# Overview on Regulatory Status of Halogenated Solvent Cleaners

Several solvents used in parts-cleaning operations — such as methylene chloride (MEC), perchloroethylene (perc), and trichloroethylene (TCE), and n-propyl bromide (nPB) — are all filed under "Risk Evaluation" by the U.S. EPA under the Toxic Substances Control Act (TSCA).

While some manufacturing facilities continue using nPB for vapor degreasing in parts-cleaning operations, time may be running out for the use of those solvents as regulators at the federal and state level are beginning to look at banning or severely limiting those solvents' uses. The EPA announced in 2016 that 10 chemicals — including methylene chloride, perc, TCE, and nPB — would undergo "Risk Evaluations," the second step in EPA's existing chemical process under TSCA.

The purpose of the evaluation is to determine whether a chemical substance presents an unreasonable risk to health or the environment under the conditions of use. As part of this process, EPA must evaluate both hazards and exposure, exclude consideration of costs or other non-risk factors, use scientific information and approaches in a manner that is consistent with the requirements in TSCA for the best available science, and ensure that decisions are based on the weight of scientific evidence.

- **Methylene Chloride**: the EPA released the final risk evaluation in June 2020 and found unreasonable risks to human health in 47 out of 53 conditions of uses.
- **Perchloroethylene**: this was also evaluated in June 2020, and the EPA found that there are unreasonable risks to workers, occupational non-users, consumers, and bystanders for 59 conditions of use.
- **TCE**: the EPA completed the final risk evaluation in November 2020 and found unreasonable risks to workers, occupational non-users, consumers, and bystanders for 52 out of 54 conditions of use.
- **nPB**: also known as 1-bromopropane (1-BP), it had its final risk evaluation completed by the EPA in August 2020; this evaluation identified unreasonable risks in 16 out of 25 conditions. Further EPA updates include a pending proposal to set the existing chemical exposure limits (ECEL) to 0.05 ppm, expected by August 2021.

The next step in the process required by TSCA is addressing the risks of these solvents. EPA will develop ways to address the unreasonable risks identified and has up to one year to propose and take public comments on any risk management actions.
However, some states are taking it upon themselves to take action now. In 2020, Minnesota passed a law banning TCE after June 1, 2022, the first state to do so. Other states are also issuing regulations affecting the content limits of volatile organic compounds (VOCs) for solvent cleaners and degreasers:

- **California**: the South Coast Air Quality Management District (SCAQMD) reduced VOC content limits for solvents used in degreasing to 25 grams/liter; however, certain applications are afforded a higher limit.
- **Illinois**: specifies that solvent vapor pressure must be less than 15 mmHg or 0.3 psi measured at 38°C under certain conditions and other operational requirements.
- **Massachusetts:** for degreasing, solvents must have vapor pressure that does not exceed 1.0 mm Hg measured at 20/°C, and the enclosure must have a VOC control efficiency of at least 90%.
- **Michigan:** regulates VOC emissions on a quantity-per-hour basis and emission limits for existing automobile and light-duty truck coating line categories. For the prime-electrodeposition process, it is 1.2 pounds of VOC per gallon of coating, minus water, as applied. For primer surface and topcoat, it is 14.9 each.
- **Ohio:** the Ohio Administrative Code (OAC) Chapter 3745 includes sections on VOC, https://codes.ohio.gov/ohio-administrative-code/rule-3745-21-23
- **Texas**: control requirements are set at 0.42 pounds of VOC per gallon of solution, with the partial vapor pressure of the cleaning solution at 8.0 mm of mercury at 20°C.
- **Connecticut, Delaware, the District of Columbia, Maine, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia**: adopted Ozone Transport Commission (OTC) rules that specify that solvents used in degreasing processes cannot have a vapor pressure of 1.0 mm of mercury (mm Hg) or greater, measured at 20°C.

## Part 2: Options to Meet Future Parts-Cleaning Needs Regulations

The decisions by the EPA, states, and local communities on further restrictions for halogenated solvent cleaners will have a profound impact on how facilities currently utilizing solvents such as nPB can continue to clean parts to meet stringent requirements.
There are two paths that facilities generally take to ensure they will be in compliance with current and future restrictions on the use of nPB: using different cleaning chemistry or using different cleaning equipment.
**Chemistry Conversion**: this entails converting your cleaning system to take advantage of newer solvent-based degreasing systems that provide both efficiency and cost improvements as well as other benefits. These benefits include:

- Significantly higher cleaning efficiency
- Non-flammability
- Faster drying
- Smaller equipment footprint
- Lower operating cost
- Self-cleaning

**Equipment Conversion**: those facilities that use an open-top vapor degreaser (OTVD) will need to evaluate engineering controls to determine how best to meet current and future regulations. This should include modifications to current equipment or investing in newer closed-loop equipment with better control technology.
For existing open-top vapor degreasers, modifications are recommended to limit vapors from escaping the machine. This can include additional freeboard, additional cooling coils, heated vapor zones or automatic closing covers, or programmable hoists.

- Closed loop or vacuum degreasing systems are completely sealed and do not have an open solvent/air interface. Parts are placed into the machine, and once closed, the solvent is introduced in a closed cabinet.
- Airless or vacuum degreasers effectively shield the operator from the solvent and any emissive vapors.
- Vacuum degreasers allow for the use of several different chemicals, including halogenated solvents, combustible modified alcohols, and azeotropic mixtures.

## Part 3: Considerations When Deciding Chemical Management Actions

Before deciding whether to change your parts-cleaning chemistry or equipment in order to comply with possible nPB regulatory changes, there are several considerations.
A facility should examine these pertinent considerations before making a decision on what action plan to undertake when it comes to chemical management:

- **Company Policies**: first among the list of considerations is checking whether your organization has policies and procedures already in place that cover using "Chemicals of Concern" as specified by the Toxic Substances Control Act (TSCA). Some companies have adopted "Chemical Prioritization Protocols" to systematically evaluate and potentially eliminate chemicals of concern, so a review of your organization's policies will help you know where to start.
- **Future-Proofing**: as new regulations for nPB continues to emerge, a "wait and see" approach may not be an option. For instance, if your site is investing in new equipment, it may be a good time to find equipment solutions that move away from nPB. Consider what the right decision will be for your company to ensure nPB compliance for years to come.
- **Threshold Limit Value (TLV) vs. Process Needs**: when TLVs are eventually set on nPB and other cleaning chemistries, will you be able to sufficiently clean parts to meet your needs as well as your customers' quality expectations?
- **True Costs**: chemistries are just a small part of the overall cost of sustainable cleaning. Consider the direct and indirect costs of converting chemistries or equipment and waste treatment and how those will affect overall budgets and quality standards.
- **Global Manufacturing**: another important consideration is ensuring that your operations can perform the same consistent and high-quality parts-cleaning operations throughout an organization's global operations based on regional regulatory restrictions. For instance, companies that operate in a country where nPB is banned may choose to eliminate it at sites worldwide.
- **Equipment**: ensure that the equipment you choose whether it is an open- or closed-loop system, will be able to meet and exceed requirements in future parts-cleaning operations.
- **Scalability**: is your organization poised to grow? While you may be able to operate within compliance limits now, will that still hold true if the production scale meets future growth objectives?
- **Stabilization**: your system may need to utilize stabilizers to reliably prevent problems with organic acids or sulfur compounds from happening in your system.

In regard to stabilization, since vapor degreasing is a closed system where solvents are heated and then condensed to clean parts, contaminants such as oil, grease, and emulsions are removed from the parts, and that may have a negative effect on the machine's bath life. As is the case with all distillable cleaning agents, there is the possibility that the acid content of the medium may increase, which can lead to corrosion and process challenges.

Stabilizers are an excellent way to combat this from occurring as they alleviate many of the organic acids and sulfur compounds that can arise from the vapor process. The non-contact stabilizers are added to the machine's steam generator, instead of being added onto parts, and take effect in the areas where potentially harmful substances could develop. As the stabilizer remains in the distillation residue and counteracts the development of acids and sulfur there, it does not come into contact with critical components of the cleaning machine. More importantly, the stabilizers can also help to extend the service life of components in the system that are delicate, such as seals, shut-off slides, valves, and copper cooling units.

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