Case study
Lower energy consumption and high fiber quality

ANDRITZ MDF Spiral refiner plates
The challenge: Reduce energy costs and increase fiber quality

MDF producers are facing a situation with considerably more competitive pressure globally, while being confronted at the same time with a drop in raw material quality and higher demands on the quality of the final product. Rising energy costs always account for a large part of the manufacturing costs in MDF production. That is why there is no alternative but to make more efficient use of existing refiner plants.

With these requirements, ANDRITZ refiner plate technology is also breaking new ground and presenting important innovations for energy-efficient operation of existing refiner units.

Fiber samples from refining with standard plates

Parallel design
Before the innovative ANDRITZ MDF Spiral design was developed, all models had parallel bars with varying cutting angles depending on the current position of the fibers on the refiner plate. Parallel bars do have an average cutting angle of 30° between rotor and stator, however the range can fluctuate between 17° and 38°. The parallel refiner plate design is accompanied by erratic raw material feed and constant breaks in the fiber pad. In addition, the following was noted: the smaller the cutting angle, the higher the number of fiber cuts. And the larger the cutting angle, the higher the fines content. This means that the fibers are treated differently depending on their position on the refiner plate.
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The diagram shows how the cutting angle thus tapers from the inner diameter outwards as the rotor rotates against the stator. This reduction in cutting angle has a negative impact on the fiber quality and on energy consumption. In the inner sector of the refining zone the fiber is produced more by the cutting effect, while in the outer sector it is produced more by crushing in the refiner gap. This is why short, broad fibers are produced in the inner sector and long, thin fibers in the outer sector. Due to the varying cutting angles in parallel bar refiner plates, the load on the cutting edges varies, which can lead to higher energy consumption.

Fiber samples from refining with ANDRITZ MDF Spiral plates
The **ANDRITZ solution:** MDF Spiral refiner plate technology

Unlike the parallel bar refiner plates, the Spiral refiner plate has a constant cutting angle formed by the logarithmic shape of the bars, and fiberizing takes place with the same angle over the entire refining zone. Due to the constant cutting angle, a homogenous fiber spectrum is created. The energy consumption can be reduced by up to 20% compared to conventional designs due to the high fiberizing intensity of this design. A further positive aspect of the Spiral refiner plates is the reduction in vibrations achieved by even fiber transport in the refining zone.

The cutting angle zones can also be illustrated in a graph of the cutting angle spectrum. This shows the angle of the refiner plate and the cutting angle applied as the rotor rotates. The constant angle of the refiner bars on the Spiral refiner plate and the constant cutting angle are illustrated as one single point in the diagram. By contrast, the parallel bar refiner plate with its refiner bars at varying angles and changes in cutting angle as the rotor rotates is displayed as a wider spectrum in the diagram.

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**Crossing angle in course of sweeping process**

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**Bar angle**

**50°**

**40°**

**30°**

**20°**

**10°**

**0°**

**15°  20°  25°  30°  35°  40°  45°  50°**

**58°**

**Rotation**

**Rotation**

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**ANDRITZ innovation**
The challenge: Reduce energy costs and increase fiber quality

ANDRITZ innovation

In the meantime, the new Spiral refiner plate technology is available for all types and sizes of refiner. It has been tested successfully on all continents and has already become established as standard plate equipment in many mills. Depending on the process requirements and characteristic production data (throughput, required fiber quality, specific energy consumption, quality of raw material, etc.), ANDRITZ develops a refiner disc design to suit a specific customer’s needs and then assesses the result. If necessary, the refiner disc design is then adapted to suit specific customer requirements.

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Spiral (top) vs. standard pattern (bottom)
The ANDRITZ solution: MDF Spiral refiner plate technology

In one test series the 58” MDF Spiral refiner plate design was compared with the 58” ANDRITZ parallel bar design. In this case, the specific refining energy was 4% less, whereas the fiber quality showed an improvement.

The second example shows a 48” Spiral refiner plate (48SD801/811) in a comparison with a plate from a different manufacturer. Here, too, 7% of the specific energy could be saved, while maintaining the same fiber quality.

The comparison of refiner plate lifetimes (PLT) shows that there are no differences when using MDF Spiral refiner plates. The service lifetime of the refiner plate is depending on its design and intensity.

In both of the examples shown above there was a positive increase in the PLT.

If savings of 10 kWh/t at an output of 20 t/hr are assumed and the energy costs are calculated at 0.07 €/kWh, the annual savings potential is as follows:

\[ 10 \text{ kWh/t} \times 20 \text{ t/hr} \times 24 \text{ hrs/day} \times 365 \text{ days/year} \times 90\% \text{ availability} \times 0.07 \text{ €/kWh} \]

\[ \approx 110,000 \text{ € per year} \]
Production reliability, reduced energy costs, consistent quality, and maintenance efficiency are the key challenges facing MDF manufacturers. To ensure that you meet these challenges, ANDRITZ offers a portfolio of technologies, services, and process experts who can help you extract the maximum productivity from your refining system.

Technology and service are the highest priorities at ANDRITZ. We provide the world’s best plate designs to meet your demands for lower energy consumption and improved fiber quality (or lower resin usage) due to longer average fiber length. Adaptations to general plate designs can be tailored to your individual application.

Our process experts can help you optimize your refining process to keep productivity and quality at a high level. Following a thorough analysis of your refining process, we offer advice on how you can reduce the amount of energy required to manufacture your fiberboard product and increase refining quality.

Kastamonu Entegre Agaç San.Tic.A.S. in Turkey is already using the MDF Spiral refiner plate technology successfully in its 48” and 66” lines.
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