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RUBBER & PLASTICS INC.

Product Line & Services

CONVEYOR BELT
Heavy-Duty Rubber Belt
Lightweight Rubber Belt
Oil-Resistant Belt
High-Temperature Belt
PVC, RMV Belt
Profile, Rubber & PVC Belt (Roughtop, V-Cleat, Chevron, Crescent Top, etc.)
Integrally Molded, Cleated Belt
Food Handling Belt

CUSTOM FABRICATION
Rubber (Hot-Vulcanized) Cleat
PVC (Thermo-Welded) Cleat
Custom Cleats: Transverse, Beefy T-Cleat, Herringbone, Chevron (Open & Closed), Scoop, Curved, etc.
V-Guides (Plain or Notched)
Corrugated Sidewall
Vanner Edges
Dewatering Belt
Elevator Belts
Punched Parts, Flaps, etc.
Specialty OEM Applications
Vulcanized, Endless Belt
Rubber Boots (Sleeves)

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Troughed Idlers (Equal & Unequal Length Rolls)
Return & Flat Carrier Idlers
Impact Idlers (Rubber Cushion)
Self-Aligning (Training) Idlers
Feeding/Picking Troughed Idlers
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Return Roll Guards
Replacement Component Parts
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Side Guide Idlers
Live Shaft Idlers

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Wing-Type Pulleys
Spiral Wing & Drum Pulleys
Heavy-Duty, Reinforced Pulleys
Motorized Drive Pulleys
Magnetic Pulleys
Hubs & Bushings
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Roughtop & Vulcanized Lagging

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Bolt-on Cleats
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Belt Scraper Blades
Impact Beds
Mats
Dock Bumpers
Metal Back Rubber
Rubber Boots (Sleeves)

ADHESIVES
Truflex/Pang Products
Belt Splice Kits
Neoprene Contact Cement
PVC Cement
Urethanes

SHEET RUBBER, ETC.
Skirtboard Rubber
Combi-Rubber
Crown Bar Rubber
Chute Lining
Pure Gum Rubber Sheet
Urethane Sheet
Neoprene Rubber Sheet
Diaphragm Sheet
Cloth-Inserted (C.I.) Sheet
Red Gum Rubber (40 Duro)

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MECHANICAL FASTENERS
Clipper, Staple, Bolt-Hinged, Rivet-Hinged, Installation Tools, etc.

PULLEY LAGGING
Herringbone, Plain, V-Groove, Roughtop, etc.

Used Belt and Much More Available From R & P!

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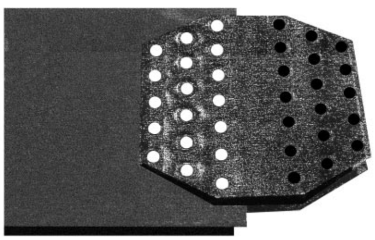
RUBBER & PLASTICS INC.

The Conveyor

Fall 2000

New Breakthrough Product – The Super-Screw Flexible Fastener

The Super-Screw flexible fastener is part rubber and part metal. It is a truly hybrid splice with the advantages of vulcanization and the quick and easy installation of metal. The splice is flexible and works around small pulleys—without any product leakage.



The Super-Screw is a patented product produced by Minet Lacing Technology, Inc. of France. It works with scrapers and can perform like a vulcanized splice. Sometimes, it can even pull more tension than a vulcanized splice. Best of all, a maintenance mechanic can install it quickly with a power drill and screwdriver.

The Super-Screw flexible fastener is available in a range of sizes and tensions.

Width	**12" to 72"**
Thickness	**3/16" to 13/16"**
Maximum Operating Tension	**150 PIW to 1,000 PIW**

TO ORDER, CALL R & P TODAY

Rubber Ron's Report

I've talked about the NIBA convention all year and am pleased to report that it was an outstanding success. In all, 560 attended the September event. The three keynote speakers were great, and the event at the Kennedy Library met all expectations. In addition, we saw new products, including the Super-Screw—the most innovative splice procedure I've seen developed in my 30+ years in the business (see article above).

So, what was on everyone's minds this year: 1) employee retention and recruitment and 2) e-commerce. With the current economy and employment levels, it is very hard to keep and get new employees. E-commerce is changing our traditional methods of distribution and has broad implications for the way that we do business. While we didn't come up with any resolutions this year, I think NIBA plans to have several seminars at the next convention to address these concerns.

The discussion made me think of what's really important in running a successful company and increasing sales. Things are always changing; if it's not e-commerce, it is some other challenge. In my view, the one thing that remains true is that people buy from people. As John Asher puts it, "For most companies, 80% of new business comes from old clients." No matter what our challenges, we should always remember that the relationships we have and maintain are critical to the growth of our businesses.

To achieve anything, you must be prepared to dabble on the boundary of disaster.
- Stirling Moss

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Vulcanization . . . What Is It?

rub·ber (noun)

1. A yellowish, amorphous, elastic material obtained from the milky sap or latex of the rubber tree, modified and vulcanized into products such as electric insulation, elastic bands, conveyor belts, and tires. Also called caoutchouc (weeping tree).

2. Any of numerous synthetic elastic materials of varying chemical composition with properties similar to those of natural rubber.

The Discovery of Rubber

The discovery of what we today call "rubber" goes back a long way. Both the Mayas and Aztecs tapped rubber trees, which they called "caoutchouc" or the weeping tree. By heating the sap over a smoking fire, they produced elastic balls, which they used in ritual games. It took another 2,000 years or so for the advantages of rubber to be known outside its native South America, but today it is one of the world's most important resources.

Rediscovery of This Natural Resource

Charles Marie de la Condamine spent ten years traveling through South America. Upon his return home in 1745, he brought samples of the sticky substance caoutchouc, whose elasticity was the source of great amazement.

Caoutchouc Gets a Name Change

In 1770, the English theologian, chemist, and discoverer of oxygen, Joseph Priestly, reported on how the mechanic Edward Nairne had stumbled upon the eraser effect. He accidentally rubbed his pencil sketch with a piece of caoutchouc instead of the breadcrumbs that they usually used at the time. When he saw that the caoutchouc was actually more effective than the breadcrumbs, he started to sell pieces of it under the name of rubber.

Rubber Goes on the Hot Seat

In the early 1830s, rubber became an obsession for Charles Goodyear, and hopefully the answer to his debts. Goodyear began mixing up rubber concoctions while in debtor's prison. He was convinced that the inventions he created from the flexible, weather-resistant sap of the rubber tree would someday help him pay back his debts and provide a comfortable living for his family.

There was one small problem: Rubber melted in the summer heat and turned brittle in the winter cold. Goodyear spent a fruitless decade experimenting with lead and other chemicals to try to keep rubber "rubbery." But, the life preservers, draperies, shoes, purses, and hats he created slowly disintegrated over time—along with his finances.

In 1839, Goodyear believed he finally had his rubber problem licked. He added sulfur and produced 150 rubber mailbags for the postal service. However, after just a few weeks, the mailbags began to decompose. Somehow, he inadvertently exposed the rubber mailbag to the heat of a fire. "The specimen, being carelessly brought into contact with a hot stove, charred like leather," he later wrote in his autobiography. He called the process hot vulcanization because he associated sulfur and heat with volcanoes. Hot vulcanization became one of the fundamental inventions of modern manufacturing.

How Does This Affect Me?

Today, we use vulcanized rubber materials that offer protection against the effects of premature failure in the most demanding of applications. These materials must be compounded for excellent tear strength and abrasion-resistant properties.

A rubber polymer by itself has poor physical properties and limited commercial value. A variety of chemicals and agents must be added to the unvulcanized base polymer (compounding) to improve its physical properties and make it commercially useful.

Compounding With Chemicals and Agents

In sulfur vulcanization, the most commonly used, the rate and state of vulcanization is dependent on the quantity and activity of special chemical additives, particularly accelerators. Many types of curing agents and accelerators are also used, but only the highest grade and proper mixing ratio can provide a safe, stable product.

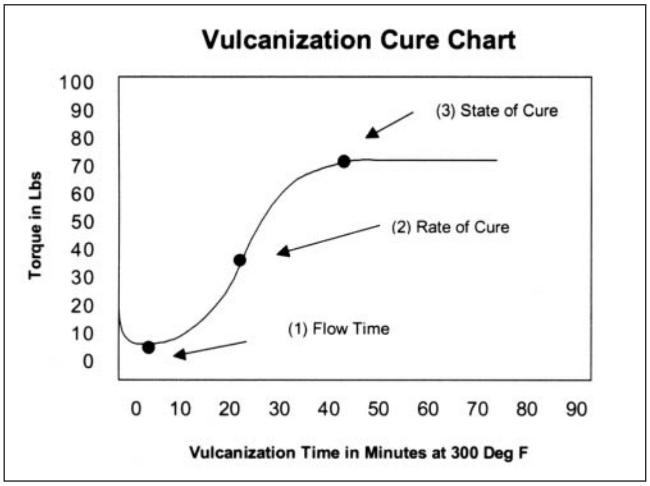
Depending on the choice of vulcanization chemicals, the state and rate of vulcanization of a rubber compound can be rapid or retarded. In the vulcanized splice process, it is necessary for the rubber compound to maintain a prolonged flow time and, thus, a controlled rate of cure is necessary.

The Basic Concepts of Vulcanization

Vulcanization is a process that transforms the predominantly thermoplastic uncured rubber into an elastic cured rubber or hard ebonite-like state. This process causes the chain-like rubber molecules to crosslink with one another via sulfur bridges, converting the rubber from the plastomeric to the elastomeric state. It is called crosslinking or curing.

The vulcanization process occurs in three stages, and each stage can affect the number of crosslinks and thus, the service life. (See chart on the next page.)

Vulcanization . . . What Is It? (cont.)



Stage 1. The induction or scorch period (flow time)

Flow time represents the time at vulcanization temperature during which no measurable crosslinking has occurred. During that period, the rubber compound flows uninhibited. An example is in vulcanized splicing and molding. It is necessary for the rubber compound to maintain a prolonged flow time (scorch) in order to fill all cavity spaces and for all entrapped air to escape completely.

Stage 2. Curing or crosslinking (rate of cure)

Following the induction period, crosslinking proceeds at a rate (rate of cure) which is dependent on the temperature and the composition (compounding) of the unvulcanized rubber. By crosslinking, the rubber changes from the uncured thermoplastic state to the cured elastic state. As more crosslinks are formed, the vulcanized compound becomes tighter, and the forces (stress forces) necessary to achieve a given deformation increase.

Stage 3. Reversion or overcure (state of cure)

Since all technological properties of the compound are now forming, it is necessary to cure the rubber to its optimum state of cure (maximum stress value), but not past that point. As crosslinking proceeds to a full cure state and continued heating of the rubber occurs, an overcure may result, which can cause stiffening (marching modulus) or softening (reversion) of the compound. These effects will reduce physical and adhesion properties of the rubber compound.

Working Shelf Life and Physical Properties

Working shelf life (scorch time) is a measurement of the amount of time before premature vulcanization occurs during the controlled storage of the unvulcanized rubber compound, due to the accumulated effects of heat and time (heat history).

If all the scorch time is depleted during storage, it will no longer provide the necessary crosslinking sites, and thus will result in low adhesions and poor physical properties and lead to failed vulcanized splices.

Summary

These special compounds are used in a wide range of conveyor belt applications because of their versatility. In some of the applications, considerable emphasis is placed on a single property. Other applications require a balance among several properties. Commonly measured properties include tensile, elongation, and hardness.

Specialty rubber compounds like splice materials are extremely formula-dependent and typically cost more, but you can justify their use because they have many unique physical properties such as high adhesion values.

Consequently, the mix of elastomers and other compound ingredients used will influence the cured physical properties.

What Does the Future Hold?

More improvements in rubber compounds will likely follow. “The demands made by society on rubber products increase all the time, especially with regard to [their] environmental aspects,” states Dr. Hugo Vernaleken, head of research for Bayer Chemical. “The battle between quality and cost now extends to ecology as well. We therefore have to produce high-quality products at an attractive price and with [minimal] environmental impact.” He goes on to say that we will have to be at the leading edge of technology if we are to be economically efficient in the long term, keeping rubber scientists busy well into the next decade.

Thanks to Michael Cremeens, Member of NIBA’s Technical Committee, for providing the content for this article.