

First Intelligent UV LED Based High-Speed Furniture Coating Line Utilizing Inline UV Monitoring

Breakthrough in Furniture Coating with UV LED Curing

SC Freda, Lithuania's oldest furniture company founded in 1880, has started production on their new high-speed furniture coating line. SC Freda specializes in manufacturing flat pack furniture from chipboard, MDF and cellular lightweight construction panels. The surfaces range from decorated paper surfaces with clear UV varnish, to highly pigmented UV coating systems. SC Freda is a major supplier for IKEA manufacturing multiple product series.

As a measure to increase their manufacturing capacity, SC Freda expanded with a new production facility, featuring a high-speed production line with UV-curing. This new line must comply with the high IKEA quality and process control standards, to supply superior products. In addition, sustainability and energy efficiency are important topics that are taken into consideration to ensure a strategic, long-term investment, and to stay in forefront of sustainable manufacturing.

EFSEN UV & EB TECHNOLOGY, founded in 1986, are experts in radiation curing technology, with extensive experience in measuring and integrating UV-curing equipment for a wide range of applications and industries. Due to the strong heritage of furniture production in Denmark and its neighbouring countries, it has been natural for EFSEN to develop a unique understanding for optimizing curing solutions for the wood and furniture industry. With an innovative and dynamic team, EFSEN always thinks a step further in order to design solutions that are not only user friendly and safe but that also provides an energy efficient, long lasting, stable process to consistently deliver high performance products.

EFSEN and Freda has been working on optimizing UV for many years, and the discussions about the super-efficient and intelligent UV line started between Freda and EFSEN in 2017. There have been many things for Freda to consider, with cost efficiency, superior product quality and maximized production capacity being some of them. Their intention to implement modern, effective and environmentally friendly production process was key directives from the start of the project.

At EFSEN, this challenging request was highly appreciated. It was clear that the only reasonable way to supply a highly efficient and future-proof production line would be with UV-LED curing. While UV-LED curing in the wood industry is nothing unique anymore, the current UV-LED curing production lines are only using a fraction of the capability the UV-LED technology can offer. EFSEN wanted to go one step further, not limiting the use of UV-LEDs to gelling positions, which is how UV-LEDs are used in most lines. The intention was to change the whole process to UV-LED curing on all positions except the final top coat cure. The price /

performance of conventional Mercury lamps can't be matched yet for the final layer, due to the challenges of formulating price competitive UV-LED curing top coatings that meets the high resistance and colour accuracy requirements of a top coat.

Curing the sanding sealer with LED only is an industry first, and such a challenging task goes beyond what an equipment supplier can accomplish alone. With the high-power output of LEDs today, the primary limiting factor of the technology, and also the main cost driver, is the coating itself. Therefore, it was a benefit that Akzo Nobel was the designated coating supplier for this project. Akzo Nobel, a leading manufacturer of wood coatings, is known as an innovative company with extensive R&D capabilities. Already from the first discussions Akzo Nobel agreed into a co-operation to develop a UV-LED curable process which with as much UV-LED as possible, without a negative impact in coating price or proper-

ties. EFSEN has been working closely with Akzo Nobel, sharing not only the technical expertise, but also utilizing the chemical expertise of David Ivarsson, the EFSEN chemist, highly specialized in UV-LED formulations. In direct contact with Akzo Nobel, it was possible to develop a new curing process, replacing all conventional UV systems with the exception of Mercury lamps at the end of the production line. A key decision to make this a reality, was the choice of 365 nm LED for the sanding position.

Going through the normal coatings process, starting with sealing of the surface with two clear coats, following up with sanding the surface, and then proceeding to build the colour with multiple layers of base coats, to finally finish it off with a top coat, the challenge has been to find a process solution with only one LED unit in each position, replacing multiple conventional UV lamps on each station.

The conventional line setup which was the starting point at SC Freda is as follows, with 50 m/min as the target speed:



- Step 1: Sanding primer, gelled with 1x 120W/cm Hg-lamp
- Step 2: Sanding primer, cured with 2x 120W/cm Hg-lamps
- Step 3: Base coat layer 1, gelled with 2x 120W/cm Ga-lamps
- Step 4: Base coat layer 2, gelled with 2x 120W/cm Ga-lamps
- Step 5: Base coat layer 3, cured with 2x 120W/cm Ga-lamps
- Step 6: Top coat, cured with 3x 120W/cm Ga-lamps & 3x 120W/cm Hg-lamps

The biggest difficulties to be considered have been the surface cure in front of the sanding station. It is critical that the coating cures well enough not to clog the sanding. Furthermore, there will run both white and dark grey base coats, which include titanium dioxide pigment that absorbs a lot of the UV irradiation up to 400nm.

EFSEN solved these challenges together with Akzo Nobel by defining the optimal LED wave-

length on each station, ensuring a perfect match with the chemistry for optimal curing. The final setup also uses height adjustable LEDs to adjust the gloss level of the top coat. With the low temperature of an LED-cured process in combination with the full control of the UV uniformity with EFSEN's proprietary ICAD® Technology, the process runs with very high gloss stability. Furthermore, the low running temperature prevents issues with edge band glue melting, which can otherwise be a problem.



Energy efficiency is a major requirement for any modern installation. The calculation below shows that 55% energy saving could be realized by selecting UV-LED systems rather than conventional mercury-based systems. In addition, the long lifetime and reduced maintenance required with UV-LED systems, helps to maximize the uptime of the production line. The standby power consumption of conventional UV-lamps (which has not been taken into account in the calculations below) is eliminated when choosing UV-LED, increasing the actual efficiency further.

In addition to the LED systems, EFSEN's conventional UV lamp system, the WoodCure, provides some nice benefits. Due guided cooling and superior temperature control, in combination with state-of-the-art reflectors and power supplies, they provide an exceptionally high intensity and a maximized lifetime. These systems are utilizing reflector cassettes which allow for a very quick and convenient cleaning and bulb change. With only 25% stand-by power level,

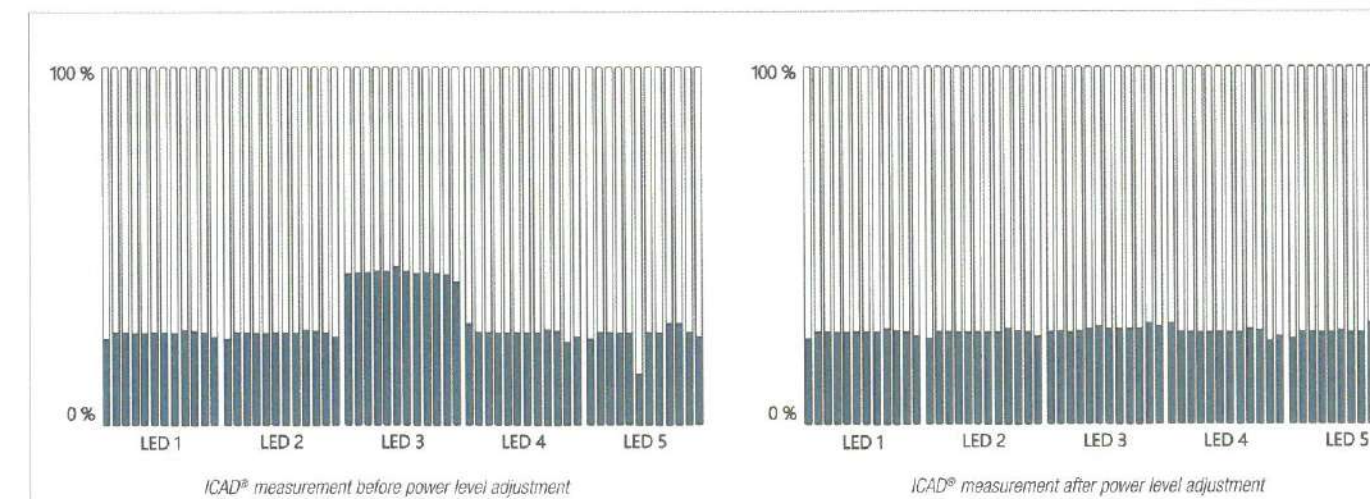
they feature some of the markets lowest stand-by power consumption.

But even after ensuring that the chemistry and the light sources works in synergy, fulfilling the application requirement, LED-curing presents a unique obstacle to overcome in order to ensure long term process stability. UV-LEDs, in difference to conventional UV systems, consist of thousands of individual light sources and each of them are slightly different. Measuring the light source at a few defined positions, as it is being done at conventional light sources, will not give the required process security. During the lifetime of the LED, a deviation will occur, such as a defect segment, damaged optics or dirt on the lens that would have a negative impact on the output, hence the cure. If this would happen in a position away from the measuring point, it would not be recognized in a normal measurement.

But defect segments, damage or dirt are not the only reason why an in-line process con-

trol would be a huge benefit for UV-LED. Even if UV-LEDs lasts much longer than based UV lamps, they still age. This means they lose power over their lifetime. This aging is temperature sensitive, requiring a performance of the cooling within the UV-LED system. Aging might also be different from chip to chip, something resulting in that deviations within the UV-LED system will become bigger over time. Furthermore, any replacement LED-unit would have a higher power output compared to the remaining modules.

EFSEN solved this process stability issue with the proprietary ICAD® inline process control. It is an integral part of all EFSEN's UV-LED production lines. ICAD® is an inline control which is continuously measuring the UV output of the lamp across the width of the whole line. It recognizes deviations in the emitted UV power and is automatically adjusting the individual UV LED arrays to produce a homogeneous UV-distribution over the whole width of the UV LED system. Deviations of <5%



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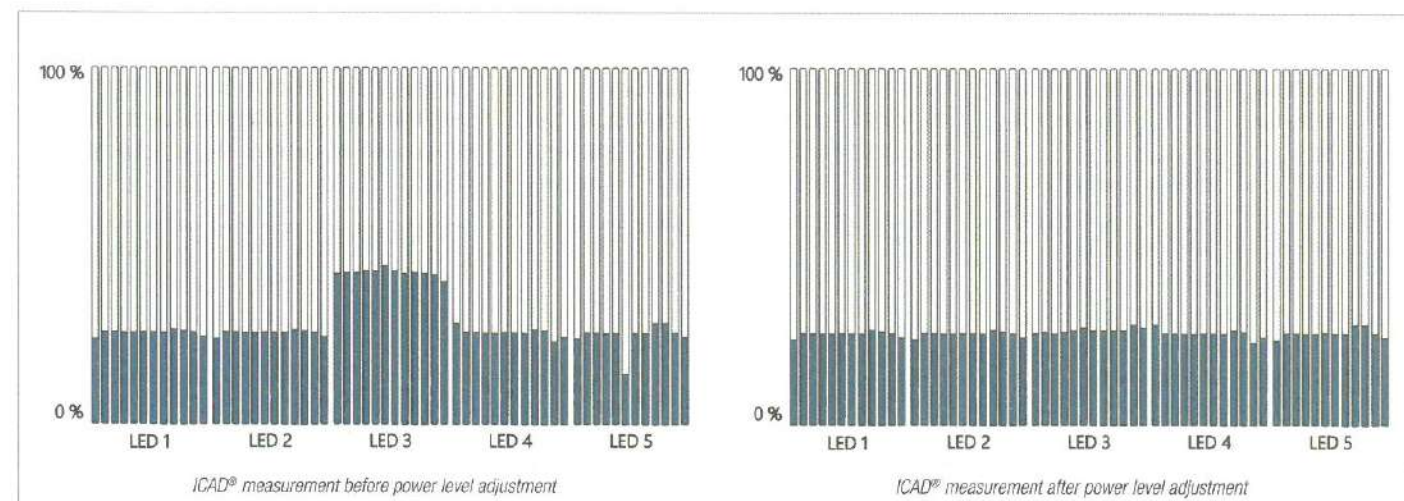
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All photos and illustrations are made by EFSSEN.

EFSEN UV & EB TECHNOLOGY has been designing high-end UV curing system for the wood industry with the user in focus since 1986. The W-LED is designed to allow for a quick and easy installation by a local technician. It measures and controls itself and warns operators if any action needs to be taken. This is what "user friendly" and "full process control" really is about.

ily be reached using ICAD® technology. This technology is capable to measure inline during production, something that has been confirmed by countless hours of production testing.

Byutilizing EFSSENs ICAD® technology, SC Freda is able to have a continuous control of the UV output being applied during actual production. All this information generated by ICAD® can be extracted to provide a complete history of UV output, which can be used for quality documentation of the production batch. If required the documentation can be made for each piece of product individually, showing the actual UV energy being applied to each individual product.

SC Freda decided to choose EFSSEN's W-LED systems incorporating ICAD®. The W-LED is a "all in one" unit, where power supplies, PLC control and cooling air supply are all included into an "easy to maintain" housing. This saves space around the line, as no external electrical cabinets are required. W-LED is made with the user in mind. It is easy to install and use, only requiring a power and PLC connection. The integrated cooling air blowers forward filtered cooling air to the LED modules taking care that the LED modules are not getting dirty to guarantee optimal cooling of the LED modules increasing the lifetime further.

www.efsen.dk

Focus on Sustainability

The IVM Group, a global leader in wood coatings, participates with the Croma Lacke brand at Ligna. At the center of the stage were the new wood coatings solutions, featuring - environmentally-friendly and sustainable options: today IVM stands out in the global market for the development of new technologies and sustainable finishes.

The IVM Group's R&D laboratory has an unwavering commitment to reduce CO₂ emissions as much as possible, by introducing raw materials from renewable sources. The purpose is to develop a new generation of sustainable coatings, able to guarantee high performance results, yet in an eco-friendly manner.

Among the innovations, a 100 % UV oil with the highest content of renewable raw materials on the market, and the new Bio line of 100 % UV products are featured.

UV OIL 100 %, a matte clear topcoat, 3 gloss, is the innovative VOC-free finish made with 94 % renewable raw materials, the highest content currently on the market. A perfect alternative to traditional oils, it ensures an excellent aesthetic result, able to revive the natural color of the wood, and enhance the grain. Ideal for parquet, but also for furniture, doors and paneling, it can be applied with a roller and dries in seconds. The proposed system is completed with the clear regenerating Oil 100 % natural 281GAA3, applicable by brush

or wipe, created to renew surfaces on site in an extremely simple way.

The unwavering commitment of the IVM Group's Research and Development laboratory has made it possible to create the new BIO line of 100 % UV products, made with up to 70 % of raw material content from renewable sources.

Particular attention to sustainability is combined with high productivity, thanks to the use of UV technology that shortens drying times. Ideal both for open and closed pore cycles, the new BIO line, 100 % UV, offers applications for use in many different fields, as furniture, parquet, doors and panels.

Croma Lacke presented as well the CROMASOL DIGITAL PRINTING CYCLE. Developed specifically for digital, single-pass printing, it is a UV solution that combines the durability of wood coatings with the versatility and quality of digital printing. The cycle, ideal for parquet, is extremely resistant to light, and can be made in all the desired colors

using a colored UV primer. The solution is applied with a roller and made in various tactile effects.

Additional new proposals include the new WATER-BASED IMPREGNATORS for decking and furniture, characterized by excellent resistance to foot traffic and superior protection against weathering, biological agents and UV rays. Particular attention has also been paid to health and safety: the new range of water-based impregnators are compliant with the EN71 / 3 safety regulation for toys, making them suitable for use on children's playground equipment and or children's play areas.

All the impregnators are available in a clear version, as well as in 12 tinted colors, and are ideal for soft wood, exotic woods and thermo-treated woods. Maintenance is also extremely easy: surfaces painted with the new Croma Lacke water-based impregnators can be renewed using the same products, without sanding them.

www.cromalacke.com // www.ivmgroup.it

Ilva at DREMA 2019

Top-Coating Solutions to Enhance and Protect Wood

The IVM Group, the global reference standard in wood coatings, participated with the Ilva brand in DREMA 2019, the International Trade Fair for Machinery and Tools for furniture and woodworking industry, reference event for Eastern European markets both for the industry and for specialized craftsmen.

At Poznań, Ilva displayed some of the most innovative wood coating solutions as result of constant R&D activity, a strategic driver with over 200 researchers divided between the Italian headquarter and branches distributed throughout the world, which led the Group to stand out globally. The aptitude for research activities is one of IVM winning factors, a multinational company with a turnover exceeding 300 million euros per year - with about 8 % invested in research - which from Parona-Pavia, has conquered the global leadership thanks to its ability to respond and anticipate technical, functional and aesthetic needs in an extremely wide and varied market.

The main product novelties

UV OIL 100 % TUM1AA4x COLOR

The new TUM1AA4x UV oil 100 % is made with more than 30 % content of bio-based raw materials, it is VOC free thanks to 100 % dry residue and it represents the perfect solution for those who want to combine sustainable choices and innovation.

Clear matt (3 gloss), tintable in all the desired colors it is born for wood flooring but it is perfect too for furniture, doors and paneling. Suitable for hardwoods and non-resinous conifers, it gives the surfaces excellent resistance to abrasion and liquids, definitely superior to that of traditional oils, together with a unique aesthetic. It is applicable by roller.

Compliant with the safety standard for toys EN71/3.

The product is presented with PXSGAA3, studied to regenerate surfaces on site in a very simple way.



TUM3AA18 UV SOFT-TOUCH EFFECT

The new Ilva Soft Touch UV solvent-based top-coat TUM3AA18, represents an important technical and aesthetic goal that has allowed to add the elegant and sought-after soft-touch effect, a trend in design furniture, to the UV technology, with important advantages.

TUM3AA18 is suitable not only for cycles on wood and wooden substrates, furniture and doors but also on materials such as ABS and PVC, commonly used in furniture, both on flat and shaped surfaces, greatly expanding the application segments.

TUM3AA18 is a clear matt (3 gloss) top-coat, applicable also on pigmented cycles, extremely innovative from the technical point of view as it gives surfaces a soft-touch, guaranteeing excellent scratch and abrasions resistance, excellent surface hardness and high resistance to color changes due to exposure to light.

Compared to the soft-touch polyurethane top-coats already on the market, TUM3AA18 has certainly a very high productivity: very short drying times perfectly meet the needs of industrial processing. Furthermore, the ease of application makes TUM3AA18 suitable for the most common UV coating plants. Applicable with automatic spraying and curtain, it dries with hot air and UV rays.

WJ55AA2 and WUM5AA45 WHITE MATT WATER-BASED UV COATING CYCLE COMPLIES WITH NORDIC ECOLABEL AND IOS-MAT-0066-11

The new white matt water-based UV coating cycle is designed for industry and it complies with IOS-MAT 0066-11 and the European Nordic



Ecolabel certification. The goal of this certification is to reduce the environmental impact of products in production and in consumption terms.

Ideal for doors, cabinet doors, furniture panels, this cycle is made with two new products, the white water-based UV sealer WJ55AA2 and the white matt water-based UV top-coat WUM5AA45, which are characterized by very low VOC content, excellent liquid resistance, excellent scratch resistance, excellent hiding power, obtainable with a single coat. Both of them are applicable with air spray and airmix and they dry with hot UV rays. Only the top-coat is applicable airless.

HUM5A487 WATER-BASED UV CLEAR MATT TOP-COAT

HUM5A487 is the new water-based UV clear matt top-coat (5 sheen) designed to enhance and protect the aesthetic qualities of surfaces on hardwood, characterized by veins and very fine pores.

The most remarkable performance of this cycle is its extraordinary scratch resistance, ensuring an unprecedented resistance even to exposure to tough stress such as for example in doors.

The low opacity allows detection of the color of these essences without altering their natural appearance and yellowing resistance helps to preserve colors over time.

Applicable by spray with hot air and drying with excellent ease of application and fast drying speed.

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