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A CLOSED-LOOP UV CONTROL SYSTEM ENHANCING PRODUCT QUALITY AND REDUCING ENERGY CONSUMPTION

UV curing processes such as UV Hotmelt and Pressure Sensitive Adhesive (PSA) applications present significant challenges due to their narrow process windows and sensitivity to fluctuations in UV lamp output. In response to these challenges, ICAD Technology A/S has developed a patented, closed-loop UV control system designed to enhance process reliability and efficiency.

ICAD (Inline Continuous Automated Dosimetry) is an innovative technology for real-time, inline UV measurement. Moving directly in the path between the UV or UV-LED lamp and the substrate, ICAD captures the actual UV irradiance across the full width of the radiation source. This enables precise UV monitoring and control, making it particularly suited for converting and printing equipment.

Through closed-loop feedback, ICAD can continuously regulate the UV output of multiple lamp systems to maintain a consistent, predefined UV dose. This ensures operation within tight process tolerances, which is critical for high-performance UV Hotmelt and PSA applications. The system dynamically adjusts lamp performance during production, thereby improving process stability.

By enabling accurate and continuous control of UV energy delivery, ICAD allows operators to reduce UV dose to the minimum required levels. This results in significant energy savings, reduced thermal load on substrates, and prolonged lifespan of UV system components.

ICAD Technology provides a comprehensive solution across the development and production lifecycle. The ICAD Test Bench, a laboratory unit capable of curing samples at speeds up to 250 m/min under production-like conditions, supports formulation and testing. Subsequent implementation stages include ICAD-controlled UV and LED systems on pilot lines and full-scale production lines. The ICAD Control Station, featuring quick-change docking interfaces for lamp cassettes, facilitates rapid and accurate emission quality verification, even in production environments where inline measurement has previously been impractical.

This paper will show the use of ICAD Technology from R&D all the way to production, giving the market a reliable method of matching development to production settings.

ICAD Test Bench and ICAD Pilot Line systems are currently operational at the Henkel R&D & Test Center, where they contribute to the development and optimization of formulations. ICAD Technology A/S is actively collaborating with several UV lamp manufacturers to support the integration of ICAD systems into industrial production lines.