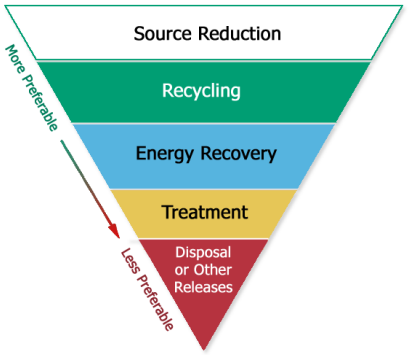
# Management of TRI Chemicals

In addition to collecting information on the disposal or other releases of chemicals to the environment, TRI collects information on the quantities of toxic chemicals in waste that are recycled, combusted for energy recovery, and treated for destruction, whether on– or off-site. This production-related waste managed includes the total amounts of toxic chemicals in waste managed by facilities, giving a more complete picture of what happens to chemical wastes at facilities, rather than focusing only on their final disposition.

Looking at production-related waste managed over time helps track industry progress in reducing waste generation and in moving towards safer waste management methods. For example, EPA encourages facilities to first eliminate waste at its source. However, for waste that is generated, the preferred management methods are recycling, followed by burning for energy recovery, treating, and, as a last resort, disposing of or otherwise releasing the waste. The goal is that, when possible, waste management techniques will shift over time from disposal or other releases toward the preferred techniques in the waste management hierarchy. These waste management priorities are illustrated in the waste management hierarchy (Figure 14) established by the Pollution Prevention Act of 1990.

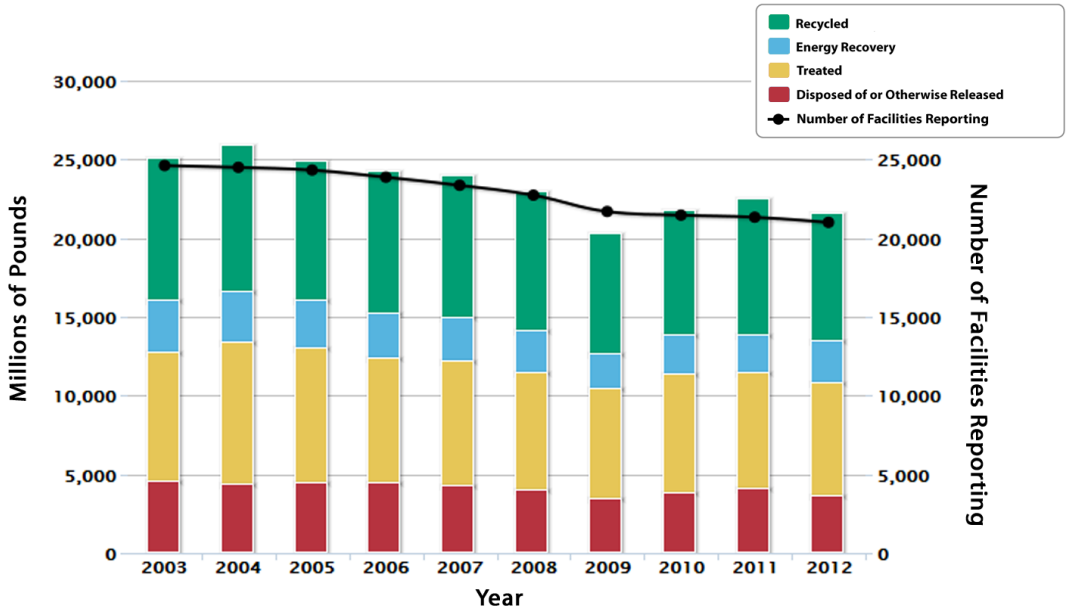
**Figure 14. Waste Management Hierarchy**




As shown in Figure 15, from 2003 to 2012, production-related waste managed by TRI facilities declined by 14% (more than 3.5 billion pounds) to 23.52 billion pounds, with decreases occurring for every waste management method:

- recycling decreased by 11%
- combustion for energy recovery decreased by 19%
- treatment decreased by 11% and
- disposal and other releases decreased by 21%.

**Figure 15. Production-Related Waste Managed, 2003-2012**



As with disposal or other releases, production-related waste managed can increase or decrease due to factors like changes in operations at facilities that alter the chemicals they use, the adoption of pollution prevention activities, or changes in business activity.

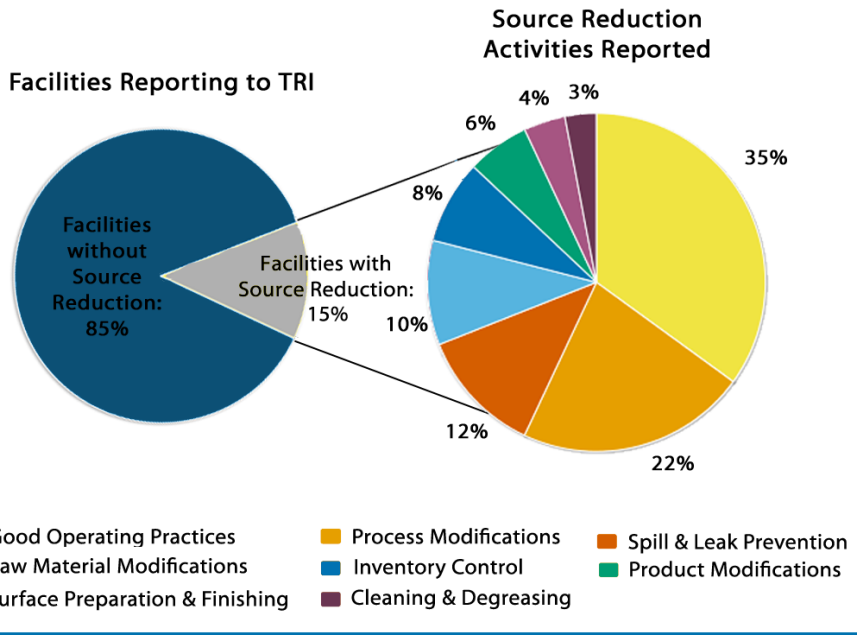
## What is source reduction?

Source reduction includes activities that eliminate or reduce the generation of chemical waste.

The adoption of pollution prevention activities can help eliminate waste at the source. Progress in implementing these activities can be tracked, in part, through the source reduction practices that are reported to TRI. The term "source reduction" generally refers to any practice that reduces the total quantity of chemical waste generated at the source. TRI facilities report newly implemented* source reduction activities each year. Examples of these include: good operating practices (e.g., improving maintenance scheduling), process modifications (e.g., instituting re-circulation within a process), and raw materials modifications (e.g., increasing the purity of raw materials).

In 2012, a total of 3,152 facilities (15% of all TRI facilities) reported initiating 10,250 source reduction activities. Good operating practices, process modifications, and spill and leak prevention were the types of activities reported most frequently, as shown in Figure 16. For 2012, EPA added six new types of source reduction activities as options to the TRI form that are more closely aligned with green chemistry practices. These additional "green chemistry" source reduction activities were added within the existing categories and accounted for 4% of all source reduction activities reported in 2012, and fell into the good operating practices and raw material, process and product modifications categories featured in Figure 16.

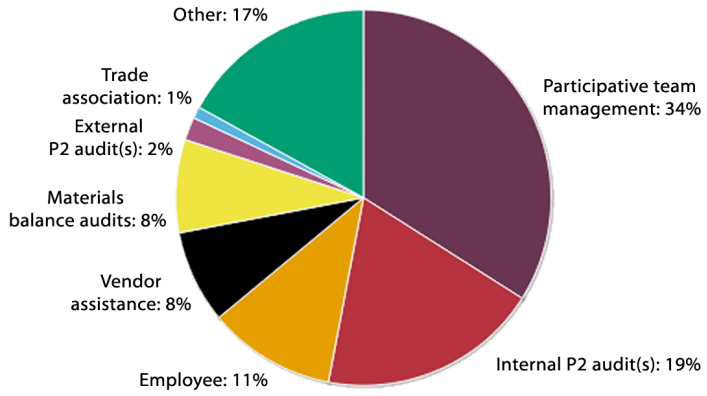
**Figure 16. Newly Implemented* Source Reduction Practices, 2012**




* Facilities may have ongoing source reduction activities initiated in previous years that are not captured in the graphs in this document. To find data on previously implemented source reduction activities see the TRI Pollution Prevention Website (www2.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri).

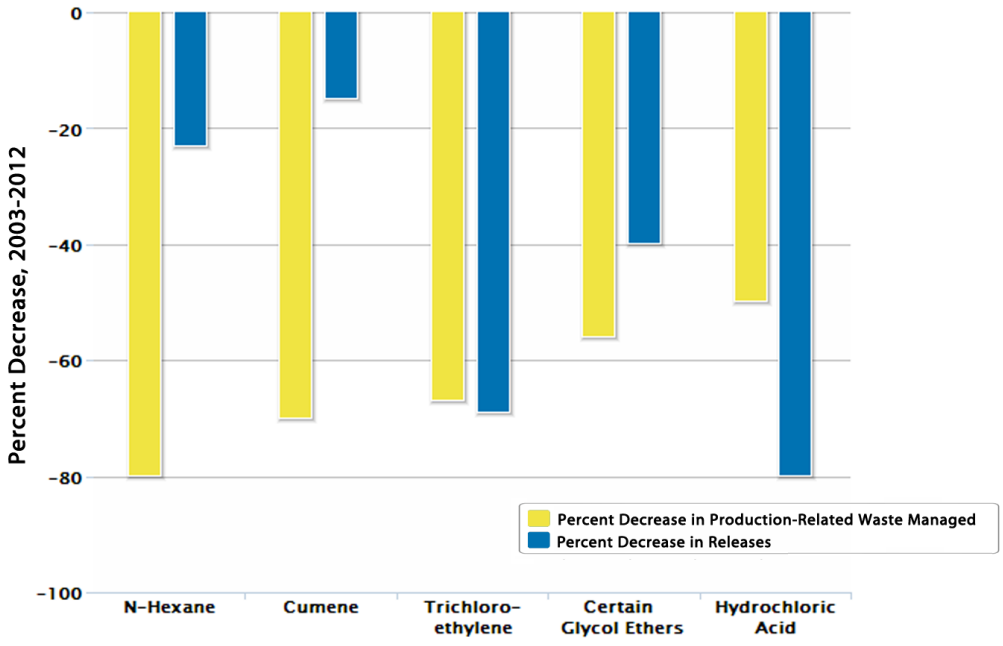
For each of the source reduction activities, facilities also provide information about how they identified the opportunity for source reduction. Facilities most commonly identified these opportunities through participative team management (e.g., team training to identify process improvements) and internal audits (Figure 17).

**Figure 17. Methods to Identify Newly Implemented Source Reduction Activities, 2012**




For many chemicals, source reduction activities have contributed to substantial decreases in waste generation in recent years. The five chemicals with the greatest percent decrease in waste management quantities from 2003 to 2012 are displayed in Figure 18.* Although decreases in waste management quantities can be due to other factors, including changes in estimation methods and facility closures, source reduction appears to have played a significant role in limiting waste generation for these and many other toxic chemicals.

**Figure 18. Percent Change in Production-Related Waste Managed and Releases for Chemicals with Largest Decreases in Waste Managed, 2003-2012**

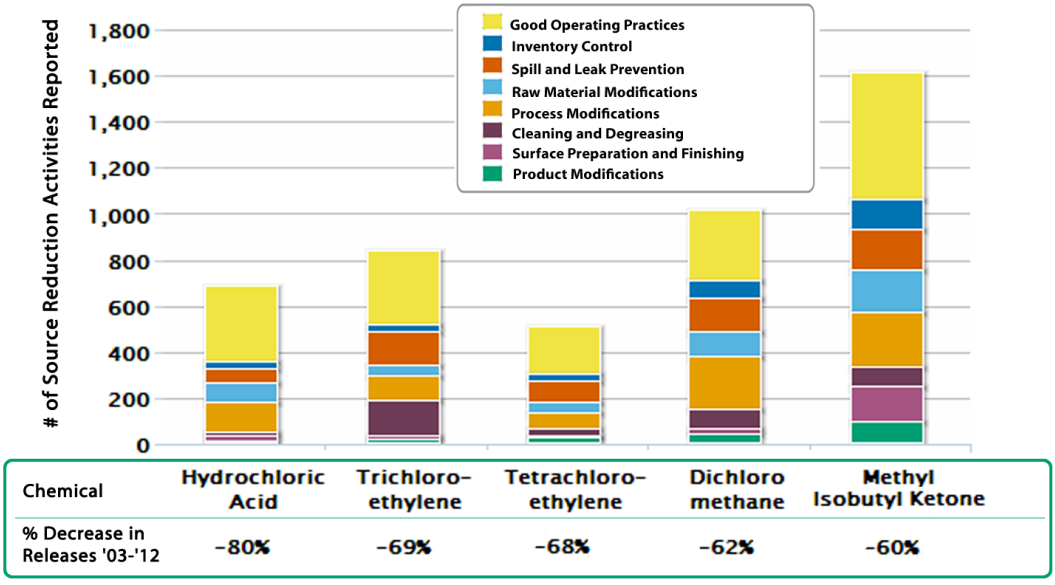



* Limited to chemicals with at least 25 forms reporting source reduction in 2012, and at least 100 total forms submitted in 2012.

In many cases, reducing the generation of waste at its source is an effective way to reduce the amount of the chemical that is ultimately released to the environment. For example, releases of trichloroethylene (a carcinogen that is released primarily to air) declined by 69% over the same period that total waste managed declined by 67%. In other instances, pollution is already being effectively controlled through methods such as treatment and recycling, so source reduction reduces the amount of the chemical being managed but does not significantly decrease the amount released to the environment. Cumene, for example, is managed almost exclusively through recycling and treatment at TRI facilities, with less than 0.5% of the waste released, so decreases in cumene waste do not necessarily correlate with reductions in releases.

Figure 19 shows the newly implemented source reduction activities reported from 2003 through 2012 for chemicals with the greatest percent decrease in releases over this time period.* Trichloroethylene, tetrachloroethylene, dichloromethane, and methyl isobutyl ketone are all industrial solvents, while releases of hydrochloric acid (which is only reportable in aerosol form) are most commonly a byproduct of fuel combustion. All five chemicals are primarily released to air. As shown in the figure, the type of source reduction activity implemented varies depending on the chemical's use in industrial operations and the chemical's characteristics. For example, cleaning and degreasing activities, like changing to aqueous cleaners, are more commonly implemented for trichloroethylene, while process modifications, like instituting re-circulation within a process, are more commonly implemented for dichloromethane.

**Figure 19. Number of Newly Implemented Source Reduction Activities for Top Chemicals by Percent Decrease in Releases, 2003-2012**




| Chemical | Hydrochloric Acid | Trichloro-ethylene | Tetrachloro-ethylene | Dichloro methane | Methyl Isobutyl Ketone |
|---|---|---|---|---|---|
| % Decrease in Releases '03-'12 | -80% | -69% | -68% | -62% | -60% |

* Limited to chemicals with at least 25 forms reporting source reduction in 2012, and at least 100 total forms submitted in 2012.

Facilities may also report additional details to TRI about their source reduction, recycling, or pollution control activities. For the chemicals profiled in Figure 19, examples of additional pollution prevention-related information reported are shown below with a link to each facility's pollution prevention report in Envirofacts.

## Source Reduction Activities

The type of source reduction activity implemented for each chemical depends on how the chemical is used in industrial operations and the chemical's characteristics.

- **Hydrochloric Acid:** A facility in the food and beverage sector reduced its use of coal for generating steam and relied more on its natural gas boiler instead. This change corresponded with a 30% decrease in the generation of hydrochloric acid aerosols from 2011 to 2012 and reduced greenhouse gas emissions even though production increased. [facility details]
- **Trichloroethylene:** To reduce the amount of solvent used, the production team at a plastics facility modified the facility's process to allow for an additional cycle of trichloroethylene distillation and use prior to disposal. The change was made in 2011, and from 2010 to 2012, the facility's trichloroethylene releases declined by 71%. [facility details]
- **Tetrachloroethylene:** An aircraft manufacturer substituted an alkaline cleaning process for some of its tetrachloroethylene degreasing in 2011. Its tetrachloroethylene releases and production-related waste managed declined by about 30% from 2010 (prior to the change) to 2012, even though production increased by more than 30% during this time period. [facility details]
- **Dichloromethane:** Based on an employee recommendation, a fabricated metals facility decommissioned its dichloromethane degreaser in 2012 after purchasing a new parts washer that uses hydrocarbons. This change will entirely eliminate the facility's use of dichloromethane. [facility details]
- **Methyl Isobutyl Ketone:** In 2012, a commercial printer added a more efficient and automated solvent still to improve its recovery of solvents and also installed a more efficient printing press. From 2011 to 2012, the facility reduced its methyl isobutyl ketone waste by 20% while production increased by 15%. [facility details]

You can view all reported pollution prevention activities and compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.