Singh Plasticisers & Resins (I) Pvt. Ltd. (SPR) is an ISO 9001:2008 certified manufacturer and exporter of POWERPLAST brand Rubber Processing Chemicals.

SPR is located in New Delhi, India with our manufacturing facility in the neighbouring state of Rajasthan.

SPR is a leading manufacturer of Dry Bonding Chemicals in India and second only to Indspec Chemical Corp in the production of Resorcinol based resins globally.

SPR is a privately held company run by professionals with decades experience in companies like GE Plastics, Motorola, IBM etc.

SPR is a Government of India recognized Export House.
TYPES OF RESINS

RESINS

NATURAL RESIN
- PINE TAR

SYNTHETIC RESINS
- GUM ROSIN/ WOOD ROSIN
SYNTHETIC RESINS

- HYDROCARBON RESINS
- CI RESINS
- PHENOLIC RESINS
HYDROCARBON RESINS

Also called PETROLEUM RESINS
- C5
- C9
- C5/C9

USES: Tackifiers, Adhesives, Paints, Inks
BENEFITS: Low Color, Hypoallergenic, Low Cost
LIMITATIONS: Inadequate performance unless used with other kinds of resins.
COUMARONE INDENE RESINS

- Made with a combination of Coumarone and Indene products.
- Raw materials have some unsaturation
- Different ratios for different melting points
- USES: Linoleum, Glues, Adhesives, Artificial Leather, Insulating Tape, Tackifiers
- BENEFITS: Wide compatibility, Torque improvement on curing
PHENOLIC RESINS

PHENOL (Resorcinol, Phenol, PTOP, PTBP, Cresol, etc.)

ALDEHYDES (Formaldehyde, Acetaldehyde, etc.)

MODIFIERS (Cashew Oil, Tall Oil, etc.)

Acid Catalyst

Novolak Resin (Methylene Acceptor)

Resol Resins

HMT or HMMM (Methylene Donor)

Heat

Hard Cross-linked structure

Heat
Characterization of Resins

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novolak Resin – Pastilles/Flakes</td>
<td></td>
</tr>
<tr>
<td>Softening Point</td>
<td>Ring and Ball method</td>
</tr>
<tr>
<td>Melting Point</td>
<td>Capillary test method</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Auto densitometer</td>
</tr>
<tr>
<td>Free Phenol</td>
<td>Gas Chromatography/Kjeldhal Distillation</td>
</tr>
<tr>
<td>Volatile Content</td>
<td>Loss in weight upon heating</td>
</tr>
<tr>
<td>Two-Stage Powder Resins</td>
<td></td>
</tr>
<tr>
<td>Gel Time</td>
<td>Time to gel on a hot plate</td>
</tr>
<tr>
<td>Inclined Plate Flow</td>
<td>Prepared tablet flow length at constant temperature</td>
</tr>
<tr>
<td>Hexa Content</td>
<td>Kjeldahl and Perchloric acid</td>
</tr>
</tbody>
</table>
Phenolic Resin Applications

Novolak Resins

Resol Resins

Reinforcing Resins
Tackifiers
Bonding Resins

Curing Resins

Rubber Compound
Reinforcing Resins

Powder Resins (pre-mixed Hexa or HMMM)
- Cashew Oil modified
- Tall Oil modified
- Pure phenol based

- Offers Increased Abrasion resistance
- Increased Initial Tear resistance
- Improved Heat resistance
- Improved Oil and solvent resistance
- Reduced Residual Compressive set

Novolak Resins (no Hexa or HMMM pre-mixed)
- Cashew Oil modified
- Tall Oil modified
- Pure phenol based

- Fine particle size – ease of mixing
- Added at end of mixing cycle to prevent scorch
- Short shelf life

- Longer Shelf life
- Can be mixed at higher temperatures
- Hexa or HMMM added in the second stage
Cashew Oil Modification

PP-1811, PP-1811N
Rubber Reinforcing

- High compatibility with NBR
- Used extensively in Rice rollers, Bead wire, etc.
- Acts as plasticizer during mixing cycle; reduces compound viscosity
- X-links with Hexa Improves
  - Hardness
  - Tear Strength
  - Abrasion
  - Stiffness

Brake Linings

- Preferred Resin for Brake Linings
- Improves
  - Heat dissipation
  - Reduces Fade
  - Water repellance
  - Cold-wear
Tall Oil Modification

- High compatibility with SBR, Natural Rubber
- Used extensively in Bead wire compound, etc.
- Acts as plasticizer during mixing cycle; reduces compound viscosity
- X-links with Hexa Improves
  - Hardness
  - Tear Strength
  - Abrasion
  - Stiffness

PP-1817, PP-1817N

Rubber Reinforcing
Unmodified Phenolic Resins

PP-1818
PP-1818LS

- Novolak with very low residual free phenol
- High viscosity – no plasticization during mixing
- Lower color and higher hardness than modified resins
- X-links with Hexa Improves
  - Hardness
  - Tear Strength
  - Abrasion
  - Stiffness

PP-1819
PP-1910

- Powder form with Hexa (HMT) pre-mixed
- Plastisol and Butyl based adhesives for sheet metal bonding-to-profiles with lower %HMT
Reinforcing Resins

For Ease of Processing
Cashew modified > Tall Oil Modified > Unmodified

For Hardness
Unmodified > Tall Oil Modified > Cashew modified

<table>
<thead>
<tr>
<th>Cashew Modified</th>
<th>Tall Oil Modified</th>
<th>Unmodified</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBR, Chloroprene, EPDM</td>
<td>SBR, Natural, EPDM</td>
<td>Natural, SBR, NBR, EPDM</td>
</tr>
</tbody>
</table>
Alkyl Phenolic Resins

**Novolaks**
- PP-1820
- PP-1825, PP-1825M, PP-1825SY
- PP-1827, PP-1827HT
- PP-1924

- Primary use is Tackifiers for synthetic and natural rubber – provides ‘green tack’
- Higher softening point resin = improved tack
- PP-1827 improved long term tack
- Has no impact on cure characteristics
- Used for Tyres, Hose, airspring, Conveyor and power transmission V-belts

**Resols**
- PP-1813
- PP-1815

- PP-1815 Curing of Butyl Rubber for tyre bladders – Heat stable curing
- PP-1815, PP-1813 Neoprene/NBR based adhesives, sealants, etc. – Heat stable contact adhesives
Tackifier Resins

- High initial Tack with Better Tack Retention.
- Lower loading levels to achieve the same degree of
- Compounds with less HEAT BUILD-UP.
- Higher modulus with lesser loss of rebound resistance

- PP-1924 – Similar chemistry to KORESIN
Resorcinol Formaldehyde Resins

RF Resins
PP-1860
PP-1861T
PP-1875L

- Reduced fuming of Resorcinol during mixing
- Adhesive bonds resistant to heat and humidity ageing
- Available as aqueous solutions for cord-dipping

Modified RF Resins
PP-1863
PP-1861
PP-1961
PP-1870

- Modifications to reduce the content of free Resorcinol
- Reduced moisture absorption

Form cross-linked structures on curing with Methylene Donors like PP-1891 (HMT), PP1890 (HMMM)
Dry Bonding Chemicals

PP-1830
- Resorcinol Silica blend
- Reduced fuming of Resorcinol during mixing
- Best suited for V-belts, conveyor belts, tyres, hoses, rubberized fabrics
- Commonly used along with PP-1891 (HMT)

PP-1850
- Resorcinol Stearic Acid melt
- Reduced fuming of Resorcinol during mixing
- Improved Handling
- Lower Energy consumption during mixing
- Improved Dispersion

Form cross-linked structures on curing with Methylene Donors like PP-1891 (HMT), PP1890 (HMMM)
Advanced Bonding Chemicals

PP - 1845

- Blocked Isocyanates
- Ideal for bonding with untreated Polyester fiber
- Heat activated – Stable until “unblocked”

PP - 1895

- Cobalt Adhesion Promoter
- Enhanced bond strength with brass-coated steel compared to RFS systems

Durable Bond Strength with Brass-coated steel

PP-1830, PP-1850
+ PP-1891/PP-1890

RF resins
+ PP-1890

PP-1861T + PP-1890
+ PP-1895
Amino Curing Resins

PP-1891

- Hexamine or Hexamethylene Tetramine
- Pre-dispersed forms for efficient distribution in rubber compound

PP-1890

- HMMM Hexamethoxy methyl melamine
- Better suited for Polyester and steel wire applications

Added during second stage of mixing with Sulphur and accelerators
Customer Base

**POWERPLAST** resins and tackifiers are used widely in the rubber products manufacturing industry for Tires, Hoses, Conveyor and transmission belts, Industrial fabrics, rollers, adhesives and sealants, etc.

**POWERPLAST** products are approved and accepted by global customers as a result of our world-class quality and consistency.

SPR is a supplier for global locations of several international manufacturing giants such as, Continental AG, Apollo tyres, Henkel Adhesives Technologies, Cooper Standard, etc.

We currently supply to clients all over the globe, specifically in India, USA, South America, EU, China, South-East Asia, Africa and the Middle East.
Amongst Our Customers:
Markets Serviced:
SPR is committed to complying with all REACH registration guidelines.

Several **POWERPLAST** products are in various stages of registration activities.
Contact Us

Singh Plasticisers & Resins (I) Pvt. Ltd.

UG 34 B, Somdutt Chamber 1, Bhikaji Cama Place,
New Delhi 110066, India
www.power-plast.com
info@power-plast.com
orders@power-plast.com
sales@power-plast.com
India Phone: +91 11 26194641
India Fax: +91 11 26169709
US Fax: 001 516 706 1822