

## Energy-Saving Series

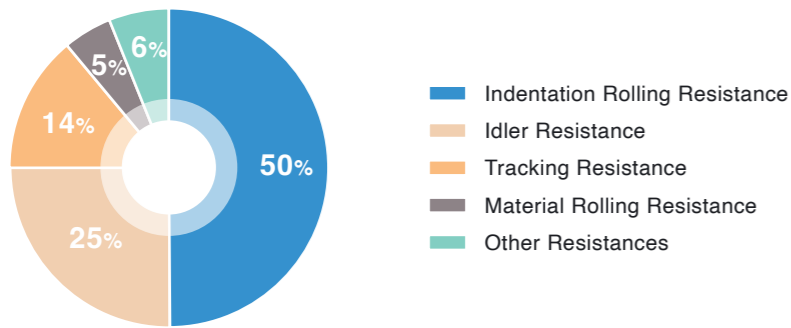
Enhances overall system energy efficiency and reduces operating costs

Long-distance systems operate thousands of hours annually. Excessively rigid belts or high indentation rolling resistance can lead to significant energy consumption and idler wear. Improper cover design or overly stiff carcass can cause sustained high loads, resulting in low energy efficiency.

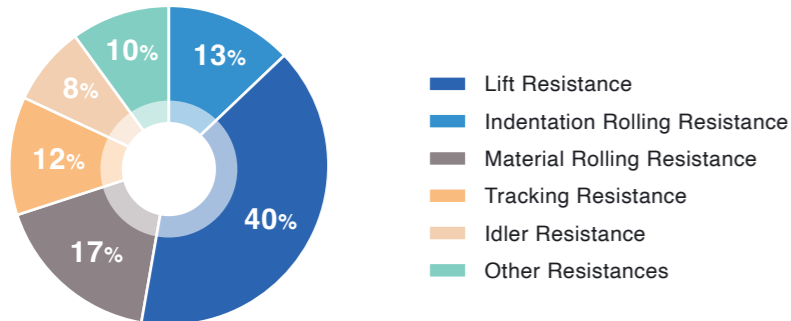
# Energy-Saving Requirements for Long-Distance Conveyor Belts

In horizontal conveying, indentation rolling resistance can account for over 50% of the conveyor system's total energy consumption; in inclined conveying, the lifting resistance represents about 40% of energy use, while troughing roll resistance can still reach 13%. Therefore, reducing the conveyor belt's weight and the indentation rolling resistance of the bottom rubber under load is key to improving energy efficiency and lowering energy costs. Traditional steel cord belts are rigid and heavy, which not only increases deformation losses but also drives higher power consumption. Conventional rubber compounds also consume more energy, leading to higher operational and maintenance costs over time.

## Energy Consumption of Horizontal Conveyor Systems



## Energy Consumption of Inclined Conveyor Systems



## Solutions and Selection Recommendations

### ✓ Lightweight carcass + energy-saving bottom cover

Lighter belt body reduces driving resistance; combined with the new low indentation rolling resistance cover rubber, overall energy savings can reach 10-25%, especially suitable for long-distance systems with continuous operation, high energy cost sensitivity, and strict green certification requirements.

### ✓ Steel cord belts can also be paired with energy-saving cover rubber.

Reduce frictional resistance while maintaining cost efficiency.

# Aramid Energy-Saving Cord

DPP Energy-Saving Long-Distance Critical-Task Lines Heavy-Duty / High-Lift

Aramid belts leverage its lightweight, high-strength, low-indentation resistance, and corrosion-resistant properties to deliver outstanding energy efficiency and durability in long-distance, heavy-duty, high-lift, and continuous operation scenarios. Compared with conventional steel cord belts, aramid belts are lighter and therefore operate under lower tension. When paired with high-performance cover compounds, they significantly reduce system indentation resistance, achieving energy savings of over 15%. Additionally, they offer excellent tear resistance and flex-fatigue performance, making them ideal for high-intensity, high-frequency critical conveyor lines—providing an efficient, reliable, and cost-effective solution.



## Key Features

### Lightweight and high-strength, significantly reducing operating tension

Aramid offers strength beyond that of steel cord while maintaining a fabric-like low density. Compared with steel cord belts, the belt weight can be reduced by over 20%. In high-lift and long-distance conveying conditions, the lighter belt significantly reduces operating tension and take-up caused by its own weight, lowering overall system energy consumption.

### Low elastic modulus, reducing indentation energy loss

The aramid fabric structure is flexible and uniform, providing even roller contact pressure. Compared with steel cord belts, it exhibits lower indentation deformation and significantly reduced indentation resistance per unit area. When paired with the EcoTrans™ energy-saving cover rubber, rolling resistance between idlers is further reduced, achieving energy savings of over 15%.

### Higher cover rubber utilization, reducing wear and maintenance energy consumption

Aramid carcass belts have no risk of steel cord pull-out, allowing safe operation with a thinner bottom cover, extending belt life, reducing downtime for replacements, and thereby lowering indirect energy consumption.

### Fewer splices, improving operational efficiency

Due to the thinner overall thickness of aramid belts, a single roll can be longer at the same roll diameter, reducing the number of splices by approximately 10-20%, lowering installation costs, and improving operational efficiency.

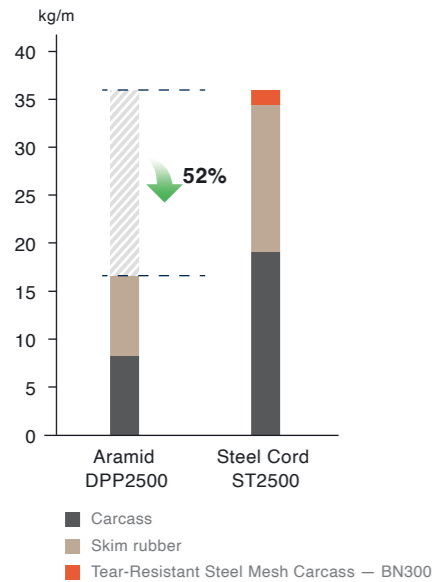
**Excellent bending fatigue resistance, suitable for smaller pulley configurations**

A smaller bending radius allows the use of smaller pulleys and drive systems, indirectly saving on equipment investment and drive energy, especially suitable for conveyors with limited installation space or multiple incline sections.

**Increase throughput or reduce belt strength grade to achieve system-level energy savings**

By reducing operating tension and belt weight without modifying the drive system, it is possible to either: increase throughput by up to 20% at the same belt strength, improving system energy efficiency per unit; or lower the belt strength rating (e.g., using DPP2000 instead of ST3150), achieving savings in both raw materials and manufacturing energy consumption.

Weight Comparison of Aramid vs. Steel Cord at the Same Strength



**The aramid carcass achieves a 52% reduction in carcass weight, resulting in an overall 26% decrease in total belt weight.**

【Comparison based on equivalent tensile strength of 2500 N/mm and belt width of 1800 mm: Aramid DPP2500 vs. Steel Cord ST2500】

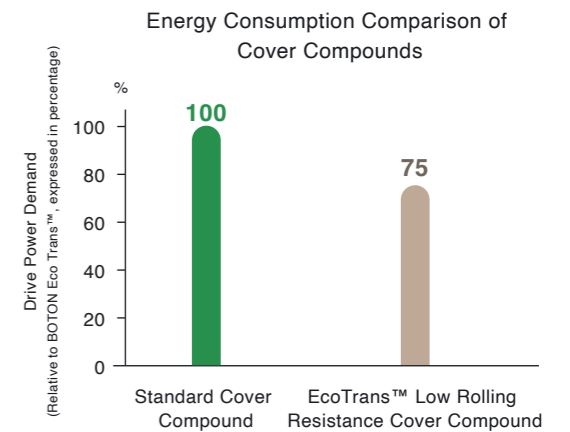
	Steel Cord ST2500	Aramid DPP2500	
Theoretical Strength (kn/m)	2680	3100	↑ 13.5%
Carcass Weight(kg/m)	36	17.1	↓ 52.5%
Total Belt Weight(kg/m)	73.6	54.5	↓ 26.0%

Note: Calculation for steel cord: 0.167kg/m × 114 cords ≈ 19kg/m

**EcoTrans™ Low-Rolling-Resistance Covering Rubber**

Bottom Cover Rubber Reduce Energy Consumption Compatible with Fire Resistance

EcoTrans™ is BOTON' s energy-saving bottom cover rubber, specially developed for long-distance and high-frequency conveying systems. Its core advantage lies in reducing idler compression rolling resistance, thereby significantly lowering system energy consumption. It effectively minimizes energy loss caused by rubber deformation during belt operation. This technology is compatible with both steel cord and fabric carcass belts, and can be flexibly applied in fire-resistant or standard setups. EcoTrans™ seamlessly combines energy saving and system optimization, making it particularly suitable for long horizontal conveying applications, where it delivers up to approximately 25% energy efficiency improvement while ensuring safe and stable operation.



**Key Features**

**Significant energy savings, reduced operating costs**

- Based on research findings from Leibniz Universität Hannover, indentation rolling resistance can account for 50% of the total energy consumption in general conveyor systems.
- EcoTrans™ effectively reduces rolling indentation resistance and minimizes rubber deformation hysteresis loss(tan δ), reducing power demand at the source.
- Field tests have shown energy savings of approximately 10-25%, with even better performance in long-distance/high-frequency operation scenarios. When combined with aramid conveyor belts, it can achieve maximum energy-saving effects and reduce energy consumption.

**Lightweight belt structure, lower initial investment**

Lower tension requirements mean thinner and lighter conveyor belts can be selected, paired with smaller-power drive systems and reduced drive pulley sizes, comprehensively lowering the initial equipment investment.

**Compatible with multiple carcass types, adaptable to various applications**

It is suitable for various conventional carcass structures such as steel cord and fabric, and can also be used in conjunction with special products like flame-retardant conveyor belts and pipe conveyor belts.



# Case Study / Based on EcoTrans™ Technology

## Energy-Saving Optimization of the Conveyor System at an African Bauxite Mine

### Project Background

In an African bauxite mine conveyor system, BOTON was responsible for the R&D, design, manufacturing, and technical support of all conveyor belts required for the long-distance belt system. The route traverses mangroves, roads, waterways, gullies, and open-air rock formations, with dramatic terrain changes and multiple horizontal and vertical curves. The harsh natural conditions demanded exceptionally high performance in belt weather resistance, strength, and energy efficiency.



### Operational Results

To tackle the challenges posed by ultra-long distances and complex terrain, BOTON fully implemented its self-developed, US CDI-certified ultra-low rolling resistance conveyor belt technology in this project. This technology specifically addresses the energy loss caused by idler indentation rolling resistance. By using an optimized bottom cover compound, it effectively reduces the required belt tension and drive power, achieving the following key results:

- **The conveyor belt specifications were optimized from the original ST3500/4000 to ST2000/2500**, significantly reducing structural strength requirements and procurement costs while maintaining performance.
- **Operating energy consumption decreased by over 15%**, effectively alleviating the operational pressure caused by limited power resources in Guinea.
- For the critical sections of the conveyor system (C06, C07, C08) totaling 45.2 km, the energy-saving belts enabled long-term, efficient, and stable operation.
- Motor design power was reduced by **40%**

**15%+**   
Energy Saving

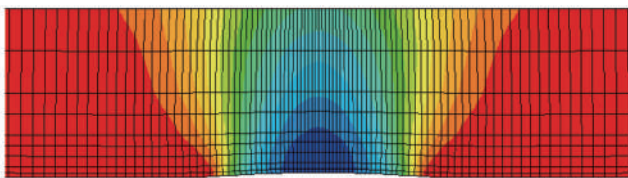


Figure 5. Stress field perpendicular to the belt surface (S22 in figure 1) in a rubber belt indented by a solid roller

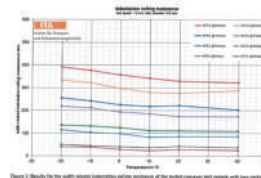


Figure 2. Results for the multi-temperature rolling resistance of the tested conveyor belt samples with two rollers

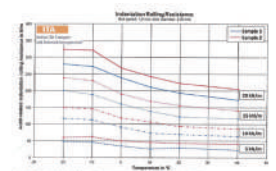
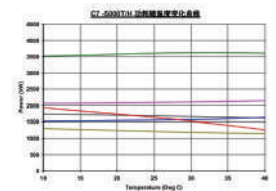


Figure 3. Results for the multi-temperature rolling resistance for all tested belts



	Percent Normalplate 電耗減率百分比 (%) 百分比 SLRR	電耗減率 SLRR (折數倍)
Fully Loaded - Normal Friction 滿載 - 正常摩擦	46.1%	49.8%
Fully Loaded - High Friction 滿載 - 高摩擦	60.5%	47.7%
Fully Loaded - Low Friction 滿載 - 低摩擦	26.4%	29.3%
Empty - Normal Friction 空載 - 正常摩擦	39.0%	33.9%
Inclines Loaded - Low Friction 斜坡滿載 - 低摩擦	-11.9%	-12.9%
Inclines Loaded - High Friction 斜坡滿載 - 高摩擦	89.8%	76.5%

- ✓ Set the record for the “**Longest Single Conveyor Belt in Africa**”
- ✓ Achieved world-leading operational efficiency with the “**Lowest Energy Consumption per Ton of Material**”