

**MATERIAL  
SAFETY  
DATA SHEET**

**A GUIDE TO THE SAFE HANDLING  
OF  
UNSATURATED POLYESTER RESIN  
AND  
RESIN SYSTEMS**

## SUPPLIER'S DETAILS

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**Product Description**     **Solution of Unsaturated Polyester Resin in Monomer.**

**Solution of Unsaturated Polyester Resin in Monomer with Pigments and Fillers.**

**Cobalt Soap Accelerators.**

**Tertiary Amine Accelerators.**

**Release Agents.**

**Organic Peroxides.**

**Diluents.**

**Cleaning Solvents.**

**Resin Additives.**

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"Customers are encouraged to conduct their own tests before using any product. Read its label."

# UNSATURATED POLYESTER RESIN SOLUTION

## PRODUCT DESCRIPTION

Unsaturated polyester resins are formed by the polycondensation of polyhydric alcohols with unsaturated and saturated dicarboxylic acids and anhydrides. They are usually solid at ambient temperatures and can be supplied in powdered or granulated form, or, more commonly, as liquid solutions in monomers, i.e. styrene monomer. To prevent uncontrolled or premature polymerisation, inhibitors are usually added, at parts per million level; the most common types of inhibitor are substituted hydroquinone derivatives.

The curing of polyester resin solutions in monomer is effected by the use of catalysts (i.e. organic peroxides), the reaction being initiated by accelerators (various amines and organo-metal compounds) or by heat, UV radiation or combinations of these. In powdered or granulated form polyesters may be pre-catalysed as supplied; this is not recognised practice with polyester solutions, however.

A polyester resin system is either a solid resin – which may in addition contain catalysts – or a resin solution, possibly including accelerators, fillers, pigments, plasticisers, thixotropes and other additives. Fillers and pigments are generally inert, with little effect on hazards; reduced fire risk systems, however may contain antimony oxide ( $Sb_2O_3$ ) as well as phosphate esters and chlorinated plasticisers, and may present special hazards. (See Section 2.3.1.)

Organic peroxide curing agents or catalysts, which are normally supplied separately, are dealt with in Appendix A.

Accelerators which are normally supplied separately are dealt with in Appendix B.

Additional information in respect of mould release agents is dealt with in Appendix C.

## HAZARD AND PRECAUTIONS

### General

The handling of polyester resins, catalysts, accelerators and mould release agents presents no exceptional hazard. However, some risk to health could arise, eg. from exposure to the monomer in uncured polyester resins and to dust from machining cured glass fibre laminates or composites. These hazards can be reduced if good workshop practices, including the measures described in this data sheet, are enforced.

The main hazards arise from polyester solutions, which contain volatile monomers that are harmful and highly flammable. Dust contained in powdered or granulated resin can constitute a fire and explosion hazard as well as an inhalation hazard; dust from low fire risk systems containing antimony oxide requires special consideration.

## 2.2 Fire and Explosion

Most polyester resins are capable of burning, giving rise to flammable, volatile materials and acrid smoke, the quantity and characteristics of which depend on the composition of the resin involved.

Powdered and granular polyesters contain dust, which in sufficient concentration constitutes a fire and explosion hazard (see O.H.S. Act 1985). Care must be taken when mixing or conveying powdered and granular resins to avoid generation of static electricity, which on discharge can cause an explosion or fire. Dust extraction equipment should be earthed. Dust explosions in workshops should not occur where good housekeeping is observed.

Polyester solutions give off highly flammable vapours of the monomers in which they are dissolved, accelerators are also supplied as solutions in flammable solvents. The three monomers most commonly encountered are:

Styrene / Methyl Methacrylate / Butyl Acrylate.

Details of fire and explosion hazards are summarised in the General Appendix, attached. Information on other solvents should be obtained from the suppliers.

The majority of polyester resins, accelerator solutions and cleaning solvents come within the scope of the Hazardous Substances Act of 1973 and Draft Regulations for Hazardous Chemical Substances.

Static electricity may be generated when polyester resins are conveyed through pipelines to storage tanks, vessels or bulk carriers. Because of the attendant fire risk, splash filling should be avoided, and pipelines and vessels must be earthed and bonded. Road tankers should be earthed when charging or discharging. A powder or carbon dioxide type fire extinguisher should be provided in the vicinity when discharging or charging vessels. A fire alarm point, clearly marked, should also be provided.

Lighting, heating and other electrical equipment where a flammable atmosphere could be formed must be in accordance with the standards laid down in SABS 086 of 1974 and S.A.B.S. 089 for Petroleum Industry, S.A.B.S. 0108.

All polyester resins and solutions should be handled and used in well-ventilated, flameproof areas, preferably in enclosed systems. Smoking must be prohibited. If fumes or dust are likely to escape, an adequate ventilation or exhaust system must be installed. (See also section 2.3.1.)

Under no circumstances must accelerators be mixed directly with organic peroxide catalysts;  
**THIS WILL CAUSE EXPLOSION.**

### 2.2.1 Fire Hazard of Spontaneous Polymerisation

To retard premature polymerisation, polyester solutions

contain inhibitors, which are slowly depleted during long storage, particularly at temperatures appreciably above 20°C. Inhibitor depletion may allow spontaneous polymerisation to begin; in a bulk quantity of resin solution this polymerisation may accelerate rapidly because of the heat generated, and there is a high risk of an explosion in the container, and of fire from the highly flammable vapours.

Contamination with certain materials, eg: alkalis, reduces inhibitor concentration, and increases the risk of spontaneous polymerisation; exposure to UV radiation, eg: from fluorescent light fittings, may initiate a slow polymerisation that can continue in a re-sealed container. Oxidising agents (eg: inorganic and organic peroxides and related compounds), strong acids such as sulphuric acid, ferrous salts, present in rust, and some metal halides can promote polymerisation; contamination of polyester resins with these substances must therefore be absolutely avoided.

## 2.3 Health Hazards

Good industrial and personal hygiene should be observed. Personnel should be told of the nature of the products being handled. As with any chemical product, persons known to have a history of dermatitis, skin sensitisation or asthma should not work in direct contact with polyester resins, except with medical approval. Adequate general washing facilities and skin cleansers are necessary. Emergency eyewashing facilities must be available close to the point of use.

### 2.3.1 Inhalation

Powdered and granular polyesters present no vapour hazard at normal temperatures. On the other hand precautions must be taken to maintain dust concentrations within the Threshold Limit Value\* of 10mg/m<sup>3</sup> for all nuisance particles; this may necessitate working in closed systems, or the provision of air extraction equipment. Where dust concentrations regularly exceed the Threshold Limit Value, dust masks of approved pattern must be worn. With polyester systems containing antimony oxide, allowance must be made for the Threshold Limit Value (currently 0,5mg/m<sup>3</sup> as Sb).

The monomers used in polyester solutions, and the solvents in accelerator solutions, give off vapours that can prove harmful. In general, inhalation of vapour can cause dizziness, headache, nausea, vertigo, irritation of mucosae and unconsciousness at high concentrations. Excessive inhalation can be avoided by adequate air extraction or ventilation facilities; vapour concentrations must not exceed the relevant Threshold Limit Values. The most common monomers and solvents are listed in Section 2.2; their health hazards are summarised in the general Appendix, attached. Details of other solvents, especially in accelerator solutions, should be sought from the suppliers.

Discharge from all ventilation and exhaust systems should be carried well clear of the workplace and of any neighbouring houses or other buildings; dust filters or arresters may be necessary with powder processes.

### 2.3.2 Ingestion

The effects of ingestion are similar to inhalation. The most commonly used monomers are harmful and cause severe irritation of the alimentary tract. Food or beverages should not be prepared or consumed in areas where any polyester resin is processed or handled.

### 2.3.3 Skin Contact

Prolonged or frequent contact with monomers or solvents removes the natural protective oils from the skin, exposes it to bacterial attack, and may lead to dermatitis. Polyester resin solutions are therefore moderate to severe skin irritants. There is little evidence of skin sensitisation, although allergic reaction may occur with especially susceptible individuals.

The use of barrier cream on exposed skin is recommended to minimise dermatitic effect. Wash with a proprietary cleansing agent; do not use solvents. Gloves, overalls, and safety boots should be worn. Overalls should be laundered frequently. Heavy perspiration induced by impervious gloves can cause skin infection; it is generally advisable to wear cotton inner gloves as well, and to have them washed frequently to maintain absorbency and suppleness.

### 2.3.4 Eye Contact

Monomer and solvent vapours irritate the eyes, resin solutions cause acute eye irritation, and goggles of hardened glass should therefore be worn where there is danger of splashing. Resin dust may also cause eye discomfort, necessitating the use of goggles.

## 3. EMERGENCY ACTION

### 3.1 Firefighting

Polyesters and accelerators, particularly those containing monomers and flammable solvents, burn fiercely once ignited, giving off acrid smoke; this also applies to grades of reduced fire risk and finished products based on them. Because of the smoke and the noxious or toxic fumes produced, self-contained breathing apparatus is necessary when fighting fires in a confined space. Providing there is no danger to personnel, small indoor fires may be controlled by the use of sand, carbon dioxide, dry powder or foam extinguishers; foam is recommended in the open.

Water is unsuitable, but may be used to cool tanks, containers and drums in the proximity of fires, to prevent overheating and consequent explosion or spread of flames. Polyester resins are not water soluble. Dry powder is the most suitable medium for fighting accelerator fires.

In large outbreaks of fire the local fire service should be alerted. The fire may be contained provided personnel

are not put at risk. All not engaged in fire fighting should be evacuated from the area.

### 3.2 Remedial Action and First Aid

When summoning medical assistance explain the nature of the product involved, with any details from the supplier regarding special hazards.

#### 3.2.1 Inhalation

Remove to fresh air. Keep warm and if recovery is not rapid, SEEK MEDICAL ATTENTION. Apply artificial respiration if necessary.

#### 3.2.2 Ingestion

If large amounts are ingested, the mouth should be washed out with water and large quantities of water drunk. SEEK MEDICAL ATTENTION.

#### 3.2.3 Skin Contact

Remove any contaminated clothing immediately, wash affected skin area with a proprietary cleansing cream, finally washing with soap and water. On no account use solvents.

#### 3.2.4 Eye Contact

Immediately thorough and continual flushing of the eye with clean water for at least 15 minutes is essential. SEEK MEDICAL ATTENTION.

### 3.3 Spillage

Because of the fire and health hazards of the monomer and solvent vapours, large spillages of polyester resin solutions must be dealt with promptly, using the procedures given in Section 6. Operators dealing with large spillages should wear the appropriate protective equipment.

## 4. USE

Unsaturated polyester resins are intended for use in the fabrication of laminates, castings, mouldings, pultrusions and sheeting as well as for surface coating applications. The hazards presented in this data sheet relate to polyester resins in such applications. If other uses are contemplated, the advice of the supplier should be sought regarding additional hazards that may then arise.

The user should not assume from the information provided in this data sheet that any one product is suitable for all purposes.

Certain risks, not associated with the resins and auxiliary materials, are encountered if UV initiation of curing is employed, and the necessary safety recommendations should be obtained from the suppliers of the UV radiation equipment.

Dust created by grinding or polishing finished products has similar fire and explosion hazards and toxic effects to those of resin dust. (See Section 2.2 and 2.3.1).

## 5. STORAGE

Good standards of industrial hygiene should be observed where polyesters are stored. Smoking and the preparation and consumption of food or beverages should not be allowed.

Statutory regulations affecting polyester resin solutions and accelerators in organic solvents are listed in Section 2.2.

Polyester resins should be stored below 25°C, in closed containers, away from all sources of ignition, in a well-ventilated, flameproof area.

The use of stocks in strict rotation is good stores practice, and helps to avoid storage times longer than the manufacturer recommends; it should also eliminate the possibility of premature polymerisation (Section 2.2.1).

Storage areas must be selected to avoid accidental exposure of bulk resin to fluorescent lighting, sunlight or heat. The contaminants listed in Section 2.2.1 must be rigorously excluded from the storage area.

A "fool-proof" system of segregation for storage and use of accelerators and catalysts must be operated.

All containers must be appropriately marked, and during transportation be marked, designated and documented so that sufficient information regarding their nature, hazards and emergency procedures is always available.

Storage locations should be chosen so that in the event of fire there is adequate access for firefighting services. It is strongly recommended that users liaise with the local fire officer regarding the provision of firefighting equipment and the emergency procedures to adopt; it should be remembered that most polyesters are not water soluble.

## 6. WASTE DISPOSAL

Operators dealing with large spillages of resin or solution should wear the appropriate protective equipment.

All resins should be regarded as notifiable under the Hazardous Substances Act 15 of 1973, and Draft Regulations for Hazardous Chemical Substances. Advice should be sought from the Local Authority regarding disposal. Solid resins can be swept up and placed in containers for disposal but it may be necessary to spray them with water to avoid airborne dispersal of powder. Liquid resins should be absorbed on to dry sand or similar inert material and disposed of by means of approved landfill or controlled incineration. Rags or paper used as absorbents constitute a fire risk and should be disposed of in the same way, as promptly as possible.

Empty drums etc., contain vapours of the monomer present in the original resin solution and therefore entail fire, explosion and noxious vapour risks. They should only be disposed of by methods that follow recognised safe procedures.

# APPENDIX A

## ORGANIC PEROXIDES FOR CURING UNSATURATED POLYESTER RESINS\*

### A1. PRODUCT DESCRIPTION

Organic peroxides and mixtures of organic peroxides - in various diluents - in liquid, paste or powder form.

### A.2 HAZARDS AND PRECAUTIONS

#### A.2.1 General

Organic peroxides entail a high fire risk, and have a strong irritant effect; they must be stored and handled with caution.

#### A.2.2 Fire and Explosion

Organic peroxides are strong oxidising agents, and under conditions of low heat loss may cause spontaneous ignition of any organic matter with which they come in contact. They themselves are combustible and burn vigorously; some have low flash points.

Peroxides react violently with accelerators, heavy metal salts, reducing agents, acids, alkalis and many organic materials. Auto-induced decomposition may also occur, and is accelerated by heat. All these reactions produce heat and large volumes of gas; storage and processing in confined vessels is therefore accompanied by a risk of explosion.

It is recommended that "Codes of Practice for the Storage and Handling of Organic Peroxides" (issued by peroxide manufacturers) be consulted. Scrupulous cleanliness, to exclude all contaminants and combustible matter from processing areas, is an obvious necessity. Smoking must be prohibited.

#### A.2.3 Health Hazards

Good industrial and personal hygiene are vital. Personnel should be told of the nature of the products being handled. As with any chemical product, persons known to have a history of dermatitis, skin sensitisation or asthma should not work in direct contact with peroxides, except with medical approval.

Emergency eye-washing facilities must be available close to the point of use.

Adequate general washing facilities are necessary (but see A.3.2.3.)

### A.3. EMERGENCY ACTION

#### A.3.1. Firefighting

Wear protective gear, especially breathing apparatus and protective devices (PVC or rubber gloves and boots; goggles giving complete eye protection; plastic head protection). If large quantities of peroxide are involved, the fire is best approached from behind cover. Water spray is the recommended fire fighting medium as this cools and extinguishes. Flammable and toxic fumes may be suddenly released, or there may be a sudden increase in the fire intensity if a unit container melts and releases its contents.

The fire brigade should be advised of the presence, grade and quantity of organic peroxides on the premises.

#### A.3.2 Remedial Action and First Aid

When summoning medical assistance, explain the nature of the product involved, with any details from the supplier regarding special hazards.

##### A.3.2.1 Inhalation

Remove from exposure and keep warm. OBTAIN MEDICAL ATTENTION if signs of distress or other symptoms appear.

##### A.3.2.2. Ingestion

Rinse out mouth with water but do not swallow. Then drink copious quantities of water. Treat for shock as necessary. OBTAIN MEDICAL ATTENTION.

In cases of delay and in absence of lip or mouth burns, induce vomiting, then give milk of magnesia (Cream of Magnesia BP 1963, 8.25% Mg(OH)<sub>2</sub> or equivalent).

##### A.3.2.3 Skin Contact

Remove contaminated clothing at once, wash before re-use. Wash skin promptly and thoroughly with plenty of water - do not use soap or solvents.

##### A.3.2.4. Eye Contact

Wash immediately with copious quantities of clean water or normal saline solution (0.9% w/w NaCl) for at least 15 minutes and OBTAIN MEDICAL ATTENTION. Use no oild or ointments.

#### A.3.3. Spillage

Because of their hazardous nature, spilled peroxides and peroxide preparations must be dealt with promptly and carefully.

Personnel dealing with spillages must wear all requisite eye, respiratory and general protective equipment.

Refrigerated peroxides may decompose at normal temperatures; some peroxides are sensitive to mechanical shock and friction, and water damped grades may become sensitive once dry. Contamination promotes violent decomposition. (See Section A.2.2.)

Contain and absorb liquid organic peroxides with an inorganic non-combustible material such as clean diatomaceous earth, vermiculite, dry sand or soil. Solid peroxides should be water-dampened and brushed up. Transfer in small amounts under as little confinement as possible (eg. polythene bags) to a safe place, taking into account that the material may be unstable. Seek advice on the best method for disposal. (See "Codes of Practice.")

If any spilled material enters public drains or water courses, the local Water authority and the Police must be informed immediately.

### A.4 USE

All information in this appendix relates solely to organic peroxides, and preparations containing them for use as curing agents or catalysts in polyesters.

### A.5 STORAGE

Store in the original containers as received. Exclusive storage facilities of recommended design and materials of construction should be provided; seek advice. All metallic equipment fabricated from suitable materials must be thoroughly cleaned and treated by recommended methods. All stores should be kept cool, clean and free from combustible materials, eg. rags and labels. All stores should be kept locked, with access restricted to authorised personnel. The area around the store should be kept free from litter and weeds. No smoking inside the storage building or its vicinity can be tolerated. Matches and lighters should be given up before entering the storage building.

### A.6 WASTE DISPOSAL

Waste peroxides must be disposed of only after consultation with relevant statutory authorities. Safe procedures should be checked with the suppliers. It is desirable to prevent any waste arising by careful stock control and cleanliness in storage and use.

# APPENDIX B

## ACCELERATORS

### B1 ACCELERATORS

#### B.1.1 Introduction

Accelerators for use with polyester resins may be placed conveniently into one of three groups; those based on cobalt soap, those based on tertiary amines, and those based on a mixture of the two.

#### B.1.2 Cobalt Soap Accelerators

NCS Resins supply the following accelerators in this group:

ACCELERATOR	DESCRIPTION	FLASH POINT
Ultracure AC 1	6% Cobalt solution	31°C
Ultracure AC 2	1% Cobalt in Styrene solution	31°C
Ultracure AC 9	0.4% Cobalt in Styrene solution	31°C
Ultracure AC 4	Cobalt accelerator mixture in alcohol	13°C

All are purple/violet liquids with solvent-like odours.

#### B.1.2.1 Nature of Hazards

Toxicological data on Cobalt Octoate is not available but it is expected that values would be very similar to values obtained for Cobalt Naphthenate. The cobalt salts involved are slightly toxic on ingestion of relatively large quantities (Cobalt Naphthenate LD50 (oral-rats) 3900mg/kg). Prolonged and regular skin contact may produce mild irritation.

The greater hazards come from the diluents used, which are highly flammable and are irritant to the skin, eyes and respiratory system at concentrations above the Threshold Limit Value.

Accelerators which come into direct contact with catalysts and other strong oxidising agents may react with explosive violence.

Accelerators containing styrene may polymerise if subjected to excessive temperatures or if they become contaminated, eg: with rust.

#### B.1.2.2 Handling advice

The advice given in this Technical Leaflet is applicable to cobalt soap accelerators and if followed the use of NCS Resins cobalt accelerators present no exceptional hazards.

#### B.1.3 Tertiary Amine Accelerators

NCS Resins supply the following accelerators in this group:

ACCELERATOR	DESCRIPTION	FLASH POINT
Ultracure AA 5	10% Di Methyl Aniline in Styrene	31°C
Ultracure AA 3	100% Di Methyl Aniline	48°C
Ultracure AA 10	100% Di Ethyl Aniline	88°C

All are yellow liquids with distinct odours.

#### B.1.3.1 Nature of Hazards

The toxicological data currently available indicates that the undiluted Diethyl Aniline and Dimethyl Aniline are poisonous.

Although dilution of all these chemicals reduces their potency, for practical purposes it is prudent to treat the accelerators as if they were undiluted amines.

These accelerators should therefore be considered as highly toxic, by ingestion, inhalation or skin absorption. They are readily combustible, giving off highly toxic fumes if heated to decomposition. Accelerators which come into direct contact with catalysts and other strong oxidising agents may react with explosive violence. Accelerators containing styrene may polymerise if subjected to excessive temperatures or if they become contaminated.

#### B.1.3.2 Handling advice

The advice given in this Technical Leaflet is generally applicable to amine accelerators. However, the following additional information should be noted:

#### B.1.3.3 Inhalation

Amine vapours will arise if the material is heated in such a way that the styrene is driven off and then the residual amine is further heated.

Inhalation is then possible due either to imperfect ventilation or inadequate protection. The symptoms of those affected by amine vapours are flushing of the face; throbbing in the head; tightness in the chest, followed by violent headaches, dizziness, noises in the ears. If exposure has been considerable the face becomes blue-gray, nose, ears, lips, tongue and nails become lilac colour ("bluing up") and the knees become weak and a staggering gait is apparent.

The symptoms may be delayed and close observation must be kept on anyone suspected of being exposed to a situation which has given rise to the generation of amine vapours.

Oxygen with up to 5% carbon dioxide may be administered if necessary under the supervision of a competent person.

If the "bluing up" is severe a doctor should consider giving 10 cubic centimetres of 1% Methylene Blue intravenously.

#### B.1.3.4 Skin Absorption

The relative ease with which amines are reported to be absorbed through the skin makes it necessary not only to remove contaminated clothing but also rings, watches and other jewellery.

It also emphasizes the need to ensure complete and thorough washing of affected areas. Failure to do so may result in the effects described above as "bluing up". Treatment is similar.

#### B.1.4 Cobalt Amine Accelerators

NCS Resins supply the following accelerators in this group:

ACCELERATOR	DESCRIPTION	FLASH POINT
Ultracure ACA 5	Cobalt Amine mixture in Di Butyl Phthalate	46°C
Ultracure ACA 6	Cobalt Amine mixture in Di Butyl Phthalate	46°C
Ultracure ACA 7	Cobalt Amine mixture in Di Butyl Phthalate	46°C

All are purple/violet liquids with distinct odours.

#### B.1.4.1 Nature of Hazards

These should be considered as tertiary amine accelerators with hazards as tertiary amines described above.

#### B.1.4.2 Handling advice

These should be considered as tertiary amine accelerators and handled as above.

## APPENDIX C

### MOULD RELEASE AGENTS

#### C.1 PRODUCT DESCRIPTION

Mould release agents serve as barriers between mould and moulding. They can be either in the form of a liquid or paste and in various diluents. NCS Resins manufactures and supplies a range of polyvinyl alcohol release agents and wax paste release agents. In addition, NCS Resins supplies the Moldwiz range of mould release agents.

#### C.1.1 Release Agents

NCS Resins supplies the following mould release agents:

#### NCS RELEASE AGENTS

RELEASE AGENT	DESCRIPTION	FORM	FLASH POINT
NCSX-L MR2	Soya lecithin dissolved in Xylol	liquid	29°C
NCSX-L MR3	High melting point wax in white spirits	paste	above 36°C
NCSX-L MR5	Blue polyvinyl alcohol solution in water & IMS	liquid	above 13°C
NCSX-L MR6	Clear polyvinyl alcohol solution in water & IMS	liquid	above 13°C
NCSX-L MR8	Red polyvinyl alcohol solution in water & IMS	liquid	above 13°C
NCSX-L Polishing Cream	Buffing compound	paste	above 61°C

#### RAMWAX

RELEASE AGENT	DESCRIPTION	FORM	FLASH POINT
RAMWAX Run-in	Carnauba wax in solvent	paste	above 36°C
RAMWAX Silicone	Carnauba wax and silicones in solvent	paste	above 36°C
RAMWAX H13 Glaze	Buffing compound	paste	above 61°C

#### MEQUIAR'S

RELEASE AGENT	DESCRIPTION	FORM	FLASH POINT
Machine Cleaner MGM 1	A heavy duty abrasive cleaner	paste	93°C
Machine Glaze MGM 3	Non-abrasive polish	paste	93°C
Release Wax MGM 8	Blend of waxes	paste	65°C

#### AXEL PLASTICS

RELEASE AGENT	DESCRIPTION	FORM	FLASH POINT
Clean Wiz # 9	A heavy duty solvent system*	Liquid	38°C
Molax - 3F	Mould sealer	paste	30°C
Mold Wiz # Int - 44-800	Internal release agent	Liquid	137°C
Mold Wiz F - 75	External release agent	Liquid	24°C
Mold Wiz # 249	External release agent	Liquid	non flammable
Paste Wiz	Paste release agent for porous materials such as wood, plaster	paste	43°C

\* Solvent can cause blistering of skin, impervious gloves must be worn.



## C.2 HAZARDS AND PRECAUTIONS

The greatest hazards come from the solvents used in the preparation of the release agents. They are highly flammable and can be irritable to the skin, eyes and respiratory system at concentrations above the Threshold Limit Value. The least toxic of the release agents are the polyvinyl alcohol solutions.

Handling and safety precautions for NCS Resins' mould release agents should be as for Unsaturated Polyester Resin Solutions detailed in Section 2. If correctly handled mould release agents supplied by NCS Resins should not present any special hazards for users.

## C.3 EMERGENCY ACTION, STORAGE AND WASTE DISPOSAL

Methods described in Section 5, for Resin Solutions is applicable to mould release agents supplied by NCS Resins.

For further information, health and safety data sheets are available from NCS Resins.

# APPENDIX D

## DILUENTS

### D.1 PRODUCT DESCRIPTION

NCS Resins supplies various diluents. These are essentially for diluting Unsaturated Polyester Resins or more specifically to reduce the viscosity of Unsaturated Polyester Resins.

#### D.1.1 Diluents

The most important diluents supplied by NCS Resins are the following:

DILUENT	DESCRIPTION	FLASH POINT
NCS Monomer	Inhibited Styrene	31°C
Methyl Methacrylate	A sweet smelling liquid	10°C

### D.2 HAZARDS AND PRECAUTIONS; EMERGENCY ACTION, STORAGE AND WASTE DISPOSAL

These are the same as stipulated in Sections 2, 3, 5 and 6 under Unsaturated Polyester Resin Solutions.

For further information, health and safety data sheets are available from NCS Resins.

# APPENDIX E

## CLEANING SOLVENTS

### E.1 PRODUCT DESCRIPTION

Cleaning Solvents are solvents used for cleaning equipment such as brushes, spray guns and moulds. They remove resin residue, grease, waxes, release agents, dirt and dust.

NCS Resins supplies a limited range of these cleaning solvents.

#### E.1.1 Cleaning Solvents

Some of the common cleaning solvents supplied by NCS Resins include the following:

SOLVENT	DESCRIPTION	FLASH POINT
Methylene Chloride	Highly volatile liquid with anaesthetic properties	Non flammable
Acetone	A Sweet smelling highly volatile liquid	-18°C
Axel Clean Wiz # 9	Heavy duty solvent system *	38°C
NCS Soap Solution	Solid powder	Non flammable

\* Solvent can cause blistering of skin, impervious gloves must be worn.

### E.2 HAZARDS AND PRECAUTIONS; EMERGENCY ACTION, STORAGE AND WASTE DISPOSAL

These are the same as stipulated in Sections 2, 3, 5 and 6 under Unsaturated Polyester Resin Solutions.

For further information, health and safety data sheets are available from NCS Resins.

## APPENDIX F

### RESIN ADDITIVES

#### F.1 PRODUCT DESCRIPTION

NCS Resins supplies various resin additives to the industry. These additives impart special properties to polyester resins. The additives are supplied in a highly diluted form either in styrene or other monomers.

##### F.1.1 Resin Additives

*The most common resin additives supplied by NCS Resins include the following:*

ADDITIVE	DESCRIPTION	HAZARD	FLASH POINT
NCS Waxsol 5	Wax in Styrene and toluene	Fire	10°C
NCS inhibitor N7400	TBC in styrene solution	Fire	31°C
Acetyl Acetone	Resin Promoter	Fumes **	55°C
Soya Bean Oil	Vegetable Oil	Nil	282°C
RGR 40	Titanium Dioxide	Dust*	Non flammable
Zinc Stearate	Waxlike internal release agent	Dust	Non flammable
Filler D	Diatomaceous Silica filler	Dust	Non flammable
Filler G	Aluminium Silicate filler	Dust	Non flammable
Kulu 5	Fine calcite filler	Dust	Non flammable
Cab - O - Sil	Thixotropic additive	Dust*	Non flammable
NCS Catalyst Indicator	Methylene Blue dye for tinting catalyst	-	Non flammable

\* Suitable dust respirator must be worn. \*\* Suitable respirator must be worn.

#### F.2 HAZARDS AND PRECAUTIONS; EMERGENCY ACTION, STORAGE AND WASTE DISPOSAL

These are the same as for diluents and cleaning solvents as stipulated in Sections 2, 3, 5 and 6 under Unsaturated Polyester Resin Solutions.

*For further information, health and safety data sheets are available from NCS Resins.*

## GENERAL APPENDIX TO SAFETY DATA FOR HANDLING RESINS

(Further details should be sought from the suppliers)

SUBSTANCE	FLASH POINT	EXPLOSION LIMITS (v/v in air)		OEL - TWA		TOXIC EFFECT
		Lower	Upper	ppm	mg/m <sup>3</sup>	
Acetone	-18°C	2.1%	13.0%	750	1800	<p><b>Inhalation:</b> Irritation of eyes, nose, throat and lungs. Narcosis at high concentrations.</p> <p><b>Ingestion:</b> May cause vomiting and dizziness.</p> <p><b>Skin Contact:</b> Removes oils from the skin and prolonged or frequent contact may cause irritation or even dermatitis.</p>
Ethanol (IMS)	13°C	4.3%	19.0%	1000	1900	<p><b>Inhalation:</b> Vapour can irritate nose and throat and cause headache, drowsiness and loss of concentration.</p> <p><b>Ingestion:</b> Can lead to acute alcohol poisoning.</p> <p><b>Skin Contact:</b> Slight irritant.</p> <p><b>Eye Contact:</b> Irritant.</p>
Methylene Chloride (Dichloro Methane)	None	13%	22%	50	174	<p><b>Inhalation:</b> Can cause nausea, headaches, drowsiness and giddiness.</p> <p><b>Ingestion:</b> Low acute oral toxicity.</p> <p><b>Skin Contact:</b> Removes natural grease from the skin and may cause irritation.</p> <p><b>Eye Contact:</b> Irritant.</p>
Methyl Ethyl Ketone (2 - Butanone)	-7°C	1.8%	10.0%	200	590	<p><b>Inhalation:</b> Causes headache, dizziness and nausea.</p> <p><b>Ingestion:</b> Causes gastric irritation and may cause narcosis.</p> <p><b>Skin Contact:</b> Irritant; removes oils from skin, exposing it to bacterial attack.</p> <p><b>Eye Contact:</b> Liquid irritates and may cause severe damage.</p>
Styrene	31°C	1.1%	6.1%	50	215	<p><b>Inhalation:</b> Odour is detectable at 25 ppm. At 200-400 ppm there is a transient irritant effect on the nasal passages. At 400 - 1000 ppm increasing systemic effects such as dizziness, nausea and headache. At 800 ppm and over becomes intolerable to mucous membranes. 10 000 ppm may cause death in less than 1 hour.</p> <p><b>Ingestion:</b> Severe irritation and symptoms similar to inhalation.</p> <p><b>Skin Contact:</b> Irritant and defatting, may cause dermatitis and permit bacterial attack.</p> <p><b>Eye Contact:</b> Vapour at 200-400 ppm has a transient irritating effect on the eyes. Splashes extremely irritant and dangerous.</p>

## GENERAL APPENDIX TO SAFETY DATA FOR HANDLING RESINS

Continued...

SUBSTANCE	FLASH POINT	EXPLOSION LIMITS (v/v in air)		OEL - TWA		TOXIC EFFECT
		Lower	Upper	ppm	mg/m <sup>3</sup>	
<b>Methyl Methacrylate</b>	10°C	2.1%	12.5%	100	410	<p><b>Inhalation:</b> Odour is detectable at 10 ppm. At 200-400 ppm there is a transient irritant effect on the nasal passages. At 400-1000 ppm, increasing systemic effects such as dizziness, nausea and headache.</p> <p><b>Ingestion:</b> Severe irritation of alimentary tract. Symptoms as for inhalation.</p> <p><b>Skin Contact:</b> Removes oils from the skin, exposing it to bacterial attack. Dermatitis.</p> <p><b>Eye Contact:</b> Low vapour levels have transient effects. Splashes extremely irritant and dangerous.</p>
<b>Butyl Acrylate</b>	36.5°C	1.5%	9.9%	10	55	<p><b>Inhalation:</b> Irritation of the eyes, throat and lungs. High exposure can cause accumulation of fluid in the lungs.</p> <p><b>Ingestion:</b> Causes severe irritation of the mouth, throat and stomach. Can cause dizziness, severe difficulty in breathing and nervousness.</p> <p><b>Skin Contact:</b> Can cause moderate injury (reddening and swelling). Sensitization (allergic reaction) can occur.</p> <p><b>Eye Contact:</b> Can cause chemical burns - damage irreversible.</p>
SUBSTANCE	FLASH POINT	EXPLOSION LIMITS (v/v in air)		TLV * (ppm v/v)	TOXIC EFFECT	
		Lower	Upper			
<b>White Spirit</b>	36°C	0.9%	6.1%	100	<p><b>Inhalation:</b> High vapour concentrations irritate respiratory passages and may cause dizziness, vertigo, lack of co-ordination and unconsciousness.</p>	
<b>High Flash White Spirit</b>	46°C	-	-	100	<p><b>Ingestion:</b> Low order of toxicity but severe irritation.</p> <p><b>Skin Contact:</b> Defats skin tissue. Prolonged contact may cause dermatitis.</p>	
<b>Solvent Naphthas</b>	29-48°C	-	-	100	<p><b>Eye Contact:</b> No tissue damage but irritant effect</p>	

**OEL - TWA:** Occupational Exposure Limits - Time Weighted Average. Concentration over 8 hour work day and a 40 hour work week.

ppm Parts Per Million (@ 25°C and 760 mm Hg)

\* TLV: Threshold Limit Values

\* **Threshold Limit Values:** usually the maximum permitted time-weighted average concentration for a 7 or 8-hour work day and 40 hour work week, where the 'ceiling' value is stipulated (e.g. formaldehyde), this is a maximum permitted concentration, and no excursions are allowed.