

Recycled solvent - the myth dispelled

Of course there are recycled products which do not meet the stringent requirements of modern day living

Here, of course, we are talking very generally

Some products are designed to be manufactured down to a price, others to perform up to a quality

Let's take a simple example; cars and motoring (bear with me) are very close to the hearts of many of us. But when choosing what is essentially the second most expensive investment that the majority of us will make do we actually consider the provenance of many of the materials used in the manufacture? In fact Ford utilises up to 25% recycled products in its new production whilst VW up to 40%. Across the board modern cars are now up to 95% recyclable - clearly an indication that the concept of recycling is not only here to stay but set to increase dramatically as resources diminish and environmental concerns rise to the top of the political agenda. In truth we are only concerned with the quality and performance of the finished product.

"But what has this to do cleaning and degreasing?" I hear many of you ask. Well, rather a lot I would venture to say. As well as offering consistently high performance in a robust process, solvent degreasing as a concept is all about recycling. Unlike water based cleaning where dirty water is drained during every wash cycle, the continued distillation (and therefore recycling) of solvent within a sealed machine and the removal of concentrated waste products on a regular basis makes the process fundamentally environmentally friendly. Of course here we are referring to modern plant where emissions are tightly controlled using

vacuum technology and not the traditional 'tank' type system even if fitted with enclosures and multiple lid configurations.

So why is there (at least in the UK) a degree of reticence when it comes to considering a recycled product to start with? Even a so called 'virgin' brand of solvent will be classified as recycled when it has completed even one wash cycle in a modern machine. In fact, whilst an aversion to recycled product has been largely manufactured by a culture of misunderstanding (even misinformation) concerning the attributes of such products, the fact remains that many operators are moving in this direction simply because of the inherent sustainability of supply and the favourable political and environmental accreditation which accompanies such forward thinking operations.

Whether synthesized from the high temperature chlorination of acetylene or dichloroethane as a virgin solvent species or produced from the waste stream of industrial processes the provenance of the feedstock is irrelevant. The principle issues are purity and stability. For instance, the major European producers generally offer degreasing grade perchloroethylene with a purity greater than 99.9% and an alkalinity stabilisation ratio of 15 - 20 ppm. Richard Geiss GmbH, the Europe-wide leader in the recycling of organic halogenated and non-halogenated solvents produces perchloroethylene with a purity greater than 99.98%.

As a subject of significant importance to the UK market let us not forget that trichloroethylene specifically will be added to Annex 14 of REACH in February 2013 and its demise will be a natural consequence. Traditionally trichloroethylene has been the mainstay of cleaning and degreasing operations for the aerospace industries and the prime solvent species approved by Rolls-Royce Aerospace for the vapour degreasing of titanium.

As an addition, and ultimately a successor, to trichloroethylene the modified alcohol Geiss RG63 has received formal Rolls-Royce approval for titanium (and all other substrates) based



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upon purity and performance, the provenance of the product not being a consideration.

Clearly with the demise of trichloroethylene many operators within the aerospace sector (and other critical applications) will be seeking an alternative.

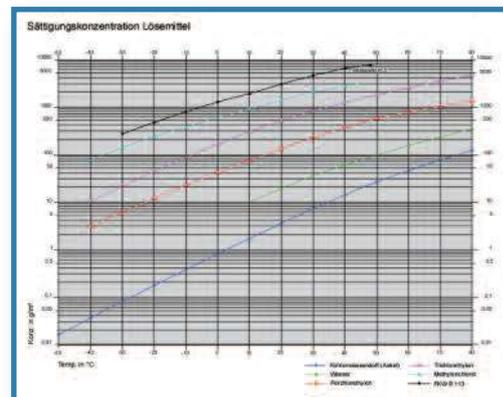
For some applications perchloroethylene will remain a logical choice (approvals permitting) and its ability to be utilised in systems compliant with The Solvent Emissions (England & Wales) Regulations 2004 an added bonus as plant investment will be minimised.

Unfortunately one of the main deceptions is the suitability of methylene chloride (or methylene chloride based formulations) for use in traditional (or even enclosed) installations. The problems again lie in misunderstanding and misinformation largely because even many of those intending to supply it for use in liquid/vapour degreasing do not themselves understand the basic physics.

With a Kauri Butanol value of 136, methylene chloride indeed displays high solvency and is proven to be an excellent degreasing medium. The big problems remain its volatility and very high vapour pressure. It boils at approx. 40 Celsius and displays vapour pressure of (mm Hg) 350 @ 20C. "Put a glass of methylene chloride on the table and it will be gone in a couple of hours". A practical disadvantage of methylene chloride is the low boiling point which renders it less effective on heavily soiled components.

One of the greatest fallacies is that methylene chloride can be abated in a simple carbon system (whether regenerable or sacrificial) -

it cannot. As always the devil is in the detail and one has to look at the science for the answer. First of all the adsorption process constitutes an exothermic reaction - it produces heat. Very rapidly the carbon reaches the temperature at which adsorption ceases and desorption (liberation) occurs i.e. the exhaust stream will subsequently pass straight through!



It can be seen from the official saturation curves that if we are drying (at ambient pressure) at e.g. minus 30 Celsius the concentration for perchloroethylene is approx. 6g/m³, for trichloroethylene approx. 20g/m³, but for methylene chloride a massive 150g/m³. In practice this means that it is very difficult to condense back from vapour into liquid solvent and consequently the solvent laden air is passed to the carbon for adsorption (and straight through it as stated above). We can improve this massively by adding a vacuum in the drying phase (essentially removing air molecules and thereby increasing the effectiveness of the sub zero drying) but temperature control (cooling) of the carbon is vital in order to render it effective (let us not forget that methylene chloride is classed as a carcinogen).

In utilising methylene chloride in an average size application without vacuum drying and without temperature controlled carbon we know that a standard 200 kg drum of carbon can be saturated in approx. 40 minutes and not the many months or years which some have been led to believe.

It is becoming clear that many of the so-called 'drop-in' replacements have fundamental drawbacks whether physical, chemical, environmental or economical. The trend has been set in Germany where trichloroethylene is already out of general circulation and the fastest growing technology remains non halogenated hydrocarbons or modified alcohol. **CSW**

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