



## **WEBER ULTRASONICS**

User Report: Weber Ultrasonics / OJSC Svetlogorskhhimvolokno

### **Production of roofing underlays: Faster, more flexible and energy-saving laminating with ultrasound**

**Just like filter materials used for mask making or in the dust filter sector, roofing underlays are typically produced from various layers of material that are bonded to one another to create a web-shaped product. This can be done using various processes. One of the largest European producers of nonwoven fabrics and their end products relies on ultrasonic welding with technology from Weber Ultrasonics. The high productivity, flexibility, process reliability, and energy efficiency of the laminating solution were the key factors behind this decision.**

Founded as a manufacturer of synthetic fibers back in 1964 in the then still Soviet Zavodskaya, OJSC Svetlogorskhhimvolokno is today one of the largest producers in this sector. Its production program encompasses a wide range of polyester textile yarns, carbon fibers, and heat-resistant polypropylene yarns. In addition to this, the Belarusian company produces various nonwovens from these synthetic fibers that can be adapted to meet the requirements of a wide range of applications thanks to their specific properties. Among others, these comprise products in the hygiene and medical engineering sectors, as well as the agriculture and construction industries. The latter includes roofing underlays, which a division of OJSC Svetlogorskhhimvolokno produces from two layers of nonwovens and a vapor-permeable film.

#### **Lamination – a quality-critical step**

The roofing underlays are produced to the specifications of the customers. They typically comprise one 20 micrometer thick, vapor-permeable film and two layers of nonwoven fabric, whose thickness varies. These three web materials are bonded to create a composite, which then passes through various quality checks, such as water column, abrasion resistance, and tear resistance testing.

For a long time, the quality-critical lamination step was performed exclusively using thermal processes, such as calendaring and hot pressing. The company also integrated ultrasonic welding as a laminating process for the first time in 2017 with a

new production line for roofing underlays from the Taiwanese KNH Enterprise Co., Ltd. The ultrasonic components used for this were supplied by Weber Ultrasonics AG. "First of all, we did some testing with ultrasonic equipment from one Asian manufacturer and another European manufacturer. However, neither of these worked for our applications. Only the solution from Weber was able to meet our quality standards," adds Vadzim Kavaliuk, Engineer for Investment Projects at OJSC Svetlogorkkhhimvolokno.

### **Ultrasonic welding – more than an alternative**

The high productivity, flexibility, and cost efficiency together provided the key impetus to go with the comparably young technology. Ultrasonic welding allows to laminate all of the company's products with good results, regardless of the layer thickness.

The various layers of the roofing underlays are bonded to create a web for the continuous welding process. This web then runs into the gap on the structured roller at a defined angle. A converter converts the electrical signals generated by the ultrasonic generator into mechanical oscillations of the same frequency for the subsequent lamination process. A booster and the actual welding tool, the sonotrode, are then used to apply these oscillations to the web that is to be bonded. The plastic molecules in the material are excited and melted by the frictional heat that occurs here. The web is bonded under pressure to create a durable composite.

Thanks to its operating principle, ultrasonic welding eliminates the long heat-up times required for the rollers used in thermal and bonding processes. This not only saves energy, but also allows faster production. In comparison with calendaring, where radiant heat is applied over the entire surface, the web that is bonded with ultrasound is more flexible and softer, as well as free of deformations. In addition, there is no risk of overheating, which could otherwise lead to a fire. Since no adhesive is required, the rollers do not get soiled. Production interruptions for performing necessary cleaning work are therefore also a thing of the past.

### **Optimally matched ultrasonic technology and process design**

The plant at OJSC Svetlogorkkhhimvolokno for welding the 160 centimeter wide roofing underlays is designed for a throughput of 50 meters per minute. A total of ten ultrasonic systems were integrated to achieve this. The digital HS 4000 DIN rail generators employed each deliver 3.6 kW of power and, just like the converters, were designed specifically for continuous welding in non-stop operation.

To eliminate any risk of "streaks", which not only represent a visual problem but generally also have a negative impact on quality, particular attention was given to the design of the welding tools. This design ensures that the unavoidable elongation of the sonotrodes due to thermal load is reliably compensated. At the same time, an overlap is achieved on the material in the welding process. This compensates for the gap which is required between the individual sonotrodes. The linear expansion encountered when feeding in the material, which causes the gap to change and thereby affects the welding result, represents a challenge with systems used for continuous ultrasonic welding. In this case, it was overcome by using a rigid and high-precision bearing mounting of the transducer. The solution, which has been proven in many applications, secures a constant gap and consistent force between the welding tool and the roller.

The angle and the tension with which the material web is fed into the plant has a decisive influence on the welding result. "The design engineers from Weber Ultrasonics also used their many years of experience here. For example, they precisely stipulated the inlet and outlet angle for the various products, so that each product is wrapped optimally around the roller," reports Vadzim Kavaliuk. Beside installation of a high-precision roller with a rod-shaped structure, whose bearing mountings were optimized, the tensions in the welding process were minimized using a nip roll.

The fully automatic adjustment of the process parameters, such as the inlet gap as well as amplitude, contributes to the high ultrasonic welding quality of the various products. Product-specific programs are defined in the system control for this. "We have now been working with the system for more than two years and we are very happy with its performance and quality, as well as the consulting and service provided by Weber Ultrasonics," adds Vadzim Kavaliuk.

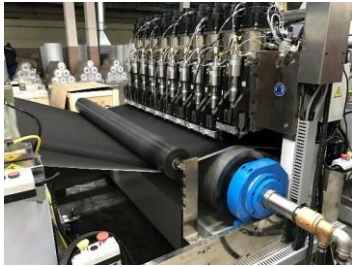
#### **About Weber Ultrasonics AG**

Weber Ultrasonics AG develops, produces, and markets solutions and components for ultrasonic technology in industrial use. Its business area focuses on cleaning, welding, and cutting with ultrasound and includes other special applications. The company is certified to DIN EN ISO 9001 and has received multiple awards for exemplary corporate governance. The family-run medium-sized company with HQ in Karlsbad, Germany, has 160 employees worldwide. Weber Ultrasonics AG owns subsidiaries in the USA and Asia as well as Weber Entec GmbH & Co. KG based in Waldbronn (Germany), which specializes in ultrasound-based plant technology for biogas and sewage treatment plants.

Find out more at [www.weber-ultrasonics.com](http://www.weber-ultrasonics.com)

## Image texts

Photo: WU\_AWB\_OJSC\_Anlage\_1



In the ultrasonic welding plant, two layers of nonwovens and one vapor-permeable film are merged with one another in a continuous lamination process to create roofing underlays.

Photo: WU\_AWB\_OJSC\_Sonotroden



A booster and the sonotrodes are used to apply the mechanical oscillations generated from electrical signals to the web being bonded.

Photo: WU\_AWB\_OJSC\_Generatoren



The plant is equipped with ten ultrasonic systems, which are designed for continuous operation.

Photo: WU\_AWB\_OJSC\_Walze mit Stäbchenstruktur



The high productivity and cost efficiency of the process were the key motivation behind the decision to go with ultrasonic welding. All of the company's products, regardless of their thickness, can be laminated effectively and accurately using the system.

Image source: Weber Ultrasonics AG