DYZE DESIGN

Material Testing Report

Pulsar™ Pellet Extruder

Revisions

Date	Description
2025-11-11	Initial report

Scope of the tests

1. Set and Prime
2. Calibration
3. Simple Square Prints
4. Purge and Clean

0. Test Conditions

Material :	BioStruct CH60
Extrusion System :	Pulsar Prod 220V
Nozzle Size :	Ø3mm
Extrusion Screw :	Minimal Compression (1.5)
Printer :	3DP W300
Setpoint °C :	MAX 190/190/190

Important points

- Do not exceed 190°C
- Avoid prolonged exposure to ambient air
- Keep in sealed container once bag is opened

Pictures and videos folder are linked in the email

1. Set And Prime

Initial condition of the extruder : Leftover PETG from previous work. Setpoint @ 230°C incompatible with BioStruct CH60

1. PLA is used to flush out the PETG and prepare for BioStruct CH60.
2. Once PETG is flushed, set 185°C temperature on all 3 zones
3. Without adding the CH60 Powder, empty the PLA.
4. Scoop 100 gr approx of CH60 to flush the remaining PLA
5. Notice a transition between PLA and CH60 as White PLA is mixed with beige / brown CH60
6. While waiting for complete transition between the 2 materials. Extrusion Screw jams and completely stops turning in one direction and the other.
7. Increased temperature to 190°C on all zone.
8. Resume extrusion command. No success. Screw is fully blocked
9. A single cylinder of 6 mm long was extruded before the failure
10. Set and Prime is unsuccessful. Full cleanup is necessary.

CH60 Ø3mm x 6 mm cylinder. Compacted powder

Observations :

1. Material has a color shift from white to beige / brown. Heated wood smells from the material. Material is starting to deteriorate. No further increase in temperature can be done.

2. Failure to resume extrusion even after removing the restriction caused by the nozzle and anti-oozing. Heat Shield, Nozzle and anti-oozing are removed. Extremely slow extrusion command is given to maximise torque output. Motor skips clearly visible and audible on video.

3. Hotzone is detached from the feeding section to inspect for bridges. Exposed screw is visible in video, indicating that there's no bridges or jams in the feeding section.

4. Full disassembly is required to extract the Extrusion Screw from the Barrel filled with compacted BioStruct.

5. Anti-Oozing mechanism needs replacement. Parts are stuck inside compressed powder

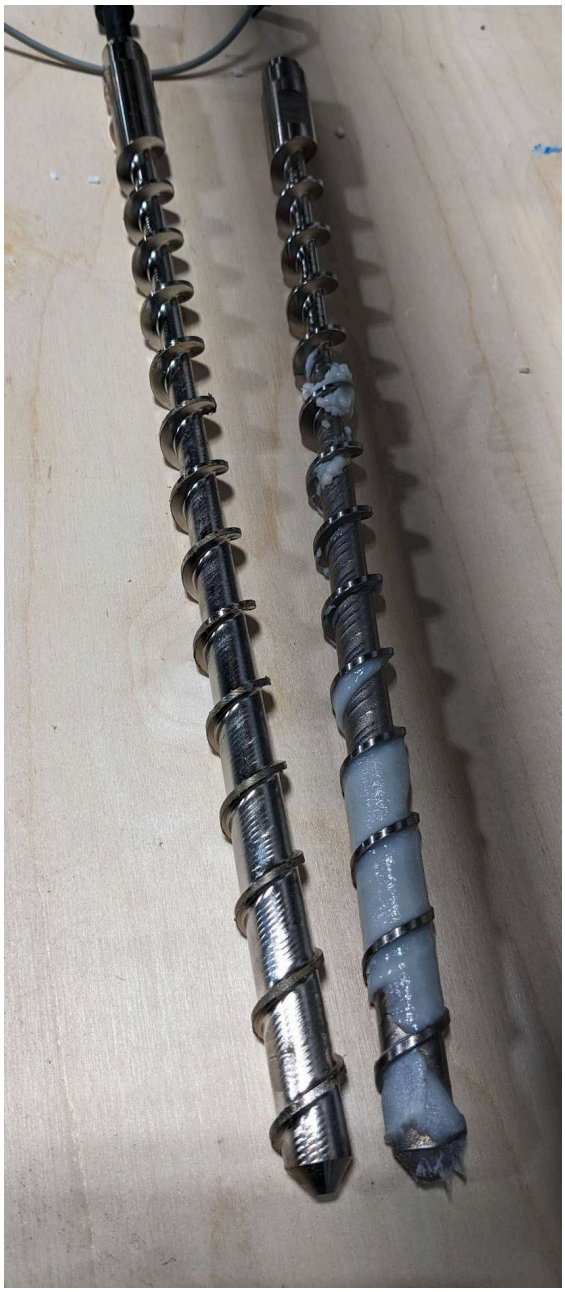
Anti-Oozing stuck in compressed powder

6. Full disassembly of the extrusion screw needs unconventional work.
    a. Performed cold. Usually, heat is required to melt the thermoplastic
    b. Full removal of heaters and sensors required to fit in vice and use torque arm on the screw
    c. Slowly working the screw back and forth and breaking off the compressed powder from the tip eventually works.

7. Removed chunks of materials show no signs of phase transition from solid to liquid, evidenced by the friability of the chunks even in the lower section of the screw.

8. Video showing the removal of the remaining material shows :
    a. Color transition from white to beige and brown indicates proper heat transfer and eventually a limit in heat absorption by the material. Deep brown color indicate the material is at its limit and degradation starts to occur
    b. No phase transition. From the top to bottom of the screw it is compressed powder.

Extrusion Screw Removed from Barrel with CH60



Extrusion Screw Removed from Barrel with thermoplastic (screw on the right handside)

2. Calibration

Set & Prime failed. Calibration not performed

3. Print

Set & Prime failed. Print not performed

4. Purge and Clean

Set & Prime failed. Cleaning detailed in the set and prime section

Conclusion and recommendations

We would advise against using BioStruct CH60 with the Pulsar™ Extruder. The Pulsar™ Extruder is designed to process thermoplastic and thermoplastic based composite. Materials with thermoplastic-like behavior can achieve some sort of success. A combination of shear rate and temperature will lower a polymer viscosity up to a point where the extrusion screw has control on the output flow. Those characteristics are absent in BioStruct CH60.

During our testing with BioStruct CH60, I reached a temperature limit. Increasing the temperature above 190°C would most likely degrade the material and bake the material into a hard block. Complete disassembly, cleaning and repair of the unit was necessary in order to refurbish the extruder to its original state. A level of maintenance that is only required in critical failure of the machine.

In order to achieve compatibility of the fungi with our machinery, a composite with a thermoplastic matrix would be required. Multiple composites with high volumetric density of metal powder relative to the matrix (60% Vol of powder) were used with success. The compatibility of the matrix needs to respect the thermal limitations of the fungi.