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On-Site Solvent Recycling Equipment

Solvent use is a major contributor to air and water pollution, and is a leading source of hazardous waste. By recycling your waste solvent on-site you may be able to save raw material costs and reduce waste disposal costs and your environmental regulatory requirements.

But first, see if you can eliminate or reduce your solvent usage. You may be able to eliminate solvent usage by finding a solvent alternative. If you cannot eliminate solvents, see if there are ways to reduce how much you generate. This will not only reduce how much solvent you purchase and dispose of, but may allow you to purchase a smaller solvent recycling system.

This fact sheet outlines some of the issues you must consider before purchasing on-site solvent recycling equipment.

Can my waste solvents be recycled?

Not all solvents are readily recyclable. Some solvents are blends of two or more pure solvents and additives. Distillation could alter these solvents' composition and usefulness.

Contaminants in your spent solvent also may prevent recycling. Suspended solids affect the efficiency of the recycling equipment and limit which types of recycling units can be used.

How will I know whether my solvents can be recycled?

Before purchasing a recycling system, ask the equipment supplier to recycle a sample of your spent solvent. These tests results will help you determine whether the quality and quantity of the recycled solvent meet your requirements. You also can use this information to evaluate the amount and quality of still bottoms that will be produced.

Will the recycled solvent meet my quality specifications?

You must determine your solvent quality requirements. The quality of recycled solvent from a simple distillation unit is usually lower than that of your new solvent. Even if the recycled solvent's quality is lower than the new solvent's, it doesn't mean the recycled solvent can't be used for its original purpose or used where the recycled solvent's quality is acceptable.

Ask your supplier how to reformulate your solvent. Stabilizers and/or other additives may be required in order to make the recycled product usable.

What are the different types of solvent recycling equipment?

Distillation is the most common method of solvent recycling. However, if your solvent is contaminated with only solid particles, you may be able to filter them out or let them settle before pouring off the clean solvent to reuse it.

Are there different types of distillation equipment?

There are three types of distillation units: simple distillation units, fractional distillation units and thin film evaporators. The most common method is simple distillation. During simple distillation, solvent wastes are heated to the solvent's boiling point, driving off the solvent in vapor form. The solvent vapor is condensed back to a liquid and collected in a separate container. The remaining wastes, or still bottoms, are then removed and disposed of appropriately. Simple distillation units are run in batches.



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Fractional stills produce a higher purity of recycled product. Fractional stills have a reflux column between the boiling pot and the condenser that allows them to separate solvent blends into individual solvents. Fractional distillation units are generally more expensive to operate and are generally better suited to larger volumes. Fractional distillation units are usually batch units.

Thin film evaporators distill solvent by running a thin film of dirty solvent down a heated cylindrical vessel where it is vaporized. The vapors are collected and condensed back into liquid form. Thin film evaporators are generally suited for use in high-volume, continuous processes. Thin film evaporators work best when the dirty solvent has a low suspended solids content.

How are solvent vapors cooled?

The condenser may be cooled by circulating air, water or a chemical coolant or refrigerant. While air cooled condensers may be adequate for your still, they are not as effective as water-cooled condensers.

Why do some stills use a vacuum?

A still with a vacuum distills solvents at lower temperatures. Solvents with a high boiling point are typically distilled with vacuum units to reduce the fire and explo-

sive hazards associated with operating stills at high temperatures. Vacuum units are more costly to purchase and operate.

Can I mix my spent solvents?

Different spent solvents should be segregated whenever possible. If two wastes containing two solvents are distilled, a simple still may produce a solvent blend of the two. This blend may not be usable for the original purposes of the individual solvents. When pure solvent is the goal, it is best not to mix wastes.

What if my waste solvent has a lot of solids in it?

If your spent solvent's suspended solids content is high, additional distillation time will be required and additional still bottoms will be generated. For these solvents, you may want to first reduce the suspended solids content with simple filtration or simply let the solids settle before distillation. Alternatively, some "total recovery systems" use microwave units or other technologies that can more easily recycle spent solvents with suspended solids content. These normally would be difficult to distill.

Will my solvent deteriorate my still's components?

During distillation, water can mix with the spent solvent resulting in an acidic mixture that is corrosive to the still. Also, some solvents, 1,1,1-trichloroethane for example, can break down during distillation and become acidic. Under these conditions, stainless steel and Teflon fittings and gaskets should be used because they are corrosion resistant and will last longer than other materials.

Should I be concerned about cleaning the still?

Ease of still cleaning should be considered. Some still bottoms are difficult to remove. You can use still liners to facilitate cleaning the still and disposing still bottoms. Still cleaning can make up a significant portion of a still's operating costs.

Do I generate enough solvent to justify a still?

Stills come in a wide range of sizes and specifications. Batch stills can range from two to more than 55 gallons. They distill their capacity in six to eight hours. Continuous flowing stills range in distillation capacity and can distill as much as 500 gallons per hour. Smaller stills can run on electricity while larger stills may require a steam connection.

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Is it safe to distill my solvent?

Explosion or fire hazard conditions can be created when some materials are distilled. Some printing and painting solvent wastes, for example, contain nitrocellulose. This can pose a fire or explosion hazard if not distilled under strict conditions. Consult with the equipment manufacturer to see whether the still comes equipped with “nitrocellulose” or other explosion-proof components.

What safety features should I consider?

Consider the following safety features:

- explosive-proof electrical components — look for UL approved components;
- a pressure relief valve on the pot;
- automatic shutdown after a batch is finished;
- automatic shutdown when the boiling chamber’s temperature exceeds a threshold setting; and
- automatic shutdown if the water/coolant temperature in the condenser goes above a certain threshold temperature.

Safety regulations must be met when installing and operating a solvent recycling system. The Occupational Safety & Health Administration requirements for ventilation and employee safety must be followed. Local fire regulations also must be followed. Finally, notify your insurance carrier to determine how installing the equipment may affect your coverage.

What factors should I include when I conduct a cost-benefit analysis?

Several factors should be considered when reviewing the costs and benefits of a still. These factors include:

- the amount of solvent used;
- the cost of new solvent;
- the disposal costs of still bottoms or other wastes;
- usefulness of recycled solvent;
- the operating cost of the still (e.g., electricity, labor requirements and still liners); and
- the still’s installation costs, including the cost of the still.

Will I need air permits for a still?

You may be required to obtain an air permit-to-install (PTI) and an air permit-to-operate (PTO) for your solvent still. These permits will establish emission limits for volatile organic compounds (VOCs), recordkeeping requirements and reporting requirements.

There are, however, some exemptions from the air permitting requirements. For example, batch solvent recycling units that have a capacity of less than 20 gallons are exempt from air permitting requirements.

There also are other exemptions from air permitting for small air pollution sources (called “de minimis sources”). These sources are exempt if they emit very small amounts of air pollutants. Some solvent stills may be de minimis. This usually depends on the VOC content of the solvent and how much solvent is recycled each day.

Contact your local Ohio EPA district office, Division of Air Pollution Control. Small businesses can contact OCAPP at (800) 329-7518 for more information about air permits.

If I recycle my solvent, will it be regulated by the hazardous waste rules?

You must comply with the hazardous waste requirements if you accumulate hazardous waste spent solvent prior to the distillation process. This includes evaluation, storage, handling and transportation. However, the distillation process itself is exempt from regulation as a hazardous waste treatment process.

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How do I count the recycled solvent when determining my hazardous waste generator status?

You only count your spent hazardous waste solvent toward your generator status the first time it is generated each calendar month, no matter how many times the solvent becomes spent that month. However, once a new calendar month begins, the cycle starts over and you are required to count the solvent the first time it becomes spent during that calendar month.

Should I be concerned about the still bottoms?

Still bottoms generated from distillation units are generally hazardous wastes. If the spent solvent you generate is listed in the hazardous waste rules, the still bottoms generated from the distillation of this solvent also would be a listed hazardous waste. Still bottoms also may be hazardous wastes because they meet one of the four hazardous wastes characteristics (ignitability, corrosivity, reactivity and toxicity).

Hazardous waste still bottoms should not be counted toward your generator status the first time they are generated in a calendar month because they are counted with the spent solvent when it is counted the first time each month. However, any additional still bottoms generated during the rest of the month must be counted toward your generator status.

Is there any regulatory advantage to recycling my solvent?

The amount of hazardous waste you generate in a month determines your generator status. The more hazardous waste you generate, the more requirements with which you must comply. Therefore, using an on-site solvent distillation unit can reduce your hazardous waste requirements if recycling lowers your waste volumes enough to change your generator status.

Where can I get a list of solvent recycling equipment suppliers?

OCAPP maintains a partial list of manufacturers and distributors of on-site solvent recycling equipment.

www.epa.state.oh.us/ocapp/p2/solventeq.html

Inclusion on this list does not constitute endorsement by Ohio EPA. Before purchasing any on-site solvent recycling equipment, you are encouraged to understand and comply with all environmental requirements associated with installing and operating it.

Where can I get more help?

For additional help with eliminating or reducing your solvent usage, selecting solvent recycling equipment or other environmental regulatory issues, contact Ohio EPA's Office of Compliance Assistance and Pollution Prevention at (800) 329-7518 or (614) 644-3469.