

# Hand fabrication regains its day in the sun

*Fabricating the old fashioned way may just be faster and cheaper for some small production runs.*

**T**he high cost of tool and die setup and prototype production keeps many small manufacturers from offering cost-effective, short run production and hinders new product development. But hand fabrication — the old fashioned way — is helping some small manufacturers compete in today's market.

Hand fabricators offer several benefits. These shops can often accommodate special shapes, bends, or notches when manufacturing cases or other enclosures. Many times, the process is also quicker and more cost-effective than other fabricating methods.

In addition, hand fabricators can quickly produce prototypes for clients to test out designs or show to prospective customers as well as prequalifying components for first article approval. Another advantage is that hand fabrication lends itself to parts that would be hard to duplicate with assembly line production.

Precision Metal Components (PMC), Grover Beach, Calif., specializes in close tolerance hand fabrication for many industries, including telecommunications, electronics circuitry, and automotive. It produces parts from metal components for the U.S. military's Trident and Stinger missiles to electronic pickups and pre-amp equalizers for guitars and violins.

Tricia Brehm, PMC general manager, explains that hand fabrication works especially



PMC is a hand fabrication shop that specializes in close tolerance parts for the telecommunications, electronics circuitry, and automotive industries.

well for customers who need tiny, precise parts in small quantities. "Say a client needs 500 parts and doesn't want to pay huge fees for engineering and tooling. Our hand fabrication department can build the parts without creating tooling — and do it very economically. We can also do the job in less time than it takes to tool up and produce the parts on a punch press."

A typical job in the PMC plant begins when a fabricator shears blanks to size and then folds up the sides on a hand press brake. The operator then moves the parts to the assembly department where they are either hand brazed or sent through an atmospheric brazing furnace. Next, the parts are hand soldered with silver solder. Finally, finishing processes, like powder coating,

## Sample QC checklist

### Quality assurance

- ✓ Does the fabricator have a quality assurance manual?
- ✓ Is responsibility and authority for product quality assigned to qualified personnel for effective resolution of problems?

### Procurement control

- ✓ Are there written procedures for the purchase of raw materials and/or other services?
- ✓ Are incoming materials traceable to the applicable purchase order?

### Material storage and handling

- ✓ Are procedures for the control and issuance of materials in the stock rooms adequate to prevent unauthorized stocking or removal?
- ✓ Can stock materials be traced to specific purchase orders, certifications of compliance, and test documents?

### Production processes and in-process inspection

- ✓ Are adequate controls used to ensure that the applicable engineering drawings, revisions, and specifications are current and in use by production and inspection personnel at the time and place of their task?
- ✓ Are current work instructions and drawings readily available and used by personnel?

### Final inspection

- ✓ Are final inspections, acceptances, and tests performed under the supervision of quality assurance?
- ✓ Are records of inspection and test dates maintained?

### Discrepant material control

- Do written procedures provide for:
- ✓ Identification of discrepant material?
  - ✓ Segregation of nonconforming material?

### Corrective action

- ✓ Does the fabricator maintain a corrective action system?
- ✓ Are corrective action requests issued to vendors when quality problems surface on procured materials?

### Measuring devices and test equipment

- ✓ Does the fabricator's calibration system meet MIL STD 45662A and MIL I 45208A?
- ✓ Are calibration standards traceable to the National Institute of Standards and Technology?

### Sampling inspection

- ✓ Do inspection personnel have procedures for covering sampling inspections?

This checklist provided by California Fine Wire/Precision Metal Components.

painting, and plating are vended out for clients.

Although one might think that handcrafted work would be less accurate than parts produced through automation, PMC's work is produced to very tight tolerances and exceeds MIL-

I-45208-A specifications. PMC uses equipment calibrated to the National Bureau of Standards requirements, and all of its products must pass stringent quality control checks at every stage of production. In-line checks ensure that prod-

ucts are constructed to tolerances within  $\pm 0.002$  in., and all product test results are tracked on computerized statistical process control charts for quick reference.

### Picked by hand

As high-tech industries and start-up companies look to hand fabrication as a means to prototype, test, develop, and even produce metal enclosures for new electronic products, they should understand the capabilities of any fabricator before using its services. A good fabricator will have the expertise to help in product development, the ability to produce a quality product, a willingness to make design changes as the product evolves, and the capacity to perform all of the above within a short timeframe.

By researching the following areas, manufacturers should be able to find a metal fabricator that meets their needs.

**Technical support.** Confirm that the shop has engineers or technical support readily available to provide design assistance. This is especially important early in the development process.

**Small production runs.** Determine that the shop can fill small quantity orders. This is vital for rapid prototype production and is ideal for completing production runs that are too small to warrant extensive tooling changes.

**Secondary operations.** Make sure that the fabricator can provide all secondary operations including installation of terminals and inserts, drilling, notching, abrasion tumbling, soldering, brazing, laser cutting, and silk screening. Finishing the work at one location simplifies scheduling, ensures responsibility for quality, improves security, and facilitates design changes.



Having skilled personnel on hand is a must for PMC. Operators work together to improve the hand fabrication process at every stage of production.

**Close tolerances.** Check that the fabricator uses inspection equipment calibrated and traceable to the National Institute of Standards and Technology (NIST) requirements. Fabricators should also perform quality control checks at every stage of production.

**Quick turnaround.** Confirm that the fabricator meets deadlines and responds quickly to large or unplanned orders. Some metalforming shops maintain an inventory of standard dies and molds to hasten the production of stock shapes.

**Inspection.** Make sure that the fabricator inspects 100% of the finished parts rather than making random spot checks.

**Quality control checklist.** Prepare a quality control checklist and submit it to potential hand fabricators. Information on this list should establish that the fabricator has mechanisms in place to track the purchasing, handling, and storage of materials; ascertain that tools are calibrated; guarantee that finished products are inspected; and trace what happens to rejected parts. ●

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