Rubber – the key to conveyor belt success

Bob Nelson looks at the critical importance of the quality of the rubber in conveyor belts and why, unlike most of their competitors, Netherlands-based Fenner Dunlop Conveyor Belting continues to make its own rubber and invest in more advanced mixing equipment.

The biggest influence

Representing around 70% of the volume and some 50% of the raw material cost, the standard of the physical properties of the rubber are the single biggest influence on the length of a belt's day-today performance, operational lifetime and price. In these times of fierce competition, dominated by Southeast Asian manufacturers, especially China, rubber is seen as the biggest opportunity for a variety of corner-cutting practices. These include using unregulated, low-grade raw materials, bulking agents such as chalk and clay, scrap rubber of highly questionable origin and the substitution of performance-critical polymers such as carbon black with low-grade versions. Other tactics include reducing the quantity, and often the total omission of key ingredients such as the antioxidants vital to resisting premature degradation caused by exposure to ozone and ultraviolet light.

Such unscrupulous methods, together with an almost complete disregard for human and environmental safety, enable them to massively undercut the few remaining manufacturers at the quality end of the market, such as the Fenner Dunlop's of this world. Despite recent announcements of more closures of competitor conveyor belt manufacturing plants in Europe, Fenner refuses to change direction. Instead, it is more committed than ever to further expanding the quality and value gap.

A science in itself

To fully appreciate the importance of the quality of the rubber it is first necessary to have at least a basic appreciation of how it is created. Because of its adaptability, nearly all conveyor belt rubber is synthetic. The creation of rubber compounds is the process where numerous 'specific task' chemicals, reinforcements, antioxidants and anti-degradants are mixed together with rubber polymers.

The most common polymers used in conveyor belts are Styrene- Butadiene rubber (SBR) and Nitrile rubber (NBR). The chemical agents form chains of polymers to form rubber compounds that will ultimately be vulcanized. Vulcanization is the process in which the compounds are chemically converted into a more durable final product by using heat and what are termed as 'cross-linking agents' such as sulphur and accelerators. It is a highly scientific process and even more complex when you begin to consider the multitude of physical properties and characteristics that the rubber used in conveyor belts need to possess.

Meeting every need

Every type of rubber has to meet a long list of demands, so each compound has to be made according to a very precise recipe. The most basic ability is to resist abrasive wear together with specific minimum requirements in terms of tensile strength, elongation (stretch), hardness, and resistance against tearing. Then of course, there is the ability of the rubber to resist the seriously damaging effects of ground level ozone and ultraviolet light (both sunlight and fluorescent light). As touched on earlier, both of these last two properties require special additives to be an integrated

Creating rubber compounds is a highly complex process.

part of the rubber compound.

These are just the basic requirements. In dry cargo handling there is also a need for 'specialist' rubber covers such as resistance against the effects of oil, chemicals, fire, extreme cold (as low as minus 60°C), impact, ripping & tearing and the numerous combinations of those qualities for multi-purpose belts such as oil and fire resistant for example. Last but not least, the rubber needs to be able to form strong, reliable splice joints. Being able to consistently achieve all these requirements during the mixing process so that every individual batch of rubber compound is exactly the same is unbelievably challenging.

Quality and consistency begins at home — Fenner Dunlop makes all its own rubber.

The mixing process

Dozens of chemicals and ingredients are used to make the wide variety of rubber compounds. The mixing process is where all of the polymers, chemical additives, carbon black and zinc oxide are mixed together according to the specific recipe for the required rubber type.

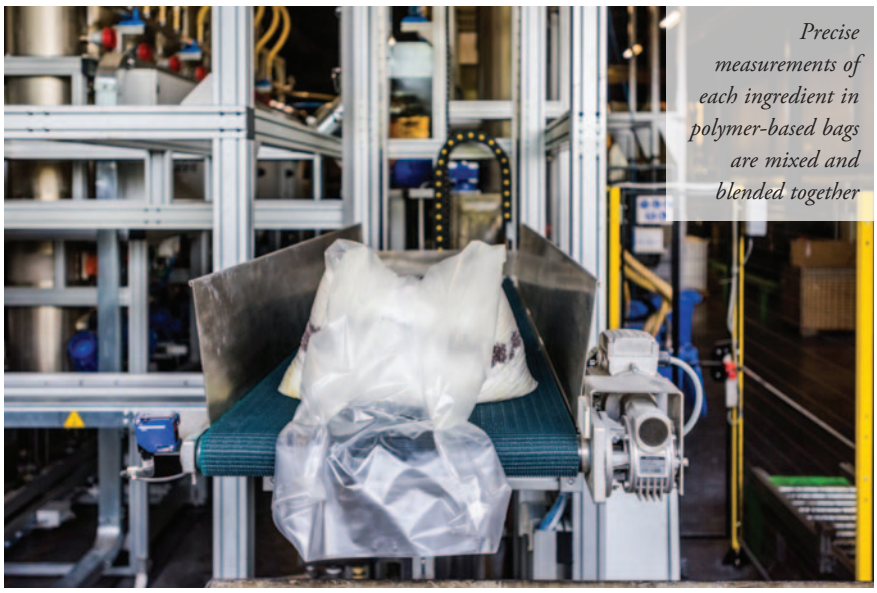
For accuracy and consistency, Fenner Dunlop uses a highly advanced computerized, automated mixing carousel that places very precise measurements of each ingredient into polymer-based bags, with one technician likening it to "making cakes that have to taste precisely the same every time".

Quality control begins at home.

It quickly becomes obvious that everyone in the company's production facility in Drachten is fiercely proud of the fact that Fenner Dunlop is the only remaining European belt manufacturer that continues to make all of its own products using its own production facilities in Europe. This includes the rubber, which is now a rarity due to a growing trend to outsource rubber compound manufacturing, mostly to Southeast Asia, rather than produce it in-house.

The advantage is that specialist rubber compound manufacturers can better minimize costs through mass production, but the downsides outweigh the perceived advantages. Outsourcing makes it virtually impossible to apply the strict quality process and raw material control disciplines needed to ensure the quality and consistency between batches of rubber produced at different times. Another downside to mass production rather than 'just in time' is that some compounds have a 'best before' shelf life, so they need to be vulcanized before some important physical characteristics begin to diminish. Unless the large mass-produced volumes are used within a reasonable time-span, they begin to deteriorate.

According to Fenner Dunlop's Innovation & Sustainability Director, Dr. Michiel Eijpe, outsourcing rubber production is not an option. "It is essential that we have total control from beginning to end, not only to consistently achieve identical high qualities and properties but also to comply with environmental regulation, which we believe is extremely important".



Precise measurements of each ingredient in polymer-based bags are mixed and blended together

Safe to handle, safe for the environment

It is an inescapable reality that to make some rubber compounds it is necessary to use chemicals that are hazardous in their own right. Fortunately, at least as far as Europe is concerned, there are very strong regulations in place to protect humans and the environment such as REACH (Registration, Evaluation and Authorisation

of Chemical substances) regulation EC 1907/2006 and EU Regulation No. 2019/1021 concerning the use of persistent organic pollutants (POP's).

Manufacturers located outside of EU/EEA member states are not of course, subject to REACH and POP's regulations so they are free to use unregulated raw materials, which cost much less compared to their regulated counterparts, even though they may be entirely prohibited or at least have strict usage limitations within the European community. Sad to say that it is also true that even most European belt suppliers ignore these regulations because doing so creates an extremely significant price advantage.

Investing in the future

Fenner Dunlop is certainly committed to its policy of making everything itself, recently proven by its investment of some €2.4 million in new machinery in its mixing department. "The primary reasons why such investment was needed revolves around quality, safety and the environment", explains Dr. Eijpe. "Firstly, we wanted to achieve even better control over the mixing process, especially when processing some of the more difficult materials we are now having to use. This is

Dr. Michiel Eijpe. Fenner Dunlop's Innovation & Sustainability Director.

a result of the need to find alternatives to materials that we can no longer source from previous suppliers, for example due to the Russia–Ukraine conflict. It is, of course, essential that these alternatives have the same or higher quality properties as we have used before.

"REACH and POP's regulation compliance also means that we need to find processing solutions for the substitute chemicals that replace those that become banned or have usage limitations placed upon them. There is also the question of safety because new ISO standards relating to the operational safety of machinery are being introduced. When they are implemented, our new mixing machines will instantly be compliant".

Conclusion

There is no question that the quality of the rubber has the biggest part to play in terms of performance, longevity and human and environmental safety. Unfortunately, it also provides the greatest temptation for manufacturers to sacrifice quality in order to create an even wider price gap. However, for those importers who place price ahead of quality and longevity, there will be an even bigger price to pay because ultimately the big prize for the 'market saturation' tactics employed by Southeast Asian manufacturers is that when their competitors have been forced out of business, the market is at their mercy. Not only will they have lost their challengers in terms of quality standards, they will also be free to charge what they like, which we have seen happen in many other industries.

Fortunately, Fenner Dunlop certainly has no intention of becoming their next victim. By taking a quality-led stance, it is at least providing the end-user market with a choice. Long may that continue.

Bob Nelson