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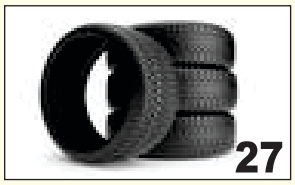

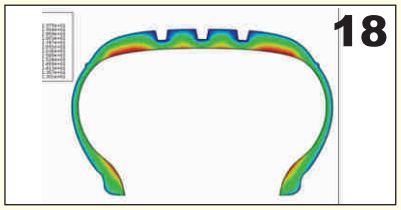

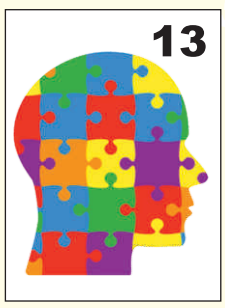

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Editor's Note

Manoj Shah
Editor, RMWA

" Technical Seminar at Rajot"

Manoj Shah

Dear Readers ,,,,

On 6th march 2019 RMWA organised a technical seminar at Rajkot. This is good step forward by RMWA to extend value added technical knowledge sharing to industries based in and around Rajkot. Normally technical presentations are in English language. Here at Rajkot we tried to blend local language as far as we can.

I have been honoured to speak on more than one subject at this venue. Previously my impression was that our small industries are lacking in basic compounding knowledge but I also found that there is lack of application of applied science too.

There are so many basic theories which we have studied at graduate or even at higher secondary level. We need to revisit such theories, particularly related to chemistry, physics and basic engineering. This can help us to solve small problems which are always there during processing & compounding.

During my interaction with participants I found problems about cost of rubber compound & moulding defects. We need to be techno-commercial when costing is concern. Moulding defects can be corrected through proper compounding and processing.

I wish RMWA should carry out such programme to benefit rubber industries based in Gujarat.

Happy Reading ....

NITRILE RUBBERS

Manoj Shah
Nitro Polymers

1.General
2. Properties –a. Physical b. Environment C. Oil & Fuel Resistance
3.Compounding
4. Processing
5. Guideline Formulation

1.General

* Special purpose rubber resisting oils & fuels.
* Copolymer of butadience & acrylonitrile.
* Dissolves faster in solvents of similar polarity e.g.Aniline) due to presence of polar monomer like ACN.
* Solubility parameter of nitrile rubber changes with CAN%(Acrylonitrile%)

*Commercial polymers are available with five differen levels of CAN%

20 %	Extremely – low
28 %	Low
33 %	Medium
40 %	High
50 %	Extremely High

*As ACN content increases in polymer, following properties increases:

1. Density
2. Processibility
3. Oil resistance
4. Cure rate
5. Heat resistance
6. Physical properties(H-T.S-Abrasion Resistance)

At the same time following properties decreases:

1. Resilience
2. Low temp flexibility
3. Solubility in aromatics.

2. Properties :

(a) Physical Properties:-

*Gum Compound shows poor physical properties.

*General purpose compound shows 500 /2500 P.S.I. tensile strength and 200/800 % elongation.

*% Compression set is important property. Many applications require sealing at high pressure over a long period. It is possible to achieve 10 to 15 % at 100' C

*Excellent abrasion resistance at high r.p.m. application e.g. friction rollers. &Resilience is lower but can be achieved using soft black, tight cure, and ester plasticizer.

(b) Envirolment Properties :-

*Water resistance is good. Black filled compounds are better than mineral filled compounds. Though not ozone resistance can be blended with PVC-CSM-EPDM to achieve the same .(CSM – Hypalon)

*Serviceble upto – 120 'C for continues use Mineral filled compounds (Mgo) are better than black filled.

*Flexible at --- 57 'C with low CAN %

*Does not provide electrical insulation. On the contrary it is possible to develop electrically conductive compound from high ACN % polymers.

*Excellent resistance to gas diffusion, 40 % ACN% polymer shows the same level of permeability as that of buty rubber.

(c) Oil & Fuel Resistance:-

*Depends on four factors.

1. ACN content
2. Chemical nature of oil & fuel
3. Type of softner used
4. State of cure.

* Higher the ACN % higher is the polarity. Hence higher is oil & fuel resistance.

*Aniline, a polar aromatic chemical swells nitrile rubber extensively, due to nearest solubility parameter of both material. Therefore it is important to know aniline point of oil or fuel in which nitrile rubber is to be used.

*Aniline point is the temperature at which oil & aniline are completely miscible.

*The lower the aniline point of an oil the higher is the swelling effect to nitrile rubbers.

*Softneres which are not extractable by immersion in oil should be used.

*Optimum curing is important, particularly for low ACN % content polymers.

*Nitrile polymers also resist :

1. Alkaline solutions.
2. Salt solutions.
3. Aliphatic hydrocarbon
4. Dilute acids
5. Vegetable oils
6. Completely halogenated chemicals.

3. Compounding :

*Activation of 5 % ZNC + 1.5% stearic acid.

*Higher ACN % polymers require low sulphur(1.5%)

*R/F blacks or silica must for reinforcement.

*Softners like D.O.P./D.B.P. are must for reducing hardness and improving processing.

*Esters & polar type plasticizers are generally used, solubility parameter of ester plasticizer must be considered.

*Good low temp flexibility can be achieved using 30 % of adipates & sebacates type softners.

*C.I. resins and polyester plasticizer are best for heat resistant NBR compound.

*Different curing systems :-

1. 1.5 % MBTS + 1.5 % Sulphur + 0.2 % TMT Gen. purpose safe processing.
2. 1.0% CZ/HBS + 1.0% MBTS + 0. 5 % Sulphur fast curing.
3. 4.0 % Di-Cup 40C. + 02% Sulphur heat resistant non blooming.
4. Cdo +Mgo with ethylcadmate fast curing heat resistance and compression set Resistance.

4. Processing :-

*Cold Tight Mill – drop rubber into pan between two passes to keep the heat down.

* Add suplhur in the beginning to provide maximum dispersion time.

* Do not cut the batch before complete dispersion.

*Softners should not be added while pigment Is there on mixing bank.

*Magnesium carbonate is the best filler for extruded & calendered goods. It reduces porosity.

*Safe curing system should be used for extruded & calendered goods.

*For frictioning, good tack is essential. 40 % + 50 % plasticizers are used.

*Polar solvents are best MEK MIBK MCB & nitrile benzene.

5. Guideline Formulation:-

* Nitrile base compound

Medium ACN Polymer	100.00	P.b.w
Zinc Oxide	5.00	P.b.w
Stearic Acid	1.50	P.b.w
Di-butyl-Phthalate	10.00	P.b.w
Antioxident TDQ	1.00	P.b.w
Sulphur	1.50	P.b.w
MBTS	1.50	P.b.w
TMT	0.25	p.b.w

For general purpose moulding above base formula can be extended with different fillers and / or Carbon blacks. Accelerator system can be modified to meet specific requirement of hardness, tensile strength and compression set.

*Heat resistant sealing ring:-

Medium Viscosity / Medium ACN % Polymer p.b.w	100.00	
Sulphur	0.30	p.b.w
Stearic Acid	0.50	p.b.w
Antioxident PBN	2.00	p.b.w
Polyester Plasticizer	10.00	p.b.w
Zinc Oxide	15.00	p.b.w
FEF Carbon Black	25.00	p.b.w
MT Carbon Black	100.00	p.b.w
DTDM	1.50	p.b.w
TMTD	1.50	p.b.w
CBS	1.50	p.b.w

Selective features for above formulation

1. Good extrusion & firmness
2. 2. High heat resistance
3. 3. High Oil resistance
4. 4. Higher Suplhur donor chemicals.
5. Scorch Safety
6. Low compression set resistance.

***High harness roll covers :-**

Medium Viscosity/ Medium ACN % Polymer P.b.w	100.00	
Sulphur	5.00 to 10.00	P.b.w
Zinc Oxide	5.00	P.b.w
Antioxident SP	2.00	P.b.w
Silica Ultrasil Vn3	15.00	P.b.w
Hard China Clay	20.00	P.b.w
Precipitated Calcium Carbonate p.b.w	80.00	
Plasticator FH	10.00	p.b.w
DPG	1.50	p.b.w

Selective features for above formulation :

1. Easy processing polymers.
2. Balancing of fillers for high hardness and easy processing.
3. Plasticator FH for good building tack.
4. High suplhur/slow accelerator for high hardness.

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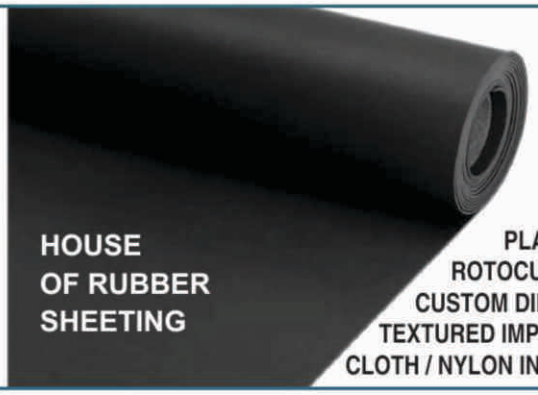

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NITRILE	Sealing, gasket & packing to avoid leakages from oil, solvent, petroleum based fluids, lubricating oil, transformer fluid & very low permeability to gases.
EPDM	Outdoor applications like weather strips, drinking water applications, rain water sealing, protection against sunlight & heat gaining as a roof membrane, acid resistance, liner in pulverizing system.
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An Overview of Antidegradants for Rubber Compounds

Indian Rubber Manufacturers Research Association
Suchismita Sahoo, Dr. K. Rajkumar

Introduction

Rubber is a special type of polymer with very high molecular weight and comprises of primarily carbon and hydrogen with few exceptions. Most of the general purpose rubbers used for more than 50% of applications are unsaturated rubber hydrocarbons for example natural rubber (NR), acrylonitrile butadiene rubber (NBR), styrene butadiene rubber (SBR),

Polychloroprenerubber(CR). Unsaturated rubbers possess a double bond in the backbone of the rubber chain and are highly susceptible to attack by oxygen and ozone present in the atmosphere. The other saturated rubbers like ethylene propylene dienerubber(EPDM), isobutylene isoprene rubber (IIR) possess good resistance to oxidation and ozonation but still needs to be protected for enhancing the service life of the product as they are hydrocarbon in nature. The aging leads the rubber turn into a sticky mass, formation of deep cracks or surface hardening could be observed. Most of the deterioration encountered with natural rubber and synthetic diene rubbers is due to oxygen or ozone and this has led to an extensive development of both antioxidants and antiozonants. Based on the end application and the chemical nature of rubber various types of antioxidants and antiozonants are used in rubber industry.

Antioxidants

Based on their function in the rubber compound the antioxidants can be classified as primary and secondary antidegradants.

Primary antidegradants are generallyheat stable and provide long – term protection

(Examples are: Amines and Phenolics)

Secondary antidegradants are generally used to stabilize polymer systemsduringthe manufacturing phase. They are deactivated by cure systemsand are not heat stable. (examples are: Phosphites and Thioesters)

Amine antioxidants

Amine antioxidants are more effective but are staining in nature. The aniline derivatives are predominately. As the major applications of rubber are along with black, the effectiveness of amine antioxidants outweighs their staining nature. The amine antioxidants can be subdivided as below

- Phenylnapthyl amines
- Ketone-amine condensates
- Substituted diphenyl amines
- Substituted p – phenylenediamines

Phenylnaphylamines however has regulatory restriction due to the identification of β-napthylamine as a potential carcinogen. The **ketone – amines** is one of the major class of antioxidant which is commercially exploited. It imparts excellent heat resistance and flex cracking resistance but little impact on metal inhibition and ozone resistance. Therefore they are widely used in tires, cables and heavy – duty mechanical goods where heat resistance is an important parameter for performance. The **polymerized quinolones** show similar behaviour and are less staining in nature. Alkylated diphenylamines such as octylated diphenyl amine also show less staining but they are less effective as antioxidant as compared to the previous two classes. The disubstituted p – pheneylenediamines are a very important class of commercially used antioxidants. The alky– aryl derivatives are good antioxidants and at larger dosage also act as antiozonants. The dialkyls are mainly used as antiozonants.

Considering different types of applications , more often a combination of different types of antioxidants are used. For example, , the hydroquinoline derivative which imparts excellent long-term heat resistance is used in conjunction with p – phenylenediamines in tyre applications.

Table 1: Properties of main classes of amine antioxidants

Class	Heat Resistance	Flex – cracking resistance	Metal inhibition	Ozone activity
Aryl Napthyl Amines	Good	Good	Good	None
Ketone Amine Condensates	Very Good	Good – Very Good	None	None
Substituted Diphenyl Amines	Good	Moderate	None	None
Substituted p– Phenylenediamines(Aryl – Aryl)	Very Good	Very Good	Very Good	Very Good
	Staining and discoloration	**Volatility**	**Solubility**	**Chemical stability**
Aryl Napthyl Amines	Considerable	Low	No bloom	Oxidizes
Ketone Amine Condensates	Considerable	Low	No bloom	Oxidizes
Substituted Diphenyl Amines	Slight	Very low - Low	No bloom	Slight Oxidation
Substituted p – Phenylenediamines(Aryl – Aryl)	Severe	Very low - Moderate	No bloom	Oxidizes

Phenolic Antioxidants

For few of the rubber applications it is an important parameter that the additives should not stain or cause staining due to migration. They are widely used in colored rubber products and alos improve stability of the raw rubber before compounding and in formulations where toxicity is a consideration.

There are two main classes of phenolic antioxidants, simple hindered phenols, bridged hindered phenols. The simple hindered phenols do not show good heat resistance and are comparatively more volatile with respect to amine antioxidant of same molecular weight. Some simple phenols show good protection against light and flex cracking. The monohydric phenols are widely used for polymer stabilization for light colored rubber products and to meet FDA regulations in some cases. Most of the commercial materials are complex mixtures.

Table 2: Comparison of Phenolic antioxidants

Class	Heat Resistance	Flex – cracking resistance	Ozone activity	Staining and discoloration
Simple hindered monohydric phenols	Moderate	Poor -Moderate	None	Slight
Phenol alkane bisphenols	Moderate - Very Good	Poor - Moderate	Negligible	Moderate
Phenol sulphide bisphenols	Moderate -Good	Poor - Moderate	Negligible	Moderate
Polyhydric phenols	Moderate -Very Good	Poor - Moderate	Negligible	Slight
	Volatility	**Solubility**	**Chemical stability**	
Simple hindered monohydric phenols	Low-moderate	No bloom	Stable	
Phenol alkane bisphenols	Very low - Low	No bloom	Slight Oxidation	
Phenol sulphide bisphenols	Very low - Low	No bloom	Slight Oxidation	
Polyhydric phenols	Very low	No bloom	Slight Oxidation	

Antiozonants

Ozone is produced in the upper atmosphere at about 12 – 22 miles above the earth's surface by photolysis of oxygen. At that level the concentration of ozone is approximately 100 pphm. Just above the earth surface the concentration is in the order of 0 – 10 pphm. Concentrations above the normal level also occur near electrically operated machinery and over the sea.

The most common characteristic of atmospheric ozone attack is the formation of cracks perpendicular to the direction of stress in a strained rubber piece. Wax has been used traditionally for ozone protection. But the wax have the limitations and fail to protect against ozone attack under severe dynamic conditions. Therefore the substituted p – phenylenediamines are used extensively.

Information of Upcoming Rubber Events / Exhibitions

China International Tire & Wheel Fair(CTF)

16th Edition to be organized at Qingdao China, between 9th to 11th April, 2019.

Chinaplas

33rd Edition to be organized at Guangzhou, China between 21st to 24th May, 2019.

Rubber & Tire Vietnam

Organised at Ho Chi Minh Vietnam between 26th to 28th June 2019 exhibition of Rubber and Rubber Products.

Brain Teaser

PUZZLE 1

Search For 11 Words of Rubber And Chemicals : Vertical / Horizontal / Diagonal

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C	T	E	E	G	U	S	K	O	E	L	T	Z	Y	T
V	Z	H	L	B	T	M	M	Q	I	Y	O	Z	T	W
A	J	M	Y	Y	B	I	H	Z	D	M	M	W	A	B
Z	S	V	R	L	P	U	O	T	A	E	W	F	H	X
F	S	E	E	F	E	O	R	H	T	R	C	M	B	E
Q	N	N	B	C	I	N	R	L	U	R	F	J	E	T
E	L	I	R	T	I	N	E	P	B	G	R	N	I	A
Z	X	H	V	S	L	Y	M	Y	D	X	E	Q	S	L
M	E	H	T	X	R	U	P	E	M	R	U	K	Q	T
D	I	E	H	G	X	Y	Y	U	P	B	Q	W	J	R
Z	E	Q	O	L	V	T	D	O	D	V	V	Y	Z	O
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Dynamic Properties of Polymers Materials and their Messurements

Kartik Srinivas
Principal Engineer
Advanced Scientific and Engineering Services (AdvanSES)

1.6 Effect of Fillers on Dynamic Properties

Dynamic properties of rubbers are affected by fillers and other compound ingredients. It is found that the filler network can substantially increase the effective volume of the filler due to rubber trapped in the agglomerates, leading to a high elastic modulus. Fillers like carbon blacks increase the modulus of rubbers by forming reinforcing bonds with the polymers. The increase in modulus is due to the fact that fillers can be considered having higher rigidity as compared to the rubber. They do not participate in the deformation and increase the strain in the rubber matrix between adjacent filler particles. The strain increase because of this can be expressed by

$$X = 1 + 2.5c + 14.1c^2, \tag{1.11}$$

where x is the strain increase ratio and c is the volume fraction of the material. The equation shows that $tan\delta$ increases linearly with x.

1.7 Application of Dynamic Material Characterization

Dynamic material characterization is a technique that measures stress as a function of strain, or force as a function of displacement and time. It also involves the application of one or more forces at various frequencies, as a means of determining how material changes in a dynamic environment where the material comes under the effect of multiple frequencies. Dynamic characterization testing normally includes components like tires, springs, dampers, biomedical implants and vibration isolation components from the automotive, aerospace and biomedical industries. These components perform under time and frequency varying conditions during their entire lifecycle making them ideal candidates for dynamic study bothfor product development and failure analysis.

1.7.1 Development and Failure Analysis of Rubber Rollers

Equation (1.11) can be particularly applied to materials where the carbon black filler size is larger (e.g. N990). In smaller sized filler particles the rubber is just in static form around the blacks and the effective volume fraction has to be suitably used. The strain increase or

amplification concept due to the presence of fillers also affects the energy losses per cycle of operation. Since the presence of higher rigidity fillers magnify and increase the local strain, the dynamic losses which are proportional to local strain amplitudes also increase. During cyclic strain, while the stable filler network can reduce the hysteresis of the filled rubber, the breakdown and reformation of the high sructure filler network would cause an additional energy dissipation resulting in higher hysteresis. More information on this increase of losses can be obtained from *Meinecke et al*. As per studies, as compared to carbon black, silica is able to form a stronger and more developed filler network resulting in higher modulus and lower hysteresis at low and room temperature applications.

The E', E", E* or Tan Delta values are to be used as a comparative set of values from different compounds, or a single compound tested at different conditions i.e., temperature, frequency, or strain levels. When different compounds are tested, variables such as cure systems, filler types and levels and plasticizers can be evaluated and compared to provide inputs about dynamic properties.

For an example where dynamic properties testing could be helpful a filler is changed from N-762 to a N-550 black in a rubber covered pinch roller for paper applications. Some other compound adjustments were also made to maintain the same tensile, elongation and durometer values. A few weeks after the compound revision it was observed that there is a noticeable increase in failures of the roller. The operating conditions dictate that the paper roller runs at 180 rpm under 8000 Newtons resulting in the rubber warming up. A dynamic test at three Hertz and Tan Delta values is carried out to compare the compounds. The greater values of E" and Tan delta (damping coefficient) indicate a higher hysteresis in the compound. It can be inferred from the results that higher hysteresis can cause greater heat buildup in the rollers leading to failures.

1.7.2 Viscoelastic Analysis of Tires

Tires are subjected to cyclical high deformations when vehicles are running on the road. When exposed to harsh road conditions, the service lifetime of the tires is jeopardized by many factors, such as the wear of the tread, the heat generated by friction, rubber aging, and others. As a result, tires usually have composite layer structures made of carbon-filled

rubber, nylon cords, and steel wires, etc. In particular, the composition of rubber at different layers of the tire architecture is optimized to provide different functional properties.The desired functionality of the different tire layers is achieved by the strategical design of specific viscoelastic properties in the different layers. Zones of high loss modulus material will absorb differently than zones of low loss modulus. The development of tires utilizing dynamic characterization allows one to develop tires for smoother and safer rides in different weather conditions.

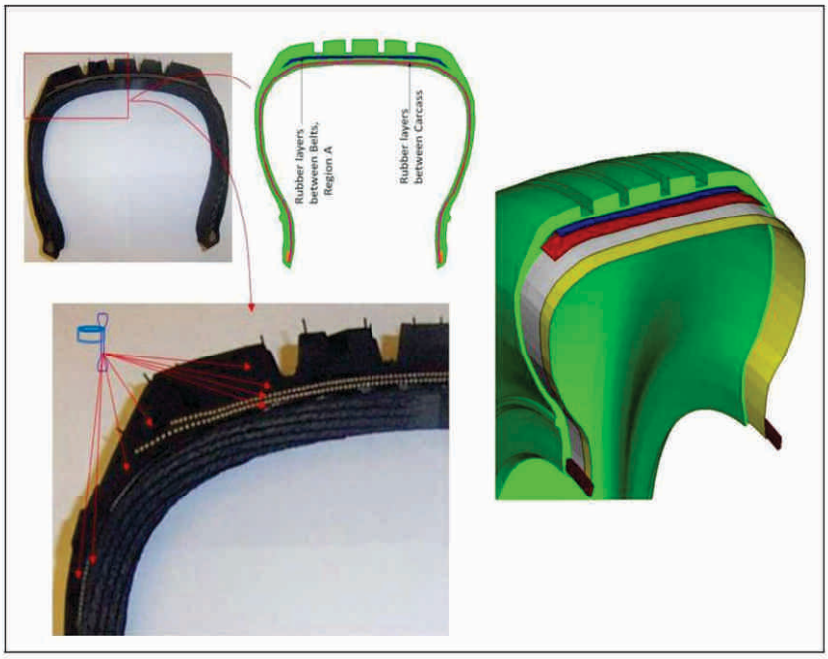


Figure 1.11: Locations of Different Materials in a Tire Design

The dynamic properties are also related to tire performance like rolling resistance, wet traction, dry traction, winter performance and wear. Evaluation of viscoelastic properties of different layers of the tire by DMA tests is necessart and essential to predict the dynamic performance. The complex modulus and mechanical behavior of the tire are mapped across the cross section of the tire comprising of the different material. A DMA frequency sweep test is performed on the tire sample to investigate the effect of the cyclic stress/strain frequency on the complex modulus and dynamic modulus of the tire, which represents the viscoelastic properties of the tire rotating at different speeds. Signigcant work on effects of dynamic properties on tire performance has been carried out by Ed Terrill et al. at Akron

1.7.3 Non-linear Viscoelastic Tire Simulation Using FEA

Non-linear Viscoelastic tire simulation is carried out using Abaqus to predict the hysteresis losses, temperature distribution and rolling resistance of a tire. The simulation includes several steps like (a) FE tire model generation, (b) Material parameter identification, (c) Material modeling and (d) Tire Rolling Simulation. The energy dissipation and rolling resistance are evaluated by using dynamic mechanical properties like storage and loss modulus, tan delta etc. The heat dissipation energy is calculated by taking the product of elastic strain energy and the loss tangent of materials. Computation of tire rolling is further carried out. The total energy loss per one tire revolution is calculated by;

$$\Psi^{diss} = \sum_{i=1}^{\infty} i2\pi\Psi_i Tan\delta_i, \tag{1.12}$$

where Ψ is the elastic strain energy,
Ψ^{diss} is the dissipated energy in one full rotation of the tire, and
$Tan\delta_i$, is the damping coefficient.

The temperature prediction in a rolling tireas shown in Fig (1.12) is calculated from the loss modulus and the strain in the element at that location. With the change in the deformation pattern, the strains are also modified in the algorithm to cause a change in the temperature distribution in the different tire regions.

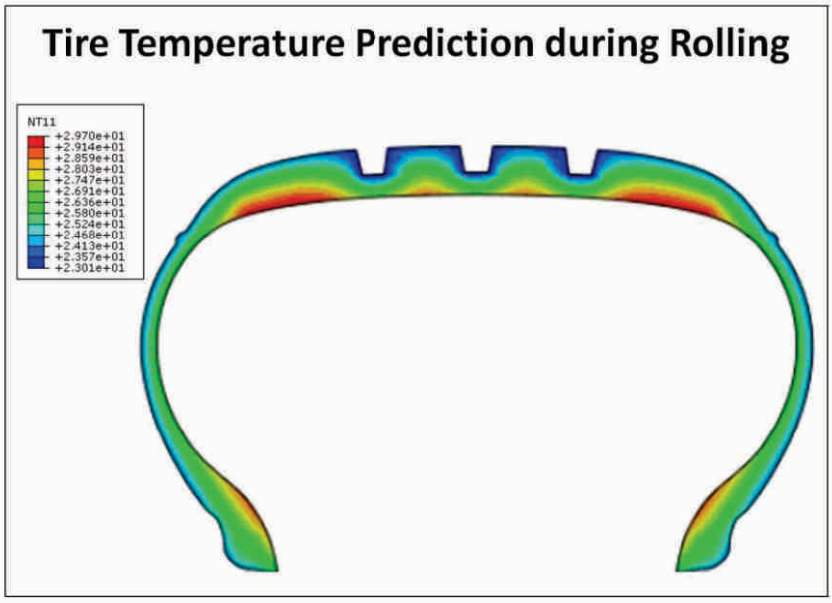


Figure 1.12: Temperature Distribution in a Tire under Rolling Conditions

Rolling resistance is now calculated from;

$$F_{RR} = \frac{-\Psi^{diss}}{2\pi R} where, \tag{1.13}$$

F_{RR} is the Rolling Resistance

$2\pi R$ is the Circumferential length.

In summary, the absolute values from dynamic tests are meaningful, but have little values as isolated data points.They do become valuable as values when compared to each other or some other known variable. A tan delta or damping coefficient value of 0.4 is poor for a natural rubber or EPDM based compound, but very good in FKM materials where the structure of the compound makes it venerable to lower than optimum dynamic properties. Most uncured rubbery compounds start on the viscous side, and as we cure the compound, we shift towards the elastic side.

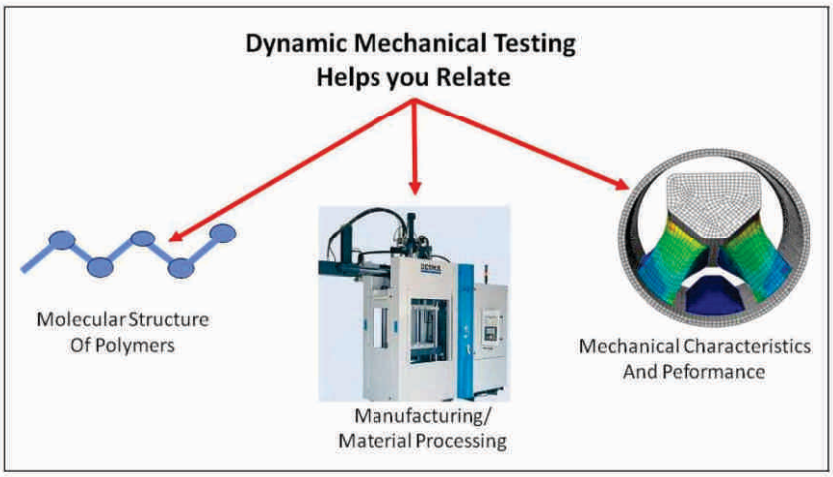


Figure 1.13: Viscoelastic Studies Correlate Molecular Structure to Manufacturing and Mechanical Properties of Engineering Components

As it stands today, the theory of dynamic properties can be applied judiciously to product development or failure analysis problems. The field of application has evolved over time with availability of highly sophisticated instruments. The problems need to be studied upfront for any time or frequency dependent loads and boundary conditions acting on the components and the theory be suitably applied. Needless to say that dynamic properties have utmost importance when rubber components show heat generation and fatigue related field failures as it relates the molecular structure of the polymer material to the manufacturing process and to the field performance of engineering products.

Silicone Rubber

Material Benefits and Fabrication Advantages

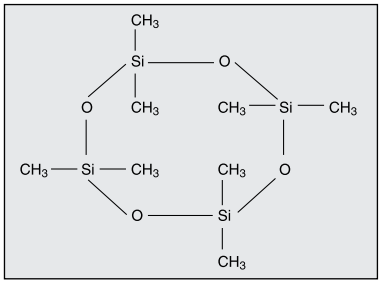
Source : Vesta, Inc. U.S.A.

The Facts About Silicone Rubber

Selecting a high-quality elastomer for critical applications, particularly medical devices, can be a challenge. Designers, engineers and managers must carefully evaluate a wide array of material properties and processing possibilities in order to meet demanding performance specifications and budget requirements, so the performance criteria must be clearly defined. For example, durometer, elongation, modulus and tear must be determined to specify the correct material. With so many materials and fabrication methods available today, it is often difficult to recognize the optimum solution. Further, the implications of selecting an inferior material may cause a project to fail.

To make the most informed decision, it is helpful to gather as much data as you can about each material. This white paper is intended to provide you with factual information on silicone rubber elastomers, their properties, fabrication methods and advantages.

Silicones: Their History and Definition



Alternating silicon and oxygen atoms contribute to the superior heat resistance offered by silicone rubbers.

Since the 1960s, silicone rubber has found widespread use in medical, aerospace, electrical, construction and industrial applications. Flexibility over wide temperature ranges, good resistance to compression set, a wide range of durometer selections, and inert and stable compounds are some of the reasons for its use.

Silicone rubbers are synthetic polymers with an unusual molecular structure a giant backbone of alternating silicon and oxygen atoms. This linkage is similar to the linkage found in quartz, thus silicones have superior heat resistance compared to other elastomers. There are two popular catalyst systems used to cross-link silicon polymers: the platinum (addition cure) systems and peroxide (free radical).

Properties of Silicone Rubber

Gumstocks
are routinely extruded, as they have excellent green strength and will retain their shape uncured prior to vulcanization.

Liquid Silicone Rubber (LSR)
flow is readily achieved with little shear stress. This flow characteristic makes the liquid silicones ideal for molding. They are normally run on semi- or fully automated liquid injection molding machines.

The strong silicon-oxygen chemical structure of silicone gives the elastomer its unique performance properties. Examples include:

Temperature Resistance
Silicones withstand a wider range of temperature extremes than nearly all other elastomers, remaining stable through a range of -75°F to 500°F. They may be sterilized by ethylene oxide (ETO), gamma, e-beam, steam autoclaving and various other methods.

Mechanical Properties
Silicone rubbers have high tear and tensile strength, good elongation, great flexibility and a durometer range of 5 to 80 Shore A. The softest durometers available are reinforced gels.

Electrical Properties
Silicones exceed all comparable materials in their insulating properties as well as flexibility in electrical applications. They are nonconductive and maintain dielectric strength in temperature extremes far higher or lower than those in which conventional insulating materials are able to perform.

Biocompatibility
In extensive tests, silicone rubbers have exhibited superior compatibility with human tissue and body fluids, and an extremely low tissue response when implanted, compared to other elastomers. They do not support bacteria growth and will not stain or corrode other materials. Silicones are odorless, tasteless and are often formulated to comply with biocompatibility guidelines for medical products.

Chemical Resistance
Silicones resist water, oxidation and many chemicals, including some acids and alkali solutions. Concentrated acids, solvents, oils and fuels have a negative effect on silicone rubber and should not be used with silicone.

Overall Benefits of Silicone Rubber
Uilicone rubbers are unmatched by other elastomers in many important specification categories.

Rutstanding benefits of silicone includeC

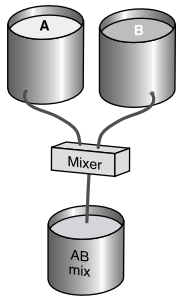
- Unsurpassed biocompatibility
- Ability to be sterilized by many methods
- Low compression set
- High tear strength
- High elongation
- Natural translucence or high clarity
- Ability to be pigmented and radiopacity
- Ability to retain softness indefinitely
- Long shelf life
- Processing versatility
- UV, moisture and steam resistance
- Ease of cleaning

Fabricating Silicone Rubber

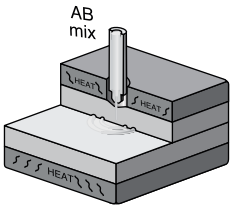
Molding

LIM Steps:

1. *Meter Mixing*



2. *Mold Forming and Vulcanization*



3. *Final Part*

Uilicone elastomers are typically molded by three main methodsC liquid injection molding (ONP), transfer molding and compression molding. Vhe injection molding process, an excellent choice for high-volume applications, employs lower pressures and higher temperatures than the other molding methods 15/ to 1,/// psi injection pressure and temperatures of 145L to 4A5L. Gy contrast, transfer and compression molding operate at pressures of 1,/// to A,/// psi and temperatures of 1//L to 3?/L. Nn designing for the molding process, designers should take into account the material shrinkage rate, which can range from 1% to 4%, depending on the material.

luring molding, the three variables that must be controlled are temperature, pressure and time. Vhe temperature must be optimized to ensure sufficient crosslinking in a minimum cure time but low enough to prevent scorching the elastomer. Vhe pressure must allow complete filling, maintain dimensional stability in the part, prevent voids and flash. Viming of all functions is critical for the production of consistently acceptable, fully cured parts.

Liquid Injection Molding (LIM)
Oiquid injection molding has many benefits in the fabrication of silicone rubber, including cleanliness and speed. Nn the ONP process, pumping systems deliver the two-part liquid silicone (catalyst and crosslinker) directly into a mixer for homogenization, then directly into the mold cavity in a completely closed process. Polding and vulcanization (curing) occur rapidly within the mold cavity at a range of temperatures.

Rverall, injection can take as little as ./5 to 0/ seconds, while molding and vulcanization take 0/ to B/ seconds or more, depending upon shot weight and cross-section thickness.

Oiquid injection molding, due to its closed process, minimizes contamination. Fdditionally, because it employs a single automated step, it provides consistent part quality with less chance for material mix variation.

Vhe principal advantages of ONP includeC

- Cleanliness
- No material preparation labor
- Lower injection pressure
- Faster cycle rates
- Availability of fully automated systems

Transfer and Compression Molding Using High-Consistency Rubber (HCR) Silicones
Vransfer and compression molding are widely accepted and are in use today. Wnlike the ONP process, transfer and compression molding require separate pre-mixing of the MHT silicone rubber on a two-roll mill. Vhe material is then cut into predetermined shot size and fed into the tool via transfer or a stuffer box.

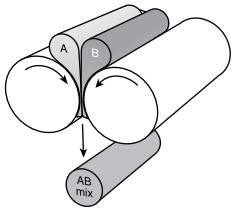
Vhese processes must be operated at lower temperatures, requiring longer operating cycles. Vhis is why its not uncommon to see large molds with 0// cavities or more on diaphragm, bottle closure, R-ring seal and many other applications.

Xhen transfer molding, a hydraulic ram displaces MHT silicone through the sprues and gates into the cavities. Hompression molding differs. Vhe MHT silicone is manually placed into the cavities, and it is compressed in the mold to complete the fill during the closing action of the press.

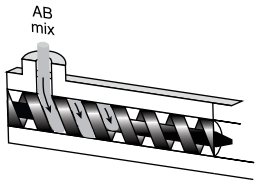
Extrusion

Extrusion Steps:

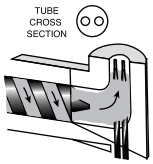
1. *Mill Blending*



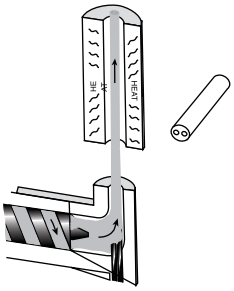
2. *Extrusion Feed*



3. *Pin and Die Profile Forming*



4. *Vulcanization*



Vhe MHT silicone extrusion process yields a broad range of tubing and profiles. Vhe extrusion process begins with the two-part MHT silicone (catalyst and crosslinker) being blended on a two-roll mill. Vhe blending yields a homogeneous compound that is formed into strips and fed continuously into the extruder. F feed screw maintains proper pressure at the pin and die. Rnce extruded, the tubing passes through hot-air vulcanization ovens (HAVs), where radiant heat cures the product. luring the extrusion process, laser micrometer checks are performed to continuously ensure proper dimensional control.

Vhe extrusion process is able to produce single-lumen, multilumen and coextruded tubing in a variety of properties and diameters. Rther extrusions includeC

- Profiles or non-round cross-sections, for such applications as instrument stands, clips, gaskets, seals, ties and markers
- X-ray opacity in stripe or opaque form to provide the doctor with a visual aid
- Reinforced tubing to provide added strength, electrical conductivity, kink resistance or stretch resistance

Kxamples of extruded silicone products include catheters, drain and fluid path tubes, gasketing, ribbon, sheathing, balloon cuffs and coextruded electrical conductors, with fluid path lumens.

Assembly

Vhere is almost no limit to the configurations in which two or more silicone rubber components may be joined to create assemblies for special functions.

Uome silicone fabricators can provide the assembly of silicone subcomponents in special environments, such as clean rooms and HEPA filtered facilities, to meet OEM cleanliness requirements.

Vhe most common assembly methods for joining multiple silicone rubber subcomponents include insert molding and bonding. Vhe insert molding process involves injection-molding liquid silicone around an existing part or parts. Vhe bonding process entails joining one or more silicone components together with silicone adhesives.

Rther methods include tipping, reinforcing, dipping and cuffing.

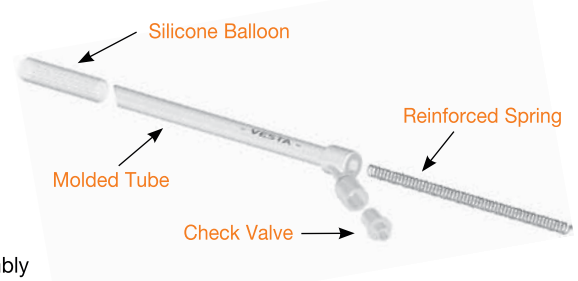
Uilicone rubber assemblies can include airways, shunts, occluders, laparoscopic devices and many others.

Secondary Operations

Lull-service silicone fabricators provide a range of secondary operations to satisfy specialized product requirementsC

- Silk screening
- Slitting
- Punching
- Beveling
- Bundling
- Functional testing

A multi-component assembly This catheter began with a molded or extruded tube, internally reinforced with a stainless steel spiral wire. The wire, specified by the customer to provide kink resistance, was inserted into the mainshaft I.D. and then encapsulated. Next, a molded balloon was bonded onto the distal end. The tip of the mainshaft was beveled and coated for ease of insertion. The check valve assembly was then attached through bonding for cuff inflation. The assembly also has several secondary processes, including holes pierced in the sidewalls for drainage and printing on the side for identification.



Silicone Rubber Comparative Analysis

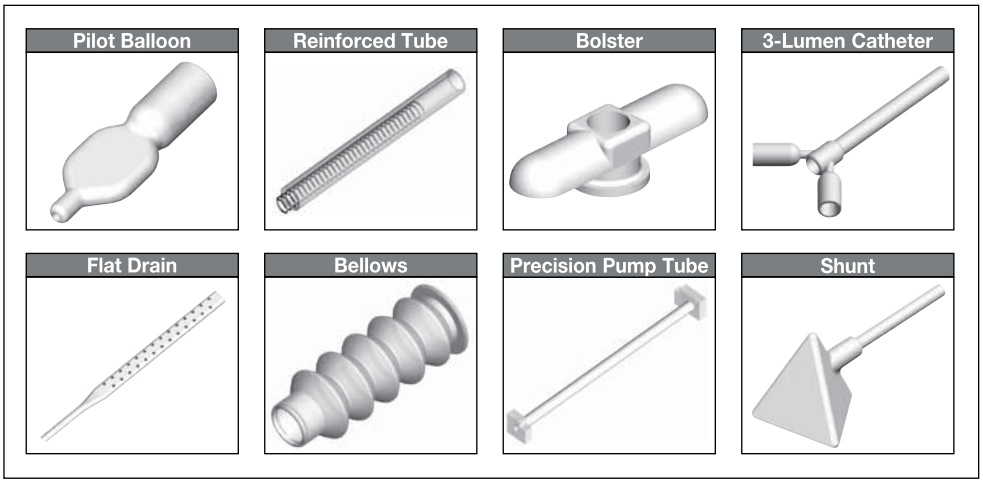
When Compared To...	Silicone Material Delivers...
Oatex	• Lot-to-lot consistency due to controlled synthetic process, vs. organic lot-to-lot variations • Superior biocompatibility • Higher clarity • Better electrical insulation properties • Stability over a broader temperature range
PVCs	• Inertness and absence of leachable additives • Superior biocompatibility • Stability over a broader temperature range • Superior sterilization properties
Polyurethanes and Vinyls	• Plasticizer- and toxin-free • Superior biocompatibility • Broader temperature stability • Lower compression set • Better clarity • Greater softness
TPEs	• Superior biocompatibility • Superior chemical resistance • Lower durometer • Lower compression set

Applications

Uilicone rubber components and assemblies are employed in a wide range of applications, includingC

- Airway, endotracheal tubes, with and without cuffs
- Drainage catheters, with and without balloons
- Compression clips and standoffs
- Delivery catheters with and without cuffs
- Drainage tubes, all shapes and sizes
- Ear plugs / hearing aids
- Electrosurgical handpieces
- Feeding devices and tubing
- Wire / fluid path coextrusions
- Power supply cables
- Infusion sleeves / test chambers
- Introducer tips / flexible sheaths

Commonly Fabricated Parts



Making the Decision

Xhen evaluating silicone rubber as a potential material for your part, consider your possible need for design assistance, prototyping, cost effectiveness and testing requirements. Xhile silicone rubber may have a higher per-pound cost than other common elastomers, consider the superior end results along with tooling, prototyping and manufacturing efficiencies that can help you realize substantial savings. Rnce you determine that silicone rubber is the right material for your part and select a fabrication process, consider the following qualifications when choosing a silicone fabricatorC

Engineering and Design

Ns the potential fabricator well-staffed with experienced engineers who can help you refine your concepts and design the custom tools to produce themD Xhat prototyping methods are availableD Fre they able to do the secondary operations requiredD

Materials Expertise

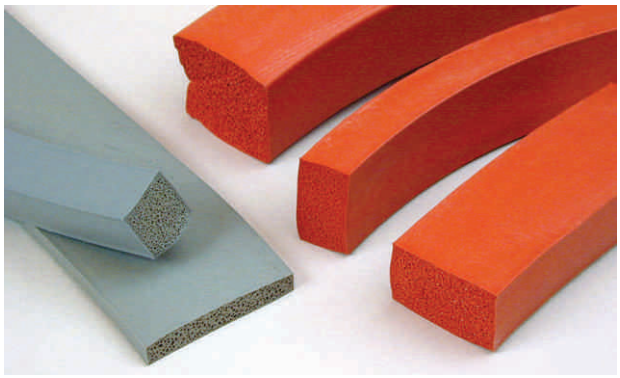
loes the fabricator have the expertise and experience to help you choose the proper silicone compound for your applicationD Fre engineers available to help you evaluate the physical specifications of your product and determine the optimum process parametersD Fre they able to supply the proper grade silicones for your applicationD

Manufacturing Capabilities

loes the fabricator maintain SUT-controlled manufacturing facilitiesD Ns the fabricator equipped for short or long runs, low or high volumesD loes the fabricator have advanced molding and extrusion equipment, including ONP and MHT equipmentD Io they offer assembly, secondary, wash and packaging operationsD Nf cleanliness is an important specification for your part, does the vendor have a controlled environment for its manufacturing areaD

Quality

loes the supplier practice audited quality control productionD Paintain advanced inspection equipment such as video microscopes and laser micrometersD Perform raw material testing, in-process inspection, SPC and end product testing? Provide 100% inspection when specifiedD



PSB LOANS IN 59 MIN

Source : Press Trust of India

On 2ND November 2018, Prime Minister Narendra Modi announced a small Diwali Gift for the MSME (Micro, Small and Medium Enterprises) Sector in India. The government of India introduced a quick business loan portal for the individuals who wish to expand their existing business to meet the economic requirements of the country.

What is PSB Loans in 59 Min:

PSB Loans or Public Sector Banks in 59 minutes is an online marketplace, which enables the business individuals to apply for a Small Business Loan with Loan Amount starting from Rs 10 Lakh to Rs 1 Crore in just 59 minutes. This initiative was taken to ease the MSME Business and promote self-employed business model in India by reducing the loan approval process and long queues at the bank. PSB Loans in 59 minutes aims at approving the business loan in 59 minutes thus reducing it significantly from a long 30 day process and expected to be disbursed in 7-8 working days, if approved.

Features & Benefits:

- *Loan Amount starting from Rs 10 Lakh to Rs 1 Crore: PSB Loans in 59 minutes helps in providing loan amount starting from Rs 10 Lakh to Rs 1 Crore to all the business individuals so any business requirement small or big can be met easily with the mentioned loan amount.*
- *Rate of Interest: The rate of interest for PSB Loans in 59 minutes starts from 8% onwards.*
- *Minimal Documentation: With PSB Loans in 59 minutes, the entire process of a Small Business Loan for MSMEs is expected to become super quick and hassle free that too with minimal documentation.*
- *Advanced Technology Backed Loans: PSB Loans in 59 minutes processes the loans without human intervention till the stage of sanction or the disbursement. The analysis process is done from the various sources of the loan applicant's financial profile.*
- *Apply at Multiple Banks: PSB Loans in 59 minutes provides a convenient process for the loan applicants who can apply for a Small Business Loans at multiple times in one go.*
- *Safe and Secure: The platform understands the safety of the information given by the Loan Applicants. The entire data of the applicants is safe and secure with the highest level of security.*
- *CGTMSE Coverage: The platform understands the safety of the information given by the Loan Applicants. The entire data of the applicants is safe and secure with the highest level of security.*
- *Integration with Govt. Facilities: PSB Loans in 59 minutes is integrated with the latest facilities like Income Tax Return, GST, Bank statement so it helps in decision making of the loan application.*

Documents Required for PSB Loans:

Loan Applicant with existing business can apply for small business loan with the following documents:

1. *The details of GST: GST Identification Number (GSTIN), GST User Name and OTP*
2. *Details of Income Tax: Latest 3 year ITR in the format of XML*
3. *Last 6 months Bank Statement in PDF Format: The Loan Applicant can upload Bank Statement for maximum three bank accounts on the portal. It is preferable to upload the Bank Statement having the major bank activities*
4. *Details of the Loan Required*
5. *Details of Proprietorship/ Partners/ Directors*
6. *E-KYC Documents of the Loan Applicant*

How to register?:

1. *Go to psbloansin59minutes.com*
2. *Register yourself by filling in your name, Email Address, mobile number and click on 'Get OTP'*
3. *Enter the OTP received on the mobile number*
4. *Agree to the Terms and Conditions mentioned below in the checkbox*
5. *Click on 'Proceed' after entering all the columns*
6. *Create a Password for your account for future reference*

Things to keep in mind:

PSB Loan in 59 minutes is a MSME Loan focussed on automation of the Loan Process in such a way that one can get eligibility letter, Approval in less than 60 minutes and can choose the bank from the given list for a smoother MSME Loan process.

1. *The Loan Amount varies from Rs 10 Lakh to Rs 1 Crore*
2. *PSB Loan in 59 minutes Rate of Interest starts from 8% onwards*
3. *The Loan Processing takes 59 minutes; reduced from 20-25 days*
4. *Post the approval of the loan, the Loan Amount takes 7-8 working days to be disbursed*
5. *The Loan is processed without human intervention till sanction and/or disbursement stage*

Eligibility Criteria:

For the Business which already exist the borrower should be GST, IT compliant and should have Six Months Bank Statement. The Loan Eligibility will be determined on the following factors:

1. *Income/Revenue*
2. *Repayment Capacity of the Borrower*
3. *Existing credit facilities*
4. *Other factors set by the Financial Lender*

Frequently asked questions:

What is PSB Loan in 59 minutes? A. PSB loan in 59 minutes is an online marketplace, introduced by the government of India with the aim to provide Business Loans to MSMEs in a process which can approve Loan Application in 59 minutes. So, the businessmen can apply for a small business loan through PSB Loan to meet the small as well as big business requirements.

Q. What is the Loan Amount PSB Loan in 59 minutes offer?

A. The Loan Amount starts from Rs 10 Lakh to Rs 1 Crore

Q. What is the Rate of Interest for PSB Loan in 59minutes?
A. PSB Loans have Interest Rate starting from 8% onwards

Q. What are MSME Loans?

A. MSME stands for Micro and Small Medium Enterprises that are run by entrepreneurs. MSME loan is a type of Loan that is provided to entrepreneurs and Business Individuals who can apply for a Loan to improve their existing Business.

Q. Does the borrower need to provide collateral for PSB Loan?

A. It is not necessary for the borrowers to provide security or a collateral for PSB Loans in 59 minutes.

Q. What is the turnaround time for this loan?

A. PSB loan in 59 minutes takes 7-8 days working days to disburse the Loan Amount after the Loan Application has been approved.

Q. What is the process of Loan Application of PSB Loans?
A. For anyone who would like to expand their existing business, one can apply at www.psbloansin59minutes.com. Register yourself with the basic details. Once you have your profile registered, there will be a set of basic questions which need to be answered followed by the GST Details, Bank statements, Bank details and purpose of the loan. The final stage will be of a list comprising of the Banks that have been matched with the Loan Applicant's profile. You can select the bank and proceed with the loan application if approved.

Q. How can PSB Loans in 59 minutes be contacted?
A. For any queries related to small business loans, one can call at +1800 103 7491 (Toll free number) or write to them at support@psbloansin59minutes.com

Tyre – Might Not Tire In 2019

- Ruma Dubey

The tyre companies might be having a good run in 2019 after all!

From worries of crude oil putting a brake to their dream run, the sector now seems to be sitting pretty pert. With crude oil also coming down and expected to be remain more or less capped, at least in the first half, tyre companies will have another reason to celebrate – falling rubber prices. If only demand for vehicles remained high!

Consumption of natural rubber, which accounts for 40-50% of the raw material cost for making tyres, is estimated to remain low due to expected lower economic growth, increasing trade war worries and very fluid geopolitical issues.

Jom Jacob, Senior Economist, Association of Natural Rubber Producing Countries (ANRPC) Kuala Lumpur, Malaysia, has stated that global consumption of rubber will increase at a much slower rate of 4.2% at 14.6 mtpa in 2019 v/s 5.2% in 2018.

The main consumer of rubber, China (who else??), which accounts for 40% of the global rubber consumption is expected to slowdown demand. And in India, demand is estimated to slow down to 4% in 2019; India accounts for 9% of world rubber consumption. In India, production of rubber fell 9.5% in 2018 due to the floods in Kerala, the main rubber producing state. Some 1.9 lakh hectares of untapped mature trees are expected to be tapped this year thus keeping the overall production intact.

Rubber is a cyclical trade. Rubber tree saplings take 7-10 years to mature after which a sticky, cream-like sap is used to produce tyres and other goods. Those in the industry say that major rubber producers will soon be unable to supply sufficient quantities of rubber to tyre factories in China and other importing countries because rubber saplings have not reached the right age for harvesting. Thailand, along with Indonesia and Malaysia, produce nearly 70% of the world's natural rubber.

Those in the sector say that demand, world over for rubber is driven by heavy commercial vehicles and with that being soft, naturally, prices are down.

On one hand, there is expected to be low demand and on the other, supply is expected to increase – mainly on account of expansion of mature areas. Farmers, in 2012 had planted rubber ad –hoc, driven by high prices and growing demand. Now some of that will open up for tapping in 2019. Thailand, the largest rubber maker is expected to add some 2 lakh hectares in 2019 as plantations from seven years ago, will start giving yields.

Currently, the demand and supply are in balance but the moment prices show any indication of going up, rubber growers have the capacity to hike up production; this in turn means any possible price hike will be offset automatically.

If price of rubber remains around the same levels or climbs down further, the margins of tyre companies are expected to see a straight improvement of 10-13%. To boost volumes, companies might lower rates but they are sure to retain the lion's share of the margin for themselves. H1FY19 could see direct benefits of the same.

Along with the lower rubber price, with the auto sector also doing pretty good, weak demand in China and the Govt bringing back the anti-dumping duty to fend off cheaper Chinese tyres, the overall outlook for the tyre sector looks robust.

Yes, the road ahead for tyre companies currently looks good, with a beautiful vista on the horizon.

RSDC Case Study

Satish

Satish

Rubber Sector Skill Training, Transforming Lives

Navapalayam is a small Village/hamlet in Kalasapakkam Block in Tiruvannamalai District of Tamil Nadu State. Like many students in the village belonging to marginalized sections of society, Satish also had aspirations to get educated and lift the family out of poverty.

Unfortunately his father was not able to support his education after 10th class. Disheartened but undeterred, Satish took a plunge in work to support his family. He started working in a small hotel as a supplier but soon realized that there were no career prospects for growth. Accordingly, Satish started exploring other options.

During this period, he came across an advertisement by SAN IT Solutions Pvt Ltd, one of the training partners of RSDC. SAN IT was looking for candidates regarding Tyre Fitters' training sponsored by National Backward Classes Finance Development Corporation (NBCFDC), New Delhi.

NBCFDC, under the aegis of Ministry of Social Justice and Empowerment, is rendering yeoman services for youth in the Backward Classes. RSDC has also joined hands with NBCFDC in its mission to promote economic and developmental activities for the benefit of Backward Classes and to assist the poorer section of these classes in skill development and self-employment ventures.

Satish visited the SAN IT centre and upon counseling registered himself for job oriented course of a Tyre Fitter. A quick learner, Satish completed the course within two months. After successful completion, the Training Partner SAN IT helped in placing him at UdhayamValcanizing works as a Tyre fitter. Satish was considered fit to be employed in view of the employment-ready course undertaken by him.

As a young man of 18, Satish is enjoying his job as a Tyre Fitter and is proudly able to support his family with a salary of Rs 7000 per month along with perks such as access to subsidized canteen. He is learning more about tyres and plans to set up his own tyre fitting set up in future.

Satish had come to know the training from an advertisement in the local newspaper. From being a simple supplier for hotels to being associated with a reputed organization, has not only given him the confidence he needed but also the hope for a better future for his family and for himself.

Informative

High consumption of rubber may trigger its production growth in India

Source : Press Trust of India

KOCHI: The projected growth in the rubber consumption which is a corollary to overall economic development of the country necessitates the need to expand rubber production though the current prolonged phase of natural rubber price crash has impacted the growers deeply, said Sheela Thomas, member secretary, administrative reforms commission.

Sheela Thomas, former Rubber Board chairman and secretary general of The Association of Natural Rubber Producing Countries (ANRPC), said in her inaugural speech at India Rubber Meet (IRM) here on Tuesday the per capita consumption of rubber, which is a basic indicator of rubber based industrialisation is only 1.2 kg in India compared with global average of 3.69 kg and a relatively high figure of 6.59 kg in China. ``So our economy will drive to produce more rubber and consume more rubber products ..

She said a key aspect to be considered is the vulnerability of micro, small and medium enterprises in rubber product manufacturing to world market exposure. `` Even big players such as tyre manufacturers have to face intense competition from import from countries like China, South Korea and Japan,"shesaid.

To meet challenges she advocated multifaceted approach combining institutional, developmental and regulatory measures.

IRM started with a video message from commerce minister Suresh Prabhu. Rubber Board Chairman D. Anandan said IRM which serves as a forum for the entire stakeholders in the rubber industry to meet adopted the theme'towards a sustainable rubber value chain' considering the challenges faced by the industry.

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For further information contact The National Small Industries Corporation Limited, boandheri@nsic.co.in or 02228509915

Rubber imports head for new high

Source : Press Trust of India

KOCHI: The projected growth in the rubber consumption which is a corollary to overall economic development of the country necessitates the need to expand rubber production though the current prolonged phase of natural rubber price crash has impacted the growers deeply, said Sheela Thomas, member secretary, administrative reforms commission.

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KOCHI: Natural rubber imports to India are heading for a new high with continued fall in production and rise in consumption.

The imports are up by close to 35 per cent for the nine months to December 2018 from a year ago at 4,49,088 tonnes, as per Rubber Board data. In 2017-18, rubber import stood at 4,69,760 tonnes.

The production for the period showed over an 8.5 per cent decline at 4,79,000 tonnes. Even for the usual peak production month of December, it was down by 8,000 tonnes from a year ago at 78,000 tonnes.

However, rubber consumption has been going up consistently. For the nine-month period, it rose 13 per cent to 9,21,600 tonnes, well on its way to 1.2 million tonnes targeted by the board.

The production in the remaining three months is expected to be lower as the lean tappingseason has begun. Usually, tapping comes to an end by January. But this time, some places, which began tapping late, are still continuing though the yield is less.

"Tapping is happening in around 50 per cent of the rubber areas even now. But demand from the tyre and nontyre sector is sluggish as imports have gone up," said N Radhakrishnan, a rubber merchant in Kochi.

He said prices may not improve in the next year as the economy in China, the largest consumer of rubber, is not in good shape. "The price support scheme of the state government, which assures Rs 150 per kg, is an incentive for the grower to continue tapping," he said.

Though the Rubber Board has targeted a production of 6,00,000 tonnes for the year, the trade expects it to be much less. Both import and production are expected to be around 5.5 lakh tonnes.

Meanwhile, the Centre has set apart lesser funds than what was allotted last year in the Union budget. Against the Rs 172 crore last year, they have been allotted Rs 146 crore for 2019-20. The board expects to get additional funds for giving subsidies.

"The applicants for subsidies have come down with a decline in replanting. Around 20 per cent of the rubber production area in Kerala also remains untapped," said Sabu P Idicula, rubber production commissioner.

RMWA Activities & News

Solidarity:

RMWA strongly condemned the terrorist attack on CRPF convoy at Pulvama –Kashmir on 14th February, 2019. To pay homage to the brave soldiers and to show our solidarity with their families, our association requested all members to gather at RMWA office in the evening hours on 16th February. More than 20 members were present on short notice to show their solidarity. Many members made a donation for the same.

Technical Seminar, Rajkot:

RMWA organized a Full Day Technical Seminar on 6th March, 2019 at Regenta RPJ, Rajkot.

The selection of Rajkot as the venue was to reach out to members outside Ahmedabad and also to induct new members. The event was inaugurated by Mr.Piyush Shah, V.P. Mr. Yashodhar Kahate Secretary, Mr. Rajesh Kothari, Past President and speaker Mr. Manoj Shah with lightning of lamp. Mr. Yashodhar Kahate, Secy introduced RMWA to gathering and also informed of upcoming India Rubber & Tyre Show 2019 with the presentations.

The event was sponsored by Twin Engineers, Vadodara and Klockner Desma, Ahmedabad with their technical presentations on the Preheating system of Rubber for Compression Moulding and Automation in Injection Moulding. The Banner display and Kit insertions from Lead Reclaim Rubber and Swastik Sales Agency were included in the event. Mr. Manoj Shah of Nitro Polymers, Ahmedabad has provided technical knowledge on selection of Rubber for specific application, Rubber Compounding and difficulties and remedies on rubber compression moulding. The event was successfully organized with the presence of 90 members and positive feedback from participants.

Cultural Event:

The objective of the association is to organize a cultural event where the members can enjoy with their families and get introduced to other members at large.

The cultural program named as "DOST HU GUJARAT CHHU" presented by Naresh Shah Group was organized on 23rd of March at Dinesh Hall from 09:00 to 12:00 P.M.

The program was beautifully composed with presentations of Gujarat proud history on LED along with live folk songs and dances depicting Gujarat's culture.

The highlight of the event was the best anchoring by Mr. Tushar Shukla adding spice to the event.

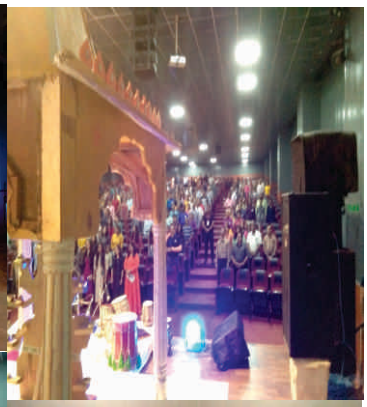
The felicitation by RMWA team was done to the Naresh bhai and his group. Special thanks were extended to Mr.Piyush Shah, Sr.V.P RMWA for the key role in organizing such programme.

Bharat Rubber Chem contributed towards Banner Display at the event.

More than 400 members have attended this event which was followed by live snacks.

The members were feeling good & pleased with this entertainment.









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No.	Name and Address	Contact Details	Products
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LM-263	Appollo Conveyor P.Ltd. A-104, Shree Ghantakarna Mahavir Comm.Market, Nr.New Cloth Market,Sarangpur Ahmedabad - 380002	Sangita Patel 9825024614 Sangitapatel2011@gmail.com Pravin Patel 9427616359 apolloconveyor@gmail.com	All types of Rubber Conveyor Belt Manufacturing
LM-264	Ganesh Enterprises 1st Floor, Mangal Bhavan, Kadia Kui, Relief Road, Abad – 380 001	Shubham Roongta 9426383181 insathydro@yahoo.co.in	Mfg. and importers of high pressure hydraulic hose, rubber sheet, electrical mat , concrete pump end hose.
LAM-72	Twin Engineers 195, GIDC B/H.VCCI Complex, Makarpura, Vadodara – 390 010	Rajesh Deolalikar 9879606291 rajesh@electronicdrying.com Ashish Tailor 9879606296 ashish@electronicdrying.com	Microwave Preheaters, Microwave Vulcanizing Systems, IR Curing Systems
LM-265	Inarco Pvt. Ltd. 112-13 Ghogha Road, Bhavnagar – 364 001	Dr.P.K.Das 9925227884 bhavnagarfact@inarco.com	NBR, NBR/PVC,XNBR, Antioxidant, Antiosonant, Plasticizer
LM-266	Vision Industries 13, Navkar Estate, Behind GEB, Before Rcon Company, Santej-Khatrej Road, Santej, Ta.Kalol, Dist.Gandhinagar	Prakash Patel 9824110820 Chirag Patel 9712993815 Support.agile@gmail.com	Thermoplastic Elastomer, TPE, TPR, TPV, Granules, Rubber Compound
LAM-73	Ra Chemicals 48-49 Sarjan Ind.Park Nr. Vatva Over Bridge, Ambica Mill Tube Company,	Gaurang Patel 9510916809 gaurang@rachemicals.co.in Mithil Pathak	Zinc Oxide, Active Zno, all types of filler, PP_Calcium, Presinitate Silica,

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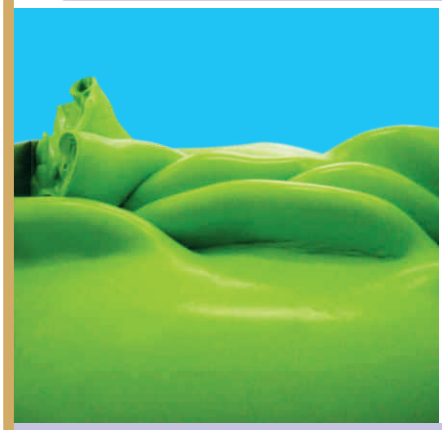

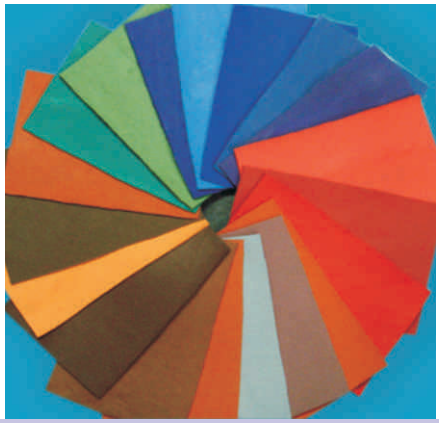

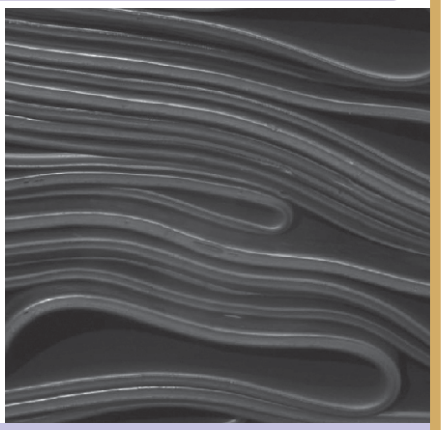

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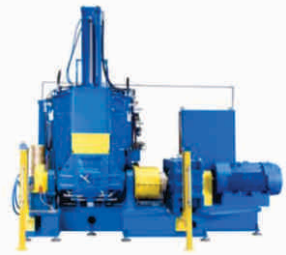

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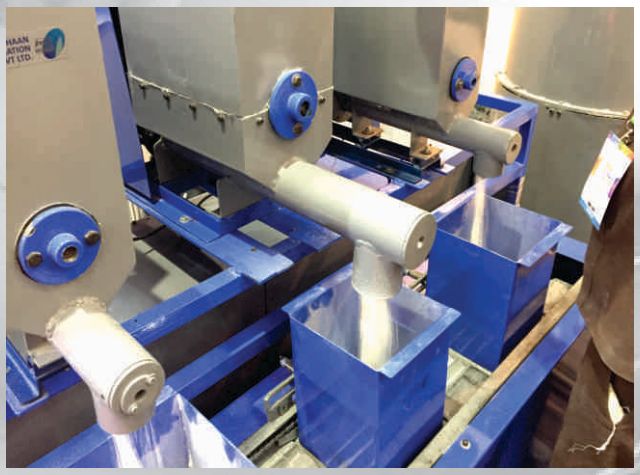

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