

	EARTHCARE FOUNDATION	Doc No: SOP/PROD/00 Rev No: 00 Eff Date: 01.08.2023
	STANDARD OPERATING PROCEDURE	

Safety Inspection & Operational Controls for PVC Profile Extrusion Machinery

PURPOSE:

The purpose of a safety check standard operating procedure (SOP) for a PVC profile extrusion machine is to eliminate workplace accidents, protect equipment from catastrophic damage, and ensure a repeatable, risk-free manufacturing process.

SCOPE:

The scope defines exactly who, what, and where this standard operating procedure (SOP) applies across the manufacturing facility.

Responsibilities:

Machine Operators: Responsible for completing pre-start checklists, continuous monitoring of run-state variables, immediate reporting of hardware issues, and cleaning local material drops.

Shift Supervisors: Mandated to execute safety checklist validation audits, enforce strict personal protection equipment conformance, and authorize restart procedures following unexpected trip line triggers.

Maintenance Technicians: Accountable for executing absolute isolation rules via Lockout/Tagout protocols, system re-calibration intervals, structural barrier remediation, and planned utility service actions.

HSE Officers: Responsible for formal policy audits, near-miss logging oversight, executing facility emergency simulations, and conducting root-cause assessments for process line variances.

Procedure:

1. Preheating phase (Shift start)

- 1.1 **Verify Material and Venting:** Check that the hopper is free of metal contamination. Ensure the barrel venting zone is clear to allow moisture and initial gases to escape safely.
- 1.2 **Power and Utility Activation:** Turn on the main water supply valve. Verify cooling water pressure to the feed throat, barrel zones, and calibration table meets factory specifications. Switch on the main electrical isolator. Inspect the control panel for any active safety faults or alarms.
- 1.3 **Initiate Controlled Heating:** Set the target temperatures for the barrel zones, adapter, and die head (typically between 170°C and 190°C for PVC). Activate the heating bands. Never attempt to rotate the screw during this phase; forcing cold PVC resin will snap the screw or damage the gearbox.

2. Heat-Soak Phase (Soaking)

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2.1 **Execute the Heat-Soak Time:** Once all zones reach their target temperatures, start a 45 to 60-minute heat-soak timer. This ensures the internal core of the PVC material inside the screw is fully melted, preventing "cold start" mechanical damage.

2.2 **Pre-Start Mechanical Inspection:** While the machine is soaking, physically inspect all downstream equipment. Manually verify that the haul-off rollers and cutting saw guards move freely and are unobstructed. Ensure the water drainage channels on the calibration table are clear of debris.

3. Start-up and Purging Phase (Live Material Introduction):

- 3.1 **Clear the Hazard Zone:** Instruct all non-essential personnel to step away from the front of the die head. Molten PVC can trap gas pockets and spit violently out of the die when first pressurized.
- 3.2 **Don Specialized PPE:** Put on heavy-duty, heat-resistant sleeves and gloves. Wear a full-face shield to protect against toxic gas puffs or hot plastic splatters.
- 3.3 **Low-Speed Screw Activation:** Start the main extruder drive motor at the lowest possible RPM (typically 2 to 5 RPM). Monitor the motor amperage and melt pressure closely. If pressure spikes rapidly, stop the screw immediately; the die or barrel is still blocked by cold material.
- 3.4 **Purging the Barrel:** Feed purging compound or fresh PVC resin into the hopper. Allow the old, degraded material to purge out of the die head until a clean, uniform melt stream is achieved. Use a brass scraper to safely remove purged material from the die lips. Never use steel tools, as they will scratch the polished die surfaces.

4. Line Threading and Downstream Setup:

- 4.1 **Guide the Profile:** Pull the hot, pliable PVC profile out from the die head using insulated pliers. Guide the profile carefully into the vacuum calibration sleeves and cooling water tanks.
- 4.2 **Engage Downstream Systems:** Thread the cooled profile through the haul-off caterpillar belts. Close the haul-off pressure rollers safely, ensuring hands are kept clear of the crushing zone. Switch on the calibration table vacuum pumps and water spray valves to solidify the final profile shape.
- 4.3 **Activate Automatic Cutting:** Close the safety housing doors of the flying saw or guillotine cutter. Reset and arm the cutting unit's safety light curtains. Switch the cutter control to "Automatic" mode so it measures and cuts the profiles to length without manual intervention.

5. Live Production Monitoring:

- 5.1 **Hourly Safety Walks:** Inspect the line every hour for any water leaks near electrical lines or heaters. Check the barrel vent dome for excessive yellowish or white smoke, which indicates PVC thermal degradation and the release of toxic Hydrogen Chloride (HCl) gas.

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- 5.2 **Housekeeping:** Immediately sweep up any dropped PVC pellets to prevent slip hazards. Safely collect scrap profile cut-offs and place them into designated recycling bins.

6. Post-Operation and Shutdown Procedure:

- 6.1 **Empty and Purge:** Close the material hopper slide gate. Run the extruder screw until the barrel is completely empty of PVC resin. Feed a stable purging compound into the barrel to displace the PVC, preventing the polymer from degrading and corroding the screw overnight.
- 6.2 **Safe Power Down:** Stop the main drive motor. Turn off all die and barrel heating zones. Leave the cooling water running for at least 30 minutes after shutdown to cool the feed throat and protect the gearbox seals from ambient heat soak. Power down all downstream tables, haul-offs, and cutters.

Checklist:

Operators must complete and sign this checklist before each production shift.

Status	Inspection field required.
☐ Verified	Personal Protective Equipment: Standard safety eyewear, safety footwear, and heat gloves accessible.
☐ Verified	Housekeeping Status: Run track floors free from surface water, processing lubricants, or raw pellets.
☐ Verified	Physical Guard Arrays: Main drive covers, haul-off panels, and cutting saw shields locked shut.
☐ Verified	Utility Pressures: Internal cooling water pathways operational with positive gauge response.
☐ Verified	Ventilation Extraction: Degassing node vapor collection systems engaged and pulling draft.
☐ Verified	Emergency Stop Circuits: Physical validation of all local line e-stop impact keys.
☐ Verified	Interlock Mechanisms: Control line validation of hopper panel safety limit contacts.

Prepared By:	Reviewed By:	Approved By:
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