Proper Preparation: The Key to Successful Pipe Welds

Properly machining the weld prep will enhance the efficiency of your welding operation and minimize defects and rework

BY MARK LESKA

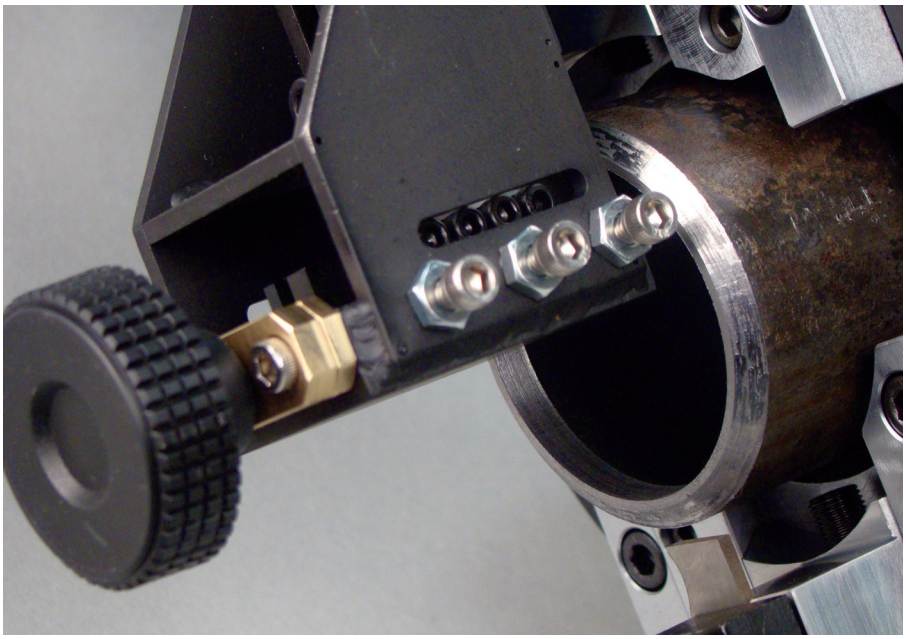

Fig. 1 — Accessories are available as part of a complete machining system. Shown here is a counterbore module machining the inside surface of the weld prep area.

In today's economic, regulatory, and legal environment, proper weld prep procedures are more critical than ever to ensure your firm is producing high-integrity welds. To remain competitive, it's important that your welding throughput remains high, yet welders today are facing increasing headwinds caused by inexpensive imported materials and products, short staffing, and increasingly stiff welding regulations. Ultimately your failure to comply with these regulations, or producing marginal or substandard welds, can open your company up to substantial liability and legal issues.

Following are some of the challenges encountered in the welding sector today:

- An influx of inexpensive imported materials and tools
- The appearance of low-cost, low-quality tubing, pipe, and fittings
- Poor tolerances in wall thickness, out of roundness, and material composition
- Unflagging demand for realiable, skilled welders and trained new welding entrants
- More stringent welding codes, with ever-higher standards and specifications
- Specialized requirements for the power-generation field including nuclear, hydro, and coal, as well as petrochemical and refining
- Critical requirements for high-purity environments in the aerospace, biopharmaceutical, semiconductor, and nanotechnology industries.

As a supplier of portable weld prep machine tools, E.H. Wachs believes the key to effective welding is in the weld preparation. Without it, even the most skilled welder using the most sophisticated welding equipment cannot produce the repeatable, high-integrity welds required for your bottom line.

To illustrate, automatic orbital welding is now being specified on many new projects. Depending on the type of orbital system required, it can involve a substantial capital investment that, if well managed, can produce a substantial return on investment. However, the consensus among today's manufacturers of orbital welding equipment is that users appear reluctant to properly prep (machine) the tube or pipe to be welded. This leads to a lack of success with this equipment, which is preventable by simply following the recommended prep procedures.

Often the welder will attempt to thermal (oxygen or plasma) cut and grind the desired bevel, either 30 or 37.5 deg. Hand grinding is often used after cutting as a shortcut or rough substitute for the proper weld prep. Compound bevels or the "J" bevel typically recommended by the manufacturers of automatic welding systems are impossible to produce without machining. In addition, thermal cutting has the major drawback of changing the metallurgical properties of the pipe in the area around the cut.

Regardless of whether the welds are being made manually or automatically, properly machining the weld prep will enhance the efficiency of your welding op-

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Fig. 2 — OD-mounted split frame machine tool with air drive shown simultaneously parting (cutting) and beveling a standard 37.5-deg weld prep. Note the lathe-quality finish ready for welding.

eration and minimize or totally eliminate defects and rework. By contrast, not taking steps to properly machine the required weld prep can cause gaps and mismatches, and may result in either overwelding or poorly executed, unsuitable welds. In the best case this leads to increases in material spoilage and higher labor costs (due to reworking). In the worst case it can lead to contamination considerations or a catastrophic failure, all with high potential liability risks.

When looking for increased welding throughput, the weld prep is often overlooked as a likely place to create efficiencies. In fact, some may think of it as a production bottleneck. However, it offers a great opportunity for savings since a proper prep offers a substantial decrease in consumables and arc times. Portable machining equipment will consistently outperform hand grinding in labor costs and time savings as well. In addition, the consistency and repeatability of properly machined pipe and tube preps allow your welding team to move quickly without "customizing" each weld to an erratic prep. This is true regardless of whether your team is using manual or automated welding.

Choosing a Machine

Field-portable machine tools provide the capability to part (cut), bevel, and compound bevel and counterbore pipe, leaving a lathe-type finish that in years past was only available in a well-equipped machine shop. When looking for the best machines for your organization, the following are important points to consider:

- Build quality and rigidity
- Size range and capabilities
- Speed of operation
- Feed rate
- Mounting system
- Tooling availability and quality
- Parts and service availability
- Rental options
- Amount of training needed for operation.

Portable machine tools mounted on either the outside or inside of the pipe are available, witha large range of sizes and capabilities suitable for most any tube, pipe, or fitting application. Inside diameter (ID) mounted machines are intended for pipe already cut to length. These utilize a mandrel and chuck assembly, and this mounting method offers the advantage of being automatically self centering. They can face, bevel, compound bevel, counterbore, and, with optional accessories, be used for flange facing — Fig. 1.

Outside diameter (OD) mounted machines are split frames that are designed to split in half for mounting to the outside of inline pipe, and can be used for parting, beveling, counterboring, and flange facing — Fig. 2. ◆