

Standard Operating Procedure

Polycarbonate (PC) Processing

Barrel Management & Troubleshooting Guide

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Prepared By: Engineering Department

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SOP: Polycarbonate (PC) Processing & Barrel Management

Objective: To ensure structural integrity of PC parts and prevent mechanical damage to the injection unit during startup/shutdown.

1. Material Preparation (The Foundation)

Drying: PC must be dried in a desiccant dryer.

Parameter	Specification
Temperature	120°C (248°F)
Time	4 hours minimum
Dew Point	Should be -40°C or lower

Check: Moisture content must be < 0.02%. If you see "splay," stop and re-check the dryer.

2. Startup Procedure (Protecting the Screw)

- Heat Soak:** Once the barrel reaches set points (280°C–310°C), allow it to "soak" for at least 20 minutes. This ensures the core of the screw is not cold, which prevents galling.
- Initial Purge:** Use a high-viscosity purging compound or the PC itself at a low RPM.
- Air Shot:** Perform an air shot. The melt should be clear, free of bubbles, and flow like smooth honey. If it "pops," it is wet. If it's yellow, it's over-cooked.
- Cushion Set:** Ensure a minimum cushion of 3mm to 6mm. Never let the screw bottom out.

3. Production Monitoring

Parameter	Expert Target	Why?
Melt Temp	290°C - 310°C	Lowers viscosity; prevents molded-in stress.
Mold Temp	80°C - 120°C	Prevents "shocking" the plastic; ensures impact strength.
Back Pressure	50 - 150 psi	Essential for melt homogeneity and bubble removal.

Injection Speed	Moderate/Slow	Prevents shear-burning and "record-grooving."
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4. Shutdown Procedure (Preventing Screw Damage)

Crucial: Never leave PC in a cooling barrel over the weekend. PC contracts significantly and can seize or snap the screw.

1. The Purge-Out:

- Stop the PC feed.
- Purge the barrel empty.
- Immediately introduce a Purge Compound (e.g., Acrylic-based or HDPE) that is stable at PC temperatures.

2. Temperature Ramp-Down:

- Run the purge material until the discharge is clean.
- Drop barrel temperatures to 200°C while continuing to purge to "seal" the screw.

3. **Final Stop:** Leave the screw in the fully forward position to prevent material buildup on the check ring.

4. **Power Down:** Turn off the heaters only after the barrel is filled with stable purge material.

5. Safety Notes

WARNING: In the event of a "frozen" nozzle, do not stand in front of the nozzle tip. PC can hold massive pressure and "splatter" when it finally breaks loose. Always use safety shields.

SOP: Polycarbonate (PC) Processing & Troubleshooting

1. Troubleshooting Quick-Fix Table

Use this matrix to address common defects on the fly without shutting down the press.

Defect	Likely Cause	Recommended Action
Splay / Silver Streaks	Moisture or Overheating	Check dryer temp (120°C). Lower melt temp by 10°C increments.
Brittleness / Cracking	Cold Mold or Low Melt Temp	Increase Mold Temp to 90°C+. Increase Melt Temp to reduce stress.
Sink Marks	Shortage of Material/Pressure	Increase Hold Pressure. Check for "Cushion" (must be >3mm).
Vacuum Voids	Center of thick part cooling last	Increase Hold Time or slow down injection speed to pack the core.
Jetting (Snake lines)	High speed thru small gate	Slow down initial injection speed; check if gate is in thick section.
Burn Marks (Diesel)	Trapped Gas	Clean vents. Reduce injection speed in the last 5% of stroke.

2. Startup Procedure (The 20-Minute Rule)

- **Heat Soak:** Allow barrel to sit at target temp (300°C) for 20 minutes before turning the screw to prevent mechanical fatigue.
- **Air Shot:** Verify melt is crystal clear. Bubbles = Wet material. Yellowing = Heat degradation.
- **Purge:** Always purge the old "slug" out before cycling.

3. Mandatory Weekend Shutdown

NEVER leave PC in the barrel.

- Stop PC feed.
- Purge until empty.
- Introduce Purge Compound: Use Acrylic-based or high-viscosity HDPE.
- Run until discharge is 100% purge material.
- Set screw to Full Forward position.
- Power down heaters.

4. Safety First

- **Blowback Warning:** If the nozzle is "frozen," do not stand behind the hopper or in front of the nozzle.
- **Thermal PPE:** Always wear heat-resistant gloves; 300°C PC sticks to skin instantly.

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