

European legislation governing the polyester industry



European legislation has an important impact on the framework in which the polyester processing industry operates within the EU.

The European industry is required to be compliant with legislation both at national and European level.

This guide provides an overview of the European legislation, directly related to the polyester processing industry. The main points are summarized below and are structured following the life cycle of a fiberglass reinforced plastic (FRP) product. The figure below (1 - 4) describes this process.

One European regulation that is important throughout the life cycle stages of FRP products is the REACH regulation (EC) 1907/2006. REACH applies to the manufacture/import, use, distribution or sale of, substances on their own, in mixtures or in articles.

The REACH regulation entered into force in 2007 to streamline and improve the former legislative framework of chemicals within the European Union (EU). REACH places greater responsibility on industry to manage the risks that chemicals may pose to human health and the environment. Under REACH, all non-exempt chemical substances produced or imported into the EU in quantities of 1 ton or more per year per company must be registered with the European Chemicals Agency (ECHA).

Existing or so-called "phase-in" substances must be registered by each affected EU manufacturer / importer within a given timeframe that is divided into three phases. The registration deadlines are based on the yearly tonnage of the manufacturer / importer as well as the hazardous properties of the substance. Category 1A or 1B Carcinogens, Mutagens and Reproductive toxicants (CMR) manufactured / imported over 1 tonne per annum (tpa), as well as substances classified as very toxic to aquatic organisms (R50/53) > 100 tpa and substances manufactured / imported over 1000 tpa (regardless of the classification) were to be registered by November 30th 2010 at the latest. Then the substances manufactured / imported above 100 tpa were to be registered by May 31th 2013. The final REACH registration deadline is 31 May 2018 for substances manufactured / imported between 1 and 100 tpa.

Phase 1: Production of Unsaturated Polyester (UP) Resins

UP resins are produced in large modern chemical plants that meet the local legal requirements. The EU legislation that applies to the UP resin industry during this first phase is summarized below.

The Classification, Labeling and Packaging (CLP) of substances and mixtures Regulation (EC) 1272/2008 which entered into force in January 2009.

The CLP regulation introduces throughout the EU a new system for classifying and labeling chemicals based on the United Nations' Globally Harmonized System (UN GHS). It also replaces two Directives to which the UP resin industry has historically complied: The Dangerous Substances Directive 67/548/EEC (DSD) and the Dangerous Preparations Directive 1999/45/EC (DPD).

Under CLP, it is the task of industry to establish the hazards of substances and mixtures before they are placed on the market, and to classify them in line with the identified hazards. In case a substance or a mixture is hazardous, it has to be labeled so that workers and consumers know about its effects before they handle it. A Safety Data Sheet (SDS) describing both hazards and Risk Management Measures is also provided to the customer allowing him to handle the substance/mixture safely with a life cycle approach.

There are certain timelines for industry to classify, label, and package substances and mixtures according to CLP. The classification and labeling according to CLP for substances applies since 1 December 2010 and for mixtures from 1 June 2015.

Phase 2: Manufacturing of FRP parts

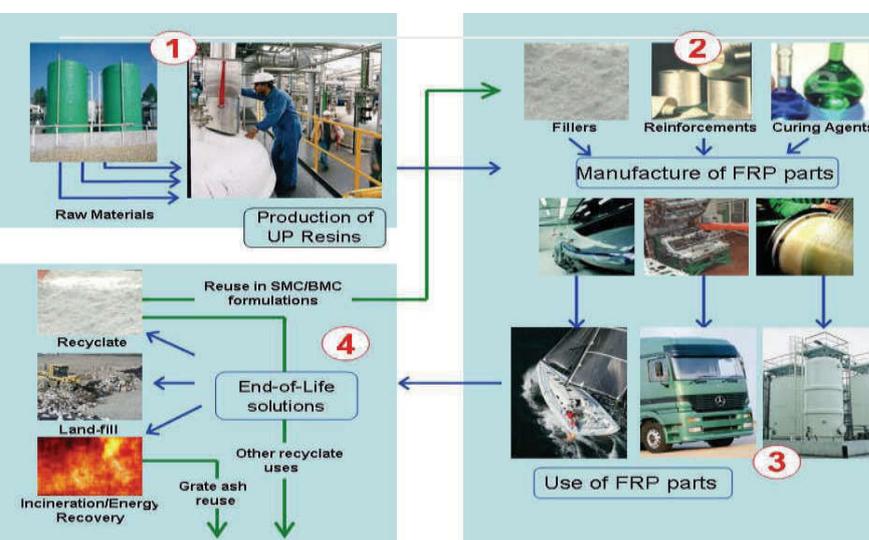
During the manufacture of FRP parts, the focus of European legislation relates to occupational health and environmental emissions. In most European countries, strict limits are set over occupational exposure to dangerous chemicals. There is not yet a European standard for occupational exposure limits. SCOEL, the Scientific Committee on Occupational Exposure Limits, is working on proposals for the standardization of these limits.

Other directives that are relevant in relation to safe working in an industrial setting are:

Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work.*

Council Directive 89/656/EEC on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace.*

Several European directives relate to the regulation of industrial emissions. The following Directives, which may differ from local or national regulatory requirements, may be relevant to manufacturing activities:



Council Directive 1999/13/EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations (VOC Solvents Emissions Directive)* through Article 13 of the Paints Directive (2004/42/ EC).*

Directive 2010/75/EU of the European Parliament and of the council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

Cefic UPR sector group believes that the FRP industry does not fall under the scope of the VOC Solvents Emissions Directive as it stands. A position paper on this particular subject was issued and can be found on the UPR resins website (<http://www.upresins.org>).

Phase 3: The use of FRP products

Many FRP products are used in applications or sold in markets where European legislation determines, to a large extent, the properties of a product. For example, many products, used in applications for food and drinking water have to comply with a number of European regulations and directives.

Food contact materials

The European Food Safety Authority (EFSA) is the keystone of EU's risk assessment regarding food and feed safety. In close collaboration with national authorities and in open consultation with its stakeholders, EFSA provides independent scientific advice and clear communication on existing and emerging risks. For the production of UP resins used in applications for food or drinking water contact, only approved raw materials may be used. Applicable regulations include:

The Regulation (EC) 1935/2004 of the European Parliament and of the council of 27 October 2004 on materials and articles intended to come into contact with food

The EU Directive 2002/72 has been superseded by Regulation EU 10/2011 - Plastics material and articles intended to come into contact with food.*

Commission Regulation 450/2009/EC on active and intelligent materials and articles intended to come into contact with food.*

At present, drinking water legislation is still regulated on a national member state level, but a European directive is under development similar to the food contact legislation.

Building products

The Construction Products Directive (CPD) harmonizes the methods of test, the methods of declaration of product performance values, and the method of conformity assessment. Products sold in the building industry have to be marked with a CE marking, which implies that the products comply with European legislation on aspects like mechanical strength and stability, fire safety, hygiene, health and environment and safety of use.

Please refer to:

Council Directive 89/106/EEC on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products.*

Regulation (EU) No 305/2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC of 4 April 2011.*

Tanks and pipes

Many technical FRP products like storage tanks, pipes, etc must be manufactured following the guidelines in the Pressure Equipment Directive (PED). When compliant, these products will be marked with a CE marking. Non compliant products may not be manufactured and sold in the European Union. Further details are found under:

The Pressure Equipment Directive 97/23/EC sets out the standards for the design and fabrication of pressure equipment (e.g., steam boilers, pressure vessels, piping, safety valves and other components and assemblies subject to pressure loading) generally over one liter in volume and having a maximum pressure more than 0.5 bar gauge. It also sets the administrative procedures requirements for the "conformity assessment" of pressure equipment, for the free placing on the European market without local legislative barriers.*

Phase 4: End of Life solutions

When FRP products come to the end of their life, several European legislative acts apply and have an impact on composite waste management, collection and recycling. Please see: Council Directive 99/31/EC on Landfill of Waste member states have to close 'cheap doors' on landfill and set a national list of waste to be accepted or refused.*

Directive 2000/53/EC on End-of-life vehicles (ELV) addresses reuse if suitable for reuse; recovery when cannot be reused; preference for recycling when environmentally viable.*

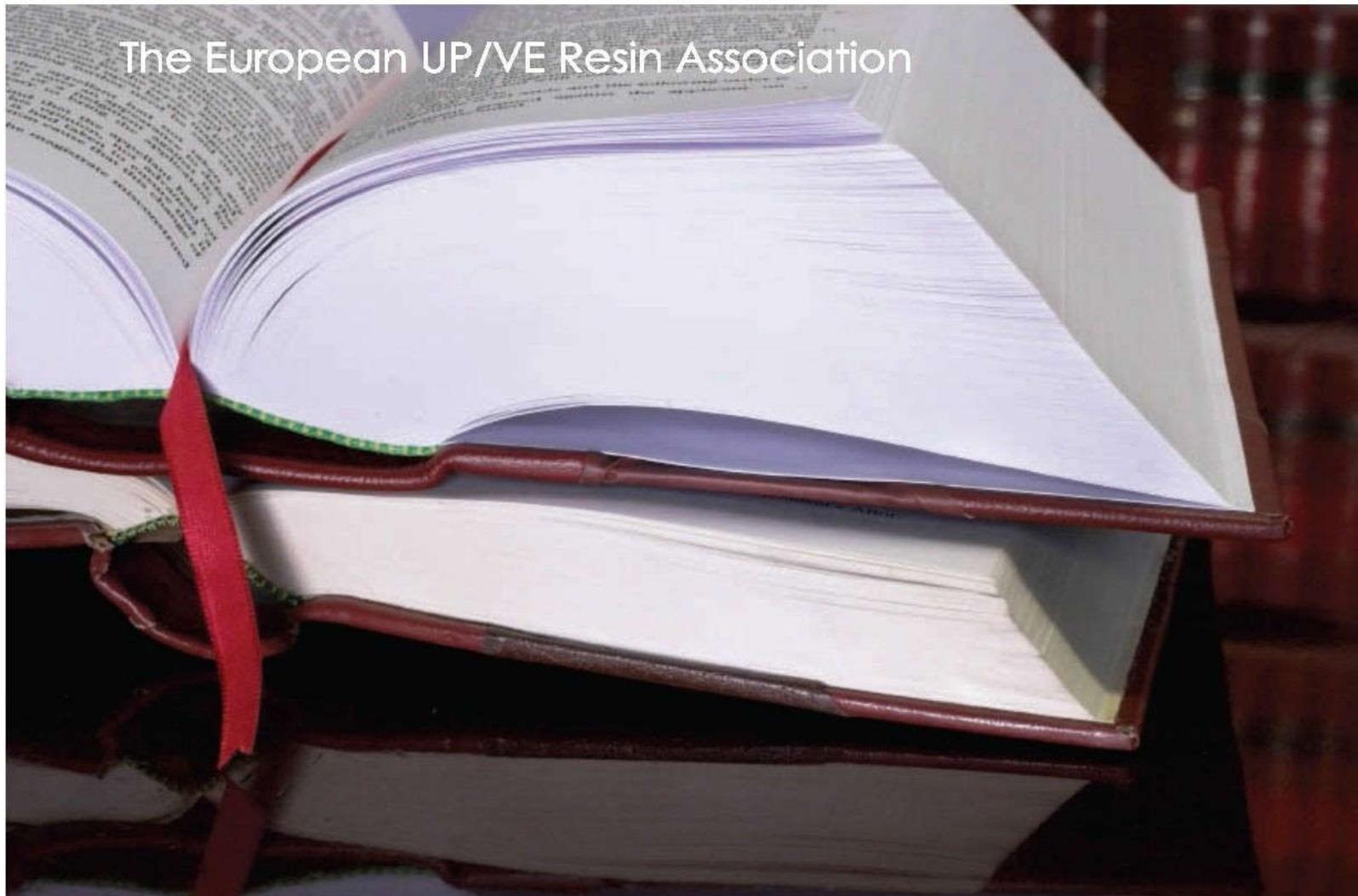
Directives 2002/96/EC on Waste of Electric & Electronic Equipment (WEEE) obliges producers to make internal provision for recovery, dismantling, re-use and recycling.*

Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage (ELD) establishes a framework based on the "polluter pays" principle, according to which the polluter pays when environmental damage occurs. There have been many amendments to this directive including management of waste from extractive industries and on the geological storage of carbon dioxide and amending several directives.*

** Please refer to resources on-line (by using the directive number in your search engine) to find the most current version, including potential amendments.*

REACH for the polyester Processing Industry

The European UP/VE Resin Association

A photograph of an open book with a red ribbon bookmark. The pages are white and contain faint, illegible text. The book is resting on a dark surface, and the background is blurred, showing what appears to be a bookshelf.

Introduction

The chemical industry in Europe is to a large extent governed by European law. In 1967 the first European Directive was put into force, regulating the classification, labeling and safe handling of dangerous substances. Since that time, more than 40 regulations and directives have been issued on various aspects of the risks of handling chemicals. Some of the most important directives were the following:

- Directive 67/548/EEC: Classification, Packaging and Labeling of Dangerous Substances
- Directive 88/379/EEC: Classification, Packaging and Labeling of Dangerous Preparations
- Council Directive 98/24/EC: Protection of Workers of the risks related to chemical agents at work
- Council Regulation 793/93/EC: Evaluation and Control of the Risks of Existing Substances

In the beginning of the 21st century, it became clear that the current legislative framework for chemicals was inadequate. It had not produced sufficient information about the effects of chemicals on human health and the environment, and where risks were identified, it is slow to assess them and introduce risk management measures.

In 2001, the European Commission outlined its strategy for ensuring a high level of chemical safety and a competitive chemicals industry through a new regulatory system for the Registration, Evaluation, Authorization, and Restriction of Chemicals, also known as "REACH."

The REACH Regulation (EC) No. 1907/2006 is based on seven objectives that must be balanced within the overall framework of sustainable development:

- Protect human health and the environment
- Maintain and enhance the competitiveness of the EU chemical industry
- Prevent fragmentation of the internal market
- Increase transparency
- Integrate with international efforts
- Promote non-animal testing
- Conform with EU international obligations under the WTO

On 1 June 2007, REACH entered into force in the European Union (EU). REACH has also been adopted by the European Free Trade Association (EFTA) states of Norway, Iceland and Liechtenstein. REACH places greater responsibility on industry to manage the risks that chemicals may pose to the health and the environment.

Under REACH, chemical substances manufactured in or imported into the EU in quantities >1 ton per year, even if supplied in mixtures or preparations, must be registered with the new European Chemicals Agency (ECHA) along with information to use them safely. Products that do not meet these requirements cannot be sold in the EU unless they are specifically exempt.

REACH - Registration

Registration is the foundation of REACH. Manufacturers and importers are required to gather information on the intrinsic properties and hazards of each substance (such as physicochemical, toxicological, and ecotoxicological properties) and submit the information in a registration dossier to a central data base maintained by ECHA.

For chemicals manufactured or imported above 10 tons per year, registrants also need to prepare a Chemical Safety Report (CSR), which must include a chemical safety assessment of the environmental and human health hazards of the substance. If the substance is classified as dangerous, an exposure assessment and risk characterization must also be provided.

The CSR is the source from which safe handling information is extracted and communicated down the supply chain through extended safety data sheets (eSDS) for identified uses of the substance. SDS are well-understood and internationally accepted for the communication of information.

REACH - Evaluation

There are two types of evaluation.

Dossier evaluation involves a quality check of the dossier by ECHA, and may include checks for compliance with REACH requirements, for example, to ensure that unnecessary animal testing is avoided.

Substance evaluation is performed by Member State competent authorities when there is reason to believe that a substance may present a significant risk to human health or the environment (for example, because of its structural similarity to another substance or for other reasons).

REACH - Authorization

Substances of Very High Concern (SVHC) may be subject to authorization and placed in Annex XIV of REACH. Authorization applies to specific uses and suppliers. Each substance has a date by which companies seeking authorization must submit their applications, and a sunset date after which manufacture and use are prohibited.

Authorization will be granted if it can be shown that risks from the SVHC use in question can be adequately controlled or that the socio-economic benefits from their use outweigh the risks.

Applicants will also have to investigate the possibility of substituting these substances with safer alternatives or technologies, and prepare substitution plans, if appropriate. Examples of substances that will be prioritized for authorization are:

- CMRs (carcinogenic, mutagenic or toxic to reproduction), category 1a and 1b
- PBTs (persistent, bio-accumulative and toxic)
- vPvBs (very persistent, very bio-accumulative)
- Substances identified as having serious and irreversible effects to humans and the environment, such as endocrine disrupting substances (substances that disturb the body's hormone system).

REACH - Restriction

If necessary, the EU can impose restrictions and prohibit or set conditions for the manufacture, placing on the market or use of certain dangerous substances or group of substances when unacceptable risks to humans or the environment have been identified.



REACH addresses manufacturers, distributors, importers, and downstream users.

Manufacturers produce substances. **Importers** import substances from non-EU countries, and **downstream users** make industrial or professional use of chemicals.

Distributors only store or place a substance on the market. Distributors must ensure that safety information is provided with the substances they sell. Some of them also mix chemicals to make preparations (such as ink), others use substances or preparations to make articles (such as chairs or cars), or use them in their business (such as CD manufacturers who use degreasing agents to clean their machines).

The vast majority of the REACH requirements apply directly to manufactures and importers of substances. They will supply data on the properties of their chemicals, develop chemical safety assessments, and implement risk management measures.

Downstream users will be supplied with safety information about the chemicals they purchase and should follow them when handling the chemicals. They also need to make sure that their customers (e.g. other industries and consumers) have all the information necessary to use their products safely.

When a chemical is to be used in a manner not covered by the original registration, the new uses or risk management measures will have to be reported to ECHA if the volume is higher than 1 ton per year.

REACH for downstream users

A downstream user (DU) is any natural or legal person other than the manufacturer or the importer who uses a substance, either on its own or in a preparation, in the course of his industrial or professional activity. Most polyester processing companies will be considered as DU's.

The DU has to communicate with his supplier for which application he wants to buy a certain product. These applications or processes are called "identified uses". The manufacturer of the product must provide exposure scenarios and risk management measures for all identified uses. This information is provided in the new extended Safety Data Sheet or eSDS.

For a DU, the new eSDS will be a very important document as it provides not only the usual information which is today already given in the SDS supplied with every product; the new SDS will have a separate health and environment section in which all relevant information on identified uses, exposure controls, operating conditions, and risk management measures can be found for the substance or product. Downstream users may only use substances classified as dangerous, PBT, or vPvB if they apply risk management measures identified on the basis of exposure scenarios for their use and indicated in the eSDS.

Substances, mixtures and articles

REACH distinguishes between substances, mixtures and articles.

A **substance** is a chemical element or a compound, composed of chemical elements. The European Inventory of Existing Commercial Chemical Substances (EINECS) contains approximately 140.000 substances. From this list, it is expected that over 30.000 substances will be registered under REACH.

Most unsaturated polyester resins are polymers, dissolved in styrene or other reactive diluent. For the time being polymers, are exempted from registration and evaluation. However, the starting raw materials (monomers) for the polymers must be registered.

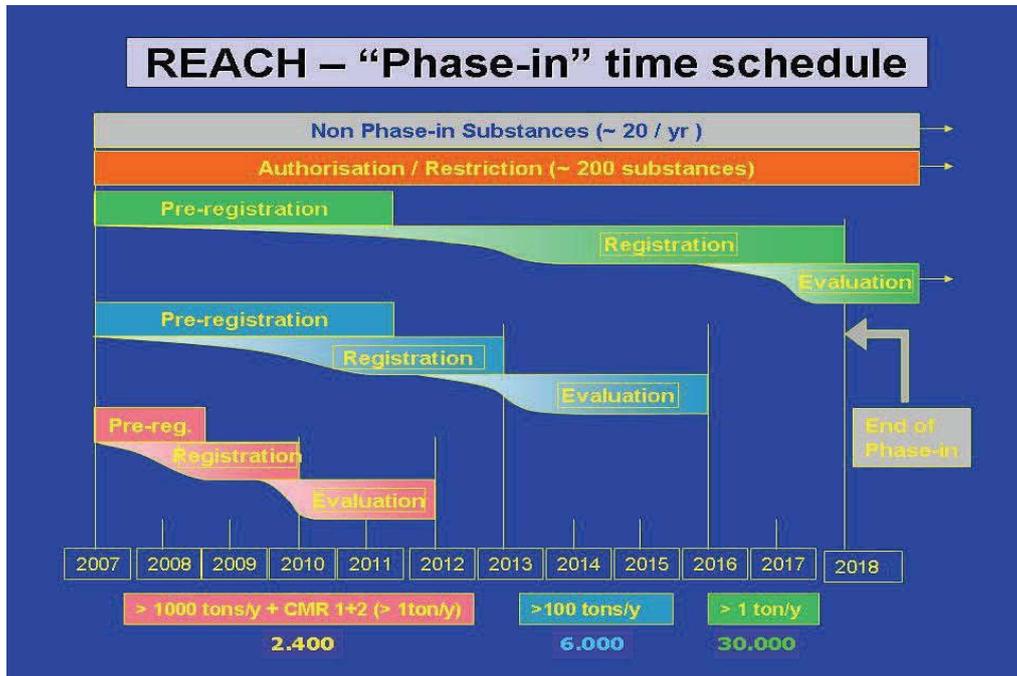
A **preparation** is a mixture or solution, composed by two or more substances. Well known examples are paints, polyester resins in their commercial form, printing inks, etc.

In a UP resin formulation several additives may be present, such as thixotropic agents, accelerators, UV stabilizers, etc. Preparations are referred to as "mixtures" under the Classification, Labeling, and Packaging or "CLP" Regulation (EC) No. 1272/2008 that amends REACH.

An **article** is an object composed of substance(s) and/or preparation(s) which during production is given shape, surface or design that determines its end use function to a greater degree than does its chemical composition.

Within REACH only substances have to be registered. When considering a preparation, the required information has to be gathered for all individual substances in the preparation (or monomers in the case of polymers), unless they are specifically exempt.

Articles do not have to be registered. However, if an article contains substances which are intended to be released during use of the article and which are classified as dangerous, a notification to ECHA has to be made.



Unsaturated Polyester Resins & the VOC Directive



Since the introduction of the European VOC Directive there has been uncertainty about its applicability to the Fibre Reinforced Plastics (FRP) industry, both from legislative authorities in various countries as well as in the FRP industry within the EU. In some EU member States, the FRP industry has been penalised by legislators attempting to enforce legislation that does not apply to the activity in question.

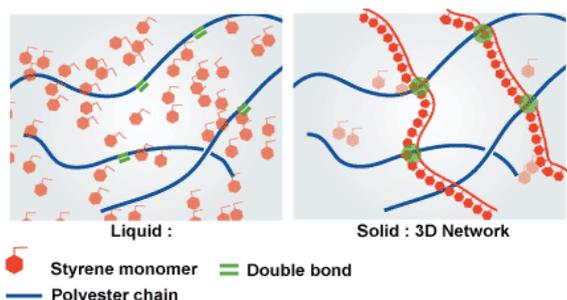
The UP/VE Resin Association has assessed the position of the FRP industry with reference to the Directive. This guide provides guidance with respect to the applicability of the Directive to the FRP industry.

The Fibre Reinforced Plastics (FRP) moulding process

The FRP moulding process is a versatile means of converting an unsaturated polyester resin (a solid polymer at room temperature), dissolved in a volatile, reactive, unsaturated monomer, (usually styrene), in combination with reinforcing fibres (usually glass fibre) into structural materials, generally referred to as fibre reinforced laminates or fibre reinforced composites.

In most processes where solvents are used, all of the solvent is released during the process: and unless emission restriction controls are in place, all of the solvent is released into the atmosphere. However, during the cure of unsaturated polyester resins, styrene - the reactive monomer in which the unsaturated polyester is dissolved - co-polymerises with the reactive sites in the unsaturated polyester chains to form a three dimensional solid: in other words a thermosetting plastic. The diagram below (courtesy SpecialChem), shows the cross-linking mechanism of UP resins.

In some FRP processing techniques, a very small proportion of the reactive monomer may escape into the atmosphere before copolymerisation. Strategies for dealing with styrene emissions are the subject of other Technical Bulletins within this series.



Definitions

The VOC Directive contains terminology that may differ in meaning to what is commonly accepted within the FRP industry. An understanding of the difference in the interpretation of the vocabulary used within the VOC Directive and that used within the FRP industry is essential for a qualified decision to be made on the relevance of the VOC Directive to the FRP industry.

Organic solvents

In the FRP industry, the styrene in the resins is cross-linked with the unsaturated polyester. This means that very little of the volatile monomer is released into the atmosphere during processing.

The VOC Directive defines an organic solvent as follows:

‘A VOC used alone or in combination to dissolve raw materials without undergoing a chemical change or as a cleaning agent, dispersion medium, a viscosity adjuster, a surface tension adjuster, a plasticiser, a preservative.’

Applicability to the FRP industry

As styrene undergoes a chemical change during processing of the unsaturated polyester resin, it cannot be defined as an organic solvent within the terms of the VOC Directive. Only if styrene were to be used for cleaning purposes (which is rarely the case), would it possibly fall within the VOC directive.

Industrial activities

In Annex 1 of the Directive, twenty activities are cited for which the Directive is valid. These activities include ‘wood and plastics lamination’ which is defined as: ‘Any activity to adhere together wood and/or plastic to produce laminated products.’

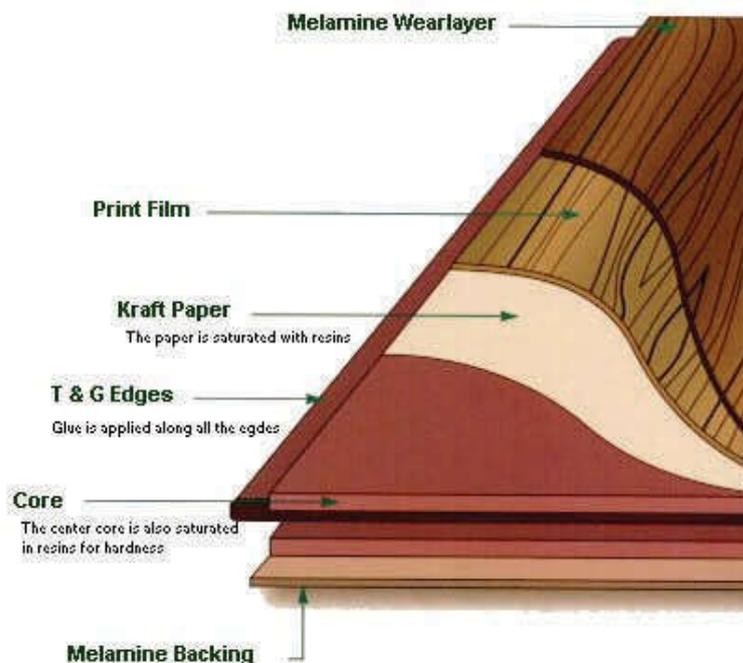
Applicability to the FRP industry

Only this ‘wood and plastics lamination’ category activity appears to have anything remotely relevant to FRP fabrication. But in the product resulting from the ‘wood and plastics lamination’ process, the individual layers of which the product is built up, can still be distinguished and recognised. This is not the case in the FRP process since the resulting laminate is homogenous. During FRP fabrication, glass fibres are impregnated with unsaturated polyester resin. After the curing or cross-linking of the UP resin with the styrene monomer, the glass fibres cannot be distinguished as separate layers in the product. Although this process is called ‘lamination’, it has nothing in common with the ‘wood and plastics lamination’ as described under Annex 1 of the Directive.

The term ‘laminates’ as used in the FRP industry is not defined in the Directive. It can therefore be concluded that the lamination process, as commonly referred to in the FRP fabrication / moulding industry, cannot be classified under the Directive category ‘wood and plastics lamination’.

Laminate Construction

This photo is compliments of Mannington Laminate Floors



The diagram above shows a cross section of laminate flooring and is a good example of ‘wood and plastic lamination’ as defined in the Directive. Here a melamine resin is used to provide a protective coating to the wood based core in a distinctive build-up of layers. By contrast, in the FRP lamination process (next page), the resin completely ‘wets out’ the glass fibre to form an integrated and homogenous structure.

Annex II and annex III of the VOC Directive

Annex II of the Directive specifically targets coating activities in the vehicle coating industry. Annex IIB concerns the principles and practices for emission reduction for the activities outlined in the Directive.

Annex III provides details of a plan for guidance on solvent management.

FRP position

Since styrene cannot be defined as an organic solvent with respect to its use as a reactive monomer for UP resins under the terms of the VOC Directive, and the lamination process as used in the FRP fabrication industry has nothing in common with the process called 'wood and plastics lamination', we must conclude that Annexes II, IIB and III are not relevant for the application of the VOC Directive to the FRP moulding industry. Therefore:

- The VOC Directive, as it stands today, does not apply to processes where reactive, monomer type, solvents are used.
- The VOC Directive can therefore not be used to control the FRP moulding industry with respect to emissions of volatile organic material.
- EU Member State legislators should direct local authorities that the FRP moulding industry does not have to comply with this Directive, in its present form.



'Lamination' as understood in the FRP industry

Relation to Directive 2004/42/CE

Directive 2004/42/EC deals with the limitation of emissions of volatile organic compounds arising from the use of organic solvents in certain paints and varnishes and vehicle refinishing. This Directive is more focused on paints and varnishes but may also be referred to in conjunction with UP resin related activities. However, the Directive under Article 2 / Definitions states:

'The mass of volatile organic compounds in a given product which react chemically during drying to form part of the coating, shall not be considered part of the VOC content'.

FRP position

So once again this directive follows the same pattern: an organic compound which reacts chemically is not considered to be a VOC.



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