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RESINS

For Printing inks



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ABOUT US

The Cytech Group is a dynamic, proactive international business partner that consistently provides value, reliability & quality in every product ensuring customer satisfaction. We leverage our core competencies of manufacturing and developing to continually expand our product lines and diversify our business portfolio. We aim to continually enhance the success and fortitude of the Cytech Group. The Organization is committed to Reliability, Innovation and Quality.

The major ground for Cytech's constant growth is research and innovation, with the belief of "Production quality, solid reputation, innovation & service, we have been dedicating our efforts to technological development & promotion, with greater quality production, to carry out principle of sustainable growth & techniques for continually offering benefits to the public.

With an operating goal of Cytech plan for the future and build the global brand. We take a broad view in a more capacious international field and attempt, with our hand ploughing in the global market, to prove ourselves to be a global - brand supplier of flexible packaging industries.

Facing the future Cytech seeks constant self-evaluation and growth.

We believe we are well prepared to stand firm and confront challenges ahead despite the intense competition, to create another high peak in our continual growth.

PROSPECTS



RESINS

HIPACK PLASTICIZING POLYURETHANE RESIN

PRODUCT : HIPACK 115, HIPACK 116, HIPACK 118, HIPACK 119 & HIPACK 171L

Hipack plasticizing polyurethane resins are used in Flexo and Gravure Inks for adhesion promoting and flexibility to resins for other film forming binders. The resins improve hardness, gloss, blocking resistance and colour strength of inks.

HIFILM FILM FORMING POLYURETHANE RESIN

PRODUCT : HIFILM 135, HIFILM 140, HIFILM 141, HIFILM 142

Hifilm polyurethane resins are used in Flexo and Gravure Inks for high flexibility, low tack property and reducibility with alcohol and esters.

POLYKETONE RESIN

PRODUCT : HIREZ KR-100, HIREZ KR-SP, HIREZ KR-500, HIREZ KR-1000, HIPLEX 1717H

Polyketone resins are clean, pale and straw to water white resins soluble in ethanol and exceptionally compatible with film forming polymers like Nc, Vinyl, Acrylics etc. It is widely used in inks and coatings to impart pigment wetting and enhance adhesion and gloss.

POLYAMIDE RESIN

PRODUCT : HIMIDE 2010, HIMIDE 9030, HIMIDE 6010, HIMIDE 1002/H

Polyamide resins are traditionally Inks binder particularly suitable for gravure inks for improving block resistance, water resistance and solvent release.

MALEIC RESIN

PRODUCT : MR150, MR 190, MR 200

Maleic resin are soluble in alcohol and highly compatible with various solvents including coal tar oil, ester, vegetable oil and turpentine oil. Resins are used in flexo and gravure inks to improve gloss, hardness drying speed and abrasion resistance.

ADHESION PROMOTER

PRODUCT : HIAID 250

Adhesion promoter is suitable for high quality printing application with special advantage of low odour and colour.

Polyketones

General Properties of Series of Polyketone Resins

Polyketones:

Cytech's Polyketones are clear, pale, straw to water white resins which are very soluble in ethanol and exceptionally compatible with film-forming polymers such as nitrocellulose, vinyl, acrylics and polyamide resin.

Structure:

As polymeric condensation products of cyclohexanone and formaldehyde, these resins exhibit certain distinctive qualities based upon their chemical structure. The saturated ring structures that form during condensation account for gloss, hardness and for resistance to degradation and colour loss in sunlight. Besides, the reaction with formaldehyde introduces polarity in the form of hydroxyl groups which accounts for desirable solubility and compatibility characteristics. Hydroxyl polarity introduces qualities of pigment wetting and adhesion, as well as reactive sites of interest in various curing systems.

In Coatings:

Especially useful in clear colour stable lacquers. Quality of adhesion, gloss, levelling and percent nonvolatile in nitrocellulose lacquers can be materially improved. Improves the general utility and performance of paper coating lacquers. Extra hardness and faster solvent release are favoured by the higher melt point type.

In Inks:

Improved pigment wetting, gloss, adhesion, printability and higher solids can be expected when Polyketones are included in gravure and flexographic ink formulations. Gel points of polyamides are reduced and may permit more latitude in the choice of resins. Many adhesion problems on difficult substrates are overcome by the addition of Polyketones. Printing on PVDC-treated cellophane is notable in this respect. Ball-point pen inks are reportedly improved in terms of flow and set. Suggested usage levels are 3-15% of total solids.

RESINS



Typical Properties

Particulars	Hi-Rez KR-100	Hi-Rez KR-SP	Hi-Rez KR-500	Hi-Rez KR-1000
Colour	1-2	1-2	1-2	1-2
Appearance	Granules	Granules	Granules	Pearl shaped Granules
Viscosity (50% in ethanol) Ford Cup 8-4	21+/- 5 sec @ 30°C	21+/- 5 sec @ 30°C	21+/- 5 sec @ 30°C	21+/- 5 sec @ 30°C
Softening Range	95-105°C	95-105°C	105-110°C	105-110°C
Hydroxyl Value	160-180	180-200	160-180	160-180
Add Value	<1.0	<1.0	<1.0	<1.0

Compatibility's Series of Polyketone Resins

	Hi-Rez KR-100	Hi-Rez KR-SP	Hi-Rez KR-500	Hi-Rez KR-1000
Polyvinyl Chloride or Acetate	✓	✓	X	
Polyvinyl Butyral	✓	✓	✓	✓
Copolymer of Vinyl Chloride Acetate	X	X	✓	✓
Nitrocellulose, Ethyl	✓	✓	✓	✓
Cellulose Acetate, Cellulose Acetobutyrate	X	X	X	X
Natural and Synthetic Rubber	✓	✓	✓	✓
Chlorinated Rubber	X	X	✓	✓
Short Oil Alkyds, Ureas and Melamines	✓	✓	X	X
Chlorinated Rubber	✓	✓	X	X
Epens	✓	✓	X	X
Acryloid A-10, B-44	✓	✓	X	X
Acryloid B-66	✓	✓	X	X
Polyamide Resin	✓	✓	✓	✓

✓ Compatible
X Non Compatible

Polyketone Resin -

Hi-Rez KR-100, Hi-Rez KR-SP, Hi-Rez KR-500, Hi-Rez KR-1000, HIPLEX 1717H

Introduction:

Hi-Rez KR-100 is a transparent solid granules, alcohol soluble, aldehyde-ketone resin having a broad range of compatibility. Hi-Rez KR-100 offers very good solubility in spirit & very good compatibility with shellac. **Hi-Rez KR-SP** is a pale coloured, alcohol soluble, aldehyde-ketone resin having a broad range of compatibility. Hi-Rez KR-SP is an improved version of Hi-Rez KR-100, with a low hydroxyl value. Hi-Rez KR-SP offers very good solubility in spirit. Both Hi-Rez KR-100 & Hi-Rez KR-SP are suitably formulated combination of Hi-Rez KR-100 & Hi-Rez KR-SP respectively with nitrocellulose resin and addition of phthalate plasticizers with a certain proportion of polyurethane resin can be used for flexographics & gravure printing inks, ball point inks, preparation of polishers, polishing varnishes and lacquers for the surface treatment of wood & paper lacquers. This unique chemistry significantly improves adhesion, pigment wetting & gloss. Typical usage levels range from 3% to 15% of total formulation. Inks and coatings utilizing Hi-Rez KR-100 show improved inner-coat adhesion, offers a good light fastness to inks, ideal for base primers or coatings. Being low in viscosity, it permits the formulation of high solids, coating and the reduction of high viscosity polymers.

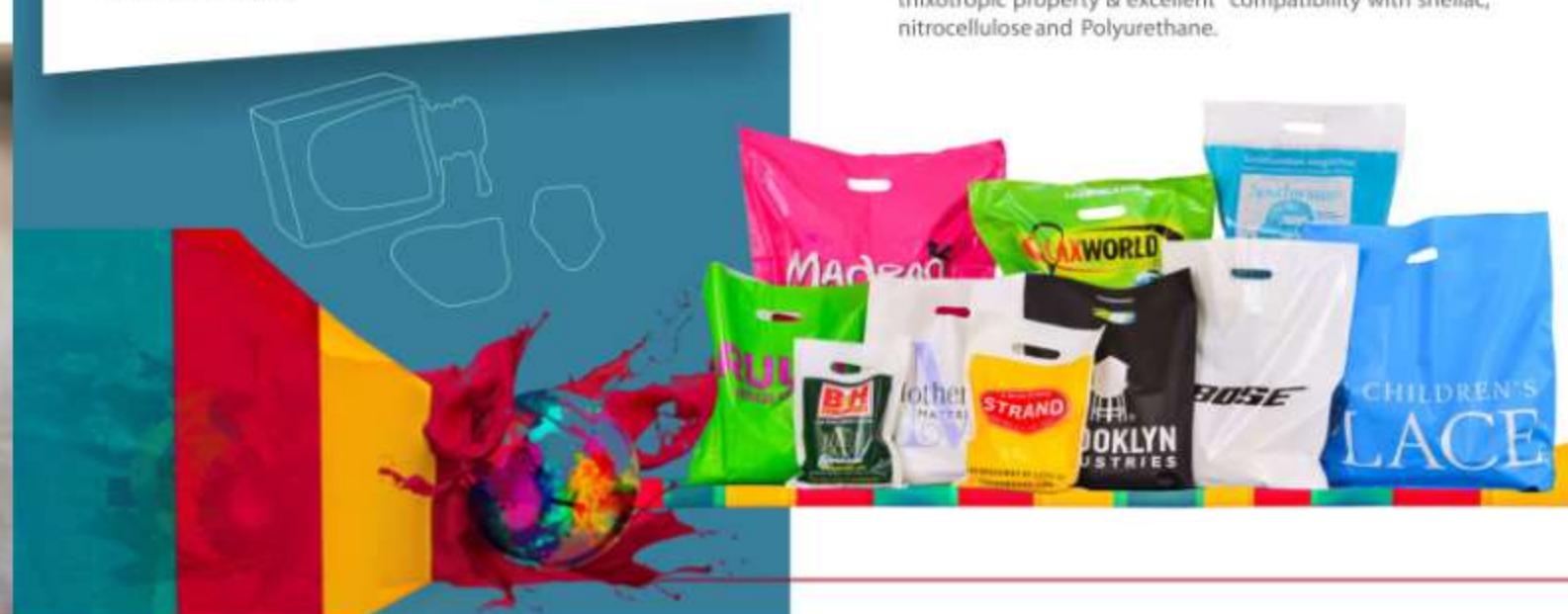
Hi-Rez KR-500 is a ketone with higher hydroxyl value. It imparts improved heat resistance & better blocking resistance. Its high degree of polarity & the unique chemistry significantly improves adhesion, pigment wetting & gloss. The solvent release is the fastest with Hi-Rez KR-500. Typical usage levels range from 3% to 15% of the total formulation. Inks and coatings utilizing Hi-Rez KR-500 show improved inner-coat adhesion, offers a good light fastness to inks, ideal for base primers or coatings.

RESINS



Hi-Rez KR-1000 is a pearl shaped solid granule, which offers very good light fastness, neutral reaction and resistance to saponification of synthetic resin. Hi-Rez KR-1000 is very much suitable for flexographic inks, gravure inks & ball point pen inks due to its high viscosity, high softening range, excellent thixotropic property & excellent solubility. Compatibility with shellac and hardness are the useful factors of Hi-Rez KR-1000 for the preparation of paper lacquers, polishers, polishing varnishes and lacquers for the surface treatment of wood; suitable formulated combination of synthetic resin Hi-Rez & nitrocellulose containing in addition to phthalate plasticizers. A certain proportion of alkyd resins are suitable for wood lacquers and distinguished for their elasticity and resistance to the cold check test.

HIPLEX 1717H is widely used in flexographic and gravure inks due to its high viscosity, high softening range, excellent thixotropic property & excellent compatibility with shellac, nitrocellulose and Polyurethane.



Typical Applications

Hi-Rez KR-100 & Hi-Rez KR-SP

- Hi-Rez KR-100 is the best option & is very suitable for use in lamination inks, paper inks, paper coating, flexographic & gravure ink formulations.
- Flexo & gravure inks
- Paper inks
- Ballpoint pen inks
- Wood primer
- Paper coatings
- Surface coatings
- Nail varnishes
- Vinyl sealers & coatings

Hi-Rez KR-500

- Hi-Rez KR-500 is the best option & is very suitable for use in lamination inks, paper inks, paper coating, flexographic & gravure ink formulations.
- Cellulose lacquers
- Nail varnishes
- Vinyl sealers
- Ballpoint inks
- Surface coatings

Hi-Rez KR-1000

- Hi-Rez KR-SP is the best option & is very suitable for use in lamination inks, paper inks, paper coating, flexographic & gravure ink formulations.
- Flexographic inks
- Gravure inks
- Ball point inks
- Paper coatings
- Wood lacquers & polishing varnishes
- Surface coatings

HIPLEX 1717H

- Best suitable for use in flexographic inks, gravure inks, paper coating & wood lacquers.

Typical Properties

Hi-Rez KR-100, Hi-Rez KR-SP & Hi-Rez KR-500

Properties	Results
Colour (Gardener Scale)	1-2
Appearance	Solid granules
Viscosity (50% in ethanol) Ford Cup B-4	21 +/- 5 sec @30 deg C
Softening range (Capillary method)	95-110 deg C
Hydroxyl value	160-200
Acid value	<1

Hi-Rez KR-1000

Properties	Results
Colour (Gardener Scale)	1-2
Appearance	Pearl shaped granules
Viscosity (50% in ethanol) Ford Cup B-4	25 +/- 5 sec @30 deg C
Softening range (Capillary method)	105-110 deg C
Hydroxyl value	160-180
Acid value	<1

HIPLEX 1717H

Properties	Results
Colour (Gardener Scale)	2-3
Appearance	Pearl shaped flakes
Viscosity (50% in ethanol) Ford Cup B-4	30 +/- 5 sec @30 deg C
Softening range (Capillary method)	125-135 deg C
Hydroxyl value	350-370
Acid value	<1

Solubility of Hi-Rez KR-100, Hi-Rez KR-SP, Hi-Rez KR-500, Hi-Rez KR-1000, HIPLEX 1717H:
Ethanol, N-Butanol, Iso-Butanol, Acetone, MEK, Cyclohexanone, MIBK, Phenoxy Glycol, Xylene

Packaging of Hi-Rez KR-100, Hi-Rez KR-SP, Hi-Rez KR-500, Hi-Rez KR-1000, HIPLEX 1717H:
25 kgs sealed packed paper or plastic bags.

Safety & Handling of Hi-Rez KR-100, Hi-Rez KR-SP & Hi-Rez KR-500 & Hi-Rez KR-1000:
All relevant data have been brought up-to-date in the Material Safety Datasheet.

Polyamide Resins

Introduction to the Himide Range of Non-reactive polyamide Resins

Himide 2010 Series - Co-solvent Resins

The Himide 2010 series of resins may be considered as the traditional polyamide ink binder. This range is particularly suited for the production of gravure inks and the resins are characteristically be their:

- Excellent resistance to blocking
- Good solvent release
- Poor tolerance to polar solvents
- Poor gelation recovery

Himide 4030 series - Co-solvent resins

The Himide 4030 series of resins may be considered as the traditional polyamide ink binder. This range is particularly suited for the production of gravure inks and the resins are characterised by their:

- Excellent resistance to blocking
- Good solvent release
- Good water resistance
- Poor tolerance to polar solvents
- Poor gelation recovery

Himide 6010 Series - Alcohol Reducible Resins

The Himide 6010 series of resins offer properties intermediate between co-solvent and alcohol soluble resins. The range is suited for the production of both gravure and flexographic inks. Compared to co-solvent resins, these resins have:

- Improved tolerance to polar solvents
- Improved gelation resistance
- Good blocking resistance
- Improved compatibility with nitrocellulose

Himide 9030 series - Alcohol Soluble Resins

The Himide 9030 series of resins offer a wider variety of properties than the co-solvent and alcohol reducible resins. These resins are particularly suitable for the production of flexographic inks but generally require the incorporation of nitrocellulose to optimize performance. The resins offer:

- Excellent tolerance to polar solvents
- Very good compatibility with nitrocellulose
- Poor to good blocking resistance
- Poor to good water resistance
- Low solution viscosities
- High melting points

Himide 1002/H Series - Alcohol Soluble resins

The Himide 1002/H series of resins offer a wider variety of properties than the co-solvent and alcohol reducible resins. These resins are particularly suitable for the production of flexographic inks but generally require the incorporation of nitrocellulose to optimize performance. The resins offer:

- Excellent tolerance to polar solvents
- Excellent compatibility with nitrocellulose
- Poor to good blocking resistance
- Poor to good water resistance
- Low solution viscosities
- High melting points

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- Excellent tolerance to polar solvents
- Excellent compatibility with nitrocellulose
- Poor to good blocking resistance
- Poor to good water resistance
- Low solution viscosities
- High melting points



Polyamide Resins

Physical Properties and Applications

Grade	Melting Point °C	Viscosity: Sec Ford cup B-4 @ 30°C	Uses	Features
Himide 2010	105-115	40-60	Gravure inks & Lacquers	Excellent Solvent Release
Himide 4030	105-115	35-60	Gravure inks & Lacquers	Improved Solubility
Himide 6010	110-120	20-25	Gravure & Flexographic inks & Lacquers	Good gelation resistance and antiblocking properties
Himide 9030	105-115	20-25	Flexographic inks	Good water resistance and low odour
Himide 1002/H	105-115	16-24	Flexographic inks	Good Adhesion on Untreated PP & HDPE



Information Sheets

Himide 2010

Description:

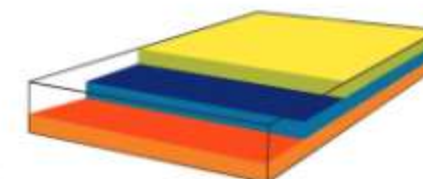
Himide 2010 is a co-solvent thermoplastic polyamide resin designed for use in gravure inks and lacquers. Himide 2010 is the highest viscosity grade of the standard range of Himide non-reactive polyamide resins. The composition of Himide 2010 is similar to that approved under FDA 175.320 - "Resinous and polymeric coatings for polyolefin films."

Typical Properties:

Acid Value	max 6 mg KOH/g
Amine Value	max 6 mg HCL/g
Softening Point (Ball & Ring)	105 - 115°C
Solution Viscosity (40% Toluene, 10% IPA & 10% Butanol Ford cup B-4)	40-60 seconds @ 30°C

Application

Himide 2010 exhibits the properties of the traditional co-solvent group in resins with poor resistance to gelation and low tolerance to polar solvents but excellent solvent release and a good lay. Incorporation of phenolic resin will improve the performance characteristics of the resulting inks or lacquers. For optimum solubility, blends of alcohols and hydrocarbons are recommended.



Information Sheets

Himide 4030

Description:

Himide 4030 is an alcohol reducible thermoplastic resin containing wax for specialist applications.

Typical Properties:

Acid Value	max 6 mg KOH/g
Amine Value	max 6 mg HCL/g
Softening Point (Ball & Ring)	105 - 115°C
Solution Viscosity (40% Toluene, 10% IPA & 10% Butanol Ford cup B-4)	35 - 60 seconds @ 30°C

Application

Himide 4030 exhibits good relation resistance and anti-blocking characteristics. Alcohol dilutability is excellent with Himide 4030 being borderline between the alcohol reducible and alcohol soluble types. Himide 4030 has an extremely low odour making it suitable for inks and lacquers where the odour is critical. Coefficient of friction for lacquers made from this resin is typically 0.31 static; 0.295 dynamic.

Himide 6010

Description:

Himide 6010 is a medium viscosity alcohol soluble polyamide resin for use in flexographic inks and lacquers, where water resistance is less important.

Typical Properties:

Acid Value	max 6 mg KOH/g
Amine Value	max 6 mg HCL/g
Softening Point (Ball & Ring)	110 - 120°C
Solution Viscosity	20-25 seconds @ 30°C
(IPA 35%, Toluene 15%, Butanol 10%; Ford cup B-4)	

Application

Himide 6010 exhibits good gelation resistance, compatibility with nitrocellulose and low odour. However, the good anti-blocking characteristics of Himide 6010 allow its use for inks and overprint lacquers where water resistance is not critical.



Himide 9030

Description:

Himide 9030 is a co-solvent thermoplastic polyamide resin designed for use in packaging inks and lacquers. Compared to Himide 4030, Himide 9030 has much-improved solubility characteristics, compatibility with nitrocellulose and greater tolerance to alcohol and polar solvents.

Typical Properties:

Acid Value	max 6 mg KOH/g
Amine Value	max 6 mg HCL/g
Softening Point (Ball & Ring)	105 - 115°C
Solution Viscosity	20-25 seconds @ 30°C
(IPA 35%, Toluene 15%, Butanol 10%; Ford cup B-4)	

Application

Himide 9030 retains the beneficial properties of the traditional co-solvent polyamide resins with the added advantage of improved resistance to gelation and greater tolerance to polar solvents. The compatibility of Himide 9030 with nitrocellulose is much improved to that of other Himide range of products. Incorporation of a phenolic resin will also improve some of the performance characteristics of Himide 9030. For optimum solubility blends of alcohols and hydrocarbons, solvents are required.

Himide 1002/H

Description:

Himide 1002/H is a general-purpose low odour alcohol soluble polyamide resin for flexographic packaging inks. Optimum performance requires higher levels of nitrocellulose than Himide 9030.

Typical Properties:

Acid Value	max 10 mg KOH/g
Amine Value	max 6 mg HCL/g
Softening Point (Ball & Ring)	105 - 115°C
Solution Viscosity	16 - 24 seconds @ 30°C
(40% IPA, 10% Toluene, 10% Butanol; Ford cup B-4)	

Application

Himide 1002/H has excellent nitrocellulose compatibility and optimum performance of ink is obtained with relatively high levels of nitrocellulose. The low odour of Himide 1002/H makes it suitable for food packaging inks. Himide 1002/H complements Himide 9030 and between them they span the normally encountered levels of nitrocellulose with Himide 9030 being suitable for lower levels. A solubility characteristic of Himide 1002/H is excellent and is gelation resistance. Himide 1002/H can be considered as a general-purpose, alcohol soluble resin for flexographic inks.

Packaging of all Himide Brands:

Available in 25 kg bags normally 500 kg per pallet

Shelf life of all Himide Brands:

Store under cool, dry conditions. It is recommended that the material be used within 12 months of certification.

Handling of all himide Brands:

Himide polyamide resins are not classified as dangerous and present little or no toxic hazard at normal ambient temperatures, providing good standards of industrial and personal hygiene are practised.

However, dust may be produced during handling and the wearing of protective masks and precautions to avoid potential dust explosion etc. are required.

Properties of Polyamide Ink resins

The properties measured for every development or production resin include those related to the chemistry of resin and those specific to its performance as an ink.

Knowledge of resin chemistry is essential to obtain reproducibility of molecular weight and other physical parameters. Similarly, a knowledge of those properties related to solution and film behaviour is required to ensure that satisfactory ink performance is obtained.

Study of all these properties allows the effect of compositional and process changes on ink performance to be assessed.

All comparisons are made using the resin in unmodified form. For continuity, the modifying resin used is a spirit soluble, 1/8 sec nitrocellulose, which is compatible with all resins at the level used. It is appreciated that many other types of modifying resin is used depending upon the final properties required.

Resin

Physical Properties	Chemical Properties
Melting Point	Amine Value
Melt Viscosity	Acid value
Odour	
Colour	

Ink

Solution Properties	Film Properties
Viscosity	Water Resistance
Alcohol and Ester Tolerance	(Crinkle and Scratch Resistance)
Gelation resistance	Solvent Release
Overnight Stability	Anti Blocking
	Tape Adhesion
	Visual Gloss

Full details of the test method are available on request.



Test Methods for Polyamide Resins

Softening Point

The softening (or melting) point is measured using the ring and ball method with a heating rate of 5 deg C per minute. The result is expressed in deg C.

Acid Value

The acid value is determined by titration with 0.1N alcoholic potassium hydroxide solution using phenolphthalein indicator. The results expressed in mg KOH/g of resin.

Amine Value

The amine value is determined by titration with 0.1N hydrochloric acid using a bromo cresol green indicator. The result is expressed in mg KOH/g of resin.

Colour

The colour is determined on a 35% nvc solution in n-propanol using a comparator. The results are expressed in terms of the unit on the Gardner scale.

Test Procedures for Assessing Ink Properties

Varnish Properties

The varnish properties are determined on a 35% nvc solution of the test resin in n-propanol. The resin is tested unmodified and modified with 20% of an "alcohol soluble" nitrocellulose resin based on resin solids.

Gel recovery

The gel recovery temperature is the temperature at which the test resin solution becomes liquid after storage at -12 deg C for 16 hours.

Polar Solvent Tolerance

The solvents used for determining the polar tolerance is either industrial methylated spirit or ethyl acetate. The amount of polar solvent required to precipitate the test resin from solution is determined and the tolerance is expressed as a percentage over the original resin solution (i.e. 1 part resin solution to 1 part polar solvent is 100% tolerance; 1 part resin solution to 1.5 part polar is 150% tolerance).

Solvent release

The solvent release is measured as the relative drying of the test solution against a fast-drying, high molecular weight co-solvent solution (Himide 831, at 35% nvc in n-propanol). A twin channel grind gauge is used. The result is expressed on an arbitrary scale of 0-10, with the standard expressed as 5.

Anti Blocking

Anti-blocking is measured as the degree of adhesion between varnish film (varnish to varnish) stored for 16 hours at 40 deg C and 90% relative humidity under a 1 kg weight.

Ink Properties

the ink properties are determined on flexographic inks made from resin alone and resin-modified with nitrocellulose. The inks are pigmented with phthalocyanine blue at a pigment/binder ratio of 0.36:1

Water Scratch Resistance

The wet scratch resistance is exposed as the resistance of the film to marring or removal by fingernail after being soaked in water at 25 deg C for 3 hours.

Water Crinkle Resistance

The wet crinkle resistance is the number of crinkles to remove or damage the film after soaking in water at 25 deg C for 3 hours.



Recommendations for the Safe Handling of Polyamides Recommendations for the Safe Handling of Polyamides

A. Precautions

1. General

Solid polyamide resins not normally harmful but can present dust hazard.

2. Skin Protection

Not normally harmful

3. Eye Protection

Avoid contact with eyes. Wear eye protection at all times when handling polyamide resins.

4. Respiratory Protection

Avoid breathing dust. Wear suitable dust mask when handling polyamide resins.

5. Protection from Fire and Explosion hazards

The main hazard is represented by dusting from solid polyamide resins. Avoid sources of ignition and take precautions to avoid build-up of static.

Efficient ventilation to minimize dust concentrations is essential. In the event of a fire suitable extinguishers are foam and dry powder carbon dioxide.

Combustion of the resins may yield toxic by-productions; therefore, firefighters should wear suitable protective clothing including breathing apparatus.

6. Environmental considerations

Not normally dangerous for the environment.



Recommendations for the Safe Handling of Polyamides

B. first Aid

1. Skin Contact - Wash with soap and water.

2. Eye Contact - Flush promptly with water for at least 10 minutes. Seek medical attention.

3. Inhalation - Immediately take fresh air, seek medical attention.

4. Ingestion - Immediately rinse the mouth with plenty of water. Seek medical attention.

C. Storage

Store away from sources of ignition.

D. Spillage

Powder spillages should be swept up; avoid causing excessive dust, and placed in closed containers for disposal.

E. Disposal

All wastage must be disposed of in accordance with the requirements of the Pollution Control Act.

N.B. when the above resins are formulated into end productions, due account must be taken of other constituents of the formulations on their handling hazards.



Polyurethane resins

Introduction to Polyurethane resins

Polyurethane products first made their appearance in the market place in the late 1930s. These were after an intense investigation by Dr Otto Bayer who was looking for synthetic fibre to replace nylon. Once the basic technology was understood, new applications for foams (1941) and elastomers (1943) were developed. In the early 1950s, commercial applications appeared.

The variety of raw materials, as well as the range of different manufacturing techniques, enabled pioneers to make a seemingly endless of tailor-made products with different physical properties. These include soft foams, rigid structural and insulation foams, soft and hard elastomers and coatings.

Processing techniques include casting, spraying, foaming, reaction injection, moulding injection, moulding extrusion and painting.

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Basic Chemistry

Polyurethane is a name that is given to resin that contains urethane groups. The urethane groups in the molecule give the end product certain unique properties.

A urethane group is formed when isocyanate and hydroxyl chemical react together.

The component containing the hydroxyl group is referred to as the polyol component and the component containing the ISO cyanate group is referred to as the isocyanate component. There are a large number of raw materials available and this means polyurethanes are one of the most versatile product in the market.

Most polyurethanes consists of large molecules made by reacting various combination of these basic materials:

1. Diisocyanate: e.g. TDI, MDI, IPDI
2. Polyol: e.g. Long-chain polyether, polyester or polycaprolactone
3. Crosslinker: Such as glycerol or diamine

Note: Prepolymers are resin where the diisocyanate and polyol have been pre-reacted under carefully controlled condition. To make useful polyurethane, very high molecular weight (macromolecules) must be achieved. This means that the OH:NCO (polyol: ISO) ration must be correct and component and two components must be mixed thoroughly. (The component react if are in contact with each other)

Hi-Pack Plasticizing Polyurethane Resin

Hi-Pack plasticizing polyurethane resins are intended for nitrocellulose based inks and coating systems. An extensive range of aromatic based Hi-Pack products is available in a choice of hardness and plasticizing effects, which can be applied to both, rigid and flexible substrates. The grades listed in this document represent the most commonly used products with a choice of non-volatile content, viscosity and solvent release characteristics. All conventional Hi-Pack Products are supplied as isocyanate.

Product	Viscosity in brookfield viscometer	Solids	Solvent	Description
HI-PACK - 115	2000-2200	70	27% ETAC + 03% NPA	General purpose semi aliphatic resin, flexographic and gravure inks. This is used in combination with nitrocellulose & vinyl resin for lamination & surface printing inks.
HI-PACK - 116	2500-3000	95	05% NPA	Very flexible, excellent solvent release.
HI-PACK - 118	450-500	40	50% ETAC + 10% Ethanol	Very flexible, excellent solvent release.
HI-PACK - 119	2000-2200	70	27% ETAC + 03% NPA	Aliphatic resin with very good water resistance. Suitable for both surface & lamination printing inks. Highly recommended for deepfreeze ink application.
HI-PACK - 171L	600-800 cps	50% +/-2%	50% ETAC	Improves hardness, gloss and blocking resistance as well as the color strength of organic pigments and the adhesion on many plastics and aluminium



Hi-Film Film-forming range of Polyurethane Resins

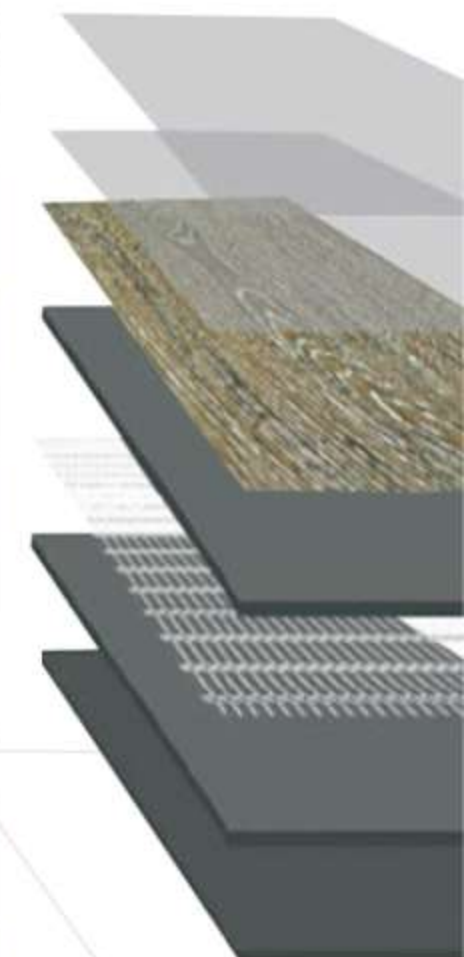
Hi-Film polymer contains both polyether and polyester, high molecular weight structures. Hi-Film comprises a range of solvent-based film-forming urethanes, which can be used on a wide variety of substrates where a demanding performance calls for high-quality inks. Hi-Films polymers have been formulated to lower the non-volatile content for cost-effectiveness. Special grades have been developed for vinyl substrates in combination with vinyl co-polymers. All conventional Hi-Film products are:

Product	Viscosity in Brookfield viscometer (25°C)	Solids	Solvent	Description
HI-FILM - 135	1000-1200	30	70% ETAC	Film forming, non-reactive polyurethane prepolymer designed for use in Flexo or Gravure packaging inks.
HI-FILM - 140	1000-1200	30	60% ETAC + 10% IPA	Film forming, non-reactive polyurethane prepolymer designed for use in Flexo or Gravure packaging inks.
HI-FILM - 141	1100-1500	30	20% ETAC + 50% NPAC	Film forming, non-reactive polyurethane prepolymer designed for use in Flexo or Gravure packaging inks.
HI-FILM - 142	1100-1500	30	50% ETAC + 20% NPA	Slow drying, Film forming, non-reactive polyurethane prepolymer designed for use in Flexo or Gravure packaging inks.

Hi-Film Aliphatic Film-forming range of polyurethane resins

Resins in this category are 100% aliphatic and prepared by chain extension of pre-polymer and diamine, nitrocellulose compatible and ethanol dilutable in all proportion.

Product	Viscosity in Brookfield viscometer (25°C)	Solids	Solvent	Description
HI-FILM - 129	800-1000	30	67% ETAC + 3% NPA	Suggested for gravure lamination.



Product Data Sheet: HI-Pack & HI-Film Series

Introduction

Hi-Pack 115, Hi-Pack 116, Hi-Pack 118, Hi-Pack 119, Hi-Pack 171L

Hi-Pack 115 is solvent born non-reactive, thermoplastic polyurethane resin. Hi-Pack 116 is a softer version of Hi-Pack 115. Both are used as adhesion promoting and flexibilising resin for other film-forming ink binders.

Hi-Pack 119 is aliphatic and prepared by the chain extension of Pre-polymer & diamine, this is a typical ink binder & having very good water resistance, hence highly recommended for deep freeze ink systems. It can be used for the surface & reverse printing inks.

All the above three resins give good adhesion on substrates like PE & PP films, Aluminium foils. These resins are used to formulate solvent-based flexo and gravure inks for packaging films, especially poly, polyester, BOPP, polyolefin films. Inks based on these resins are recommended for surface printing as well as laminating applications.

Hi-Film 135, Hi-Film 140, Hi-Film 141, Hi-Film 142

They are a film-forming, non-reactive urethane pre-polymer designed for use in flexo or gravure packaging inks. The products are compatible in all proportions with nitrocellulose, has excellent reducibility with alcohols and ester sand has a low odour and high flexibility.

	HI-PACK				HI-FILM			
	115 & 116	118	119	171L	135	140	141	142
1.Type	Non-reactive polyurethane	Non-reactive polyurethane	Non-reactive polyurethane	Non-reactive polyurethane	Film Forming Resin	Film-Forming Resin	Film-Forming Resin	Film-Forming Resin
2. Appearance	Transparent Colourless Liquid	Transparent Colourless Liquid	Transparent Colourless Liquid	Transparent Colourless Liquid	Transparent Colourless Liquid	Transparent Colourless Liquid	Transparent Colourless Liquid	Transparent Colourless Liquid
3. Total Solids (%w/w)	70 / 95	40	70	50	30	30	30	30
4. Viscosity in Brookfield Viscometer (25°C)	2000-2200 / 2500-3000	450-500	2000-2200	600-800	1000-1200	1000-1200	1100-1500	1100-1500
5. Volatiles	27% ETAC + 3% NPA / 5% NPA	50% ETAC + 10% Ethanol	27% ETAC + 3% NPA	50% ETAC	70% ETAC	60% ETAC + 10% IPA	20% ETAC + 50% NPAC	50% ETAC + 20% NPA
6. Flash point°C (C.C)	5	5	5	5	5	5	5	5
7. Specific Gravity (25°C)	1.09 / 1.10	0.95	1.07	1.025	0.91	0.91	0.91	0.91
8. Acid Value	1.0 (Max)	1.0 (Max)	1.0 (Max)	1.0 (Max)	1.0 (Max)	1.0 (Max)	1.0 (Max)	1.0 (Max)



Application:

Hi-Pack 115, Hi-Pack 116

- Flexo & gravure inks with excellent press behaviour for printing common flexible packaging films like polyolefins, PET, aluminum foils, & metalized films.
- Blending with hard resins may be required to eliminate tackiness. The use of nitrocellulose should be in appropriate ratio to ensure the lamination adhesion, low solvent retention.
- At the time of printing on PET films, adhesion promoter is not required.
- Recommended adhesion promoter while printing on polyolefin & BOPP films.

Hi-Pack 118

- Manufacturing of Flexo & Gravure inks
- Wood coatings & Nail polish

Hi-Pack 119

- Polymeric plasticizing resin to be used in combination with alcohol soluble nitrocellulose.
- Product is normally used as flexibilising resin for other film-forming binders like NC and/or other hard film formers.
- Flexo & gravure printing inks on PE & PP
- OPV
- Highly recommended for deep freeze inks.
- Use of nitrocellulose must be minimised to ensure adhesion, lamination bond strengths and low solvent retention

Hi-Pack 171L

- Flexo & Gravure printing inks.
- Wood and furniture coatings

Hi-Film 135

- High performance flexo and gravure inks for printing on common flexible packaging like PET (Chemically Treated), polyolefin, aluminum foils & metalized films.
- Blending with the hard resins may be required to eliminate residual tackiness
- The use of nitrocellulose must be minimized to ensure adhesion,

Hi-Film 140, 141, 142

- High performance flexo and gravure inks for printing on common flexible packaging like PET (Chemically Treated), polyolefin, aluminum foils & metalized films.
- Blending with the hard resins may be required to eliminate residual tackiness
- The use of nitrocellulose must be minimized to ensure adhesion, lamination bond strengths and low solvent retention.



Key Benefits:

Hi-Pack 115, Hi-Pack 116

- Balance of adhesion & alcohol solubility
- Excellent compatibility with alcohol soluble nitrocellulose
- Good adhesion on aluminium foils
- Very flexible
- Non-blocking films even at high temperatures
- Solvent retention values are very low
- Recommendations for end-use for Hi-Pack 115, hi-Pack 116
- Flexo and gravure inks on films

Hi-Pack 119

- Balance of adhesion & alcohol solubility
- Very good water resistance
- Good compatibility with nitrocellulose
- High heat resistance of the formulated product
- Fat and grease resistance of the formulated product
- Recommendations for end-use
- Flexo and gravure inks on films

Hi-Pack 118

- Improve adhesion
- Excellent Compatibility with alcohol soluble resins
- Improve resolubility of inks
- Increases hardness of ink
- Non-blocking films even at high temperatures
- Solvent retention values are very low

Hi-Film 135, 140, 141, 142

- Film forming resin with low tack property
- Excellent reducibility in alcohol
- Compatible with nitrocellulose, PVB and Maleic resin
- Excellent dot reproduction.
- Solvent retention values are substantially lower than conventional inks

Packaging

200kgs capacity tight headed, non-returnable drums

Shelf life

Store under cool dry place. It is recommended that material should be used within 12 months from the date of manufacturing.

Safety

All relevant data have been brought up-to-date in the Material Safety Datasheet.



Recommendations for the Safe Handling of Polyurethane resin

A. Precautions

1. General

Liquid non-reactive polyurethane resins are themselves classified as non-hazardous but because of flammable, relevant solvents, relevant handling precaution must be observed.

2. Skin Protection

Avoid contact with skin; wear impervious gloves at all times

3. Eye Protection

Avoid contact with eyes. Wear eye protection at all times.

4. Respiratory Protection

Wear approved suitable vapour mask where vapour may be generated.

5. Protection from Fire

In the event of a fire suitable extinguishers are water carbon dioxide or a dry chemical powder. Combustion of the resins may yield toxic products therefore, firefighters should wear suitable protective clothing including breathing apparatus.

6. Environmental Considerations

Not normally dangerous for the environment.

Recommendations for the Safe Handling of Polyamides

B. First Aid

1. Skin Contact

Remove all contaminated clothing; wash with plenty of soap and water

2. Eye Contact

Irrigate with eyewash solution or clean water holding the eyelids apart for at least 10 minutes. Obtain medical attention.

3. Inhalation

Remove patient from exposure. Obtain medical attention.

4. Ingestion

Drink plenty of water or milk. Do not induce vomiting. Obtain medical attention if ill-effects occurs.

C. Storage

1. Solvent containing store away from sources of ignition.

2. Keep containers tightly closed and dry.

D. Spillage

Ensure suitable personal protection during removal of spillages on to sand earth or any suitable absorbent material and place closed containers for disposal.

E. Disposal

Do not allow into drains, water courses or where ground/surface waters may be affected. Disposal should be by following regulations made under the special waste Regulation and Environmental Protection Acts or appropriate local/national regulations.



Maleic Resins

Maleic Resins MR 150, 190 & 200

Alcohol soluble maleic resin MR-150 is made from Gum rosin and pentaerythritol via esterification with polyhydric alcohol. **Alcohol soluble maleic resin MR 190** is made from Gum rosin and trimethylol propane on esterification. **Alcohol soluble maleic resin MR-200** is made from Gum rosin on esterification.

They are easily compatible with various solvents including coal tar oil, ester, vegetable oil and turpentine oil. Application is done for surface coatings and primers to improve the gloss, hardness, drying speed, abrasion resistance and yellow resistance.

Applications:

Maleic resins are best suitable for use in laminating inks, paper inks, paper coating, flexo graphic & gravure ink formulations.

- Flexo & gravure inks
- Paper inks
- Ball point pen inks
- Wood primer
- Paper coatings
- Surface coatings
- Nail varnishes
- Vinyl sealers & coatings

Typical Properties:

Properties	Specificationss		
	Maleic Resins		
	150	190	200
Colour (Gardner Scale)	5-6	5-6	3-4
Appearance	Pale Yellow Flakes	Dark Yellow Flakes	Pale Yellow Flakes
Viscosity (50% in IPA) Ford Cup B-4 @30°C	30-35 seconds	30-35 seconds	30-35 seconds
Softening Range (Capillary Method)	150-160 °C	160-165°C	165-175°C
Acid Value (mgKOH/gm)	140-150	200	190-200

Packing:

25 Kgs sealed packed paper or plastic bags.



Adhesion Promoter Hi-Aid 250

Adhesion Promoter Hi-Aid 250

Description

This preferred product is for the demanding duties of inks in today's quality printing and packaging environment. Hi-Aid 250 is a chelated titanate containing isopropanol and ethanol as solvent. It is a titanium chelate developed in response to the need of the printing industry for a low odour, low colour adhesion promoter. It does not contain acetylacetone. Today Hi-Aid 250 is the leading adhesion promoter for high quality, demanding printing applications.

Sr. No.	Property	Specification
1	Appearance	Transparent water white Liquid
2	% of Solid content	45+/-2
3	Solvent	Iso Propyl Acetate
4	Viscosity by B4 Cup in sec. @30°C	16 - 20
5	Flash Point	5°C
6	Acid Value	<2.0
7	Specific Gravity	1.04+/-0.02
8	Colour Gardner	1 max.
9	Dry Odour	Odourless

Supplier Specification:

Pot Life: pot life of mixed Cross-linking resin is about 6 months

Shelf life: Shelf life of Cross linking resin/unopened/undamaged packing under normal storage condition is 1 year.

Dilution: Dilution is recommended by using the recommended solvent.



Hi-Aid 250

Preferred Substrate

Coextruded oriented polypropylene

Although the impetus for developing HI-AID product was the need to promote adhesion, it was also found that it improved the ink's heat resistance. This allowed the film to be heat sealed in the printed area, helping pave the way for HI-AID 250 to establish a market leader in co-extruded oriented polypropylene applications. To obtain increased adhesion using HI-AID 250, you need to treat the film surface usually by corona discharge.

Other substrates

HI-AID 250 also works successfully in inks for printing on corona discharge treated polyethylene. The resulting increased water resistance is important for deep-freeze and boil-in-the-bag applications. They are also effective on NC coated cellophane, OPP film, shellac-washed aluminium, pearled polypropylene and on polyethylene coated milk cartons.

Preferred Resins

Polyvinyl Butyral based (PVB) inks

Whilst adhesion of PVB based inks to polypropylene films is good, it can be improved further by the addition of HI-AID product on heat stability depend on the ink formulation and substrate. Improvements can be achieved up to 160 deg C. the addition of a stabilizer such as maleic acid to control the ink viscosity is particularly important.

Nitrocellulose/polyurethane and nitrocellulose/polyamide inks

HI-AID 250 is effective in a variety of resin systems which have nitrocellulose (NC) as the principal film former and usually incorporate a co-binder such as a polyamide or fully reacted polyurethane. It brings the following demonstrable benefits:

Improved adhesion to OPP film

Improved heat stability depending on the grade of OPP film used
Reduced yellowing effects with HI-AID 250 compared with titanium acetylacetonates.

No reduction in gloss with HI-AID 250

improvement in the performance of acrylics, alkyd and maleic resins used with nitrocellulose

RESINS



Preferred Printing Process

Flexographic

The flexographic process provides good quality printing on to a variety of substrates, including stretchable films, offering versatility and economic cost. Low viscosity liquid inks which dry by absorption or solvent evaporation are used either directly or for producing laminate structures. HI-AID 250 is widely used in solvent-based flexographic inks to improve adhesion to film and increase heat resistance, water resistance, grease resistance and chemical resistance.

Gravure

The gravure process produces very high-quality graphics on paper, foil and some (non-stretchable) plastic films and is best suited for long production runs. For some flexible packaging applications, properties of the printed ink films are improved by the incorporation of HI-AID 250 in the case of C-type inks containing nitrocellulose which dominate the packaging gravure market, HI-AID product improves the adhesion and grease resistance. With D-type inks based on polyamide resins, HI-AID additives improve adhesion and increase heat resistance.



HIPRINT UV DUCK VARNISH

PRODUCT CODE – FLX 400

PRODUCT NAME – UV DUCK VARNISH

Product Features:

- Outstanding Adhesion to variety of Substrate
- Very Good Gloss.
- Excellent Toughness
- Very good dimensional stability
- Excellent Flow.
- Good Scratch Resistance.
- Excellent Print transfer while machine application

Substrate:

- Coated Paper and printed board
- Adhesion is to be confirmed for non-absorbent substrate

Application:

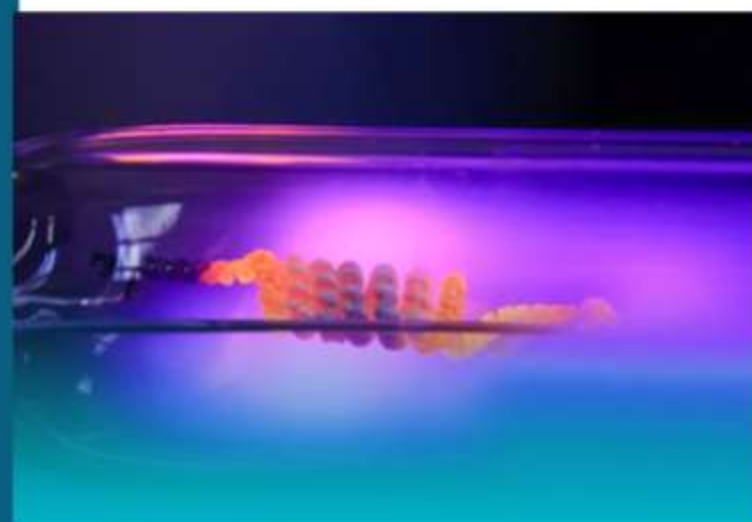
- Roller Coater Coating system

Specification:

Appearance	Colourless liquid
Viscosity	40 ± 10 sec @ 30°C by Ford Cup No.84.
Solid%	99+/-1%

Storage:

UV curing Coatings should be stored in amber glass, baked phenolic lined, stainless steel, or polyethylene lined containers. This material should be stored in the dark and at temperatures not exceeding 30°C. Shelf life of the material is 6 months from the manufacturing date.



UV COATINGS & RAW MATERIALS

AMINE SYNERGIST

Description:

Amine Synergist is a reactive amine additive that is generally used in place of more fugitive Amine Synergist to increase the cure speed of ultraviolet cured coatings. When Amine Synergist is used in combination with other photo initiators an increase in curing speed, especially at the surface, can be observed. Besides the improved stability, other advantages of Amine Synergist are including light colour, low viscosity and low volatility.

Properties :

Appearance	Clear Slight yellowish liquid
Odor	Slight amine smell
Freezing point	<5 °C
Density	0.99 g/cm3
Polymer solids	> 99.5 % by weight

Performance Highlights:

The UV/EB cured products based on Amine Synergist are characterized by the following properties:

- Faster cure response, especially at the surface
- Low Odour Coating
- No Surface migration of amine
- No reaction of amine with organic solvents
- High gloss coating

Application:

Formulated UV/EB curable products containing Amine Synergist may be applied by lithographic, screen, gravure, direct or reverse roll, and curtain coating methods. Amine Synergist is recommended as a reactive co-initiator in the following applications. Recommended levels are from 5 to 15 % based on the total weight of formulation, usually combined 5 % Amine Synergist.

- Overprint varnishes
- Silkscreen and flexo inks
- Wood fillers and top coats
- Clear coatings in paper and plastics.
- Pigmented coatings



UV COATINGS & RAW MATERIALS

EPOXY ACRYLATE

Description:

Epoxy acrylate is a partially acrylated ester of a bisphenol A type epoxy resin. It contains both acrylate and epoxy functionalities. This resin may be cured by exposure to either ultraviolet light (UV) or electron beam (EB) in conjunction with conventional epoxy curing. It may also be cured with UV radiation using a mixed photoinitiator system consisting of free radical application requiring improved coating performance properties over those obtainable with conventional UV/EB curing alone.

Properties :

Viscosity at 60°C, mPa.s	1100
Colour, Gardner	5 max.
Acid value, mg KOH/gm	1 max.
Density, g/cm ³	1.12
Molecular weight, theoretical	450
Acrylate functionality, theoretical	1
Weight per epoxide	450
Polymer solids, % by weight	100

Performance Highlights:

Epoxy Acrylate is characterized by both epoxy and acrylate functionalities & Good cure response

UV/EB cured products based on Epoxy acrylate are characterized by the following performance properties:

- High gloss finish
- Good solvent resistance
- Good adhesion to metals and other non-porous substrates
- Improved flexibility over other epoxy acrylates

The actual properties of UV/EB cured products also depend on the selection of the other formulation components, such as reactive diluent (s), additives and photo-initiators.

Viscosity Reduction:

Epoxy Acrylate can be diluted with reactive monomers such as 1,6 hexanediol diacrylate (HDDA) (2), trimethylolpropane triacrylate (TMPTA) (2), tripropyleneglycol diacrylate (TPGDA)(2) and octyl/decyl acrylate (ODA) (2). The specific reactive diluent(s) used will influence performance properties such as hardness and flexibility.



Application:

Formulated UV/EB curable products containing Epoxy Acrylate may be applied by lithographic, screen, gravure, direct or reverse roll, and curtain coating methods. Epoxy acrylate is recommended for use in:

1. Coatings and inks for metal substrates including aluminium
2. Applications where portions of the curable material are in "shadow" areas
3. Applications where thermal post-curing will enhance coating properties
4. 2-component curing systems

Handling & Storage for Amine Synergist & Epoxy Acrylate:

Care should be taken not to expose radiation curable oligomers to temperatures exceeding 40 deg C (100 deg F) for prolonged periods of time or to direct sunlight. This might cause uncontrollable polymerization of the product with generation of heat. Use dry air to displace material removed from the container. Storage and handling should be in stainless steel, amber glass, amber polyethylene or baked phenolic lined containers.

Packing:
20/200Kg Drum



TPGDA

Description:

Tripropylene glycol diacrylate (TPGDA) is a difunctional monomer and polymerisation occurs when TPGDA is exposed to sources of free radicals. TPGDA have good hardness, abrasion resistance and high gloss properties, used in varnishes, inks and coatings.

Properties :

Chemical Name	Tri propylene glycol diacrylate
CAS No.	42978-66-5
EINECS No.	256-032-2
Molecular Formula	C ₁₅ H ₂₄ O ₆
Appearance	Clear liquid
Odor	Bland
Color, Apha	150 max.
Boiling point °C	120°Cmin. (1mmHg)
Specific gravity, 25°C	1.03-1.05
Viscosity, cps, 25°C	8-16
Inhibitor (MEHQ ppm)	600max.
Moisture, %	0.2max.
Residual solvent, %	0.1max.
Acid value, mg KOH/G	1.0 max.

Performance Highlights:

TPGDA is characterized by low viscosity, light color, light odour & good diluent for oligomers. UV/EB cured products based on TPGDA are characterized by good flexibility & good cure speed without brittleness.

Application:

TPGDA finds application in UV/EB ink and coating system.



Handling & Storage:

Care should be taken not to expose radiation curable products to temperatures exceeding 40°C for prolonged periods or to direct sunlight. This might cause uncontrollable polymerization of the product with generation of heat. Storage and handling should be in stainless steel, amber glass, amber polyethylene or baked phenolic lined containers. Do not store this material under oxygen free atmosphere. Use dry air to displace material removed from the container.

Packing: 20/200Kg Drum

UV COATINGS & RAW MATERIALS



TMPTA

Description:

Trimethylol propane Triacrylate (TMPTA) is a trifunctional monomer which polymerizes when exposed to sources of free radicals. It is compatible with a wide range of acrylated resins. Cured films containing TMPTA provide hardness, good solvent and abrasion resistance and high gloss properties.

Properties :

Chemical Name	Tri methyl propane triacrylate
CAS No.	15625-89-5
Molecular Formula	C ₁₅ H ₂₀ O ₆
Appearance	Clear liquid
Color, Apha	150 max
Specific gravity, 25°C	1.09 – 1.12
Viscosity, cps, 25°C	70-115
Water Content	≤ 0.2%
Acid value, mg KOH/G	1 max.
Functionality, theoretical	3
Inhibitor (MEHQ ppm)	100-300

Performance Highlights:

TMPTA is also characterised by low viscosity & light colour while UV/EB cured products based on TMPTA are characterized by good cure response, high crosslinking density, hardness, good solvent and abrasion resistance.

Application:

TMPTA is a reactive diluent compatible with a wide range of acrylated resins used in Radiation curing applications. Hardness, abrasion resistance and high gloss properties make TMPTA popular for overprint varnishes, inks and coatings.