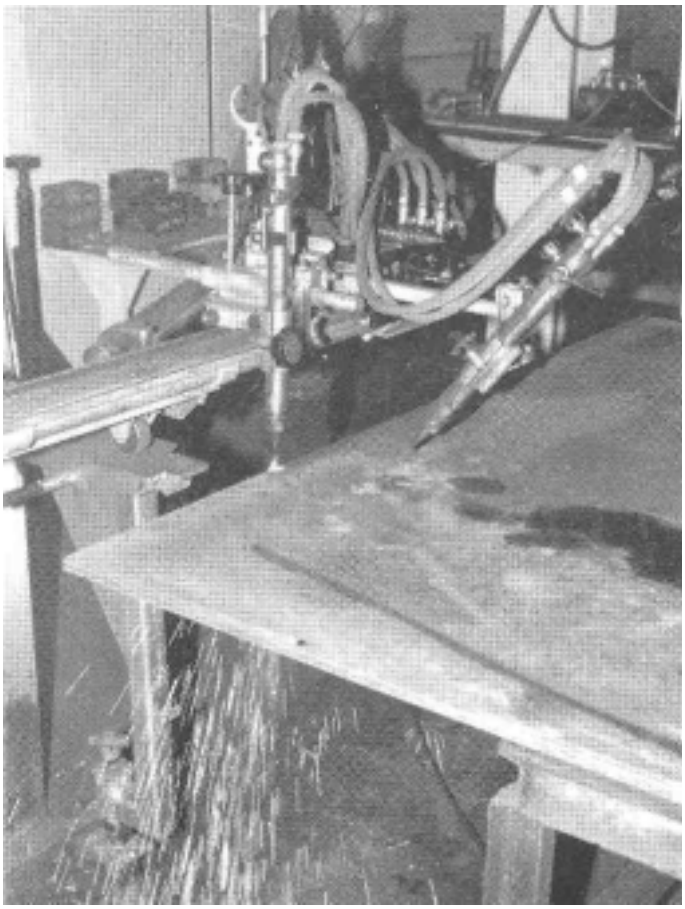
EQUIPMENT:

FOLDING MUG-O, DC II Cross Drive with Remote Pendant Control and special fixture









HOB-O MECHANIZES SUB ARC WELDING HEAD

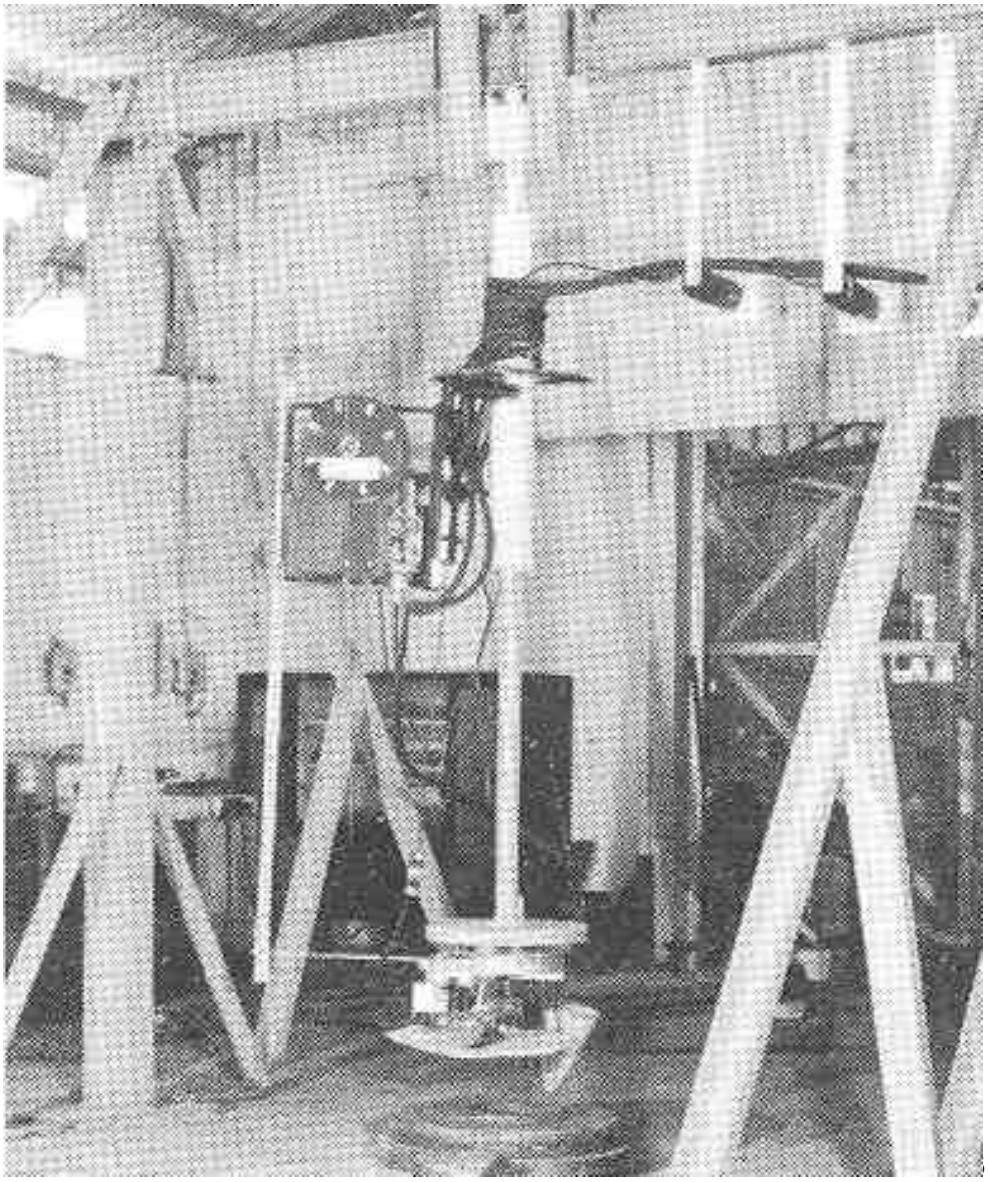
Costly steel plant equipment worth $8,000.00 was ordered for us to manufacture. The delivery schedule was extremely stringent and the most critical component was a high quality forging of dimensions as shown in the sketch. Normal lead time of six months was not matching with our committed delivery schedule and we were on the verge of losing this order as well as repeated orders for this equipment.

The urgency of this critical component led us to develop an innovative metal working process, viz., "shape welding", which is forming a particular shape by weld deposit itself. The deposited pure weld metal proved to be of superior quality due to its isotropic properties and refined grain structure even without heat treatment. Strict adherence to a particular dimension also reduced because of its higher all directional stress values. Having established this, we designed and made a special fixture and used the HOB-O unit for building up the shape of this critical component as shown in the photograph.

Due to fully automatic submerged are welding process coupled with HOB-O utilization, total welding time spent was only four shifts. The total manufacturing cycle of this component including designing and making the fixture, shape building and machining took only one month. Thus, the component was delivered to the manufacturing shops at the right time, thereby meeting the committed schedule. The cost analysis showed a marginal decline of cost involved by adopting the new method due to reduced dimensions (for superior properties), low cost welding consumables and minimum hours of labor by using automation.

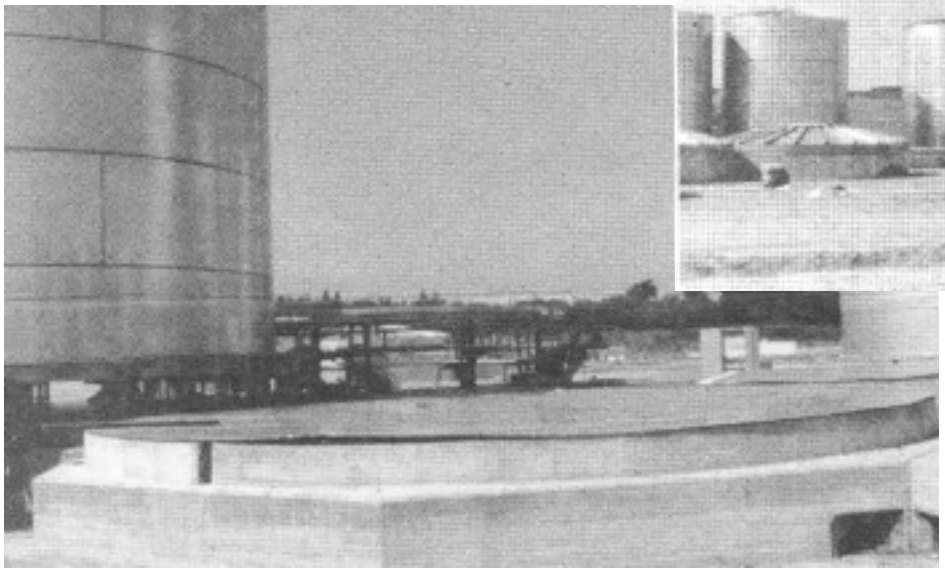
EQUIPMENT:

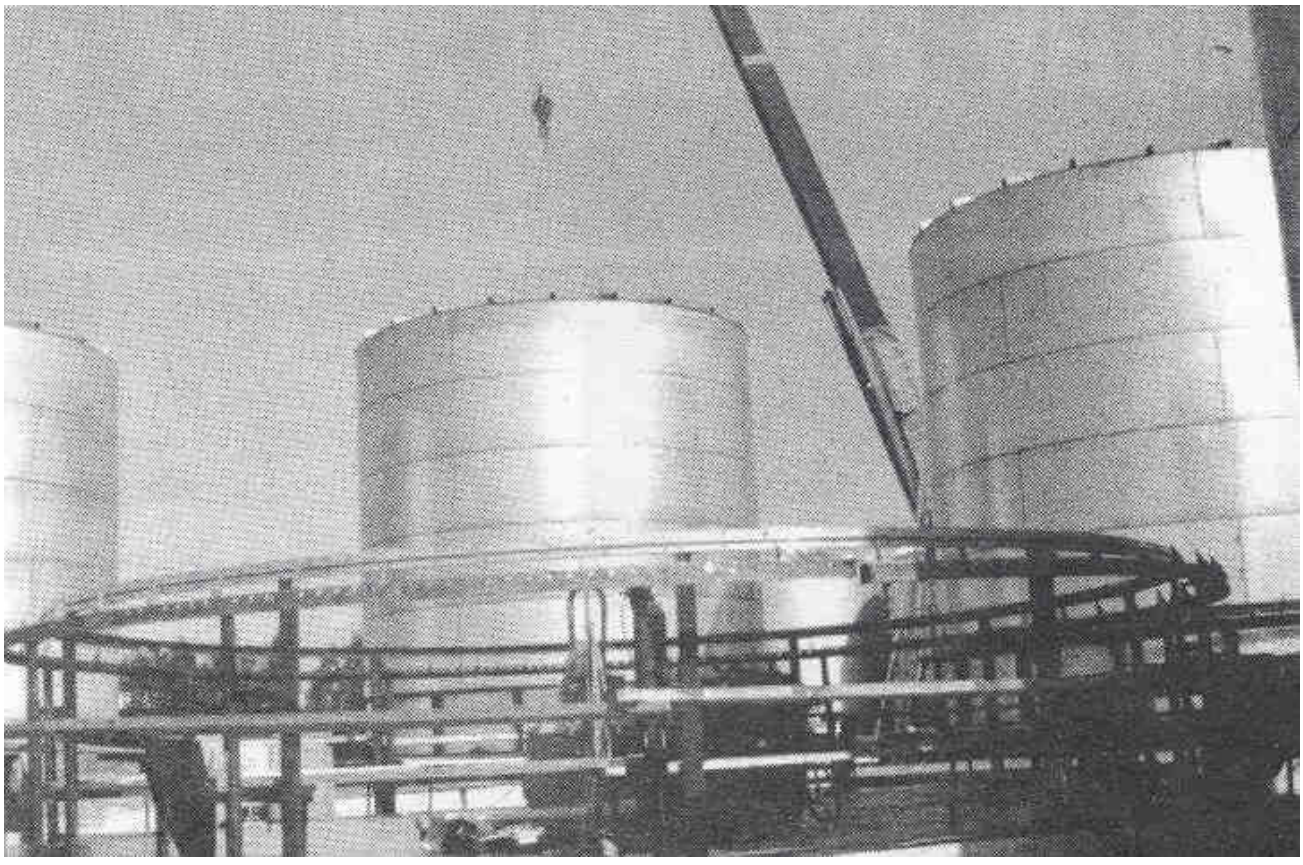
HOB-2003 HOB-O unit consisting of precision hole borer, beveler and welder, drive unit center locator, radial calibrated rack and three magnet sub-base



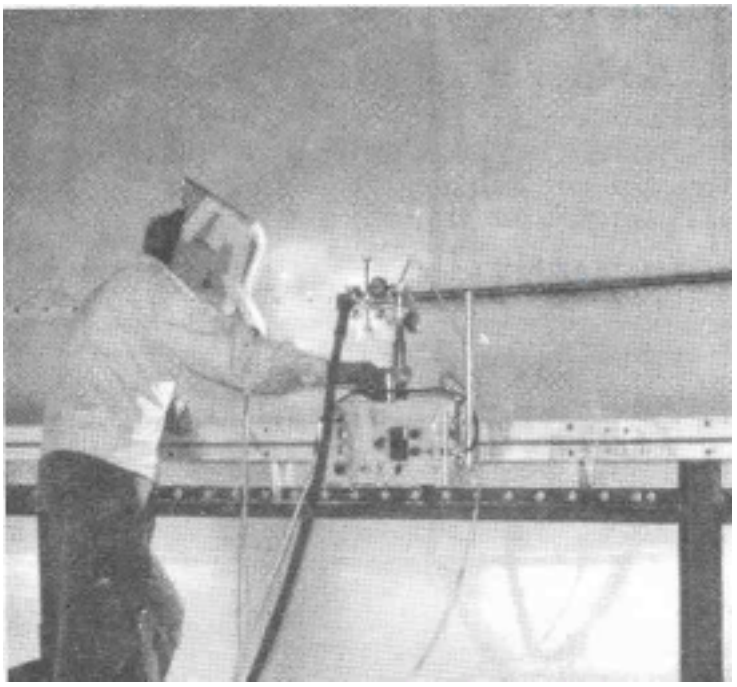
MECHANIZED WELDING INCREASES WELDING SPEED 250%

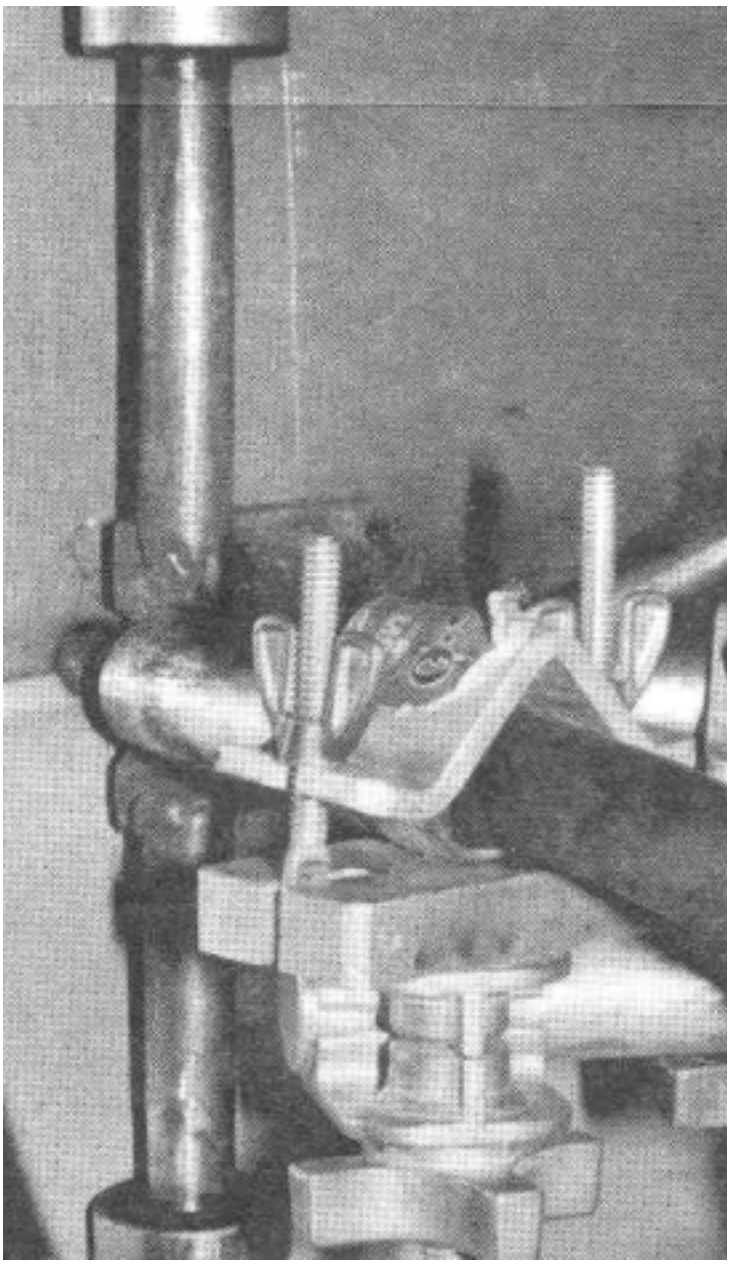
Our company received an order to build 75 tanks, to be used for storing wine. The tanks were to be fabricated from chrome nickel [18/8 steel], for 1/8"-5/32" (3-4mm) thick; 40"x 80" (1-2 m). Previously these tanks have been welded using manual TIG. The welding speed was 13-3/4" ipm (350 mm/min) and required highly skilled operators.

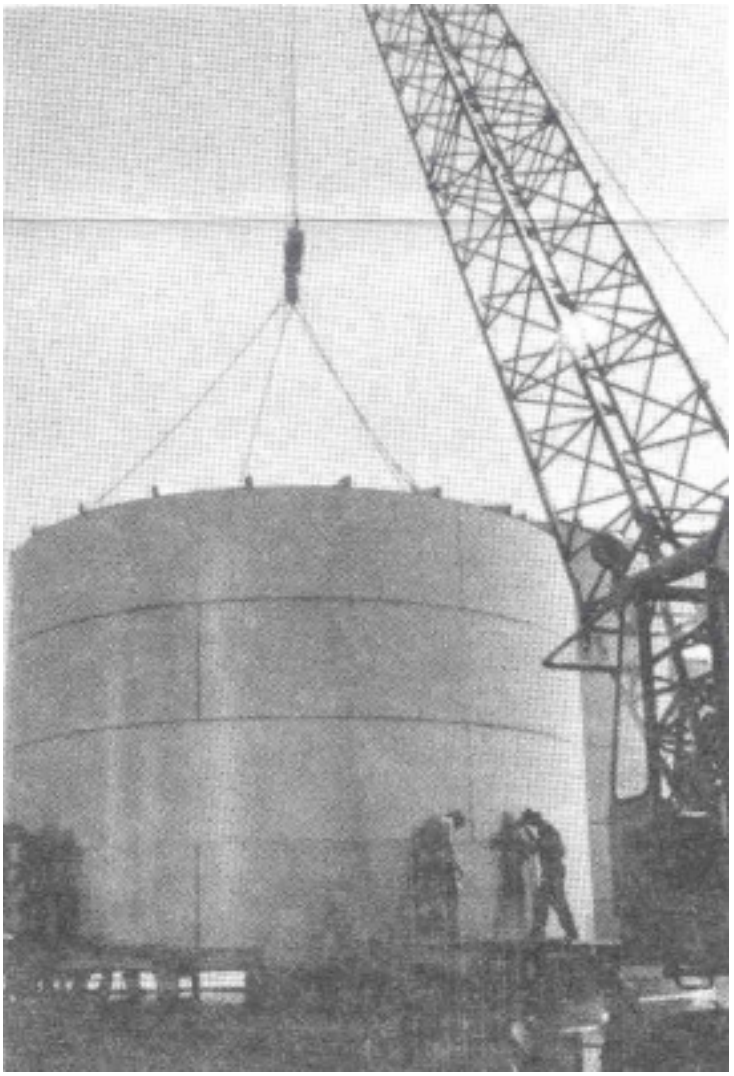




A special, fixture was made to fit the inside of the tanks and positioned on the base on which the tank would be assembled. This fixture employed standard structural shapes to insure that each course would be uniformly round. Inside this structure another structure was assembled and BRR-1180 Bent Rigid Rail was bolted to the inside fixture. The bent plates for each course were welded together and positioned in the fixture. The roof section was placed on top of the first course and welded from the inside with a second operator moving a copper shoe along the outside to keep pace with the welding. When the welding was completed, a crane raised the roof and first course to permit installation of the second course into the fixture. The process was repeated until all of the courses had been welded. The welding was done with pulsed MIG at 250 amps, 28 volts using 1/32- 3/64" (1.0-1.2 mm) stainless steel wire. The entire tank when completed was moved by crane to its final position.



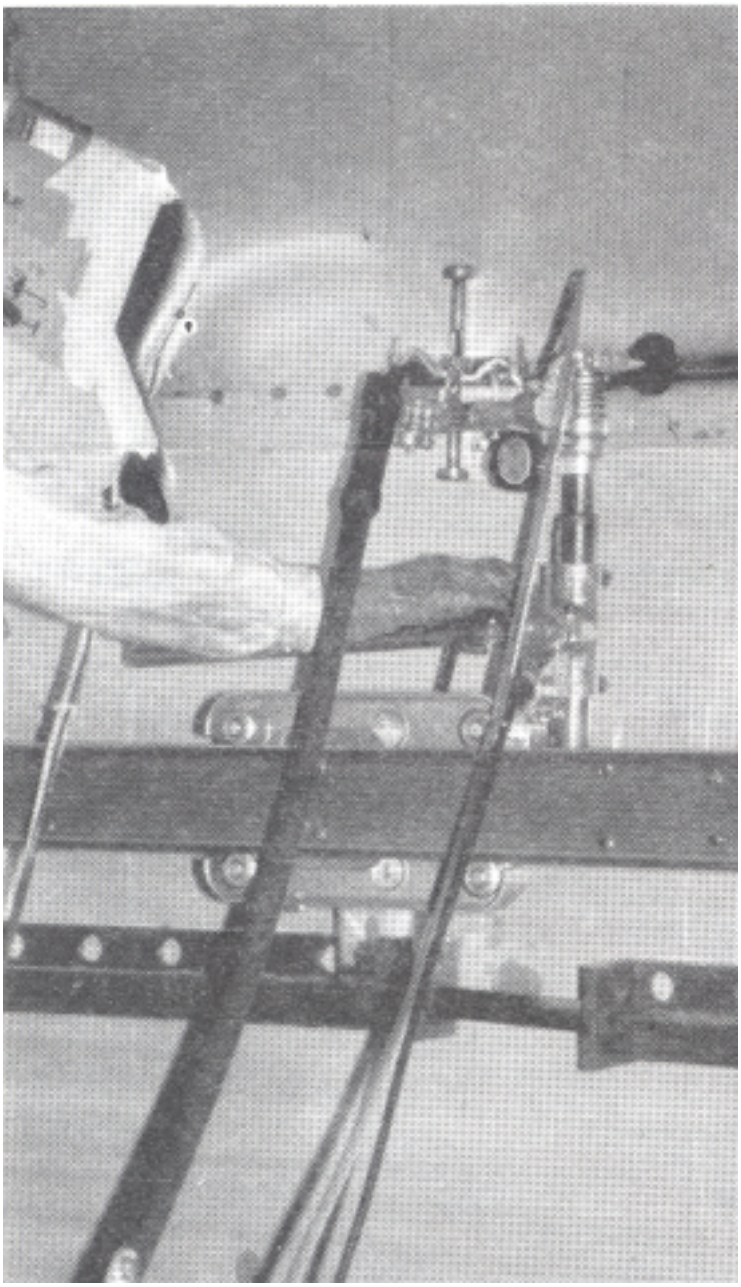


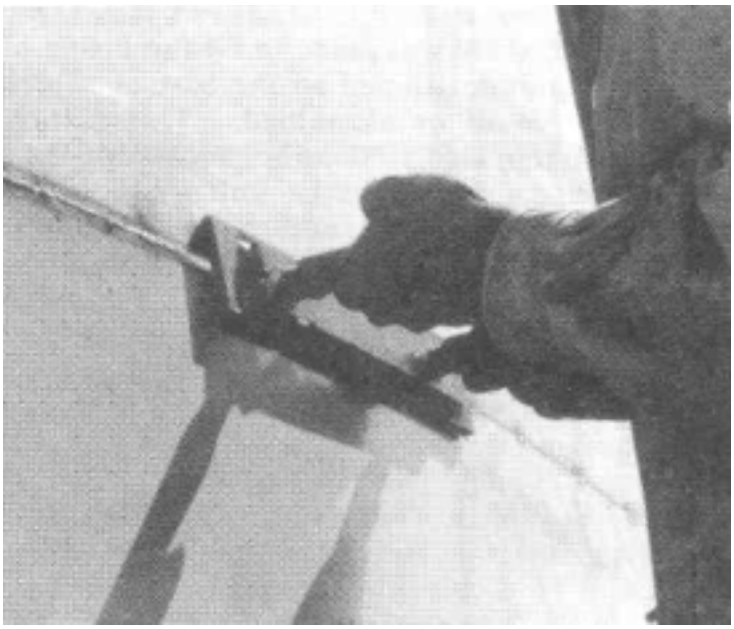


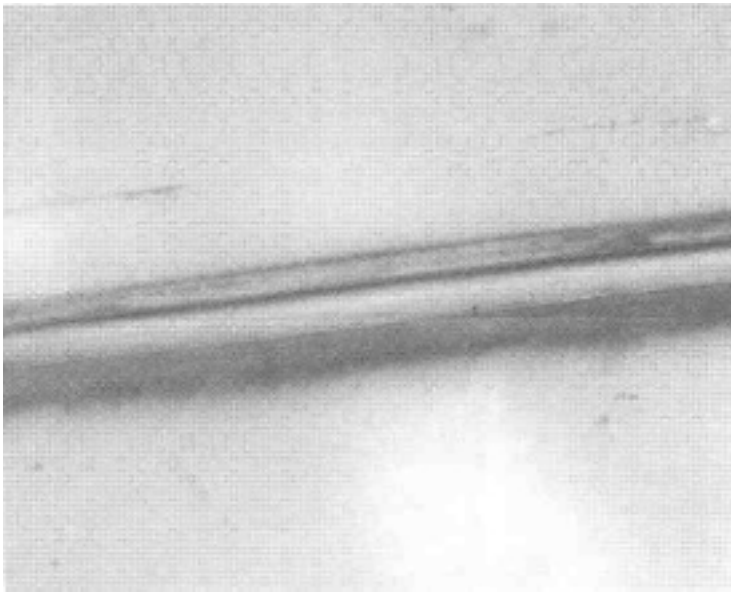
The speed of welding was increased 2-1/2 times to 35-1/2 ipm (890 mm/min) and the weld quality was improved considerably. Also, the working conditions of the operators was improved substantially.

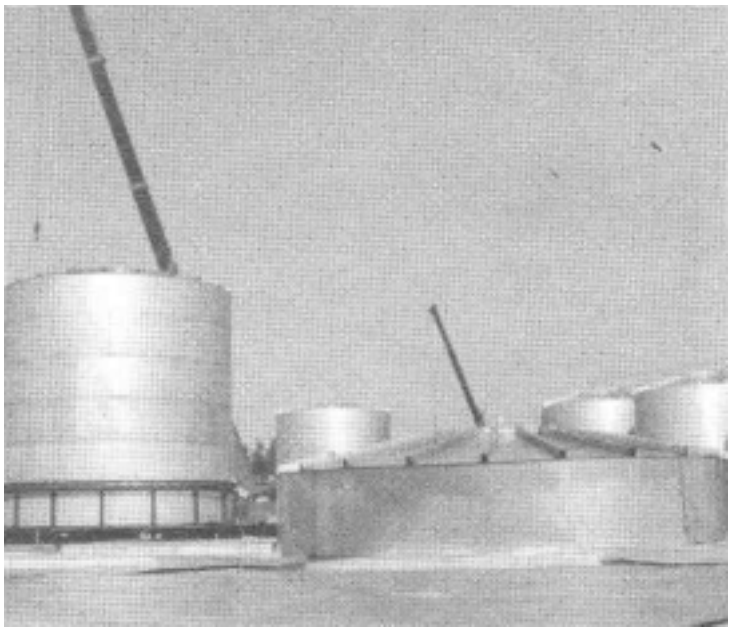
EQUIPMENT:

Both a BUG-O MARK IV and a BUG-O- MATIC were used on this application along with a modified PANOGRAPH which straddled the weld joint and maintained constant tip to work distance.







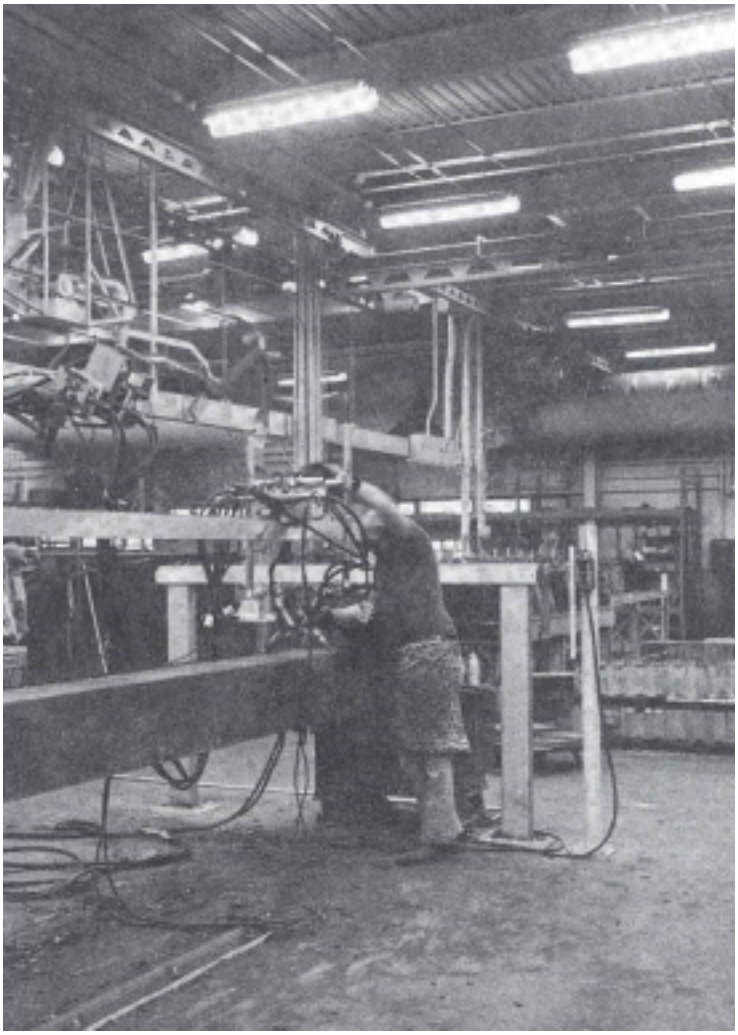


AUTOMATED BOOM WELDING IMPROVES QUALITY AND REDUCES COSTS

A method was needed to fabricate quality 14 f t. (4.27 m) boom weldments with a minimum of dimensional distortion and accurate weld size control. These boom sections slide inside each other, demanding precise dimensional squareness and accuracy. Costly rejects and repairs after assembly were common with the hand-held sub are weld process, which required a slow, intermittent welding procedure.

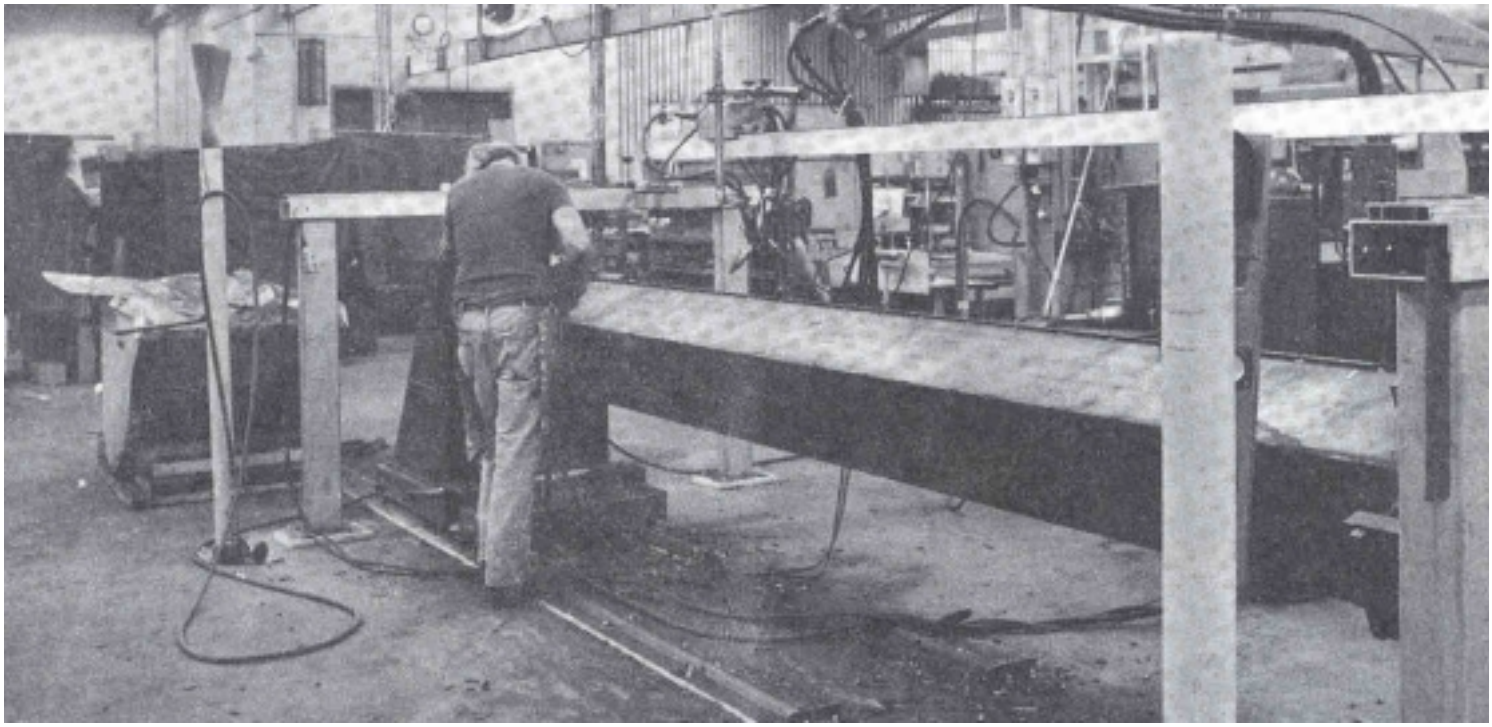
A dual torch sub are weld process was established with the use of an overhead track, in combination with a set of 2500 lb. (1134 kg) trunnion weld positioners. Dual weld torches were mounted on a BUG-5070 Bidirectional DC Skip Welding unit, running the length of the boom. Two seams are simultaneously welded the entire length of the boom, resulting in even heat distribution and minimal distortion after cooling.

Weld distortion was eliminated, weld sizes are held within 3/16" [+1/16", -0111 (4.Smm) [+1.6mm, -Omm] and labor productivity has been increased 200%. The use of the BUG-O equipment provides a low cost, reliable solution to the boom quality problem. We have significant time and labor savings with less operator fatigue.



EQUIPMENT:

BUG-5070	Bidirectional DC Skip Welding Kit
MUG-1020	18' (5.49 m) Crossing Rail
MUG-1140	Carriage w/Spotter
MUG-1498	Pedestals (4)
MUG-1020	8' (2.37 m) Crossing Rails (2)
BUG-1045-3	Column H = 60" (1.5 m)



Applications

Structural

The UNI-BUG Plays A Major Role In Reducing Labor Costs

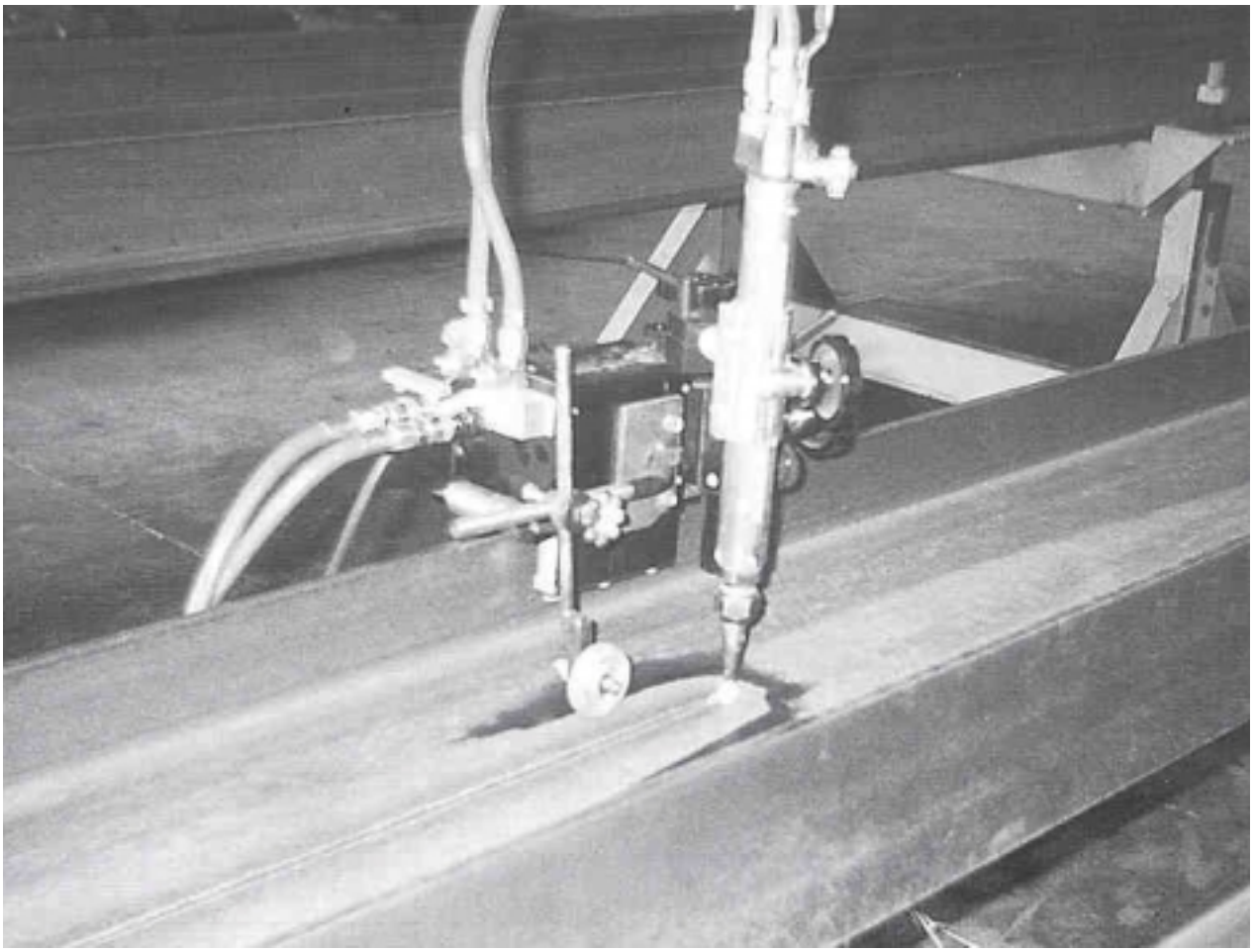
Big R Manufacturing and Distrib- uting Inc., in Greeley, Colorado, is a bridge fabricator. One of our customers needed a walk'bridge constructed. This particular style of bridge requires a "tee" for the main fi-ame. This "tee" is produced by splitting beams.

Cutting by hand was time consuming and produced rough edges that required grinding. In addition, the heat input was very high causing the beam to warp. The beam then had to be straightened. We looked at different ways to approach this project and decided to buy a Bug-O Systems UNI-BUG.

The flange contained numerous nicks and bends that caused the Uni-Bug to move on the workpiece producing an unsatisfactory cut. We were going to return the machine, but decided that possibly, with some minor modifications we could get the UNI-BUG to work.

We moved the top rollers up, this lowered the drive roller. Next, we added a support roller to the torch side of the machine to stabilize it. After making these few modifications we cut another beam and the results were very good. Minimal grinding was necessary and very little warpage occured. The combination of the Uni-Bug and a few minor modifications have cut our labor 50%.

EQUIPMENT:
Bug-O Systems UNI-BUG, support roller.

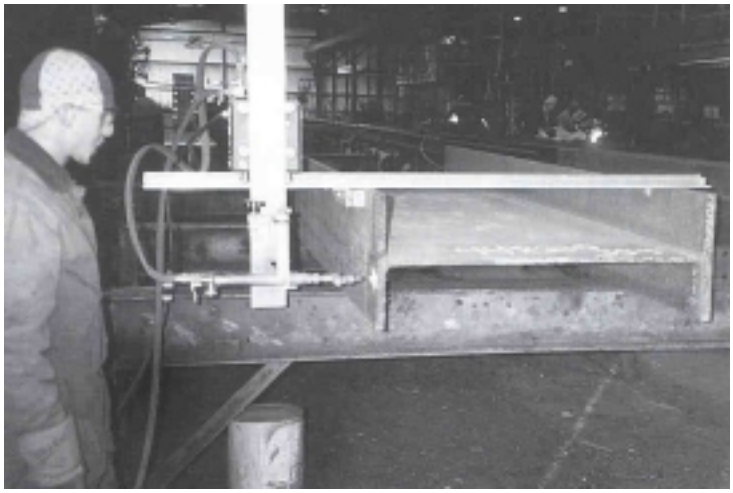


Beam Bug Cuts Compound Bevels With Easel!

We are a structural steel shop and had to cut some large columns and beams from W14 x 311 members. The biggest problem we had was that we had to put compound bevels on these beams before we could fit them into a truss assembly. The Bug-O Beam Bug III unit cut the bevels much better than the regular hand layout and hand torch that we would have had to use.

We also are using dual Bug-O Beam Bug III units (we bought two each of the Beam Bug III units in 1995) in our steel storage and unloading yard. We had a job with 24 special beams (W36 x 300 x 75" long), due to this extra long beam we had to special order them from the NUCOR- YAMATO steel mill in Arkansas. Due to their length and weight, it was easier to fabricate these long beams in the unloading and storage yard, which reduced our handling time. The portability of the Bug-O units helped us pull off this semi-field operation with ease. The quality of the cut reduced our clean up time in both of these operations.

Maintaing quality cuts in this field type operation would have been next to impossible without the



Bug-O Beam Bug III units. In shop use, the 6% real" time savings comes from the quality of the cut, reduced cleanup time and better fit-up which results in a better weld.

EQUIPMENT:
Bug-O Systems Bearn Bug III.

DC III provides a cleaner shop & savings in handling, straightening and cut-time.

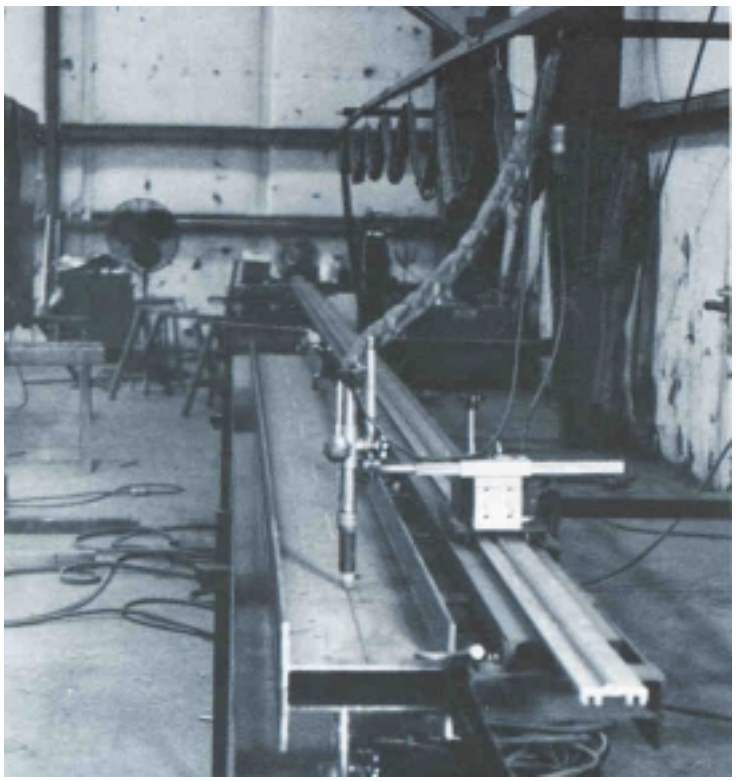
The company needed to split beams into structural tees at a rate of 100,000 lbs (45,400 kg) or more per month. Trying to make the cuts with a standard "track-type" burner with an oxyacetylene torch proved to be too slow because of the set-up time required turning the beams before each cut and heat straightening requirements.

The company built a 2' (610 mm) wide x 40' (12.2 m) long water table. A BUG-O with plasma torch was mounted on a rail that runs the length of the water table. Electrical leads ride in a festooned track overhead.

Set-up time has been virtually eliminated. The company places a beam on the table, the torch is racked into position and the cut started. The increased speed of the BUG-O takes full advantage of the plasma's capabilities and the cut is made at speeds up to 150 in./min. (3.18 m/ min). The combination of the increased travel speed and the cooling effect of the water table results in much less heat distortion and, therefore, minimizes straightening time.

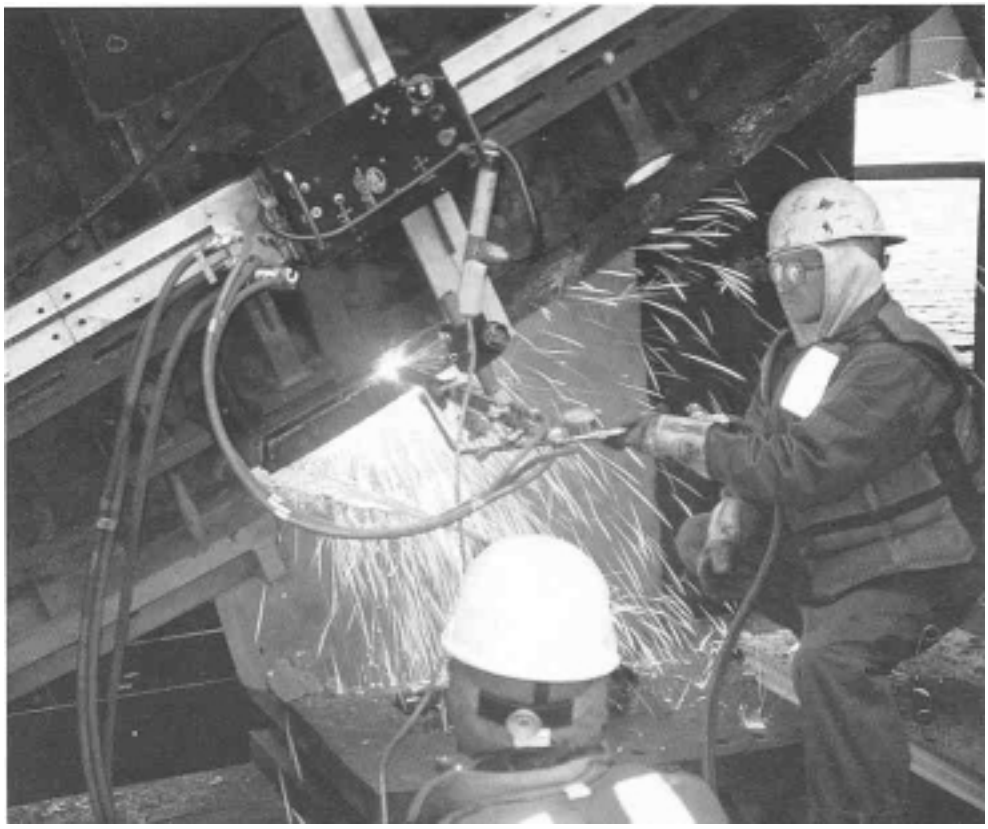
The savings in handling, straightening and cut-time were estimated to be over $40,000 on an annual basis. This system also contributes to a cleaner shop environment.

EQUIPMENT:
One BUG-0333 DC III drive unit and one BUG-



9464 torch mounting group with 40' (1 2.2 m) of track. The water table was fabricated in-house and a Thermal Dynamics PAK-10 plasma torch does the cutting.

Speed And Precision Are A Must in Bridge Rehabilitation Project!



The problem was the fit up and mounting of new segmental girder plates to an existing segmental girder for a bascule lift bridge built for the railroad during the early 1900's. Rehabilitation of the bascule bridge segmental girders required quick and precise reduction of the irregular surface radii of the girder flange to a constant smooth radii in order to fit the new segmental girder plates to the +/-I/ 1 6 " radii bearing tolerance. The existing girder flange consisted of 9 plys Of 314, (19.1 mm) plate which had to be burnt completely thru, maintaining a constant smooth radii. To further complicate matters, sections of each girder had to be reworked during the maximum 24 hour river channel closures and with minimal rail traffic interruption.

Grinding and other machining techniques were not feasible due to time and work space constraints so a Bug-O Programmable Shape Machine was selected to perform the task after a careful and thorough ex- amination and test of its capabilities and the following criteria:

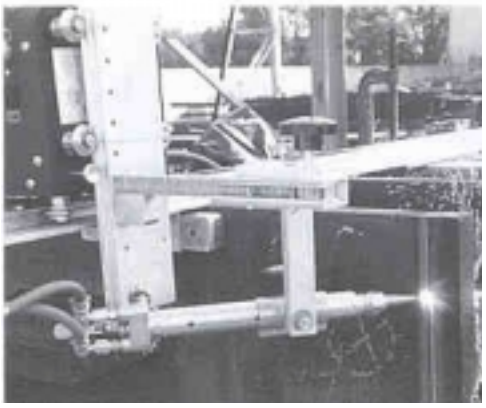
1. Accuracy in maintaining radius and surface tolerance.
2. Speed and simplicity of operation.
3. Rugged and compact (allowing partial setup and checkout prior to start of river closure operations).
4. Versatility (afterjob completion, it will be a valuable toot on other projects).

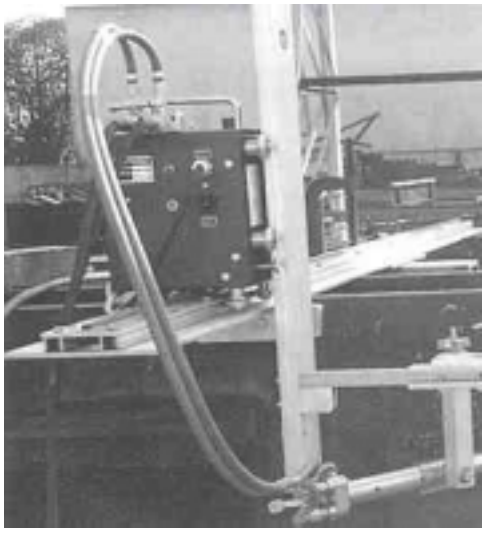
The results were accurate, efficient and rapid flange modifications which contributed greatly to the successful completion of segmental girder repairs. Inconvenience to river and rail traffic was minimized, and a smooth finished surface was obtained.

EQUIPMENT:

Bug-O Systems Programmable Shape Machine, Victor MT 318-N machine cutting torch equipped with #5 high speed tip.

The Beam Bug III Easily Handles Multiple Applications!





The company needed to find a versatile machine to cut bevels, straight, horizontal, and vertical in all directions and positions. They were cutting wide flange beams with Koike Mini Mantis and had nothing but costly down time and getting parts that were hard to come by. We contacted General Welding and after receiving literature on the Bug-O Beam Bug decided to purchase one.

The Beam Bug solved the problem of down time and finding replacement parts with equipment that is efficient made the job run smoothly.

EQUIPMENT:

Bug-O Systems Beam Bug III.

Consistent Performance Produces Less Than 1 % Weld Rejection Rate.

Our problem was to match cut and bevel large plates in preparation for full penetration butt welded splices for flanges in bridge girders. Welding was submerged arc with N.D.T. being x-ray and ultrasonic to AWS DI.5 standards. Plates as wide as 8'6" (2.74 in) with thicknesses up to (69.5 mm) and spliced lengths exceeding 127' (38.71 in) requiring up to 3 splices (4 plates) needed to be fitted, welded, ground and then stripped into flanges on our fully remote MUG-O burning table [Capacity: 16'(4.88 in) x 140'(42.67 in) with 7 heads.

The plates were aligned and match cuts made at a 30 degree angle to include groove preparation in the same operation using a Bug-0 DC III. Tractor equipped with a standard torch mounting group on 12' (3.66 in) of rail. A transition at 22 degrees from horizontal was then cut into the thicker of the two butted plates. Our second DC III Tractor was set up with a rack and "fits-all" clamp to carry a sub arc gun. The lightweight portable qualities of the DC III allow us to be burning and prepping one end of a plate, while the other end is being welded with no material handling, regardless of length. The plate is then turned over, backgouged, and welding completed prior to being moved to the burning table for cutting.

The DC III Tractor produces straight cuts with virtually no grinding for final fit-up. The quality of welding using x-ray criteria and measured by inch of weld runs less than 1% reject, is evidence of Bug-O's consistent performance. We are currently working on a Bug-O rack configuration that will allow us to make match cuts in abutting plates as well as the transition cut in a single operation.

EQUIPMENT:

2 BUG-O 335 DC III Drive Units, 2 ARR- 1080 8' (2.44 in) rails, 2 ARR- 1085 4' (1.22 in) rails,
1 BUG-9464 torch mounting group, 1 BUG-2660 fits-all clamp, 16 ARM-2325 magnets.

STIFFENER WELDER
Helps Build Barges On Schedule.

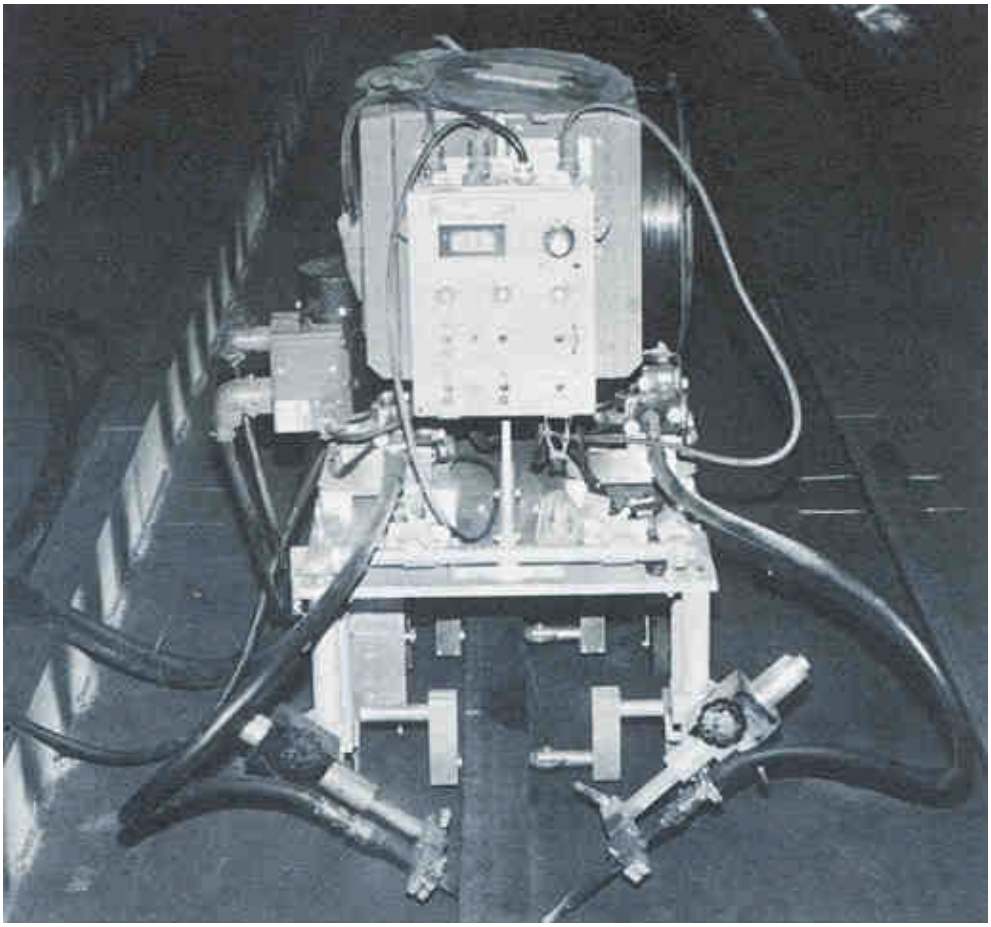
In barge building, a great number of angles are used to provide support for the top, bottom and side panels. These angles are placed flange- edge down and are welded to the base plate by hand using Lincoln 5/64" (0.5 mm) diameter NR-211-MP Innershield wire fed with LN-22 feeders. In most cases these welds are done in 100' (30 m) lengths, with 20-25 angles per plate. In order to keep up with the production schedule, a large number of welders were needed to make these fillet welds.

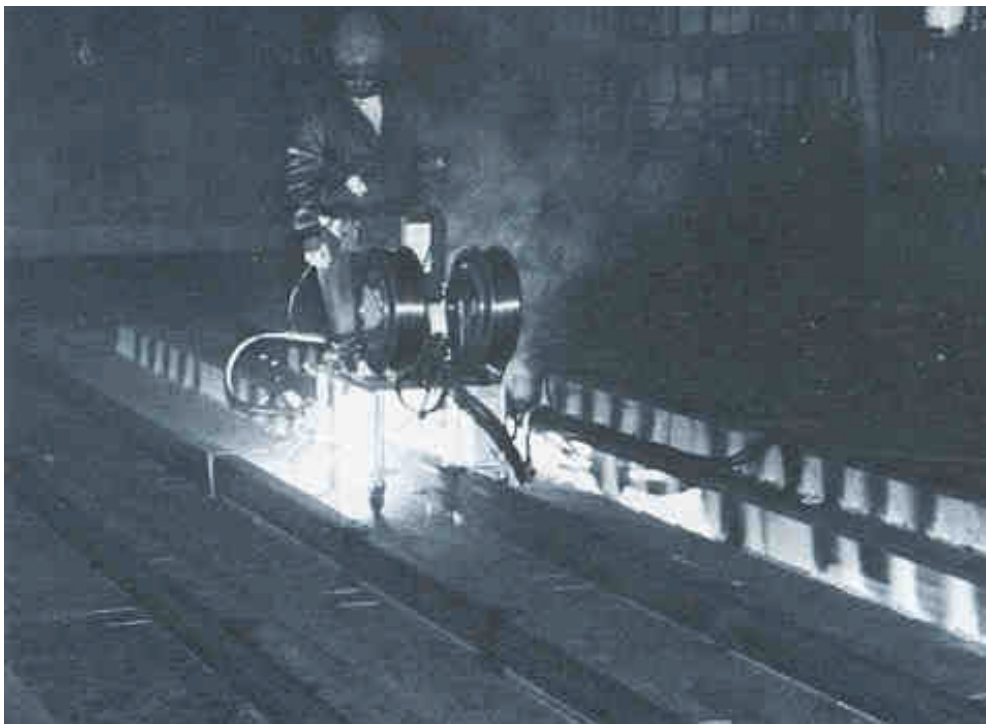
The company asked for a demonstration of the BUG-3210 STIFFENER WELDER to see if it could speed up the process.They used Lincoln 3/32" (2.5 mm) diameter NR-311 wire to keep up with the faster weld speed at which this machine was expected to run.

It didn't take long to realize that welding time would be cut significantly by using the STIFFENER WELDER. The same angle which took two welders one hour to weld was being welded by one man in 15 minutes!

By using the STIFFENER WELDER the company was able to change wire capacity to 50 lbs. (22.7 kg) per roll. This change allowed them to purchase wire at better prices because of the packaging. Because the STIFFENER WELDER is equipped with two wire feeders, one man could easily do the work of two in less time.

After calculating the cost of wire, labor and the new equipment purchased, the company discovered they could pay for the STIFFENER WELDER before they used up one pallet of wire.





EQUIPMENT:
One Bug-3210 STIFFENER WELDER equipped with two LN-9F wire feeders and two DC-600 power sources.

BUG-O HELPS BUILD AUSTRALIAN LANDMARK

The problem was, how to weld the inside of the 19.5 ft. (6 m) long triangle sections of the four tapered legs that support the flagmast. The fillet welds ranged in size between 1/4' (6 mm) and 5/8"(18 mm) and turned out to be almost impossible for a welder to manipulate the MIG welding gun. Because of the confined space in the triangular sections, only about 2 ft. (200 mm) could be welded at a time. Before the first triangle section was finished, it was decided that the welding must be mechanized; the problem was, how?

BUG-O track was simply joined and placed on packers to straddle the internal gussets, and clamped at the ends. A standard BUG-O MK III drive unit was used to transport a CDT Pulse MIG welding gun, allowing 78" (2 m) of welding to be carried out without stopping.

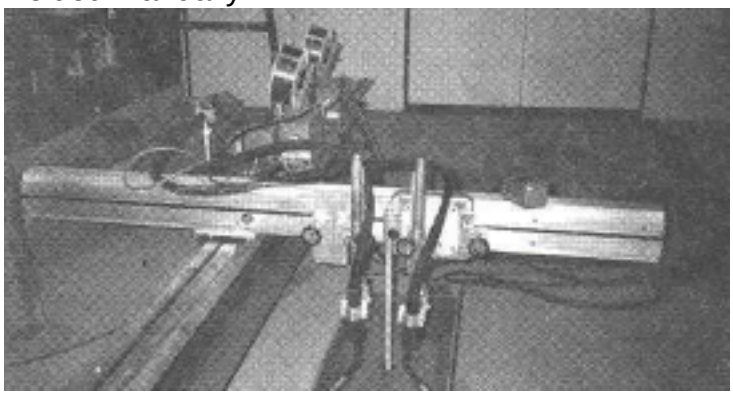
For what may appear to be a simple job of mechanizing a MIG welding gun, the results were astounding. Total welding time was reduced by 50%. The advantages of mechanization included elimination of operator fatigue, uniform weld bead, penetration, heat distribution and minimal distortion. As a result of these advantages, BUG-O was used on many other parts of the flagmast, including welding of the 2" (60 mm) flanges to the ends of the triangular sections and some of the on-site erection welding.

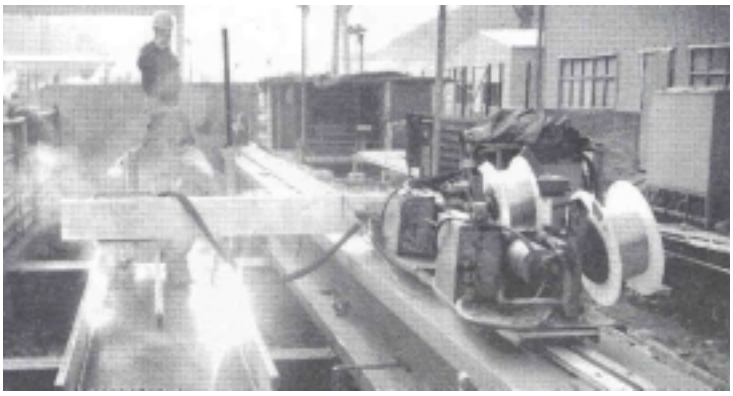
EQUIPMENT:

Two sets of equipment were used, each consisting of the following items: BUG-O MK III drive unit fitted with a two-motion torch carrier, three lengths of standard rigid rail, a CDT MIG welding machine fitted with a Hulftegger push-pull welding gun with a 26 ft. (8 m) cable'.

MECHANIZATION INCREASES PRODUCTION WITH MINIMUM DISTORTION

Our company was looking for a way to speed up the fabrication of "H" and box shaped beams because it required many hours to fabricate these beams using the MIG welding process. Also, there was a distortion problem because all of the joints were welded manually.





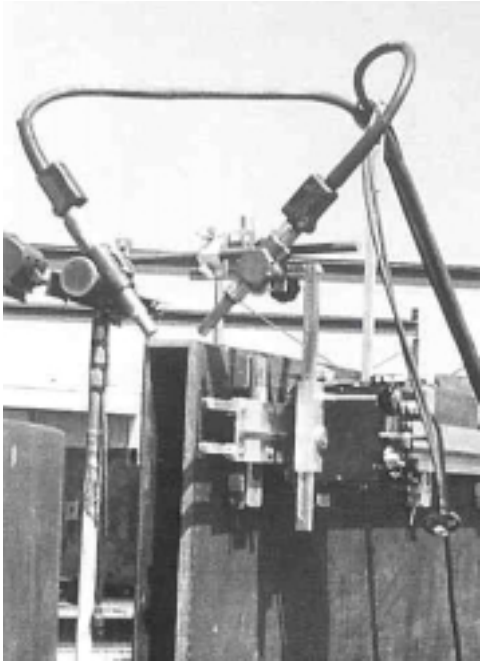
To increase productivity and eliminate the distortion problem, we used a DC-V drive unit mounted on an 18" (457 mm) carriage. Across this carriage, we mounted a box section rail with provisions for mounting two torches and adjusting them laterally to accommodate beams up to 40" (1000 mm) wide. This unit also pulled a MUG-O trailer carriage with two wire feeders and wire. We used a caster wheel, riding on the beam to help support the weight of the beam and a counter weight on the opposite end to balance the load. One operator controls both units using a pendant control.

The operating factor was increased 150% and fabrication was increased 242%. Distortion was minimized by making two welds simultaneously with uniform beat input.

EQUIPMENT:

BUG-0356 DC-V Drive Unit, MUG-1120 Box Rail, MUG-1130 Trailer Carriage, MUG-1140 Carriage, BUG-1148 Carriage, BUG-5166 H. D. Rack (2), BUG-5165 Racker Mount Assy. (2), BUG-1635 Remote Weld Starter

General Welding Kit Handles The Curves.

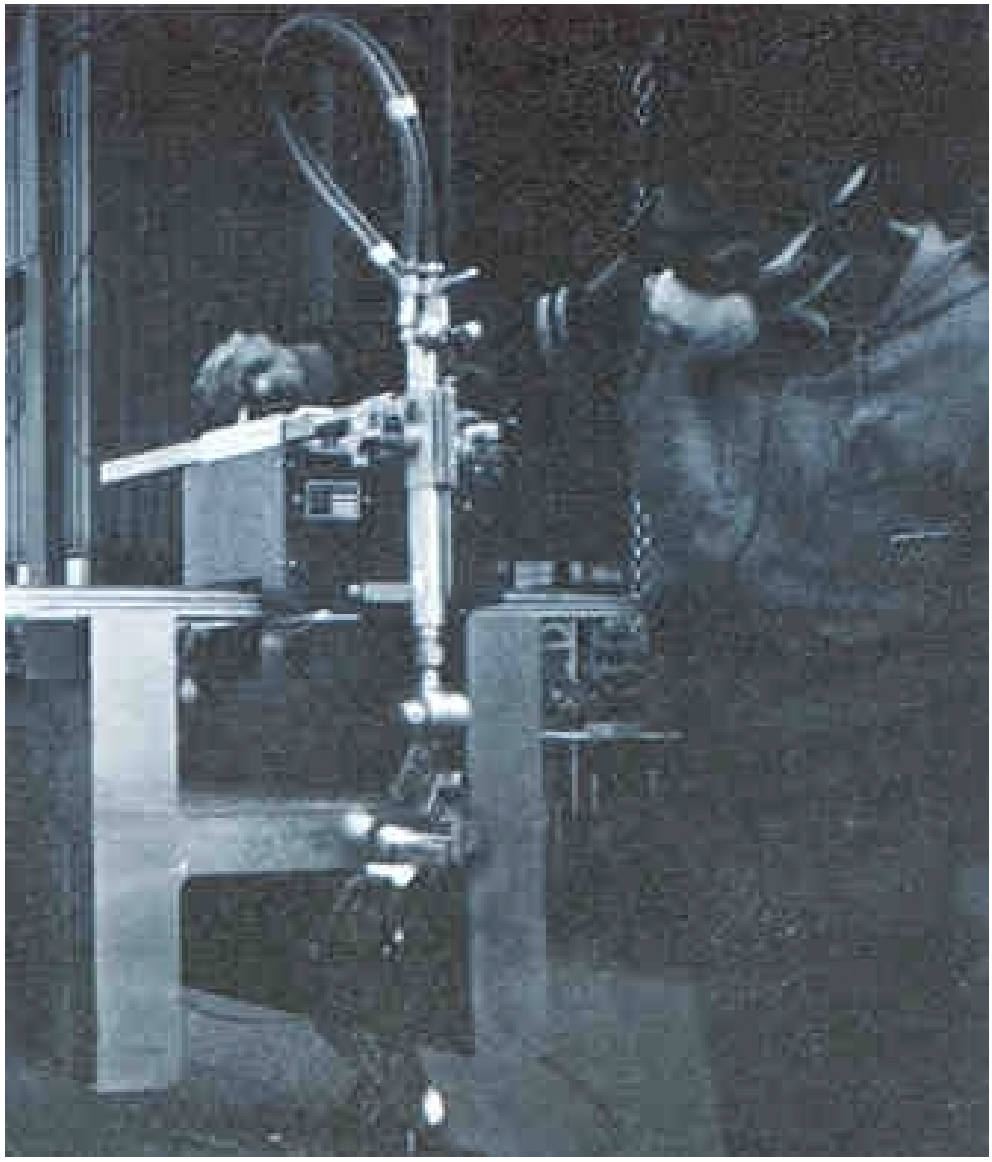


We obtained a contract to build 16 box beams. Each beam measured 40' long by 4' high by 4" deep, and was to be built out of 1/2" plate. One problem we had was each of the beams were curved. We could not have one operator work on each of the 40' welds one at a time due to the warpage from the heat.

To solve this problem, the decision was made to purchase a Bug-O Systems General Welding Kit and additional rail. We positioned the unit on the 4' side with two torches positioned to run both welds on the 4" side at the same time. This eliminated the warp problem. We then turned the item over and repeated the process. As a result of this setup the job went quite well and we are very satisfied.

EQUIPMENT:
Bug-O Systems General Welding Kit, Lincoln DC-400 Power Sources, LN- 9 Wire Feeders, Hobart 1/16 Dual ShieldedWire.

GO-FER III saves costly handling time.



The company wanted to be able to bevel all three sides of large wide flange columns. They also wanted to bevel box columns with 3" (76 mm) thick plates on all four sides and be able to lay out and fit them at the same time. Hand operated torches can be used on thin sections but on thick ones a handheld torch will produce big gouges. These gouges required major grinding and sometimes have to be welded and ground. Using a radiograph requires turning the column three times for thewideflangecolumns, and four times on the box columns. This process will give good cuts but no layout or fitting can be done during this very costly extra handling time.

A GO-FER III was purchased and used to make all four cuts on the box sections and all three cuts on the wide flange sections. The cuts were perfect! Gouges were eliminated and the operator was able to do layout and fit-up while the cut was being made.

EQUIPMENT:
GO-FER III.

Applications

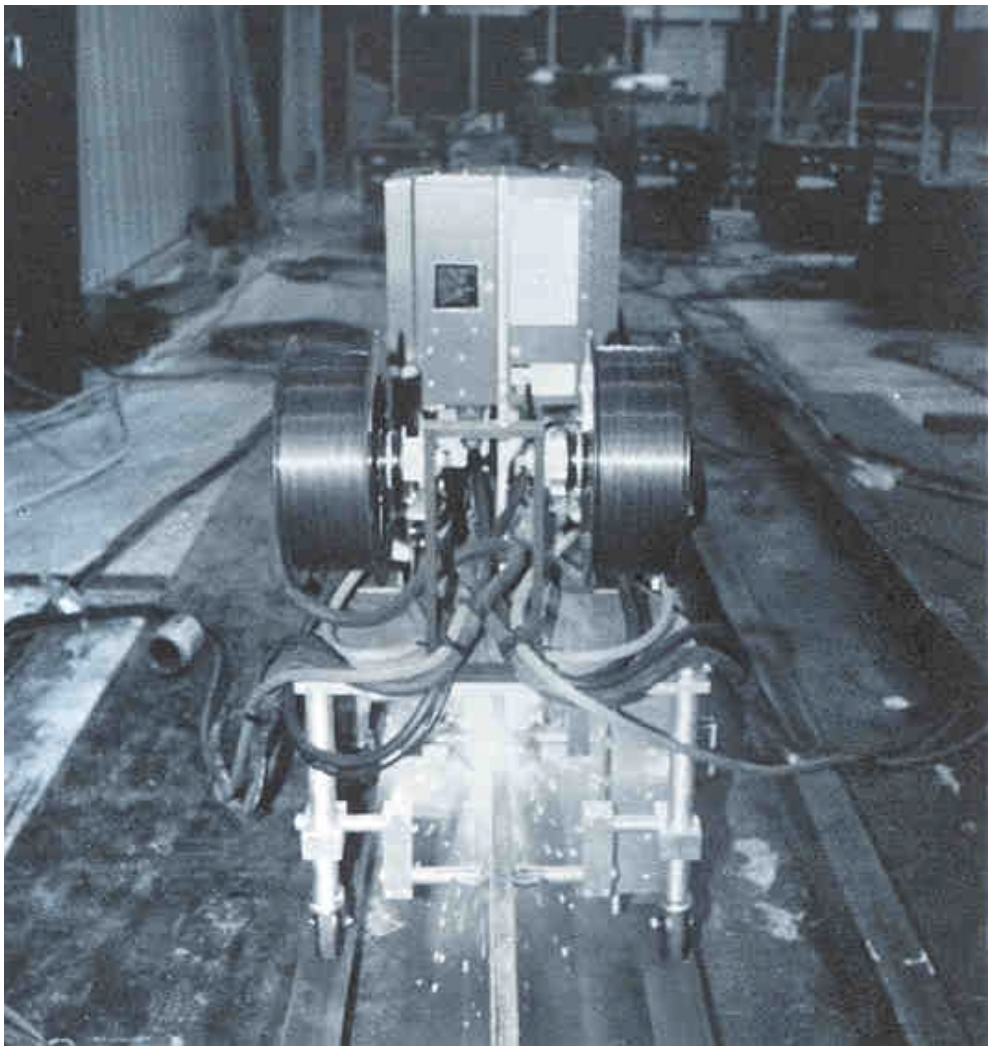
Shipbuilding

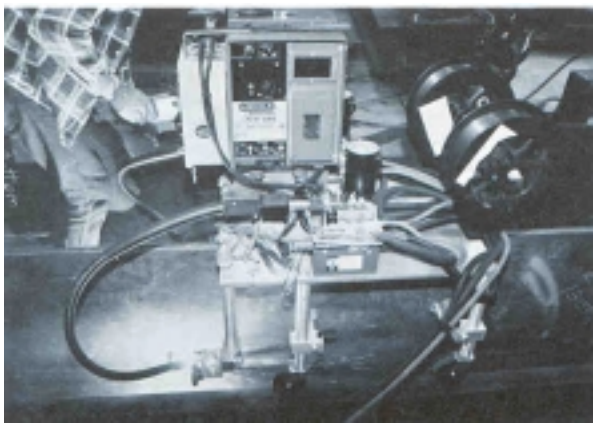
The STIFFENER WELDER Is The solution To The Problem

The problem was to manufacture T-Beams that ranged in height from 10" (254 mm) to 33" (837 mm) for bow and hull stiffeners for a 300' icebreaker ship. Previously it had been taking two welders 10 hours per day to manufacture four 20' (6.10 m) T-Beams using a semi-automatic handheld flux-cored/ gas-shielded process. With 47,432 feet of beam welds to do, the job would have been very time consuming and costly.

The customer purchased a BUG-O STIFFENER WELDER with a leg extension kit that gave him the ability to weld beams from 3" (76 mm) to 35" (889 mm). Two Lincoln LN-9 GMA wire- feeders, powered by two Lincoln DC-600 power sources, with 100' (30.48 m) of control cable assemblies were also purchased.

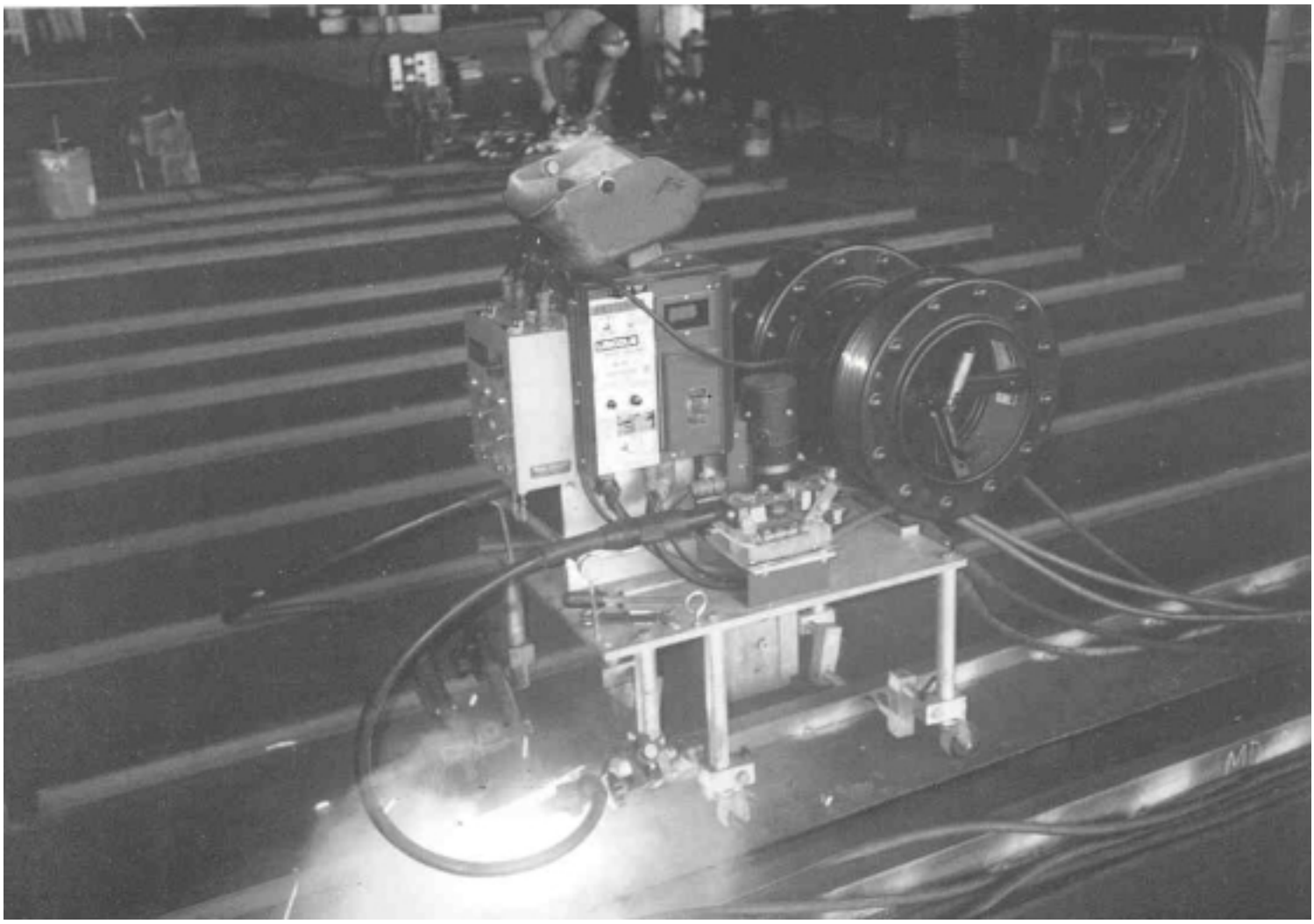
By automating this application the customer was able to do the job with one welder using the machine and was able to manufacture fourteen 20' (6.10 m) beams in the same ten hour period. The customer estimated they saved $172,652 by goingfrom $4.25per foot to$.61 per foot. At this savings, the machine will pay for itself in 21 days.





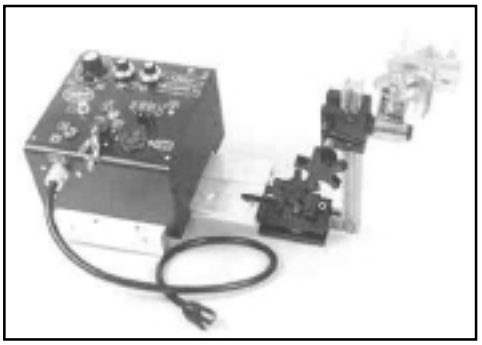
EQUIPMENT:
Bug-O STIFFENER WELDER, Lincoln LN-9 GMA wirefeeders, Lincoln DC-600 power sources and 100' (30.5 m) of control cable.

Stiffener Welder and Speed Weaver II Team Up For Production!



Stiffener Welder

Our shipyard had several applications that were very expensive and time consuming because they were being performed by hand. Two of our most troublesome applications were welding 3" x 2" (76 x 50 mm) angles to plate, and welding bulkheads and butt joints. The solution to these problem applications was to purchase a Bug-O Stiffener Welder and Speed Weaving Kit. Smaller wheels were put on the Stiffener Welder because the angles it would be welding were so short. Using the Stiffener Welder we were able to cut man hours in half and hundreds of feet of angle iron are being welded daily. We wouldn't have it any other way. With the Speed Weaver II we purchased longer rail, for less stop and start, and we are welding about 35 inches per minute. You can also hook a cutting torch to the Speed Weaver II and cut in any position.



Speed Weaver II

Both of these machines should be should be at every shipyard. They are really time and money savers. We are very pleased to have them.

EQUIPMENT:

BUG-O Systems Stiffener Welder,Speed Weaver II.

Applications

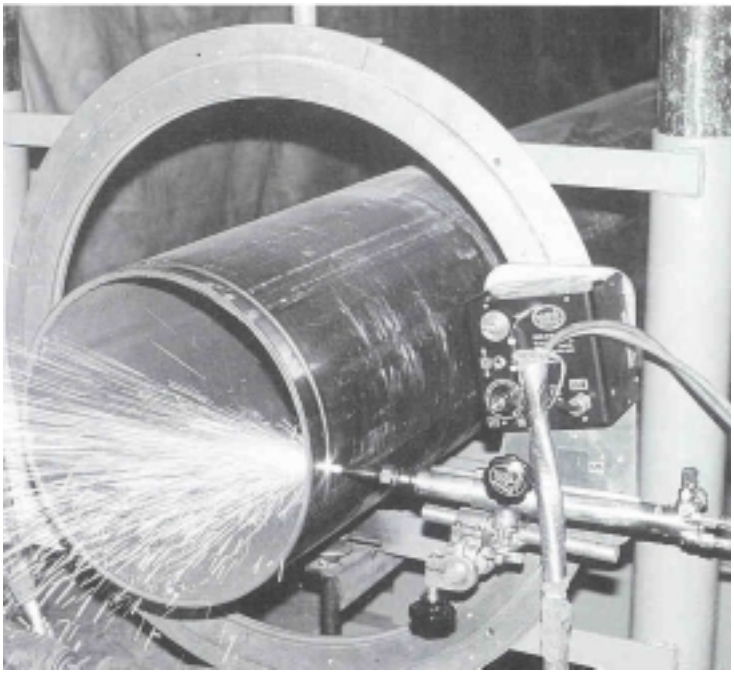
Pressure Vessels / Pipe

CIR-O ELIMINATES COSTLY PIPE CUTTING PROCEDURE!

Every time we had to cut pipe we would have to stop fabricating in a welding booth and use the weld positioner to machine cut the pipe or some other costly method for cutting.

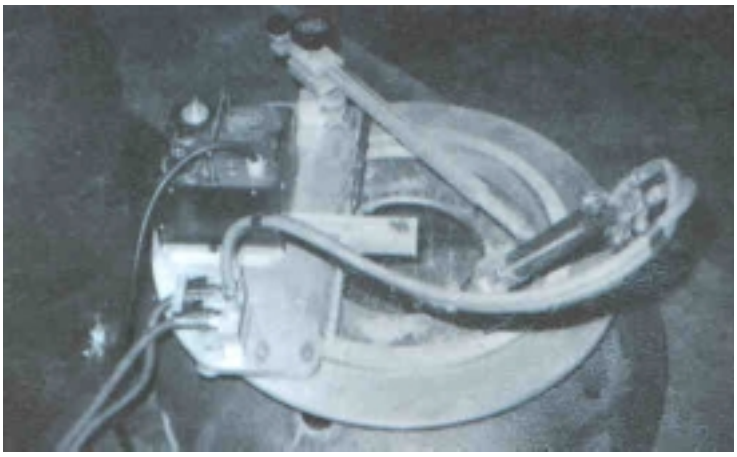
To solve this problem we mounted a Bug-O Systems CIR-O on a vertical frame made from pipes which would center carriage to pipe with one hand jack screw. We also made a V-type roller conveyor system to support and center pipe.

We had very positive results. One machine will cut 6" to 26" (152.4 to 660.4 mm). The cuts are within 1/32" (0.79 mm) and very little clean up is needed. The pipe is always supported and there is no need for jack stands. With the use of a conveyor system, several cuts can be made without the use of a crane. The weld positioner is only used to fabricate pipe.



EQUIPMENT:
Bug-0 Systems CIR-O circle bumer, beveler and welder.

Reduced fit-up time with a CIR-O



The problem was to burn and bevel heads and cylinders 18" (457 mm) through 120" (3048 mm) in diameter without spending tens of thousands of dollars for a turret table. The company needed to attain A.S.M.E. tolerances in their cuts and had to make fit-up checks of protruding nozzle connections on a regular basis.

The company purchased a CIR-O PRECISION CIRCLE BURNER, BEVELER AND WELDER. It is placed quickly and easily on the center of a head or cylinder and makes smooth accurate cuts and bevels for nozzle connections.

The CIR-O reduced fit-up time per nozzle connection as much as 50%. By mechanizing the burning and beveling, there was no grinding and cleanup. Mistakes that had previously been made by hand have been reduced and the quality of the cut greatly improved.

EQUIPMENT:
CIR-O PRECISION CIRCLE BURNER, BEVELER & WELDER, 5" (127 mm), 8" (203 mm), and 10" (254 mm) extension legs.

Saddle Contour Cutting System Reduces Welding Time!

The welding of manway nozzles on thick cylindrical vessels and dish ends was performed by using a shielded manual metal arc welding process. This operation was very time consuming and the operator had to work in a difficult environment due to high preheating and interpass temperature during welding.

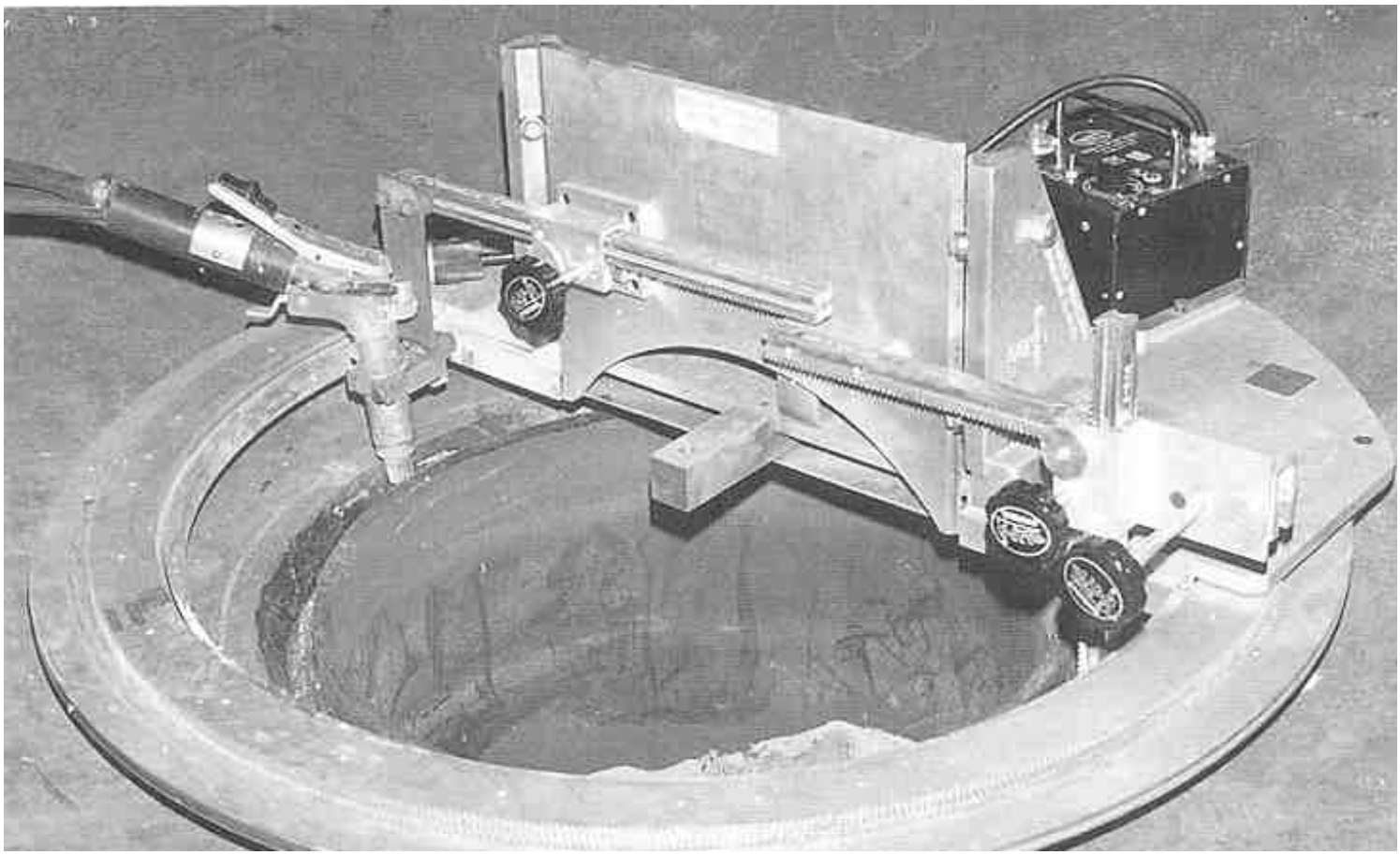
In order to reduce the welding time, a CON-5 Saddle Contour Cutting System with a semiautomatic submerged arc welding gun was used to weld the groove from the shell side which accounts for the major chunk of the weld metal (60-70%).

To exploit the idea of a saddle contour cutting system, an arrangement was made to mount the semiautomatic welding gun in place of a flame cutting torch. To accomplish this, an adaptor was designed for the manipulation of the torch to suit the weld path in the joint. For the adjustment ofthe welding gun, the vertical slide of the guide wheel rack and horizontal slide of H racks were used. The guide wheel takes a path outside the joint. A suitable arrangement was made for holding the welding cables and flux hose to avoid any difficulty in flux and wire feeding system. This adaptor can be mounted on any of the three models on CON-O machine to suit the size of the nozzle being welded.

The new arrangement improves the operator's working conditions. The weld quality is improved substantially due to mechanization and the welding time has been drastically reduced. For a 24" (610 mm) nozzle the welding time was reduced by more than 25%.

EQUIPMENT:

Bug-O Systems CON-5 Saddle Contour Cutting System with a custom built adaptor.

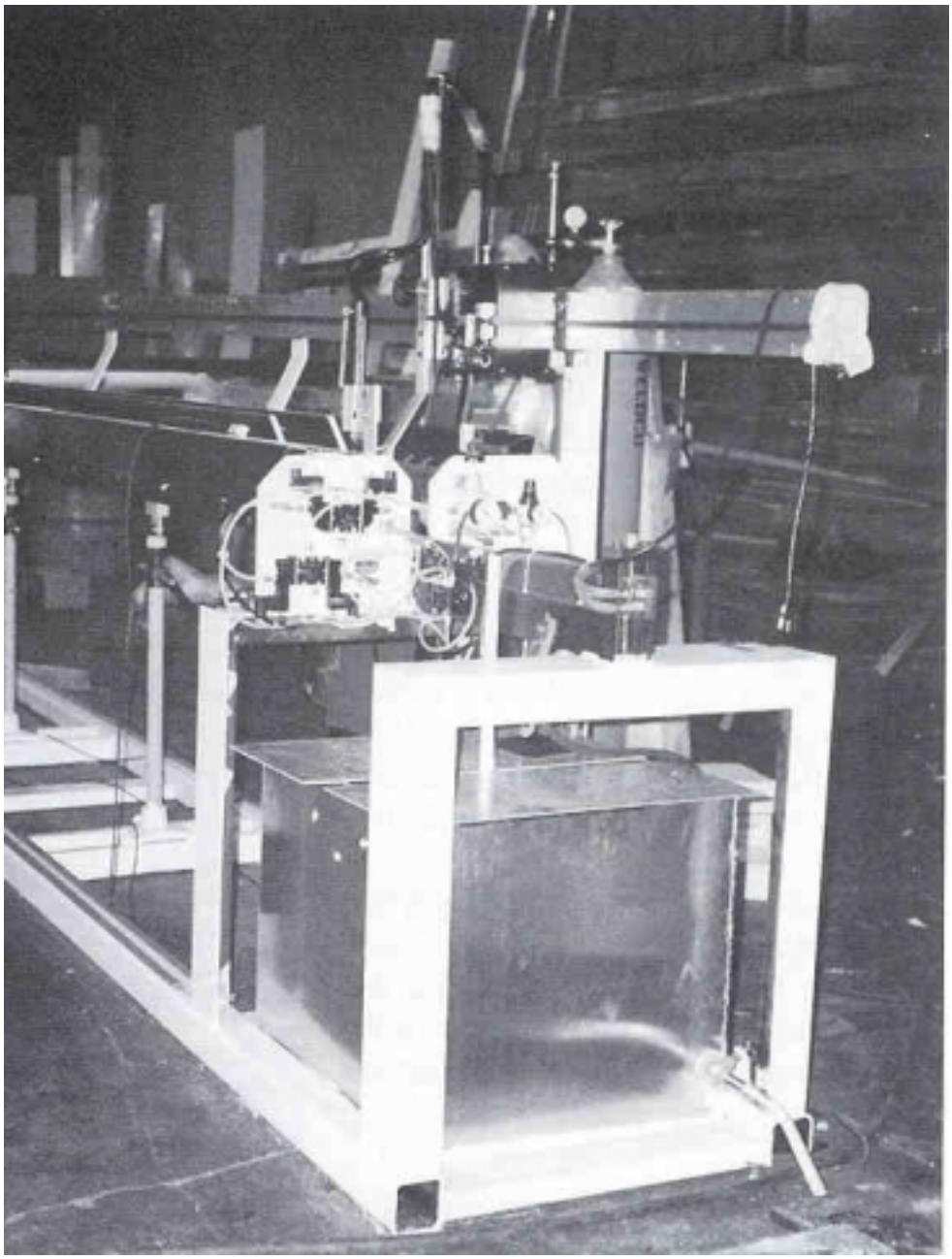


Accuracy Plus Versatility Equals Minimal Adjustment And Savings.

We were required to manufacture a 1. 5 x 6" (3 8 x 152 mm) stainless steel tube which could not be purchased as a standard item. We attempted to weld two 3/4" x 6" (19.1 x 152 mm) channels together. The material was 16 gauge and had a tendency to warp. We had to tig weld these together with a piece of stainless steel filler rod laid in the joint to build the weld up high enough so we could grind it down and refinish the part to a #4 finish. The two channels were brake formed from flat sheet. It was very time consunung and extremely tedious to hand weld 12'(3.66 in) lengths of channel together. It was difficult to make the weld consistent and we found that we had to scrap about 30% of the parts either because we burned through or the part was too distorted to be able to refinish to an accept- able part. Time and budget did not permit us to purchase a $70,000 seam welder.

Our solution - we manufactured our own version of a seam welder. We made a water cooled mandrel that was I" x 2" (25 x 50 mm) steel, chambered to allow cool water to flow through it. We attached 1/4" (6.4 mm) thick copper to the top to reduce heat. Aluminum fingers were made, with copper attached to the bottom of the fingers. The fingers were approximately 4" (I 02 mm) long and were butted continuous to the length of the 12' (3.66 in) mandrel. A high pressure fire hose was installed above the fingers, which when filled with air, would clamp the two pieces of channel against the mandrel. A GO-FER III H. S. was installed on the frame which held the tig. The versatility of the GO-FER III H.S. allowed us to make adjustments necessary to track the seam. The accuracy of the unit made these adjustments minimal and was seldom required after we began the operation.

By holding close tolerances while brake forming the stainless steel channels, we were able to preset the welder at proper distance to start the welding process. The accuracy of the GO-FER III H.S. allowed the welder to track the entire 12' (3.66 m) piece and make the weld. The weld consistency allowed us to minimize the refinishing process. The purchase price of the tubes from and outside supplier was around $30,000. We have about $5,000 material cost in the unit with $1,600 labor to make it. We manufactured the tubes for approximately $7,000 and now have a piece of equipment which we can use to manufacture future work. Net savings on this job was $16,400. The entire process took nine weeks.



EQUIPMENT:

Bug-0 Systems GO-FER III H.S., 8'(2.37 m) Heavy Duty Aluminum Rigid Rail, 4'(1. 1 8 m)HeavyDutyAluminwnRigidRail, Miller Syncrowave 250 Tig welder, Jetline cold wire feeder, WP-18P Weldcraft pencil tig torch, Miller water recirculator.

Super-Flex Is Modified To Defuse A Dangerous Situation.

One of our customers had a 120,000 pound vertical pressure vessel used in high pressure isostatic pressing of refractory shapes. The wall thickness of the vessel was approximately 14" (355 mm), the diameter was 66" (1.67 in) and the length was 20'(508 mm). The vessel had ruptured due to fatigue/stress propagation and the catastrophic failure had caused the vessel to jolt upward some 5' (1.5 in) and then come back down to rest at a ten degree angle in its deep pit. A determination was made that the press was unrepairable and needed to be removed so the building could be used for another process.

A dangerous situation now existed. The pit was filled with crushed stone to stabilize the vessel from moving any ftuther and all damaged structural steel was removed. Due to the location of the vessel in the building, removal would entail dismantling a section of roof and hoisting the vessel out with a 200 ton crane. In addition, the vessel would have to be cutup into pieces 24" x 36" (610 mm x 914 mm) in order for a steel mill to reycle it.

A call was made to a national torch manufacturer who advised that even though it had never to their knowl- edge been done before, a 14" (355 mm) thick horizontal cut might be made. They advised using a torch and tip setup for 20" (508 mm) thick steel. This procedure tested satisfactory on a CNC flame burning machine in our shop. A flow rate on the oxygen was established at 1850 cubic feet per hour. This necessitated manifolding three liquid oxygen cylinders together to feed a liquid vaporizer.

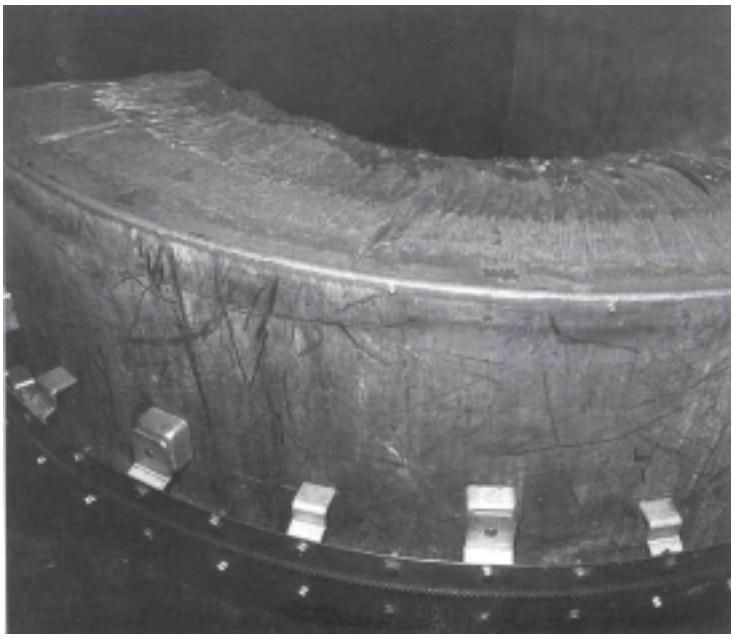
At this time Weld Tooling Corporation was contacted regarding the modification of a Bug-O Systems Super-Flex Machine to reduce its lowest speed to .5 inches per minute (12.7 mm) fro the stock speed of 1.5 inches per minute (38 mm/min).

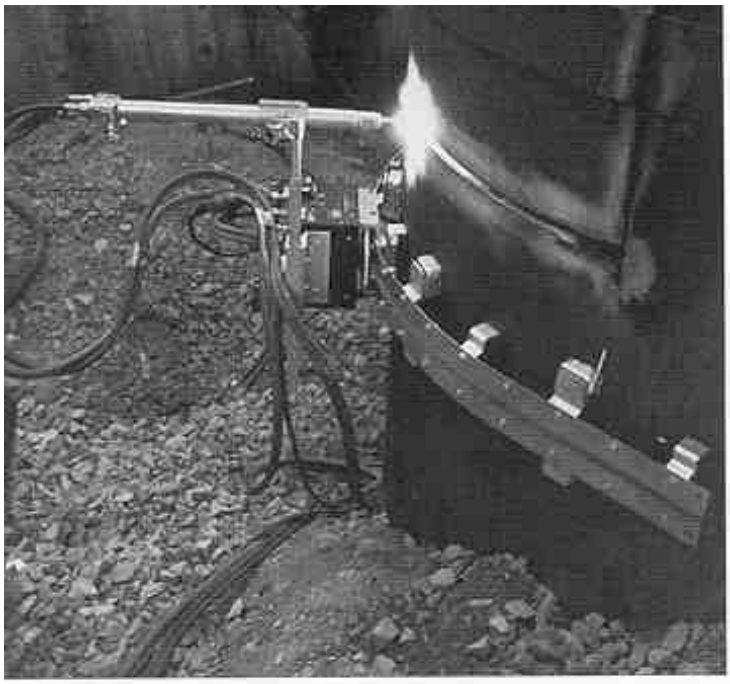
This having been done, a test bum was carried out to prove the technique to the customer's satisfaction. Having passed this test, the vessel was then cut up in place and the pieces removed with an existing 5 ton overhead crane. The crushed stone was removed with a clambucket, as the cuts progressed deeper into the pit.

The vessel was removed in pieces ready for the steel mill in 41/2 working days at a net cost savings of over $40,000.00. In addition, the roof was left intact preventing any future problems with the integrity of the roofmg system.

EQUIPMENT:

Bug-O Systems Super-Flex Flame Cutting Kit (rnodified), 1L-TEC-C-67 torch with 20" (508 mm) tip, 3 Cryocenic Oxygen bottles manifolded with a 2000 cubic feet per hour vaporizer, 1 60# Mapp Bottle.





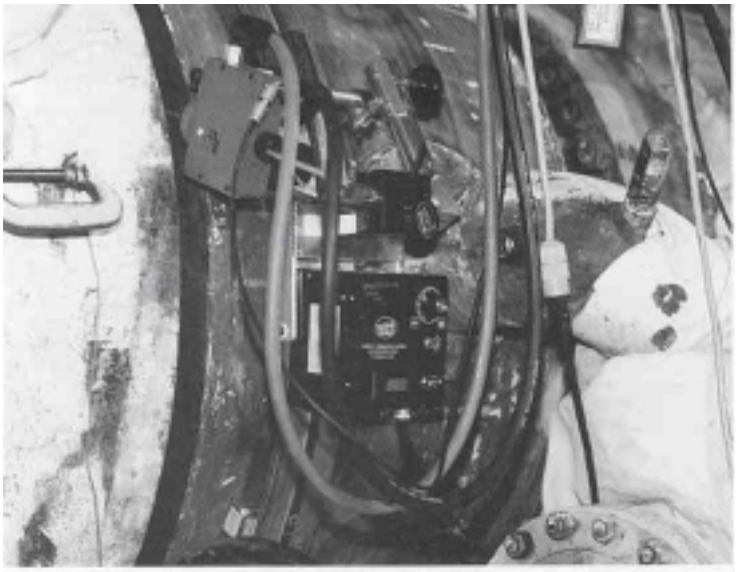
UNIQUE APPROACH RESULTS INTO TOTALLY AUTOMATED SYSTEM.

A power plant's 10th stage feedwater heater experi enced a severe crack at the tubesheet to shell weld. Due to a previous repair to this heater, access to this weld is severely limited. The weld is at the bottom of a narrow recess, approximately 11 1/1 6" (43 mm) wide and 5" (127 mm) deep.

General Shops was approached to repair this heater. As the first step in the repair procedure developed, removal of the cracked weld material was necessary. Conventional machine tooling could not be used due to confined access. The heater shell diameter was 55" (1397 mm) O.D. and had several 6" (152 mm) and 8" (203 mm) nozzles in close proximity that would prevent a 360' rotation of any known machine tooling.

The suggestion was made to purchase a Bug-O circular track conforming to the heater diameter and a tractor to fit the circular track to orbit around the heater shell. A voltage sensing Arc-Air torch would be mounted on the Bug-O tractor, providing controlled removal of the cracked weld material. This procedure was accepted by our engineering department.

This unique approach resulted in a total automated system that maintained a constant depth of cut while orbiting around the circumference of the heater.



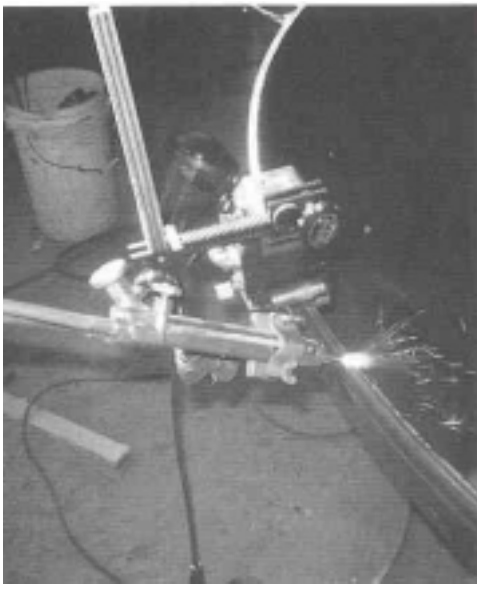
EQUIPMENT:
Bug-O Systems DCD ROL-O Carriage, heavy duty mounting group for Arc-Air, cable mounting assembly, bent rigid magnetic plate.

UNI-BUG Reduces Costly Setup Time!

Our problem has been beveling the inside of 3/8' - 3/4' (9.5 mm-19.1 mm) thick flanged and dished heads. We wanted to eliminate the costly set up of machining and time consuming grinding.

Using a BUG-O UNI-BUG, equipped with a straight cutting torch, we are now able to bevel the inside of these heads.

The UNI-BUG is a small, lightweight, versatile machine designed to weld or cut coamings, flanges, stiffeners and similarjoints. The UNI-BUG is the first machine in the industry that is small enough to carry a cutting torch or welding gun into tight work areas or around very tight curves without the use of a track. It can be mounted on a workpiece that is in almost any position.



TheUNI-BUGproducedauniform bevel that requires no grinding. The setup time has been reduced to approximately 20 minutes. In addition, the savings in labor time has been reduced 300 per cent.

EQUIPMENT:
BUG-O SYSTEMS UNI-BUG, straight cutting torch.

“Set It and Forget It” Welding System!

We had to make two 5' (1524 mm) diameter closure welds on a spent fuel cask assembly. These welds are made in a relatively high radiation field, so we wanted to reduce operator exposure at the joint as much as possible.

Bug-O Bent Rigid rail was attached to a “Quick-on/ Quick-off ‘steel adaptor fitting. This adaptor mounts to a bolt hole pattern on top of the transfer cask. A custom- ized welding carriage then mounts onto the bent rigid rail. Total installation time (to set up) is less than 15 minutes.

A custom welding carriage was built by a team of welders, electricians and engineers. It was designed for ease of maintenance, use, reliability and was based on BUG-5900 Tube Carriage.

The welding carriage uses a Bug-O trailer on a straight track, mounted 90 degrees to the bent rail, as an automatic joint following device. A spring pulls the straight-track’s trailer right against the inner wall of the vessel, providing full 360 degreejoint tracking capability. A simple “guide rail” is also used for cap-ping.

This simplejoint tracking system, combined with a simple automatic stop switch, gives us a “set it and forget it welding system. The weld operator visually aligns the torch, pushes the “GO” button, and then exits the radiation zone. The carriage completes an entire pass (approximately 15 minutes), and automatically makes the bead tie-in.

We use 0.045" E71T-1 with 75 AR-25 C02; the electrode was specially ordered to 15FT lbs. Cv impacts at 50 degrees F. A flux bearing electrode was selected to overcome rust problems in the joint and to provide extremely smooth beads as welded. Final NDT is by liquid dye-penetrant (PT); we need to reduce weld prep time as much as possible for PT to keep human exposure low. One cask has been welded to date; 26 more are planned.

Weld quality and exposure time reduction were excellent. Operators can learn to use and maintain the system quickly. Competing remote automatic systems (with cameras, manipulators, etc.) cost $300,000.00 plus, and have proven unreliable and expensive to maintain. Our “Home-Made” system cost $18,000.00, is very reliable, and very easy to maintain. Sometimes it pays to keep it simple!

EQUIPMENT:

BUG-5900 Tube Carriage, Pendant Control, Bent Rigid Rail, Straight Rigid Rail and two Bug-O trailers combined in customer built “custom” weld-ing assembly. Numerous racks and rack holders also were used. A Bug-O magnet is used for auto stop/tie-in trip lever.

Maintaining Hygienic Conditions Inside Food And Pharmaceutical Equipment.

To facilitate sterilization and to maintain hygienic conditions inside the Food/Pharmaceutical Equipment, surface finish plays a very important role.

We had to polish 126 stainless steel pipes to be used in Pharrnaceutical Equipment as per the following details.

stainless steel pipe o.d.= 60 mm
wall thicknes = 4 mm
pipe length = 9228 mm
pipe quanity = 126 nos.

Surface finish required within 1 to 1.5 microns. Mill finish of s.s. pipe was fully pitted with varying depths from 0.2 to 0.3 mm all over the surface of pipe which used to get more highlighted after second pass of polishing. This resulted in extensive polishing work.

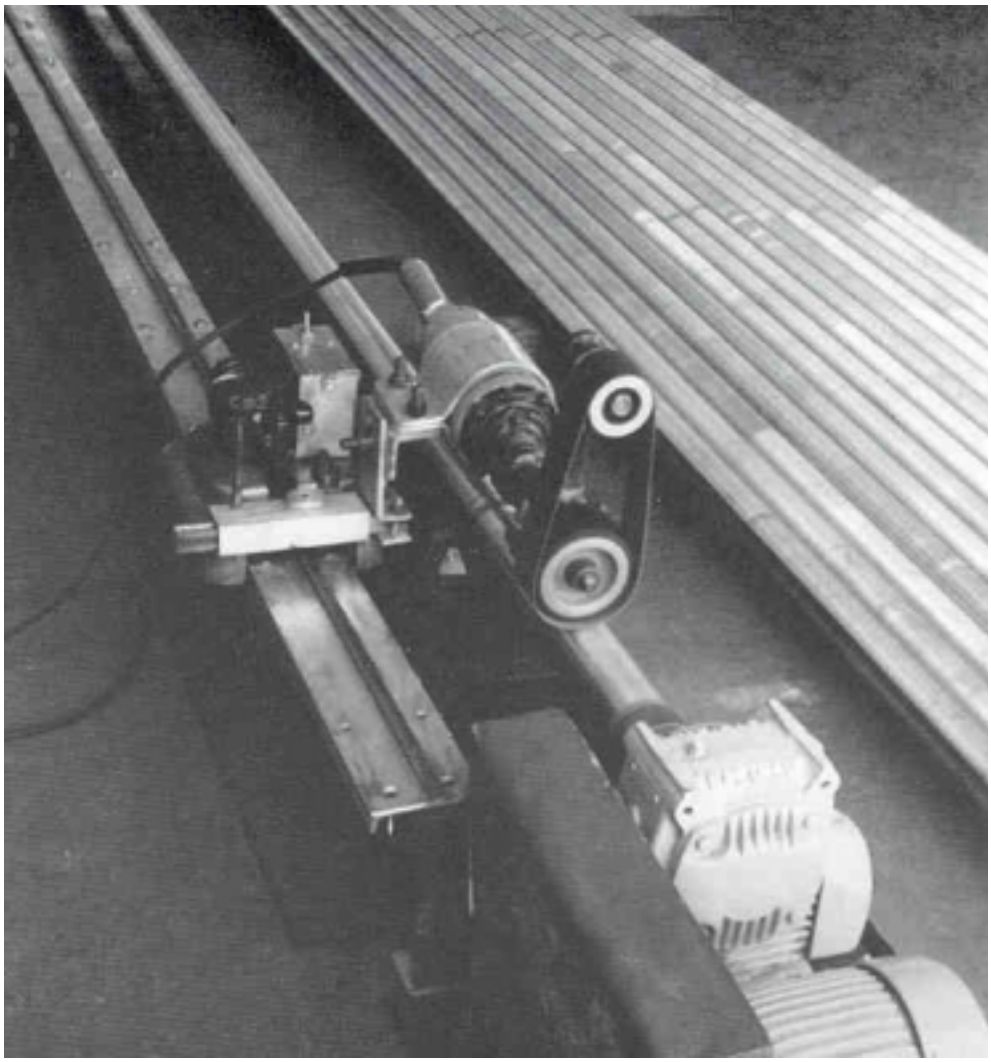
If these s.s. pipes were to be polished by conventional method (manually) - it would not be possible to meet the tight production schedule of 525 hours and stringent quality requirement of the surface finish.

We mechanized the pipe polishing operation using a Bug-O kit having the following features:

1. Pipe rotation, linear movement and polishing attachment mechanized.
2. Compact and sturdy construction.
3. Precise controls.

The mechanized pipe polishing attachment was built by using BUG-O's straight line kit, an H beam, a high frequency grinder with handy belt attachment, a gear box drive and nylon castor wheels.

The high frequency grinder along with handy belt was mounted on a BUG-O carriage and moved along the pipe length at desired speed using the BUG-O drive. The pipe was held with a mandrel at either end and rotated with the help of a motorized gear box at 50 rpm. Sagging of the pipe was prevented by nylon castor wheel supports. A polishing belt was set on the pipe surface by a cross rack movement. The carriage speed was set by the BUG-O drive and was synchronized with pipe rotation.



To meet the production schedule we made two setups of the above equipment.

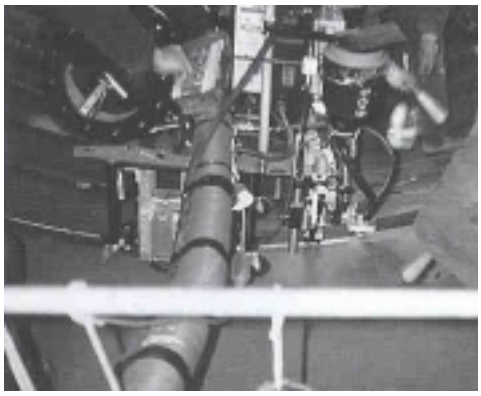
1. Operator fatigue was eliminated
2. The mechanized pipe polishing machine resulted in a man hour savings of 70%. (1239 man hours saved)
3. Surface finish obtained within 1 to 1.3 micron.
4. The skill requirement of the entire operation was brought down to semi-skilled workman.

EQUIPMENT:

BUG-O rails 4 eight foot sections, BUG-O drive motor, specification 2070, BUG-O rack of l' long (length modified), Main Drive Motor: 440 volts A.C. 3 phase 2840 rpm., Radicon Reduction Gear Box 60:1 Emery Belt Attachment, High F requency Grinding Machine 8 sets of nylon caster wheels, H beam 300 x 300 x 10,000 mm Iona.

Stiffener Welder Is The Key Factor For Making A Vital Improvement!

Part of the work content of a 19.68 ft. (6 m) diameter, 213.2 ft (65 m) long column, was the welding of 88 tray support rings internally.



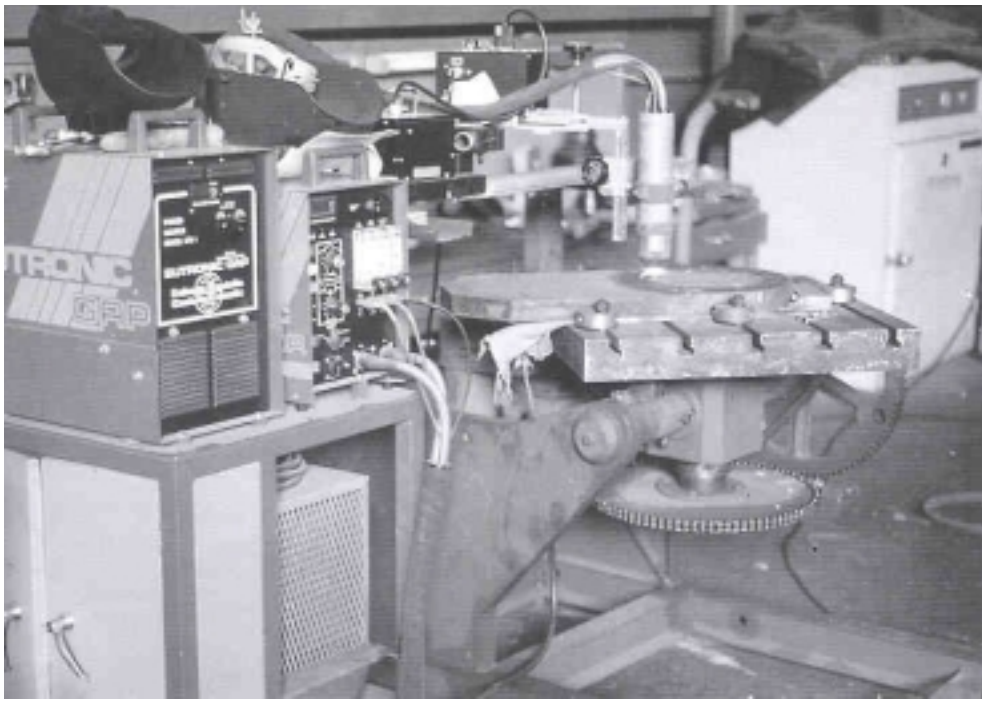
This work could of course been accomplished using many welding machines and men. The associated waste of resources; power, men, loss of time due to synchronization of rotation and overall, a time span too long to suit production targets, made a method of improvement vital.

The Stiffener Welder was the answer. This machine is easy to use, plus it carries two wire feeders. It can be set up for continuous or intermittent fillet welds on stiffeners with flange widths of 0'- 12' (0- 300 mm) and heights of 3'-16' (75-400 mm). The Stiffener Welder can be set to weld on one or both sides of the work at the same time. The machine rides on four large wheels which make it easy to move the unit. Four guide wheels steer the machine along the stiffener and two floating, spring loaded arms with “V” rollers and spatter guards follow the joint [riding over tack welds]. A heavy duty drive unit moves the Stiffener Welder along the work.

EQUIPMENT:

BUG-O SYSTEMS Stiffener Welder.

Problems Solved!



Our company manufactures steam valve seats and gates for 12" (304.8 mm) to 24" (609.6 mm) diameter valves. These valves are used in the geothermal power generation industry.

The manufacturing process requires both annular and straight deposits of cobalt alloys varying from 1" to 2" (25-50 mm) in width and 3/32" (2.38 mm) to 3/16" (4.76 mm) in thickness. The many variations of quality (cracks, laps, porosity, dimensions and distortions) that resulted from our manual gas Tungsten Arc Welding procedure increased production time and elevated the consumables required to uneconomic levels.

We solved our problem by incorporating a BUG-O SYSTEMS Speed Weaver II with a simple rotating table for annular deposits. The Speed Weaver II is a lightweight easy to use machine for automatic weld weaving. It is a precision, solid-state linear weaver with built-in weld contact control. The machine can produce any of the commonly used weld weave patterns. A semi-automatic welding gun can be mounted on it to make fully automatic welds.

The same Speed Weaver It with a BUG-0 DC TV drive, which is the basic drive for many BUG-O SYSTEMS machines, was used for the straight deposits. The DC IV is a positive rack and pinion drive and has a wide range solid state speed control.

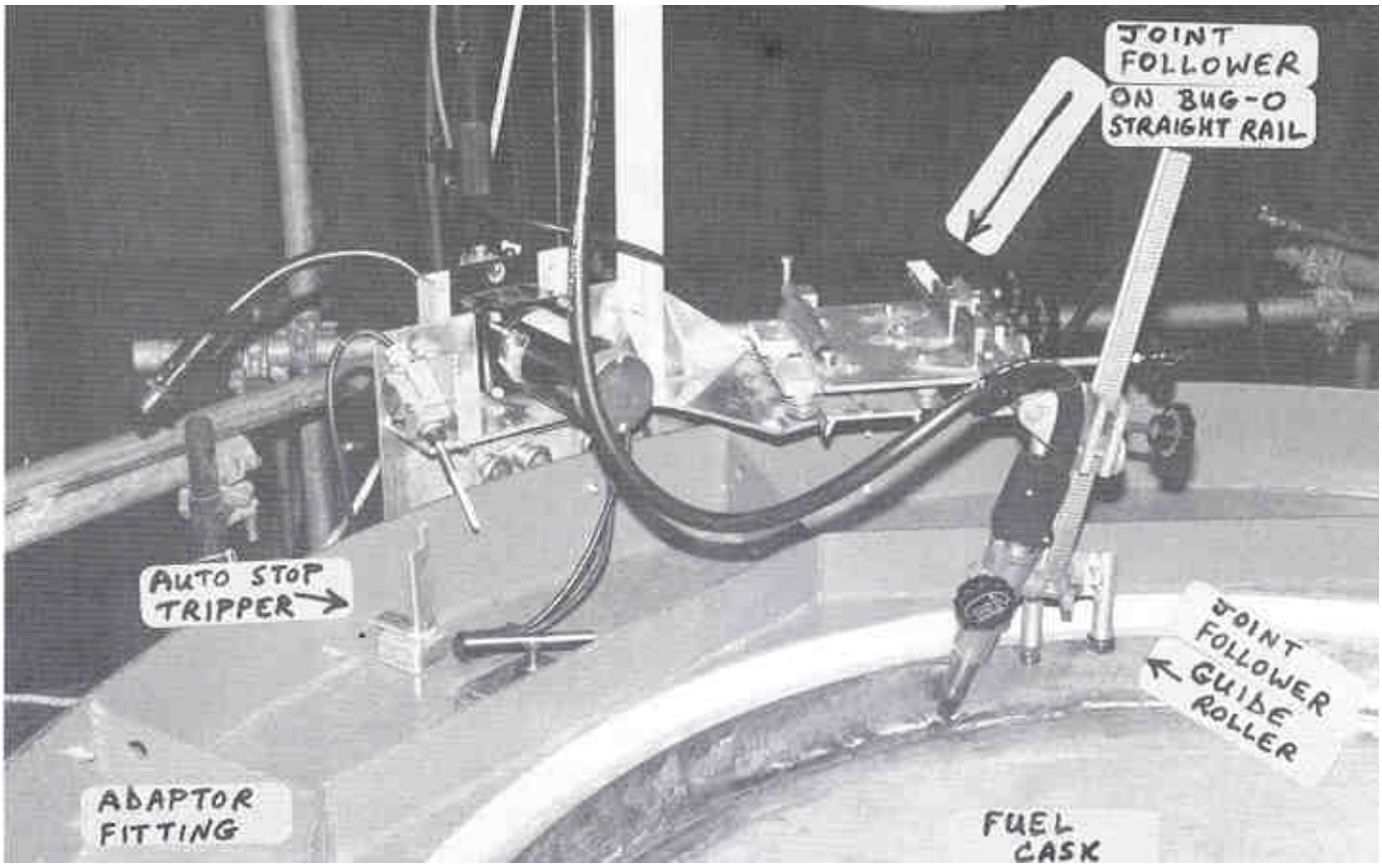
The DC IV with a plasma transfer arc welder replaced the “old painful and frustrating” procedure with an “exact and easy” process.

The problems that we incurred with cracks, laps, porosity dimensions and distortions were solved with savings in consumables and worker comfort. Machining hours and product cost were reduced along with preheat and postheat times and tem- peratures.

EQUIPMENT:

BUG-O DC IV Drive unit, BUG-O Speed Weaver II, Rotating Table and Plasma Transfer arc welder.

WELDING IN A HIGH RADIATION AREA



To make two 5-foot diameter closure welds on a spent fuel cask assembly. These welds are made in a relatively high radiation field, so we wanted to reduce operator exposure at the joint as much as possible.

Bug-O Bent Rigid Rail was attached to a Quick-on/ Quick-off steel adaptor fitting. This adaptor mounts to a bolt hole pattern on top of the transfer cask. A customized welding carriage then mounts onto the bent rigid rail. Total installation time (to set up) is less than 15 minutes.

The custom welding carriage was built by a team of welders, electricians, and engineers. It was designed for ease of maintenance, ease of use, and reliability, and was based on the Bug-5900 Tube Carriage.

The welding carriage uses another Bug-O trailer on a straight track, mounted 90 degrees to the bent rail, as an automatic joint following device. A spring pulls the straight-track's trailer tight against the inner wall of the vessel, providing full 360 degree joint tracking capability. A simple guide rail is also used for capping.

This simple joint tracking system, combined with a simple automatic stop switch, gives us a set it and forget it welding system. The weld operator visually aligns the torch, pushes the GO button, and then exits the radiation zone. The carriage completes one entire pass (approximately 15 minutes), and automatically makes the bead tie-in.

We use 0.045' E71T-1 with 75 AR-25 C02; the electrode was special ordered to 15FT lbs. Cv impacts at -50 degrees F. A flux bearing electrode was selected to overcome rust problems in the joint, and to provide extremely smooth beads as well.

Final NDT is by liquid dye penetrant (PT); we need to reduce weld prep time as much as possible for PT to keep human exposure low. One cask has been welded to date; 26 more are planned.

Weld quality and exposure time reduction were excellent. Operators can learn to use and maintain the system quickly. Competing remote automatic systems (with cameras, manipulators, etc.) cost $300,000.00 plus, and have proven unreliable and expensive to maintain. Our home-made system cost $18,000.00, is very reliable, and very easy to maintain. Sometimes it pays to keep it Simple!

EQUIPMENT:

Bug-5900 Tube Carriage,-l635-25 Pendant Control, Bug-O Straight Rigid Rail, Bug-O Straight Rigid Rail, and two Bug-O trailers combined in customer-built custom welding assembly. Numerous racks and rack holders also were used. Bug-O magnet is used for auto stop/tie-in trip lever.

BUG-O + SUB ARC INCREASES PRODUCTIVITY 60%

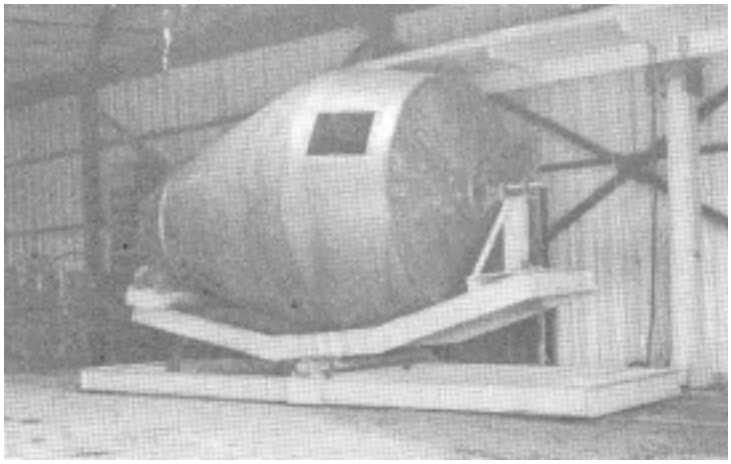
To obtain the contract, a smooth consistent weld must be made. We have been hand welding seams and rolling the concrete mixer by hand to positions to make circumference welds. This process produced an acceptable weld, but interrupted men doing other work to help the welder position the concrete mixer after each weld. This process required 10 man hours per drum for the submerged arc welds.

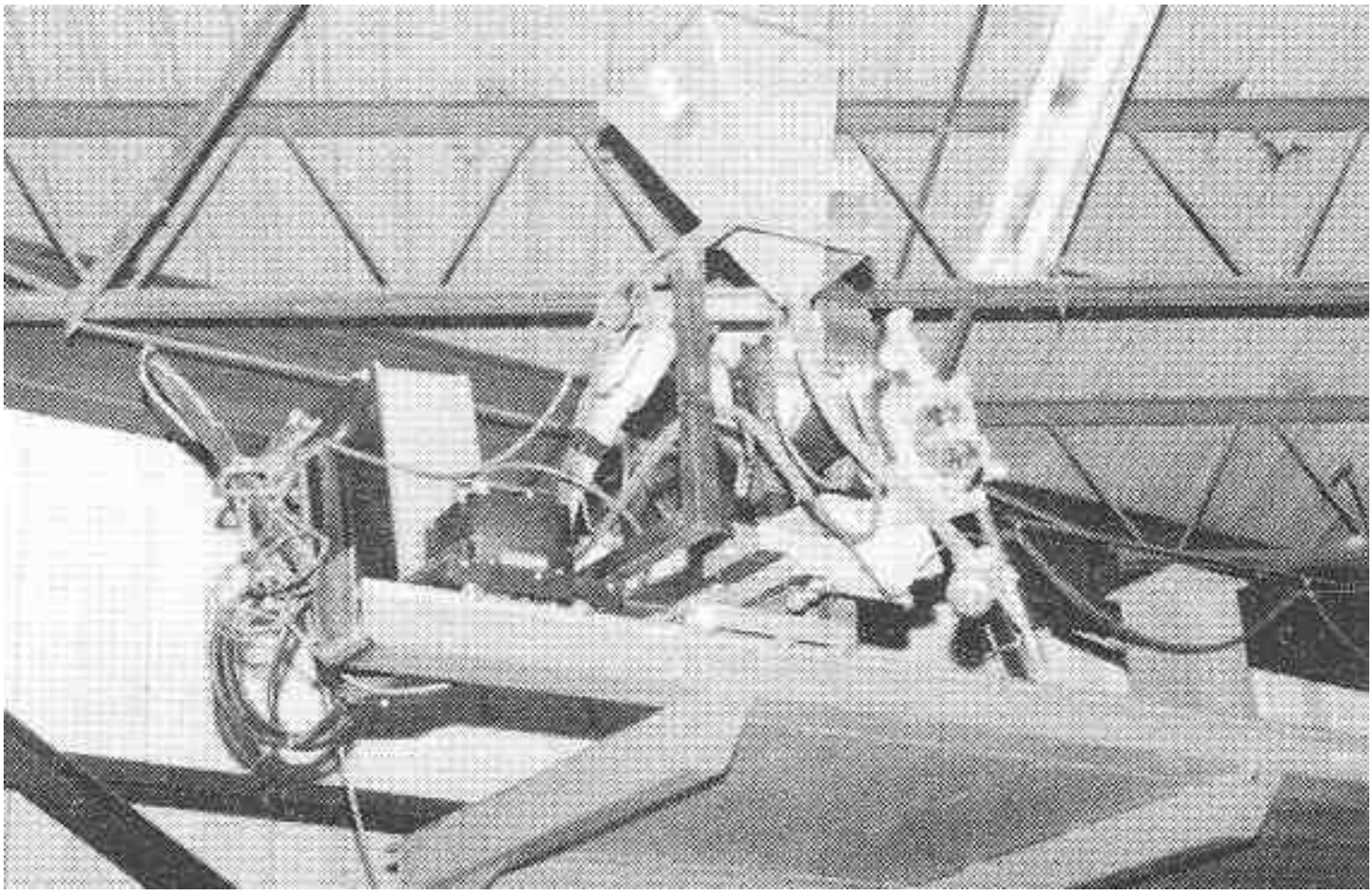
With the BUG-O and trailer we were abde to mount the wire drive, roll of wire, flux hopper and control box to have the ability to bring the welder to the seams. For the horizontal welds that were made by hand, we could now make with the BUG-O to produce a smoother weld.

The greatest advantage of the BUG-O in our operation has been the neutral gear of the drive so the operator could easily roll the welder back and forth on the track to position any weld and have all controls with him. The quality of welds increased 100% and due to mobility a concrete mixer is now welded in 6 hours. Due to the BUG-O ability to carry approximately 240 lbs. (108.9 kg.) smoothly and consistently, we have been able to weld concrete mixing drums assembled by others as well as what we produce. The cost was cut drastically, while profit increased.

EQUIPMENT:

BUG-1925 DC Heavy Duty Welding Kit Miller welding equipment.

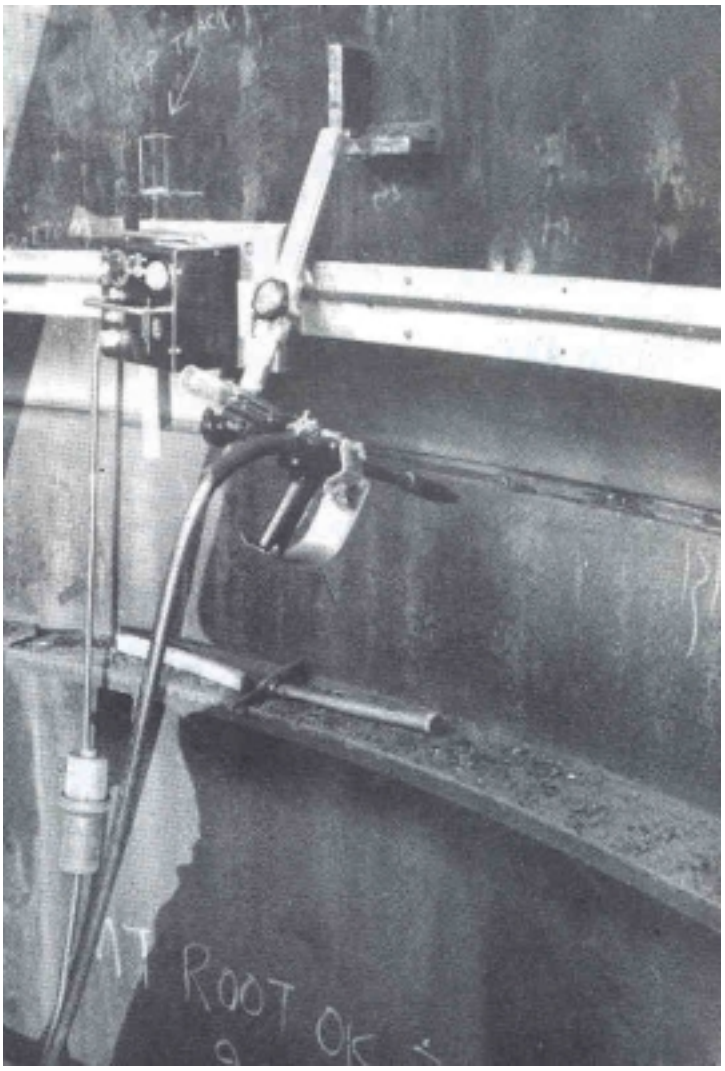


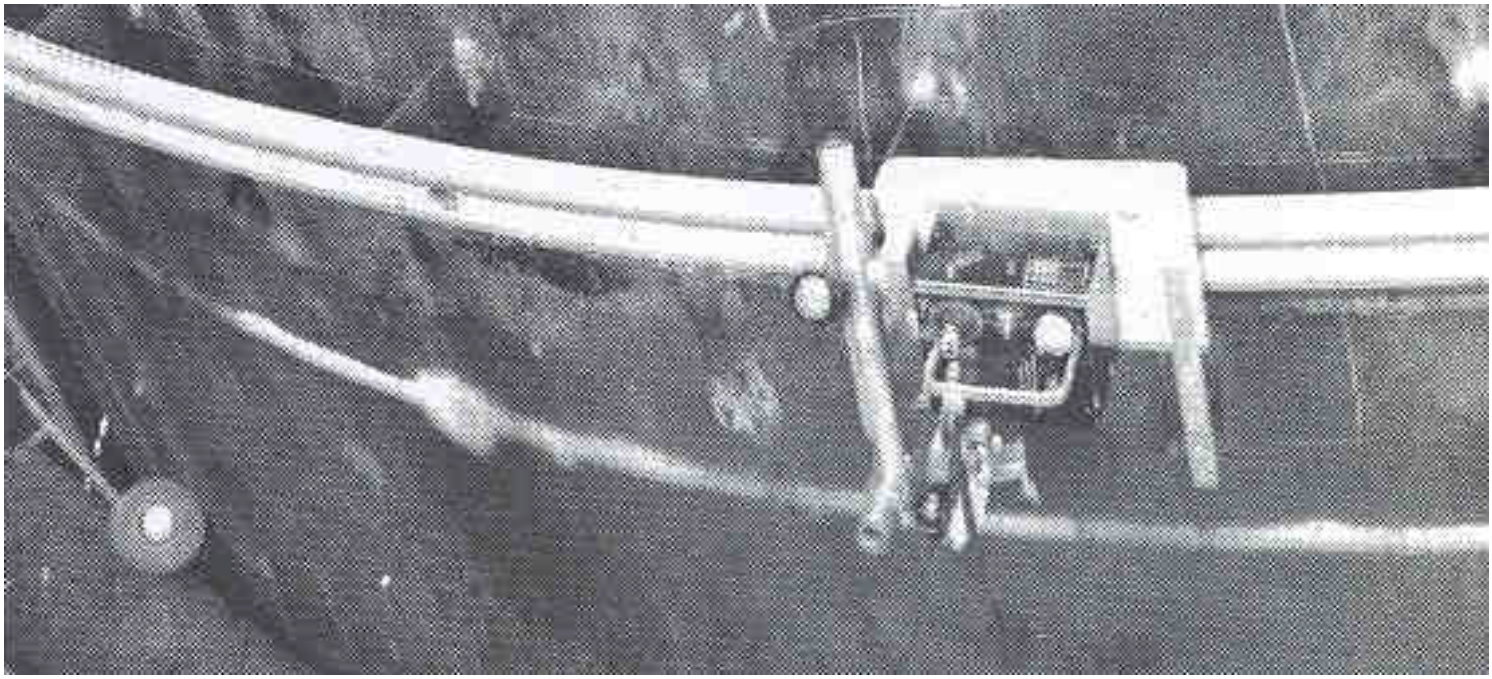


MECHANIZATION SAVES 500 MAN HOURS

The project was the welding of two 23 ft. (7 m) diameter 155 ton basic oxygen furnaces, (on 2-3/4" ASTM 387 Gr 22 chrome alloy material). Butts with a 50' included bevel. Beveled 50% from each side for a total of soine eighty weld passes per seam. Welding done to ASME Section IX Code and N.D.T. done to ASME Section VIII for x-ray and magnetic particle. The problem was to weld 75 ft. (229 m) circumferential butts in. the horizontal position with a minimum preheat of 400' F. During the entire welding process there was a working environment of 1750 and higher. It was difficult to be able to maintain quality and productivity under these working conditions. We felt hand welding would give us low productivity and inconsistent quality, due to increased welder fatigue, because of the high temperatures in the work area.

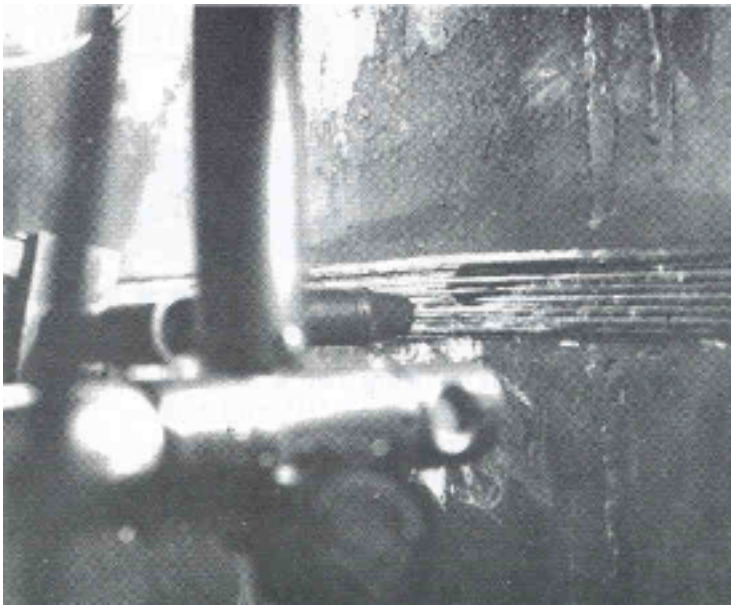
We used mechanized BUG-O Systems for the solution. It was not economical to use pre-formed track f or the required l 50 f t. (457 m) of inside and outside of the shells. Instead we purchased enough flexible track for the 75 ft. (229 m) circumference seams, that would bend to 10 ft. (30 m) inside and maximum outside radius. However, only two sections could be put together for a total of 15 ft. (46 m). The track was modified to give us a complete run around the vessel. By slotting the fixed ends, and drilling the opposite ends for splice plates, we could add as many tracks as needed. Once the track was in place, using the aligning tool supplied at each splice, the screws were tightened on each side of the splice on the rack. To eliminate slippage on the rack, we ran a BUG-O drive over the track. There weren't any hang-ups on our new joints. Everything worked smoothly.





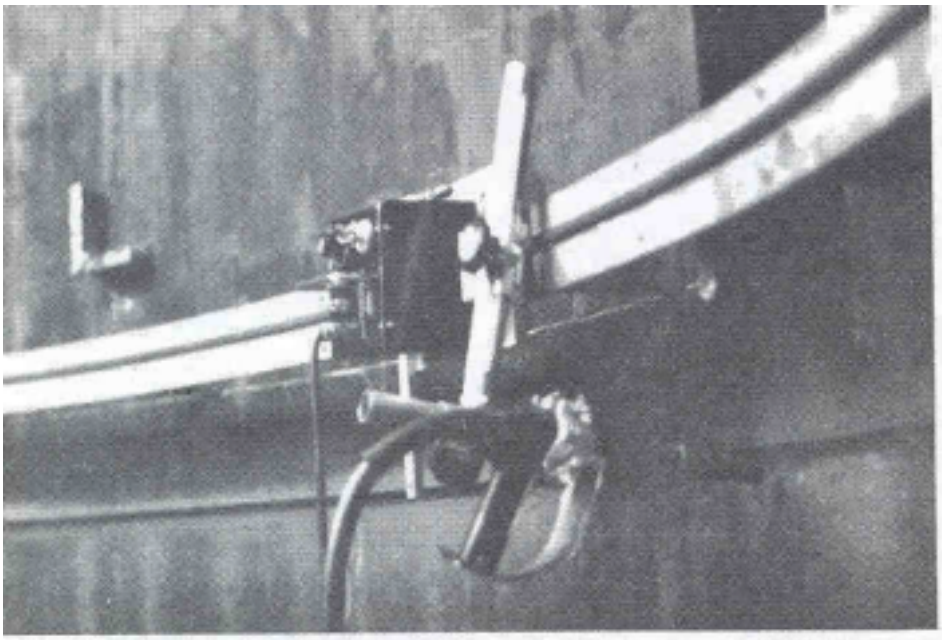
This new modified track required very little work to go from an inside radius on the vessel to an outside radius. The equipment could be used on other projcets when this one was completed.

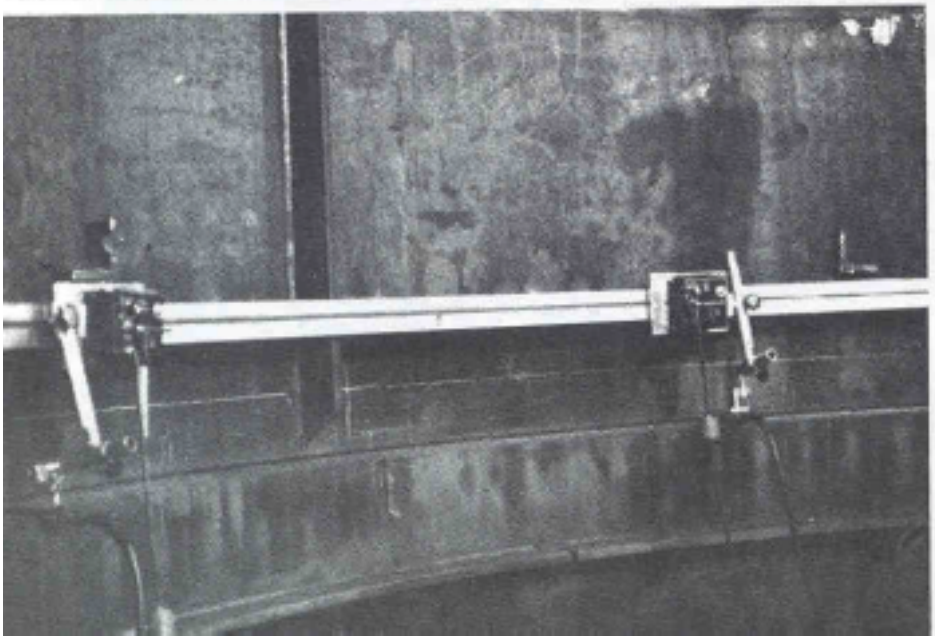
In addition to this equipment now being available for other projects, mechanization of the welding process increased quality and productivity, for a savings of 500 man hours. It also eliminated the worst possible working conditions for both man and equipment.



EQUIPMENT:

Four each of BUG-0336 BUG-O DC III Welding Machines, BUG-5160 H.D. Racker Welding Groups, BUG-2975 Cable Mounting Assemblies. Six AFR-1000 Flex Rail Kits. Also used 1/16 dual shield weld wire, MIG guns, DC 400 Amp CC/VV power source, LN-7 wire feeders, reel mounting assemblies, and input cables.





FIXTURE CUTS ELLIPTICAL OPENINGS

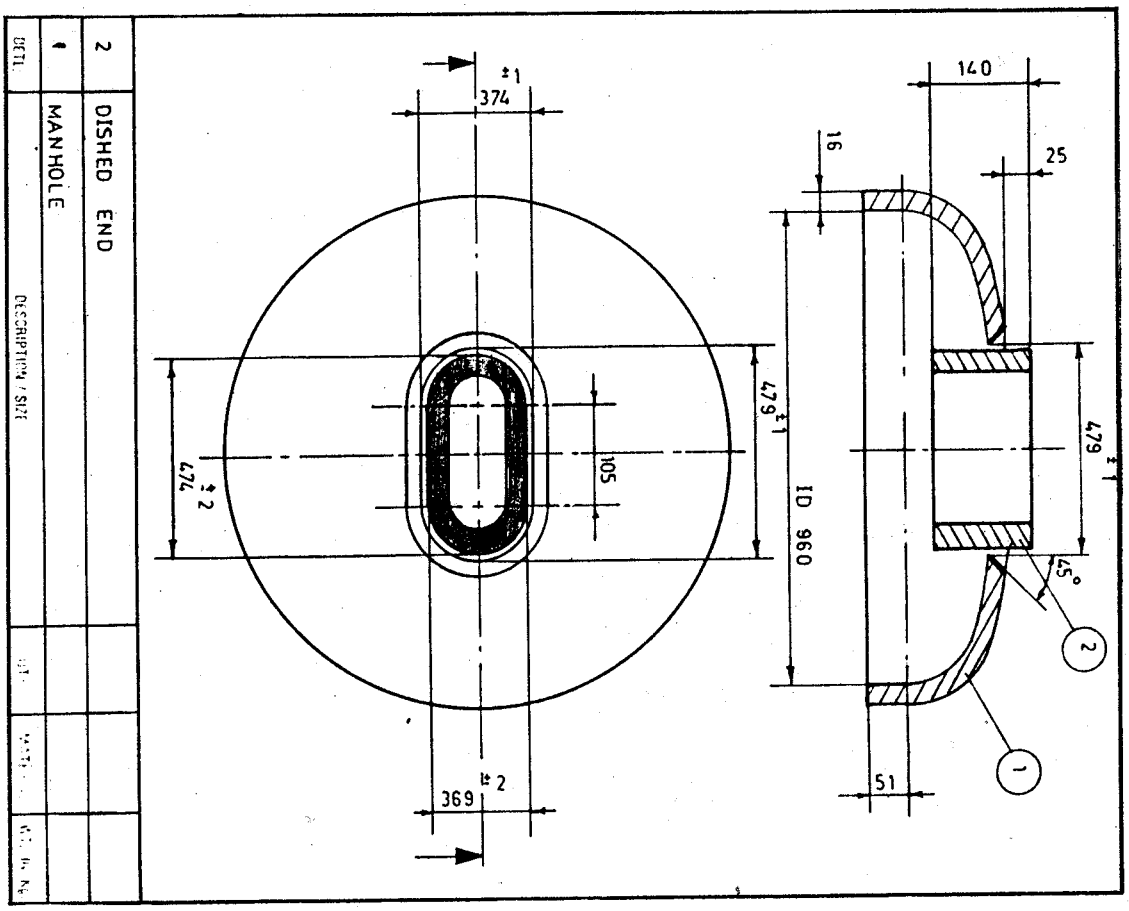
Our company was faced with a typical problem of cutting elliptically shaped manhole openings 19" x 15" (479 mm x 375 mm) on ellipsoidal dished ends, diameter 38" (960 mm). Since manholes and openings on dished ends had a manufacturing tolerance of + .79" (2 mm) and +- .39" (1 mm) respectively, fit up between manhole and dished end took considerable time and effort. As per earlier method, after marking center lines on both, manhole was placed on the dished end and outline of manhole was traced on 'the dished end. Opening was gas cut manually, initially straight and then at the required bevel angle. Fit up was achieved by grinding and sanding the gas cut edge and occasionally by rebuilding. To achieve proper accuracy frequent checking with manhole was necessary during grinding.

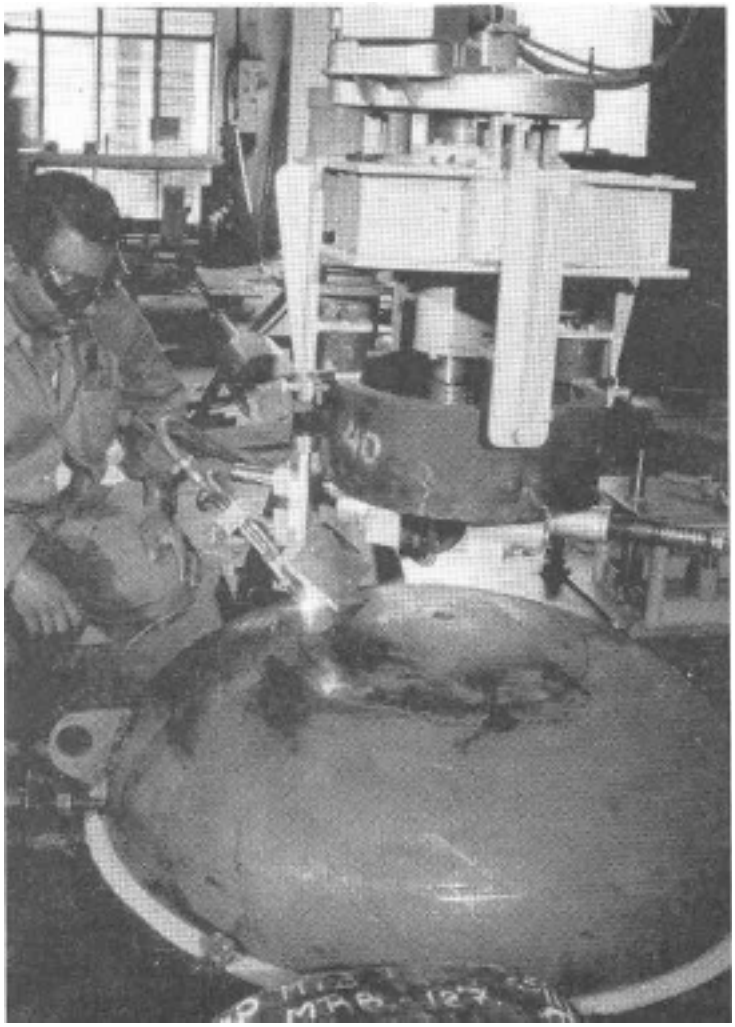
To reduce cycle time and skill needed, a special gas cutting machine was developed using HOB-O. HOB-O was selected since it was compact and was powerful enough to overcome the resistance offered by the mechanical tracing system. It also provided the necessary variable drive to the main spindle. The gas cutting torch was mounted at the required bevel angle on a three dimensional tracing system which guided the torch along the manhole profile and contour of the dished end. This whole assembly was mounted on the main spindle. Manhole and dished end were aligned and clamped in the required position with the help of a special fixture. After clamping the dished end and manhole on the fixture, a .24" (6 mm) hole was drilled on the dished end to start the cut. After preheating, the HOB-O unit was switched on and in about 7 minutes gas cutting was completed.

In this new method, after gas cutting only a light sanding was needed and perfect fit up with uniform gap was achieved. Earlier this total operation took 11 man hours, whereas now it takes only I hour. Also a semi-skilled worker can operate the machine.

EQUIPMENT:

HOB-O and special fixture

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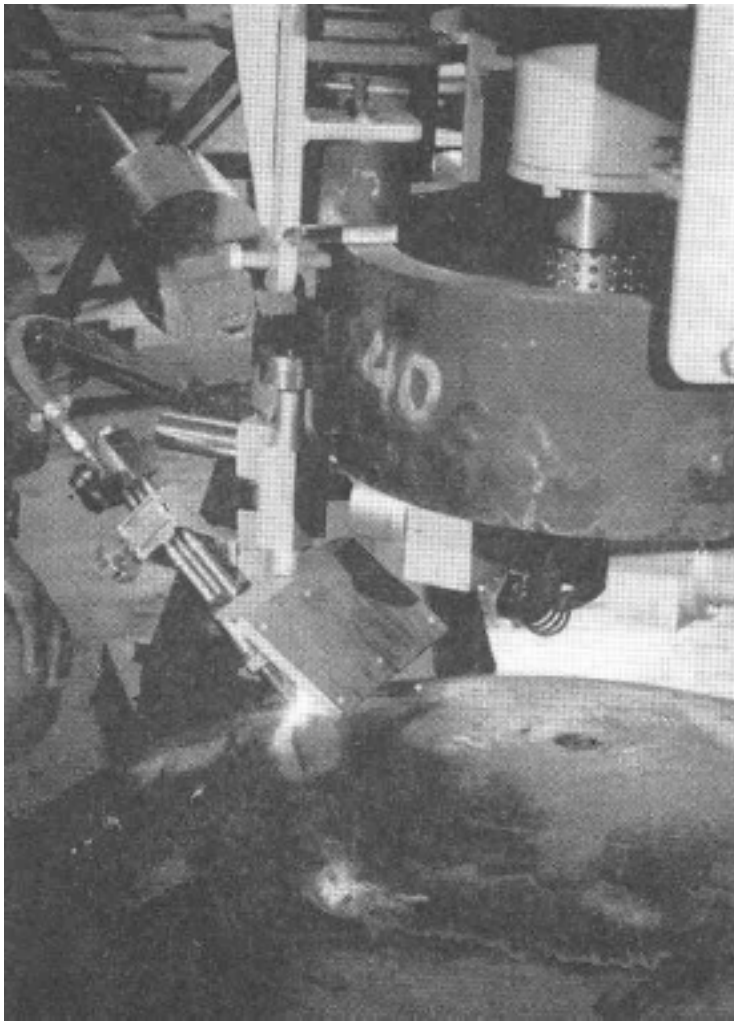
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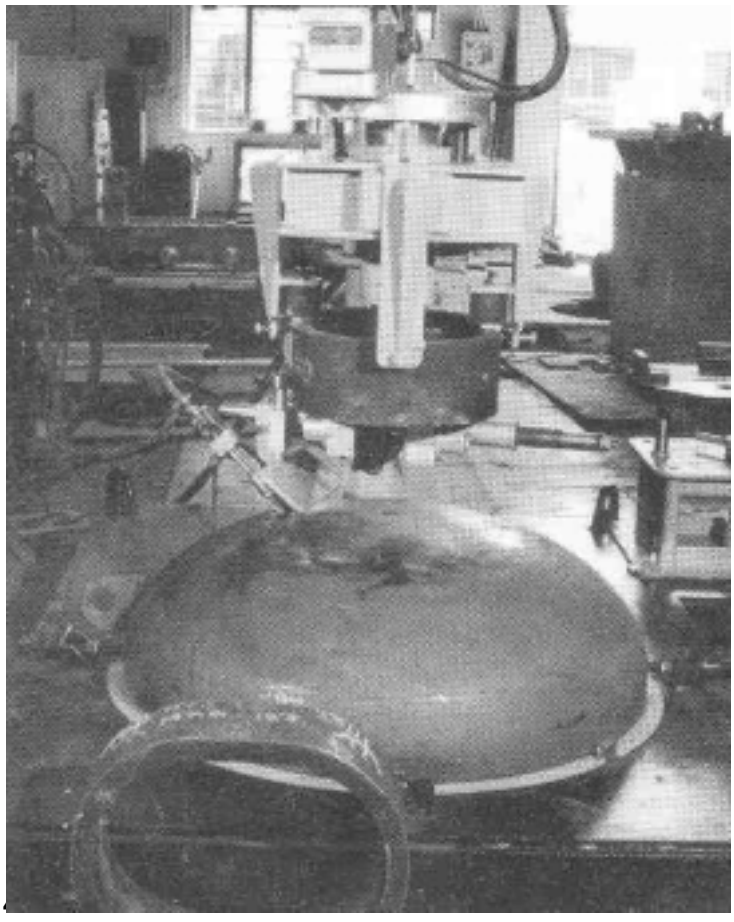


HOB-O Provides Economic Solution!

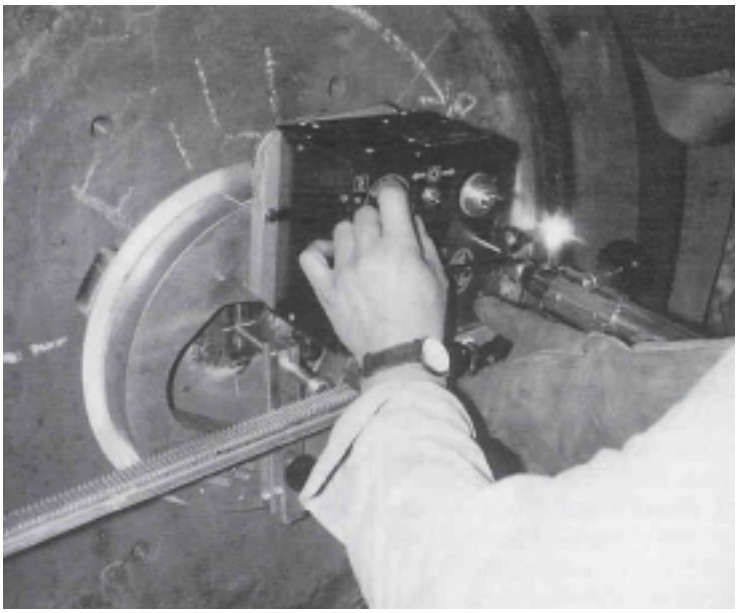
The Illinois Power Company was spending too much time and money removing and reinstalling torus rings on high pressure feedwater heaters, due to quality and productivity problems. Previously, torus rings were removed by flame cutting (oxyacetylene) by hand with the assistance of a fixture. This method was recommended by the Yuba Heat Transfer Company. The resulting kerf was often very rough and not in the same plane. To make the joint accept- able for rewelding, a considerable amount of time was spent grinding, building up low areas by welding and then re-grinding. If the torus ring was not severed in the same plane, fit-up problems had to be overcome upon reinstallation. Once the torus ring was removed from the feedwater heater, the welding procedure required a 45^0 bevel be reestablished on the torus ring. The bevel was also produced by manual flame cutting, which resulted in the same problems described above. The torus rings were often ruined upon removal, or their service life was substantially reduced. With replacement torus ring costs approaching $6,000 each, the company hoped they could save money by increasing service life. To remove and prepare each ring required 36-40 hours.

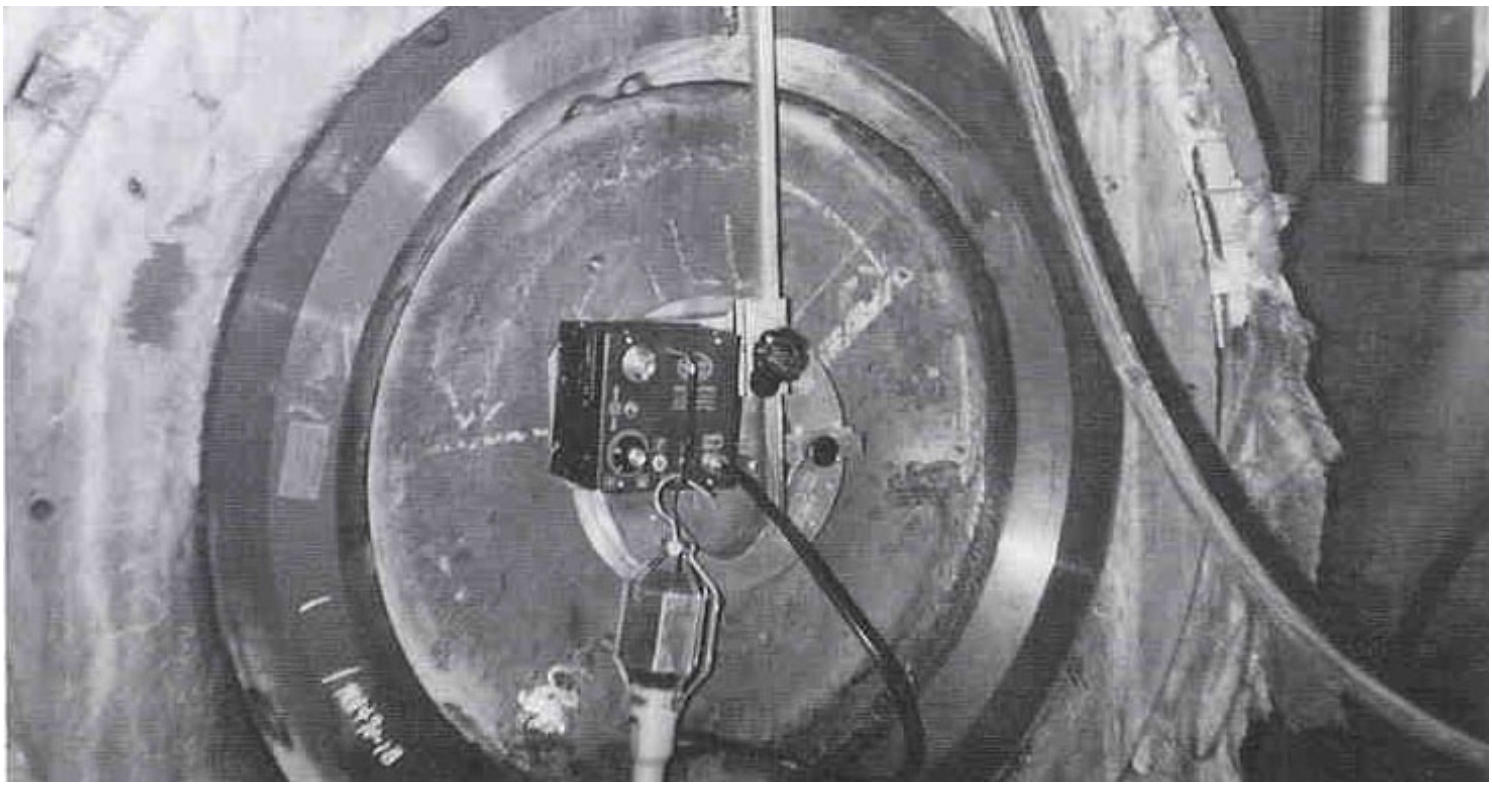
Torus ring removal by machining was too time consuming to be a viable option. Flame cutting with automatic equipment and a swivel cutting tip (to overcome clearance problems) was the solution determined to yield the greatest economy of time, money and quality. The Bug-O Systems HOB-O was chosen to do the job.

The results that were produced achieved smooth kerf and bevels, requiring minimal grinding. The service life of the torus rings was at least doubled. The fitup on reinstallation was excellent. Compliance with the welding procedure specification requirement was simplified and the man hours involved were reduced from as much as 66 to 75%.

EQUIPMENT:

Bug-O Systems DC HOB-O, nose machine torch, Adjustable Tip adaptor.





PRECISION FLAME CUTTING PAYS BIG DIVIDEND!

We manufacture steel plant equipment. Our product range includes Tuyere stock used for blowing of hot air. One of the components of Tuyere stock needs 10 accurate taper on an oval pipe. The practice was to mark the pipe, flame cut by hand, trial assemble the flange with pipe, and gas re-cutting done by hand. Using this process, there was uneven cutting and the final product needed corrective measures.

It was decided to utilize the versatile HOB-O to overcome this problem. We made a fixture to keep the HOB-O inverted, using its magnetic feet. A simple fixture was made which kept the job centered below the HC3-O and gave the required taper.

This process gave us accuracy and consistent cuts on the pipe. It totally avoided grinding, trial assembly, re-cutting and weld distortion, due to unequal gaps. A direct savings of 72% over manual operation was achieved. There was significant reduction in material handling. A cash savings of $6,790.00 per 32 Tuyere stock was realized.

EQUIPMENT:

HOB-2750, fixture for locating HOB-O, fixture for locating job, IOL gas cutting torch.

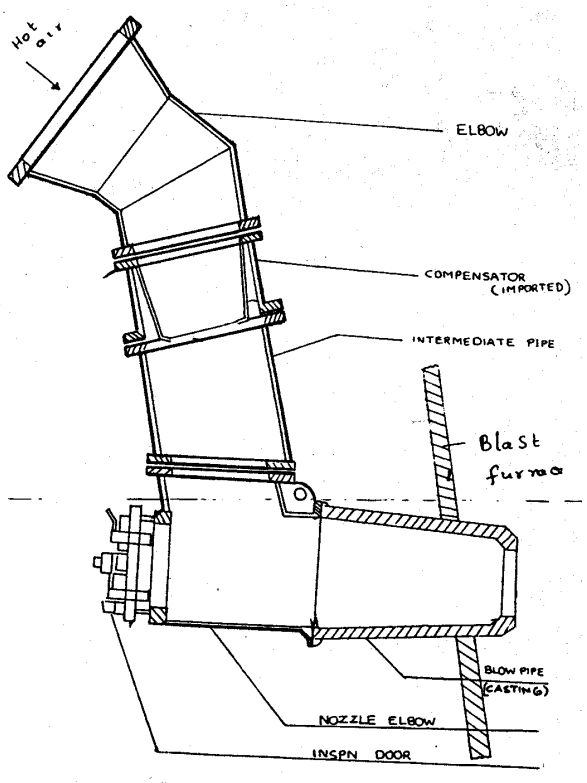
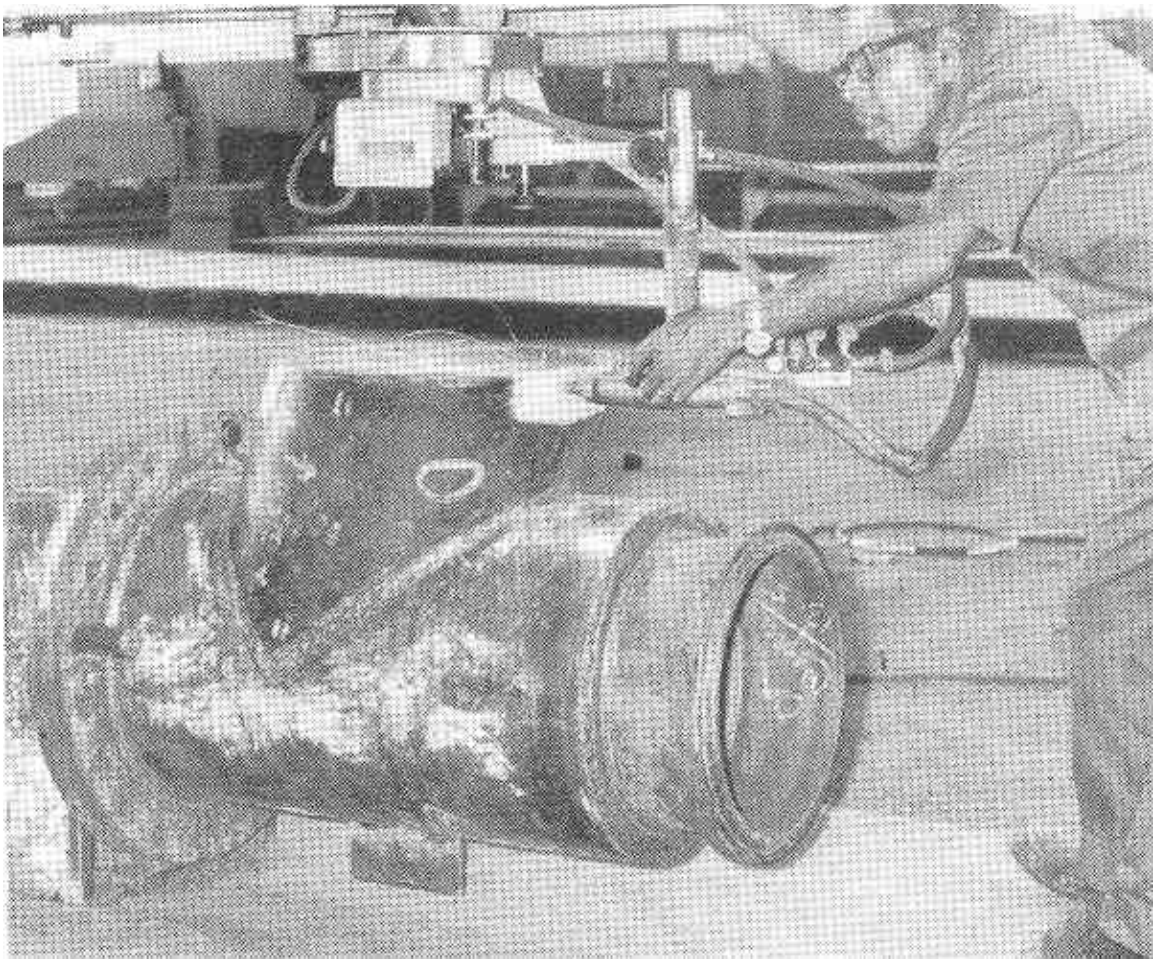


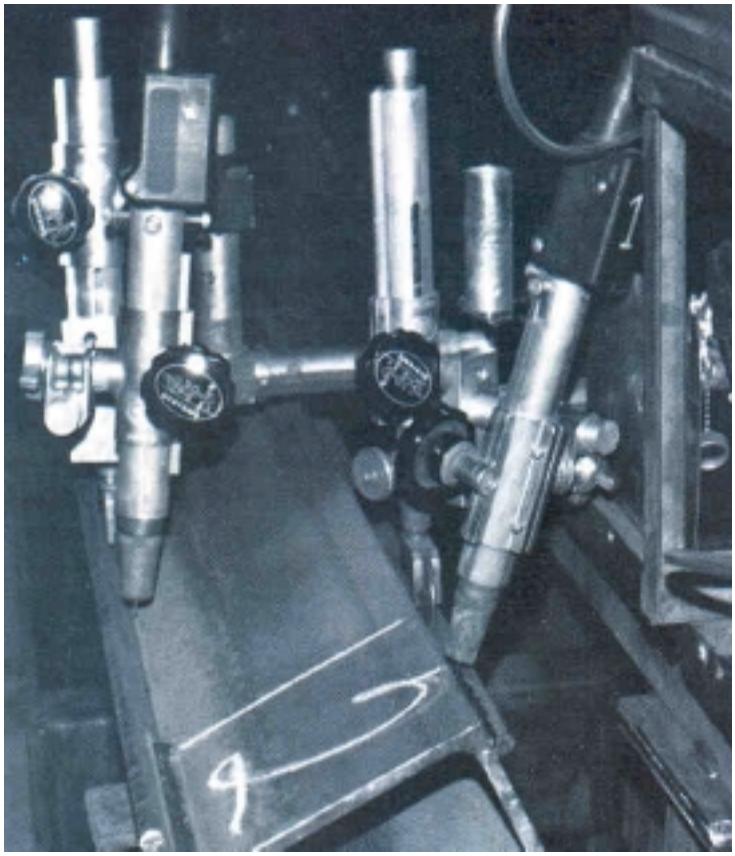
Fig. 3 SCHEMATIC SKETCH OF TUYERE STOCK



Applications

Transportation

BUG-O solves the problem of a 52-foot weld with remarkable results.



This company received a small order to build rail car kits. It involved joining together a pair of 52-foot long inverted angles with two continuous 5116" (7.94 mm) fillet welds. They had little equipment suitable for making long continuous welds, generally associated with rail car as- semblies. They had been accustomed to building lighter and smaller welded assemblies, 20 feet in length or less. Because the contract quantity was relatively small and highly competitive, the allocation for fixturing and additional welding equipment was minimal. Typically, in rail car construction of this type, submerged arc welding is preferred for long heavy structures such as rail car top cord assemblies. The objective was to minimize both camber and sweep in the welded assemblies without having to spend additional labor in the straightening process prior to installation.

By utilizing a pair of BUG-1160 PANOGRAPH TORCH HOLDERS, and constructing a simple fixture table that pre- sets reverse camber, they were able to overcome all the challenges. The box-shaped angle assembly was nested into a series of cradles which was elevated by hydraulic cylinders. This enabled the company to expose both longitudinal weld joints for easy access and tracking simultaneously. Because of the flexibility of the ARR-1080 RAIL, they were able to follow the contour of the joint with extraordinary accuracy. The positive drive of the BUG-O IVTRACTOR enabled them to carry with it all the necessary weld equipment and accessories needed to perform the job. By installing a BUG-1635 REMOTE WELD STARTER PENDANT, they were able to put all the controls for the weld station in the hands of one operator. This allowed the second operator to spend more time in the tacking position for preparing the next assembly.

Ultimately, equipment and fixturing costs were reduced by as much as 54%. The relative ease and accuracy of following the elevated weld joint enabled the operator and his helper to comfortably work this weld seam position, as well as the framing and tacking position. As a result, total man hours for this function were reduced by 50%—but still able to maintain the necessary number of welded units in a single eight-hour shift. The successful combination of BUG-O equipment and the GMAW welding process, enables the company to lay down the required 52-foot long weld with remarkable results.

EQUIPMENT:

BUG-0343 (1) BUG-O DC IV, BUG-1160 (2) HEAVY DUTY PANOGRAPH, BUG- 635-10-2 (1) REMOTE WELD STARTER, ARR- 1080 (8) HEAVY DUTY ALUMINUM RIGID RAIL, BUG-2790 (2) CARRIAGES, BUG (1) DOUBLE RACKHOLDER MOUNT, Lincoln DC (2) Power Source, Lincoln LN-9 GMA (2) Wire Feeder, Tweco-Tam-500 (2) Gun and Cable

Universal Skipwelder Helps Meet Production Demands!

Our problem was how to quickly and efficiently build side wall panels for solid waste transport trailers at a rapid enough rate to meet our production demands?

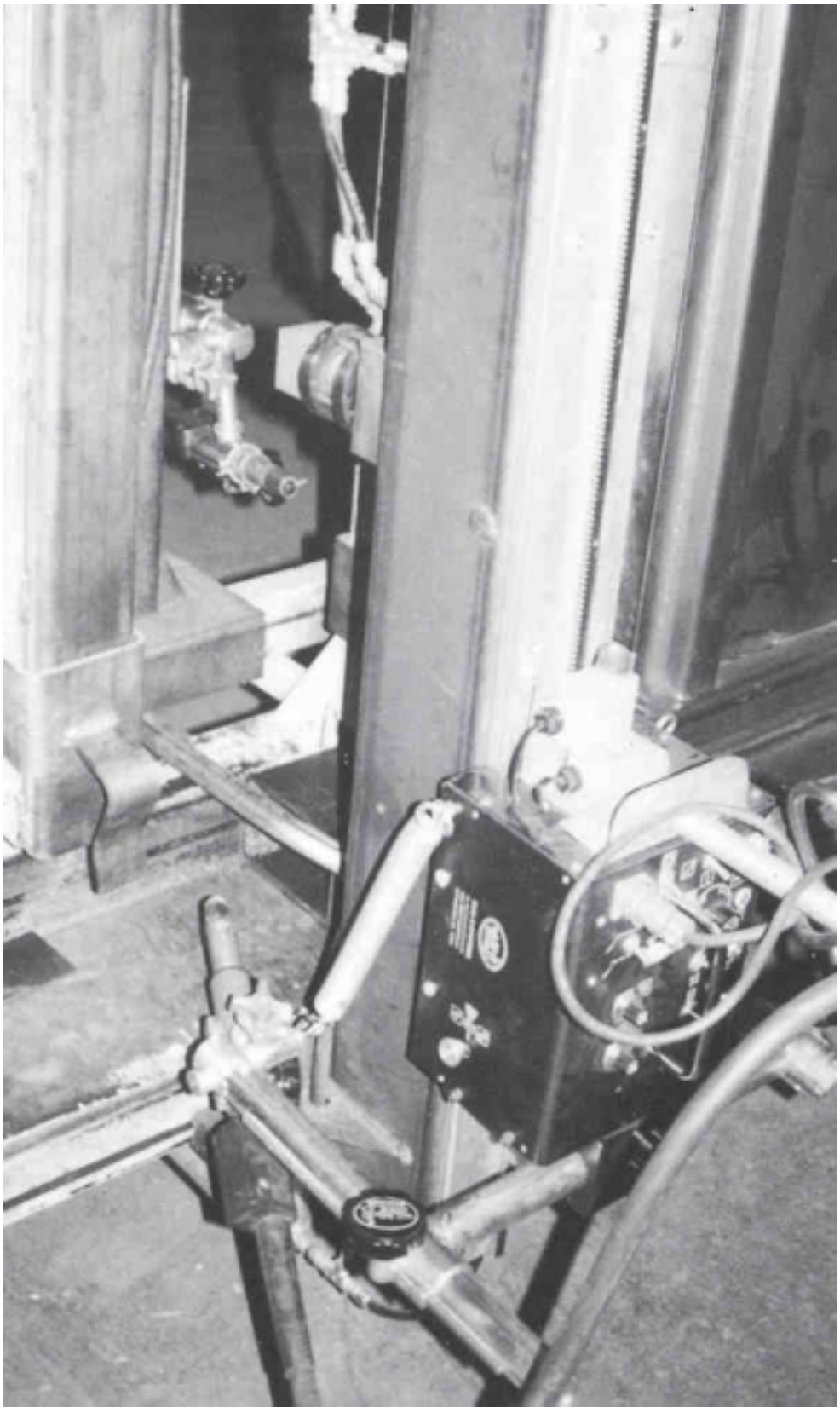
We solved this problem by changing the entire seam welding system from being a independent unit and instead made it all part of the jig fixture. To do so, we installed a tube on top and bottom of the fixture and added rollers to the top and bottom of the welding unit so it can roll easily on the fixture, from seam to seam.

To eliminate time spent tacking each seam, we installed air pots to push the seams together. The pots are on the welding unit so we can push and weld at the same time.

A second Bug-O unit and welder was added to the other side and we can now hold the seams together and weld both the inside and the outside at the same time.

Productivity was increased but was not fast enough to keep up with the main assembly of the trailers. The Bug-O would complete the vertical skip weld and return but the time spent between welds and on return was too slow.

The original drive motors on the Universal Skipwelder were geared 150:1. We installed 50:1 motors and production greatly increased to an acceptable level. We are now building panels in about one half of the time spent before.



EQUIPMENT:

Bug-O Universal Skipwelder,
Miller XMT-300, Wls-52A feeder w/Ompitma

Energy Related

Flame Cutting Used For Demolition Of Nuclear Test Facility.

I was contracted to undertake the demolition of a large pressure vessel. What made this particular project so unusual was the fact that the vessel had ten inch thick steel walls and was thirty feet tall. The vessel to be scrapped was the larger of two that were joined together in a system to test relief valves used in nuclear power plants throughout this country and overseas. The challenge of the job was converting the tank to "#I scrap steel", meaning no piece shall be larger than 5' x 2' (1524 x 610mm).

Demolition started 5' (1524 mm) down from the top of the vessel, where a pilot hole was pierced with a 36" (914 mm) 90' head, hand-held, gasoline torch. The top of the tank was dome-shaped with two lifting eyes still attached from the original instal- lation. This is where the gantry crane was going to make the first pickup in the demolition. A 5' (1524 mm) section of Bug-O Super-Flex rail was magnetically mounted to the dome and the 120 volt carriage was fitted with a gasoline straight machine mount torch. The machine mount torch was then lined up over the pilot hole and the burning commenced. After the carriage ran the lenght of the 5' (I 524 mm) rail, the torch was shut down and the assembly was repositioned. The tank was approximately 10' (3048 mm) in diameter, however, due to the spherical curvature of the top and bottom of the vessel, the total lengths of the cuts were greater than pi times 10' (3048 mm) because the flexible track can only flex in one direction. After the top dome portion of the tank was cut loose, the gantry crane moved the section to a tractor-trailer lowbed.

The tractor-trailer took the section to an area designated for fmal cutting to size. The dome was then off-loaded by a 45 ton link-belt crane rigged with a short section of boom and placed on the ground where a 36" (914 mm) hand-held Pertogen torch was used for final preparation. Small angles were then welded on the vessel approxi-mately 11' (3352 mm) down from where the first cut was made and built a staging around the vessel at a comfortable work height. The rings were cut into 2' (610 mm) wide pieces.

The remaining rings were cut. The 2' (610 mm) sections fell away from the remainder of the rings as they were cut and loaded onto a roll-off scrap trailer.

EQUIPMENT:

Two Bug-O Systems Super-Flex Rail and Carriage Systems, liquid oxygen, Taylor-Warton liquid oxygen tanks.

Maintenance

Success Welding Small Diameters

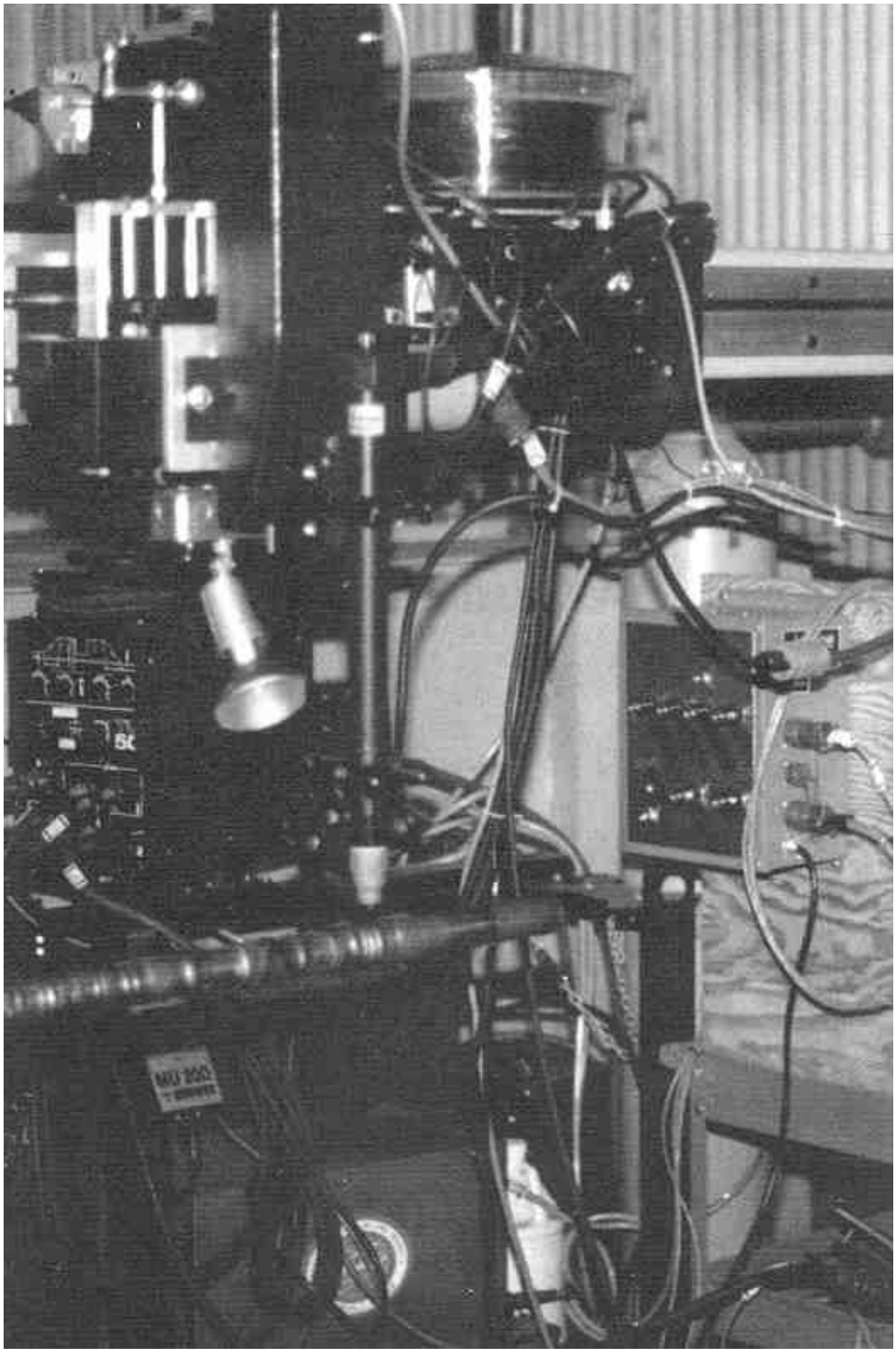
Our problem was turbomachinery restoration. We rebuild small diameter rotor shafts on steam turbines, compressor shafts and turbocharger shafts.

Rotor repair done by submerged arc welding is limited to the diameter of the rotor. On small diameters it has become necessary to select another welding process which must be capable of handling the small sizes. Normally, the small diameters had to be repaired manually with the G.T.A.W. process which took up an exorbitant amount of time.

To solve this problem we introduced the GTAW-P welding process coupled with Bug-O, Kemppi, and Jetline welding equipment.

By mechanizing the welding equipment with the Bug-O Drive Unit, we are now able to successfully weld on small diameters. In addition, we are also using this set up for developmental work for superalloy overlays, welding of integral seals and increased deposition G.T.A.W. hot wire method.

Savings by welding time are predicted to reach 40% along with no operator fatigue, minimal cleaning of the work piece, zero defects for N.D.E. and an efficient work station.



EQUIPMENT:

Bug-O Drive Unit, Bug-O Heavy Duty Welding Kit and accessories mounted on customers fixture, Bug-O rail, remote pendant control, Kemppi PS 5000 power supply, Jetline wire feeder, Oscillator, and A.V.C. unit.

Reliability Reduces Rework And Fatigue.

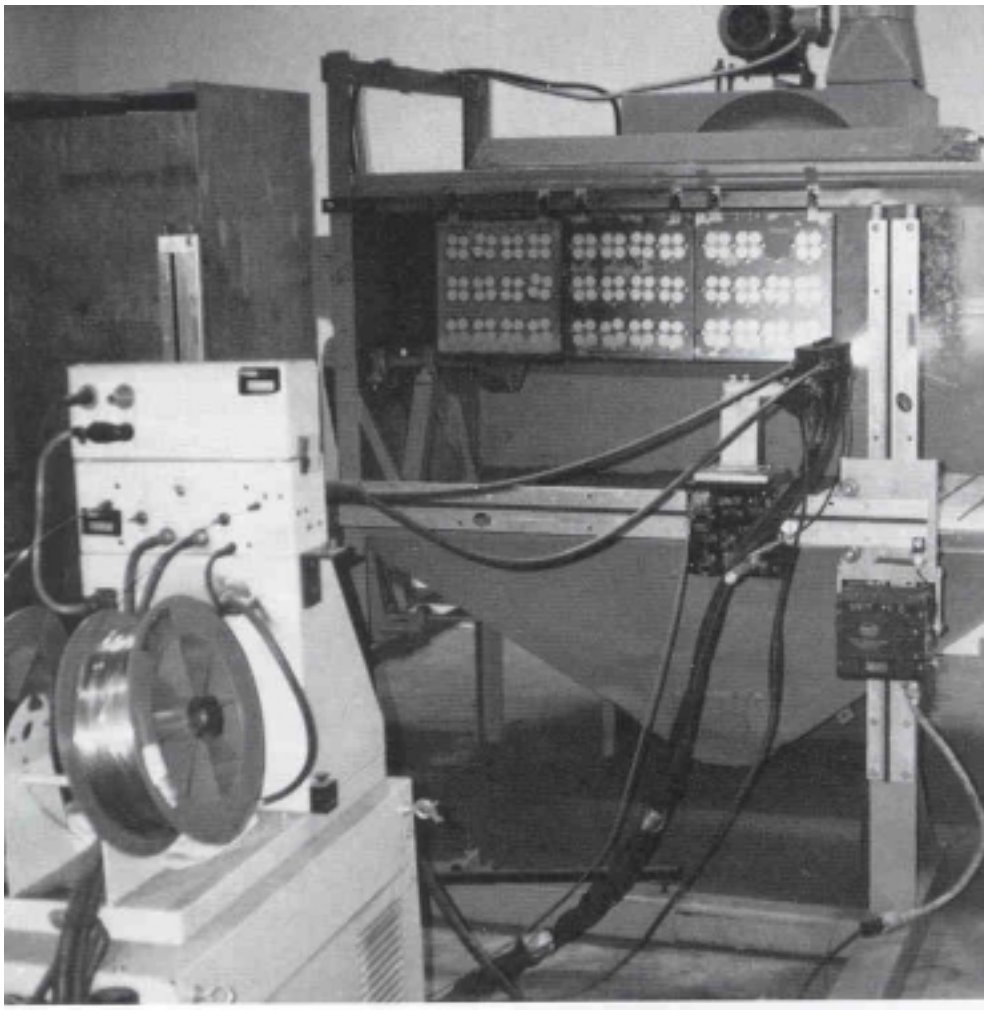
The biggest problem we were having was holding the thickness of Nickel coatings that we were applying to computer parts. We were unable to hold the specific tolerances that were called for by the customer.

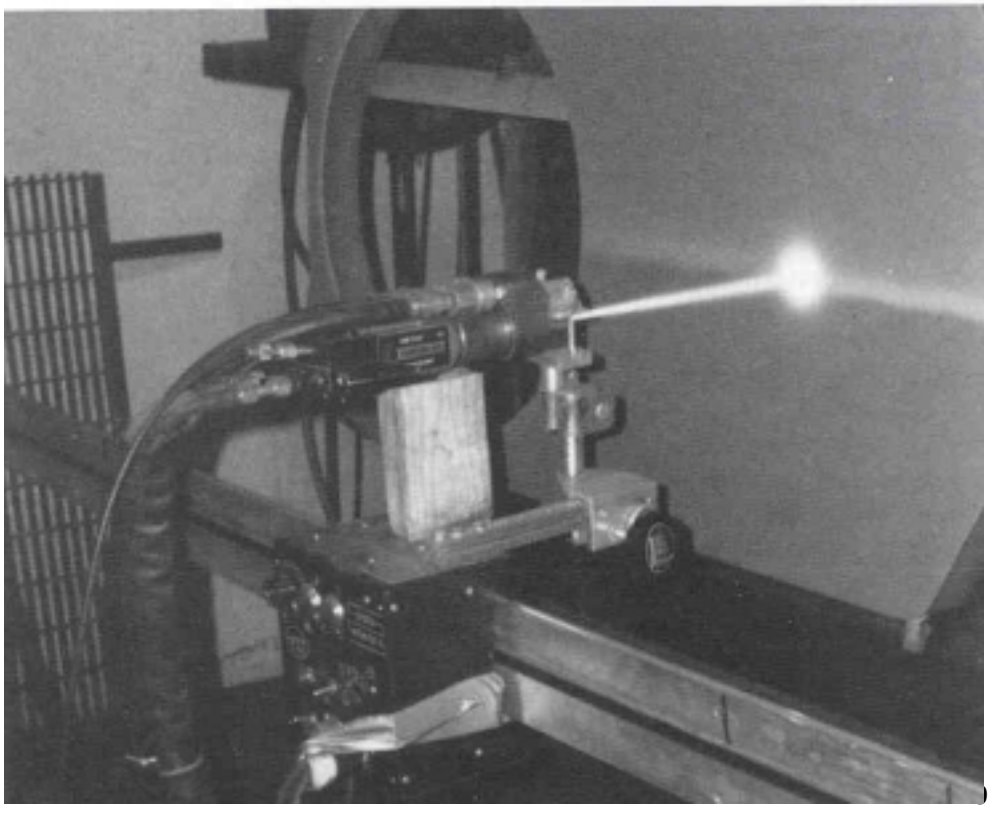
Applying tungsten carbide to big gate valves also was a difficult process to do by hand. I adapted a Bug-O Systems Speed Weaver II to hold the gun. Using the Speed Weaver II we could apply the coating and keep our distances the same on all parts.

We were able to use a Bug-O Systems DC ROL-O carriage, which is designed for applications where bent or specially shaped rail is required, Speed Weaver II, and slave drive to successfully spray these parts. If necessary we are able to change guns, or, using a stand that I made, we are able to move the entire rail to other locations in our shop.

We are now able to hold our thickness to our customer specifications. The high velocity spray gun puts a lot of pressure on the operator. The equipment not only helps with the stress of the job, it also helps with the specific needs of our customers and employees.

This unit has considerably cut down on fatigue and reworks due to the machine's continuing reliability. This lets our operator monitor the system instead of being the system.





EQUIPMENT:

Bug-O Systems DC ROL-0 Drive Car with switch, Speed Weaver II.

Universal Skipwelder Helps Increase Annual Production Rate.

Hazemag Impactors, used in limestone crushing plants, are one of the main products manufactured in the crushing and screening division of Larson & Toubro Limited, Kansbahal Works, Kansbahal.

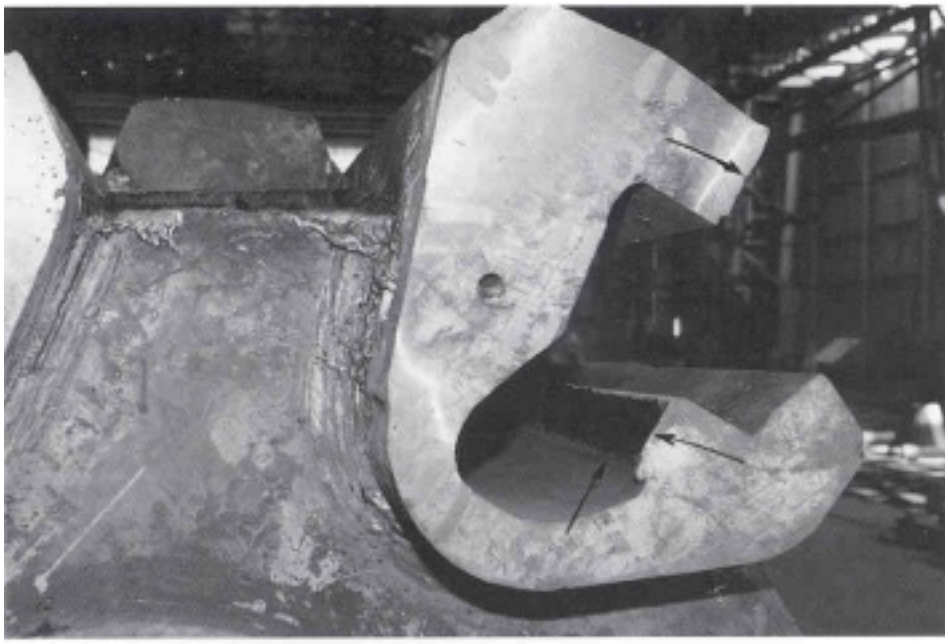
The rotor is the most important functional unit of the machine. Each rotor has six member beams radially arranged and welded to rotor plates parallel to the axis of rotation of the rotor. The beams have hardfaced seating areas for holding the wear elements. As the inside seating surface of the beam was not accessible to be overtayed, the item was cast in two parts. Overlaying was carried out on the two surfaces and then they were welded together to give final shape to the beam. It was observed that if the overlaying could be done on both the seating surfaces in the joined condition, a lot of manufacturing cost could be saved.

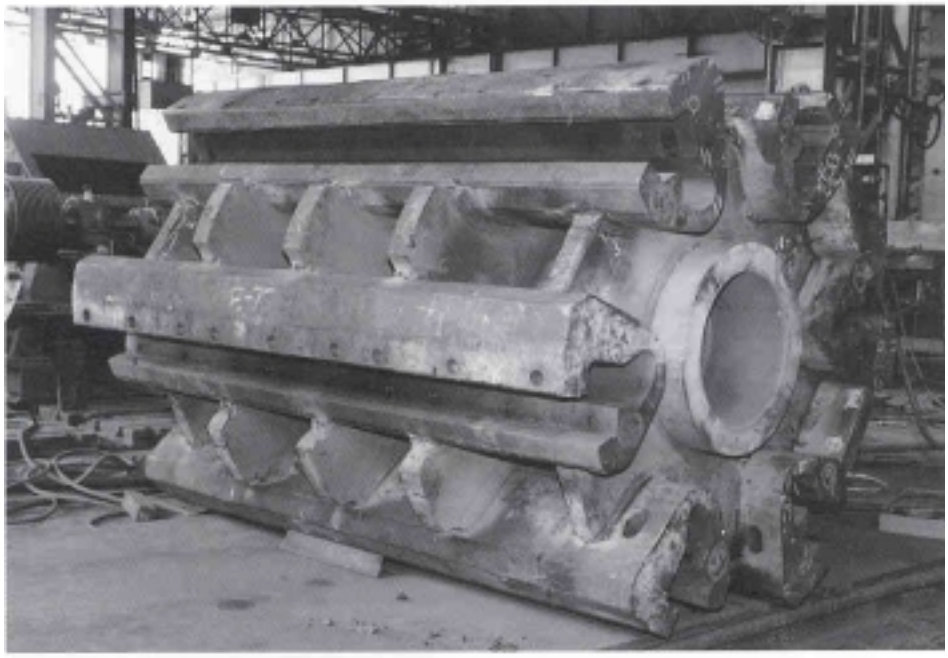
The two parts were joined first and then the overlaying was applied with the help of Bug-O Systems Universal Skipwelder. The overlayed surfaces were machined and tested for soundness and were free of any discontinuity.

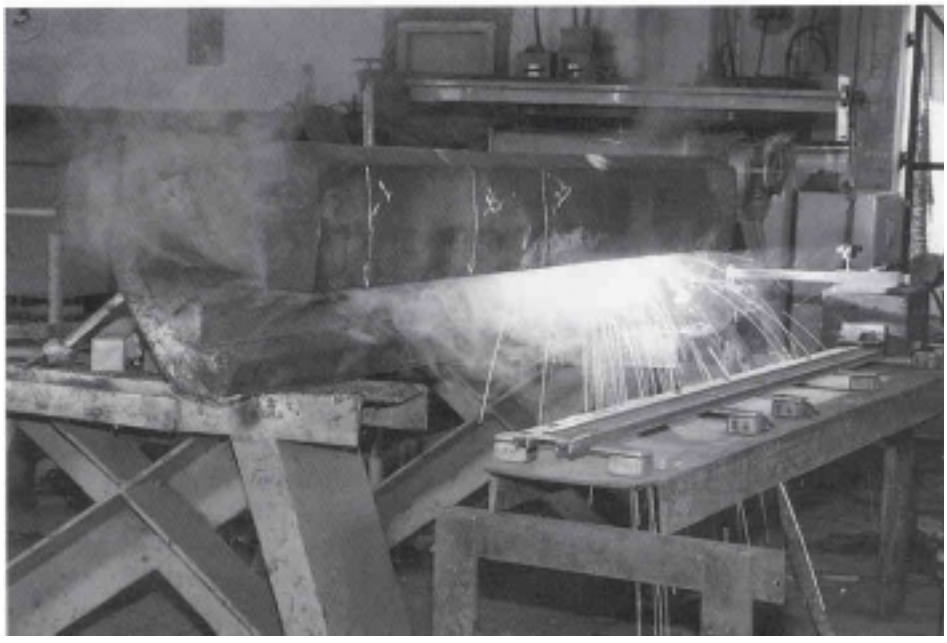
The process was established with a new WPS and feedback taken from concerned customers as to theperformance of the rotor. We experienced a savings of approximately $1500 per impactor and a reduction in production time from 25,000 to 18,000 man hours. We were also able to increase our annual production of impactors.

EQUIPMENT:

Bug-O Systems Skip Welder, modified gooseneck torch.







Speed Weaver II Lowers Rejection Rate and Improves Delivery Schedule.

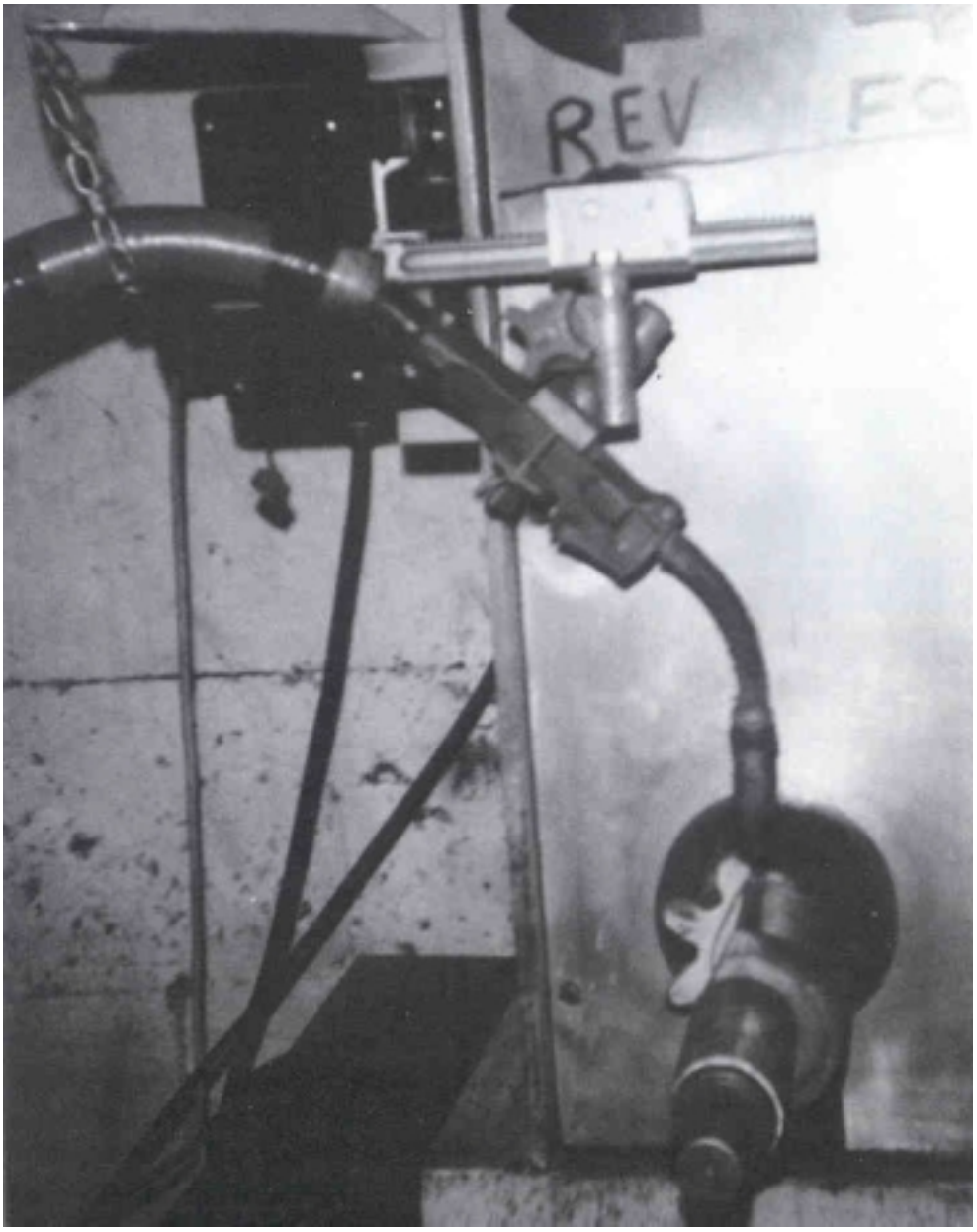
Our company has for some years been involved in the maintenance of a Cam Locking Clamp used in the Alununum Industry. The problem was to recover a machined casting by welding and remachining to standard. This process was being performed manually and as a result the rejection rate at machining was high or alternatively we suffered from excessive waste of weld material. To put the problem in perspective our company repairs 7,200 units annually.

Our machine shop was frustrated at the number of castings which required removal from the machining process for rewelding and our ability to keep up with delivery schedules was being hampered by continual rework. The decision was taken to make the operation automatic.

We contacted our local Weldwell Technical representative and jointly looked at the casting with a view to an automatic welding process being used in the repair. The major hurdle to be overcome was that the machined cam face of the casting was eccentric to the pin position and the casting could not be rotated around this arc.

We decided that the equipment best suited to overcome the problem would be a BUG-O Speed Weaver II unit in conjunction with a Reiner Auto Table. An eccentric shaft and flange assembly was manufactured and mounted on the table to annul the effect of the cam and the Speed Weaver mounted to weave weld metal back and forth across the damaged face. The arrangement was very much more effective than we anticipated.

The result of this arrangement was very satisfactory. The rejection rate from machining dropped from an average of 15% to less than I%.



The amount of metal deposited could be infinitely controlled so that waste metal was reduced significantly. The biggest gain was that the daily operation could now be achieved in 5 hours instead of the 9 1/2 hours of manual input. The final advantage was the stable position of the activity which allowed source collection of the fumes resulting in greater operation comfort.

The capital expenditure in the establishment of this new procedure was initially expected to pay back over two years but in fact the pay back period is more likely to be one year.

EQUIPMENT:

Bug-O Systems Speed Weaver II, a table top positioner, jigs and fixtures made by our company.

Bug-O Drive Unit Helps Meet Productivity Goals.

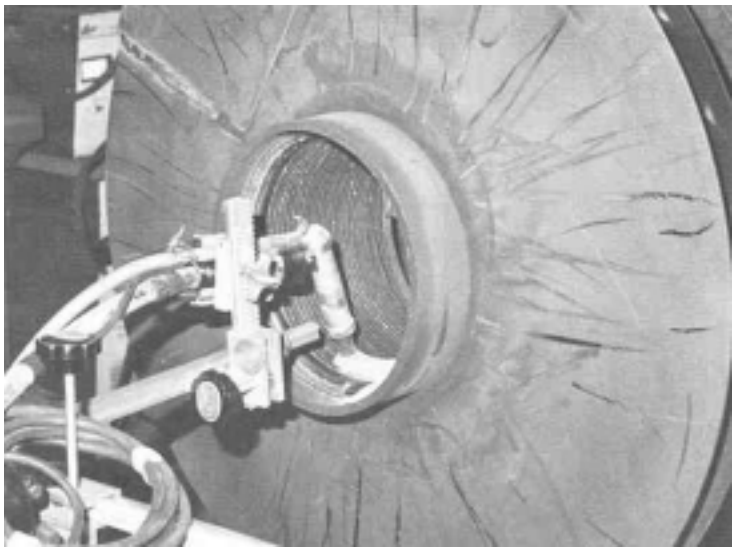
The company needed to repair the 11" (280 mm) diameter bore of an AISI 4340 quenched and tempered high-speed compressor impeller. Radial cracks measuring 3" (76 mm) deep had been discovered after machining. The impeller, which was fully welded and heat treated, would take six months to replace. In the meantime, progress billing on all other compressor rotors would have to be delayed until this impeller was finished.

It was decided to perform a weld-buildup repair using automatic submerged arc welding. The defective cracked material in the impeller bore would have to be removed and replaced with 400 lbs. (181.6 kg) of weld metal. The weld metal would have to be deposited in successive layers up to 25 layers thick. Each weld bead would be deposited circumferentially and the welding arc would be moved about 1/2-bead width to produce a very even weld layer. All welding would have to be done at 550 degrees F. minimum preheat to prevent cracking in the base metal. The final weld would be post-weld heat treated, remaghined and inspected by fluorescent magnetic particle inspection before and after overspeed spin testing.

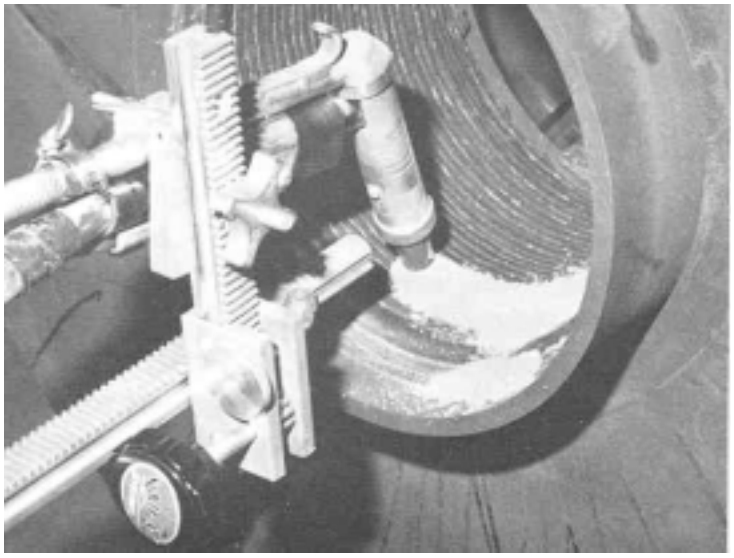
In order to get a consistent translation from bead to bead, the company decided to use a BUG-O System with a slow-speed gear ratio. The BUG-O track would be set-up in line with the impeller bore. Since the impeller would be rotating on a positioner with the bore centerline horizontal and the welding position flat, a small lever actuated limit switch could be attached to the nositioner base.

Every time the face plate of the positioner rotated 360 degrees, the switch would be closed for a few seconds. This would be used to energize the BUG-O tractor which would move the welding gun for the next circumferential bead. With the welding speed set by the speed of the positioner rotation, the switch would be closed for a fixed period of time during each rotation. Therefore, the amount of movement could be adjusted merely by adjusting the speed of the BUG-O tractor motor. The location of the weld bead could be changed from layer to layer by merely moving the location of the switch-closing device. Therefore, a small horseshoe permanent magnet was used, which could be easily attached to the back of the steel positioner faceplate and was perfectly shaped to slide over the lever on the switch causing the switch to close and open.

With the BUG-O System, the welding operator could easily adjust the amount of arc movement by adjusting the speed of the BUG-O motor. With the high preheat temperatures the welding operator could stand back and observe rather than having to manually manipulate the welding gun. Therefore, each layer was deposited without having to interrupt the are. This produced only one start and stop per layer, which reduced the chances of cold fusion and crater cracking.



Bug-O System providing automatic arc translation.

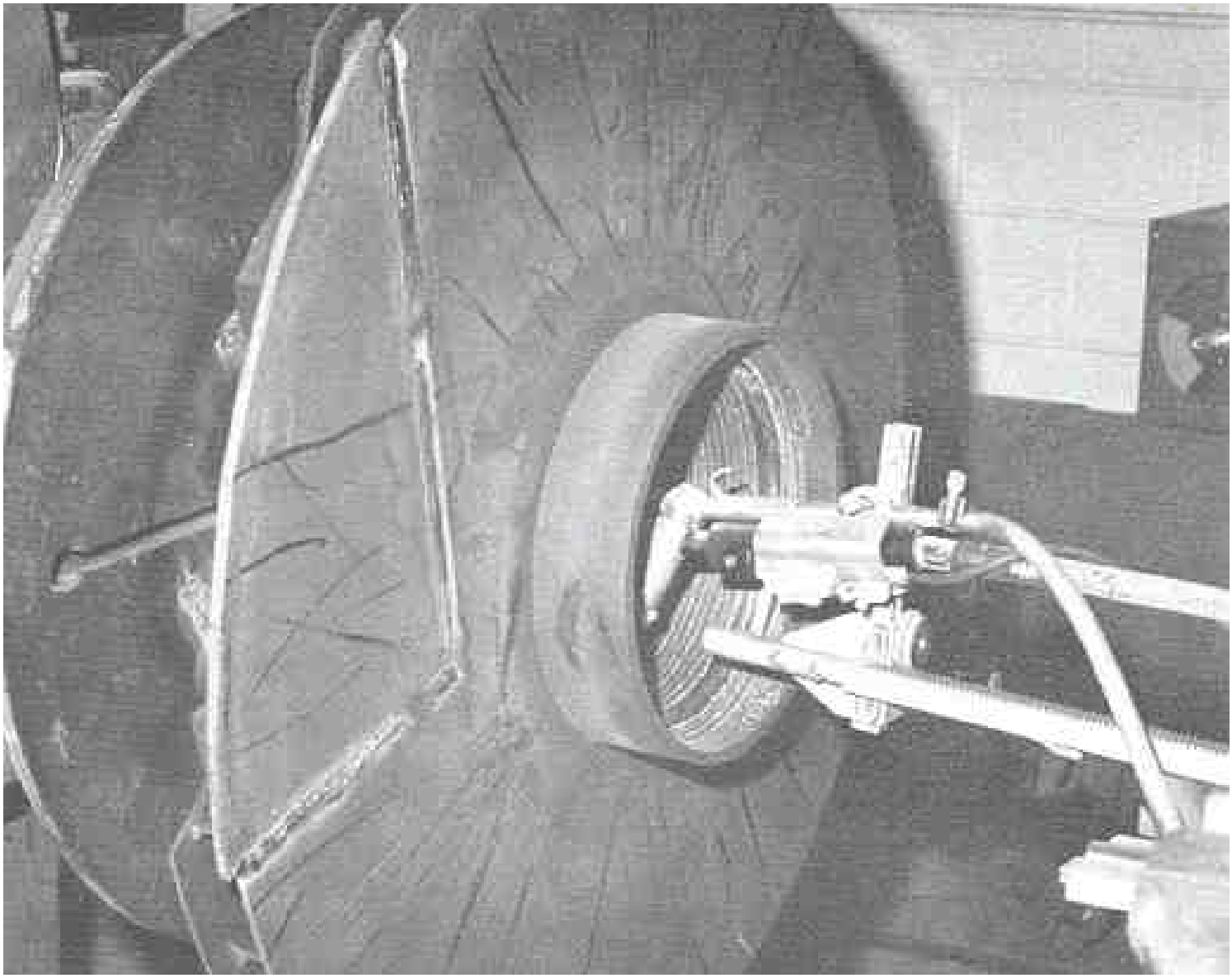


Bug-O torch clamp holding welding gun.

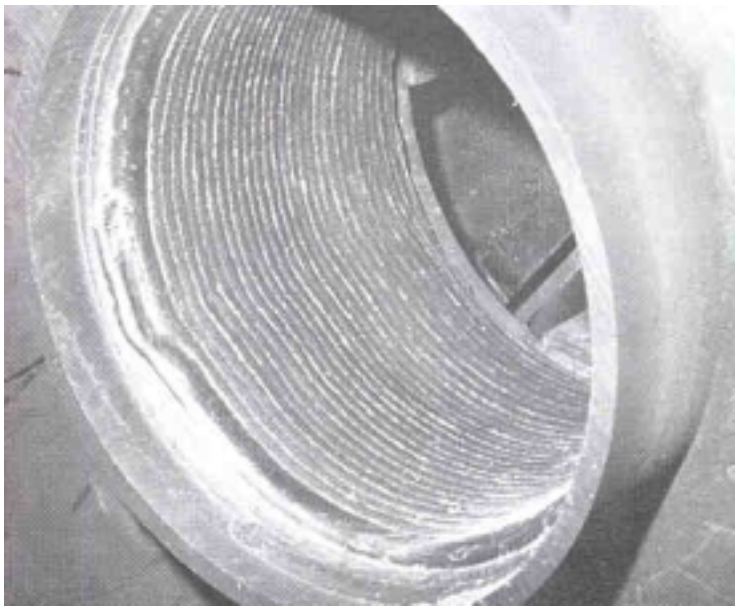
Productivity goals were met, completing the buildup in six 8-hour shifts. The repaired impeller was heat treated and remachined without defects. This entire repair saved tens of thousands of dollars in cost of working capital which was more than enough to pay for the BUG-O System and other special equipment. The system worked so well that it has been used in the production of Navy submarine components, which required a bore overlay by design.

EQUIPMENT:

A BUG-O drive unit and a single length of track was used. Also used were BUG-O System racks, a Ransome 1-ton positioner, equipped with a limit switch, the necessary wiring with receptacle and a horseshoe magnet to activate the switch.



The modified Bug-O arm that reaches into the impeller bore.



The completed weld buildup.

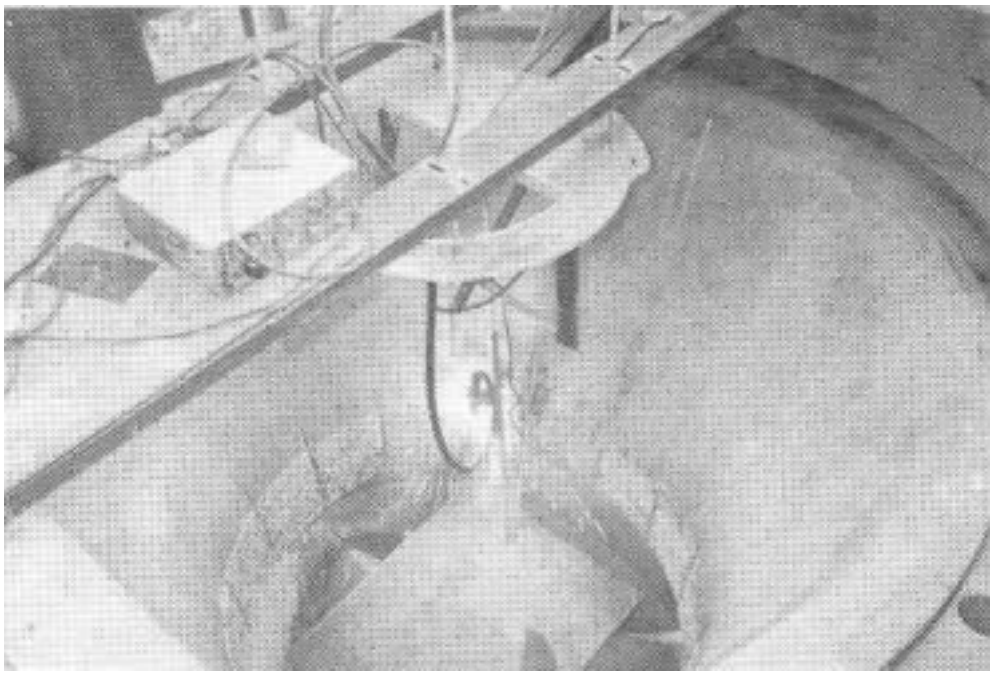
Miscellaneous

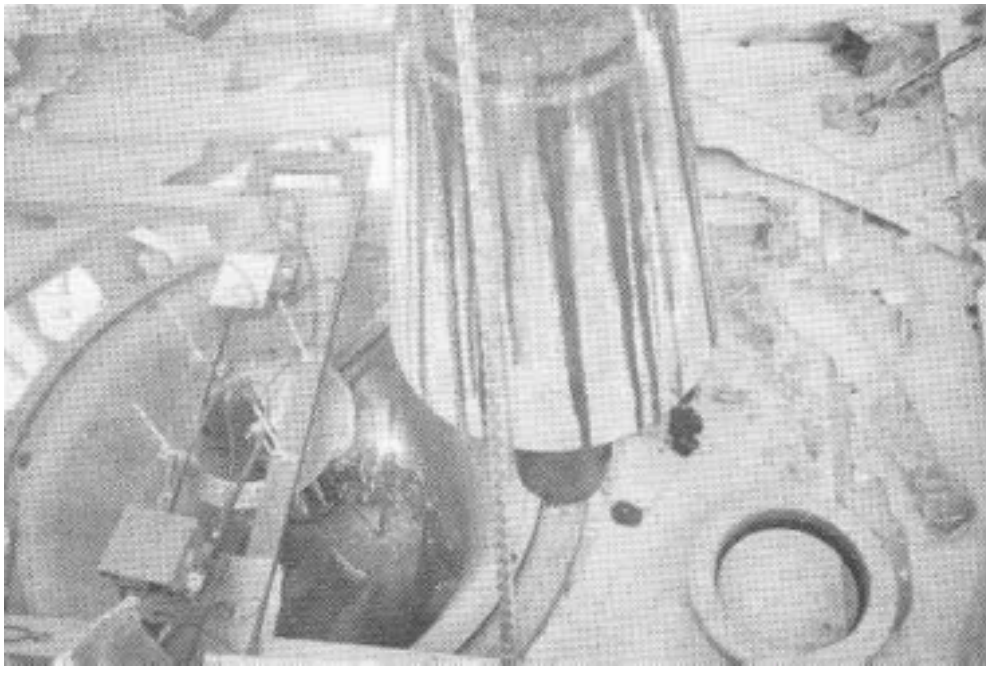
AUTOMATED WELD OVERLAY DEPOSITS 20 lbs. (19.1 kg.) PER HOUR

Building up and hardf acing of gyratory crusher coneaves, hand welding with semi-automatic welding of 7/64" (2.8mm) open are wire would be next to impossible. Maximum deposition would be about 10 lbs. (4.5 kg.) per hour. Heat build-up on manganese would be risky. Operator fatigue would be a major factor. Other equipment cost prohibitive.

Torch would weld 360' at the lowest point of crusher, activate adjustable limit switch, drive would step torch up and reverse direction, deposit another pass. Also, this unit was set up to follow the incline of concaves.

We built up coneaves to acceptable parameters at a rate of more than 20 lbs. (9.1 kg.) per hour. Our travel speed allowed us to deposit 1,200 lbs. (544 kg.) of wire in less than 60 hours. Heat was distributed evenly to avoid overheating coneaves. Operator may have gotten a little bored, but fatigue was no problem.





EQUIPMENT:
Inverted BUG-O CIR-5505 Circle Burner with BUG-5100-F Drive retrofitted with open arc torch.

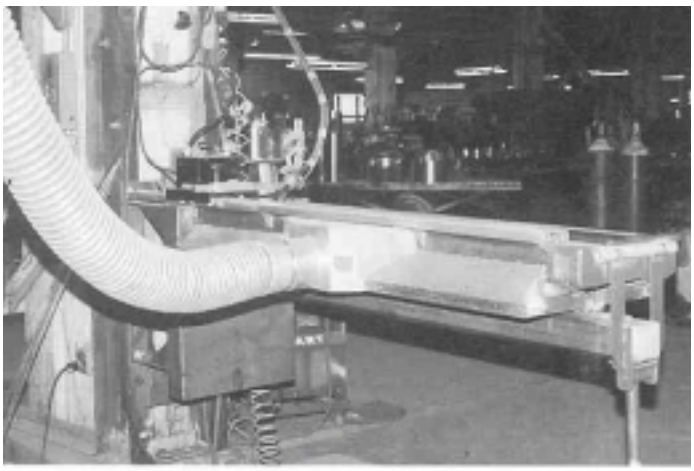
Twice The Capacity And No Problems!

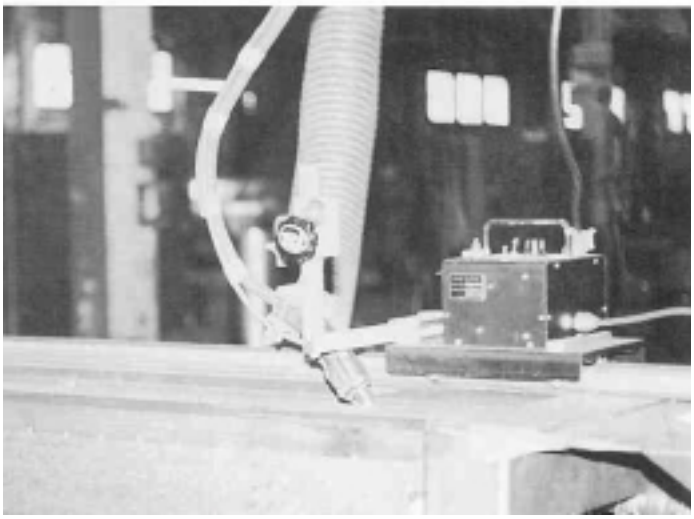
We needed to increase the capacity in the stainless steel weld area. All of the material being welded required the longitudinal seams to be butt welded. Buying new mandrels was cost prohibitive. New mandrels had to be built.

We can fabricate anything made of metal at our facili- ties, so we built two mandrels a little smaller than the eight foot units we were using. The new mandrels are 5' (1.5 in) long.

Bug-O Systems supplied the total package, which included two DC IV Drive Units. The two new units were quickly completed, in seven days to be exact. The systems were installed in a matter of hours and we were in production with twice the capacity and no problems.

We were able to double the production and had minimal down time. The machines produced perfect welds and we were able to beat the scheduled ship date. All of our automated systems are Bug-O. If we ever have a problem we can switch any of the components and be right back on line.





EQUIPMENT:

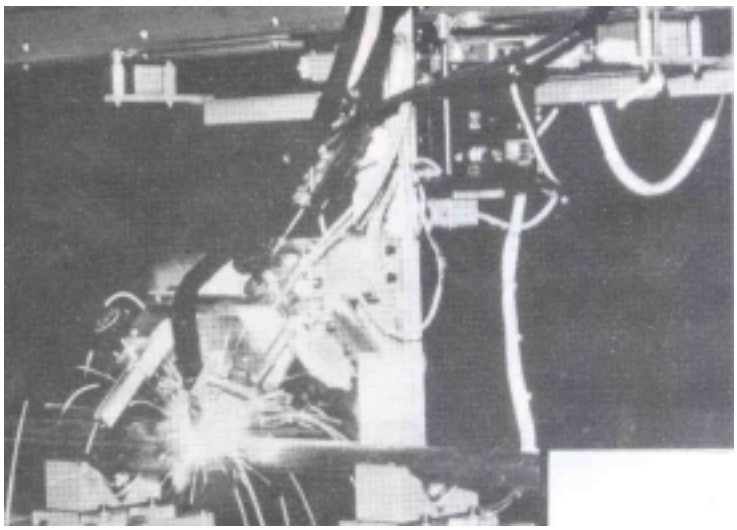
Bug-O DC IV Drive (50:1) 120 VAC with multi directional weld lead controls and track.

FLEXIBLE FIXTURE REDUCES WELDING TIME 80%

To manufacture a complete lamppost without excessive handling. The smallest lamppost has a length of 20 ft. (6 m) and has two welds. The largest lamppost has a length of 62 ft. (19m) and has four welds. The system has to do everything for these lampposts with different diameters.

The company has designed a complete system to do this job. They used turntables, BUG-O equipment, a PC program, four MIG welding machines. This system can weld any type of lamppost from 20 ft. to 62 ft. (6 m to 19 m) and also in every diameter. They used the Beam Bug as a seam finder. When it has found the seam it puts away the seam finder and brings the MIG gun in position. When the Beam Bug is finished welding it returns to the start position.

The whole system can produce three, four, or five pieces of telescopic pipe to form a compldte lamppost with controlled welds, without handling. This reduces the total welding time by 80% on a complete lamppost of 62 ft. (19 m).



EQUIPMENT:

(4) BUG-1492 Beam Bug III
(9) ARR-1080 H.D.Rigid Rail 93-1/2" (2.37 m)
(4) BUG-2669 Fits-All Clamp
(4) BUG-9087 9" (228 mm) Rack

A Minimum Amount Of Waste And Time.’

In our pipe welding any 6" (152 mm) lengths of pipe are used in practice and certification testing. After a weld is made the weld is cut out with minimum waste of material. The two lengths ofpipe are used again until all of the pipe is used up. Long lengths of pipe are cut to size for practice and testing. Welds are cut out for testing and record keeping.

Because of the extensive amount of practice needed to become a skilled pipe welder, students need to cut out many welds with a minimum amount of waste and time.

To become a skilled welder a student needs to make many welds in practice and for certification. We realize a savings in student time, workmanship and the amount of wasted pipe.

A. It takes three minutes to cut out a weld out of 8" (203 mm) schedule 40 pipe. Saved time is used for practice.

B. Extremely high accuracy and quality at the cut saves in pipe preparation time.

C. Welds can be tagged and stored with very little wasted pipe.

D. Students receive training in the use of a torch carriage.

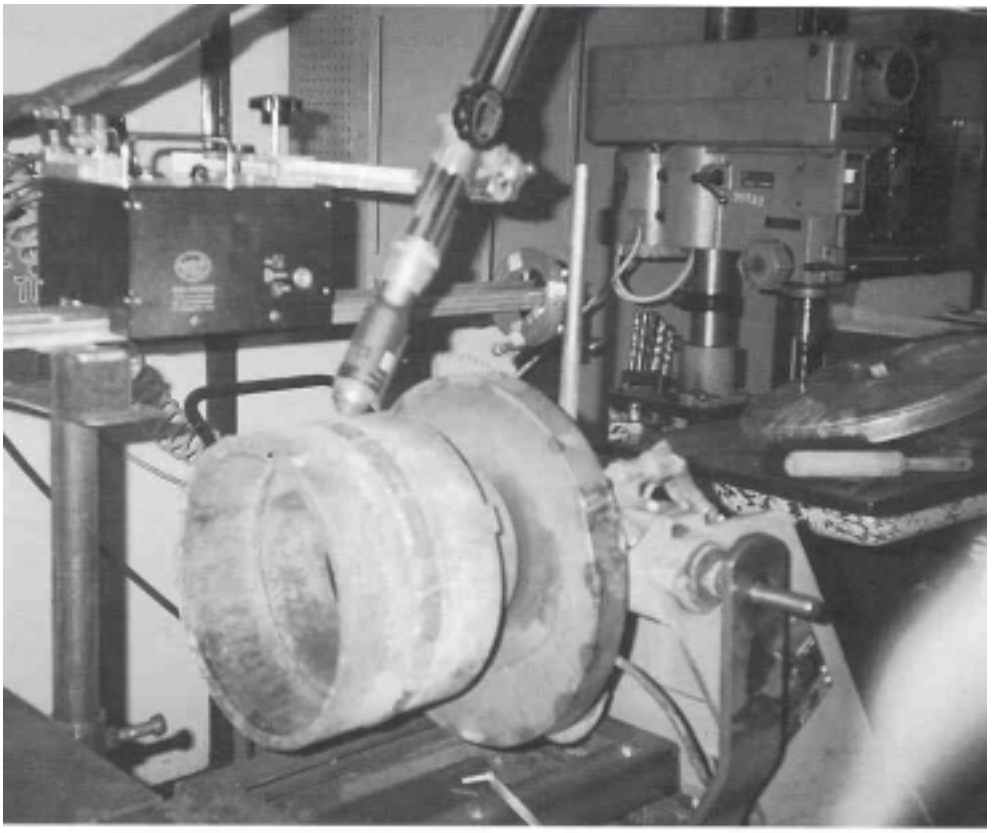
E. Short lengths can be beveled.

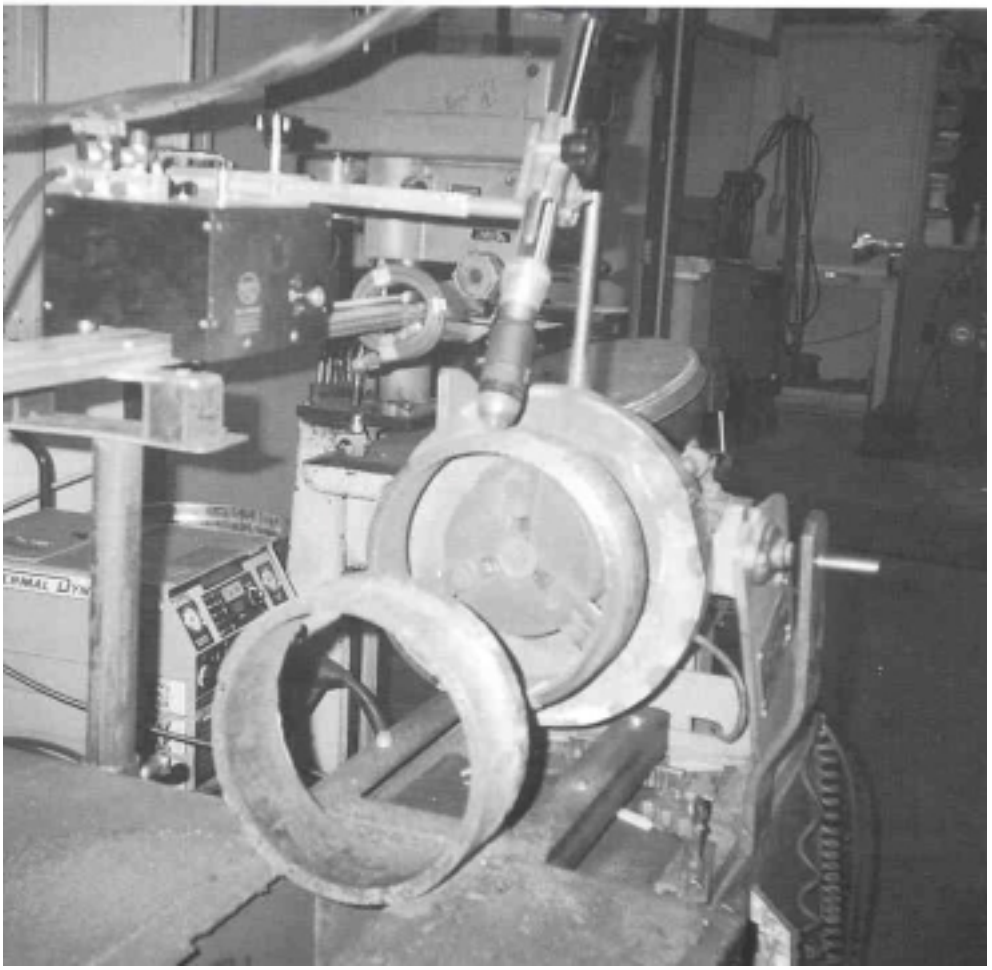
F. Our productivity has doubled from pipe beveling machines.

A GO-FER III Carriage and rail, positioner, and a plasma are cutter are used to bevel pipe and plate. The rail can be lowered or raised to cut pipe or plate as needed.

EQUIPMENT:

Bug-O Systems GO-FER III, rail, plasma arc cutter, rotary positioner.





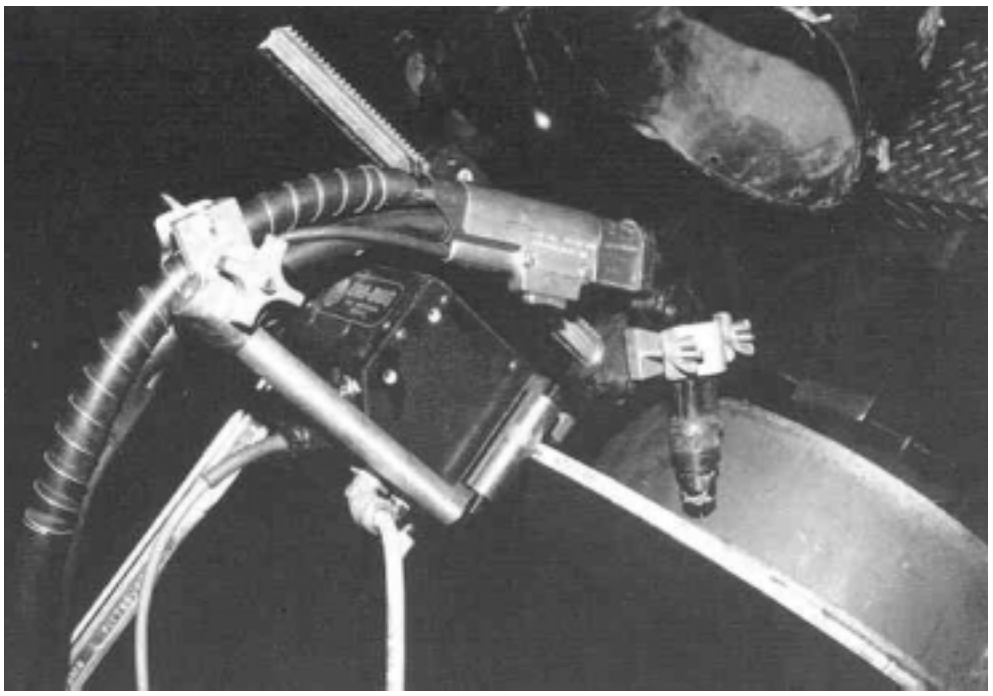
Manual Process Upgraded To Semiautomatic

A water box is one of the components of large air conditioning heat exchangers. These water boxes vary in size, the largest having an overall size of 53.9" (1370 mm) x 26.4" (670 mm) and weigh 814 lbs. (370 kg). The water boxes are an obround shape. Welding was carried out on a welding positioner with a manual flux core welding process. To complete the required 1/2" (12 mm) fillet weld, three passes were required with numerous stop-starts, particularly around each of the curved ends. Due to size and shape of the water boxes, it was a continuous problem to achieve a consistent quality of weld joint.

Welder fatigue and consistent weld quality were initially identified as an important issue to resolve. At the same time the company was looking for more production to fulfill the sales demand and meet the expansion programs. One solution under consid- eration was to procure an additional positioner, another flux core welding machine and hire a permanent welder. Estimated cost for a positioner and welding machine was approximately $30,000 plus employment of a permanent welder. In addition, space needed to be allocated for the new equipment.

The straight edge of the water box was welded in a down hand natural vee position. To achieve the down hand natural vee position on the curved portion the head is rotated on the positioner. During welding as the job rotates on the positioner it reaches a height of 5 feet (1.6 m). It is difficult at the height for the welder.

Using the manual process it was also impractical to make a complete run on the joint due to; length of weld 11 feet (3490 mm) for a large water box, weight of gun, heat, and the fumes of the flux core process. The rest period of the welder was naturally high. In addition, after each pass, cleaning with a mechanical brush was essential before the second and third passes were made.



The problems were solved by using a Bug-O UNI-BUG on a positioner with a Transmig 500 power source. The UNI-BUG travels on a template which is mounted on the tack welded water box. The template is held on the water box with six adjustable bolts which have been permanently welded on the template. This makes it easy to install the template on the water box and take off once the welding is complete.

During the welding operation on the straight edge, the UNI-BUG travels while the positioner is stationary. As the UNI-BUG reaches the curved surface the welder (operator) presses a foot paddle so the positioner starts rotating in a counter direction to the UNI-BUG. A synchronised speed this keeps the welding opertion in a natural Vee position all the time during welding opertions.

Using the UNI-BUG system the operation is complete in a single pass. A high deposition rate using Flux Core with 2.4 mm wire is possible as the welder does not need to hold the welding gun in position and is able to view the weld and make adjustments as required away from the heat and fumes of the process.

With the UNI-BUG, a 12 mm fillet weld is completed in one pass, the production capacity has been increased to three fold. The need for adding another positioner, welding machine set, and one more welder has been eliminated. Quality of the weld is consistent as there is less stop/starts and more precise control over arc length. The welder is not exposed to excessive fumes/heat and the rest/fatigue period of the welder has been reduced significantly.

EQUIPMENT:

Bug-O UNI-BUG, 10 mm thick template, Positioner, Transmig 500 Flux Core welding process.

DC IV INCREASES PRODUCTION

Our problems included welding lengths 75.6" (1920 mm) and having to make multiple passed due to heavy thickness base metal - 1.38" to 1.85 " (35 mm to 47 mm). The welds were previously done manually with a semiautomatic MIG process which required expert welders. There was a low operating factor and too many defects were present, including a bad bead appearance.

To weld complicated shape com- ponents, we arranged the welding fixture which had three dimensional movement (x-y-z). Our designed fixture has x-axis movement and the Bug-O DC IV Drive Unit was used for y and z-axis movements.

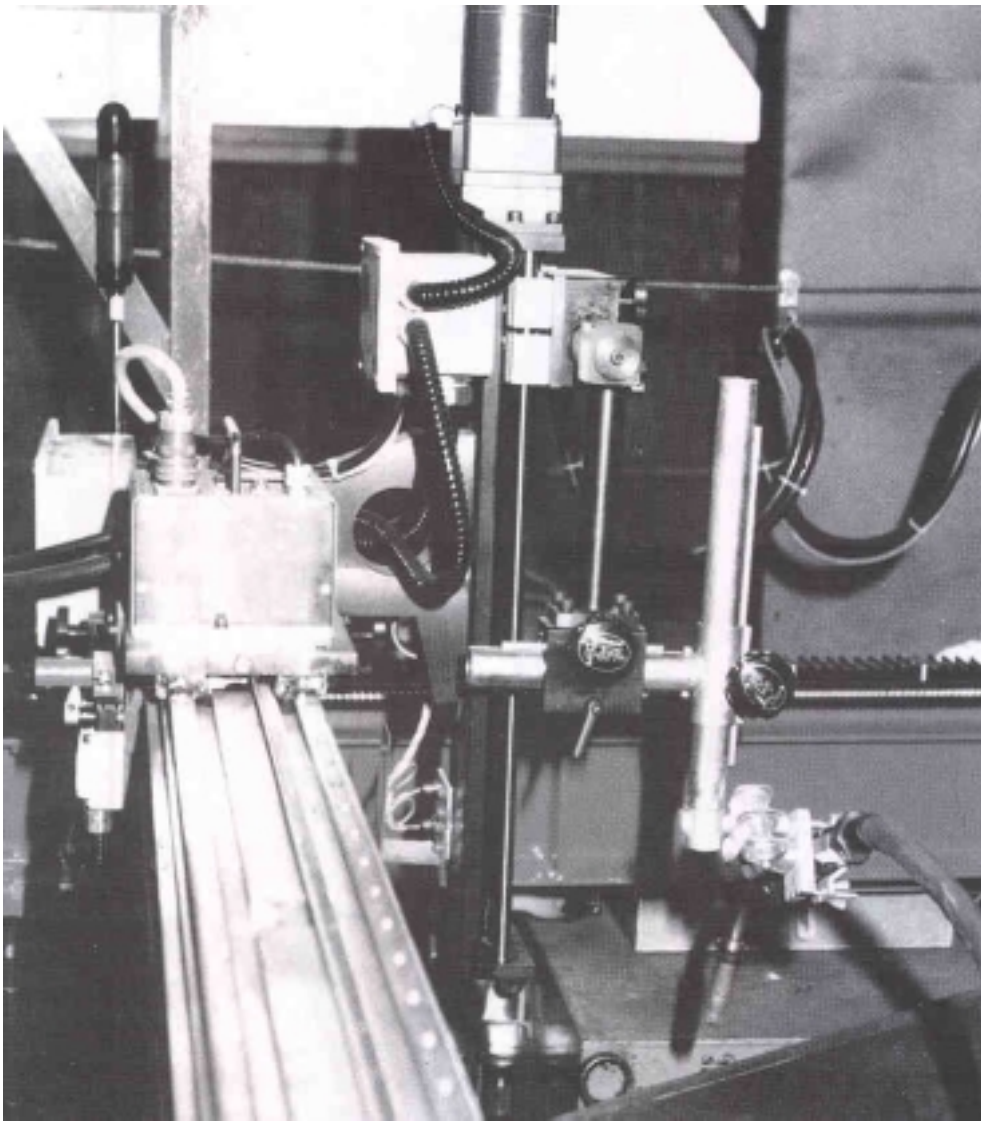
To save operation time we arranged the limit switch so that the drive unit could go back to the start position automatically after each pass was completed.

We also used the remote pendant control so that we could control all ftmctions during welding.

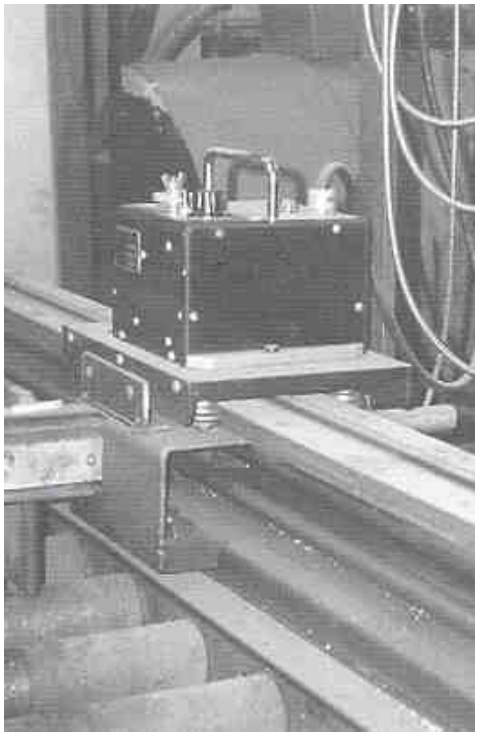
Mechanization with the DC IV Drive Unit cutdown man-hours for the project about 50%. We also had the advantage of low defects, uniform welding, and minimmized distortion.

EQUIPMENT:

DC IV Drive Unit with Digital Read- out Drive Car Assembly, DC II, Automatic Height Control, Remote Pendant, Customer's fixture.



Micro-Speed And Power Save Time And Money!



A power scale with an L.E.D. readout was needed to improve the operation of a large saw. We were using a Newall Dispac 6000 scale but we needed to power the unit.

A BUG-O SYSTEMS DC III Drive mounted on a BUG-5250 carriage was the answer. This machine was used because of the micro-speed selection and the power to pull the material.

We experienced considerable savings working with the saw. There is no longer a need to measure parts with a ruler. By eliminating this task we are able to save valuable time and money.

EQUIPMENT:

BUG-O SYSTEMS DC III.

Virtually No Distortion!

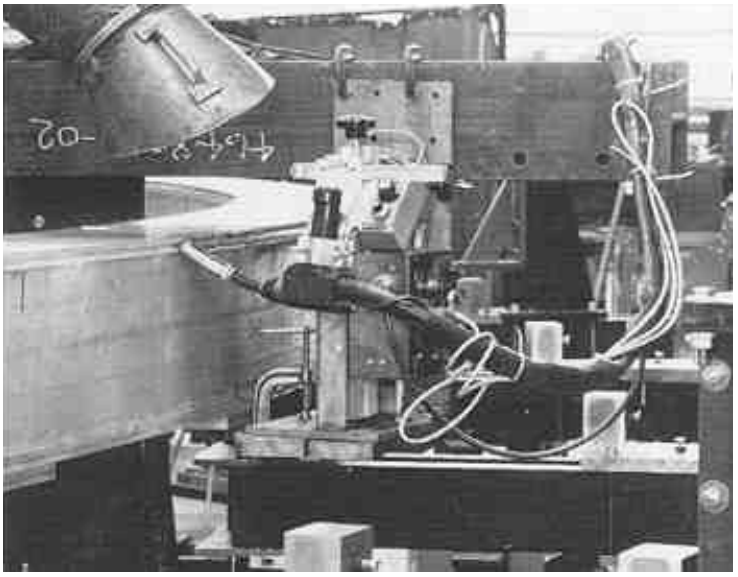
The problem was to weld closed an Aluminum Cyrostat, 50 feet ir diameter. Time was limited and wc had to have the job as leak free as possible, limiting repairs, (vacuurr tight) plus we had to control distor- tion as the Cyrostat houses a super conducting magnetic coil.

We originally welded one assembly manually. This process took 3 1/2 weeks. We had to make numerous repairs due to leaks, it took three passes to fill, and we had inconsistent bead size which affected distortion.

To solve our problem we used an existing turn table which had a platform mounted to it. Normally we used this setup to machine and wind coil. We decided to put it to work in the welding process.

We set up a GMAW unit with a Bug-O Speed Weaver mounted on the end of the plate form. The Speed Weaver was used to weld the joint in one pass with good bead consistency and size.

We were able to complete the weld in one week, and had careful control of the weld sequence. We had virtually no distortion. The ring is 00.032 T.I.R.,



and we only had three vacuum leaks minimizing our repair time.

EQUIPMENT:

Bug-O Speed Weaver, ransom turn table, M-K King Cobra Mig gun, Miller 651 Power Supply.

The Programmable Shape Machine Proves Itself Efficient And Versatile In Short Production Runs!

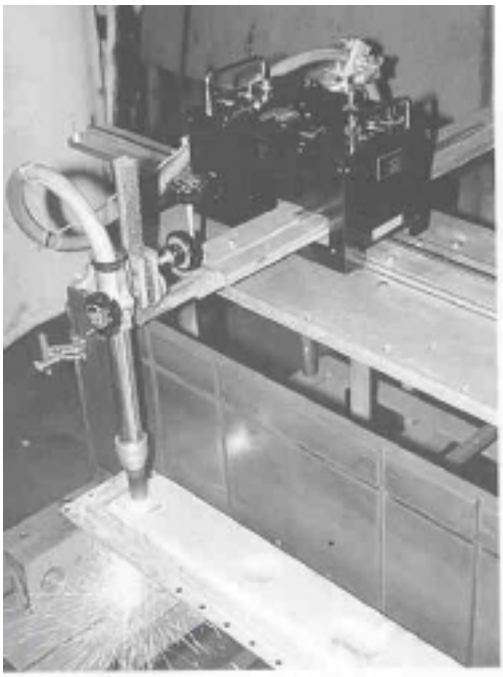
Our problem short production runs of radiator tanks requiring pierced holes of various sizes in various locations. The work had been previously done with drills and holesaws in radial drill presses.

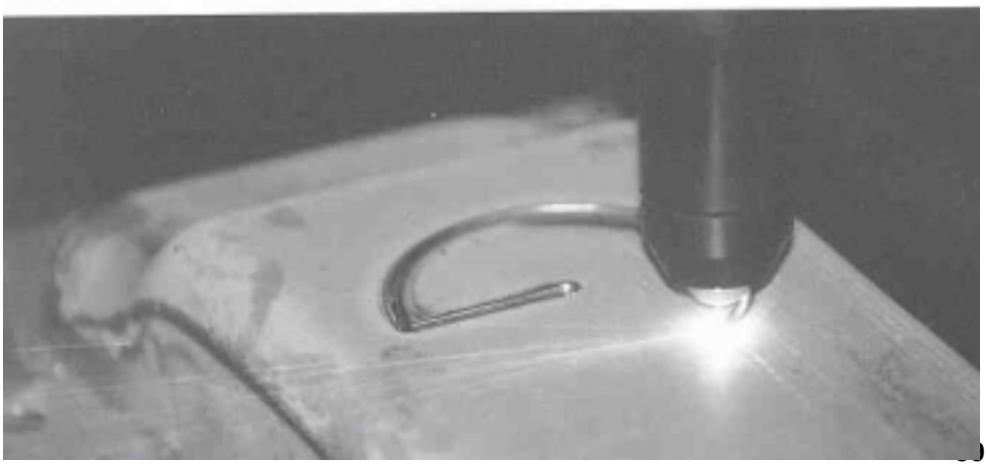
The solution to this problem was the Bug-O Systems Programmable Shape Machine equiped with a plasma torch. The machine allowed us to program any size hole in any location and also made it possible to do multiple-hole jobs in a single set-up.

The result was a reduction in the consumption of tools and labor. The operation was more efficient. It was possible to accomplish cutting multiple holes in a single setup while reducing the use of tools and labor.

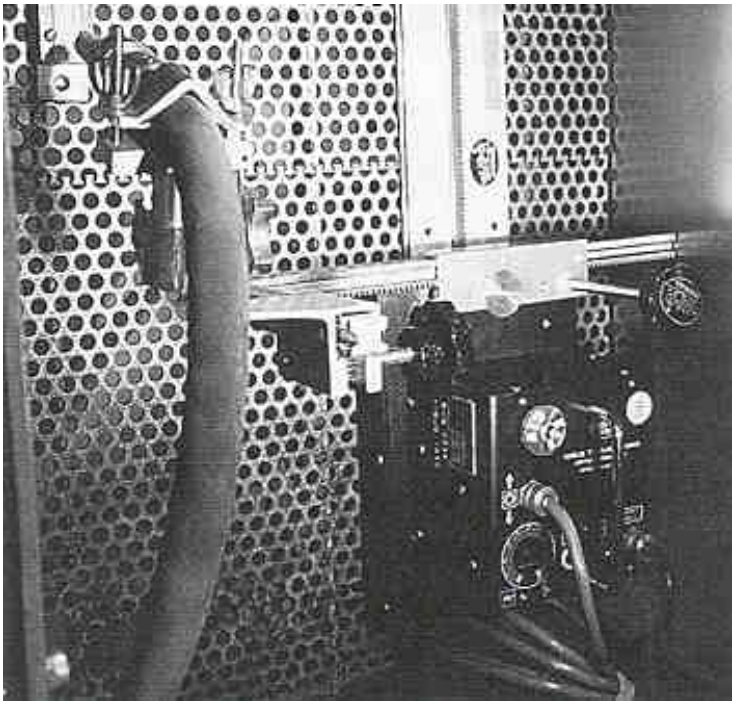
EQUIPMENT:

Bug-O Systems Programmable Shape Welding Kit with plasma torch, Heavy Duty Aluminum Rigid Rail.





DC Drive Unit - Accurate Travel Mechanism



Imbedded plastic media was found after paint removal on aluminum alloy and steel alloy aerospace structures. The stress intensity levels induced by peening was not known, and could contribute to crack masking if conventional media was used. A program was inititated at Kennedy Space Center, Flordia to develop and invent a new plastic media that contained fluorescent pigments. The fluorescent pigment could be detected with black (ultra-violet) light if residual/ impediment occurred and then removed using conventional means. It was also necessary to monitor the peening intensity of the new plastic media, using almen intensity strips and guage.

A test program using aluminum and steel hardware with a very accurate travel mechanism to replicate peening and paint removal parameters helped prove the principle of controlled blasting with fluorescent media. A paper was written and presented at the department of defense/industry advanced coating removal conference describing this new development.

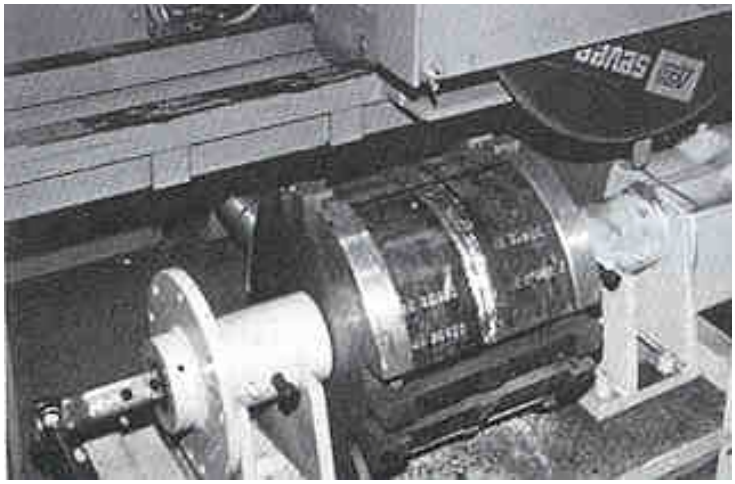
Due to the excellent process control and test program, received patent #4,877,63 8 for the fluorescent plastic media invention. Significant commercial applications exist for the new media. Significant cost reduction in paint stripping rates using plastic media as a replacement for ground walnut shells. The plastic media is safe (non-explosive) and can be recycled 15 times.

EQUIPMENT:

Bug-O Systems DC Drive with pendant control, gun holder, straight rail.

GO-FER III H.S. Speeds Procedures and Cuts Costs!

One of the industries problems is the high cost of qualifying welders. Jersey Central Power & Light Company purchased a trailer known as the Mobile Weld Center. The purpose of the MWC is to help expedite the process of training and qualifying welders by providing “on the spot” facilities to power plants throughout the JCP&L system. The trailer is equipped with welding, cutting, and bending machines for performance qualifications according to requirements of different A.S.M.E. codes.



This mobile weld center had an abrasive cutter installed that was 79" (2.00 m) long x 46" (116 m) wide x 70" (1.77 m) high. It weighes 2,000 lbs. (907 kg) and used a 20" (508 mm) x 1/8" (3.2 mm) abrasive wheel.

By using this machine the noise level is very high. The area is extremely dusty despite two exhaust fans installed next to the machine. Another drawback is that the machine took up too much space. It was decided to replace the abrasive cutting machine with a plasma arc cutting machine mounted on a GO-FER III H.S.

There is now a significant reduction in dust, noise, and power usage. There is also a time reduction in setup and cutting of materials and the elimination of constantly having to purchase abrasive cut off wheels. The new equipment enables this company to speed up the testing procedure drastically. The GO-FER III H.S. makes a very smooth and precise cut in 3/8" (9.5 mm) thick material and because the cut is so precise, grinding has been completely eliminated.

EQUIPMENT:

Bug-O Systems GO-FER III High Speed Kit.

Consistent Welds, Plus Reduced Weld Sizes Equal Reduced Weld Costs,

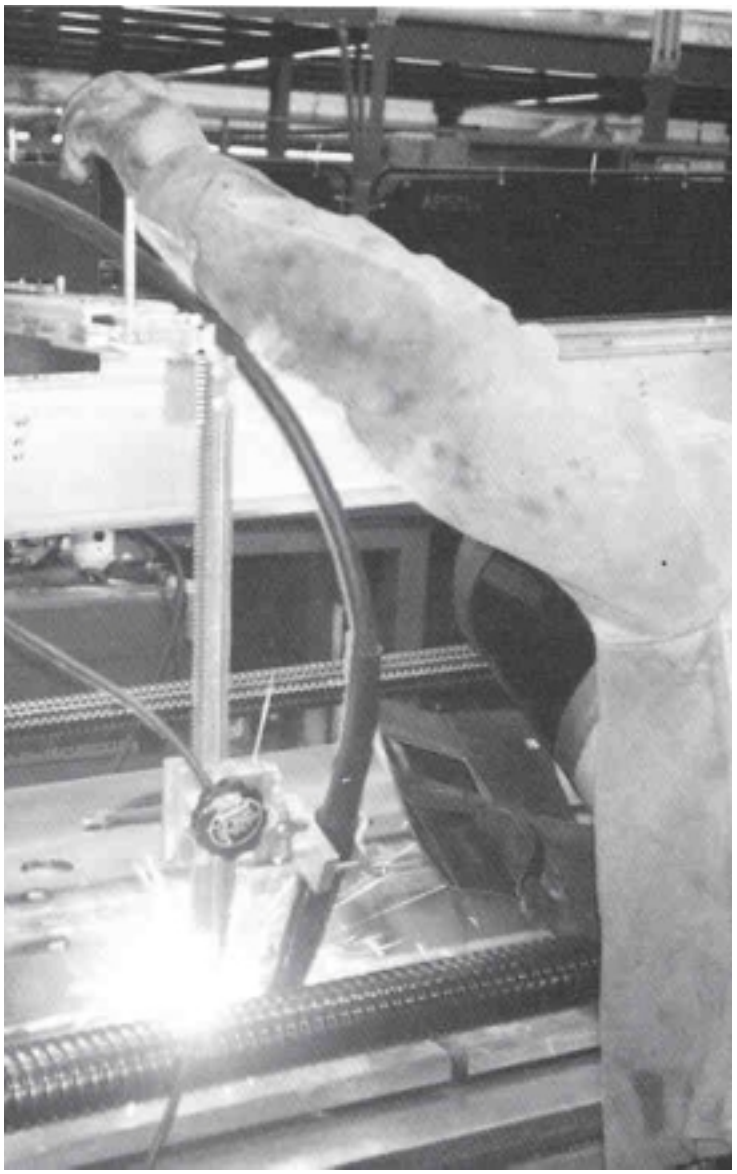
Argonne National Laboratory is constructing the Advanced Photon Source in Argonne, Illinois. The source is a High-Energy X-ray producing beam magnetically contained in an aluminum extrusion storage ring. The methods used to shape and control this High Energy Beam employ large magnets. One such magnet is called di-pole. The di-pole magnet core is produced by stacking 1/16" (1.59 mm) thick steel laminations, 10' (254 mm) long. The core weighs 2300 lbs. The beam that is being controlled is less than I mm (.0394 in.) square, thus the accuracy of the magnet cores have a 1311" (33.3 m) radius over the ten foot length. The problem was to maintain up to 1900 lbs. (864 kg) of squeeze force on the stack during welding and to produce consistent and equally sized welds to maintain straightness and flatness to weighing .009" (.23 mm) over the 10' (254 mm) length. Six welds were needed, 3 per side. The welding required a continuous horizontal butt weld at the bottom of the stack, a 1/8" (3.17 mm) continuous fillet weld and a 1/8" (3.17 mm) fillet intermittent weld 2" (50 mm) on 6" (152 mm) centers.

The problem was solved by using a Bug-O Systems Programmable Shape Machine mounted on an aluminum "I" beam between the head and tail stock of the squeezing fixture. The radius was programmed into the Shape Machine by dividing the radius shape of the magnet core into 20 segments. The fixturing was designed so that the entire beam (Shape Machine included) could be removed and replaced quickly and accurately with repeatability between magnet cores.

The desired results were consistent welds, reduced weld sizes (this reduced weld costs), improved weld appearance, no starting/stopping along the continuous weld lengths and final cores which remain flat and straight to within.009" (.23 mm) over the 10' (254 mm) length. In fact, all cores are within .005" (.127 mm) with some falling into the .001"-.002" (.025-.05 mm) range. The welds are consistent with excellent quality.

The setup is quick and consistent between cores and requires no torch adjustment during the welding cycle by the operator. We received an unexpected bonus when we realized we could increase our welding travel speed from 11-13 ipm (279-330 mm/ min) to 28-32 ipm (711-813 mm/ min), which cut the arc time by two thirds. This more than compensated for setup and tooling costs. Total cost savings over 128 half core assemblies will exceed $25,000.00.

These results are so promising that a second Programmable Shape Machine has been purchased



for the assembly welding of a sister magnet core assembly called a quadrupole. The attempt with the quadrupole magnet cores will be to weld two quarter sections in two locations simultaneously. The quadrupole employ tolerances of less than .002" (.05 mm).

EQUIPMENT:

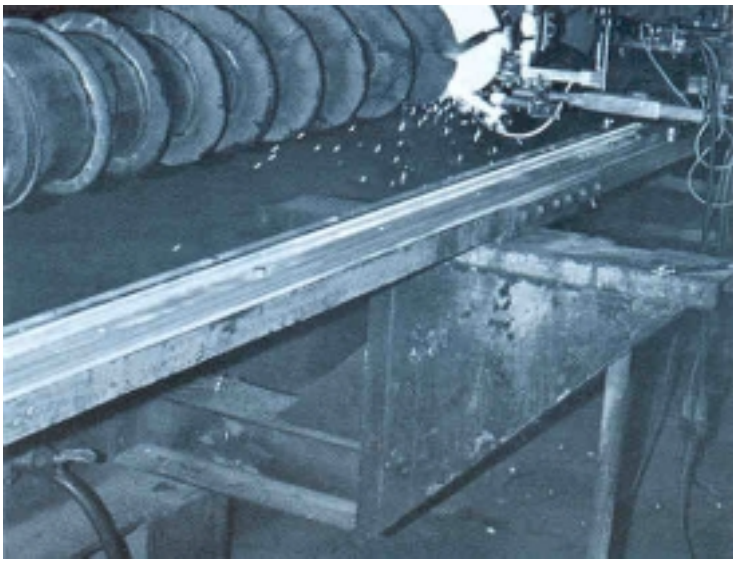
Bug-O Systems Programmable Shape Welding Kit with a second cross rail and torch holder, 8' (203 mm) heavy duty aluminum rigid rail mounted to an aluminum "I" beam, Miller 450 pulse arc with a G40C torch, ER70S-6 weld wire with Argon/8% C02 shielding gas.

Results, an excellent weld, reducing time from 12 hours to 4 hours

This company manufactures screw conveyors with a continuous hard facing weld the entire length of the screw. This was an extremely slow and diff icult application which was manually welded on both sides of the screw up to 30.0' (9.14 m) in length.

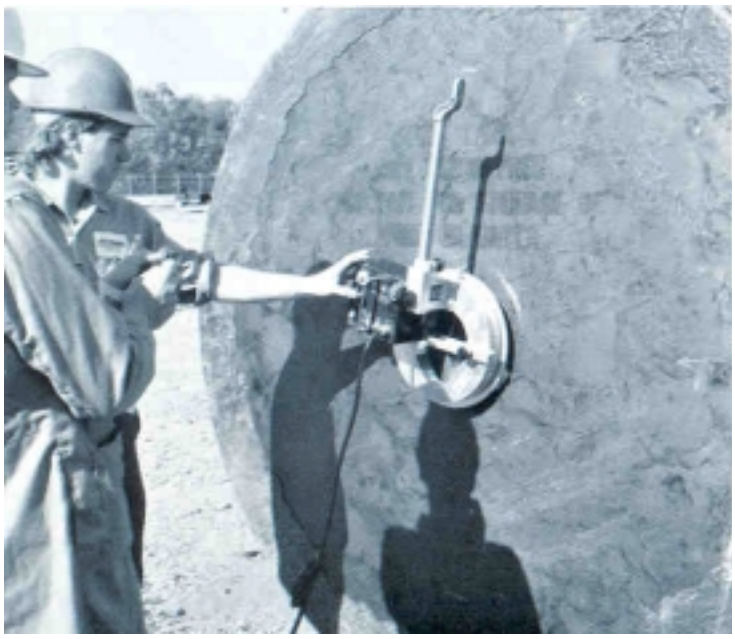
The screw consists of a screw auger mounted onto a round shaft and welded in position. Afabrication was manufac- tured with an adjustable center on one end and a driven center on the other. The BUG-O DC SPEED WEAVING KIT and Proximity Sensing Device were mounted on the same frame allowing the BUG-O to travel the full length of the screw while the screw rotated. The controls allowed an adjustable weave length to the hard facing.

An excellent weld! Reduced welding time from approximately 12 hours to 4 hours each, with large savings on welding wire.



EQUIPMENT:
BUG-1916 DC SPEED WEAVING KIT, and Proximity Sensing Device.

HOB-O HOLE BORER performs flawlessly and makes storage tanks safe



This facility has contracted to remove underground metal fuel storage tanks for the Federal Aviation Administration (FAA). After removal, the ends of the tanks must be cut out to make them safe. Once the tanks are open on both ends, air can freely pass throughand the tanks can be accepted by salvage companies. The problem was how to cut these ends out as safely as possible with a minimal exposure to danger by their employees.

The solution was to use a HOB-O HOLE BORER. This device is secured by magnets to the end of the tank to be cut. The torch and timer are then set to burn the hole. Prior to burning the hole, the tank is purged via liquid nitrogen to reduce the danger even more. Before cutting begins however, members of the work force move to a protected area in case an explosion should occur. The device is then activated by energizing it from the protected area. The cut is then made safely, with little or no danger to workers.

On May 2, 1991 theysuccessfullycut the ends out of their first kerosene tank, with a capacity of approximately 6,000 gallons (22,710 liter). The HOB-O HOLE BORER performed flawlessly and the tank is now safe for disposal. Since then, they have safely cut two more tanks (one diesel and one gas) and have gotten the same results. Thanks to BUG-O and the new improvisation, they obtained the results they wanted — a difficult job performed efficiently and safely.

The City of Memphis Fire Marshal observed this operation and commented that he would like to see all tank cutting operations performed in a similar manner. He said the operation was innovative, safe and highly professional.

EQUIPMENT:
HOB-2203 HOLE BORER

The GO-FER III Cuts It Right The First Time!

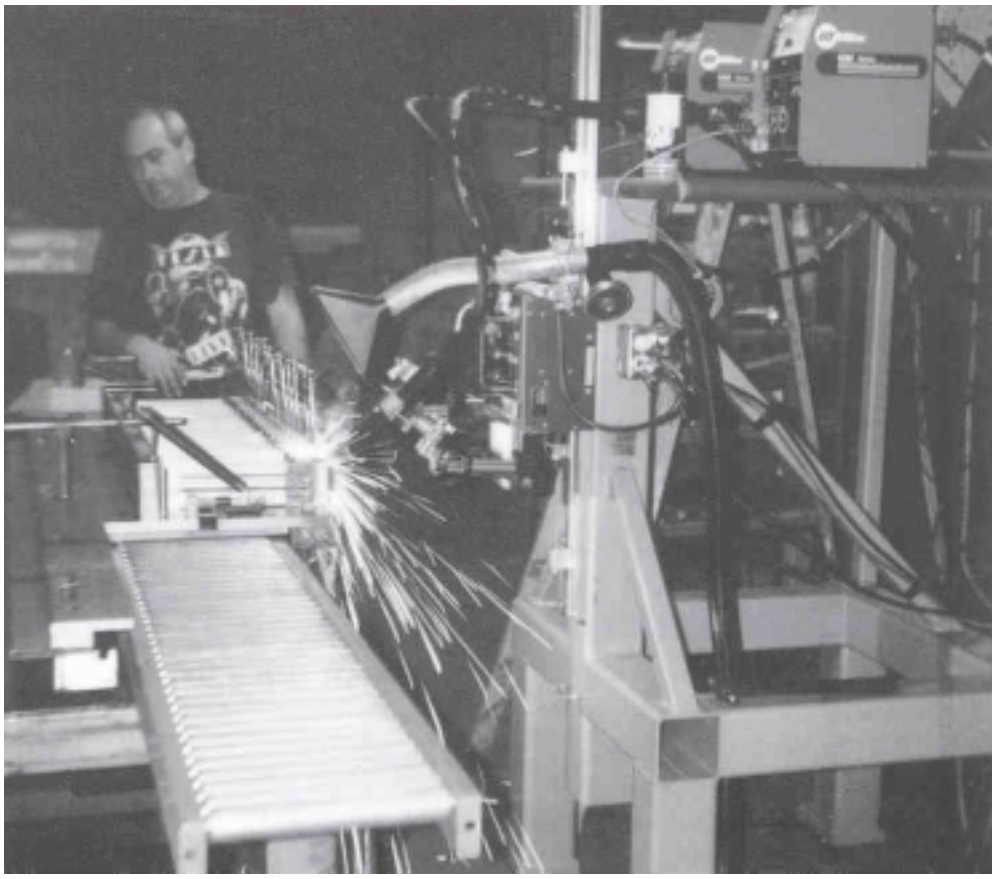
The problem was getting the proper angle on cutting a section of a 75.0' (22.86 m) P & H bucket door. There are many ribs and strong backs involved. Precision measurements had to be taken and the sections cut in a good form.

Using the GO-FER III Deluxe Kit saved time by cutting it right the first time. In addition, the sections that were cut out were put back by cutting a section of proper plate for replacement pieces. Finally, the liner was cut out of 3/4" (19.1 mm) plate. The GO-FER III did about 50% of the work. The cuts were smooth and of good quality angles for weld bevel.

EQUIPMENT:

Bug-O Systems Deluxe GO-FER III Kit, 8' (203 mm) Heavy Duty Aluminum Rigid Rail, Swivel Magnet Plate w/Release.

Universal Skipwelder Produces Stable And Consistent Welds!



We had to develop a new type of resistor grid to stay competitive in the market of replacement resistor grids to the railroad industry. The resistor element is circular in shape with a large outside radius and a smaller inside radius. Our standard equipment only formed elements with the same radius. We had to develop a “U-BEND” section element. The “U-BEND” section element has the large radius preformed and the small radius would be welded together on both sides using a thin metal center tab 1/16" (1.59 mm) thick. Our problem was how to weld these thin sections without burning through parts and also keep welds consistent and uniform for electrical conductivity. Also, because this would be a continuous welding operation in a small area, what would we do with the welding smoke?

The solution was to purchase a Bug-O Universal Skip Welder with Heavy Duty Rail and gun racking to stabilize and operate the welding equipment in conjunction with specialized holding fixtures. We also purchased an Electrostatic Fume Eliminator to remove the welding smoke.

With the Bug-O Universal Skip Welder we achieved stable and consistent welds without burning through the thin center tab section and with good electrical conductivity and strength. The fume eliminator removed the welding smoke which makes for a cleaner and safer area for all employees. Production goals can now be met with a system that can be even further automated for future use.

EQUIPMENT:

Bug-O Heavy Duty Skipwelder, heavy duty rail, gun racking group, Electrostatic Fume Eliminator, specialized Bug-O mounting stand and specialized fixturing for holding resistor elements.

MAINTENANCE PROBLEM SOLVED WITH HOB-O

The following summarizes the factors which brought about the requirement for both the development and application of a semi- rotational thermal spraying manipulator. At the commencement of Off-Crop Maintenance May 1984, a large sugar company in the Sudan identified variable levels of wear which was unacceptable in the two by 15.7' (400 mm) and one by 24.4" (620 mm) diameter bearing housings. These housings carry double row shelf aligning ball races in each of their 14 mill drive reduction gear boxes. Subsequent inspections, by both gear box manufacturer and an engineer consultant, could discover no clearly identifiable cause, nor define a solution. The sugar company was left with this overriding concern that the factory had to be operational, when the sugar cane would be ready to be harvested, quite apart from the political and financial implications of a delayed start beyond that time.

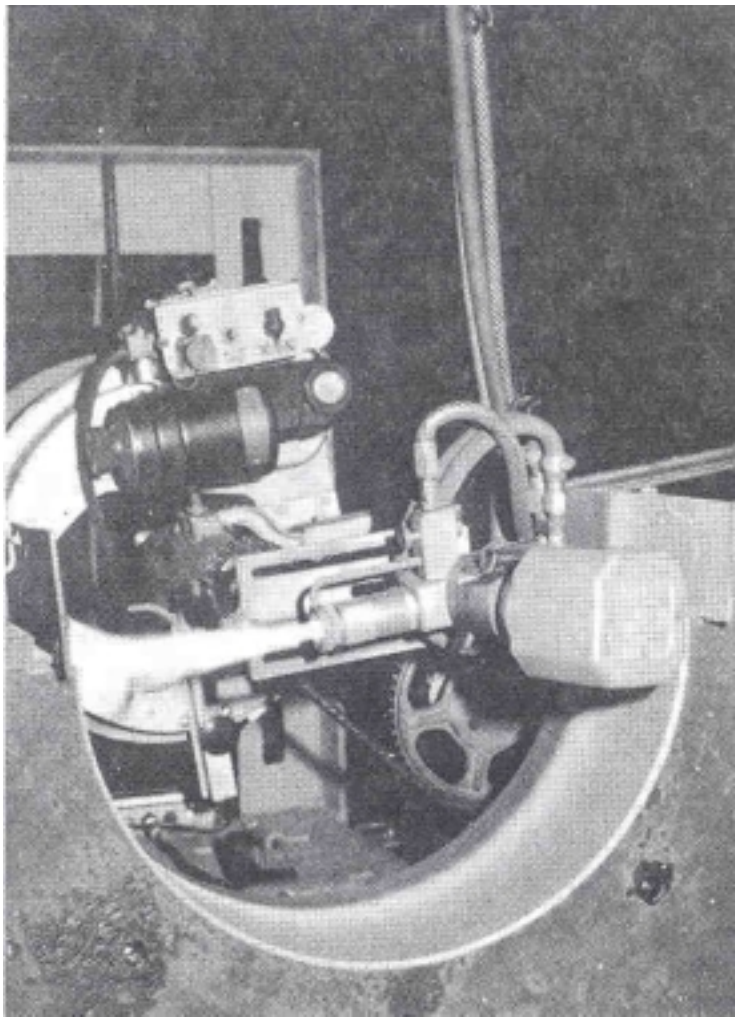
The following activities were begun:

(1) Level and re-align 14 gear boxes to the high pressure steam turbines used to power each gear box.

(2) Install higher specification M30, M39 and M59 hold down bolts in 14 gear boxes. Use extensiometer to accurately measure the amount of extension needed to develop the torque requirement of 80, 320 and 600 kpm respectively for each specification of bolt. Use a system of line-boring bars to check both housing pitch and axial alignments, as well as to provide the means of a “pre’ and “post” machining - to a H6 f it tolerance - of the thermal sprayed non-fusible prototype micro powder alloy coatings which would be used to rebuild two of the 15.7' (400mm) diameters and the one 24.4" (620mm) diameter housing in each of the four gear boxes exhibiting unacceptable levels of wear.

A Eutectic Rototec @80 thermal micro powder alloy delivery system was to be used. On the basis of the wear phenomena exhibited pressure and friction plus the fact that the coating was to be applied into an internal diameter, an aluminum bronze non-fusible Rototec micro powder alloy called Frixtec 19850 was selected.

A custom designed, portable, semi-rotational thermal spraying manipulator incorporating the HOB-O unit, fitted with selected accessories to provide rotational drive and directional change was built.



These activities were fully implemented within 2-1/2 months allowing production to commence one week earlier than expected. In continuous operation since then, mill production has been consistently pushed in excess of 125% of its design capacity, while regular inspections confirm that all metal sprayed surfaces continue to function as required without any visible signs of wear. The investment of approximately $105,000.00 for both the manipulator and powder alloys was well covered by the substantial savings arising from their successful application, i.e. potential 30% production loss averted.

EQUIPMENT:

HOB-O with Mark IV Motor and Programmer with Ajustable Limit Switches.

NUCLEAR WELDING TIME REDUCED 3:1

Submitted by: William F. Newell Jr.
Newport News Industrial Corp. of Ohio

PROBLEM:

Due to scheduler problems for the utility, manufacturer and the erector, the subject 275 ton Nuclear Reactor Pressure Vessel (RPVP) Pedestal had to be shipped to the field and completely assembled on site. Originally, schedules required the pedestal to be shipped as a complete unit from the manufacturer.

The RPVP is a double walled structure with internal webs and localized gussets that provides support for a 1200 ton boiling water reactor (approx. 1300 MW). Sidewalls and internals of the pedestal are fabricated out of 1" and 1-1/2" thick SA-516 Grade 70 steel. Welding and design of the assembly were in accordance with ASME Section III, Subsection NA-4000, ASME Section IX, and AWS D1.1. Both fabrication and erection fall under the “Nuclear Safety Related” category and all materials, design and welding were accomplished under an ASME approved Quality Assurance Program.

A critical scheduler interface problem arose between the concrete contractor and our firm. The concrete contractor was scheduled to place concrete between the lower RPV Pedestal and Weir Wall structure to a predetermined elevation. See Figure 1. However, 24 outer liner plates had to be welded in place and accepted prior to the concrete pour. Production losses attributable to the environment and available manpower required the liner plates to be installed and accepted within one-third the time previously alloted.

Originally, the Shielded Metal Arc Welding process (SMAW) with E7018 electrodes was planned for the one inch single-vee vertical joints with backing. (Vertical webs served as a backing. Refer to Figure 1). It should also be noted that all joints receive 100% Ultrasonic Inspection in accordance with AWS D1.1.

However, it was not physically possible to complete the lower outer liner welds with the planned welding process and filler material, and have them (welds) accepted on time.

SOLUTION:

The only solution to our problem appeared to be the automation of the self-shielded flux-cored welding process on the bulk of the required welds. Three BUG-O/Lincoln welding systems were utilized to complete the work (see Figure 1).

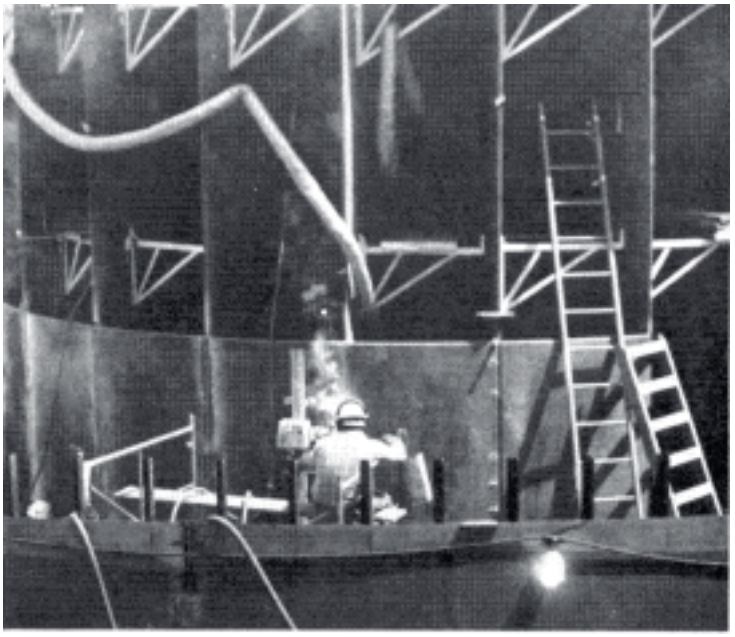


FIGURE 1.
View of lower portion of Reactor Pressure Vessel Pedestal

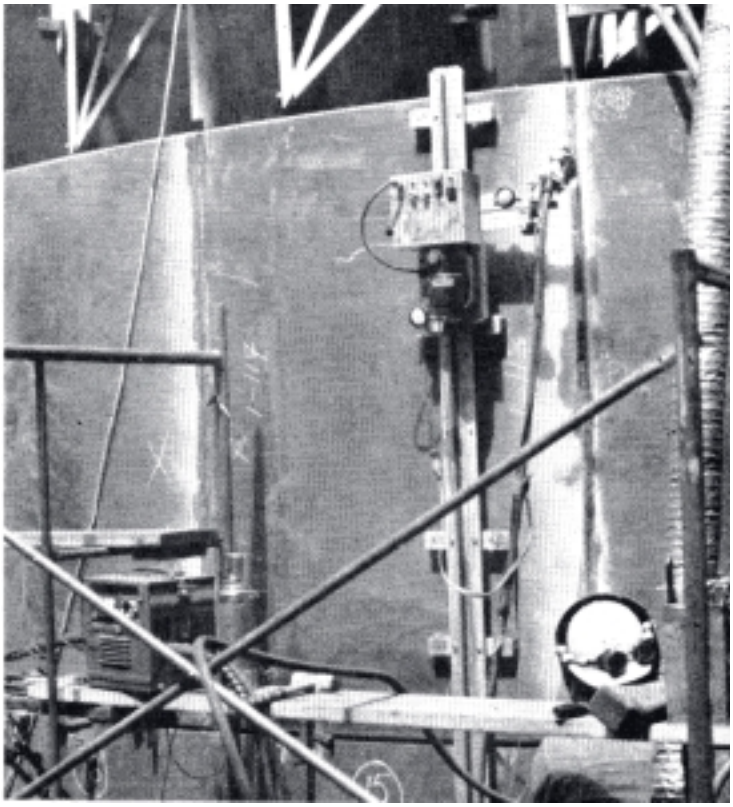


FIGURE 2.
Vertical welds of Reactor Pressure Vessel Pedestal.

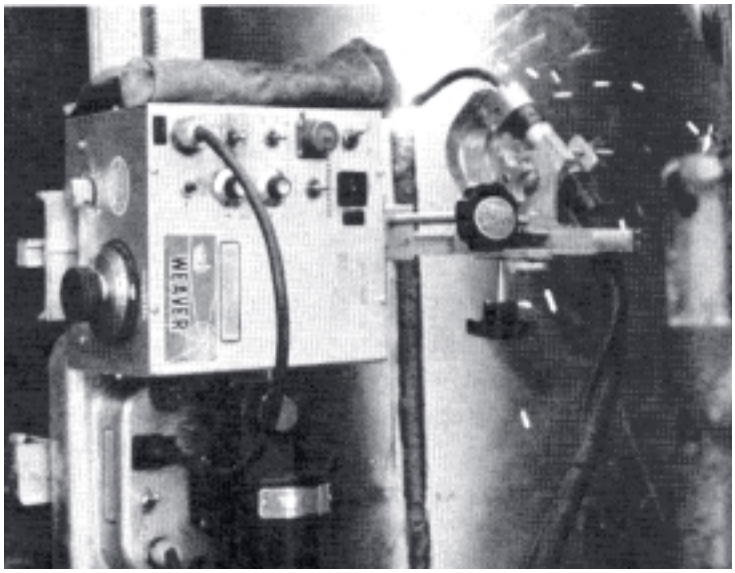


FIGURE 3.
BUG9600 Line WEAVER and Lincoln K-126 Squirtgun in opertion on a vertical joint.

Lincoln Electric Company's 5/64" NR-203M "Innershield" self-shielded FCAW wire was fed with Lincoln's LN-8NE wirefeeders and R3S-400 voltage compensated constant voltage power sources. The LN-8NE was chosen because of its portability and ability to withstand field construction abuse. A 22-1/2' extension was used between the wirefeeder and the wire reel. In addition, 150' control cables and leads were used between the power source and wirefeeders. Also, electronic voltmeters (Lincoln K-262) were installed in the wirefeeders to provide precise voltage control at the arc. A Lincoln K-126 gun with 15' cable was used and chosen because of its operator appeal and direct coupling ability to a BUG-O System. See Figure 2.

Torch manipulation and travel was accomplished using BUG-1012 Line WEAVING Kits. These kits include the BUG-9600 WEAVER and was chosen because of the precise control available for dwell and oscillation, critical variables for the successful operation of this welding process. See Figures 3 & 4.

The NR-203M wire was chosen because it does not require gas delivery apparatus; therefore, all associated equipment is less complicated and the fact that the environment has little effect on the wire.

It must be noted that the LN-8NE wirefeeders were modified, and not used as received. A 120 VAC receptacle was added to provide power for the BUG-O System. Enough power is available within the wirefeeder's control circuitry to operate the feeder, BUG-O carriage and WEAVER. This alternation eliminated the necessity for providing additional electrical service to the work area. However, alternations of this nature void the wirefeeder's warranty, but no problems have been realized from this change.

RESULTS:

As shown in Figure 4, the root pass of each joint was applied semi-automatically. Upon completion of the root, the welder simply fastened his gun in the two motion torch carrier of the BUG-9600 WEAVER and finished the remaining weld automatically. See Figure 4. Three to four automatic passes were required to complete the 1" thick vertical welds shown.

Downtime was minimal, as evidenced in Figure1. Notice that three automatic systems are operating simultaneously!

Actual results exceeded all expectations. A man-hour savings exceeding 3:1 was realized, a repair rate of less than 2% was achieved, and because of the precise manipulation control of the BUG-9600 WEAVER, final weld reinforcements required little or no grinding for visual acceptance. Most of all, use of this equipment played an important role in meeting the scheduled completion date for the portion of the work described.

EQUIPMENT:

BUG-1012 Line WEAVING Kit
ARR-1093 Rigid Rail

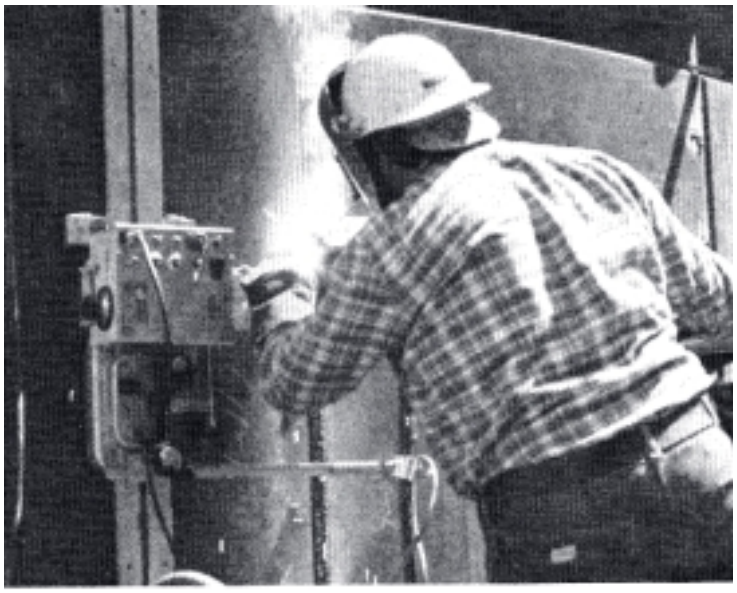


FIGURE 4.
Welding operator applying automatic cover pass to vertical weld.