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# Paper Machine Clothing Cleaning & Maintenance Guide

Best practices for PMC cleaning: chemical protocols, high-pressure shower optimization,  
and contamination prevention for extended fabric life across all positions

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# 1. Introduction & Business Case

Effective paper machine clothing (PMC) cleaning is the single most impactful maintenance practice for extending fabric life, maintaining product quality, and reducing machine downtime. Contaminated fabrics cause a cascade of operational problems: reduced drainage (wet end), decreased heat transfer (dryer section), sheet markings, edge curling, and in severe cases, catastrophic fabric rupture. Each of these failure modes results in unplanned downtime – typically costing €5,000–25,000 per hour depending on machine size and grade.

PAPTEX studies across 50+ paper machines demonstrate that a well-executed cleaning program extends forming fabric life by 15–25%, press felt life by 10–20%, and dryer fabric life by 20–35%, compared to machines with reactive or minimal cleaning regimes. The return on investment (ROI) of implementing the cleaning protocols in this guide is typically achieved within the first extended fabric life cycle – often within 3–6 months.

## 2. Contamination Types & Identification

Contaminant	Appearance	Common Source	Affected Fabric	Primary Impact
Fiber fines	White/gray matted deposit	Mechanical pulp, recycled fiber	Forming, Press	Blocks drainage channels; reduces porosity
Pitch / extractives	Brown-black sticky spots	Wood resin, recycled contaminants	Forming, Press	Adhesive deposits cause sheet picking and holes
Starch / surface size	Glossy, hard surface deposit	Size press carry-back, coating mist	Dryer	Creates impermeability zones; causes sheet sticking
Calcium carbonate scale	White, crystalline crust	Hard process water, high-pH systems	All fabrics	Abrasive – accelerates mechanical wear of filaments
Alum / rosin precipitates	Yellow-brown, gummy deposit	Acid papermaking systems, rosin sizing	Forming	Extremely tenacious – requires aggressive chemical removal
Latex / synthetic binders	White/clear, rubbery coating	Coated broke recycling, deinking residues	Press, Dryer	Blocks void volume; very difficult to remove once set
Microbiological slime	Slimy, colored, musty odor	Stagnant water zones, poor biocide program	All fabrics	Blocks drainage; causes sheet quality defects and odors

## 3. Mechanical Cleaning Methods

### 3.1 High-Pressure Needle Showers (Forming & Press Fabrics)

- Pressure: 15–25 bar (220–360 psi) for forming fabrics; 20–35 bar (290–500 psi) for press felts. Higher pressure on press felts is acceptable due to the protective batt layer.

- Nozzle type: Fan-jet (15°–25° fan angle), oscillating at 20–40 cycles/min. Needle-jet nozzles are too aggressive for forming fabrics and should only be used on press felts.
- Nozzle-to-fabric distance: 100–150 mm. Closer distances increase impact energy but may damage batt fiber on press felts.
- Coverage: Ensure full-width coverage with approximately 30% overlap between adjacent nozzle sweeps to avoid unwashed stripes.
- Water quality: Fresh water, filtered to  $\leq 50 \mu\text{m}$ . Water hardness should be  $< 150 \text{ ppm CaCO}_3$  to prevent nozzle clogging from scale formation.
- CRITICAL: High-pressure shower oscillation must never stop while water is flowing. Stationary high-pressure jets will cut through the fabric within minutes.

### 3.2 Dryer Fabric Cleaning Showers

- Low-pressure shower: 3–6 bar (45–90 psi), positioned on the return run (non-sheet side) of the fabric.
- Water temperature: 50–65 °C. Hot water significantly improves starch and coating binder removal compared to cold water. Every 10 °C increase approximately doubles cleaning effectiveness.
- Chemical injection: Metered detergent injection into the shower water line for machines running surface-sized or coated grades. Injection rate: 0.5–2.0% concentration.
- Post-cleaning drying: Ensure sufficient vacuum or blow-box dewatering after the cleaning shower to prevent water carry-over to the sheet side.

## 4. Chemical Cleaning Protocols

WARNING: Always consult PAPTEX technical service before applying any chemical cleaner. Some common industrial cleaning chemicals attack polyester (PET) and polyamide (PA) monofilaments, causing permanent tensile strength loss. In particular: NEVER use hypochlorite bleach (sodium hypochlorite, NaOCl) on polyamide (nylon) components – even brief contact causes rapid, irreversible degradation. NEVER use organic solvents (acetone, MEK, toluene, etc.) on any PMC fabric – all will cause damage.

Cleaner Type	Active Chemistry	pH Range	Target	Safe For	NOT Safe For
Alkaline detergent	NaOH + surfactants	10–12	Pitch, starch, organic build-up	PET, PA	– (both materials resistant)
Acid cleaner	Sulfamic or phosphoric acid	2–4	Calcium carbonate scale, alum deposits	PET, PA	– (both materials resistant at recommended pH)
Enzymatic cleaner	Lipase / esterase enzymes	6–8 (neutral)	Pitch, wood extractives	PET, PA	–
Oxidizing	Hydrogen peroxide	9–11	Organic dyes,	PET only	PA (nylon) – oxidative

Cleaner Type	Active Chemistry	pH Range	Target	Safe For	NOT Safe For
cleaner	(3–6%)		stubborn pitch deposits		degradation of amide bonds
Hypochlorite bleach	NaOCl (1–3%)	10–12	Severe dye contamination	PET only	PA – NEVER use hypochlorite on polyamide
Solvent-based cleaners	Various organic solvents	N/A	–	–	ALL PMC materials – solvents cause irreversible damage

Application: For batch (soak) cleaning, apply cleaner at 40–60 °C with 15–30 minute dwell time, followed by thorough rinsing with fresh water until return water is pH-neutral. For continuous shower injection, meter cleaner at 0.5–2.0% concentration into the shower water line upstream of the shower manifold to ensure thorough mixing.

## 5. Fabric-Specific Cleaning Schedules

Fabric Type	Continuous Cleaning	Batch (Chemical) Cleaning	Special Notes
SSB Forming	HP shower (20 bar), continuous oscillation	Alkaline batch every 4–6 weeks; acid batch every 8–12 weeks	Check FSI retention after each batch clean to verify no surface damage
DL Forming	HP shower (18 bar), continuous	Alkaline batch every 4–8 weeks	More tolerant of chemical cleaning than SSB due to simpler weave structure
BOM Press Felt	HP shower (25–30 bar) + Uhle box, continuous	Alkaline or enzymatic batch every 2–3 weeks	Monitor void volume trend; clean proactively before compaction becomes irreversible
NF Tissue Felt	HP shower (20–25 bar), continuous	Alkaline batch every 1–2 weeks	Tissue grades highly sensitive to chemical residues – rinse 3× minimum after batch clean
Flat Yarn Dryer	LP shower (4–6 bar) + detergent injection	Batch every 8–12 weeks if starch/coating in system	60 °C water dramatically improves cleaning vs. ambient temperature
Spiral Dryer	LP shower (4–6 bar), optional	Batch only when permeability drops >15%	Large void volume provides higher contamination tolerance than flat/round yarn

## 6. Cleaning Effectiveness Assessment

For forming fabrics: Measure air permeability (CFM) before and after cleaning. Recovery to  $\geq 90\%$  of the original (as-new) CFM value indicates effective cleaning. If recovery is below 80% after two consecutive cleanings, escalate to chemical batch cleaning with a PAPTEX-recommended protocol. Persistent low recovery may indicate the contamination has chemically bonded to the filaments and the fabric is approaching end of useful life.

For press felts: Measure void volume if laboratory equipment is available. Alternatively, use the simple "water drop" field test – a single drop of water on a clean felt surface should disappear (absorb) within 2 seconds. Longer absorption times indicate surface sealing that requires immediate cleaning intervention.

For dryer fabrics: Monitor the steam pressure required to maintain target cylinder temperature. An upward trend in steam pressure over time, after correcting for production rate and sheet grade changes, is often an early indicator of reduced heat transfer from fabric contamination – and a signal that cleaning is overdue.