

OUT OF AUTOCLAVE TOOLING for Aerospace and Composites





ISO 9001 : 2000

AS 9100

Overview

Founded in 1962, Weber Manufacturing Technologies Inc. is a leading manufacturer of precision tooling for Automotive, Aerospace, and Home/Building Products.

Located in **Midland, Ontario**, Weber is a privately held Canadian company. Weber offers high quality tooling in steel, invar and aluminum, and precision CNC machined aluminum parts.

Over the last 15 years, Weber has developed nickel shell tooling using the Nickel Vapor Deposition (NVD) process. This process is also used for capturing fine surface detail, such as leather and wood grains, and authentically replicating them into hard tools.

140 employees, 135,000 sq. ft. facility

On-site CAD Design capable (UGS, CATIA)

Certified ISO 9001:2000, AS 9100

Canadian Controlled Goods Program registered

Modern simultaneous **5-Axis CNC** machining centers

Full complement of CNC contour mills, gun-drills, vertical mills, and EDM machines



AUTOCLAVE / OVEN PACKAGE

Automotive Class A surfaces
for Carbon Fiber Lay up

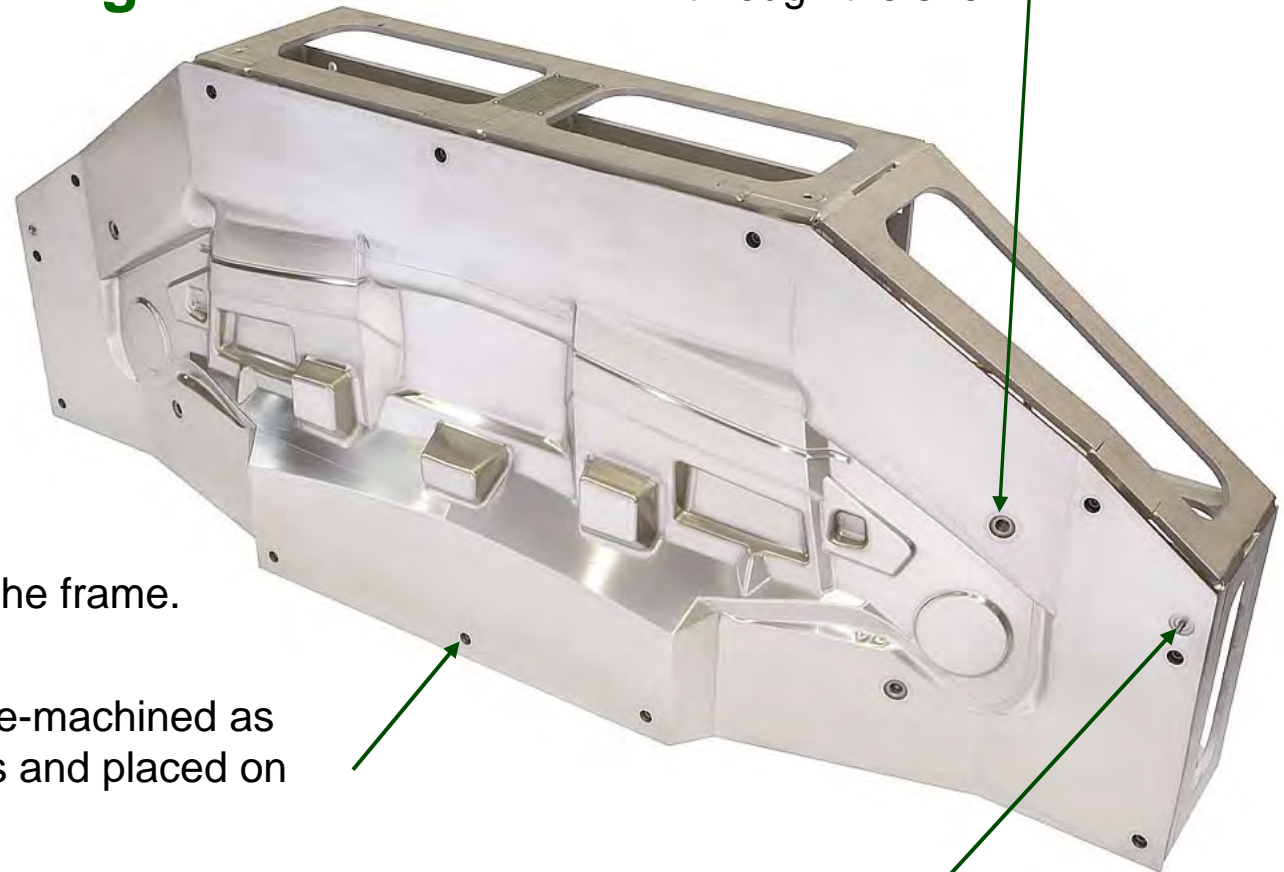


Multiple identical tools from a precision, reusable mandrel

Back of tool

Nickel Shell Design

•Encapsulations for vacuum through the shell



•No welding of the shell to the frame.

•Perimeter standoffs are pre-machined as round counter-bored blanks and placed on deposition mandrel.

•The shell is placed on the welded frame and screwed into position.

•Encapsulations for tooling holes

Shell Design - View through side cutout window

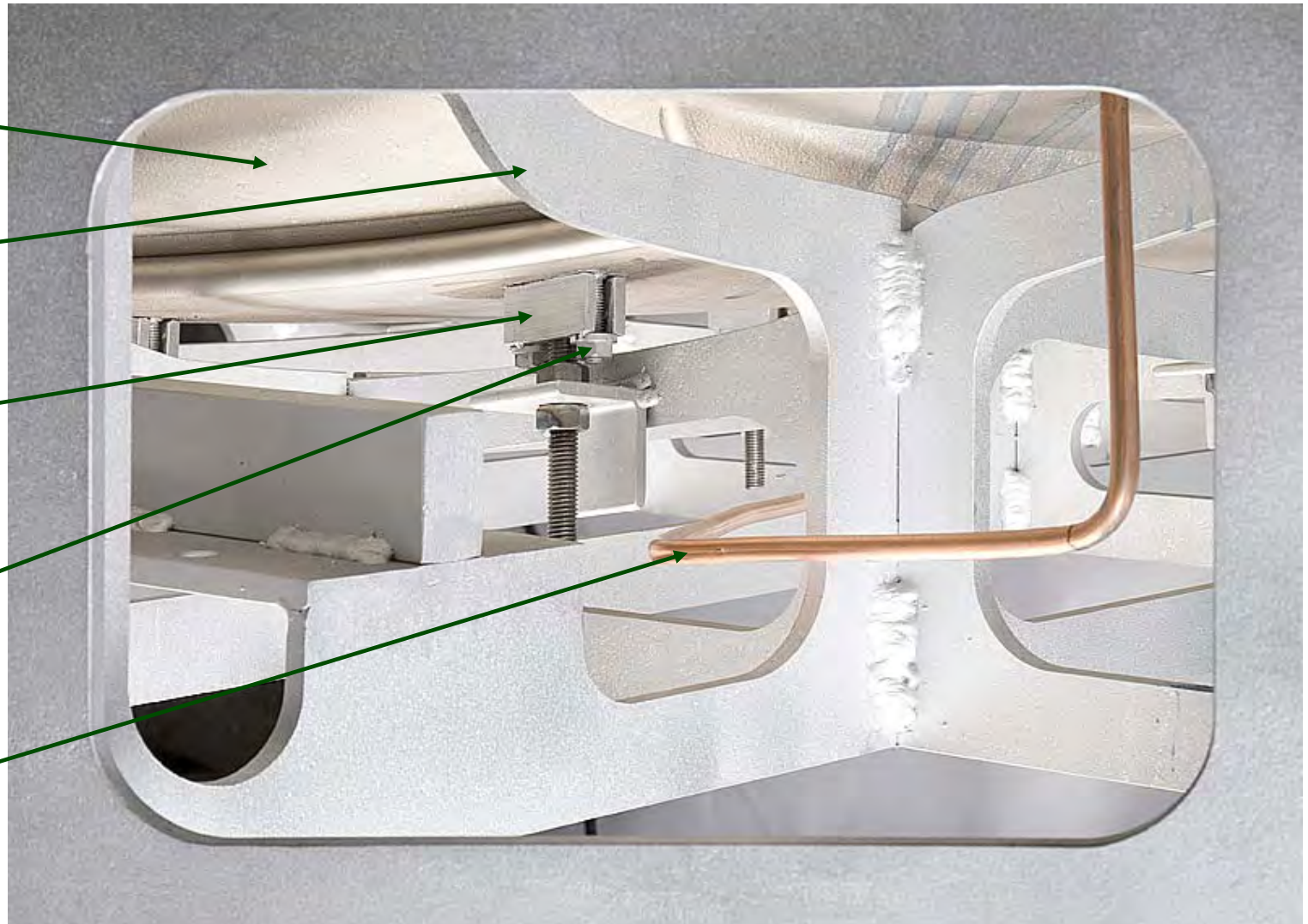
NVD Shell

Frame

Push Pull
Support

Spot
Welded
Studs

Vacuum
Line



Heat Transfer: Our History and Experience

- Various customized production processes have been developed and implemented into Weber tooling over the last 10 years
- Mold surface temperatures: steady state, or rapid cycling per part
- We have implemented:
 - Piping lines buried in high strength epoxy
 - Piping lines encapsulated with a layer of NVD nickel
 - Piping lines w Thermal arc spray of Copper or Silver
 - Liquid directly on back of surface in conformal flow against the surface
 - Piping lines soldered onto the back of a NVD shell

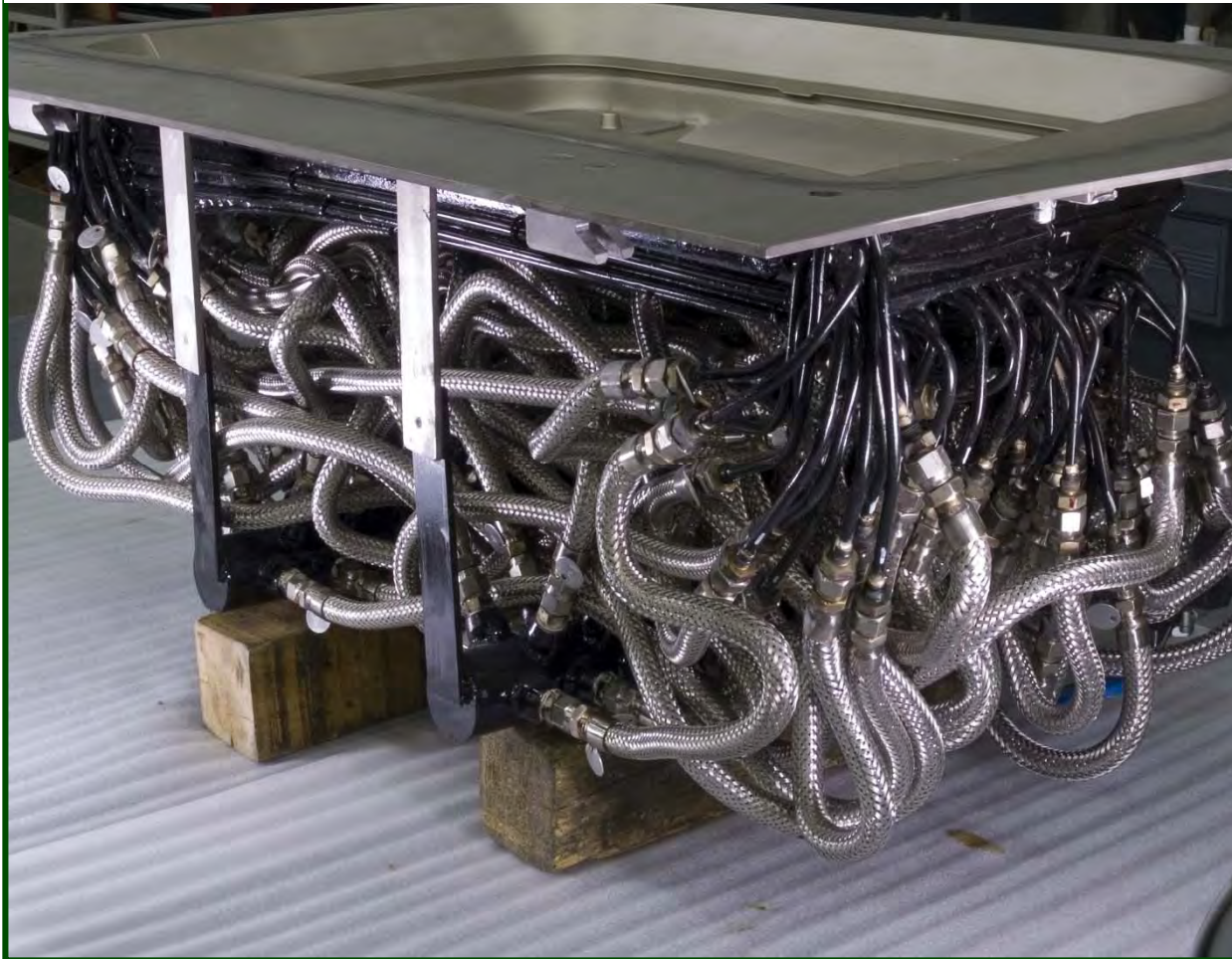
Weber's recommendation: the most cost effective way to produce a rapidly changing tool surface ~ 75 C/min (135F/min), on a 8–10 mm thick shell is:

» Soldered lines on the back of a NVD shell

Out of autoclave, and resin infusion processes benefit from rapidly changing, uniform temperature distribution on tooling surfaces

Let Weber produce the system you need.

Heat Transfer: The Start of Out – of Autoclave Tooling



- Weber has produced many self heated tools for demanding processes
- Automotive Process - PVC Door Skin for GM interior parts.
- Rapid temperature cycles: 40C (100F) to 140C (300F) in 2-4 minutes

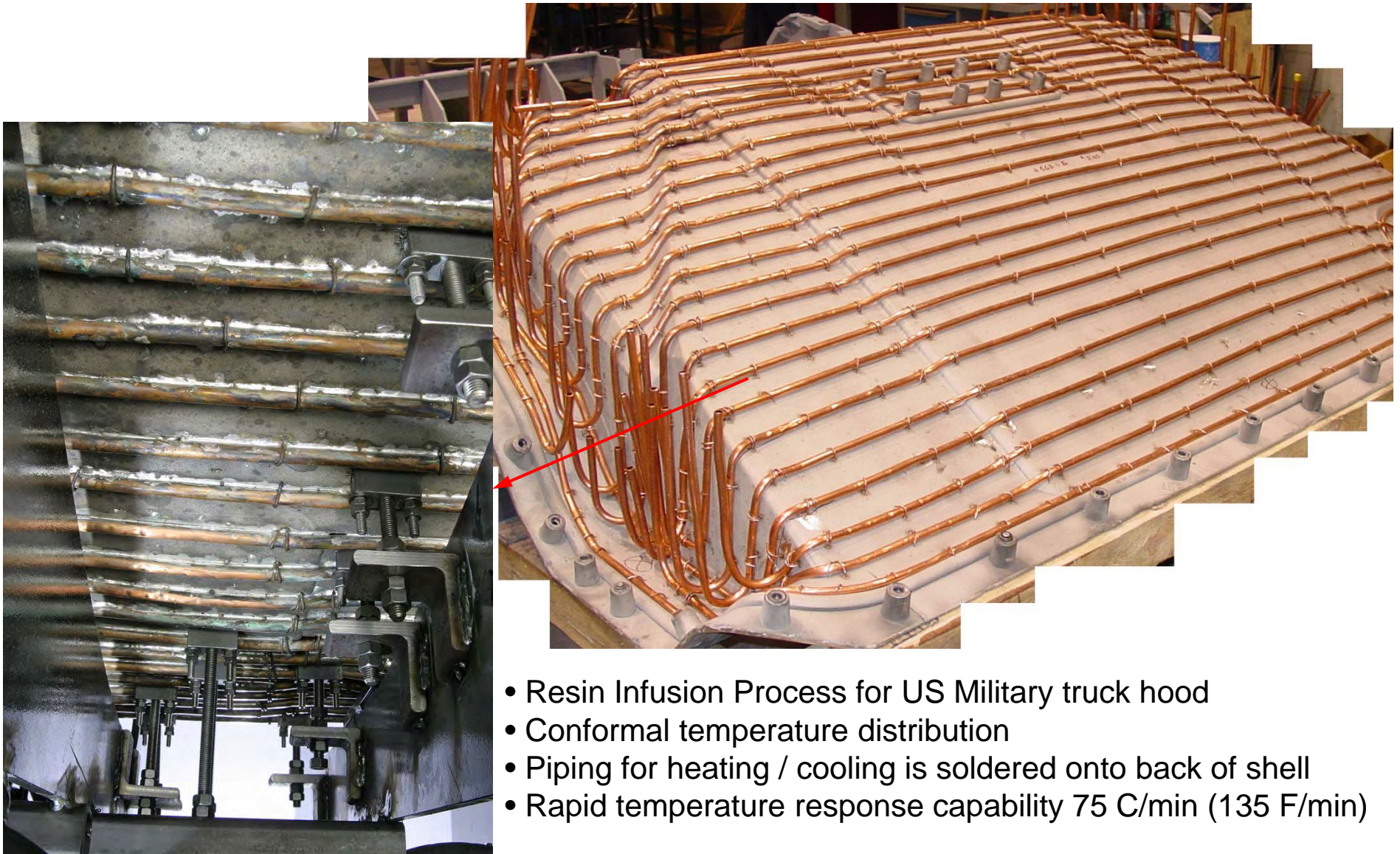
Tool Fabrication



- Automotive Class A roof panel tool
- 61" x 41" shell on frame with piping soldered onto back of shell

Note: Individual applications may have simpler piping and fewer valves.

OUT OF AUTOCLAVE PROCESSES – Thermal performance



- Resin Infusion Process for US Military truck hood
- Conformal temperature distribution
- Piping for heating / cooling is soldered onto back of shell
- Rapid temperature response capability 75 C/min (135 F/min)

OUT OF AUTOCLAVE: GURIT - Class A, NET parts

- Hood tool with integrated oil heating and precision steel inserts to produce net, carbon fibre parts



- Resin Infusion Process
- Conformal temperature distribution
- Piping for heating / cooling on back of shell

AUTOMOTIVE EXTERIOR – Gurit Sprint Resin System (CBS)

RTM PROCESS - LARGE NVD SHELLS

- 2 -15 mm NVD nickel shells welded together, forms a match metal tool on steel support frame



Complete Nickel Shell Mold



MAN Truck Roof Manufactured By Fritzmeier Composites

 **Received Innovation Award
for Best
Industrial Application 2000** 



Assembly of Nickel Shell to Mold Base

RTM PROCESS – PRATT & WHITNEY

- Jet fan splitters and spinners
- ie: Pratt F117-PW-100 engine for C-17
- Large round multi-piece tooling
- Updated manufacturing process
- Reverse engineering to confirm existing drawings
- New, integrated Oil heated design to eliminate ovens

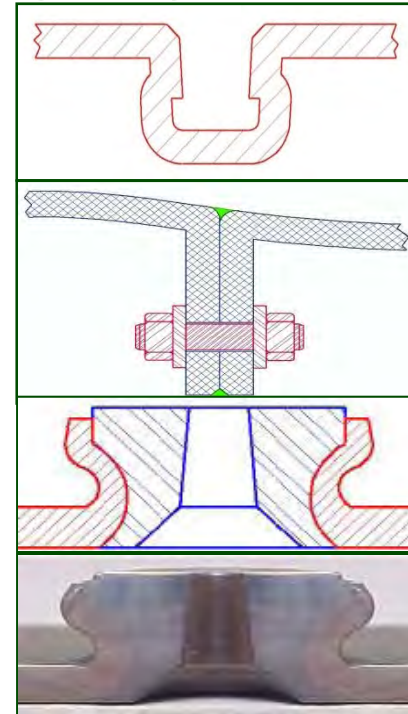


NVD NICKEL VS INVAR or STEEL

- NVD Nickel shell tooling provides a competitive solution versus Invar.
- Consider an NVD Nickel Shell tooling surface:
 - Purchase only what is needed for the tooling surface, not sacrificial material that is machined away
 - Utilize welded steel plate support structure – savings in money and timing.
- NVD nickel is 8 times the thermal conductivity of Invar, 3 times that of steel
 - Improves the thermal cycle time and temperature uniformity
 - production and quality benefit.
 - Uniform mold face thickness without machining
- CTE of NVD nickel approx. same as steel
 - Compatible with many part designs and materials
- Cost of first NVD tool is significantly less than Invar, and often less than steel.
 - Subsequent NVD tools can be <2/3 of Invar rate tool price.
 - Rate tooling can be justified sooner in a program.

NVD SHELL TOOLING FEATURES

- NVD shell tooling - high strength and lightweight
- Flexible tool design options including:
 - Undercut geometry
 - Encapsulated features for mounting and location, injection, ejection, shear edges, mechanisms, etc
 - Welded shell construction for very large parts
- For Multiple Molds, Replicate Cavities:
 - Are identical
 - Cost less than alternative machining
 - Are easy to replace if damaged
 - Replacement timing is weeks



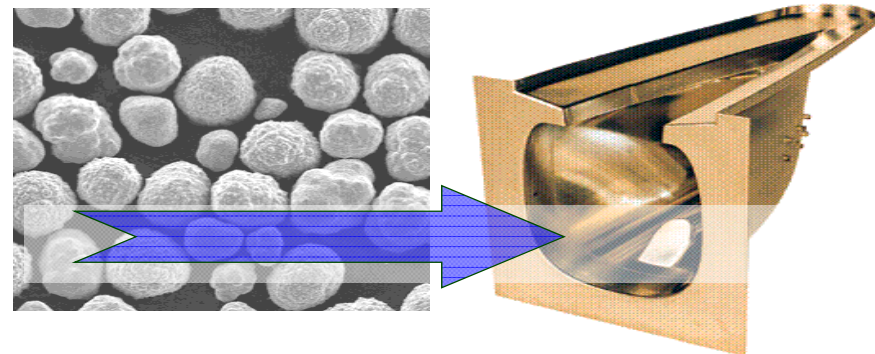
NVD SHELL BASED TOOLING OFFERS...

- Conformal Heating/Cooling -> Faster cycle time
- Uniform nickel shell wall thickness -> Improved thermal distribution
- Mold release -> Fine grain structure
- Mold durability -> 34 – 38 Rc hardness
- Weldability -> allows for repairs or joining of multiples
- Fast Process (0.25 mm/hr) -> ¼" in 1 day !
- Reusable mandrel for duplicate shells -> Repeatable accuracy
- Short duplicate shell delivery times -> ~ 2-4 weeks
- Significant cost savings for duplicate shells
- CNC Machined Metallic Mandrels -> Accurate shells, greater part quality
- NVD Shells are virtually stress free -> Accurate shells

NVD NICKEL PRODUCTION FACILITY



- World's largest Nickel Vapor Deposition facility
- Modern, computer controlled plant, built in 2000
- 400,000 lbs annual Ni deposition capacity
- NVD nickel is 99.98% pure – fully weldable
- 1.74m X 3m shell size capacity
- Speed is 0.25mm per hour, 6mm in 1 day.



Chemically convert nickel to solid shapes



ISO 9001 : 2000

AS 9100

HEAD OFFICE



16566 Highway 12
P.O. Box 399
Midland, ON L4R 4L1 CANADA

Tel: (705) 527-2930 [Main]
Fax: (705) 526-3818
Web Page: <http://www.webermfg.ca>

Robert Sheppard
Vice President

Direct: (705) 527-2976
Mobile: (705) 527-2123
Email: rob.sheppard@webermfg.ca

Tom Schmitz
Business Manager

Direct: (705) 527-2956
Mobile: (705) 527-2154
Email: tom.schmitz@webermfg.ca

SALES OFFICES



GERMANY

Thomas Helle
European Sales Agent

Tel: +49 (0) 7021 978 558
Mobile: +49 (0) 171 637 7550
Email: tom@helle-t.de



UNITED STATES of AMERICA

Greg Leidig
U.S. Sales Agent

Mobile: (419) 481-3645
Email: Greg.leidig@webermfg.ca