COBOTS

Take Weld Grinding from Good to Great

BY JOHN SPRUCE

Fig. 1 — An operator looks on as Kane Robotics' GRIT™ ST grinds centralizers for oil and gas application.

Advanced technology performs quick, precise, and safe grinding and finishing of welds

Professional welders know a good weld when they see one. They also know that there are some obvious reasons as to why good weld beads are ground once finished, such as better appearance, proper joint fit, or paint prep just to name a few. But great grinding takes time, precision, and a lot of hard work.

Luckily, today's welding operations can rely on advanced technology like collaborative robotics, or cobots, to perform quick, precise, and safe grinding and finishing of welds for a variety of different manufacturing applications — Fig. 1.

Utilizing cobots for weld grinding also makes great business sense; cobots free up workers from the tedious work of grinding so they can move on to other projects or higher order decision-making. They also supply highly competent labor for hard-to-fill job vacancies.

Rather than replacing humans in the weld grinding process, cobots enhance operators' work with improved efficiency, productivity, and safety.

How Cobots Effectively Grind

Although welding cobots (and talented human welders) can create welds that are so uniform they don't require grinding for a finished product, many welds still require grinding for the reasons mentioned above.

Cobots, as opposed to industrial robots, are easier to program, can plug into a 110-V wall outlet, and operate more safely alongside humans. They typically include a robotic arm with a specialized end-of-arm tool. In the case of weld grinding, an angle grinder, belt sander, or other specialized tool is mounted to the end of the cobot arm to remove excess material from the weld bead.

Technicians can program cobots for weld grinding in two ways. One method involves first taking a computer-aided design model of the part, along with the welding callouts, and laying out paths alongside where the welds will be. Operators then run simulations, load the program into the cobot, and

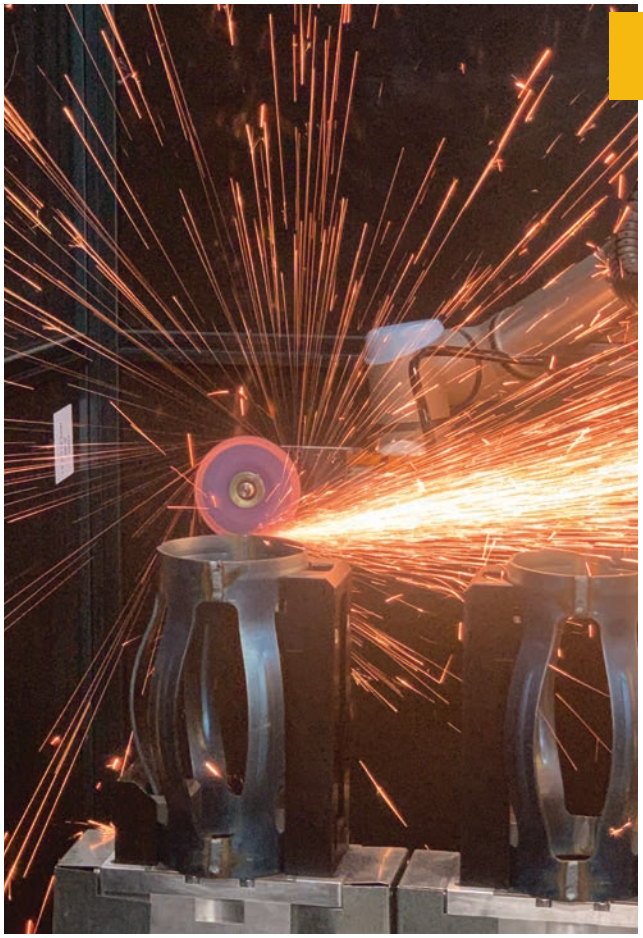

Fig. 2 — End-of-arm tools on a robotic arm grind welds and help human technicians avoid hazards.

perform testing. Process testing will determine how hard the robotic arm should push the end-of-arm tool, how fast the arm should move, and which abrasive media on the end-of-arm tool is best for achieving the desired finish.

Another method is to train the grinding cobot to touch points A and B and then grind along a path from A to B. This method is easier. Even less-skilled technicians and operators can program user-friendly cobots, but humans are still involved in the setup. However, once the cobot is programmed, the technician can turn their attention to another activity while the cobot does the grinding.

Pressure and speed may need to be adjusted according to the type and size of the weld. And, based on the finish required, an adequate abrasive must be chosen. Some welds may need only one pass of the cobot grinding tool, while others may require more than one pass to grind the weld to satisfaction.

Advantages of Using Cobots

Regardless of the job specifications, correctly programmed cobots can complete grinding much more quickly, accurately, and safely than humans can — Fig. 2. Cobots offer several distinct advantages over human weld grinders, including labor savings, cost savings, flexibility, productivity, and safety improvements.

LABOR SAVINGS

Manufacturers often hire an entry-level technician to grind welds. If companies can find this type of laborer (shortages are commonplace), this person may tire of the tedious work and seek a different job elsewhere. Or, if this person is particularly good at grinding, they will likely get promoted into a role requiring more skill. In either case, the employer must deal with continual turnover and spend time and money to interview, hire, and train replacements.

Welders themselves know how to grind, but using a cobot for grinding frees them or other would-be grinders to perform work that requires more specialized skills. And a cobot enables employers to focus on their primary business rather than on human resources.

COST SAVINGS

Higher-volume industrial manufacturers tend to use industrial robots to perform both welding and weld grinding. But industrial automation is much more expensive than cobots. Where industrial robots may cost upwards of $500,000, cobots that perform the same grinding and finishing work are likely to cost less than $150,000.

FLEXIBILITY

Unlike industrial robots, cobots are typically lightweight and mobile. They can be easily reprogrammed for various grinding projects, reconfigured for multiple different uses, and readily moved around a facility.

PRODUCTIVITY

Cobots have been shown to grind welds at twice the rate of human operators. Typically, the longer the weld, the greater the increase in productivity. Large metal panels and welded structures, for example, can take many hours to grind by hand, so utilizing a cobot yields huge productivity gains.

In general, manufacturers using cobots can see a 50–80% improvement in productivity, as cobots grind according to exact specifications with great accuracy and do so tirelessly without requiring breaks.

SAFETY

Cobots reduce healthcare costs and employee downtime because the machines do not suffer from the repetitive motion injuries or respiratory illnesses that grinding can inflict upon their human counterparts.

Precautions When Using Cobots

Cobots are safe to use for grinding and finishing welds, but safety measures must be in place. Though the cobot does the grinding, humans must load parts and operate the technology.

Users can implement simple safeguards, such as light curtains, motion sensors, or sensor floor pads, that stop the grinding mechanism when it detects human presence within a certain distance.

One prominent oil and gas equipment manufacturing company solved cobot grinding safety concerns by installing a light curtain and a simple enclosure with a single entrance/exit into the cobot workspace. The system was still considered a cobot — lightweight, flexible, mobile, and easy for humans to program and operate — but with added safety features for grinding.

Manufacturers can determine which cobot safety precautions need to be taken to meet their compliance requirements.

Future of Cobot Weld Grinding

Today, cobots offer distinct advantages for weld grinding, especially under uniform, low-variability weld conditions. Welds with high variability, however, present a challenge for current cobot and industrial automation alike. If welds are particularly thick, thin, or nonuniform, robots may have difficulty grinding them to exact specifications.

To grind challenging welds, cobots need sensors to adjust pressure and speed accordingly. Future improvements in sensors and programming, plus advanced 3D scanning, will become more commonplace and allow cobots to better accomplish more diverse welds of higher variability.

Not only do cobots provide efficiency and productivity benefits for weld grinding, but they also help manufacturing operations alleviate labor shortage woes and avoid health problems for their employees.

Material removal at all stages of the manufacturing process is a new and emerging market for cobots that will continue to grow for the foreseeable future. Cobots can already serve to take a manufacturer's weld grinding from good to great. WJ

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