AOC®
World Leader in Resin Technology

MoldTru™ LPT-68000 Tooling Resin

Smoother surface, less time, lower cost

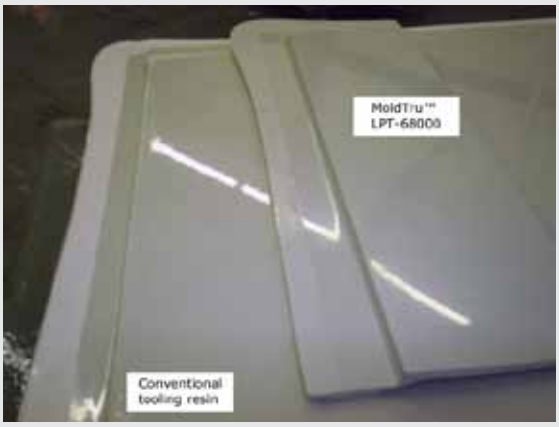
MoldTru™
TOOLING RESINS

MoldTru™ LPT-68000 Tooling Resin
For smoother, lower cost molds in less time

MoldTru™ LPT-68000 low-profile tooling resin sharpens the competitive edge of polymer composites by providing a smoother tooling surface and saving mold-makers money and time. The tooling resin is for Open Molding, Resin Transfer Molding and Resin Infusion operations that can benefit from improved quality and higher profits.

New Surface Quality Standard

Researchers drew upon AOC expertise in automotive Class A resins to engineer a special additive technology that gives MoldTru LPT-68000 resin a near-zero shrink feature. Ultralow shrinkage combines with excellent fiber and filler wetting to ensure that the mold surface is essentially a precise replica of the master model's surface. For some applications, a vacuum can be used to produce high glass content tooling with technical fabrics.



Surface comparison of flat panels made with MoldTru™ resin and conventional tooling resin

Surface comparison of covers made with MoldTru™ resin and conventional tooling resin

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Lower Tooling Costs
To prevent surface distortion from high exotherm, conventional tooling resin requires individual laminates of thicker molds to cure overnight before adding subsequent layers. In contrast, MoldTru LPT-68000 exotherm is low enough to allow up to five layers of tooling laminate to be built simultaneously without causing surface distortion. Therefore, labor costs are lowered and the integrity of the master model is not threatened when the strictly-conforming production tool is pulled.

Building A Five-Layer Laminate

With Conventional Tooling Resin

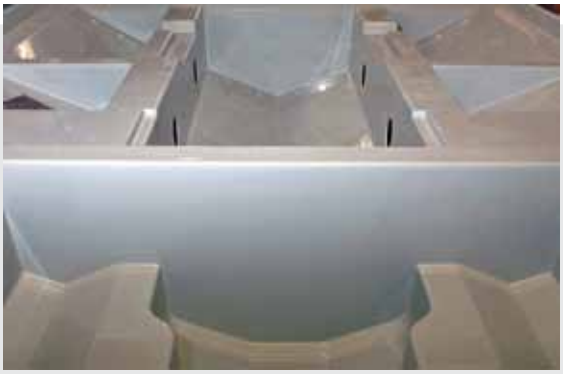
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday
Laminate Layer 1	Laminate Layer 2	Laminate Layer 3	Laminate Layer 4	Laminate Layer 5			Mold cured & ready to make parts

With Mold-Tru™ LPT-68000 Tooling Resin

Monday	Tuesday
Laminate Layers 1 Through 5	Mold cured & ready to make parts

Shorter Concept-to-Part Cycle
Producing thicker tooling in a single step also means the completed tool will be ready to create parts in up to 70% less time than a mold made with traditional tooling resin. For either prototyping or production, the shorter concept-to-part cycle is a strategic benefit to the bottom line.

Liquid and Physical Properties
MoldTru™ LPT-68000



Marine liner

Typical Liquid Resin Properties			
		Unit	**Spec**
Viscosity	LV#3 60rpm 25°C	cps	400-600
Thix Index	(Static)		2.0-3.5
Styrene	Volatiles	%	36-38
Density	Cup @25°C	lb/gal	9.7-9.8

Gel Time Properties			
Gel Time	1.25% MEKP-9	minutes	30.0-34.0
Gel to Peak		minutes	12.0-16.0
Peak Exotherm		°F/C°	330/165

Typical Mechanical Properties of Resin Casting			
Test	**Units**	**ASTM**	**Results**
Flexural Strength	Psi/Mpa	D-790	15,460/107
Flexural Modulus	Mpsi/Gpa	D-790	480/3.3
Tensile Strength	Psi/Mpa	D-638	8,720/60
Tensile Modulus	Mpsi/Gpa	D-638	430/3.0
Elongation	(%)	D-638	3
Heat Distortion	(ºC/ºF)	D-648	116/241
Barcol Hardness	(934-1)	D-2583	42
Izod Impact	(Ft-lbs/in)	D-4812	3.49

Heavy-duty truck hood/fender

Liquid and Physical Properties
MoldTru™ LPT-68000

Small tractor hood

Barcol Evolution on Laminates		
LPT-68000	**1.5% MEKP-9**	
100 Gram Mass	**Neat**	**40% ATH filler**
Gel Time	29.2	21.3
Peak Exotherm	337.1ºF	255.1ºF
Interval	8	11.8
2 ply Laminate		
Exotherm	92.8ºF	90.3ºF
HB @ 70 minutes	-	15
HB @ 100 minutes	5	30
HB @ 150 minutes	10	45
4 ply Laminate		
Exotherm	118.2ºF	110.6ºF
HB @ 80 minutes	-	20
HB @ 100 minutes	10	30
HB @ 150 minutes	16	30-35
6 ply Laminate		
Exotherm	156.9ºF	122.7ºF
HB @ 70 minutes	30	40
HB @ 100 minutes	40	46
HB @ 150 minutes	42	46

Note:
The high reactivity of this new generation polymer improves the Barcol Hardness on laminates with or without filler.

The low peak exotherm protects the laminate from potential distortions on finish surface.

Typical Mechanical Properties on 4 Layers 1.5 oz Chopped Strand Mat				
Test	**Units**	**ASTM**	**Neat**	**Filler**
Flexural Strength	Psi/Mpa	D-790	30,970/214	24,480/169
Flexural Modulus	Kpsi/Gpa	D-790	1,140/7.9	1,150/7.9
Tensile Strength	Psi/Mpa	D-638	20,340/140	14,930/103
Tensile Modulus	Kpsi/Gpa	D-638	1,300/9.0	1,260/8.7
Elongation	(%)	D-638	2.1	1.9
Izod Impact	(%)	D-4812/D-256	13.05/8.78	7.69/4.74
Non-Combustible	(%Glass)	D-2584	36.82	25.31

Air deflector

Guidelines for Building Open/Closed Mold Tools

Consult with the AOC Technical Support Team for recommendations on which tool building materials best meet the performance requirements for your application.

A full release agent system needs to be applied to the master model to prepare the surface for lamination. Once the release system is applied to the master, AOC suggests the use of a high temperature barrier to protect the surface of the mold. The barrier is the combined construction of a gel coat layer and barrier / skin coat layer. The ideal thickness of the temperature barrier (gel coat plus skin / barrier coat) is 0.079 inch (2 mm).

A. GEL COAT

- Apply a high quality Vinyl Ester tooling gel coat with an HDT (heat distortion temperature) of at least 250°F/120°C.
- Apply in two separate coats of approximately 18 mils (0.46 millimeter) wet. The first layer should be allowed to cure such that it will not "alligator" when the second coat is applied.
- The gel coat film should be cured well enough so that it does not transfer when touched.
- Before applying the second coat, inspect for porosity. If porosity is present after the film has gelled, the film must be removed and the surface resprayed.
- Apply the second coat and allow it to cure before applying the skin/barrier coat. Typical cure time is 2 to 3 hours, depending on conditions.

B. SKIN COAT / BARRIER COAT

- Once the gel coat is fully cured, continue with the barrier system. AOC suggests a Vinyl Ester skin coat, such as AOC's Hydropel® H100.
- Consult with your AOC resin vendor for recommendations regarding the optimum curing system (i.e. promotion system, catalyst type and amount).
- A surface veil needs to be used in the first layer (30 grams / square meter). It is vital to use a surface veil that molds easily, which is especially important for tight radius areas. Surface veils made from Continuous Strand Mat (CSM) are not recommended.
- Once the first layer cures, carefully inspect for blisters and other imperfections. Pay particular attention to areas containing small curves and tight radii, where AOC recommends the use of a lamp during inspection.
- Remove defective areas with dry, medium-grit sand paper and repair with resin or putty.
- After inspection and repair, if needed, continue by applying one layer of 1.5 ounce (450 grams per square meter) Chopped Strand Mat. Use the same Vinyl Ester resin that was used with the surface veil.
- Before continuing to the bulk laminate construction phase, check laminate cure. The skin coat laminate should have a minimum Barcol of 25HB.

Small part tool

Drawings on a tool that is ready for bulk lamination

Application of the first bulk layer

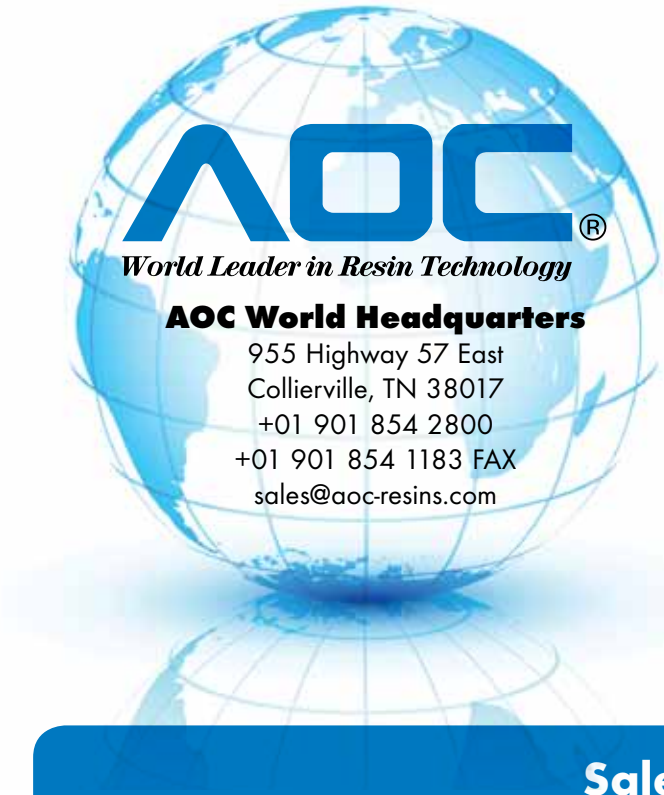
Measuring the first layer thickness

Rolling out a tight radius

C. BULK LAMINATE CONSTRUCTION

- If the resin is to be filled, AOC recommends only aluminum trihydrate (ATH, 10-19 microns) as it provides additional thixotropy properties to the mix and imparts the best profile characteristics. Other fillers, such as calcium carbonate, will not provide good profile characteristics and often increases viscosity too much.
- If ATH is to be used, AOC recommends 40 parts for every 100 parts resin.
- **Step One:** Apply a very thin, non-reinforced layer of resin to "wet" the part.
- **Step Two:** Immediately begin lamination using 1.5 ounce chopped strand mat (or chopped roving equivalent).
- **Step Three:** Immediately roll-out part to remove excess air.
- **Step Four:** Repeat steps two and three until desired thickness is obtained. Up to five layers can be applied sequentially without stopping.
- After lamination is complete, wait for cure. During the cure cycle, the laminate should change color from a light brown at the beginning to white at the end.
- Add cores such as balsa or foam as necessary. Laminate these materials using the same preparation methods described in steps 1-4.

Contact AOC Technical Service about how to best use MoldTru LPT-68000.



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AOC in Composite Tooling

AOC extends its leadership in composites materials with tooling resin technology that creates molds for Class A parts in less time and at lower cost. AOC tooling resin development is guided by the philosophy that the aesthetics and performance of a composite part can be no better than the mold that shapes it. AOC knows technology, lives quality and delivers service better than any other supplier. To discover more about AOC's tooling expertise, e-mail sales@aoc-resins.com or go to www.aoc-resins.com.

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