Damage limitation: specifying the right conveyor belt

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One of the most common problems in a conveyor system is a belt that is inappropriately matched to the structure, effecting both system efficiency and belt life. It may be tempting to specify a 'stock' belt for cost reasons, but understanding a few basic principles of belt/structure compatibility is essential to achieving optimum system performance. Without it, even a new material handling system can be doomed to inefficiency, causing increased maintenance requirements and lost production.

Strength

The rated strength of a conveyor belt is expressed in pounds per inch of width (PIW). This rating is based on the type of ply material, number of plies and the size of the reinforcing cables. The higher the rated tension of the belt, the more critical the compatibility of the belt and structure becomes.

A three-ply belt may have each ply rated at 110 PIW (~19.25 N/mm), which translates to a 330 PIW (~57.75 N/mm) belt. This is the maximum rated tension at which the belt can be operated without damage. Over time, exceeding the rated tension of the belt is likely to cause excessive stretch, splice failure, belt cupping and eventual breakage. Factors that affect the rated tension are belt length, width, material of construction and angle of incline; as well as parasitic drags, such as the size and quantity of rolling components, belt cleaners and length of transition sealing systems.

Minimum bend radius

The minimum bend radius of a conveyor belt is determined by the number of plies it has, whether it is steel or fabric reinforced, what the ply material is, the rated tension of the belt and thickness of the top and bottom covers. Bending the belt over a radius that is too small can cause damage such as ply separation or the top cover cracking. This is a common mistake that often occurs if some type of belt damage becomes apparent, as there is tendency is to place a thicker belt on the system to make it last longer. Installing a thicker belt on a system that was designed for a thinner one may require larger pulleys to prevent damage.

Aspect ratio

The top and bottom rubber covers of the belt serve to protect the carcass, and the relationship between the two is expressed as a ratio. Some belt manufacturers will make the top cover thicker for longer life, while making the bottom cover thinner to reduce costs. However, as rubber ages it also shrinks. If the top cover is much thicker than the bottom cover, it will shrink more than the bottom cover, curling the edges of the belt upward (cupping).

Matching a conveyor belt to the structure is essential to achieving optimum system performance, reliability and service life.

Troughing angle and transition distance

Conveyor belts have the ability to be formed into a trough by idlers, which allows the belt to carry more material. However, all belts have a maximum trough angle, determined by the type of carcass, its thickness, width and tension rating. Exceeding the trough angle of a belt can cause it to permanently deform into a cupped position, which makes sealing and cleaning difficult, and tracking virtually impossible. Excess trough angle can also damage the top and bottom covers or the carcass in the idler junction area.

Conclusion

A conveyor belt must be compatible with the system on which it is installed. Specifying a belt without understanding its important characteristics can reduce efficiency and belt life. A complete review of the system is the only way to ensure that the belt used on the system is the right choice. If a belt supplier cannot provide all of the properties discussed here, then it is probably time to find a more knowledgeable supplier.

ABOUT AUTHOR

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ABOUT THE COMPANY

Martin Engineering is the leading global supplier of systems to make the handling of bulk materials cleaner, safer, and more productive. Since being founded in 1944, the company has grown dramatically through the development of solutions to help the solids-handling industries around the world.

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