

*Rapid
Prototype
Tooling®*

MCP / TAF



COOL SPRAY MOLDMAKING

MCP/TAF TOOLING GUN



Specially designed equipment for moldmaking



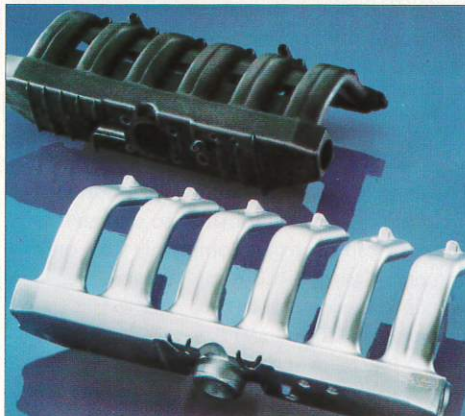
High temp spraying with the 8830 gun. MCP has ongoing development to create new mold surfaces to satisfy customer needs



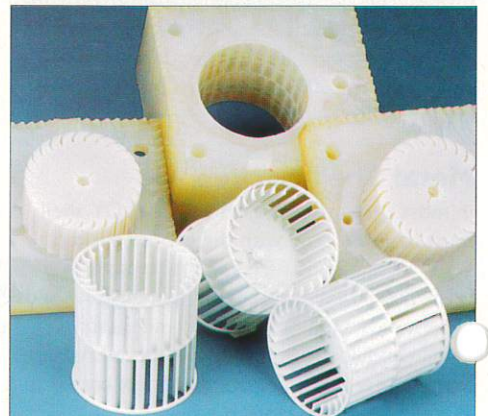
"Hands on" training at MCP's Demo Center



Special materials:
Wire, Resin, Alloy etc.



Other MCP SYSTEMS products:
Lost metal core technology for producing "impossible" components by melting out the core and re-using it.



Other MCP SYSTEMS products:
Vacuum Casting - A system of producing complex shaped prototypes in a few hours.

MCP/TAF makes a wide range line of energy-efficient thermal spray coating systems for a wide spectrum of industries. Everything from manually operated units to totally automatic turnkey systems are furnished. MCP Systems offers processes and equipment for metal molds and tooling; spray fabrication of metal parts in mold cavities; and coating electronic and electrical plastic cabinets with pure inexpensive metals to eliminate static discharge and electromagnetic interference. MCP is headquartered in a modern building located about 50 miles from New York.

The company is committed to strict quality control standards, competent technical services, and maintaining adequate stocks of equipment and materials for prompt delivery. As an adjunct to calls by our field engineer staff, you are cordially invited to call or visit MCP and discuss your applications firsthand. We look forward to helping you.

A video tape of all our products is available, and demonstrations can be arranged.



Total Package A One Stop Source

We have organized MCP Systems so that we can fulfill any - or all - of the various needs of each customer. MCP/TAFE has available a total package - materials, equipment, training and technical services.

Materials

Metal Mold Surfaces

MCP/TAFE's metal spray gun can melt and spray any material including nickel, copper, stainless, zinc, aluminium and various alloys. MCP/TAFE currently supplies numerous alloys which are specifically designed for moldmaking. All wires are packaged in convenient 25 pound spools. This permits spraying of approximately ten square feet of tooling (one-sixteenth inch) before changing reels. For larger volume requirements, 600 pound wire barrels are available.

Metal Shell Backup

In most cases, the sprayed MCP ALLOY shell must be reinforced with the proper backup system. For molds such as RIM, structural foam, thermoforming, polyurethane foams, and blow molds, MCP/TAFE recommends its aluminum filled resin because it has extremely low exotherm, low shrinkage, and fast cure time even when cast in large volumes. For smaller prototype injection molds, a low melt castable alloy, is the preferred material. This castable has no shrinkage, has good mechanical and thermal properties, and is reclaimable for further cost reduction.

Many large sprayed molds can be backed with a laminating system such as fiberglass, Kevlar, or graphite. Seventy square foot autoclave molds have been backed with laminate. When producing large injection tools MCP/TAFE recommends our proprietary resin. It can be cast in quantities up to 2000 lbs. with controlled exotherm.

Miscellaneous Materials

MCP/TAFE has determined that a special grade of PVA has the most desirable characteristics as a multi-function tool release agent. This includes anchoring the initial spray coat, adequate temperature resistance, preservation of good detail and superior release properties. When using certain pattern materials; i.e., plaster and wood, special sealants and techniques are recommended to prevent reaction with the sprayed metal or absorption of the release agent.

Equipment

The spray gun is especially designed for tool/moldmaking and is automated so that an operator can control it completely with only one on/off trigger. It is a sophisticated, yet simplified device, which runs cool to the touch, sprays at any angled and desired rate ranging from a few to over 90 pounds an hour. The wire is not melted until the trigger of the gun is pulled. The total equipment package includes all regulators and hoses, so that the unit can be simply connected to a three phase outlet and compressed air supply.

Training

MCP/TAFE offers on-going training programs for all customer personnel. Customarily, training periods range from one to five days, depending on the experience and capabilities of the trainee. All participants, through technical manuals, lectures and hands-on training sessions, become thoroughly familiar with the fundamentals of the process, maintenance, spraying and backup techniques. Training can be given at customers premises.

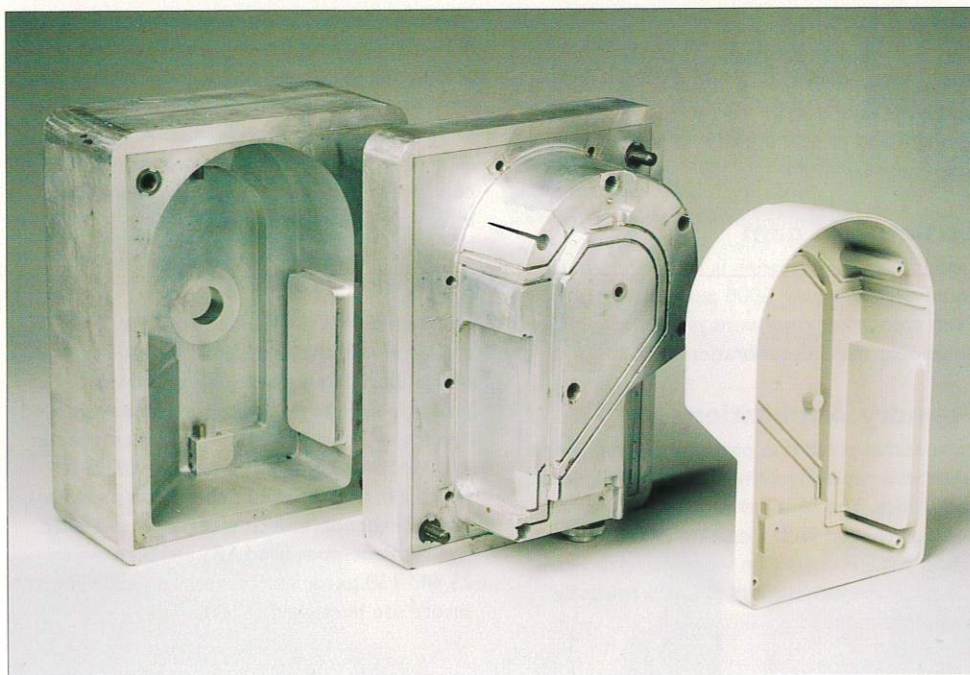


Service

An international network of specialists, as well as headquarter experts, is maintained to provide on-going technical support and to keep each customer up-to-date on new practices, help in problem solving, and keeping equipment operating most efficiently.

MCP Systems Inc. Fairfield, CT Headquarters and Demo Center.

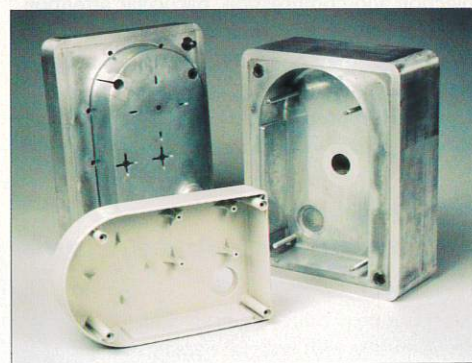




ABS injection moldings made from MCP/TAFE molds. Original patterns were made by Stereolithography (SLA).

Rapid Prototyping

The advent of SLA (Stereolithography) and SFM (Solid freeform manufacturing) has propelled the MCP/TAFE spray metal tooling technique into the fastest, most economical way to produce actual material (Thermoplastic) components. MCP/TAFE molds can be polished or etched if required to produce the exact part finish requirement. Typically, a spray metal mold can be made in 1-2 days.



**3-Dimensional
Model/Pattern**



**MCP/TAFE
Spray Metal Mold**



**MCP Prototype
Injection Molder**



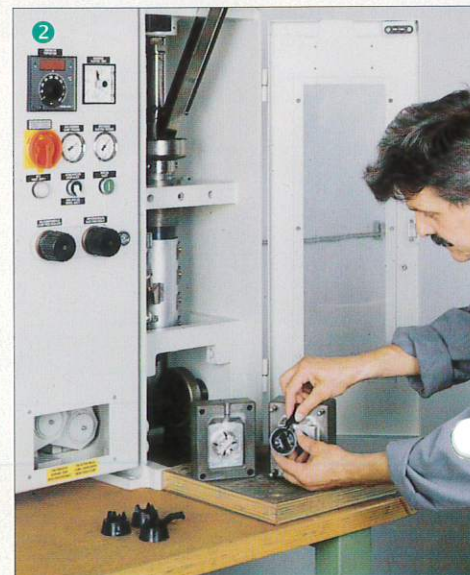
**Injection Molded
Components
Within Hours**

Typical rapid prototyping flow chart with MCP/TAFE metal spray mold technique.

Part of the MCP mold package are the MCP injection molders - specifically designed for producing thermoplastic prototypes using the metal spray tooling technique. MCP molders allow the operator easy access to the mold, making any mold changes or correction an easy operation.

① MCP prototype injection molders are available in 1 to 4 oz. (25 - 100g) in pneumatic and 5 to 10 oz. (125 - 250g) in fully hydraulic with over 200 tonnes clamp.

② MCP/TAFE metal sprayed injection mold.



Practical, Versatile Moldmaking

Molds can be made by the MCP/TAF technique which will fulfill a wide range of operational requirements. They are especially utilizable in thermal forming; pressure forming; RIM; prototype injection molding; lost wax, foundry patterns; blow molding; foamed plastics; rotational molding; and the production of large composites. For more severe - higher pressure and temperature operations - such as injection and compression, particular attention must be paid to structural design elements and selection of the correct MCP/TAF backup materials.

Both fabrication time and costs are dramatically reduced as shown in the charts.

Highlights:

Thermal Forming And Pressure Forming

Tools can be produced quickly and economically with integral cooling or heating using a specially formulated MCP/TAF backup resin with aluminum filler. Large tools can be laminated and egg crated for support. Any surface design can be produced. Unlike conventional epoxy tooling, the metal surface is durable, easy to maintain, and is very conductive.

Blow Molding

This is a routine application, providing design care is taken with severe stress areas - such as bottle necks and sharp curvatures - to ensure strength and proper backup. In some cases inserts are used.

Structural Foam

Good mold performance is routinely achieved. As an example, over 6000 parts of a structural foam typewriter case were produced without noticeable mold deterioration.

Foundry Applications

Inexpensive production patterns can rapidly be fabricated replacing conventional metal, wood and plastics. The life of wood patterns have been prolonged with a coating of MCP/TAF Alloy. Surface repairs on worn patterns, core boxes, and reject castings are also routinely accomplished.

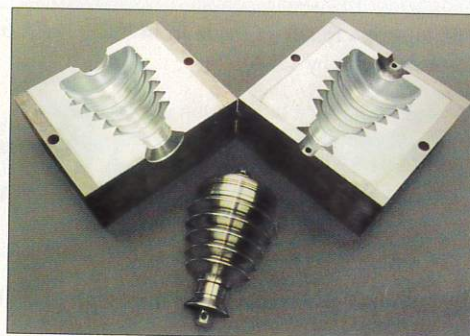
Polyurethane, RIM, R-RIM, Compression Molds

Polyurethane chemistry and processing parameters are very applicable for MCP/TAF's spray metal tools.

More molds have been made for polyurethane than any other application. Polyurethane shoe sole molds pioneered metal spray tooling and now many large RIM molds are routinely built with the MCP/TAF technique. A sprayed alloy shell backed with a proprietary conductive resin system with an aluminium mold frame is recommended.

Injection Molding

Injection molds can be made quickly and economically by the MCP/TAF technique. Present usage is primarily for prototypes and relatively short runs. A sprayed metal shell must be backed up and encased in an appropriate chase. The number of parts which can be produced depends on pressures, rate of injection, and type of plastic and filler. For example, glass filled ABS yields between 25 and 150 parts; less complex molds and less severe use have yielded 1000 plus.



Composite Autoclave Tools

Because the MCP/TAF tool technique is not size limited, it is especially applicable to composite tooling. MCP-ALLOY shells are backed up with lightweight laminates and framed in a rigid torque box to make unusually large, lightweight, dimensionally and thermally stable tools. Autoclave tools of over 120 square feet have been easily fabricated.



COOL SPRAY MOLDMAKING HOW TO DO IT

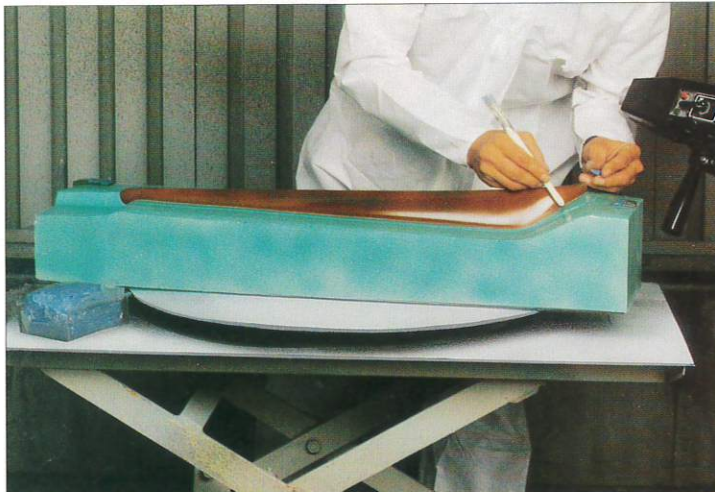
The MCP/TAF-developed technique uses a unique, high velocity, electric arc metal spray-generating system. The wire-fed MCP/TAF gun sprays cool because it is extraordinary energy efficient and energy confining - unlike gas flame devices which dissipate much uncontrollable heat.

The spray itself is fine and thoroughly atomized. (Fine atomization results in remarkable detail in reproduction.)

The compressed air/arc power/metal feed ratios are engineered to produce a cool,

forceful spray. Temperatures do not exceed 150° F (65°C) therefore no distortion is experienced. The fine atomization and force of the spray also ensure - in addition to faithful reproduction of details - buildup of an unusually dense, hard, metal shell or metal surface.

The spray gun can be operated continuously so that the results produced are always consistent. Controlled by a simple on-off trigger; no warm up of gases are required.



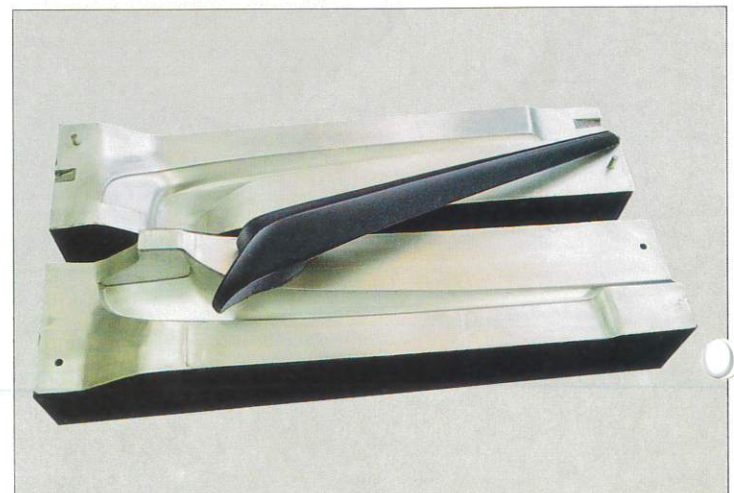
Preparing the model



Cool spray the model with MCP/TAF moldmaking wire. 8830 type gun.

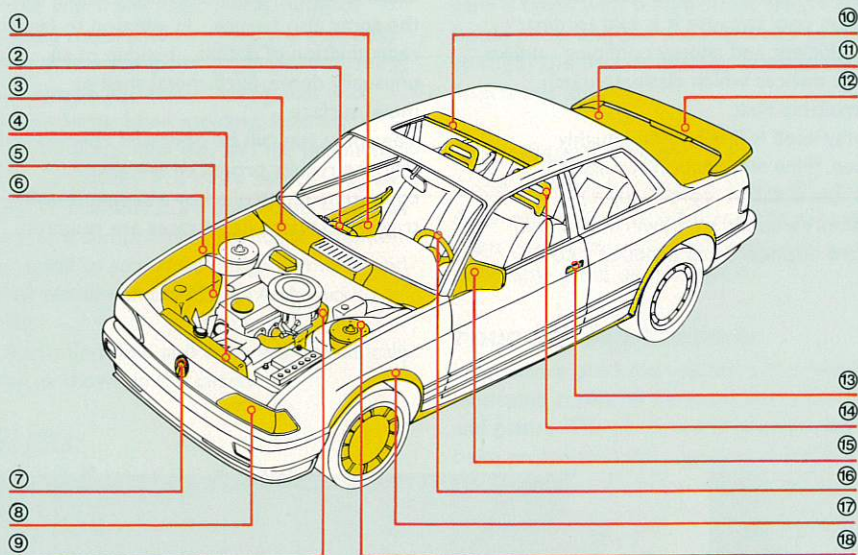


Back-up the metal sprayed shell with high temp resin

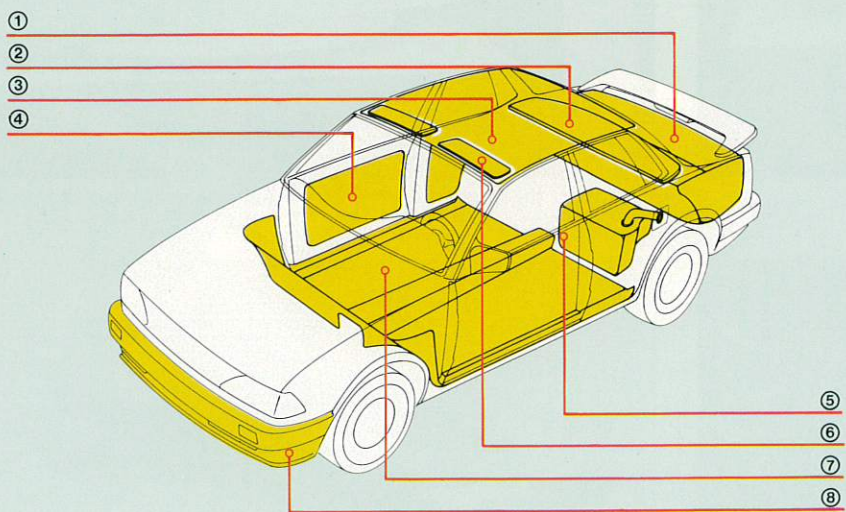


Finished mold in only 6 hours

TYPICAL MOLD APPLICATIONS SUITED TO THE MCP/TAFE TECHNIQUE



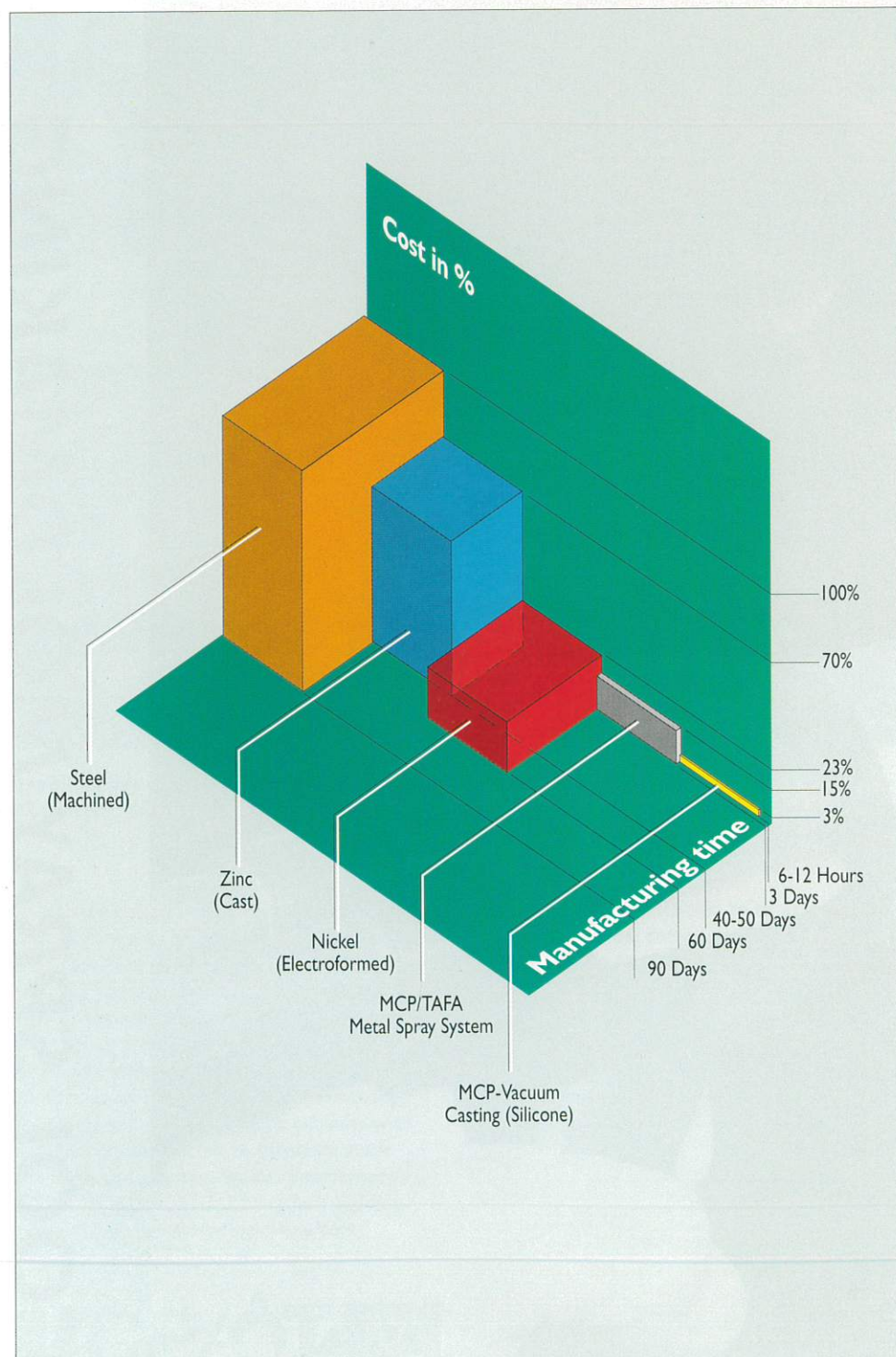
1. Storage Box - Injection Molding
2. Car Telephone - Injection Molding/
Shielding
3. Cover - Vacuum Forming
4. Radiator Tank - Sheet Metal Forming
5. Water Tank - Blow Mold
6. Wing - Autoclave Kevlar
7. Paint Spray Mask
8. Reflector - Injection Molding
9. Inlet Manifold - Fusible Core Technology
10. Sunroof - SMC
11. Trunk Lid - Sheet Metal Forming
12. Rear Spoiler - PUR-RIM
13. Door Handle - Injection Molding
14. Headrest PUR Semi Rigid
15. Mirror Housing - Injection Molding
16. Steering Wheel - PUR Semi Rigid
17. Wing Trim - PUR-RIM
18. Suspension Cover - Sheet Metal Forming



1. Trunk Lining - Glas Reinforced Sheet
2. Shelf - TF Foam
3. Headliner - TF Foam
4. Door Cover - Wood Filled Plastic Sheet
5. Tank - Blow Mold/Sheet Metal Forming
6. Sun Visor - TF Foam
7. Carpet - Pressmold
8. Spoiler - PUR-R-RIM

Reduces Time And Cost For Mold Production

These graphs show production time for a matched metal mold. When a master is available, Small simple tools can be completed in less than a day at extremely low cost.



Rapid, Economical Moldmaking Method

The MCP/TAFA tool/moldmaking technique is a process to reproduce shapes very accurately. Given any model or pattern made of materials - such as SLA, metal, wood, combinations of wood, wax, cloth or plaster - a metal shell can be build up around it to desired thickness. This is an exact copy not only of every surface detail but also of precise form and dimensions. With the MCP/TAFA Arc Spray technique there is no problem of thermal distortion or shrinkage.

Reproduction is so true that the metal shell is comparable to an electroform in its precision. However, the MCP/TAFA process is much quicker. For instance, it takes only ten minutes to spray one square foot to a thickness of one-sixteenth of an inch.

The process is versatile and not size limited. (It has been used to reproduce pieces as small as a coin and as large as a 120 square foot airplane component.) The process is simple and straightforward and can be learned by virtually anyone after a brief hands-on training session.

The MCP/TAFA tool/moldmaking technique

- Reduces costs by as much as 90 percent.
- Provides closer control of tooling process.
- Permits fast changes in product lines and thus quick response to market demands.
- Requires only a modest equipment investment.
- Minimizes labor requirements.
- Makes it possible to fabricate a part for final design and approval in minimum elapsed time.