



Solvent Recovery Systems

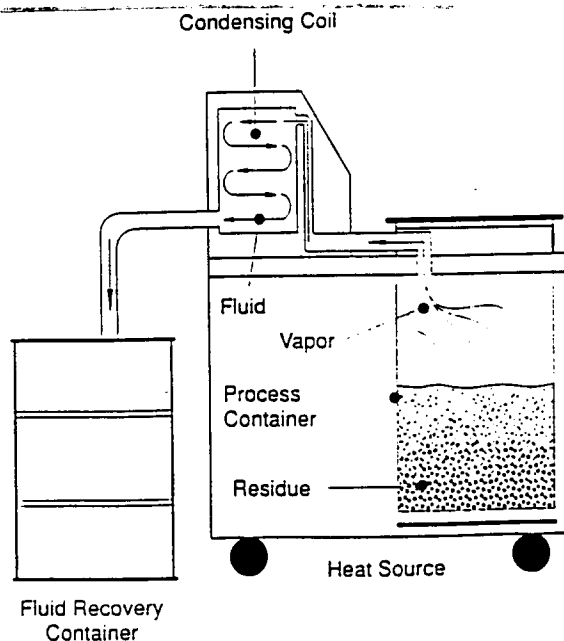
Advantages of Solvent Recovery

Companies throughout North Carolina and the rest of the country are realizing the benefits of solvent recovery not only from an environmental perspective but also from an economic standpoint. Solvent distillation systems reduce the need for raw materials because the recovered solvent can be reused in the production process as makeup or cleaning solvent. These systems provide a simple way for companies to recover spent liquid solvent thus reducing wastes and disposal costs.

Frequently Asked Questions

How do solvent recovery systems work ?

Distillation units operate on the principal of heating the waste fluids to the solvent boiling point and condensing the distilled clean vapor for reuse. The batch units consist of a boiling chamber, condenser, and reclaimed solvent collection container. Capacities of commercially available units range from 5 to 280 gallon batch sizes. These systems are easy to use and typically require the user simply to load the spent solvent into the boiling chamber and program the temperature setpoint and cycle time. The clean solvent emerges as the unit reaches temperature after approximately 1/2 to 1 hour and the batch will complete processing after about 6 to 8 hours.



*Drawing courtesy of
Solvent Kleene, Inc.
Peabody, MA*

Batch Distillation System

FACT SHEET

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What solvents can be recovered by these systems ?

Distillable solvents include paint lacquer and thinners, enamel reducers, alcohols, acetone, ketones, toluene, hexane, xylene, methanol, freon, and chlorinated solvents and most other solvents with a boiling point of up to 300-375 °F. Higher boiling point solvents can also be reclaimed safely using a vacuum assisted still which allows these solvents to boil off at lower temperatures.

Will the solvent be reusable in the original process ?

The composition of the reclaimed solvent is dependent on the mixture of waste liquids used as input into the systems. Solvent wastes should be kept separated by their common constituents to yield the best recovery efficiency because batch distillation systems cannot readily fractionate a mixture of waste fluids. Distillation of a blend of solvents might produce a product which may not be reusable in the original application. All compounds with a boiling point lower than the target solvent will evaporate and contaminate the distilled product whereas higher boiling point solvents will remain in the still bottom.

How efficient are these systems ? What do I do with the wastes?

Most companies have reported recovery efficiencies of 75-80% but higher efficiencies are possible. Only the remaining waste products in the still bottom need to be manifested and sent to a licensed hazardous waste facility. The reduction in waste products due to the distillation process reduces the cost of dealing with these waste solvents either through removal or through off-site solvent recovery.

How safe are these systems ? Do they require special enclosures?

The distillation system must meet all applicable fire and electrical codes and be explosion proof if you are recovering flammable solvents. The unit should be installed in a well ventilated area and in accordance with all local building codes. The local fire department, building inspector and insurance company should be consulted to verify that all requirements are met. If your paint, laquer, adhesive, or ink contain nitrocellulose, special precautions should be taken as it is explosive when dry and may not be suitable for recovery.

Commonly Recycled Solvents

Aliphatic

Mineral Spirits
Naphthas

Aromatics

Toluene
Xylene

Halogenated Hydrocarbons

Flurocarbons
Methylene Chloride
Perchloroethylene
Trichloroethylene
1,1,1 Trichloroethane

Alcohols

Isobutyl Alcohol
Isopropyl Alcohol
n-Butyl Alcohol
Methanol

Ketones

Acetone
Methyl Isobutyl Ketone
Methyl Ethyl Ketone

Esters

Ethyl Acetate

Economic Calculations

Several economic aspects need to be considered when selecting a solvent recovery system including: solvent usage, amount of waste solvent produced, cost of disposal of waste products, and capital and annual costs of a solvent distillation system. A simple payback calculation can be completed by considering the following factors:

Capital Investment	Comments	Costs (\$)
Unit Costs	10 gal/batch	6000
Shipping	estimated costs	200
Set-up/Training	installation and operator training	1200
Total (\$)		7400
Annual Operating Costs		
Labor	2 hrs/day @ \$8/hr	4600
Electricity	1.8kW*8hr/day@ \$.061/kWh	137
Maintenance	9 gal oil and gasket	320
Cooling Water	recirculated	0
Costs to dispose of still bottoms	7.5 gal/week @\$6.50/gal	2535
Total (\$/year)		7592
Annual Savings		
Waste solvent recovered	22.5 gal/week @ \$4.50/gal	5265
Waste disposal savings	30 gal/week @\$3.60/gal	5616
Total (\$/year)		10881
Payback Period		2.25 years

Note : Payback based on:

- 1) 75% recovery efficiency
- 2) generation rate of 30 gal/week and 3 batch/week frequency
- 4) solvent cost \$4.50/gal
- 5) still bottom disposal cost \$6.50/gal

Typical costs for units range from \$5000 to \$8000 for a 7 to 10 gallon unit or \$12000 to \$17000 for a 55 gallon unit not including shipping, setup or training fees. The payback period for these units vary with the factors discussed above. This table is provided as an example of a payback calculation and should be used only as a guideline when considering the cost/benefits associated with a solvent distillation system.

Vendor List

The following is a list of solvent recovery system vendors. This is not a complete listing and does not represent an endorsement by the state of North Carolina. Each supplier is responsible for ensuring compliance with the applicable safety and environmental regulations.

<u>Company</u>	<u>Units Available</u>
CB Mills (708)459-0007 Buffaloe Grove, IL	"Red Head Stills" 30,55,90,150,250 gallon capacities "Sidewinder" 5 gallon capacity
Chemical Management Technologies (904)276-3737 Orange Park, FL	"Chemmaster" 7.5,15,55 gallon capacities Atmospheric and vacuum distillation units available
Disti-Kleen, Inc. (201)372-1500 Irvington, NJ Local Rep: Ed Lancaster Ed Simal Assoc. (910)852-8686	Air cooled units available 3 and 15 gallon capacities Water cooled units 15 to 280 gallon capacities Atmospheric and vacuum distillation units available
Environmental Control Systems (502) 241-0433 LaGrange, KY	5, 15, 30, 55 gallon capacities available Atmospheric and vacuum distillation units available Local Rep.: Lee Manges, Archdale, NC
Finish Thompson, Inc. (814)455-4478 Erie, PA	3-5, 15, 55, 110 gallon capacities available Atmospheric and vacuum distillation units available
Interel Environmental Technologies (303)773-0753 Englewood, CO	"Barrel Distiller" 55 gallon capacity available Atmospheric and vacuum distillation units available
Solvent Kleene, Inc. (508)532-9304 Peabody, MA	8 and 55 gallon capacities Atmospheric and vacuum distillation units available
Solvent Recovery Systems 904)264-3651 Orange Park, FL	7,10,14,20,35,50,110 gallon capacities Atmospheric distillation units available
Waste Recovery Designed Products, Inc (412)257-3256 Bridgeville, PA	5 and 10 gallon capacities Atmospheric distillation units available
Westport Environmental Systems (800)343-9411 Westport, MA	5 and 15 gallon atmospheric distillation units available 15, 35, 55 gallon vacuum distillation units available

Case Studies

Presbyterian Hospital in Charlotte paid for their solvent distillation system in approximately 2 years through reduced solvent purchases and waste disposal costs. Xylene is used in the surgical pathology lab to process tissue specimens and to dewax slides. The pathology lab runs two batches a week to recover 6-7 gallons of xylene per batch. This practice has allowed them to reduce xylene purchases to 2 gallons per week from 12 gallons due to an estimated recovery efficiency of 75-80%. The economic benefits as well as the reduced liability associated with disposal of the spent solvent provided the rationale behind their decision to purchase an on-site solvent recovery system.

Sources

- 1) State of Ohio EPA. 1993. On-Site Solvent Recycling Equipment. Fact Sheet #9. January 1993.
- 2) State of Michigan, Department of Commerce and Natural Resources. 1991. Considerations in Selecting a Distillation Unit for On-Site Solvent Recycling. Office of Waste Reduction Services Fact Sheet #9005A. December 1991.
- 3) Minnesota Technical Assistance Program. 1991. Selecting a Still for On-Site Recycling. Fact Sheet #5/91-62. May 1991.