



# Precision Tooling for Auto and Aerospace Composites





# OVERVIEW

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

**Weber offers high quality tooling in steel, NVD nickel, invar and aluminum.**

**Located in Midland Ontario, Weber is a privately held Canadian company.**

**Over the last 20 years, Weber has offered nickel shell tooling using an additive Nickel Vapor Deposition (NVD) process. This process is frequently used for capturing fine surface detail, such as leather and wood grains, and authentically replicating them into hard tools.**

**Certified ISO 9001:2015      250 employees      135,000 sq. ft. facility**

**On-site CAD Design capable (UGS, CATIA V5R26)**

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

**CNC contour mills, gun-drill, vertical mills, and EDM machines**

**Canadian Controlled Goods Program and JCP registered (Satisfies US-ITAR)**







# HARD SURFACE MOLDS

- Steel
- Invar 36
- Aluminum
- NVD Nickel (Additive mfg)
- Contract machining up to 80,000lbs



**“NEW” 2 x DMG85 and 2 x DMU 340P**



**5 axis machining bay**



# SAMPLE WEBER PROGRAMS

**Mold, Trim & Drill, Bonding and Inspection Fixtures**  
**Design: from customer model file, to tooling and fixtures**  
**Canadian Controlled Goods Registered for US ITAR projects**



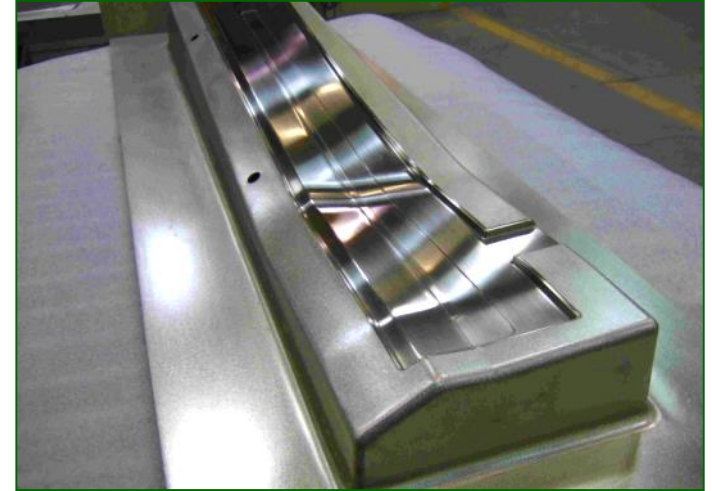




# AEROSPACE APPLICATIONS

## NVD AND STEEL

**Weber is Boeing and Bell Approved**



- Nickel tools for processing Polyimides in F414 engine (PMR15 material)

- Nickel tools for leading edges and fairings
- Steel compression molds



- Precision Aerospace RTM inserts



# INVAR TOOLING

**20' floor beam tool**





# AEROSPACE INVAR TOOLING





# MACHINING







# AEROSPACE PART MACHINING

Various Steel and Aluminum Components  
Machined for the Aerospace Industry By Utilizing  
One Of Our Many 5 Axis CNC Machines



B787 wing components in machined aluminum



Dual spindle machine:  
used for E2 landing gear  
Machining from billet



# CAUL SHEETS: NVD SHAPED INTENSIFIERS



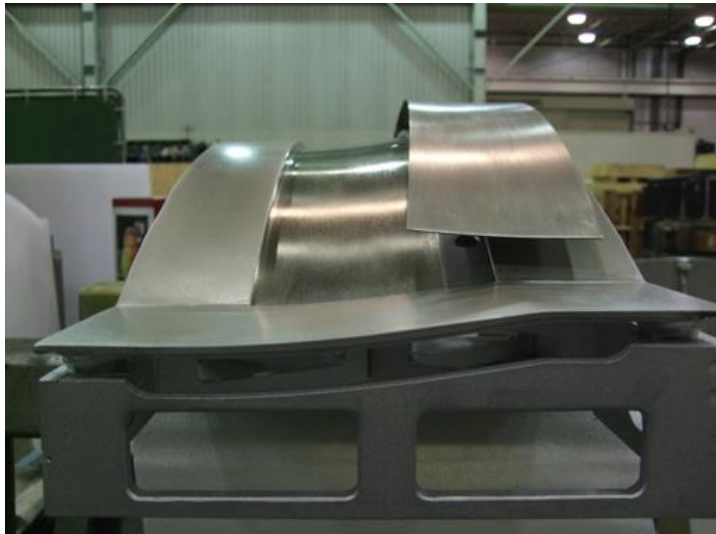


# AEROSPACE APPLICATIONS

## NICKEL CAUL SHEET

To improve surface finish,  
part thickness and heat  
uniformity on the back of  
vacuum bagged parts:

NVD NICKEL CAUL SHEET  
FIT INTO LAY-UP MOLDS  
1mm(0.040") – 3mm(0.120")



Ice Liners



Stringers



# PRESS TOOLING





# AEROSPACE PRESS MOLDS

COMPRESSION , RTM, RIM

Aluminum or P20 steel matched molds for BMC, press molding of crushed core interior or acoustic panels and high pressure RTM applications.



# RTM TOOLING



# RTM PROCESS – Cast Aluminum Tools

Pratt F117-PW-100 engine for C-17

- Jet fan splitters
- Round multi-piece tooling
- Updated manufacturing process
- Reverse engineered to confirm existing drawings
- Integrated fluid heated design to eliminate ovens and permit stationary tool layup, debulk and cure.





# RTM MOLD - NVD SHELLS

- 2, 15 mm thick, NVD nickel shells welded together for each core and cavity, on steel support frames
- Low tool weight solution for long life, uniform heating, reduced press requirements
- ~ 100" square, 30 " deep part



Complete Nickel Shell Mold



MAN Truck Roof Manufactured By Fritzmeier Composites

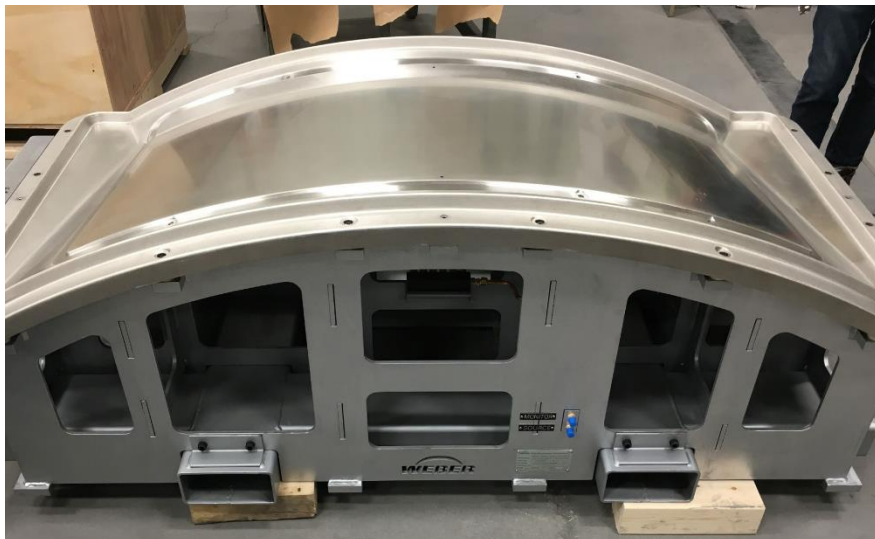
 **Received Innovation Award  
for Best  
Industrial Application 2000** 



Assembly of Nickel Shell to Mold Base

# INTEGRALLY HEATED NICKEL TOOLING:

- OUT OF AUTOCLAVE
  - OUT OF OVEN
- IN AUTOCLAVE (Pressure only)



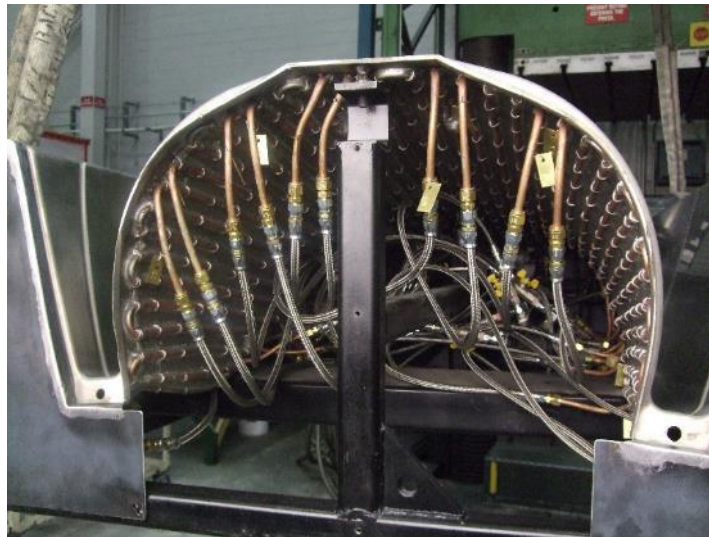




# AEROSPACE PROCESS

## RAISE EFFICIENCY WITH SELF HEATED OOA TOOLS

Wing fillet tool converted to an out of autoclave format for customer loaner trials – **ASK TO SCHEDULE THIS TOOL**



- Use of additive produced NVD shells for OOA layup tools
- Inside each self contained tool:
  - Heating / cooling lines
  - Vacuum lines
  - Fluid and Vacuum Manifolds
  - Thermocouple wiring
- To be operated:
  - Inside the autoclave
  - Out of the autoclave
  - In the clean room ie:
    - Preforming for RTM
    - B Staging

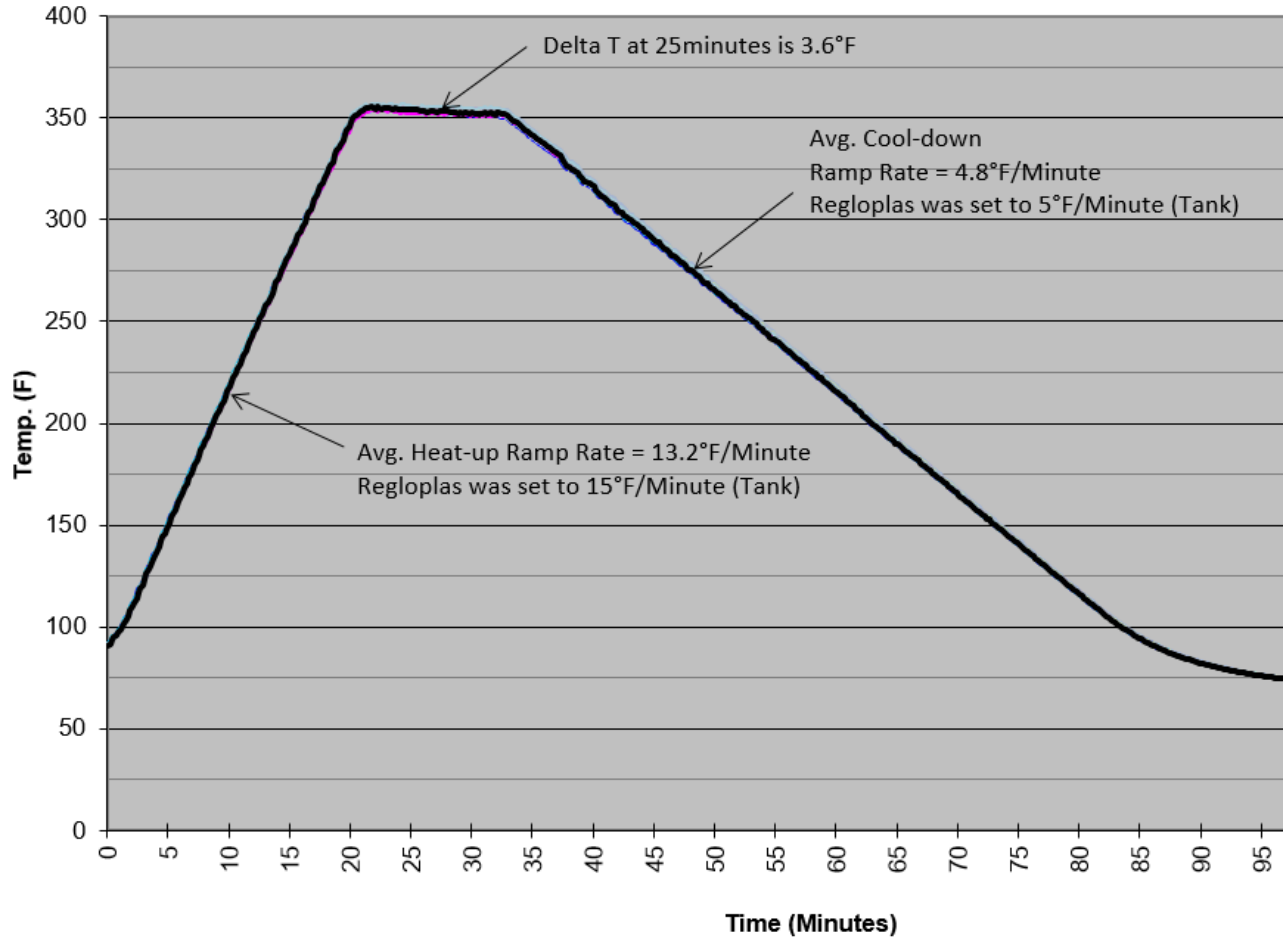




## Weber Test Tool 350 F Heat Test

### Weber Test Tool

### Regloplas 200XL (water)



- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16

## OUT-OF-AUTOCLAVE PROCESS w SELF HEATED TOOLS



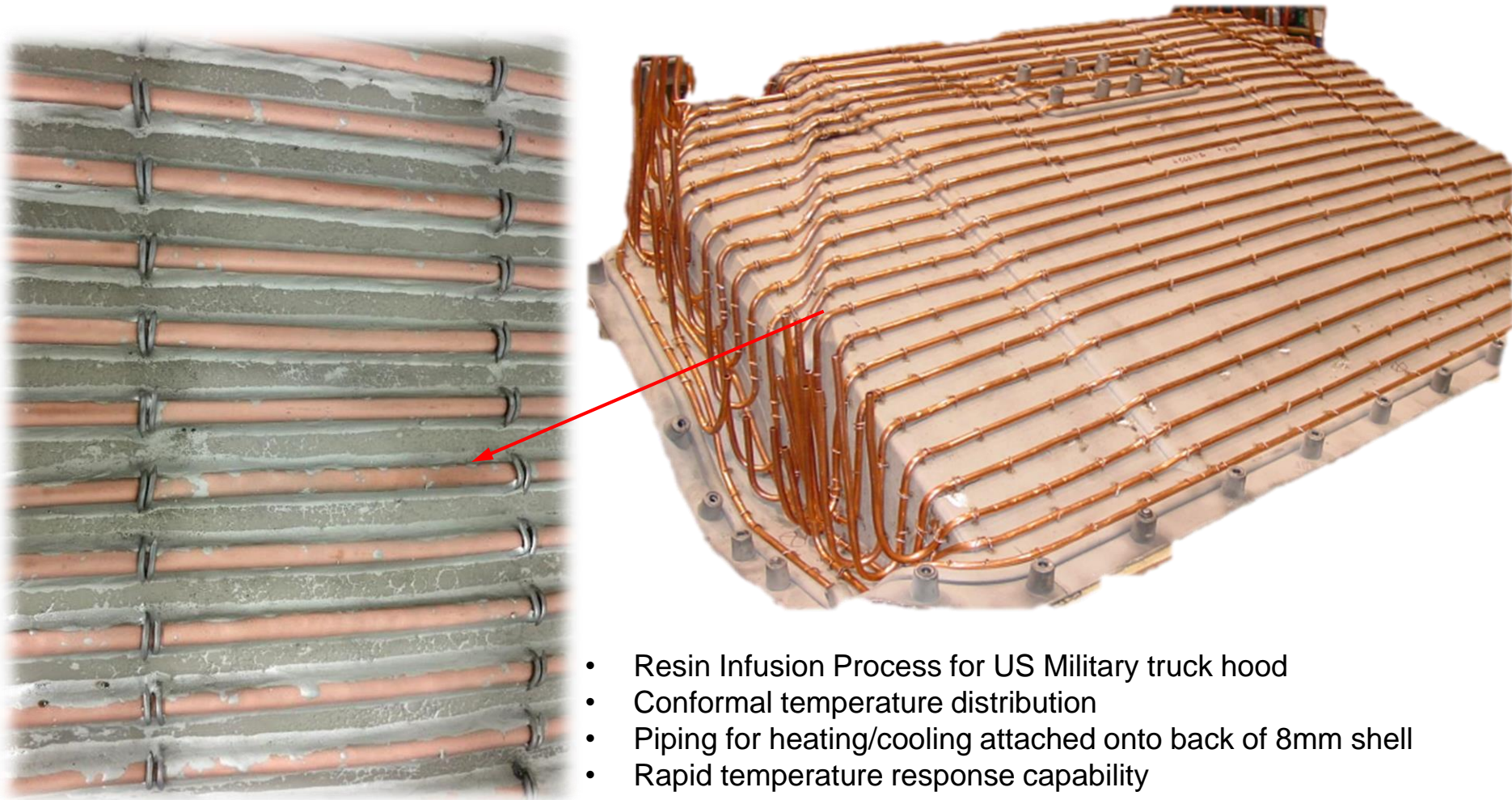
Also known as:

- OOA
- VBO – Vacuum Bag Only
- NONA – Non Autoclave

- Resin Infusion Process for US Military truck hood
- Temperature control piping included on back of 8mm thick nickel shell.
- Uniform temperature response for out of autoclave processes



## OUT OF AUTOCLAVE - THERMAL PERFORMANCE



- Resin Infusion Process for US Military truck hood
- Conformal temperature distribution
- Piping for heating/cooling attached onto back of 8mm shell
- Rapid temperature response capability



# AUTOMOTIVE PROCESS

## OUT-OF-AUTOCLAVE PROCESS w SELF HEATED TOOLS

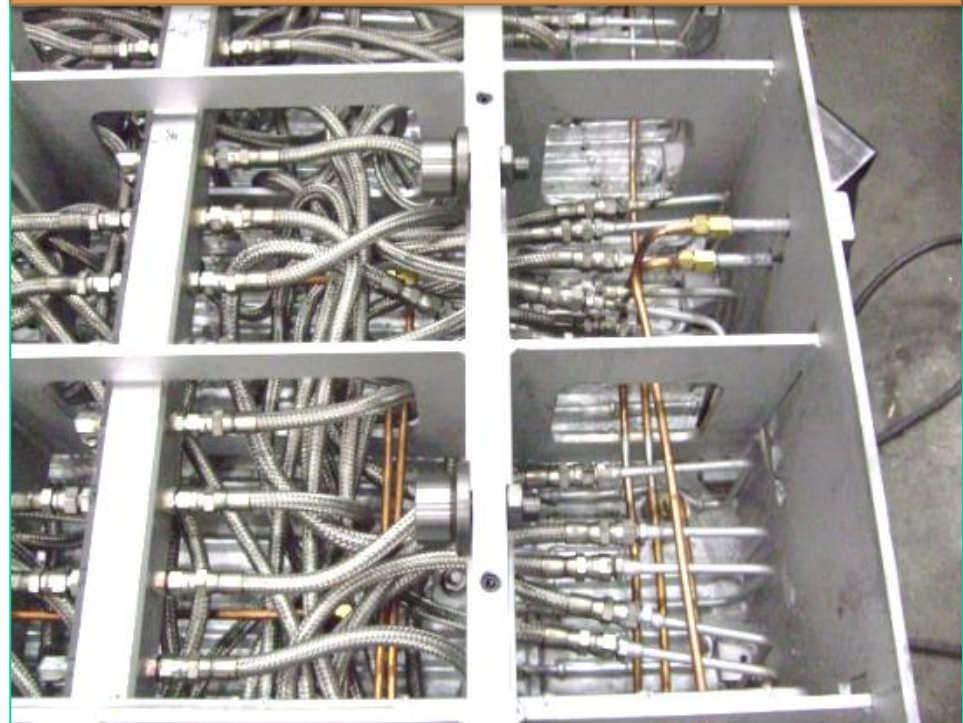


- 10mm NVD shell tools for Class A, CF Exterior panels
- Inside each self contained tool:
  - Heating / Cooling lines
  - Vacuum system
  - Thermocouples
  - Globe Press interface
  - Swing out inserts
  - (US Patent 8545662 B2)

- Multiple “Class A” *identical molds* from 1 precision mandrel

- Conformal tool temperatures
- Piping for heating / cooling

**Winner of 2013 SPE Auto Innovation Award**







# AUTOMOTIVE APPLICATIONS



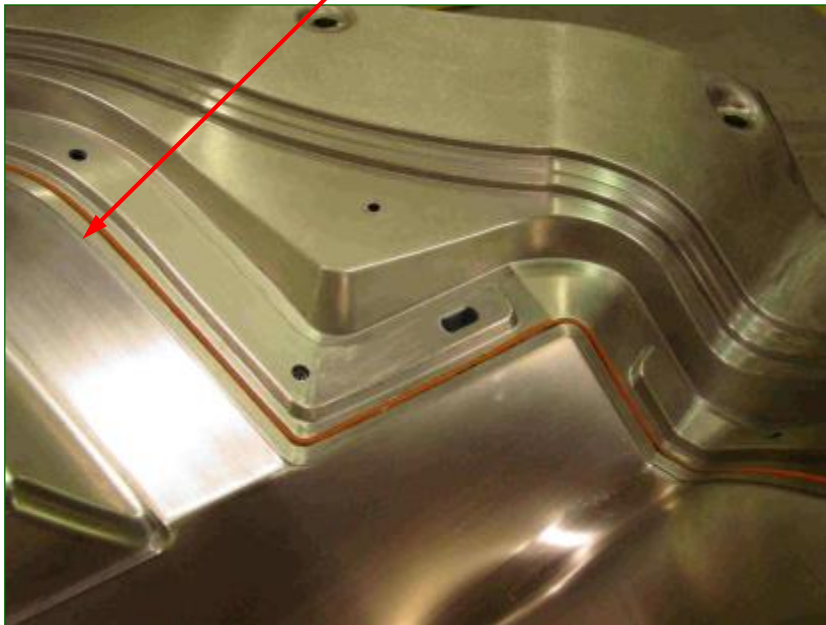


# AUTOMOTIVE PROCESS

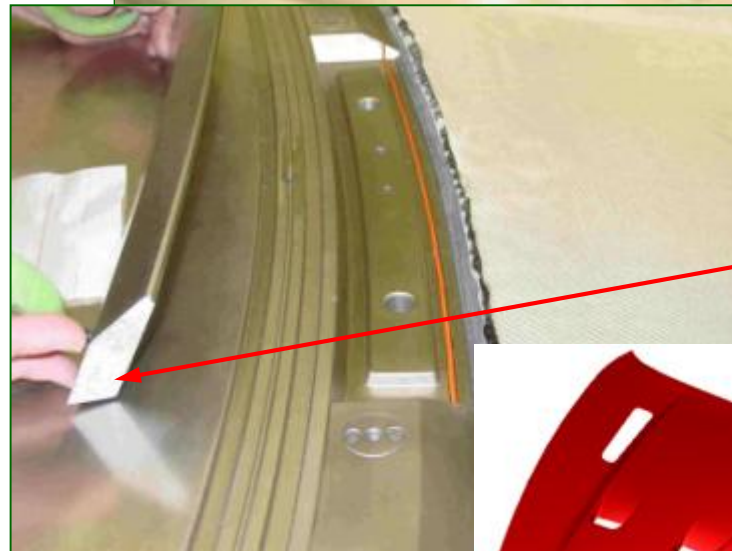
## OUT OF AUTOCLAVE - Class A, NET parts

- Weber incorporates perimeter steel inserts on the nickel shell to handle trapped geometry - such as undercuts, rounded edges, or openings in the carbon parts.

Edge of part



180° wrap around part edge



Example loose steel insert





# FIXTURES and MODELS



- 5000 Series Aluminum

- 'Soft' Master models





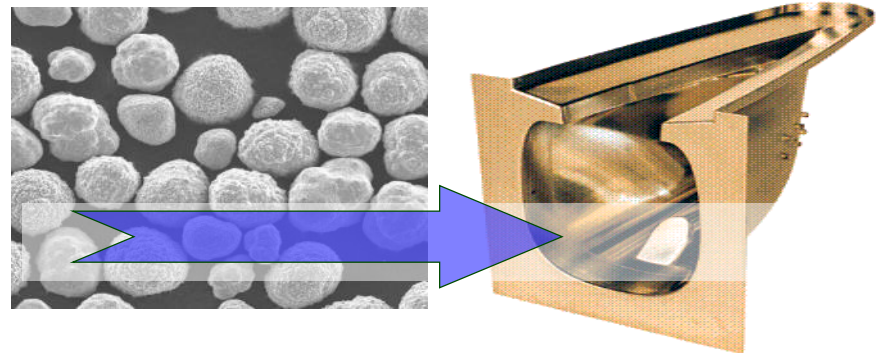
# NVD OPERATIONS



# NVD NICKEL PRODUCTION FACILITY



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

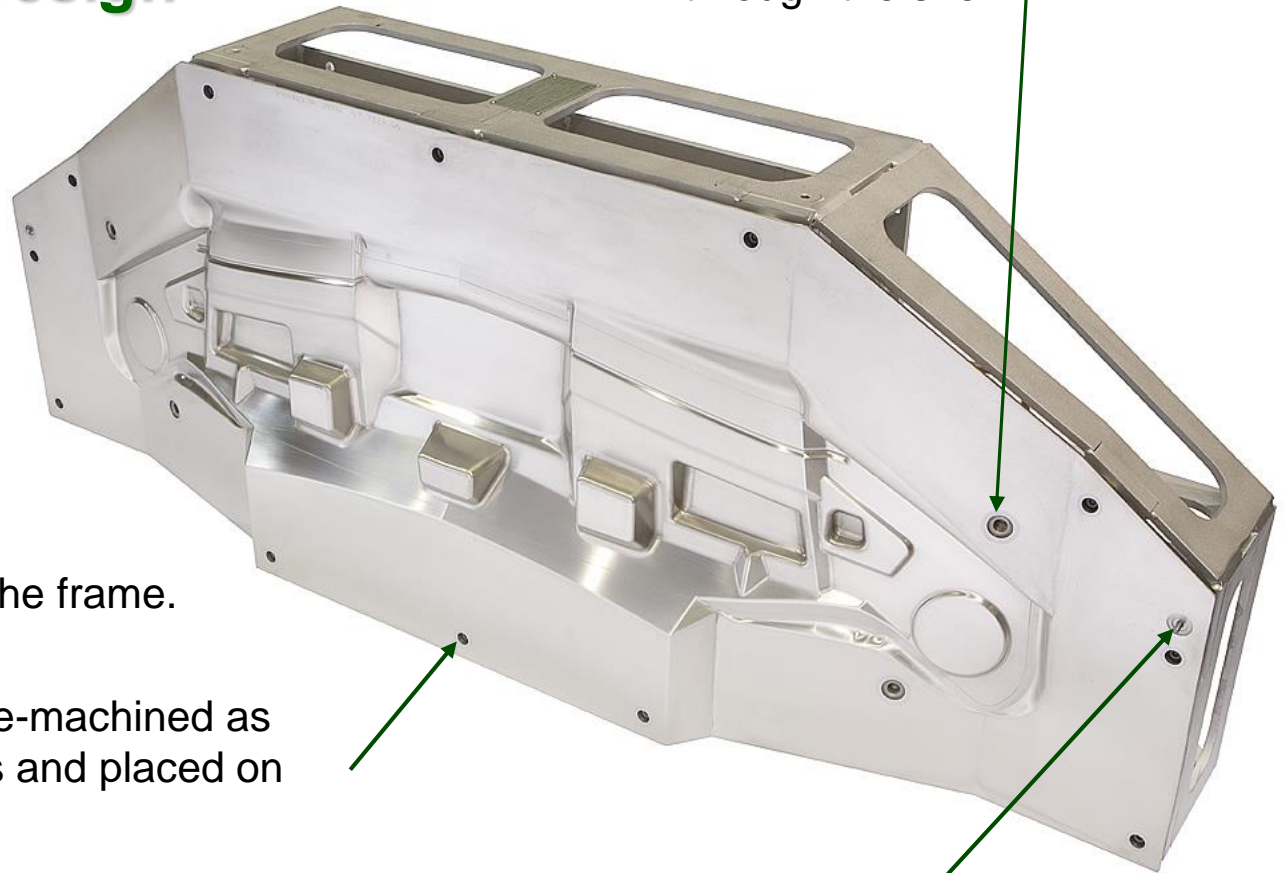


Chemically convert nickel to solid shapes

## Nickel Shell Design

- 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 vacuum through the shell



•Encapsulations for tooling holes

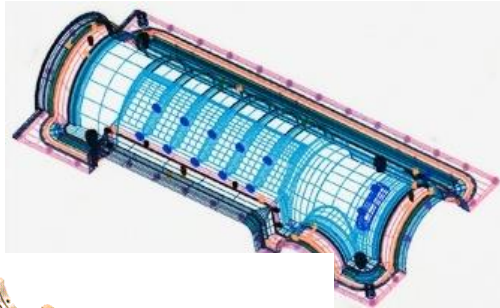
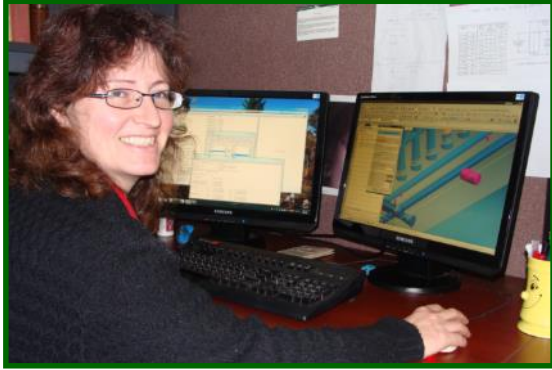
# CERTIFICATIONS

- Quality standard is ISO 9001:2015
- Canadian Controlled Goods Program (CCGP) for participation in US ITAR projects, Reg. No. 22921
- CWB W47.1, W59.1 Welding certificates
- D6-56202 – Boeing Tooling Supplier
- QPS 111 – Bell Helicopter Tooling Approved
- DD FORM 2345 – JCP Critical Tech Agreement

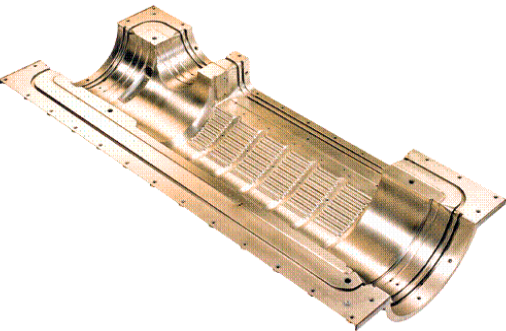




# TOOL DESIGN



- Extensive CAD/CAM capabilities
  - 10 workstations running:
    - UG-NX, IDEAS, Catia
- Innovative designers are working with customers to contribute to processes and provide tooling solutions.
- Our team manages all information and supports the machining, assembly and CMM teams.
- Strict revision control on all documents and designs.
- Part of the Weber focus of building relationships and responding to customer needs.
- CAD data transfer in:
  1. STEP, IGES and VDA (BI-DIRECTIONAL)
  2. IDEAS NX5 (NATIVE)
  3. CATIA V5-R26 (NATIVE)
  4. UNIGRAPHICS NX9 (NATIVE )
  5. SOLID-EDGE ST4 (NATIVE)





# FACILITIES

Weber has many Machining, Fabrication and Assembly bays to suit all shapes and sizes of tooling programs





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