

# Voluntary Industry Commitment

## for the supply of Trichloroethylene in metal cleaning applications

### Factsheet on closed cleaning equipment technology

#### Introduction

The aim of this document is to provide an overview of existing cleaning equipment for the degreasing and cleaning of metals with solvents in relation to the European Standard EN 12921-4. At the same time, it endeavours to provide all necessary background information to facilitate the future transition from open to closed cleaning technology.

#### Closed cleaning equipment

These machines, which are designed specifically for the bulk treatment of small parts, operate a virtually closed loop with complete re-use of the solvent. A typical machine is shown in Figure 1, below. Such machines are usually equipped with a side entry/exit, together with protected loading/unloading zones. They are designed to wash the parts by flooding the cleaning chamber with liquid solvent and then by vapour degreasing in the same cleaning chamber.

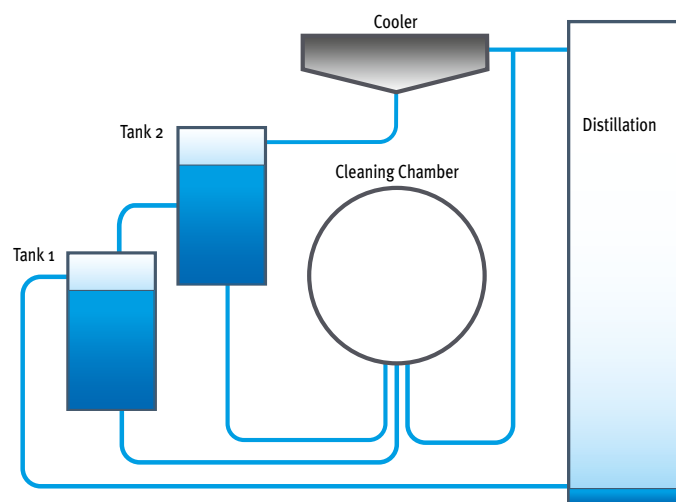


Figure 1: Scheme of closed cleaning equipment

#### Cleaning process description

1. Pre-washing – flooding of the cleaning chamber with solvent from tank 1.
2. Evacuation of the cleaning chamber and transfer of the solvent back to tank 1.
3. Cleaning/degreasing - either by spray or immersion from tank 2 (clean solvent tank) into the cleaning chamber. Cleaning power is improved by use of ultrasonics (optional).
4. Evacuation of the cleaning chamber and transfer of the solvent to the distillation unit.
5. Vapour cleaning - pure solvent vapour generated by the distillation unit is sent to the cleaning chamber and condenses on the cooler parts. Any residual oil film is completely removed.

6. Vacuum drying – by applying a vacuum to the cleaning chamber the evaporation of the solvent is accelerated.
7. Ventilation of the cleaning chamber to normal atmospheric conditions. The solvent concentration in the cleaning chamber is controlled, and the door opens only if the concentration is below the values specified by the VOC Directive.

As an option, the complete cleaning equipment can be operated under a vacuum. This enables distillation at lower temperatures and allows permanent control of the vapour emissions from the cleaning machine.

#### Vapour recovery and workplace safety

The vapour which is withdrawn from the cleaning chamber is condensed and returned to the clean solvent tank. In addition, the machines are typically equipped with reclaimable active carbon adsorption. The cleaning machines operate with virtually no emissions and thus respect the health and safety needs of workers.

#### Solvent recovery

The contaminated solvent is passed through fine strainers to remove particles. It is then distilled and returned to the clean solvent tank while the residue is removed from the machine. This process of internal solvent recovery enables a long lifetime for the solvent in the cleaning process, and reduces the amount of waste sent to external waste treatment companies. It is a modern and economical cleaning process combined with an active contribution to the protection of the environment and mankind.

#### Solvent consumption

The reduction of solvent consumption has been the subject of many studies. For example the Appendix to the 'Perchloroethylene Risk Assessment Report' prepared by the ECSA for the UK Environment Agency concerning the reduction of emissions of perchloroethylene according to the VOC Directive (1999/13/CE) (30 April 2001) states:

"In an open cleaning machine, an average use of 7.9 tonnes of product per year results in up to 5.8 tonnes of losses through emissions. The remaining 2.1 mt of solvent are collected as used solvent and are sent to specialised companies for waste treatment and recycling. For the same volume to be cleaned by a closed system, only 2.35 mt per year is used. Of these 2.35 mt, only 0.14 mt are emitted into the air. The remaining amount of solvent is collected as used solvent and is sent to specialist waste treatment companies and recycling companies to be processed."

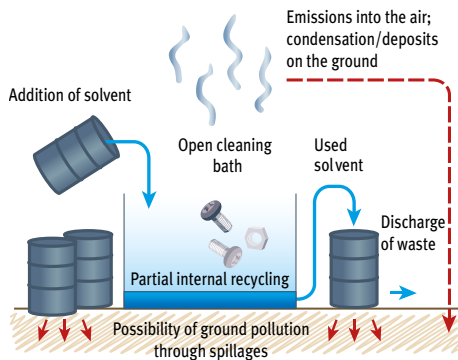
#### Ground and water protection

As a result of the product-specific risks of solvents, all machines are supplied in a retention basin in order to protect ground and water from contamination.

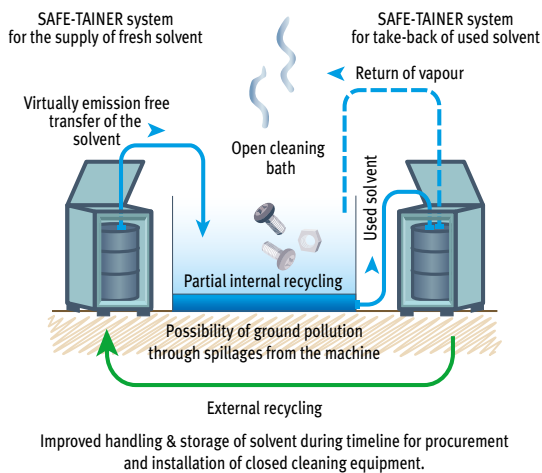
## Safety container systems

The safety container systems as offered by the leading suppliers of solvents in combination with closed cleaning equipment represent state-of-the-art technology for the safe handling, storage, delivery and return of solvents. In cooperation with Dow, SAFECHEM has developed a safety container system marketed under the brand name SAFE-TAINER™ system. This system includes two different, specially-designed double-walled containers. One is exclusively designated for the supply of fresh solvent and the other for the collection of used solvent. The used solvent is collected and sent for professional recycling – closing the loop. Leading original equipment manufacturers pre-equip their machines ready to use with safety container systems. Figure 2 shows potential areas of risk during the handling of solvents on site, which are addressed by the use of safety container systems in combination with closed cleaning equipment.

### Open system



### Open Machine Technology with SAFE-TAINER system



### Closed Machine Technology with SAFE-TAINER system

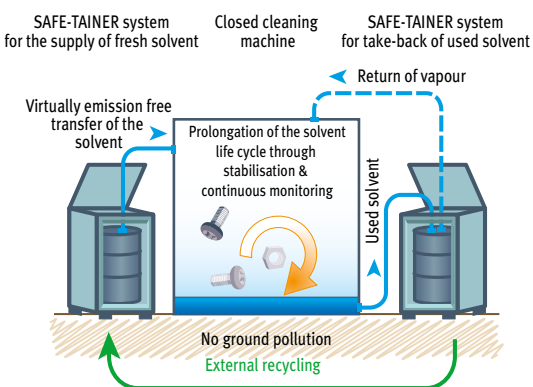


Figure 2

## Solvents

Chlorinated solvents and solvents based on modified alcohol are the first choice in the high-precision cleaning of industrial parts because of their outstanding solvency. Apart from cleaning power, they have important properties which lead to process engineering benefits - e.g. internal solvent recovery/recycling. Used in closed cleaning equipment, solvents continue to offer distinct advantages, particularly in terms of high-quality industrial cleaning combined with high throughput capacities.

### Advantage of solvents at a glance:

- They allow customers to maintain the highest levels of quality and remain competitive.
- They adopt best practice with virtually no emissions, protect the environment and comply with relevant regulations.
- SAFECHEM, as a house of cleaning solutions, provides a variety of branded chlorinated and non-chlorinated solvents from Dow, as well as related service elements and consultancy services.
- The use of MAXICHECK™ test kits for solvent monitoring and the re-stabilisation with MAXISTAB™ stabilisers increase the lifetime of the solvent used.
- Closed cleaning equipment with internal solvent recovery reduces the amount of waste sent to specialist waste treatment companies and recycling companies for processing.

### Original equipment manufacturer

Dow has successfully supplied the leading OEMs with chemical know-how, and assisted in their development of cleaning technology for over 40 years. In today's VOC-compliant, closed cleaning equipment, the quality of the solvent and continued maintenance of the product are of paramount importance. SAFECHEM Europe GmbH offers the supply of Dow branded solvents in the SAFE-TAINER™ System, as well as a variety of services for the safe and economic use of these products. On request, SAFECHEM specialists can arrange cleaning trials at OEM sites to determine the best technical and economical cleaning solution to meet the individual customer's needs.

If you would like to receive a list of OEMs in your area, please visit our website. [www.dow.com/safechem/contact/oem.htm](http://www.dow.com/safechem/contact/oem.htm)

### Conclusion

Quality cleaning requires the teamwork of all parties involved in the life cycle of the solvent. Therefore, SAFECHEM cooperates in a Service Alliance with service and customer-oriented distributors, leading manufacturers of cleaning equipment and certified waste management companies. SAFECHEM can therefore provide customers with advice and solutions from a single source regarding the safe and legally compliant cleaning process.



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