The Hidden Risk in Print Operations: Environmental Compliance Isn't as Simple as It Looks

BY JOHN TSUN

A Small Change with Regulatory Implications

A printer recently made what appeared to be a routine operational adjustment: switching to a different blanket wash due to supply chain constraints. The replacement product performed well, with no observable impact on press operations or print quality.

Several months later, during a compliance review, it was identified that the new formulation contained a higher volatile organic compound (VOC) content and different hazardous air pollutant (HAP) constituents. That change increased the facility's potential-to-emit (PTE) and required updates to emissions calculations and internal compliance tracking.

The issue is that many air permits are based on specific assumptions—such as VOC content, material usage rates, or overall emissions thresholds. When those assumptions are exceeded, even unintentionally, a facility may no longer be operating within its permit limits.

In most cases, this is not something that shows up immediately on the production floor. It is typically identified later—through routine emissions tracking, annual reporting, or during an inspection when regulators review records and compare them against permit conditions.

Depending on the extent of the change, the outcome can range from updating calculations and documentation to potential permit modifications, and in some cases, notices of violation or penalties.

From an operational standpoint, nothing had changed. From a regulatory standpoint, the facility's compliance position had shifted.

The above scenario is common, and it highlights where most compliance risk actually happens.

Compliance Is Driven by More Than Equipment

Environmental compliance in print operations is often thought of in terms of equipment—presses and pollution control systems. In practice, it's driven just as much by interactions among materials, production levels, and how emissions are calculated and tracked.

Most air programs in printing are mass-balance driven. That means:

- Emissions are calculated based on material usage × VOC/HAP content
- Adjusted by capture efficiency and control device performance

In many ways, this approach is similar to a chain-of-custody model used in sustainability programs—tracking inputs through the process to quantify outputs. It is a practical and scalable method, which is why it is widely used across the industry.

The benefit is that it provides operational flexibility. Printers can adjust materials, including incorporating more sustainable alternatives, without fundamentally changing equipment or creating separate production lines.

At the same time, that flexibility introduces complexity. Because emissions are tied directly to material inputs, even a small change in formulation can have a measurable impact on calculated emissions.

What makes this challenging is that these impacts are rarely visible on the production floor.

1. Material Substitutions and Emissions Calculations

This is where issues most commonly arise. Changes in inks, coatings, adhesives, fountain solutions, and cleaning solvents can directly impact:

- VOC content (and therefore total emissions)
- HAP speciation (which may trigger additional regulatory requirements)
- Vapor pressure (which can influence capture assumptions)
- Control device loading and efficiency assumptions

In many facilities, emissions are calculated based on material usage, VOC content, and assumed control efficiencies. When one of those inputs changes—even slightly—the resulting emissions profile can change as well.

Material substitutions are happening more frequently today due to supply chain pressures. What's often overlooked is that even a temporary substitution can affect emissions calculations, reporting, and permit limits if it's not evaluated in advance.

It's a subtle distinction, but an important one:

- Operations confirms that the product works.
- Compliance needs to determine how it impacts the facility's permit conditions.

That gap introduces compliance risk.

2. Understanding Potential-to-Emit (PTE)

One of the more common misconceptions is focusing solely on actual emissions.

Regulators, however, focus heavily on PTE—what the facility is capable of emitting under maximum operating conditions.

This is where it becomes more complex:

- A higher VOC content increases maximum emission potential, even if usage stays the same
- Increased production capacity or runtime increases allowable throughput assumptions
- Removing or loosening operational constraints can affect the enforceability of limits

Facilities operating under synthetic minor limits should be particularly mindful of this, as small changes can unintentionally impact the assumptions those limits are based on. In practice, these facilities rely on enforceable limits—such as material-use caps or operating restrictions—to keep emissions below major-source thresholds.

Over time, if those assumptions change, the limits may no longer provide the protection they were intended to.

3. Permit Conditions vs. How the Plant Actually Runs

Air permits are written based on how the facility was designed and expected to operate. This includes parameters such as material usage rates, VOC content limits, operating hours, and control efficiencies.

Over time, operations can drift from those assumptions For example:

- A new cleaning solvent has a higher VOC content than what was originally permitted
- Production increases beyond what was assumed in emissions calculations
- Process adjustments are made without updating supporting documentation

Individually, these changes may seem minor. Collectively, they can put a facility outside the bounds of its permit conditions.

A common pattern is:

- The permit assumes one set of materials and usage rates
- The plant gradually shifts to a different set of materials and usage patterns
- Emissions are still being tracked—but not always against the original assumptions

That's where facilities can find themselves technically out of compliance without realizing it.

4. Recordkeeping Isn't Just Administrative

It's easy to view recordkeeping as a paperwork exercise. In reality, it's the foundation of compliance.

Facilities are typically required to maintain:

- VOC and HAP usage records
- Monthly and rolling emissions calculations
- Control device monitoring data
- Hazardous waste documentation

These records demonstrate compliance during inspections. When documentation doesn't align with actual operations, it can create issues—even if emissions are within allowable limits.

5. Supply Chain Impacts on Compliance

Supply chain challenges have made material substitutions more common across the industry.

That introduces a few practical considerations:

- Changes in VOC or HAP content
- New chemical constituents that affect reporting thresholds
- Different waste characteristics or classifications
- Updated handling and storage requirements

Even short-term changes can have longer-term compliance implications if they're not evaluated and documented.

Why This Matters More Today

Environmental compliance is becoming more data-driven and more closely scrutinized.

At the same time:

- Facilities are making more frequent operational adjustments
- Material variability has increased
- Reporting expectations continue to evolve

It's also important to remember that compliance responsibility ultimately rests with the facility—not the supplier—regardless of where materials originate.

A More Practical Approach to Managing Compliance

Facilities that manage this well tend to treat compliance as part of their operational decision-making—not something that happens after the fact.

What separates them is not more effort, but better integration.

A few practices that consistently make a difference include:

- **Integrated environmental review into change management.** Material substitutions, process adjustments, and production changes should trigger a simple environmental check before implementation. This does not need to be complex—but it should be consistent. Even a quick review of VOC/HAP content against permit assumptions can prevent downstream issues.

- **Align operational data with emissions tracking.** In many facilities, production data and environmental data are tracked separately. Bridging that gap—so material usage, throughput, and emissions calculations are aligned—provides much better visibility into compliance status and reduces the risk of disconnects.

- **Keep permit assumptions visible to operations.** Permits are often maintained by environmental staff but not fully understood by production teams. Facilities that perform well make key assumptions—such as material limits, operating constraints, and control requirements—visible and understandable to the people making day-to-day decisions.

- **Establish a material review and approval process.** Given the frequency of supply chain-driven substitutions, leading facilities implement a basic review workflow for new or replacement materials. This includes evaluating VOC/HAP content, potential reporting implications, and any impact on existing permits before the material is introduced into production.

- **Involve environmental expertise early—not after the fact.** One of the most common patterns is bringing in environmental review after a change has already been made. Shifting that involvement earlier in the process—whether through internal staff or external support—helps identify issues while they are still easy to address.

- **Periodically recalibrate assumptions.** Over time, small changes accumulate. Facilities that step back periodically to compare current operations with permit assumptions and emissions calculations are better positioned to catch misalignments before they become compliance issues.

As a practical best practice, many facilities perform a monthly check that ties chemical consumption and production data directly to emissions calculations. This provides an early indication of whether emissions are trending toward permit limits or PTE thresholds, allowing adjustments to be made before compliance risks develop.

Final Thought

Environmental compliance in print operations isn't static—it evolves with materials, processes, and production demands.

The facilities that manage changes effectively aren't necessarily doing more; they are paying closer attention to how small operational decisions connect to regulatory requirements.

There also is a clear business case for maintaining that alignment. When compliance gaps go unaddressed, the consequences can extend beyond internal corrections. Notices of Violation (NOVs), consent orders, and enforcement actions can introduce unplanned costs, disrupt operations, and, in some cases, become public, creating potential brand and reputational risks.

In today's environment, those small operational decisions—and the attention given to them—can make a meaningful difference.

ABOUT THE AUTHOR

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