



LASER TRANSMISSION WELDING OF MULTILAYER POLYMER FILMS IN A ROLL-TO-ROLL PROCESS

Task

Roll-to-roll manufacturing processes are becoming increasingly important in many fields of application, thus constituting a key component for efficient industrial production. This is particularly true for multi-stage production chains in which, for example, coating processes are integrated. One example is the photonic production of organic solar cells. Here, functional solar cells are produced in several combined coating and laser-ablation processes on a flexible polymer-based substrate. Due to the organic substances they contain, these solar cells are highly sensitive to water and oxygen after production. For this reason, encapsulation is absolutely necessary to ensure protection against degradation and, thus, an adequate service life in their later application. This is done with so-called transparent ultra-high barrier films (UBF) to maintain the highest possible efficiency. The thermoplastic polymer base film of these multilayer polymer films enables direct welding with a corresponding wavelength-adapted laser beam source.

Method

The particular challenge that laser transmission welding poses in the roll-to-roll process is to apply the necessary joining pressure locally despite the moving polymer film ribbons. For this purpose, either a globo-optic is used, which can be moved by an axis system and allows local pressure to be applied by a glass ball, or alternatively a galvanometric scanner system can be used in combination with a glass roller.

Results

In both cases, strong and reproducible weld seams can be produced. While the configuration with the globo-optic is more suitable for weld seams in the feed direction and at lower web speeds, the more complex, scanner-based approach can also be used to generate transverse seams at higher ribbon speeds. Thus, the appropriate process can be used, depending on the requirements.

Applications

Sectors that can profit from this technology include the production of organic electronics, packaging technology, medical technology and the automotive industry.

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3 Combination of scanner system and glass roller.