



Customer Information Bulletin

CIB

CIB #: 0210A
Date: 12 April 2011
Status: Non-confidential

Subject: Tips & Information for part building with Accura[®] PEAK[™] material

1. **Software version:** Some software enhancements have been made that facilitate the use of this material. For the most optimum results, please make sure that the most current software version is loaded for both part preparation and system type. For Viper[™]Pro and iPro[™] systems, 3DPrint[™] 1.1 Patch 4 MUST be loaded.
2. **Specific values:** The values for Dp and Ec are shown below. In addition, different machine specific shrink/scale factors and LineWidth compensation values must be used. The baseline or starting values to be used with Accura PEAK material are given below:

	ViperPro/iPro 9000 System	SLA [®] 7000 System	Viper [™] System
Vat Temperature	30°C	30°C	30°C
Dp (mils)	5.6	5.6	5.6
Ec (mJ/cm2)	11.5	11.5	11.5
Baseline Scale Factors (x, y, z)	1.0035, 1.0032, 1.0000	1.0019, 1.0029, 1.0000	1.0020, 1.0018, 1.0000
Baseline Linewidth Compensation Value	0.075mm (0.003")	0.075mm (0.003")	0.1125 mm (.0045")

3. **Vat Temperature:** This material requires a higher temperature than other 3D Systems resins. The vat temperature must be set to 30°C.
4. **Supports:** Supports are built in a special way for this material, with solid supports followed by FinePoint supports. Please see item 5(e) for detailed information and CAUTIONS.
5. **Bubbles:** It is important to avoid creation of bubbles during normal operations, as bubbles are persistent in this resin (bubbles don't go away without intervention). Filling the vat, removing parts, and stirring the vat can all create bubbles, and care must be exercised to minimize bubble formation and remove bubbles if they are formed.
 - a. **Vat Filling (all systems):** Reduce bubble formation during vat filling as much as possible. Techniques to minimize bubbles include pouring resin through a large funnel, or pouring onto a sheet of plastic long enough to insure that resin is not splashed into the vat. Do not pour resin directly onto the free resin surface from a long distance.
 - b. **Bubble removal after vat filling** is important:
 - Blot the resin surface with a paper towel to break large bubbles.



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- Use the vacuum in the Zephyr[™] blade to draw the bubbles up off the resin surface. For ViperPro and iPro systems, use the bubble sweeping utility. For other large-frame systems, submerge the build platform in the resin. Lower the vat to the point just before breaking the meniscus made between the resin and the blade (~0.06" or 1.5 mm down from the position where the resin is leveled to 0.004"). Then sweep the resin surface slowly with the recoater at 1 ips.
- c. **Perform a leveling system bubble check:**
 - For all systems, make sure that the resin surface in the area which will be enclosed by the baffle of the diode-leveling assembly is free of any bubbles. If there are bubbles inside this baffle, the leveling system cannot operate properly.
 - For ViperPro/iPro systems, before calibrating the recoater, the resin surface at the Omron sensor must be checked to make sure that it is bubble free.
- d. **Starting part building and new platform installation:** Bubbles will be created when a new platform is installed for a part build. Platforms should be lowered to just above the resin surface at normal speed. However, to avoid creating bubbles, the platform should be stopped before touching the resin surface then slowly submerged into resin in 0.050 inch increments. The slow speed should be equal to or less than 0.1 inches/second.
- e. **Support building:** Care must be taken that supports are built correctly and with care relative to bubble creation. Please observe the following points:
 - Sweeping FinePoint supports: The support generation design creates 0.200" of solid supports, prior to the start of FinePoint supports. To improve build success rate with this material, it is necessary to sweep during FinePoint support building. The BUBL support recoating style is designed with sweeping, to eliminate bubbles that may be created during support building. To perform sweeping of FinePoint supports (BUBL style), **care must be taken to avoid a collision between the blade and the platform on all systems except ViperPro/iPro.** Sweeping should start at beginning of the FinePoint section, 0.200" into the build and be sure that at this point, platform is completely submerged in resin. Also, for iPro/ViperPro systems, 3DPrint 1.1 patch 4 or above is required to execute BUBL recoat style.
 - Bubble accumulation during support building: Users should take care that excessive bubbles are not accumulated during the support building process. Efforts should be made to remove any bubbles that are created during support building and not eliminated by recoating.



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- f. **Bubbles created during part build sweeping:** During sweeping, bubbles will be drawn into the Zephyr blade. However, the Accura PEAK bubbles will not break for a long period of time. Therefore, it is particularly important for this resin, that enough air space is available in the blade. The resin level in the blade should not go beyond the specified upper limit. See Zephyr vacuum setup below.
 - g. **Bubbles can be geometry and orientation-specific:** Bubbles may see in some thin wall parts that are built at roughly a 45 degree angle. To minimize these bubbles, orient the thin walls *parallel* to the recoater blade..
 - h. **Bubbles created during part building:** Accura PEAK can create two types of bubbles during part building. The default single-sweep recoating style avoids bubbles on the outer surfaces of the part. However, “microbubbles” can form in the parts. Tests indicate that these microbubbles do not affect mechanical properties of the parts, but may not be aesthetically acceptable in some cases. If you find that microbubbles embedded in parts are an issue, you can implement the part BUBL recoat style. This is a 3 sweep style, generally described as (1) first sweep normal default (detaches bubbles from green part), (2) second sweep slow (detach and sweep away bubbles from the build area without allowing them to flow under the recoater), (3) third sweep normal default (finishes the job). **For an iPro/ViperPro system, this requires 3DPrint 1.1 patch 4 or greater to execute BUBL recoat style.** Note that this 3-sweep style does significantly slow build time, and should only be used when necessary.
6. **Zephyr Vacuum setup:** The specific gravity of PEAK is significantly different from other resins, including Bluestone. Therefore, the vacuum setup is unique.
- a. Primary Vacuum = 3.5 +/-1 inches of water.
 - b. Secondary Vacuum = 1.3 inches of water (initial setting).
 - c. Adjust the Secondary Vacuum such that after resin in the vat is level, the distance d from the resin level in Zephyr blade to the resin surface in the vat is less than 0.825” AND greater than 0.600” (**0.600” ≤ d ≤ 0.825”**).
7. **Build speed increase:** This material has high build speed using default parameters. Hatch overcure has been optimized for both accuracy and mechanical properties. It is highly recommended that the hatch overcure values not be reduced from default, however, you can decrease hatch overcure to increase build speed. In general, the increased throughput comes at the cost of accuracy and mechanical properties of both green and post cured parts. For maximum build speed, hatch overcure can be reduced by 0.003 inch (0.075mm), yielding approximately a 10% build speed increase (geometry dependent).



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8. **Upfacing surface anomalies:** Some dimples or de-wetting spots have occasionally been seen on up-facing surfaces. Though rare, we have no specific techniques to eliminate these when and if they occur.
9. **Near flat surfaces (Viper only):** When building near flat surfaces on a Viper system, the scanned border vectors may not firmly attach to the layer below, resulting in border delamination. A special style is provided specifically for these near flat geometries: Part_Accura~PEAK_EXCT_0040in_NFLT.sty. This style forces the border vectors to remain in position, by scanning borders at least two times in a row, and drawing them after hatching. This style will slow down builds, so should only be used when necessary.
10. **Large, deep trapped volumes:** If you encounter a large, deep trapped volume that cannot be reoriented during part preparation to avoid the trapped volume, consider making two changes: eliminate deep dip, and slow down the recoat speed to 0.5 inch/second.
11. **Debris:** As with any SL resin, it is recommended that users promptly remove all crashed builds from the vat. Debris in the vat can impact vat life and since debris floats for a long period, floating material can interfere with other builds and with proper recoating. In addition, with Accura PEAK, the debris will take a long period of time to sink below the surface. The best way to remove this debris is filtering the resin using a strainer. Take care to avoid bubble creation when straining out debris.
12. **Stabilization:** Like the other resin types, PEAK needs to be stabilized, please abide by 3D Systems Resin Stabilization in the Field guidelines to maintain the best performance and prolong the resin life. Accura PEAK should be stabilized when viscosity has increased 30% over new resin viscosity.
13. **Part Cleaning:** When cleaning Accura PEAK parts with TPM, a soft-clay like residual may still remain. This residue can be easily removed by rinsing with IPA. If you prefer, parts may also be cleaned in IPA only, prior to UV postcure.
14. **Occasional use vat:** If PEAK is used only occasionally, and a vat is left idle for some time (days or weeks), it is important that the vat be well stirred and fully up to temperature before building parts. If not fully stirred and up to temperature, parts can be weak, have poor surface quality, and be less accurate. Platform stirring is generally acceptable, stirring at least ½ hour for a small frame system and at least 90 minutes for a large frame system. If the material doesn't return to normal performance with platform stirring, use a squirrel-cage mixer attached to a drill motor for the same length of time, making sure to place the mixer in the bottom corners as well as the center of the vat.



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15. **Thermal Post curing:** Parts built in PEAK material may be thermally post cured to achieve enhanced thermal resistance. This is particularly beneficial for higher temperature applications. In order to thermally post cure a PEAK material part, the part should be treated as follows:
- Clean and UV post cure as normal.
 - Place the part in a programmable thermal oven.
 - Slowly raise the oven temperature to 120° C (252° F) over a period of approximately 2 hours.
 - Hold the temperature for at least 2 hours, depending on the thickness of the part. Thin parts, those around 3mm (~0.125"), require only 2 hours at elevated temperature. Thicker parts will require more. Your goal is to have the entire part mass reach equilibrium.
 - Shut off the oven, and slowly return the temperature to room temperature, over approximately 4-8 hours. It is important not to cool parts rapidly as thermal shocking may occur and result in cracks in the part.

