

A Perfect Fit

Ultrasonically Welded Seals for Sustainable Packaging

The use of bio-based plastic materials – accompanied by high prices, new packaging designs and frequent technical refinements – present packaging manufacturers with a whole range of challenges. As more biopolymer packaging makes its way to the market, ultrasonic welding is proving its worth in sealing these import new polymers. Today, modern vertical form, fill and seal machines (VFFS) are capable of sealing through the package contents.

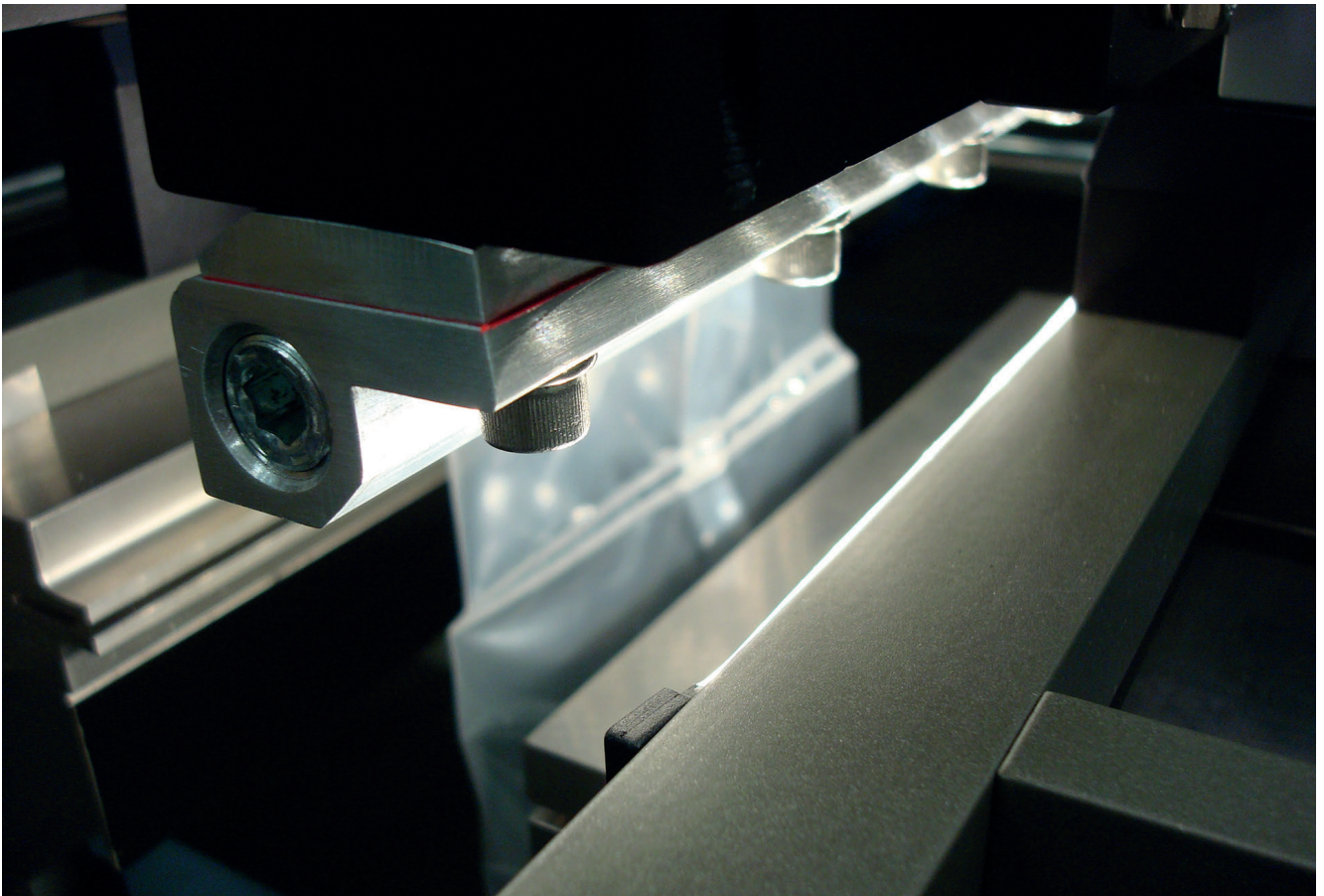
In 2019, bioplastics production capacities exceeded 2 million t, according to the European trade group European Bioplastics, and more than half of that capacity goes into packaging applications. Flexible packaging – including bags and pouches – is, by far, the largest segment of the bioplastics market.

Retail packagers, seeking to appeal to environmentally conscious consumers,

are increasing their use of biodegradable or industrially compostable bio-based plastics like polylactic acid (PLA), polybutyrate (PBAT) and polyhydroxyalkanoate (PHA), resulting in an annual growth rate of almost 20%, according to the market research firm Technavio. In fact, more than 250 manufacturers – including Mars, Nestlé, Walmart, SJ Johnson, Unilever, Colgate-Palmolive, Apple, Coca-

Cola, Johnson & Johnson, and PepsiCo – have made a global commitment to eliminate plastic waste and pollution at its source, pledging that 100% of their plastic packaging must be reusable, recyclable or compostable by 2025.

However, there are technical difficulties in using these new bio-based materials. Packaging tends to offer a more limited shelf life, most materials must be



Reducing waste due to weld failures, Branson ultrasonic components for VFFS systems by Emerson can seal directly through package contents and other contaminants at the sealing point of a wide variety of product packages © Emerson



The Bosch VIS aroma protection valve is connected to the packaging film by ultrasonic welding. The valve enables degassing and at the same time prevents the inflow of harmful oxygen © Emerson



Ultrasonically welded seals ensure the integrity of Pocket Shot, a 50 ml, three-layer plastic film pouch containing various spirits. Pocket Shot is a durable alternative to plastic bottles for people on the go © Emerson

industrially composted, and the materials carry a higher price tag than conventional polymers.

The Sensitive Material Requires New Sealing Equipment

Adapting current packaging designs and traditional package-sealing equipment to bond newer bio-based plastic materials with commercial-grade quality and reliability also can be a problem. First, bio-based plastics are more difficult to seal because they contain a lower amount of thermoplastic polymer. Instead of conventional polymer, they generally incorporate 20% or more biologically based materials to aid in biodegradability or compostability. Second, traditional heat-sealing equipment, which is used to fabricate many current-generation packages, offers only simple controls such as time, temperature and pressure. Consequently, it cannot provide the sensitive process control required to reliably seal bio-polymer materials. For this reason, more machine builders are offering, and more manufacturers and packagers are considering, a different option for fabricating and sealing packages: ultrasonic welding technology.

The Advantages Ultrasonic Welding Systems Offer

Ultrasonic welders are equipped with multiple bonding/sealing modes, fully

programmable controls and data-gathering capabilities, so they offer packagers more precise and repeatable bonding and sealing within the narrower processing "windows" of bio-based resins. They replace the simple thermal sealing tools and controls of the past with the capability to:

- Bond bio-based materials using weld-by-energy, peak power or weld-by-time modes that offer control over all parameters of the bonding process.
- Fine-tune the amplitude – the frictional heating potential generated by ultrasonic tooling – using sensitive, digital controls.
- Collect performance data for every weld that is made, comparing actual welder performance with specified parameters.

Quality Control Immediately Sorts out Faulty Batches

Weld data collected can help guide packagers to set high/low limits on selected parameters or trigger alarms that flag individual weld cycles or packages that fall outside of process limits and automatically remove bad packages from the processing line. These ultrasonic welding capabilities can not only help packagers accelerate the development and implementation of new packages made of bio-based plastic materials but also provide them with the means to ensure and manage package quality and

integrity as new designs are tested and rolled out to market.

Worldwide, manufacturers and packagers are responding to the challenges of sustainability by adopting bio-based plastic materials and ultrasonic welding technology to implement a growing range of innovative products made with bio-based plastic materials. These include compostable coffee pods, stand-up pouches and bags, sustainable VFFS (vertical form-fill-seal) snack food packages, and e-commerce packages that utilize high percentages of recyclable or compostable content. ■

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Service

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