Customer Information Bulletin

3D SYSTEMS

3D Professional Printer

CIB00153

Date: 10/30/2019

Subject: Tips and info for building with DuraForm® TPU Elastomer on sPro™ 60 SLS® systems

DuraForm TPU Elastomer is a thermoplastic elastomer which can be used to produce durable, rubber-like functional and end-use parts. Parts like gaskets, seals, and other rubber-like parts, as well as athletic shoes and equipment are ideal candidates for this material. It offers similar benefits as DuraForm Flex, but operates at a much lower temperature.

1. **sPro™ 60**: In order to spread feed powder successfully, DuraForm TPU Elastomer requires a deeply textured counter rotating roller surface than the standard roller surface. This will promote proper tumbling of the powder required for uniform powder layout in the print area. Contact your field service representative to find out if your machine has the correct textured roller. Optionally, the roller rubber scraper can be installed to the roller mount to help prevent the powder from sticking to the surface of the roller.

2. **Software version**: Sinter version 4.016 or higher and Build Setup version 4.4 or higher are the recommended software versions.

3. **Build Setup software**: SLS Build Packet Files are created in the Build Setup software. A Build Packet File (BPF) contains special instructions that are system and material specific.

4. **Material Configuration files**: The values in the material configs will be a good starting point for your initial builds with this material. DuraForm TPU has two available material configuration files, the SC version has a standard cooldown while the XC has an extended cooldown. The extended coolldown is intended to keep the part cake warm for an extended time to allow for easier sifting of reclaimed part cake powder. See Breakout (page 3)

   Note: The material configuration file contains the recommended parameters. Customers running DuraForm TPU Elastomer may need to optimize certain parameters for their systems.

5. **Process Parameters & Properties**: The following table lists the default parameter values of DuraForm TPU Elastomer as recommended by 3D Systems.

Parameter	sPro 60	DuraForm TPU Elastomer
Part Bed Heater Setpoint		98°C
Feed Bed Heater Setpont		55°C
Powder Layer Thickness		0.125mm
Fill Laser Power		55W
Outline Laser Power		20W
Scan Spacing		0.20mm
Fill Scan Count		1
Outline Scan Count		1
SinterScan™		1

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6. **Roller speed and layer thickness**: Roller traverse speed of 203.2 mm/sec and powder layer thickness of 0.125 mm of are recommended for DuraForm TPU Elastomer. A deeply textured roller surface finish is suggested to promote powder tumbling instead of pushing.

7. **Smart Feed**: Smart Feed is enabled by default. Due to the material characteristics, the default Smart Feed Gain Ratio is set to greater than 1 to ensure adequate powder to cover powder bed.

   Note: DuraForm TPU powder should be freshly sifted (to break up any agglomerates) before loading into Feed Pistons and should not be tightly compressed into the Feed Pistons. Due to the amount of available feed powder and the material flow characteristics, build height is limited to 250mm to 270mm

8. **Feed Bed Heater Setpoints**: DuraFormTPU expands and agglomerates under extended thermal conditions in the sPro60; this can lead to clumping as the roller moves powder from the feed bed. Decreasing the feed bed heater setpoints can reduce this clumping. This may also allow for better powder usage as the cooler material is less agglomerated and allows the powder to flow better.

9. **Laser Power vs Shore Hardness:** The stiffness and surface hardness of laser sintered DuraForm TPUElastomer parts can be varied using the Fill Laser Power parameter. The below table provides the Shore AHardness of DuraForm TPU Elastomer as a function of Fill Laser Power.

Fill Laser Power	Shore A Hardness
35W	44
45W	47
55W	54
65W	56

10. **Routine maintenance:** Avoid leveling powder while purging the system. Exercise care when removing powder residue from sensitive surfaces. Powder buildup should be vacuumed and oily residue should be wiped with a scratch-resistant cloth. Clean laser window with mild liquid detergent under running warm water, then clean with ethanol and a dust-free lens wiping tissue. Refer to the sPro 60 user guide and DuraForm TPU Elastomer material guide for more details.

11. **Material handling**: Follow proper PPE when handling DuraForm TPU Elastomer. This includes safety glasses, protective gloves, and a dust mask. Please refer to the sPro 60 user guide and the DuraForm TPU Elastomer material guide for more details.

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12. **Breakout**: Do not remove the print cake from the process chamber until the part bed temperature is approximately 85°C. Allow parts to continue cooling to 50°C before trying to break them out of the print cake.

    For easier breakout and cleaning of DuraForm TPU Elastomer parts, it is recommended to break into the part cake and clean the parts when the top surface temperature of the part cake is at about 50°C. The parameters in the cool down stage can be adjusted to maintain the print cake surface temperature at 50°C for an extended period of time, until the print is terminated manually and the print chamber door is opened. The XC (extended cooldown) material configuration file should be used for purpose. Please contact your 3D Systems representative for further help, if needed with maintaining the print cake surface temperature at 50°C. After a print, loose material can be sifted and reused in another print. Consistent recycling procedures are important in order to maintain consistent material properties. If recycling procedures are not followed, problems such as variable shrinkages and surface imperfections like “orange peel” may appear.

    Remove loose powder surrounding the parts with a brush. Use a combination of part breakout tools and a bead blaster to fully remove the powder adhering to the parts. Sift the loose powder using the sifter. Discard any hard, chunky powder and the powder directly surrounding the parts.

    DuraForm TPU Elastomer material is a very fine blend of small particles. As you run prints, the material is exposed to heat and energy, and as a result the particles in the used powder tend to stick together forming larger particles. You can combat this trend with sifting and blending. Sifting removes undesirable particles from the used powder and blending adds new particles of appropriate size. Blending also helps combat the changes in material melt viscosity of the used powder by creating a final blend with uniform material melt viscosity that shows less variance from blend to blend.

13. **Recycling and Sifting**: Save only the soft powder from the part cake. Discard any hard, chunky powder and the powder surrounding the parts. Both DuraForm TPU Elastomer part cake powder and overflow powder need to be sieved through a 70 Tensile Bolt Cloth screen. Note: For easier sifting of DuraForm TPU Elastomer part cake powder, it is recommended to sift the part cake powder as soon as the parts have been cleaned and while the part cake powder is still warm. To facilitate this, the parameters in the cool down stage can be adjusted to maintain the print cake surface temperature at 50°C for an extended period of time, until the print is terminated manually and the print chamber door is opened.

14. **Blending**: The recommended blend ratio for DuraForm TPU Elastomer for the sPro 60 is:

	DuraForm TPU
Fresh (virgin) Powder	33.3%
Overflow Powder	33.3%
Good Part Cake Powder	33.3%

This blend should produce good results for at least 4-5 recycle runs (10% or less change in properties).
Note: Best possible part quality and properties will be achieved using 100% fresh powder only.

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