

Summary of Solvent Substitution Information

Overview of Solvent Use and Substitution

Solvents are chemicals used to dissolve other substances. At industrial facilities, this means solvents are often used as cleaners, degreasers, reaction media, extraction aids, and ingredients in products. However, exposure to solvent chemicals released into the air, water, and land has the potential to harm humans and the environment. The best way to prevent these chemicals from entering the environment is to eliminate or reduce their use in facility operations—a process known as source reduction.

[Learn about the benefits of source reduction.](#)

Substituting a solvent with a less hazardous alternative is one approach to source reduction. Identifying suitable substitutions requires a holistic evaluation of the process(es) in question, including material inputs, energy requirements, and necessary solvent properties. The hazard profiles of potential replacement solvents must be well characterized to avoid replacing one hazardous solvent with another that is just as harmful or worse. Additionally, efficacy, cost, government regulations, and product standards may be important factors for solvent substitution. Learn more in the solvent substitution resources listed below.

Quick Stats

- Facilities in 16 industry sectors reported **391** comments about specific solvent substitutions from 2005-2020
- Comments cover **116** distinct solvent substitutions for TRI-listed chemicals
- Substitutions are typically associated with modifications to cleaning or coating materials

TRI Pollution Prevention Data Analysis

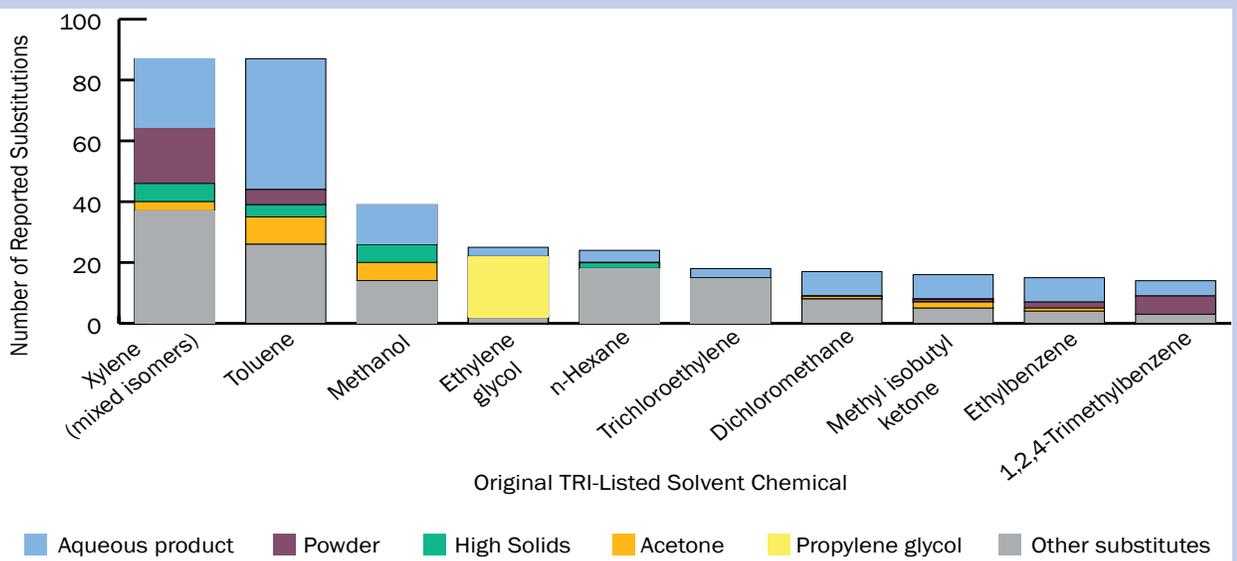
The Toxics Release Inventory (TRI) includes several chemicals commonly used as solvents. Each year, facilities subject to TRI requirements must report any newly implemented pollution prevention activities and may provide optional comments describing efforts to reduce the use of TRI chemicals. Between 2005 and 2020, facilities submitted 1,926 comments related to substitutions of TRI-listed solvent chemicals. A subset of 391 comments describe specific substitutions (e.g., name the alternative chemical or process), reported by facilities in 16 industry sectors. These comments represent 116 distinct substitution combinations for TRI-listed solvent chemicals.

The reported solvent substitution comments are mainly associated with modifications to cleaning or coating materials and processes. Facilities most commonly replaced xylene (mixed isomers), toluene, and methanol. The most common substitutes were aqueous products and powder coatings, followed by high solids. Based on comments with specific substitutions, the chart below shows the top 10 TRI-listed solvent chemicals and the top five substitutes.

Top Reported TRI Solvent Chemicals and their Substitutes

Original TRI-Listed Solvent Chemical refers to the starting chemical replaced which is often the TRI chemical on the Form R.

While most reported substitutes are not on the TRI list, some facilities transition from one TRI-listed chemical to another (e.g., from xylene (mixed isomers) to o-xylene).





Examples of Solvent Substitutions Reported by Facilities

Below are examples of optional comments describing solvent substitutions. This information provides insight into how businesses are transitioning to other chemicals and processes. In general, facilities report substituting for chemicals not on the TRI list.

- [A motor vehicle body manufacturer in Indiana](#) reduced toluene releases by replacing a toluene-based purge solvent used in paint processes with one that is primarily acetone and isopropyl alcohol.
- [A fabricated structural metal manufacturing facility in Michigan](#) stopped spray painting and instead switched to powder coating of some products, which eliminated xylene.
- [A commercial lithographic printer in Maine](#) eliminated methanol by converting from methanol- to acetone-based ink for catalog address labeling.

Note that EPA does not conduct comparative toxicity assessments of substitutions reported to TRI. To learn about other limitations of TRI, refer to [Factors to Consider When Using TRI](#).

Inventory of Specific Chemical Substitutions

The chemicals sector submitted the most solvent substitution comments, followed by metal manufacturing and fabrication and transportation equipment sectors. The table below summarizes the reported substitutes for TRI-listed chemicals by industry sectors, covering most of EPA's National Emphasis Areas.

Sector	Summary	Most Common Original TRI-Listed Solvent Chemical	Most Common Substitutes
Chemicals, 325	79 specific comments 13 TRI original solvents 24 substitutes	Toluene	Aqueous product, Xylene (mixed isomers), Acetone
		Xylene (mixed isomers)	Aqueous product, Toluene, o-Xylene
		Methanol	Isopropanol, High solids, Aqueous product, Ethanol
Metal Manufacturing and Fabrication, 331 and 332	61 specific comments 15 TRI original solvents 14 substitutes	Xylene (mixed isomers)	Powder, Acetone
		Toluene	Aqueous product, Powder
		Trichloroethylene	1-Bromopropane, Aqueous product
Transportation Equipment, 336*	49 specific comments 14 TRI original solvents 16 substitutes	Xylene (mixed isomers)	o-Xylene, Aqueous product
		Toluene	Acetone, Aqueous product
		Tetrachloroethylene	p-Chlorobenzotrifluoride
Other Sectors**	202 specific comments 18 TRI original solvents 34 substitutes	Toluene	Aqueous product, Ethyl acetate
		Xylene (mixed isomers)	Aqueous product, Powder
		Methanol	Aqueous product, High solids

*Transportation Equipment includes Automotive Manufacturing (3361-3363) and Aerospace Product and Parts Manufacturing (3364).

** Other Sectors includes other TRI sectors, including the Food and Beverage Manufacturing National Emphasis Area (311 and 312).

Solvent Substitution Resources

There are numerous resources available to help identify substitutes for hazardous solvents.

- [Solvent Selection Guide](#) from the American Chemical Society's Green Chemistry Institute
- [CHEM 21 selection guide](#) from the Innovative Medicine Initiative

To explore the solvent substitution data compiled over the last 15 years, visit [TRI's Solvent Substitution webpage](#). You can filter by TRI chemical, substitute, or industry sector, or you can export all available data.



To access all TRI P2 information, refer to the [TRI P2 Search Tool](#)