

CONSTRUCTION

Building of residential and non-residential estates

Utility buildings and civil engineering: bridge coating

Building of road & railways

Associated activities



Building of residential and non-residential estates



Coatings & paints

Solvents are used in paints to dissolve or disperse the different components used in the formulation, making paint of the desired consistency for application. The moment the paint is applied, the solvent evaporates, allowing the resins and pigments in the formulation to dry rapidly, producing a film of paint on the surface. Solvents are the reason there is such a variety of durable and decorative coatings and glossy paints for indoor and outdoor uses, be it doors, windows or walls.

Three new technologies have emerged in the production of paints and coatings: waterborne (with a small solvent percentage), powder and high-energy. All three technologies have different technical and performance characteristics, depending on application needs.

Waterborne decorative painting usually requires a coupling solvent (water soluble and water-based such as glycol ethers or acetates) and coalescing solvent (emulsion systems) to control evaporation, whereas the solvents contribute to film formation, wetting or solubility of resins. Examples are acrylic and vinyl wall paints (interior

and exterior), matt and satin finishes or paints for absorbent surfaces (wood, plaster).

Solvent-based decorative painting is used for wood, metal or exterior applications. The solvents enable the paint to spread by reducing polymer viscosity and allowing the control of the evaporation rate. Examples are high gloss paints, paints for metal substrates or aerosol paints, which mainly contain dearomatised hydrocarbon solvents with little odour.

Concrete

Hydrocarbon solvents are essential and widely used in the construction industry, for example in the formulation of curing agents for concrete or of bituminous products for decorative or protecting reasons. Thereby the surfaces treated with these products show excellent properties such as waterproofing, resistance to washing with water and are highly economical. Solvent-based construction chemicals can help make the strong, secure and aesthetic concrete needed to build infrastructure, industrial buildings, offices and homes. Solvent-based mould release agents are used in applications where concrete mimics natural stones or has other aesthetic qualities.

Insulation

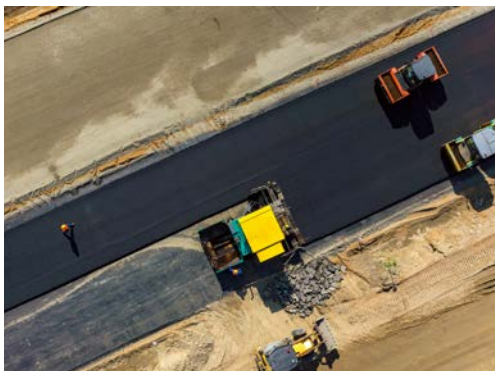
Hydrocarbon solvents are an essential component of insulation foam because they prevent insulation sheets from sticking to each other. They are also increasingly used in innovative cutting-edge insulation techniques such as aerogels, quick drying expanding foams and vacuum panels.

Sealants & adhesives

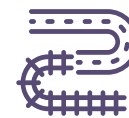
Solvent-based sealants and adhesives (contact adhesives and wet bonding adhesives) have many applications.

The main solvents used in adhesives and sealants are low boiling oxygenated solvents (methyl ethyl ketone (MEK), acetone) for a quick evaporation or high boiling aliphatic hydrocarbons. Solvent-based sealers act as decorative and protective concrete topcoats. When spread on a surface, contact adhesives dry thanks to the quick evaporation of the solvent. They strongly bind together materials that are non-porous like laminates to countertops in kitchens or bathrooms or floorings like rubber tiles, laminates or vinyl.





Building of road & railways



Road construction

Even in the extraction of bitumen from oil or tar sands, high boiling point hydrocarbon solvents are used in the so-called Vapor Extraction Process (VAPEX), which is an in-situ technology. The solvents are injected into an upper well to dilute bitumen and enables the diluted bitumen to flow into a lower well. It has the advantage of much better energy efficiency over steam injection, and the formation leads to some partial upgrading of bitumen to oil.

Road repair

Several repair techniques exist to repair potholes or cracks that appear through weathering or heavy use. In what is called cutback bitumen, bitumen or asphalt is 'cut back' by adding controlled amounts of light hydrocarbon solvents. This temporarily reduces the viscosity of the bitumen so it can penetrate the pavement more effectively or can be sprayed at temperatures too cold for neat bitumen. The material used to cut back bitumen will evaporate after application and leave the remaining material similar in hardness to the original bitumen.

Road marking

Once the road or bitumen surface is in place, marks can be added to indicate parking spaces, crosswalks, edge lines or direction arrows. The road marking will not only be applied when the sun shines, but also when humidity is high and ambient temperature is low and thus needs to dry quickly once applied. Solvents are essential to make the paint liquid. Amongst the numerous materials available, only a few ketones (methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), acetone) show the desired properties, like speed of evaporation, capability of penetration of the surface cracks to improve durability and adhesion of the paint needed when marking roads.

Utility buildings and civil engineering: bridge coating



Metal bridges allow roads or railways to cross rivers or even seas. Durability and fast drying time are again key in the coating that is used to protect them from corrosion. Many common solvents such as glycol ethers are used

in solvent-based coating mixtures which are very much driven by the resin technology. Aromatic hydrocarbon solvents are still used for high solvency power and finished product durability.





Associated activities



Water treatment

Chemicals are used during wastewater treatment in an array of processes to expedite disinfection. Wastewater treatment with chemical processes, which induce chemical reactions, are used alongside biological and physical cleaning processes to achieve various water standards. Cleaning and extraction depend very much on the composition of the water to be treated. For instance, organic solvents, such as methanol, acetates or acetone are sufficient to extract phenolic compounds from wastewater efficiently. Hydrocarbon solvents are used in the manufacture of water treatment polyelectrolytes, which are used as flocculants to remove suspended solids from wastewater.

Soil remediation

Solvent extraction uses an organic solvent to separate organic and metal contaminants from soil. One method is soil flushing, a practice that helps conserve and restore ecosystems such as forests, wetlands, drylands and mountains. Co-solvent soil flushing extracts organic contaminants from the soil with water or other aqueous solutions and a solvent mixture (e.g. water plus a miscible organic solvent such as alcohol). This can help remove radioactive contaminants, fuel spills and other pollutants from the soil.