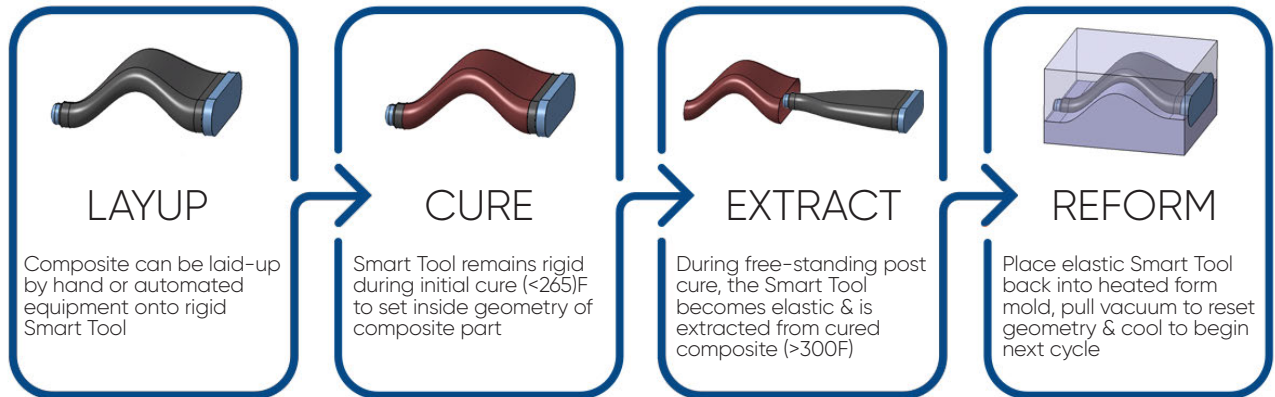


PRODUCT OVERVIEW:  
 SMART TOOLS THAT ACT AS  
**MANDRELS**



**THE PROCESS:**

Smart Tools that act as mandrels are manufactured to the inner mold line (IML) geometry of the composite part and are rigid at room temperature. After a release film is applied, composite material can be placed directly onto the Smart Tool.

Smart Tools that act as mandrels during cure are perfect for two-stage composite cures. During the initial composite cure at 121°C (250°F), the Smart Tool remains rigid and sets the inner mold line geometry of the composite part. Then, as the

temperature is being elevated to perform a post-cure of the composite part at 177°C (350°F), the Smart Tool becomes elastic and can easily be removed from the cured composite part, reformed and reused.

Smart Tools allow composite material to be laid up on the male Smart Tool and cured, eliminating the need to layup into angular female cavity cure molds that are prone to bridging and results in composite part porosity and resin rich areas.

**FEATURES & BENEFITS:**

- Reduced Labor Hours
- Improved Quality
- Higher Throughput
- Lower Consumable Cost
- Formable
- Reuseable
- Low Force Extraction
- Enables Unitization
- Clean Process

**COMPATIBLE WITH:**

- Hand Lay-up
- Filament Winding
- Automated Fiber Placement (AFP)
- Resin Transfer Molding (RTM)
- Vacuum Assisted RTM (VARTM)
- Injection Molding
- Autoclave Cure
- Oven Cure
- Heated/Cooled Molds
- Heated Press
- Automation

**SPECIFICATIONS:**

- Maximum Cure Temp: 375°F (190°C)
- Reforming Temp: 200°F (95°C) - 300°F (149°C)
- Maximum Rigid Temp: 265°F (129°C)
- Specific Heat: 110 J/Kg-K
- Density: 1.13 g/cc

## WHY SMART TOOLING?

Ensuring Success of Complex Composites

Smart Tooling offers more than just tooling. We offer total solutions that ensures successful manufacturing of your composite part. Those solutions include custom tooling engineering and design, fabrication of molds, fabrication of Smart Tools, manufacturing of the initial composite part(s), custom standard operating procedures, onsite start-up support and training, and more.

Fortune favors the bold; it's time to move on from traditional tooling methods and start manufacturing with Smart Tooling. Let's make a successful complex composite, together.



## EXAMPLES:

SMART TOOLS THAT ACT AS MANDRELS



VARTM composite duct next to Smart Tool mandrel that contracts inside mold line (IML) during cure.



Extracted Smart Tool mandrel next to the cured, trapped geometry RTM composite fuselage it made



Smart Tool mandrel used to mold a composite duct shown in forming mold

READY FOR THE BENEFITS OF SMART TOOLING?  
**LET'S MAKE A SUCCESSFUL COMPOSITE PART**



[www.smarttooling.com](http://www.smarttooling.com)



937.912.3250



[contact@smarttooling.com](mailto:contact@smarttooling.com)