

## Weld Sequencer™ Provides Production Efficiencies for Leading Forklift Manufacturer

Crown Equipment implements process control technology to help simplify, standardize and improve welding operations.



*Crown Equipment weld bay running Weld Sequencer™ Process Control Software*

### MANAGING AN IN-HOUSE TRADITION

Ever since Crown Equipment began manufacturing forklifts back in 1960, the company has maintained a proud tradition of producing the majority of their product components in-house. Today, as one of the world's top manufacturers of forklifts and material handling equipment, Crown continues to design and manufacture up to 85 percent of the components that end up in their finished products— including motors, drive units, and frame assemblies.

With so much of the manufacturing process staying in-house, managing production quality and efficiency is crucial to the company's overall success. Yet for Crown's manufacturing engineers, the process of ramping up production of a new product can present challenges – especially within a company that has a reputation for industry-leading product design and innovation.

### MEETING THE PRODUCTION CHALLENGE

During a recent round of new product releases, Crown engineers at the company's Greencastle, Indiana, facility found themselves dealing with one of these production challenges head-on. Faced with producing multiple new frame designs, each requiring a variety of welds and assembly steps, the Crown team found themselves needing a process to efficiently handle the variation of the workload. This challenge was met thanks to a big assist from Lincoln Electric.

Having recently purchased Lincoln Electric's Power Wave® S500 advanced process welders, Crown reached out to their local Lincoln Electric sales team for a possible solution – and they found just what they needed.

After a full demonstration of Lincoln Electric's Weld Sequencer™ solution, Crown quickly realized that this technology provided the type of systematic process control required by these new additions to the product line. Integrated directly into the welding cell, the user-friendly graphic interface provides operators step-by-step guidance for even the most complex weld assemblies.

Using a simple LCD monitor mounted near the workpiece, Crown implemented the Weld Sequencer software to visually guide their operators through each individual step of the fabrication process. In addition to providing visual verification of weld placement and part orientation, Weld Sequencer also automatically controlled the power source so the right settings were programmed for each weld – helping to ensure that each and every weld was made in the proper sequence with the proper settings.

“The beauty of the Weld Sequencer,” says Dan Miller, manufacturing engineer at the Greencastle plant, “is that it steps the operator through the entire process, making sure they stay on track with the sequence.”

“Some of these frame weldments have extremely tight tolerances,” Miller says. “To hold those tolerances, you have to keep as much variation out of the process as possible. The Weld Sequencer makes everybody weld it following the same process. And because it also controls the power supply, everybody's welding using the same weld settings.”

It didn't take long for Crown to see the results. After implementing Weld Sequencer, the Greencastle team saw process improvements and a boost in overall production efficiency, all very much valued by Crown's engineering team.



*Weld Sequencer Software - step-by-step process control*



*Dan Miller - Manufacturing Engineer, Crown Equipment*

## DEVELOPING A SEQUENCE

For new parts, the engineering team integrated Weld Sequencer by developing work instructions based on the welding fabrication blueprint.

“It’s just going through and determining what approach works, and what doesn’t, and taking pictures at each stage beginning from scratch,” says Miller.

Now, instead of the old method of Excel spreadsheets full of text and pictures, Crown’s engineers use the simple Weld Sequence Editor to create step-by-step flowcharts that each welder will use to produce the part. In addition to incorporating the specific weld and assembly sequence, the Weld Sequence Editor allows users to program a specific power source setting to account for different welding scenarios, automatically switching parameters based on the material thicknesses, weld length and position of the current assembly step.

“The Weld Sequencer is sort of an ‘in between’ solution,” says Mike Shriver, advanced manufacturing engineer for welding at Crown Equipment’s New Bremen, Ohio headquarters. “It’s in between what the operator would do when following a written set of instructions—based on the way he knows the process and how he’s memorized it—and a rigid process utilized by a robotic welder. The operator has to follow the sequence, just like a robot would; only it’s an operator doing it.”

Although the Weld Sequencer eliminates the need for welders to memorize long, tedious procedures, producing top quality welds is still up to each individual operator.

“They’re still the ones pulling the trigger and guiding the gun,” Miller says, “so, we still require our welders to meet all the same guidelines, the same standards, and pass the same tests, even without the Sequencer.”

## IN PRODUCTION

Today, Crown has multiple Weld Sequencer stations in full operation at its Greencastle factory, producing a number of standard welding assemblies.

“But we offer our customers a lot of options,” Miller says, which is something the Weld Sequencers helped accommodate. “None of the Sequencers are making the exact same product. Some stations make components with a high quantity of welds. Based on the components having different lengths, different heights, and different options, one station may produce many different part numbers. They can just call up the appropriate program for a given part number using the Sequencer and be guided through the welding process.

Initially, Crown set up the Weld Sequencers to produce its more complex large-volume weldments, where sequence is critical, but Dan Miller also sees other opportunities.

“As part of the options we offer our customers, we have a lot of miscellaneous components,” he says. “Typically, we weld a large number of these components at one time, but some time may pass before we weld them again.”

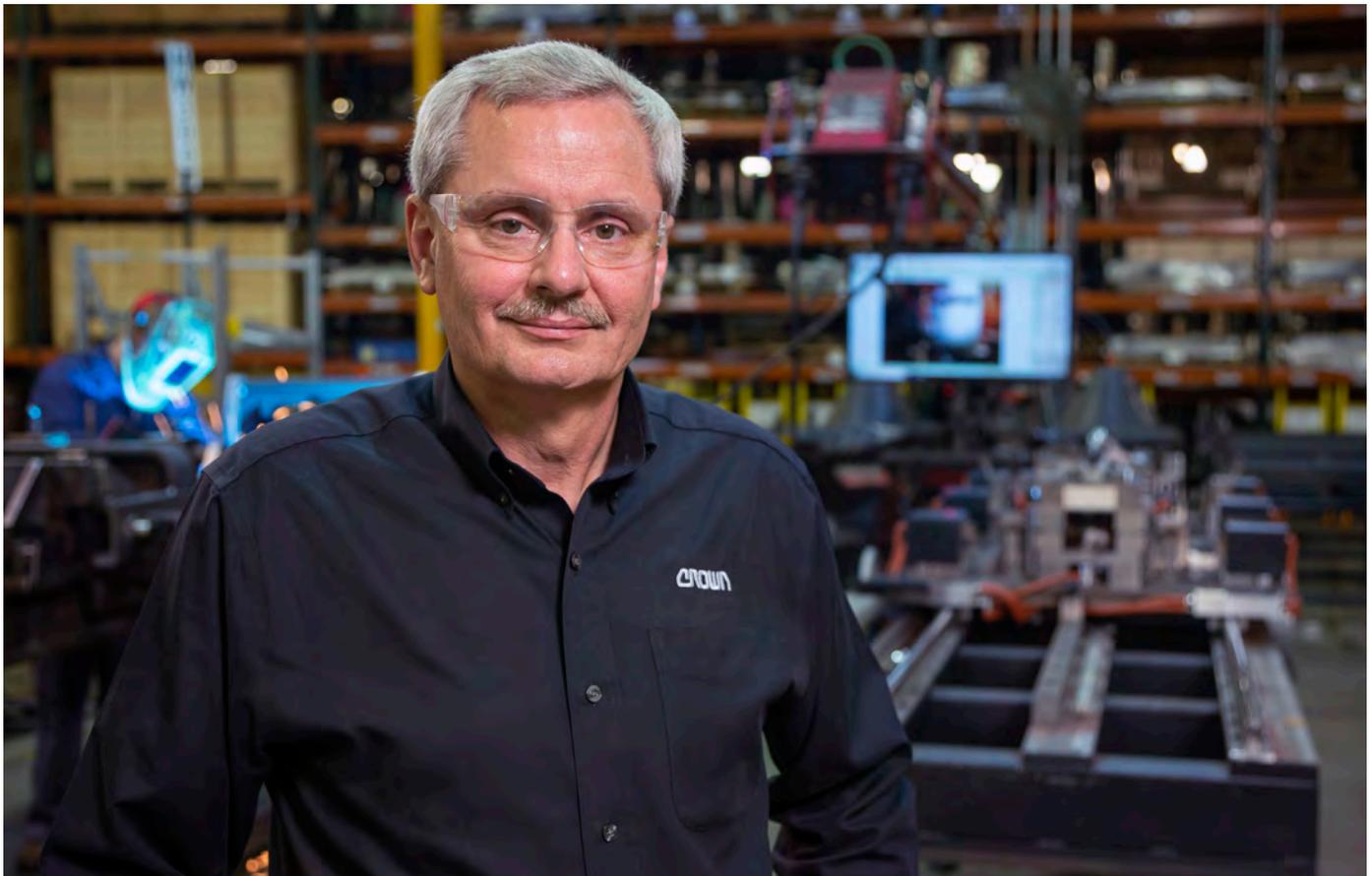
Having the fabrication processes for those components saved in the Weld Sequencer helps eliminate the downtime an operator would spend reviewing assembly instructions—in return, drastically reducing the setup time between orders.

## TRAINING TIME CUT IN HALF

In addition to greatly improving product consistency, the Weld Sequencer has also proven helpful in training new operators—an important cost-saving factor.

“Before, when we were training a new operator, someone would have to mentor them for several weeks,” Miller says. “Now all we have to do is teach somebody to use a Weld Sequencer, and then provide support when it’s needed.”

In the end, the results were clear. “Thanks to the Weld Sequencer, we have been able to introduce more complexity into our manufacturing process and still gain efficiencies in setup time and training for our welders.” Miller says. “So, from that point of view, it has certainly done its job.”



*Mike Shriver - Advanced Manufacturing Engineer, Crown Equipment*