How to reduce energy costs on conveyor systems

New materials generates proven energy savings

Habasit America

Executive summary

As the cost of doing business continues to rise, companies search for solutions to help minimize expenses that affect competitiveness and the bottom line. Automating certain functions in manufacturing and material handling does improve productivity and efficiency creating some cost savings. However, a growing area of concern is increasing energy costs. The manufacturing sector accounts for nearly 40% of total energy consumption and at the heart of this energy usage are the electric power sources that drive equipment.

Improvements to the motors that drive almost every manufacturing and material handling operation does increase energy efficiency. Other options such as replacing gear reducers with more efficient models and completely redesigned systems (for material handling) maximize energy usage by shifting as much production work to times of less energy demand. While helping in cutting energy costs, companies must weigh the price tag against the return on investment.

While these solutions do reduce energy costs, the investment required may cause companies to wait or forgo implementation of an energy savings strategy. Fortunately, additional solutions are available that also deliver demonstrated energy savings without significant investment. This paper discusses the impact of rising energy costs on material handling and the solutions available.

The cost of energy associated with material handling

A manufacturing/material handling facility, much like the actual manufacturing process, uses a great deal of energy. Because of the high energy usage, many companies look for the most obvious (and easy) fixes. Among the major areas of emphasis are items such as lighting, heating and cooling, peak time operation and machine drives.

The typical warehouse/distribution center incorporates lighting that often uses technology that is 20 years old or more. As a result, these facilities not only tend to be darker, but consume more energy, which can account for between 5% and 10% of the facility's total energy consumption. New lighting technology that incorporates T-8 compact fluorescent light bulbs and occupancy sensors significantly reduces these energy costs.

A facility's use of heating and cooling equipment plays a major role in energy costs. According to the U.S. Department of Energy, heating and cooling costs account for 10% to 28% of a company's energy usage. Improvements such as insulation, replacing old equipment or retro-commissioning existing heating and cooling equipment do reduce the amount of energy used.

Lighting along with heating and cooling help reduce energy consumption. By investing in heating/cooling, ventilation and lighting equipment for warehouse/distribution center facilities, companies can achieve a savings of 40% or more according to the New Buildings Institute. However, the opportunity for real energy savings in material handling is available in the efficient use of peak time operation and machine drives.

Practically all utilities charge more for energy during certain times of the day. These times generally coincide with the greatest demand for energy . . . most frequently

during daytime hours when manufacturing companies require the most energy. As a result, some large systems integrators are able to create automated systems to run during off-peak times.

All the items mentioned previously help reduce a facility's energy cost. However, the largest consumer of energy in a manufacturing/material handling setting is the machine drive (motor). Machine drives account for 51% of electricity consumption in manufacturing/material handling. Therefore, by addressing motors and related products, companies have a real opportunity to make significant reductions in energy usage and cost.

Energy costs and conveying

Conveyor equipment, aside from gravity conveyors, requires motors and other equipment that use electricity for power. It is said that conveying equipment can consume up to 50% of a facility's energy usage and account for nearly 70% of an electrical load in an industrial facility according to a representative from Rossi North America, a gear motor and gearbox manufacturer. This presents both a challenge and opportunity for energy savings as many facilities may still use old, inefficient motors.

There is no hard and fast definition for the lifespan of a "typical" motor used in conveyor systems. However, engineers at Leeson, a manufacturer of electric motors, developed rule of thumb for motor life expectancy based upon horsepower. For example, a 5 hp motor generally has a motor life of 17.1 years and a 10 hp motor perhaps up to 19.4 years. This means it is possible that a conveyor system installed in 1999 could still be running with original equipment today. In other words, that conveyor while technically in good working condition is likely less energy efficient.

HP Range	Average Motor Life (years)	Life Range (years)
< 1	12.9	10-15
1 – 5	17.1	13 -19
5.1 – 20	19.4	16 - 20
21 – 50	21.8	18 - 26
51 – 125	28.5	24 - 33
>125	29.3	25 - 38

How to reduce energy costs of conveyor systems

The easiest answer to this question is replacing everything older than a year or two. This may be possible in some situations but for many companies, incremental improvements may be the better route from a financial perspective. Stated earlier, motor-driven systems, such as conveyors, use 70% of an electrical load in an industrial facility. With that in mind, let's look at options to reduce energy costs.

High efficiency motors may be a good place to start. As the name indicates, these motors are improved to deliver the same amount of power using less energy, resulting in reduced energy costs. The savings however, only range from 2% to 8% over traditional motors.

Equipment controls are another means of keeping conveyor energy costs down. These controls take and interpret information coming from the motors. This information then allows the controls to regulate the motors according to production requirements. For example, conveyors generally had two options—off or on. "On" meant running the conveyor at full-speed regardless of the need. In other words, the conveyor would run at the same speed (consuming the same amount of energy) regardless whether the conveyor was full and busy or experiencing mostly inactivity. The introduction of variable frequency drives (VFD)

allows for regulating the conveyor speed and adjusting the speed to meet production needs. Another benefit of VFDs is its ability increase speed slowly while minimizing the surge of power. Both features significantly reduce the amount of energy used.

If a company is considering an entirely new conveyor system, a third option is to hire a systems integrator. A systems integrator reviews needs and requirements to design a conveyor system that reduces energy costs using high efficiency equipment that maximizes energy consumption during times of off-peak energy costs while minimizing (whenever possible) heavy usage during peak energy hours. This allows a company to achieve added energy savings by running when the cost of energy is least expensive.

Companies can dramatically reduce energy costs related to conveyors by incorporating tactics such as high efficiency motors, drives and systems designed to maximize production when energy costs are the least. However, smart companies realize it is possible to achieve additional savings by reducing the amount of friction on the conveyor lines.

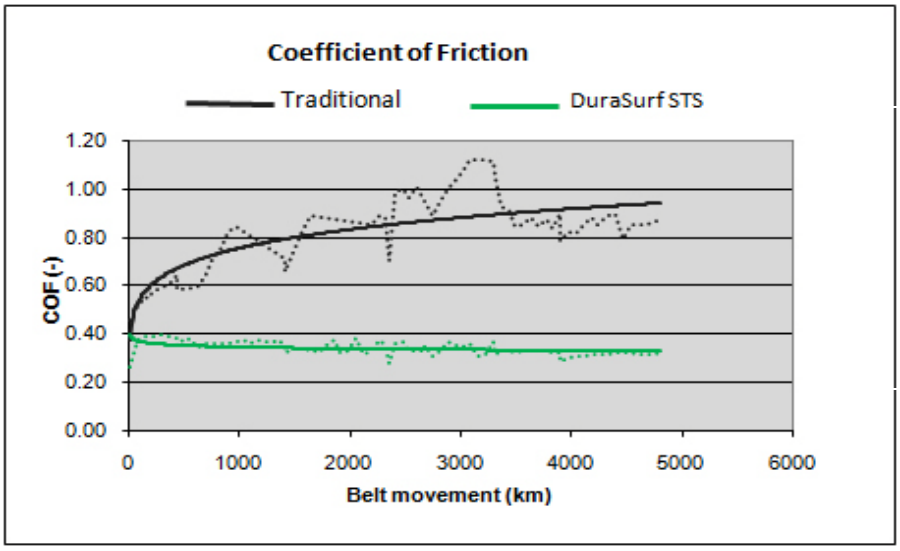
Maximizing energy savings in conveyors

The coefficient of friction (COF) [this is the ratio between the force necessary to move one surface over another and the pressure between the two surfaces] and related higher energy requirement adds to conveying energy costs. Even with energy savings gained by installing efficient motors, controls and implementing entirely new systems, friction caused by the handling or weight of products on the conveyor will actually lower those gains. The more friction on the conveyor belt caused by handling and weight of the product conveyed the more energy is required to move the product.

Habasit DuraSurf STS

Habasit, a leader in conveyor belt solutions recently introduced DuraSurf STS and e-saver (Eff-Line), new products designed to reduce energy costs caused by friction. DuraSurf STS is a thermoplastic polymer with the highest abrasion resistance of any thermoplastic polymer available. This product comes in widths up to 24” with two thicknesses (0.09375” and 0.0625”) with a standard length of 50’ or 100’. When applied to a slider bed conveyor, the product reduces energy consumption between 15% and 30%.

DuraSurf STS is particularly beneficial on conveyors moving heavy loads or one that experiences the dropping of heavy objects (product) on the belt. In fact, the diagram below demonstrates a 68% lowering of COF when adding DuraSurf STS to the conveyor.



Tests conducted revealed a 68% decrease in the coefficient of friction when using Habasit’s DuraSurf STS product versus a standard conveyor without DuraSurf STS.

Conveying heavy loads or dropping heavy objects on the conveyor cause an increase in load on the motor. This not only increases stress on the motor but also uses more energy, further adding to operational costs. Applying DuraSurf STS reduces the amount of friction caused by the heavy loads and provides a cushion that softens the impact of dropped objects on the conveyor. The material is also helpful in enhancing package flow, minimizing jams and protecting the surface of steel sorting chutes, spirals and tables.

Furthermore, DuraSurf STS provides additional benefits/savings for end users other than energy savings. DuraSurf STS offers added life to slider beds. Slider beds made of stainless or regular steel wear out more quickly because of added friction caused by heavy loads on the conveyor belt. The expense to repair/replace is significant . . . and this does not include downtime associated with any repairs or replacements.

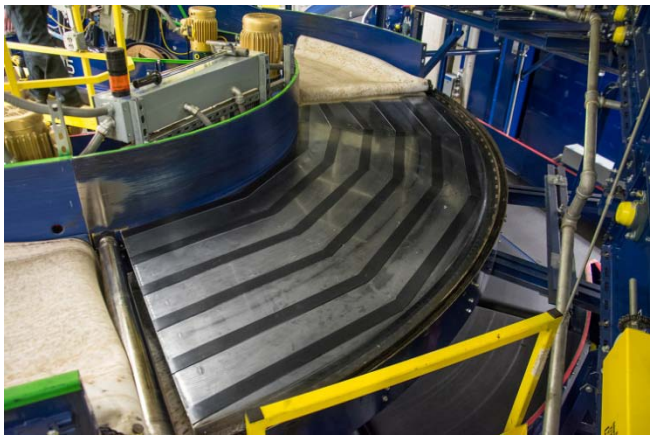
Additional benefits of DuraSurf STS

There are more benefits of using DuraSurf STS beyond energy saving. One is its impact on conveyor belt performance, particularly around belt splices. As a high-wear area, the constant friction caused by heavy loads and everyday use frequently weakens the splice causing damage and ultimately belt replacement. The "slipperiness" qualities of DuraSurf STS extend the belt life by providing a near frictionless surface with nothing for the spliced area to catch on, saving money and keeping the line running and productive.

Second, friction takes a toll on the drive system of a conveyor. Motor, coupling, gear reducers and other key components wear faster as heavy loads increase the amount of friction causing these parts to work harder. DuraSurf STS, as mentioned earlier, lowers the COF by 68%, which in turn reduces the amount of effort required extending the life of the motor and other components.

Working in tandem with an energy efficient conveyor belt

DuraSurf STS reduces the COF by 68% as a standalone solution to high energy costs. However, as companies demand greater savings, combine it with Habasit's e-saver (Eff-Line) conveyor belt to see even greater savings. The e-saver belt provides users with up to 45% energy savings because of the belt's coating applied to the running side of the fabric. This coating lowers the belt's dynamic coefficient of friction, making products on the belt slide easier and taxing the motors and related components less.



Combined with DuraSurf STS, the e-saver belt reduces the level of friction to a point where running the conveyor—even during peak energy usage—will result in savings on electricity with a favorable return on investment. Additional savings are possible because of the belt's increased durability, which results in fewer belt replacements. Finally, the e-saver belt is environmentally friendly, reducing CO_2 emissions.

DuraSurf STS and the e-saver belt help cost conscious companies reduce energy consumption by significantly reducing the coefficient of friction individually. Used together, companies gain additional savings. Learn more about Habasit's DuraSurf STS and the e-saver belt by contacting your Habasit representative.

Conclusion

Reducing energy costs in every aspect of material handling is critical to a company's ability to compete in the marketplace and maximize profitable. As a result, companies investigate many methods to reduce energy usage. Energy efficient motors, improved reducers and management systems that shift usage from peak to off-peak hours all help and all reduce the amount of energy consumed. However, the investment required for these solutions may be prohibitive for many companies.

Habasit's new DuraSurf STS product provides reduced energy costs in one of three ways:

1. DuraSurf STS used in conjunction with an overall approach to energy savings provides one additional level of energy reduction by reducing friction and allowing efficient motors and reducers to work more efficiently.
2. For companies wanting to take an incremental approach to energy savings, DuraSurf STS and e-saver belting will reduce energy consumption as standalone products.
3. Companies gain greater benefits from DuraSurf STS in combination with Habasit's e-saver energy saving conveyor belt. These two products reduce the coefficient of friction by 68% (DuraSurf STS) and save energy up to 45% (e-saver conveyor belt).

Regardless of how a company chooses to use the Habasit product(s), one thing is certain—the company will realize proven energy savings.

About Habasit

Habasit is the recognized leader in belting solutions for a broad range of industries. Our presence spans the globe with operations in more than 70 countries. During decades of market leadership, we have developed an extensive range of superior products, services and an unmatched base of knowledge and industry experience. Our totally customer-driven approach makes Habasit the best provider of high-quality power transmission and conveying solutions for every application. You can learn more by visiting the Habasit website (www.habasitamerica.com) or contacting Habasit America at 800.458.6431.