

Standard Operating Procedure (SOP) for Daily Maintenance of Industrial Roll-to-Roll Digital Textile Pigment Ink Printheads

Scope of Application: Industrial Roll-to-Roll (R2R) Direct-to-Fabric Digital Printing Machines Utilizing Textile Pigment Ink

Core Technical Tip: Since textile pigment ink is highly enriched with nano-scale solid pigment particles and heat-curable resin binders, the core of its daily maintenance lies in "**preventing dehydration, preventing sedimentation, and precise temperature control.**" Strict execution of this SOP effectively prevents nozzle deflection and ink starvation while maximizing the physical lifespan of expensive industrial printheads such as Epson I3200, Kyocera, and Ricoh.

I. Daily Pre-Start Checklists & Inspection (Daily Pre-Start)

Steps	Operation Key Points & Inspection Standards	Core Technical Purpose
1. Environment Temperature & Humidity	Ensure the workshop temperature is maintained at 20°C - 28°C and relative humidity is kept at 50% - 70% .	Prevents low temperature from driving up ink viscosity and low humidity from causing fast ink crusting on the nozzle surface.
2. Ink Sub-tank & Circulation Inspection	Check if the negative pressure of the sub-tank is normal. If the equipment features a specialized white ink or spot color system, ensure the automatic circulation/agitation system runs for at least 15-20 minutes before printing.	Pigment ink consists of nano-scale color powder and resins. Periodic physical circulation thoroughly eliminates color variation caused by color powder sedimentation.
3. Spitting & Wiper Cleaning	Activate the automatic spitting/flushing function. Use a lint-free cloth with specialized pigment cleaning fluid to wipe the wiper and capping station in a single direction.	Removes residual cured resin film from the previous day, preventing dirty wipers from cross-contaminating the nozzle plate.
4. Nozzle Check Status	Print a nozzle check test pattern. Standard: Must be 100% perfect with no missing channels or nozzle deflection before starting continuous roll-to-roll production.	Ensures that every fine nozzle orifice (typically 20-30 µm) is in a flawlessly fluent state before high-frequency jetting.

II. In-Production Process Monitoring

- **1. Strict Decapping Time Management:** During continuous roll-to-roll production, if the machine is temporarily paused due to fabric roll swapping or process adjustments, **never leave the printheads exposed to open air for more than 15 minutes**. If the printing pause exceeds 10 minutes, manual spitting or a brief capping/purging must be executed to prevent the airflow from drying out water and triggering resin crystallization at the nozzles.
- **2. Regular Mist & Ink Accumulation Check:** When continuously printing over 200 meters, pause briefly to inspect whether fine ink droplets are accumulating underneath the printhead carriage. If slight misting occurs under high-frequency shearing, trigger a gentle flush and automatic wipe to keep the nozzle plate clean and dry.

III. Daily Shut-Down Maintenance (Daily Shut-Down)

When the daily roll-to-roll production shifts end, the following sealing/capping process must be executed. This is the ultimate key determining printhead longevity:

1. Step 1: Physical Ink Purge/Flush

Press the manual purge button on the control panel to let a tiny amount of CMYK and spot color inks eject, carrying away any fine fabric lint/fuzz that may have accumulated around the nozzle edges during high-speed printing.

2. Step 2: Capping Station Humidification (Capping)

Fill the capping station (Cap) with specialized pigment capping/cleaning fluid to keep it fully saturated. Control the carriage to return to the home position, ensuring the nozzle plate and the humidified cap achieve a **perfect, airtight seal**.

**Warning: A dried-out capping pad will reverse-suck moisture out of the nozzles, causing severe clogging the next morning.*

IV. Weekend Shutdown & Long-Term Storage Regulations

If the factory faces weekend shutdowns (idle for over 48 hours) or long holiday breaks (idle for more than 3 days), the maintenance must be upgraded to the **"Full-Liquid Sealing"** process:

[End of Normal Shift] → [Extract Ink from Sub-Tanks with Syringe] → [Inject Pure Preservation/Humidifying Fluid]

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[One-Click Flush/Purge Residual Colors] ← [Stop Machine when Fluid Runs Clear] ← [Airtight Physical Vacuum Sealing]

1. **Anti-Drying Flush Method:** Drain the pigment ink from the ink lines and use **specialized cleaning protection fluid with an absolute filtration accuracy of $< 0.2 \mu\text{m}$** to gently flush the printhead under mild positive pressure until the ejected liquid runs completely clear without any color tint.
2. **Immersion Sealing:** Keep the cleaning protection fluid safely filled inside the printhead internal cavities. Externally, wrap a high-molecular humidifying sponge with plastic film, press it tightly against the nozzle plate to achieve an airtight physical vacuum seal, preventing any trace resin from drying and hardening.

V. Troubleshooting & Critical Clogging Prevention Taboos

- **✗ Strict Prohibition of High-Pressure Manual Flushing:** When missing nozzles are detected, never use a large syringe to forcefully inject cleaning fluid into the printhead at high pressure. The internal piezoelectric ceramics and manifold membranes are extremely fragile; any positive pressure exceeding **30 kPa** can easily cause internal color mixing or permanent physical damage to the actuator chips.
- **✗ Strict Prohibition of Non-Original/Inferior Cleaning Solvents:** The pH value of pigment ink is strictly balanced at a **weakly alkaline level of 7.5 - 9.5**. Any cheap cleaning solutions containing strong acids, strong bases, or industrial alcohol will dissolve the precision bonding adhesives and metallic coatings inside industrial printheads, causing irreversible ink leakage or structural failure.
- **Ø Recommended "Warm Compress Method" for Stubborn Resin Crusts:** If a trace amount of resin happens to dry on the nozzle plate surface due to operational error, soak a lint-free cloth in warm specialized cleaning fluid (**40°C - 50°C**) and gently apply it as a "warm compress" against the nozzle plate for 3-5 minutes. Once the resin film softens, perform a mild positive pressure flush. Never use hard or sharp objects to scrape the nozzle plate.