



KONE Corporation

KONE shows the ropes

Traveling a kilometer is no huge feat – unless you want to make the journey upwards in a single elevator ride. No elevator manufacturer has figured out how to do this. Until now. The KONE UltraRope™ is a revolutionary technology set to break high-rise elevator limits.

At first glance it doesn't look like much – a flat piece of black licorice, perhaps. But the superlight KONE UltraRope is a completely new take on elevator hoisting. Made of a carbon fiber core surrounded by a unique highfriction coating, the new rope weighs only about 19 percent of a similar strength conventional steel rope.

"You wouldn't think it, but rope weight impacts everything," says Samu Salmelin, who heads one of KONE's global research and development units in Hyvinkää, Finland. "If you have a lighter rope, you can have a smaller and lighter elevator counterweight and sling. This means the overall moving masses are reduced."

Put simply, the new technology enables massive cuts in the deadweight that is moved up or down every time someone hops into a high-rise elevator. Less deadweight means smaller energy consumption and operating costs. "When components are smaller, the logistics are easier," says Salmelin, adding that installing huge components inside relatively cramped skyscrapers is always a challenge. "The environmental impact is also smaller when materials are lighter."

REINVENTING THE ELEVATOR

Traveling more than 500 meters, or 100-odd floors, in a continuous elevator trip is challenging and doesn't really make sense using conventional technology. At that point, the weight of the several kilometers of rope needed to hoist the elevator becomes an obstacle. More ropes are needed just to lift the weight of the ropes.

In a building this tall, the moving masses of a single elevator hoisted with steel ropes can be some 27,000 kilograms. This is equal to fitting ten off-road vehicles inside the shaft and shifting them along with the elevator. Using KONE UltraRope for hoisting in a similar shaft, the moving masses are roughly 13,000 kilograms, or about the weight of four off-road vehicles.



The world's tallest building standing at over one kilometer upon completion in 2018, Kingdom Tower will feature KONE's people flow solutions including UltraRope.

Limits set by ropes are a major reason why most very tall buildings have sky lobbies served by shuttle elevators from the ground. Separate elevators take people higher from these lobbies in the sky. In the future, KONE UltraRope will enable elevator travel all the way from ground floor to penthouse in a kilometer-high building in one continuous journey.

"We are on the brink of something big. In a sense, we have reinvented the high-rise elevator," says Salmelin. KONE UltraRope is compatible with all other KONE high-rise solutions so it can be used to replace conventional ropes in old buildings. And with the new technology, the higher you go, the bigger the benefits. For example, the energy savings for a 500-meter elevator journey are around 15 percent versus conventional rope. For an 800-meter journey, the savings are over 40 percent.

CORE STRENGTH

In addition to being very light, carbon fiber is strong and durable. It has already revolutionized products in several other industries, including aviation and sporting equipment.

At KONE, the idea of creating a carbon fiber rope came in 2004. "The first prototypes were made by hand," says Salmelin. Actual research and development began a few years later. It wasn't long before the rope was fitted into a



KONE UltraRope can enable future elevator travel heights up to 1,000 meters – twice as high as what is possible with today's technology.

shaft at KONE's Tytyri high-rise testing laboratory in Southern Finland.

"We were surprised by how problem-free it was," says Salmelin. "Often, there are a lot of problems when you develop something completely new. But our faith in this started to grow very quickly." The rope has since been tested thor-

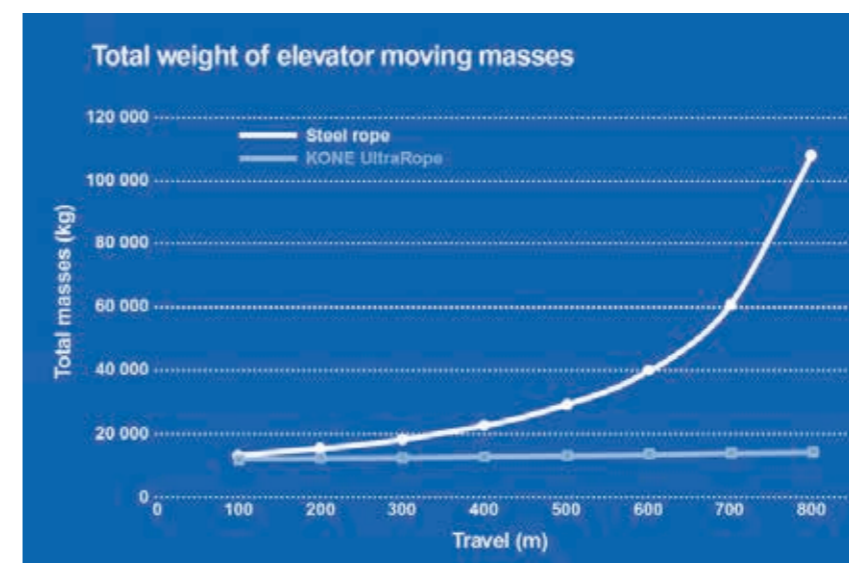
oughly both in real elevators and in laboratories.

Properties like tensile strength, bending lifetime, material aging and the impact of extreme temperatures and humidity are just some of the qualities that have been measured.

NO RUST, NO WEAR

Unlike steel, carbon fiber does not rust, stretch or wear. The special coating of the new rope makes lubrication unnecessary, meaning environmentally friendlier maintenance. Carbon fiber also resonates at a completely different frequency to most building materials. This means KONE UltraRope is less sensitive to building sway, and elevator downtime during strong winds and storms can be reduced. While typical high-rise elevator ropes need to be changed at regular intervals – no easy task in a tall building – the new technology enables a rope lifetime twice that of conventional ropes. KONE has also developed a realtime rope condition monitoring system.

"We have a rope that works, is reliable, and delivers on our promises," Salmelin beams. "This is a good place to move on from."



The benefits of KONE UltraRope increase exponentially as the travel distance grows.

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Stalatube Oy

More from less

Stainless steel hollow sections produced by Stalatube are fully recyclable and have a typical life cycle potential of over a century. They need no surface treatment and are maintenance-free, and are ideal for reducing the weight of structures and their material and energy consumption footprint.

A supplier that customers can rely on

Finnsonic is just one of many companies to select Stalatube products. A specialist in ultrasonic industrial cleaning systems designed for tough industrial environments, its machinery – used to clean parts in fields such as precision engineering, electronics, and aerospace – is engineered entirely from stainless steel.

Brewer and soft drinks producer Hartwall also used Stalatube stainless hollow sections when it built its new beverage complex in Lahti. One of the most fully integrated and automated plants of its kind, this features extensive use of stainless steel. Stalatube was chosen to supply the stainless hollow sections for the site's production and logistics machinery. Working to very tight delivery schedules, its pre-cut material saved valuable on-site assembly time.

Hollow sections precision-cut to length on the Stalatube production line have also been used by Tetra Pak to ensure that assembly work on liquid food packaging machinery can begin as soon as its steel arrives.

Stainless hollow sections from Stalatube have been used extensively in Hartwall's new beverage complex, one of the most fully integrated and automated plants of its kind.

Stalatube specialises in stainless steel hollow sections, and exports to customers in over 45 countries account for around 90% of the company's sales today. With close to 40 years in the business, Stalatube has built up extensive experience of the use of stainless steel materials in areas such as process machinery, construction and architectural design, transportation, and the food and pharmaceutical industries.

Unlike hollow sections produced from other steels, those fabricated from stainless are guaranteed to last at least a century. They are also maintenance-free and 100% recyclable.

Stalatube has promoted the concept of

'more from less' for many years. A steady programme of investments in new technology has enabled the company to broaden its product portfolio, and Stalatube now offers cut-to-length deliveries and laser cutting for hollow sections as large as 500 x 500 mm, together with quality materials such as high-strength Lean Duplex, for example.

By encouraging customers to order dimensioned tube rather than standard lengths, Stalatube helps ensure that only the steel that is actually needed is transported to the final destination, reducing the amount of waste and scrap sent for recycling. Thanks to flexible and rapid order-based manufacturing, Stalatube can deliver dimensioned

tubes almost as quickly as standard lengths.

Stalatube recently introduced a range of large tailor-made square or rectangular sections made of two laser-welded U or J-profiles. Available in sizes up to 1000 x 1000 x 10 mm, these offer excellent dimensional tolerances and are pickled after manufacturing, making them a good choice in applications ranging from process machinery to the offshore sector and pharmaceuticals.

The best one is likely to come from MacGregor

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