

What make paints flow?  
 What make inks dry?  
 What make medicines pure?  
 What stop oil rigs rusting?  
 What make microchips possible?

The answer is solvents – a group of chemicals which has dramatically changed modern day living and become an invaluable partner for industries as diverse as pharmaceuticals and pesticides to domestic cleaning and printing.

Thousands of producers and manufacturers and over 10 million workers in Europe rely on solvents every day to provide both solutions to new manufacturing needs and excellence in functional performance.

In fact, without solvents many of the products we use and rely on, from penicillin to industrial paint, would not perform to the standards we demand today.



## So, what is a solvent?

A solvent is a liquid which has the ability to dissolve, suspend or extract other materials, without chemical change to the material or solvent. Solvents make it possible to process, apply, clean or separate materials.

## Different types of solvents

This fact sheet deals with 'organic' solvents and specifically hydrocarbon and oxygenated solvents. Water is a solvent but it is 'inorganic', so is not discussed here. Organic solvents can be classified by chemical structure. There are three main groups:

Family	Major types
oxygenated solvents	alcohols ketones esters glycol ethers
hydrocarbon solvents	aliphatics aromatics
chlorinated (halogenated) solvents	

The European Solvents Industry Group represents oxygenated and hydrocarbon solvents. Chlorinated solvents are represented by the European Chlorinated Solvents Association.

## How solvents work

In simple terms, solvent chemistry is based on the principle that 'like dissolves like'. Therefore, for a solvent to be of any use it needs to have similar chemical characteristics to the substance it is trying to dissolve.



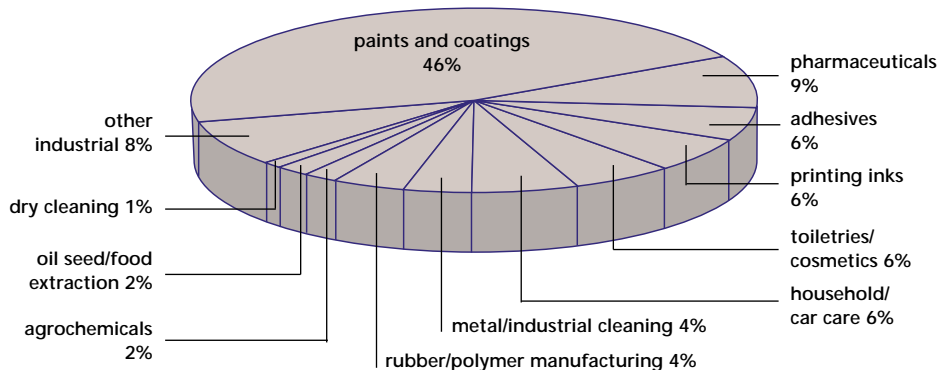
## Solvents in action

The largest demand for solvents comes from the paint and coatings industry which relies on almost two million tonnes every year. But the pharmaceutical sector is a growing market showing a steady increase in demand year on year, because of solvents' invaluable contribution to the purity of modern medicines.

In many ways solvents are 'guests' of the process they help to make work. Once their job is complete solvents are either incinerated and energy recovered, recycled and returned to repeat the process many times, or they evaporate as part of their use, for example when paint dries. In many applications, solvent emissions from evaporation are minimised with techniques such as thermal oxidation, where heat is used to destroy the volatile solvent component.

## 1993 solvents market ESIG

Total market (Western Europe) 4.3 million tonnes



## Solution providers

Solvents are very versatile, but can also be produced or blended to meet very specific requirements and so, in a way, can be 'tailor-made' for distinct purposes.

When choosing or blending a solvent, performance, health and

safety, cost and environmental factors are all weighed up. A range of considerations needs to be taken into account such as dissolving power, viscosity and evaporation rates, colour, odour, toxicity, flammability and conservation of resources.

## SOME OF THE MAJOR USES OF SOLVENTS

### Paints, coatings and inks

#### Making paint 'paintable' and fast drying...

Solvents are used in paint manufacture to dissolve the different compounds used in the paint formulation such as colour

and binder, making the paint the correct consistency for application. Once the paint has been applied the solvent evaporates, allowing the resin and pigment to produce a film of paint and to dry rapidly. Without solvents it would be impossible to produce durable, decorative and, in particular, glossy paints for use both indoors and outdoors to withstand all conditions.

#### Fast drying saves energy...

Solvents evaporate readily and thus reduce energy consumption and minimise costs. Solvent based systems dry up to 10 times faster at room temperature than low solvent alternatives, keeping production rates up, costs down and minimising energy consumption.

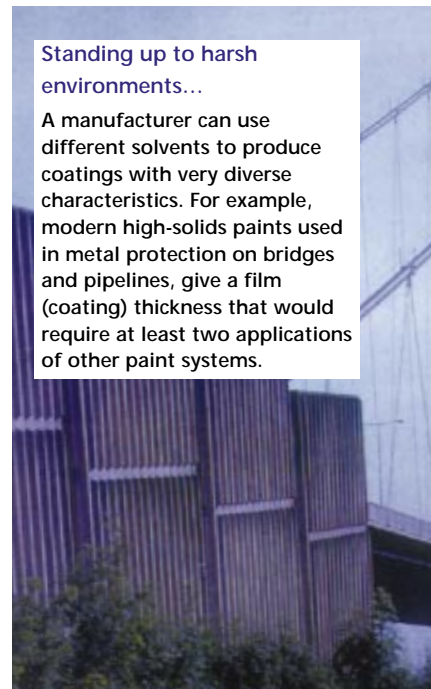


#### Making ink flow...

In printing inks, solvents are used to control viscosity and allow ink to flow without damaging printing rollers. As in paint, solvents ensure optimum drying essential for today's high speed presses.

#### Standing up to harsh environments...

A manufacturer can use different solvents to produce coatings with very diverse characteristics. For example, modern high-solids paints used in metal protection on bridges and pipelines, give a film (coating) thickness that would require at least two applications of other paint systems.



Increasing functional and environmental performance...

The flexibility given by solvents means that the whole performance of a system can be optimised, not least for the quantity of materials used, resulting in environmental gain. To minimise total consumption of solvents, high-solids paints with lower levels of organic solvents have been developed. These are proving popular where a high quality and durable finish is required. Even for water based coatings, a solvent content of up to 15 per cent is indispensable for high durability and appearance.

### Adhesives

From soles on shoes to tyres on cars...

Solvents are used in domestic and industrial adhesives and are particularly valuable where a high performance is required such as metal-to-metal bonding, and in the manufacture of everyday durable products such as footwear and car tyres.



### Pharmaceuticals

Creating purity...

Solvents are fundamental to the production of pharmaceuticals by providing the medium in which the reaction takes place. They also separate the desired chemical products from unwanted ones, maximising the purity of the drug. For example, solvents are used in the extraction processes involved in the manufacture of drugs such as paracetamol.

### Agrochemicals

Less pesticides more protection...

Agrochemical products rely on solvents to mix key components at high concentrations. Solvents in pesticides ensure slow drying to provide adequate penetration, and high spraying efficiency to reduce the total amount of pesticide required.

### Food and drink

Capturing natural flavours...

Solvents are also used in food processing to extract the required substance from a natural product more efficiently than by using mechanical methods, for example in the extraction of oils and flavourings.

### At home, or in your car

Solvents keeping us clean... and safe...

Solvents are used in a variety of home cleaning products, such as polishes, to improve cleaning efficiency and make homes easier to keep clean and hygienic. Solvents also help protect us whilst travelling by car – they are part of the make up of vital car-care products such as screen wash de-icer and brake fluid.



## The solvents industry in Europe

Around 10 000 people across Europe are directly employed in the production of solvents. However, it is estimated that over 10 million people are employed in industries which depend on solvents.

The industry has a turnover of 2.1 billion ECU and, because solvents are an integral part of many other manufacturing processes, it is estimated that the solvents industry contributes to a total European turnover of 200 billion ECU in over half a million enterprises.

The size and structure of the solvents industry is constantly evolving to meet new needs. There is increasing awareness of health and safety and environmental issues surrounding the use of all chemicals, and solvents are no exception. For solvents, particular areas of focus are toxicity levels and atmospheric emissions.

The solvents industry is committed to meeting the highest standards of protection, and spends an estimated 20 million ECU on research and development every year to enhance performance and further increase safety and environmental protection.



## Our environment

Solvent volatile organic compounds (VOCs) emissions have an impact on the environment, as the *Solvents and the environment* fact sheet in this series explains. Over the past 15 years, solvent emissions have halved per unit of production. Significant progress in emission

control and new product development ensures that air quality standards are improving. These changes mean that new, technologically-developed solvent systems, which have a reduced impact on the environment, are much more in demand.



## Our health and safety



As with all manufacturing and industrial processes, there are health and safety considerations for using solvents.

The European solvents industry has

been undertaking comprehensive health studies for over 25 years (the first tests were carried out over 40 years ago), and is totally committed to ensuring the health and safety of its own and its customers' employees. The *Using solvents safely* fact sheet in this series demonstrates the legislative and self-regulatory measures in place to protect workers and users. It gives details of assistance and product

stewardship schemes operated by solvents manufacturers to ensure safe manufacture, transport and processing of solvents.

## Solvents – providing solutions now and in the future

Solvents provide solutions for many aspects of modern business and home life, and the on-going commitment to enhancing solvents' functional and environmental performance means that Europe will continue to benefit from their use in the myriad applications which they make possible.

The European Solvents Industry Group provides a single point of contact for information on oxygenated and hydrocarbon solvents. The chlorinated solvents sector is represented by the European Chlorinated Solvents Association. Both groups are part of CEFIC and interact on issues relevant to the solvents industry as a whole.

## European Solvents Industry

### Hydrocarbon & Oxygenated Solvents

One of a series of fact sheets produced by the European Solvents Industry Group.

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