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Press Release

Choosing the Right Recycling Technology

Burnet, Texas - May 21, 2012 - Solvent recycling systems allow the re-use of cleaning and rinsing fluids for many more cycles than would otherwise be possible due to solvent loading or ingredient depletion. The term "closed loop cleaning" is often misunderstood and misused. It does not mean that waste is not generated. It does mean that the wash and or the rinse fluids are recycled and reused. Figure 1 shows a simple mass balance diagram of a cleaner with a recycling system. In this system the parts are cleaned and the soils end up in the recycling system as waste that must be dealt with.

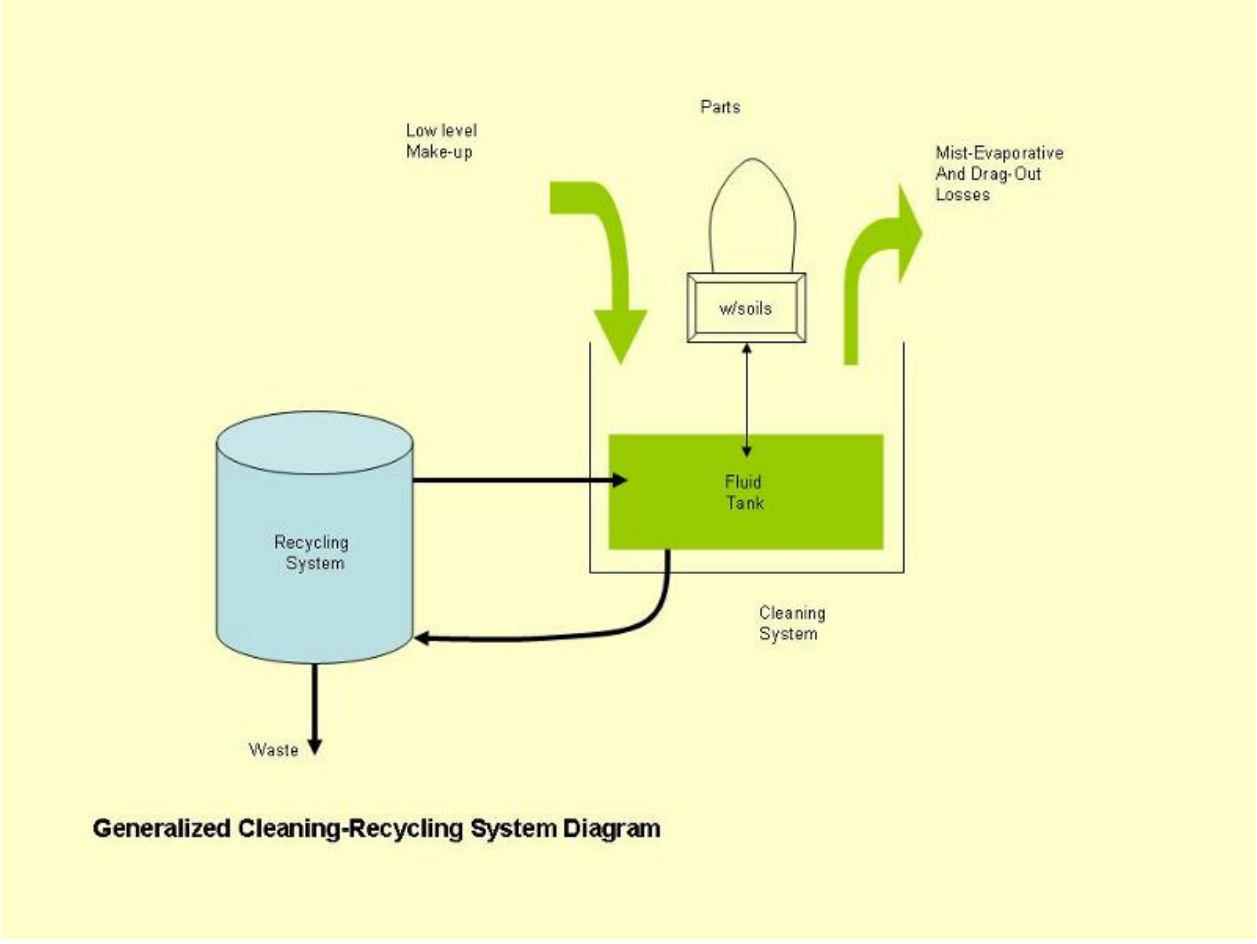

Figure 1; Mass balance diagram of a generalized cleaning process equipped with a solvent recycling system.

The recycling system should remove the soil at a rate sufficient to remove the peak soil loading rate expected in sustained production. Evaluate the impact of all potential soils other than flux residues such as temporary solder masks, uncured adhesives or raw solder paste. Remember what goes in must go somewhere. Consider the costs and the logistics required to properly handle waste streams created in any given recycling system. Figure 1 also identifies the low level make-up additions are needed to offset the fluid losses due to evaporation, misting and drag-out of fluids by the parts, baskets, and conveyors.

Key component replenishment strategies have been used for many years in the electronics industry to extend the aqueous wash baths in cleaners using a saponifier or other semi-aqueous washing fluids. Replenishment systems require some form of testing to determine the key ingredient concentration. Automatic monitoring and metering systems are available from most equipment suppliers and from some chemical suppliers. Using a key ingredient replacement strategy can extend the wash bath replacement frequency significantly and in theory could run in a steady state continuously if mass balance losses in the vent and drag-out to rinse are sufficient enough to strike a working equilibrium. Key component replenishment has also been used to maintain non-azeotropic components of degreasing fluids.

Recycling systems that remove soils from the cleaning fluids can be referred to as subtractive recycling as opposed to replenishment recycling mentioned above. This is the most popular choice for rinsing fluids and non-ionic washing solvents. There are many types of subtractive technologies including: distillation, filtration, precipitation, adsorption, ion exchange, and reverse osmosis. The subtractive recycling technologies fall into one of three basic categories based on the mechanism of removal as shown in table 2.

Recycle Method	Type	Used with	Waste stream	Waste disposal handler	System Complexity level	Safety concern
Chemical Addition	Additive Key Ingredient	1) Reactive Aqueous Mixtures (Saponifiers)	Soil Loaded Tank Dump	Company	Technician	Medium
Ion Exchange	Subtractive Adsorption	Rinse Water Alcohols Glycols Esters	Depleted DI Resins	Third Party	Operator	Low
Carbon Adsorption	Subtractive Adsorption	Rinse Water	Carbon Media with Organics	Third Party	Operator	Low
Zeolite Adsorption	Subtractive Adsorption	NPB CFCs HCFCs	Zeolite with Adsorbed Contaminate	Third Party	Operator	Low
Chelation	Subtractive Adsorption	Water with Heavy Metals	Chelation Media with Heavy Metals	Third Party	Operator	Low
Distillation	Subtractive Distillation	NPB CFCs HCFCs	Non Volatile Residues	Company	Technician	High
Filtration	Subtractive Filtration	All Fluids	Filters with Contaminate	Company	Technician	Medium
Reverse Osmosis	Subtractive Filtration	Rinse Water	Reject Fluid Stream	Company	Technician	Medium

Table 2: Comparison of fluid recycling methods

Absorptive methods involve pumping a fluid through media, typically in a tank or bed, to adsorb the soils and cleanse the cleaning fluids. The ionic purity of the fluid is usually monitored and controlled using electrical conductance or resistance. Organic loading can be monitored with COD test kits or with more practical standards such as color or process indicators such as foaming. Three types of media sets are available for absorptive removal; ion exchange resins (DI resins), granular activated carbon (GAC) and Zeolite. The major advantage to absorptive systems is that they are simple to use and the waste streams are typically handled by third party professionals. DI resins are used extensively throughout industry to generate DI water. Closed looped cleaning systems using DI beds for water purification should have dual GAC and DI beds if organics are present. Many polar organic solvents such as alcohols, esters and glycol ethers, can be purified with DI resins. Non-polar organic solvents such as n-propyl bromide (NPB) and chloroflorocarbons (CFCs) can be cleansed with zeolite adsorbers.

Distillation is the process in which the solvent is evaporated and the vapor is condensed leaving most of the contaminates behind in the boiling sump. Distillation is rarely used to recycle cleaning fluids because of safety concerns and compositional control of solvent blends. The one notable exception is the distillation of non-flammable, azeotropic cleaning fluids in all vapor degreasers. Vapor degreasing use has declined significantly since the early 1990's when most halogenated solvents used for vapor degreasing were restricted or banned from use as cleaning agents because of ozone depletion concerns. The distillation process is not 100% effective in removing soils as they may be volatile or carried over in liquid mist created in the boiling process. The waste residues generated in the distillation process are often messy and difficult to deal with in house.

Austin American Technology has pioneered both aqueous and solvent based recycling technology. Our patented MegaSolv ion adsorption chamber (IAC) trap and remove solvent impurities from solvents including; water, alcohols, di-esters, glycol ethers, halogenated hydrocarbons and mixtures thereof. In most cases, AAT recycling technology can reduce fluid consumption by 10X or greater. All AAT cleaning systems are now available with built in closed loop recycling of cleaning and rinsing fluids as a standard feature. Older cleaning systems can be retrofitted. Call AAT today to discuss how we can help you save money and the environment.

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