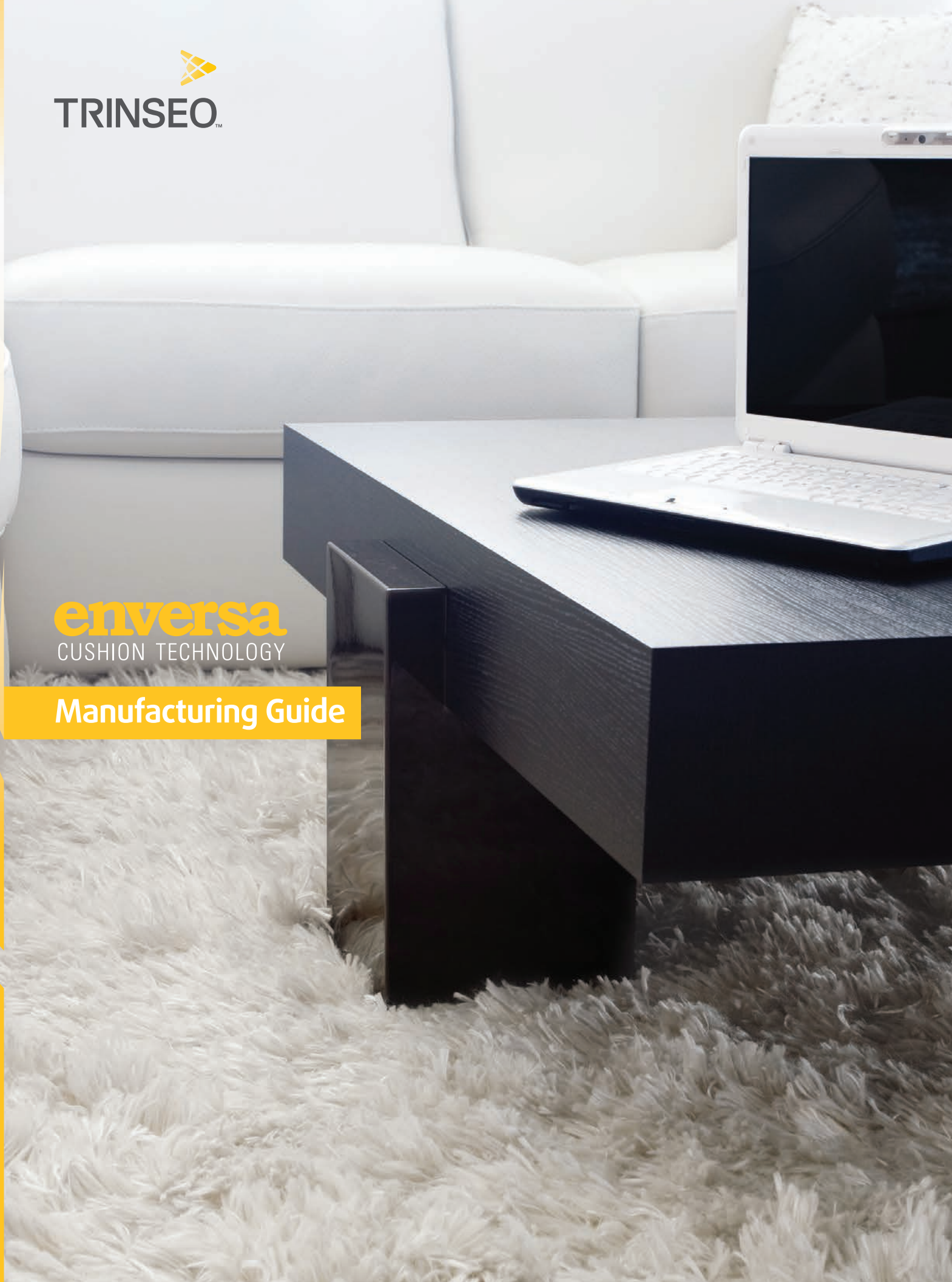
TRINSEO™



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CUSHION TECHNOLOGY

Manufacturing Guide

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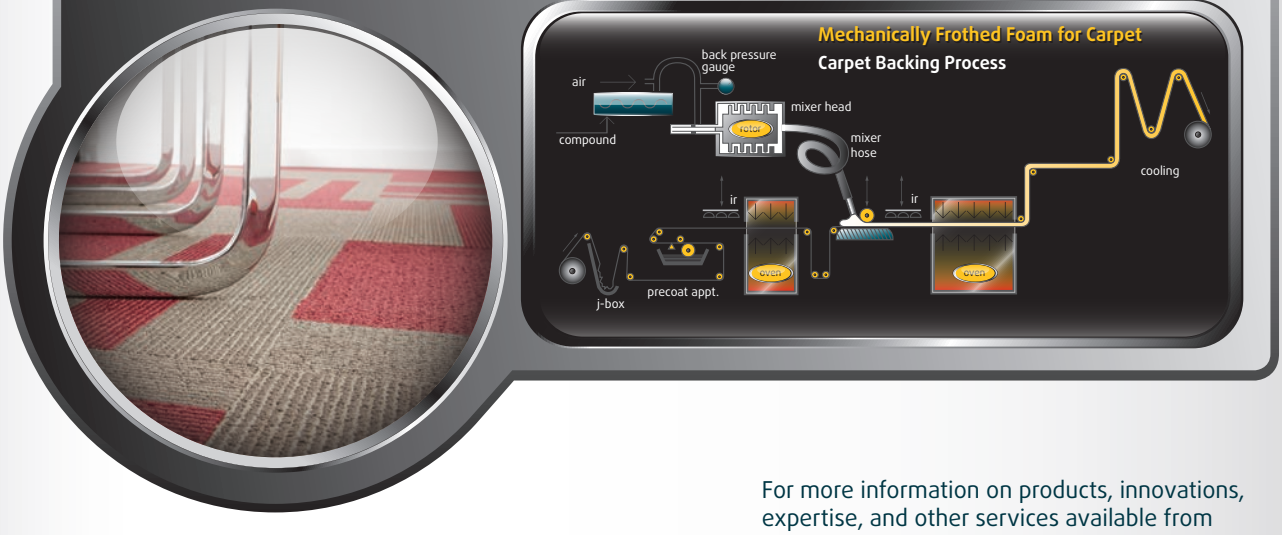
INPUTS	TARGET	COMMENTS
Brookfield viscosity	4500 - 5500 cps (number 5 spindle at 20 rpm)	Higher cup weights require higher viscosity.
Wet foam density (cup weight)	Target 230 - 475 g/quart (250 - 500 g/l)	Depends on target dry foam density.
Parts filler (overall percent solids)	110 to 160 phr	Higher will lose tensile strength. Lower will lose compound solids and will take longer to cure.
Foam surface temperature after IR	Target 125 - 140 °F (50 - 60 °C)	Too low will not seal surface and allow cracking in ovens by air movement. Too high will seal surface too much and immediately crack surface.
Foam surface temperature after ovens (before cooling)	Minimum 212 °F (100 °C)	Must reach boiling point of water to ensure water will evaporate.
Temperature of IR	70% of maximum IR capacity	Too hot will crack surface. Too cold will not seal surface enough and allow cracking in oven.
Temperature of ovens	Target 300 - 350 °F (148 - 177 °C)	Temperature should be only high enough to cure latex.
Length of IR	Minimum 3 ft (1 m)	Less than 30 seconds will not seal surface; over 2 minutes will crack surface.
Length of ovens	As long as possible, target 8 - 12 minutes minimum in ovens	If long enough, ramp temperatures up to reach set point ~ 30% of the way in, and hold at set point.
Speed of line	Adjusted to achieve latex residence time in the oven minimum 8 - 12 min at 300 - 350 °F (148 - 177 °C)	Start slow and increase speed; use bend split test to determine state of cure - if cracking, slow down line.
Length before IR	Short as possible	Start cure as soon as possible.
Doctor roller speed	Target "0"	Best when not turning at all.
Enough frothing aid	To achieve required foam density	Latex froth aid may be consumed in time; froth aid can be refreshed.
Particle size and particle size distribution of filler	Less than 20 micron	Very small particle size will give tougher foam but increases compound viscosity. Wider particle size distribution may improve frothability and physicals.
Back pressure on frothing machine	50 - 70 psi (3.4 - 4.8 bar)	Too low - not enough pressure to froth well. Too high will cause processing problems.
RPM of frothing machine	Minimum 300 rpm	The faster the better to create smaller bubbles.
Single or dual head frothing machine	Dual preferred	More flexibility, more capacity.

OUTPUTS	TARGET	CAUSES AND/OR FIXES
Surface cracks	No cracks	1. Too much heat in IR. 2. Too high temperature in first zone of oven. 3. Viscosity too low. 4. Lower percent solids.
Surface bubbles	Zero bubbles	1. Moving roller. 2. Too low density (adjust frothing speed). 3. Too low back pressure.
Depressions/collapsing	Zero depressions	1. Increase density (adjust frothing machine).
Waves/lines	Zero waves	Clean roller.
Foam cell quality	Uniform, small, no lines	1. Increase froth machine RPM. 2. Slow down line. 3. Increase back pressure.
Thickness (vs. target) growth	No change	1. Check foam density is correct. 2. Change doctor roll height. 3. Oven temperature too hot.
Thickness (vs. target) shrinkage	No change	1. Increase cup weight (decrease air) to increase stability of froth. 2. Change height of doctor roll.
Curing	Dry foam	1. Slow down line. 2. Increase oven temp. 3. Decrease IR.
Surface color	Not yellowed	1. Speed up line. 2. Decrease IR temps. 3. Decrease oven temperature.
Foam strength	High	1. Ensure foam is cured. 2. Increase foam density. 3. Decrease filler load.
Indention load deflection	5 psi minimum	1. Increase foam density. 2. Increase filler load. 3. Use smaller particle size filler.
Resiliency	Over 15%	1. Reduce foam density. 2. Reduce filler load. 3. Go to larger particle size filler.
Compression set	Below 10%	Increase foam density.
Compression load deflection	2-5 psi	1. Increase foam density. 2. Increase filler load. 3. Use smaller particle size filler.
Flex cracking	No cracks	1. Ensure foam is cured. 2. Increase foam density. 3. Reduce filler load.

STEP-BY-STEP GUIDE TO RUNNING ENVERSA TRIALS

1. Gather as much information about the line before the trial - IR capability, oven capability.
2. Define the filler type, load.
3. Define target foam density and thickness - calculate desired cup weight. See calculation 1.
4. Add filler to target.
5. Measure the compound viscosity, decide on speed of frothing machine - if same as normal, leave. If your solids are lower than normal, slow machine down the same percent (or a little more). Maintain back pressure between 50 - 70.
6. Alter the viscosity with thickener or water to meet the target range of 4500 - 5500 - target can also be changed due to what the customer is used to running.
7. Send product to frothing machine, set a target cup weight.
8. Measure cup weight. If automatic, simply tell frothing machine to go up or down. If manual, adjust air.
9. Measure thickness of roll. Ensure correct, then begin applying latex to line.
10. Remeasure cup weight right out of hose going down to the puddle to verify it has not changed.
11. If IR does not start immediately, start with a very low thickness until IR comes up to temp.
12. Measure surface of foam right after IR, to ensure temp is 125 °F (51.667 °C).
13. Measure the actual foam thickness, adjust doctor roll/blade as needed. Check both sides.
14. Measure the surface of the foam after coming out of oven, but any cool air, needs to be over 212 °F (100 °C) to drive out water.
15. Check physical properties, thickness. Check if dry (cured), push down and verify it comes back. Bend, check for cracks. Observe for defects, refer to INPUTS and OUTPUTS.



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