

Solidshandling

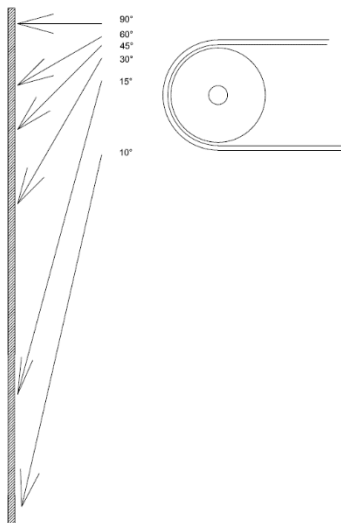
Ewout den Ronden

Polyurethane widely applicable for various wear issues

Impact wear in the processing of bulk material

Wear occurs wherever bulk material is in motion, with the degree of wear depending on the amount and the abrasiveness of the material. As a result, wear frequently occurs to the steel parts of installations in the heavy bulk industry. Various products are available to reduce wear such as: polyethylene, steel, ceramics and polyurethane. Neither one of these products on their own can completely solve each type of wear, that's why we usually need to look for a combination of these types of different products. Polyurethane offers a great deal of flexibility in applications and is almost always the right solution for a variety of wear issues, especially for impact wear. This can only be achieved by means of a thorough analysis.

Dumping, sliding, flowing and dropping: wear occurs wherever bulk material is in motion. Bunkers for receiving raw materials, free-fall mixers, weighing bunkers, chutes and pipework systems are all applications that are subject to wear. This is most serious at product overshoot area's causing direct impact. The product flow always strikes the material at the same place and at the same impact angle. For example: When bulk material leaves a belt conveyor into a hopper or is processed to another belt conveyor, is a very common situation. Without implementing the right measures, this so-called impact wear is highly cost-intensive. That's why we are mainly focussing on this kind of wear hereafter.



Analysis

A thorough analysis is required in finding the right solution. Since a choice of material made only on cost considerations is unlikely to lead to the longest service life, with wear and premature replacement as a result.

Important aspects of this analysis:

- The properties of the processed product
- The speed of the processed product
- The tonnage/loading of the installation
- The product's drop height
- The impact angle of the product flow

All these factors combined determine the current wear situation and need to be viewed, analysed and, where possible, quantified. This data is required to make a good selection of materials to reduce wear. Of the above mentioned aspects, the impact angle of the product flow is of great importance.

Elasticity

A product with a certain elasticity absorbs the impact energy well and is the key to success in fighting impact wear. The level of elasticity needs to be adjusted to the products impact angle. A more unfavourable impact angle of the product flow requires a higher material hardness. However, wear is also more tenacious in those situations. Due to their inelasticity, Hardox, steel, ceramics and polyethylene are less suitable for direct impact (60° – 90°). They don't absorb the released impact energy and will wear very quickly. Therefore, these materials are applied in situations where product flows or slides. As polyurethane is both abrasion-resistant and elastic, it provides a good solution for many wear problems. It's available in different hardnesses, allowing it to provide the best solution for more than just impact wear.

In situations where impact wear occurs, it's desirable having first checked whether product-on-product is a possibility for the installation. Then only the wear caused by flowing or sliding of the product needs to be taken care of. When the installation doesn't allow this, it's case to strive for a situation where material strikes with an impact angle of 60 – 90°, enabling the polyurethane to absorb the impact energy.

Applying a certain material in the product flow to prevent wear, is not always the ideal solution and in some cases all kinds of different wear products will fail. Another possibility then is to check for modification of the current situation. For example by moving the impact point, to create a less unfavourable impact angle. Or changing the impact point towards the product flow to reduce the fall speed.

Polyurethane

Two properties of polyurethane are essential for wear protection: elasticity and abrasion-resistance. Making it particularly suitable for absorbing impact energy of falling product. In impact situations with coarse and sharp product a polyurethane liner provided with ceramic, is a possibility. This combines the ceramic's abrasion-resistance with the huge impact resistance of the polyurethane. The polyurethane liner protects the fragile ceramic and absorbs the impact energy.

Polyurethane is widely applicable because it is available in various hardnesses. It's also applicable in situations where product slides, flows and drops with an unfavourable impact angle. Rubber is also available in various hardnesses but isn't as abrasion-resistant as polyurethane. In situations processing fine product, rubber is less suited because fine product has a tendency for adhesion to the rubber, thus blocking the product flow.

Polyurethane is also available in food quality, suited for the food industry (FDA-approved). It's also highly resistant for oil and grease. Compared to Hardox and ceramics it's significantly lighter and noise-attenuating. Polyurethane is easy to process and install as it is relatively light and flexible.

