



BUSTING

THE

DUST

Thorsten Koth, ScrapeTec, outlines how contact-free systems can prevent dust leakage and spillage at conveyor belt transfer points, whilst reducing the need for maintenance work.

Many solutions have already been developed to prevent dust emissions at special sections of conveyor belt systems and at transfer points. All measures taken for this purpose serve to protect the people working in the surrounding area, keep the production environment clean and often provide explosion protection. However, most of the classic dust prevention methods also involve risks and side effects such as increased wear

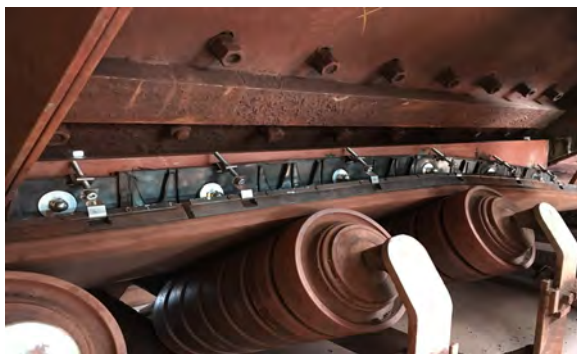
and tear, causing plant operators to face different problems. Against a background of many years of experience, the founder of the ScrapeTec Trading GmbH, a former miner and graduate engineer, developed AirScrape, a contact-free system designed to prevent wear and tear. The new system also keeps fine dust particles in the conveying area, reliably preventing spillage and – since it works without belt contact – significantly reduces the need for maintenance work.

Technology and mode of operation

Under the AirScrape brand, a patented and German-made skirting system for belt conveyors made its way into worldwide applications about seven years ago. The contact-free working AirScrape elements are attached to the sides of neuralgic areas of belt conveyors. A special



AirScrape units for skirting prevent dust leakage and spillage at belt transfers completely without belt contact.



Flexible solutions are offered for diverse demand and application conditions.

design and a precisely balanced gap, deliberately left open between the belt surface and the skirting, are responsible for the optimal mode of operation. Following physical laws, a loaded, running belt generates a slight air suction. The slanted lamellas of the AirScrape, oriented in the running direction, act as reliable airflow amplifiers. By floating contact-free above the belt surface at a defined distance, the skirting makes use of the so-called Venturi effect – air from outside is drawn towards the centre of the belt, creating negative pressure in the transport area. Fine material and dust particles cannot counteract this pressure and are forced to remain in the conveying area. Coarse material that is pushing outwards can withstand this suction, but the lamellas reliably guide it back to the centre of the belt.

As a result of combining these effects, the durable, easy-to-install system prevents spillage and dust generation at transfer points and other critical belt areas. The comparison with other systems is also positive from a wear and tear point of view. Thanks to the contact-free operation of the AirScrape, unlike classic skirting, the belt is not exposed to any frictional wear. This has a positive effect on the belt service life, while the maintenance requirements shrink to a minimum when used as intended.

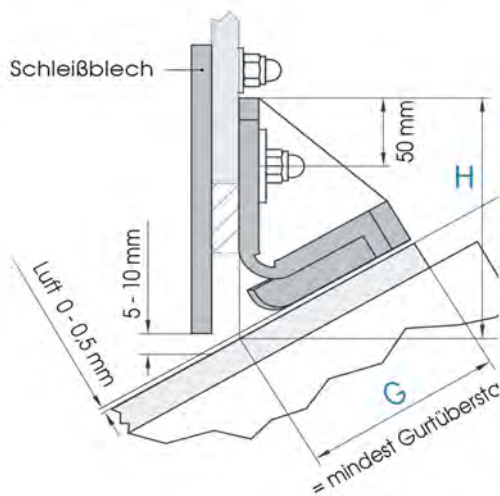
In order to further optimise the contact-free principle and achieve maximum effects in belt dedusting and cleaning, the manufacturer, ScrapeTec Trading, has developed additional components and supplementary products, which will be discussed later in this article.

Construction and assembly

The AirScrape consists of a low-wear polyurethane carrier unit. The inclined lamellas are made of Hardox steel >360 HB or, if required, stainless steel, depending on the specifications of the corresponding industry. The materials are adapted to application scenarios with temperatures ranging from -30°C to $+85^{\circ}\text{C}$. If required, the system can be adapted for certain environments e.g. for underground applications, or according to desired properties (high temperature resistant, antistatic, flame resistant, etc.). Depending on need, the AirScrape modules of 2 m length can be combined in right and left versions up to the desired length. The conditions of a conveyor system determine whether the AirScrape size Large (L), Medium (M) or Small (S) can be installed; these size specifications refer to the lamella design. The size selection itself depends on the loading width of the conveyor belt and the necessary load-free side area where the system can be mounted in order to defuse maximally dust-relevant transfer scenarios in bulk material transport. In contrast

to the space provided for assembly, belt speeds and belt widths are not relevant for the efficiency of the skirting. Although the performance of the system is the same when using an S-, M- or L-AirScrape, it is recommended to use the widest possible AirScrape with regard to the lamellas. This provides additional lifetime advantages for the system, as the lamellas of the larger units are naturally longer and thicker. Since their function is to return coarse, outward-pushing material to the centre, this increase in size and mass is a long-term advantage.

The standard length of the modules has a positive effect on the ease of installation, for example on the sidewall of chutes in transfer areas. If further belt areas are to be included, suitable fastening options will be decided upon according to the individual situation on site.

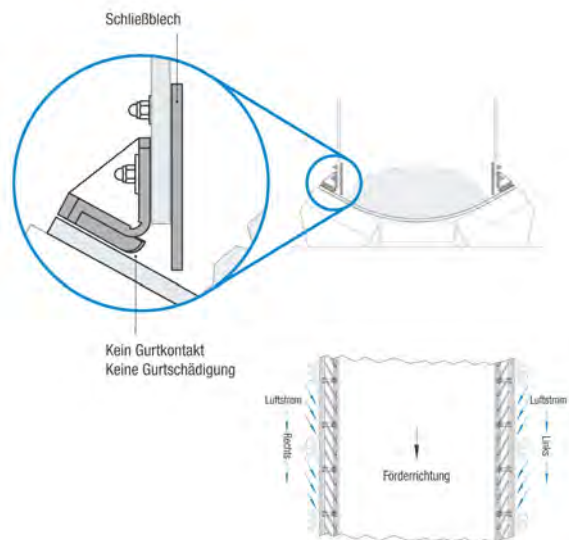


Requirements and application limits

In general, while new equipment can easily be adapted to the use of an AirScrape, retrofitting requires a state-of-the-art transfer situation. Furthermore, the conveyor belt must neither run nor sag in the feeding area. If this is the case, but an AirScrape application is desired, suitable belt guides are additionally needed. These include rollers installed close together in the middle or a transfer table. Laterally, a partial straightening of the outer belt area is achieved, for example by choosing a sliding beam construction instead of rollers. The specific transfer situation is also decisive.

The ideal sealing is provided by a wear plate on the inside of the chute wall without belt contact (distance between belt and plate 5 to 10 mm), while from the outside, the AirScrape acts at the ideal angle and with an optimal distance to the belt. The functional unit of the AirScrape with its lamellas is height-adjustable via the tensioning elements and can thus be optimally adapted to the course and shape of the conveyor belt. With a central load, the best possible result is thereby achieved. In the case of off-centre loading, instead of a straight wear plate on the inside, it is recommended to install a so-called natural slope or deflector plate (T-shape), which runs out wedge-shaped in the conveying direction. This special plate not only forces the freshly fed material directly into the centre of the belt, but also ensures that the required air gap at the edges is not buried by freshly fed material, thus deactivating the AirScrape effect.

ScrapeTec is able to leverage its experience and find flexible answers to a number of varied demands and application conditions. The wish to use existing clamping systems for the AirScrape



Air is sucked in between the diagonally oriented lamellas of the left and right side AirScrape elements from outside to the belt centre. It is important that the installation specifications are followed closely, in order guarantee the benefits of the system.

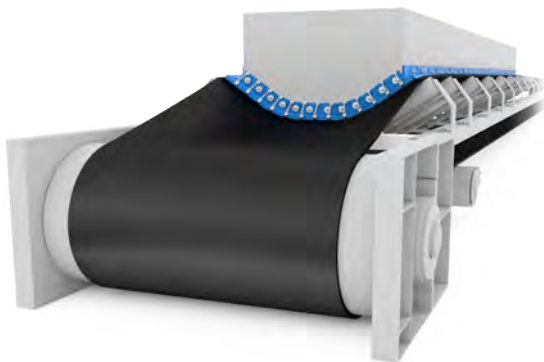
application can also be fulfilled, provided that the local conditions ensure the effectiveness of the system.

In this context, the question of application limits arises. The mode of operation of the directional airflow would suggest that the AirScape is unsuitable for reversible belts. The belt gradient also sets limits. If it exceeds 15°, an application is not impossible, but more difficult. In consultation with the customer, it must be clarified whether this angle represents an exclusion criterion for the specific case. Transfer situations in which the main volume flow meets the skirting directly have already been mentioned in connection with the use of a natural embankment sheet. Whether this special measure is sufficient must also be clarified on a case-by-case basis.

A further aspect is the type of material to be transported. Although dry bulk materials are the ideal target group, the mode of action has meanwhile proven to be good even with moist, sticky and even wet transport materials. For such special cases, only a thorough test can really provide certainty.

Special variants and extensions

In the course of the distribution of the AirScape in various bulk material industries, the



With the TailScape, a transfer rear seal was developed. It works according to the same principle as the AirScape and keeps the transfer to the sweep free of dust and spills.

developers' own demands grew parallel to the users' wish to find a technical solution for further dust emission points that reveal themselves to be problematic. To match the AirScape variants, a rear transfer seal was developed with the TailScape. It works – in this case with specially arranged lamellas – according to the same air suction principle (Venturi effect). Also available in the S, M and L versions and for all belt widths, the new rear seal keeps the transfer to the sweeper free of dust and spills. For installation, a plate adapted to the contour of the belt trough is first inserted in the final area of the transfer, to which the TailScape can be attached and adjusted to match the trough shape. Just like the AirScape, the rear skirting floats contact-free over the belt and completes the dust protection system directly after the side skirting.

A further combination of the AirScape with a dust-retaining filter cloth hood results in the DustScape that has been part of the ScrapeTec Trading product range since 2016. With 2 m elements, matching the AirScape standard modules, the DustScape can be retrofitted to existing conveyor belt systems. It consists of two side plates, matching brackets, the air-permeable but dustproof filter cloth with self-cleaning properties, and corresponding holders including fastening material. The AirScape is simply screwed together with all these elements and attached to the belt construction as a complete module. Here, as in all other cases, slotted holes allow the AirScape to be positioned contact-free at the correct distance above the belt and securely screwed on. The DustScape offers effective protection as a robust transfer cover in the area of open belt transfers. The easy-to-install dust protection system can be lengthened or shortened as required, but is also suitable for installation on free belt sections effectively preventing environmentally damaging blow-offs.

Effects and costs

Designing belt conveyor systems with the solutions shown to be dust- and spill-free helps to comply with the new, even stricter dust protection guidelines, especially for the safe workplace design of staff.

At the same time, the use of AirScape, TailScape and/or DustScape is a protective measure that has a positive effect on the operating cost balance. Not only the life-prolonging measures for belts, due to the non-existent frictional wear of the skirting must be considered, but also the minimised expenses for maintenance and cleaning measures in the respective areas. The effective dust minimisation and protection against spillage also has a positive effect on other parts of the conveyor system,

such as the rollers. Continuous cleanliness at transfer points also leads to an overall better, undisturbed belt run. The reduced friction, because of the contact-free operation of the system, and the additional cleanliness in the transfer area also results in significantly lower energy costs.

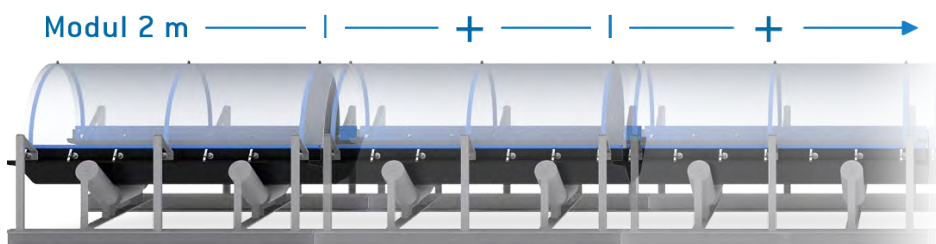
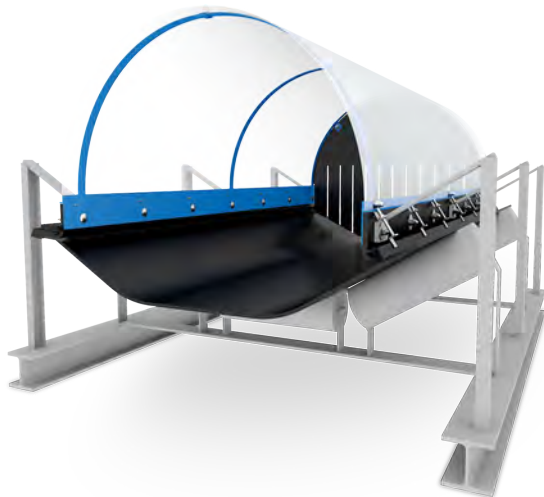
Overall, the technical effects lead to significant savings in the costs generated by wear and tear and other ancillary work that can only be carried out when the plant is shut down.

The manufacturer offers interested parties the opportunity to carry out several weeks of test runs before considering a possible investment.

Practical application experience

In 2012, in response to a specific operator requirement, Wilfried Dünnwald, inventor of this technology, developed the prototype of the AirScape. The system worked well, is still reliably in use today and was ultimately a major factor in the founding of ScrapeTec Trading GmbH.

The AirScape systems installed in plants in various industries now protect around 1000 belt transfers worldwide. Parallel to the interest in these units, the number of contractual partnerships is also growing. Some examples are described in the following:



The combination of the AirScape and a dust retaining filter cloth hood results in the DustScape. This dust protection system is suitable for installation at free transfers or conveyor sections.

Germany

The solution appealed to the operators of a dolomite processing plant, who regularly had to deal with dust and material losses at the transfer from the rotor crusher to the belt. Material spills in the ton range and enormous dust generation were a frustrating problem. In addition, there were unfavourable side effects, such as belt wear due to the friction of the former sealing solutions. The AirScape installed in 2013 helped reduce spills, time-consuming cleaning, and maintenance work. In the meantime, it has been shown that the service life of conveyor belts has increased and the service life of the belt rollers has benefitted from the dust reduction. The operators have also confirmed reduced energy costs for the conveyor systems. After the DustScape was introduced to the market, the company decided to equip further transfers with ScrapeTec's solutions. In North Rhine-Westphalia, the company, Inashco, extracts marketable mineral recycling fractions from residual ashes of waste incineration in a peripheral branch of the company. The treatment process, with different screening and cleaning stages, was well coordinated, but also characterised by material leaks at belts and transfers. As the ashes have a high moisture content due to the process, it was not clear to what extent the AirScape would be able to prevent such moist and sticky material from escaping. However, a corresponding test was surprisingly successful. In the meantime, the relevant transfers of the plant have been equipped with AirScape systems. Those responsible confirm that the cleaning effort has been reduced from several hours of daily operation to only two hours per week. Since the introduction of the AirScape, 90% of the time that was once designated to cleaning duties is now available for productive work.

Spain

A well-known manufacturer of surfaces made of stony material has also chosen the AirScape in search of a sustainable solution to minimise emissions at belt transfers. First, a handover in one of the plants was equipped for test purposes.

The measurements during the first test run and in the later process showed a minimisation of dust generation of more than 80% compared to before. Another 60 transfer points in the company's plants were then equipped with AirScape

skirting. In correlation to the dust reduction, the health-related downtimes of the workforce, previously exposed to massive dust development, was also reduced.

Peru

A new user, operator of the processing plant of a large mine, had to readjust the conventional skirting at belt transfer points every two weeks and replace them completely every four months, causing enormous downtimes and costs equivalent to €240 000 each. The plant managers hoped to stretch these cycles. They discovered the AirScrape and decided to test the skirting at one of the most critical transfers at the highest point of the plant. From there, dust not only trickled into the entire plant, but was also carried by the wind in the direction of the lower situated nearby village. After the test installation of the AirScrape of 10 m per side of the conveyor, the effectiveness was apparent. Two weeks later, the main manager approved a large AirScrape order. In the meantime, elements for 150 m (both sides) were purchased to convert a total of five belt transfers to AirScrape.

According to the manufacturer's experience, it is not only European plant operators that are taking a forward-looking, innovative and responsible approach. Nowadays, occupational safety, health protection and sustainable

productive management is an important requirement on all continents.

Summary and outlook

ScrapeTec Trading GmbH offers dust suppression solutions to the operators of conveyor systems for bulk material transport. If all the actual costs incurred for the removal of material spills, cleaning, maintenance, belt downtime, belt replacement and energy were added up, a realistic figure would have to be compared to the investment in an AirScrape skirting. This cost-benefit advantage has convinced many companies in a wide range of industries. A comprehensive consultation is always available beforehand, and finally, any risk is eliminated by the possible test application prior to purchase. ■

About the author

Thorsten Koth spent 13 years as the CEO of the company, Andritz Küsters. With a focus on machinery and processes in paper finishing production, Andritz Küsters offers customised technical solutions and services.

In 2016, Thorsten met Wilfried Dünnwald who has 25 years in underground mining and has developed several patent products with a high potential. The two agreed to combine their ideas together to help make transfer points clean and maintenance free.