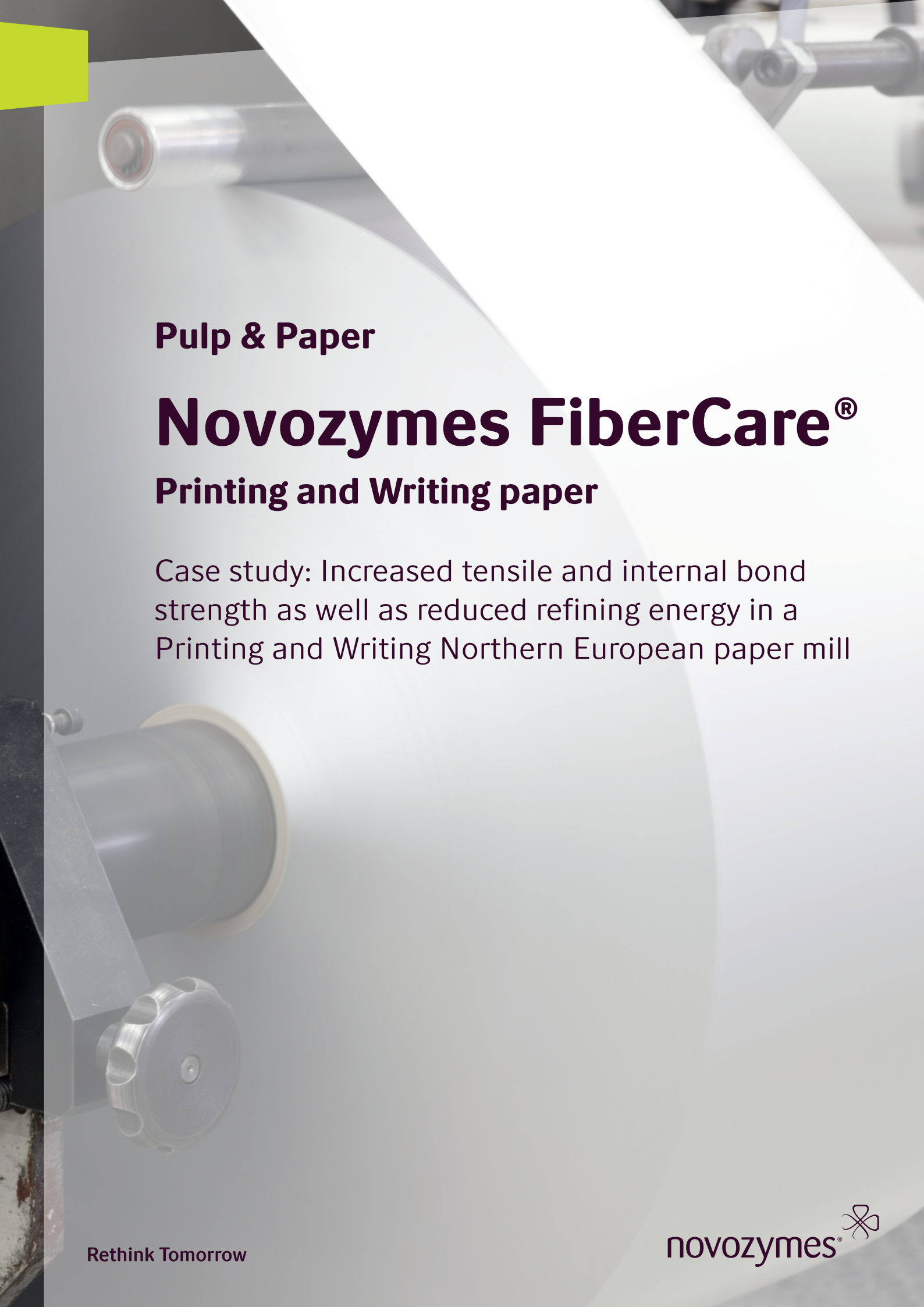

Pulp & Paper

Novozymes FiberCare®

Printing and Writing paper

Case study: Increased tensile and internal bond strength as well as reduced refining energy in a Printing and Writing Northern European paper mill

Rethink Tomorrow

novozymes®

FiberCare® improves fiber to fiber bonding. That makes it easier for paper mills to achieve more with less. In a Printing and Writing Northern European mill, FiberCare® led to significant strength gains and energy savings.

Benefits

- **Increased tensile strength by 16%**
- **Increased internal bond strength (z-strength) by 17%**
- **Reduced refining energy by 50%**

Background

Improving the strength of the paper and board they produce is a key target for many mills. Increased strength can lead to increased revenue through product upgrades. For other mills, strength is not a key concern. Instead, they aim to reduce production costs; or perhaps to increase revenue through higher production. They may also be concerned with reducing CAPEX.

The nature of the fiber surface plays a key role in the strength and structure of paper and board. Through controlled action on accessible cellulose on the fiber's surface, FiberCare® unlocks the fiber's own strengthening potential. It gives the fiber surface new chemical and structural properties. These improve interfiber bonding potential to enhance the strength of paper & board.

Some mills may choose to 'lightweight' or increase filler content and produce paper of the same strength. That leads to lower fiber costs. FiberCare® acts on accessible cellulose on the fiber's surface in a controlled way. It also improves dewatering. That allows mills to increase production and reduces dryer section steam needs. FiberCare® enhances the fibers' response to refining. That lowers mills' refining energy needs and the risk of bottlenecking in the refining steps. Fewer bottlenecks can reduce mills' CAPEX. FiberCare® also allows mills to save on chemicals including starch, dewatering aids, strength resins and debonders.

Unlike mechanical refining, which can impact the integrity of the entire fiber wall, FiberCare® is a mild treatment. It also gives mills a high degree of process control and predictability for lowered production risks. That is because products in the FiberCare® family include single cellulase enzymes. These have well-defined properties and operational ranges.

Application

A non-integrated Northern European mill producing uncoated woodfree paper wished to increase product strength. It was also aiming for lower energy usage in refining. We undertook mill-scale testing of FiberCare® on bleached eucalyptus kraft pulp. We applied the enzyme before refining, via dosing into the pulp tower. The conditions were as follows: pH 7,5-8, temperature 40-45°C and the enzyme retention time was 60-120 minutes. The pulp was refined in the mill process using conical refiners. We collected samples post-refining at various refining levels.

Evaluation and results

After implementing FiberCare®, we prepared 60 g/m2 handsheets. We evaluated and compared their strength and structural properties with control handsheets. These controls had been prepared from untreated fiber. Their fiber morphology was also investigated. The handsheets prepared from fiber treated with FiberCare® showed clear improvements in tensile and z-strength.

Compared to handsheets prepared from untreated fibers, tensile and z-strength (internal bonding) were significantly higher in handsheets prepared from fibers treated with FiberCare®.

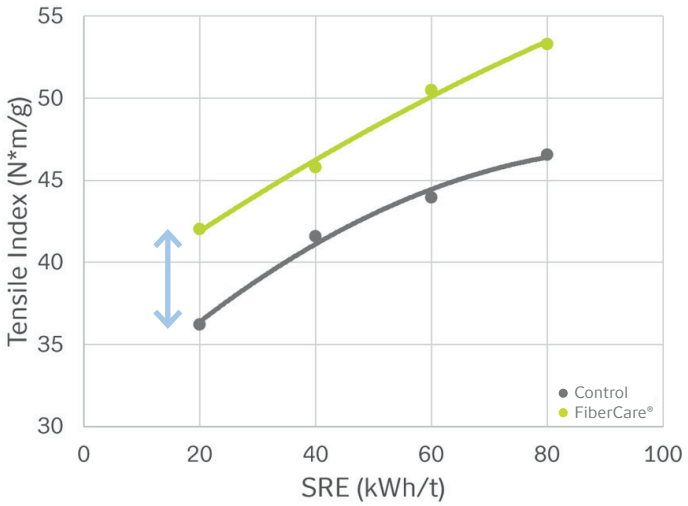

Fig. 1 Comparison of tensile strength
Compared to untreated fibers, significantly less specific refining energy (SRE) was needed to meet strength specifications with FiberCare® treated fibers.

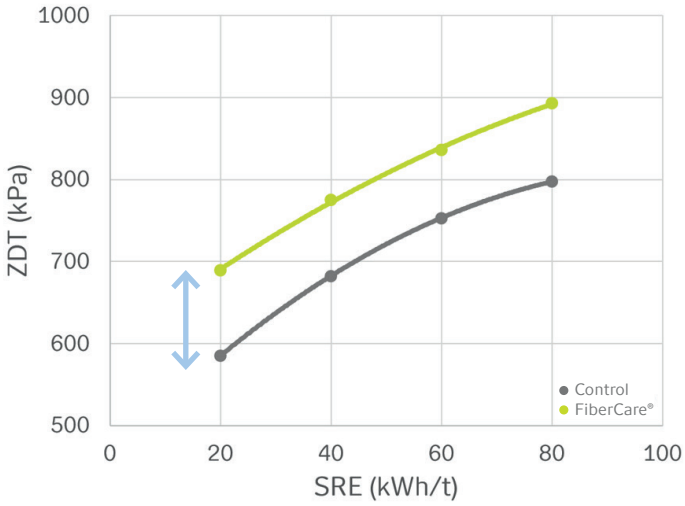

Fig. 2 Comparison of z-strength
Compared to untreated fibers, significantly less specific refining energy (SRE) was needed to meet strength specifications with FiberCare® treated fibers.

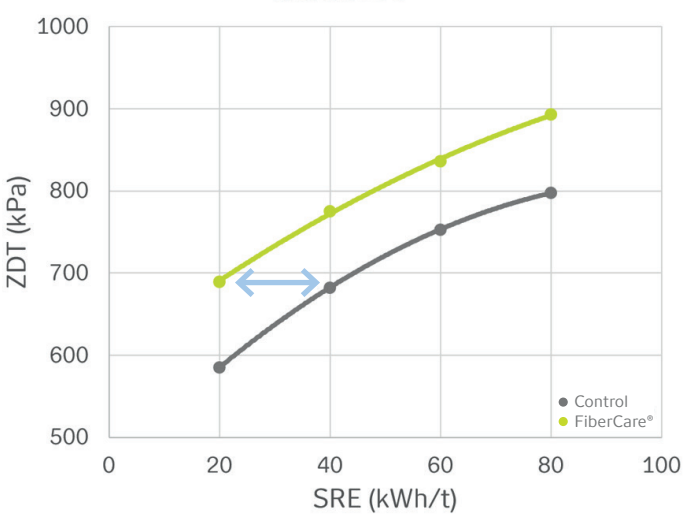

Fig. 3 Comparison of refining energy use

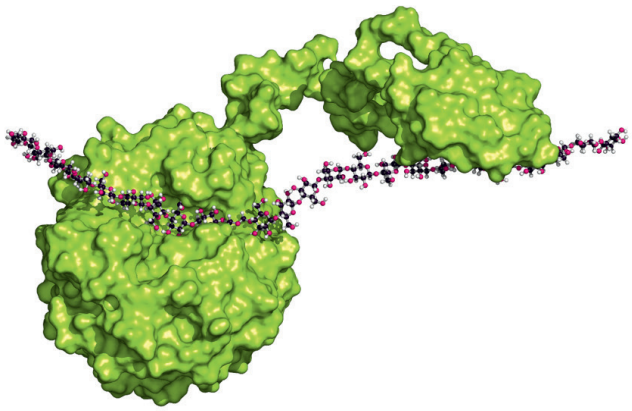

Fig. 4 A 3D visualization of a cellulase enzyme (endoglucanase)

Conclusion
After implementing FiberCare®, the mill saw immediate benefits in terms of paper strength. That meant it could potentially upgrade its products for increased revenue. Depending on raw material costs and market conditions, it could also choose to 'lightweight' or increase filler content. In either scenario, the mill would save energy in refining. Following the trial, the mill decided to implement FiberCare® into its process.

About Novozymes
Novozymes is the world leader in biological solutions. Together with customers, partners and the global community, we improve industrial performance while preserving the planet's resources and helping to build better lives. As the world's largest provider of enzyme and microbial technologies, our bioinnovation enables higher agricultural yields, low-temperature washing, energy-efficient production, renewable fuel and many other benefits that we rely on today and in the future. We call it Rethink Tomorrow.

April 2021 · No. 2021-05792-01

Novozymes A/S
Krogshoejvej 36
DK–2880 Bagsvaerd
Denmark

Tel. +45 4446 0000

novozymes.com