

# PHENOLIC RESIN AS TACKIFIERS IN RUBBER COMPOUNDS

Tackifier resins are added to rubber compounds to help bond different parts of an article together until they are cured, as well as to have tackiness between the layers of the rubber compound during the processing stage.

Tackifiers work at the surface of a rubber compound. When two pieces of rubber are brought together, an opportunity exists, for to develop various types of chemical interaction, that will bond the two surfaces together.

How strong the bond that forms, is depends on two major factors:

1. How much surface area makes contact
2. And the type of chemical interactions that occur between the two surfaces at the points of contact

## Rubber Contactability

All tackifier resins act as plasticizers which “soften” the uncured rubber compounds.

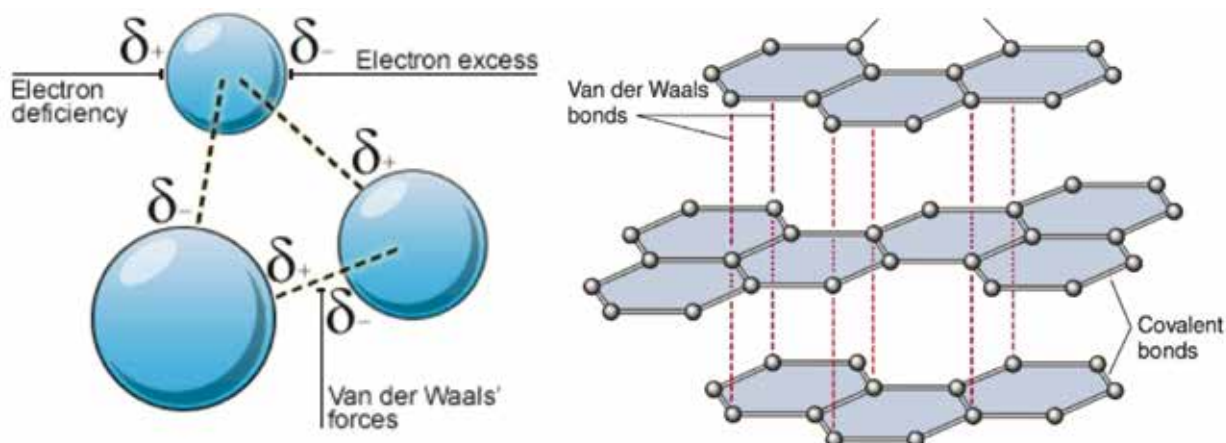
The softer compounds offer greater surface area for contact when two pieces are brought together.

Some of the tackifying resins are Rosin & Rosin-ester resin, Hydrocarbon Resin, C.I. Resin, Phenolic Resins,...

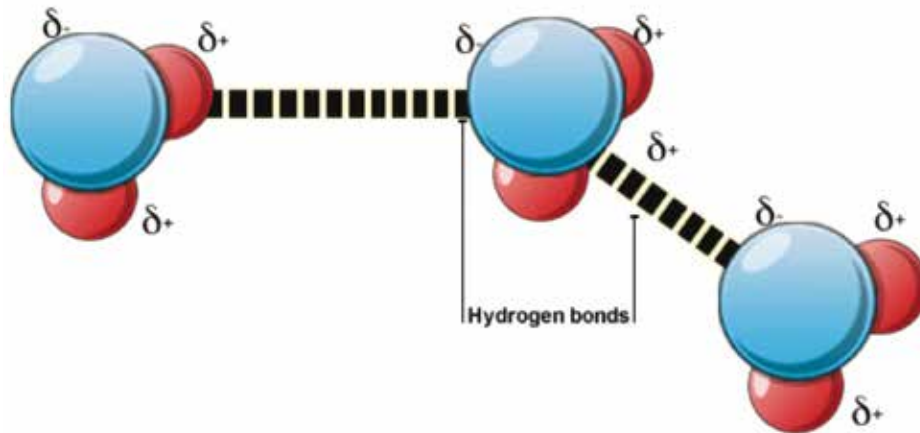
Phenolic resins are widely used as “high performance tackifiers” in different kinds of rubbers.

**The main difference between** the Phenolic Resin and the other tackifying resin like Rosin-ester, Hydrocarbon, is the type of the bond strength on the surface of the Rubber Compounds.

The General Tackifying resins form weak **Van der Waal force**, through which the tackiness forms,



whereas the Phenolic resins forms the **stronger Hydrogen bonds** with the rubber surface.



### ➤ Chemical Bond Formation

- Occurs during vulcanization

### ➤ Hydrogen Bonding

- Formed by Phenolic resin tackifiers

### ➤ Van der Waals Forces

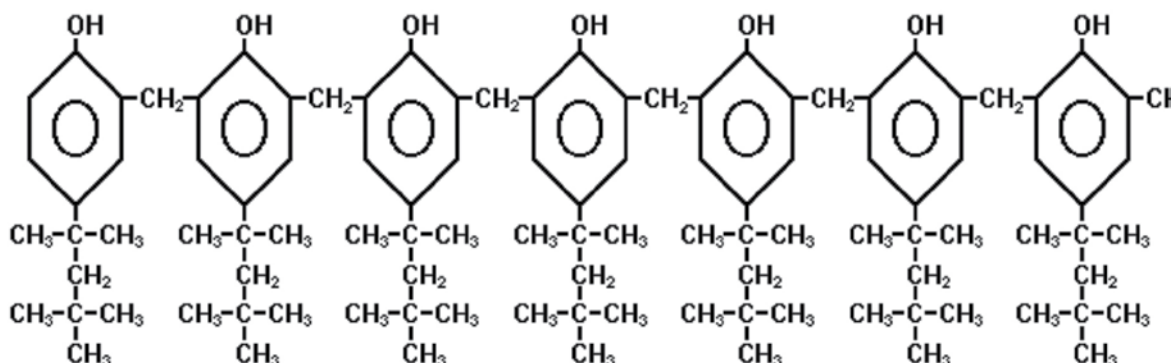
Weak intermolecular attraction improved by all tackifier resins



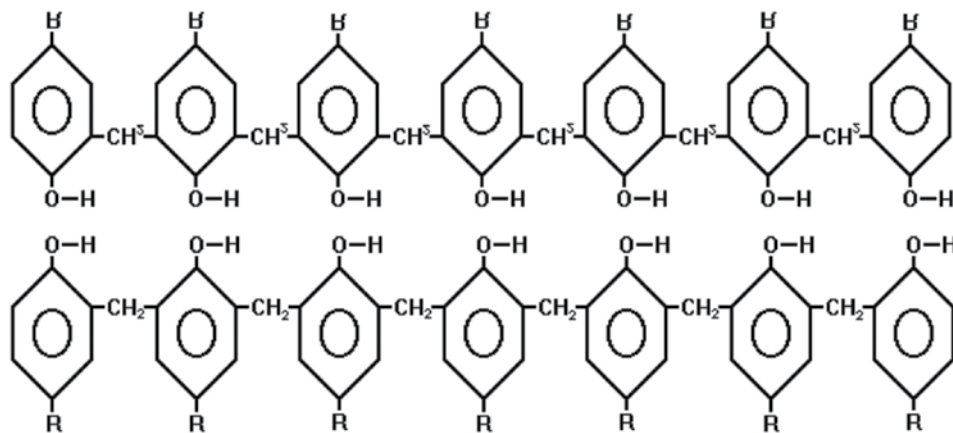
### General properties of Phenolic Resin w.r.t. to Rubber

- Linear polymers – for easy dispersion and solution in rubber
- Thermoplastic in nature - not sensitive to repeated heating
- Poly-functional in Aromatic Hydroxyls – which provide sites for **hydrogen bonding** to occur
- Contains high amount of olefinic character – to promote good solubility in rubber and compatibility with rubber compounds

### A typical phenolic resin is as follows



The ability to form strong **Hydrogen Bonds** with different rubber substrate gives phenolic resin – a high performance status compared to other tackifiers for rubber.



The advantage of PHENOLIC tackifiers over the other general purpose tackifiers are as follows:

- High initial Tack with Better Tack Retention.
- Better Heat and Humidity performance.
- Lower loading levels to achieve the same degree of tackiness in the rubber compounds which in turn gives the compounds comparatively lesser HEAT BUILD-UP.
- Acts as a process aid – its ability to wet on the different substrates helps during mixing & dispersion, and is inert in the end product

### Its Limitation

Phenolic resins undergo discolouration upon exposure to light.

RESINS FOR RUBBER COMPOUNDING					
	Acid Number	Ball & Ring Softening Point, °C	Physical Form		Uses: Tackify rubber compounds used in tires.
Tackifier Resins					DESCRIPTION
<b>Unmodified</b>					
SP-1068	25-42	85-95	Pellet		General purpose octylphenol/formaldehyde resin
SP-1068H	25-42	93-103	Flake**		General purpose tackifier resin at higher melting point
HRJ-10420	35-75*	97-107	Pellet**		Very high melting point resin - resists sintering
SP-25	n/a	100-110	Flake		Mixed alkylphenol/formaldehyde resin, used in Nitrile rubber
<b>Modified</b>					
SP-1077	25-42	92-101	Flake		Epoxy modified, high performance tackifier resin
Elazobond® T6000		110-120	Flake		Supertackifier for natural and synthetic rubber. Also useful in EPDM.

\* Different test method.      \*\*Also available in pastilles

RESIN CLASSIFICATION	TYPE	GRADES OF S.I. GROUP
Tackifying Resins	Octyl Phenol Resins	SP 1068, R 7510, SMD 31161, HRJ 2765
	Butyl Phenol Resins	R7572P, SMD31144, R7572P
	Super Tackifiers	SP 1077, T6000, T3100, T8000
	Terpene Phenolic	SP 553, SP 560

## Note

The tackiness of the Rubber compounds will get reduced by the increase in the addition of fillers, however the tackiness in the compound will be increased by the addition of tackifying resins, whereas the increase in the oil also decrease the tackiness which cannot be further increased by the increase of the tackifying resins.

## SUPER TACKIFIERS

Super Tackifiers are the special type of Modified Phenolic resins used in the Rubber Compound to have the superior initial tack and tack retention for improved processing conditions with excellent scorch safety and imparts good tackifying properties in Hot and Humid conditions, and for ideal for imparting tackiness in the synthetic Rubbers. These type of resins also gives good tackiness in PU rubber (Elastobond T8000)

PRODUCT FEATURES	IMPACT
High Initial Tack	Improved building tack
Better Scorch Protection	Wider Processing conditions
Higher modulus without loss in rebound performance	Greater strength without heat build-up
Significantly better tack in hot and humid conditions	Much better performance under all conditions.

## Tackifying Adhesive Resins

Tackifying adhesive resins are both terpene and alkylated phenol formaldehyde resins, which gives increased open time and improved green tack in the polymer based adhesives systems

SP-553: Medium MP Terpene-Phenolic

SP-557: Low MP Terpene-Phenolic

SP-558: Slight higher MP than 557

SP-560: High MP Terpene-Phenolic

SP-561: Intermediate MP Terpene-Phenolic

SP-1068 = R-7510: Low MP Phenolic

HRJ-2765: Medium MP Phenolic

\*\*All the grades mentioned in this newsletter is only the indicative one and the users should check with the manufacturer's for the correct grade suitability/availability. Manufacture can discontinue or modify any of the grades mentioned without any prior notice. The sole responsibility of using any of the grades mentioned is as per the requirement & solely lie with the users and in no way we are responsible on the outcome of any kind, which is beyond the scope of our newsletter.

Address

*Ram Charan Company* | No. 505, 5th Floor, Delta Wing, 'Raheja Towers',  
 Old No.113-134, New No.177, Anna Salai, Chennai - 600 002.

Phone : +91 44 4353 9040 • Email : [mktg@ramcharan.org](mailto:mktg@ramcharan.org) • Website : [www.ramcharan.org](http://www.ramcharan.org)

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