



Water Damage Restoration Post-Fire

Abstract:

Fire suppression in paper mills—primarily sprinklers and hose lines—introduces large volumes of water that rapidly elevate ambient humidity, produce condensation, and accelerate corrosion of electrical and control assets. This paper sets out a structured, dehumidification-led method for post-fire water-damage restoration derived from practical deployments across Indian mills. The approach combines desiccant dehumidification, engineered airflow, and continuous psychrometric monitoring within a documented workflow (assessment → proposal → rapid mobilization → on-site operation → monitoring → demobilization). Zones are prioritized to rapidly reduce ambient humidity in MCC/DCS rooms and adjacent production areas, enabling protection of electromechanical and electronic systems. The method minimizes loss, reduces downtime, and increases salvage value, while the rental model avoids capex and allows right-sizing.

Keywords: Fire Safety, Water Damage, Desiccant Dehumidification, Paper Mills, Corrosion Control



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Introduction

In a paper mill, the greatest damage after a fire often comes not from flame but from suppression water and the humid microclimate it leaves behind. Water intrusion, residual dampness, and high ambient moisture create thin conductive films and drive condensation and corrosion inside MCC/DCS rooms, VFDs, PLC cabinets, drives, sensors, and cable trays. Left unmanaged, this moisture accelerates electrical failures, degrades electro-mechanical components, and prolongs outages.

This case study focuses on asset preservation—protecting electro-mechanical and electronic systems during and after fire suppression—rather than on paper product effects. The method deploys engineered, temporary and independent control of humidity and temperature to arrest moisture-related deterioration, create condensation-free conditions for safe inspection, and enable controlled drying of affected systems. The approach combines desiccant dehumidification (fluted-media adsorption with continuous reactivation), targeted ventilation/air movement for deep and confined spaces, continuous parameter monitoring, and a documented workflow suitable for emergency mobilization.

Materials and Methods

Company Capability and Workflow

The deployment model is standardized and suitable for emergency response:

Site assessment → Technical proposal & discussion → Commercial proposal → Mobilization & installation → On-site operation & maintenance → Parameter monitoring → Demobilization.

This sequence ensures that drying plans are engineered, monitored, and documented end-to-end.

Drying Technology

- ♦ **Desiccant dehumidifiers (fluted-media):** Remove moisture by continuous physical adsorption with rotor reactivation to maintain capacity under heavy wet loads.
- ♦ **Condensing units:** Provide sensible cooling to lower air temperature and assist moisture removal where required.
- ♦ **High-static blowers/ducting:** Drive dry air through panels, cable trenches, machine frames, and confined spaces; enable negative pressure when containment is necessary.
- ♦ **Safety context:** Work proceeds under Lockout/Tagout (LOTO) and confined-space protocols as applicable.

Targets and Acceptance Criteria

- ♦ **Primary target:** Reduce RH to $\leq 45\%$ in electrical and control zones prior to inspection by the mill electrical team.

- ♦ **Moisture domains:** Address surface moisture (visible dampness, condensation) and core moisture (bound water in structural and insulating materials) to avoid rebound.

Zoning and Prioritization

- ♦ **Zone A: MCC/DCS/Drives**—highest priority for corrosion control and safe access.
- ♦ **Zone B: Paper machine floor & reel/winder**— protect mechanicals, drives, sensors, and control hardware; manage ambient moisture around equipment.
- ♦ **Zone C: Packaging/Warehousing**— stabilize environment for packaging machinery, electricals, and controls; prevent re-wetting of equipment and enclosures.
- ♦ **Zone D: Pulp prep/towers & basements**—confined areas require ventilation plus drying for worker safety.

Documentation

All deployments maintain a logbook of psychrometric data, airflow configuration, energy use, run hours, and hand-back notes for each zone, with figure/table references and photographs for auditability.

Results and Discussion

1) **Tata Electronics, Hosur, Tamil Nadu** — Post-fire suppression recovery (20 Sep 2024)

Context: A fire incident led to extensive use of water for suppression. Large volumes of moisture affected a broad range of electronic assets and peripherals across work areas.

TDS Asia’s role: The team mobilized quickly, set up equipment-focused drying zones, and used desiccant dehumidification with directed airflow to remove moisture from devices and staging areas. Items were triaged, isolated, and dried before being handed to the client for cleaning and functional checks. All work followed site safety procedures.

Equipment addressed during restoration (representative counts):

- ♦ Laptops — 1,000 nos.
- ♦ Tablets — 750 nos.
- ♦ Televisions — 40 nos.
- ♦ Scanners — 750 nos.
- ♦ UPS systems
- ♦ And additional peripherals/electronics as identified onsite.

Outcome: The drying campaign stabilized the affected electronics and power back-up units, allowing systematic inspection and recovery by the client’s teams and preventing further moisture-related deterioration. This asset-protection approach—fast mobilization, zoned drying, and documented handling—is the same model TDS Asia applies across industrial sites after suppression events.

2) Humidity Control at Paper Machine (Monsoon) — ITC Papers (Pre-Fire Analogue)

Challenge: Monsoon humidity caused insect ingress and humidity-linked quality risk near the paper machine.

Intervention: Rental desiccant dehumidifiers were deployed to supply dry, dehumidified air in the production area. TDS technicians executed multiple customer-requested modifications during trials to tune ducting, airflow paths, and unit placement. Image 1 (a) & Image 1 (b)

Result: Insect ingress drastically reduced; paper quality improved; there were no lot rejections during audits.

Service Scope: TDS-1200 × 12 with manpower for 120 days.

Post-Fire Relevance: The same rental platform and technician-tuned setup is used immediately after suppression to rapidly dry adjacent production zones and nearby electrical rooms, creating condensation-free conditions for inspection.



Image 1 (a). Installation of Dehumidifiers at ITC Papers



Image 1 (b). Installation of Dehumidifiers at ITC Papers

3) Ventilation & Temperature Control for Pulp Tower (Confined Space)

Challenge: Suffocation/low oxygen and stagnant air during AR tile-lining; scaffolded work at the bottom of the tower.

Intervention: Condensing units and centrifugal blowers with directed airflow paths to provide conditioned, moving air.

Result: Temperature stabilized at ~20–22 °C, improving worker comfort and brick binding, enabling shutdown completion ahead of time.

Service Package: TDS 7.5 × 3, TDS 900 × 1, and 1000-CFM blowers.

Post-Fire Relevance: After suppression, confined pits/towers and basements often remain wet with low oxygen; the same ventilation plus targeted drying approach provides safe access and speeds moisture removal from hard-to-reach voids and trenches.

3) Post-Fire Water-Damage Restoration Framework for Paper Mills

The following steps integrate the above tools into a repeatable post-fire method:

Step 1 — Site visit, assessment & reporting (TDS technicians/engineers).

TDS team visits the site to inspect affected areas and critical assets, conduct non-destructive checks (visual moisture/condensation screening, enclosure opening where safe, basic environmental readings), triage equipment lists (e.g., MCC/DCS panels, drives, PLC cabinets, sensors, UPS), and capture photo-documentation. Findings are compiled into a report that outlines zones, risks, recommended drying approach, expected outcomes/time windows, responsibilities, and limitations. This report is shared with the OEM representative and/or the insurer’s surveyor for concurrence before execution.

Step 2 — Immediate Stabilization and Mapping.

Delineate MCC/DCS/Drives, PM floor & reel/winder, packaging/warehouse, and pulp prep/towers. Place loggers and begin continuous T/RH trending.

Step 3 — Airflow Engineering and Equipment Sizing.

Use high-static ducting and centrifugal blowers to sweep dry air through enclosures, behind panels, under trays, and inside machine frames; apply negative pressure where contamination control is required.

Step 4 — Targets and Draw-Down.

Aim to reduce moisture in effective machines within the first 24–36 h to prevent corrosion and enable inspection. PM floor and reel/winder zones follow, then packaging/warehouse to prevent regain.

Step 5 — Verification and Staged Re-Energization.

When zones are condensation-free and within setpoints, perform IR/megger tests and visual corrosion checks. Energize lowest-risk feeders first, maintaining drying airflow to capture any latent moisture release. Document results with timestamps, photos, and sign-offs.

Step 6 — Prevent rebound.

Continue controlled airflow in adjacent production and packaging areas to avoid re-wetting of equipment/enclosures once systems are operational.

Step 7 — Document and hand-back.

Maintain zone logs, equipment run-hours, airflow notes, photos, and hand-back records for audits and insurers.

Mechanisms and Rationale

- ♦ Corrosion kinetics accelerate with condensation; RH ≤ 45% is a practical control point widely used during restoration to keep metal surfaces above their critical moisture threshold.
- ♦ Desiccant adsorption with continuous reactivation maintains drying under extreme wet loads—a condition typical immediately after suppression.

Sustainability and Economics

- ♦ Rental model: Suits short-term, seasonal, and shutdown scenarios; avoids capex; right-sizes capacity; supports instant mobilization during monsoon and emergencies.
- ♦ Restorative drying advantages (see TABLE 1): reduces reconstruction/replacement by ~40–80%, shortens downtime, quantifies results, and increases salvage value of equipment.
- ♦ Energy and reporting: Track kWh and diesel where used; relate energy spent to downtime avoided and scrap prevented for a credible ROI narrative.

Risk Management and Safety

- ♦ Apply LOTO and confined-space protocols in towers/pits; ensure oxygen and gas monitoring where required.
- ♦ Maintain worker comfort (e.g., ~20–22 °C) in restoration zones to improve productivity and quality of rework (as demonstrated in the pulp-tower case).
- ♦ Preserve electrical safety by verifying dryness before panel access; keep desiccant air flowing during and after energization to prevent re-condensation.

4) Related Observations from Deployments

- ♦ **Technician-led tuning is crucial:** small changes in duct placement, airflow rate, and filtration significantly affect draw-down speed and uniformity.
- ♦ **Zonal sequencing minimizes re-wetting:** prioritizing electrical rooms first, then process zones, then warehouses reduces loop-backs (see TABLE 2)
- ♦ **Documentation quality** (continuous logs, photos, hand-backs) correlates with smoother insurer discussions and faster audit closure.

Table 1. Restorative Drying — Benefits Relevant to Post-Fire Incidents

- ♦ Minimizes loss; saves ~40–80% of reconstruction/replacement value.
- ♦ Reduces interruption to business/production due to shifting and reconstruction.
- ♦ Lowers damage compensation expenses incurred by the insurer through **quantified documentation**.
- ♦ Improves salvage value of damaged equipment by preventing corrosion and electrical degradation.
- ♦ Provides **traceable, auditable** project records (psychrometric logs, inspection reports).

TABLE 2. Indicative Zone-Wise Targets and Checks

Zone	Target RH	Primary Checks	Hand-Back Condition	Notes
MCC/DCS/Drives	≤ 45% RH	Visual dryness, IR/megger, corrosion check	Safe to open panels and stage energization	Maintain dry-air purge during energization
PM Floor & Reel/Winder	≤ 50% RH (then trend to ≤ 45%)	Surface moisture, bearings, sensors	Run-ready	Prevent drip/condensation on frames
Packaging/Warehouse	≤ 50% RH	Roll/pallet moisture, hygiene checks	Stocking allowed	Avoid regain/microbial growth
✓ Assumption: Replace with mill setpoints where they differ.				

Conclusion

Post-fire recovery in paper mills is primarily a humidity and moisture-migration challenge. A desiccant-led, rental-enabled methodology—engineered to bring zones below corrosion thresholds, remove both surface and core moisture, and verified through IR/megger and visual inspections—provides a disciplined pathway from suppression to safe, stable production. The same tools and practices that eliminate monsoon-driven defects at the paper machine and deliver safe, conditioned environments in pulp towers translate directly to post-fire water-damage restoration. With continuous monitoring, staged re-energization, and documented hand-backs, mills can minimize loss, reduce downtime, and increase salvage value—all while avoiding capex and aligning with sustainable operations.

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