Seal the deal

Ultrasonic sealing could give bio-based plastics packaging an even more widespread, sustainable future. **Bill Reed** explains why

The recent increase in demand for single-use plastics packaging due to the Covid-19 pandemic will likely lead to longer-term demand for sustainability, once the pandemic is brought under better control. Many manufacturers are preparing to meet those expectations by increasing their use of bio-based plastics materials.

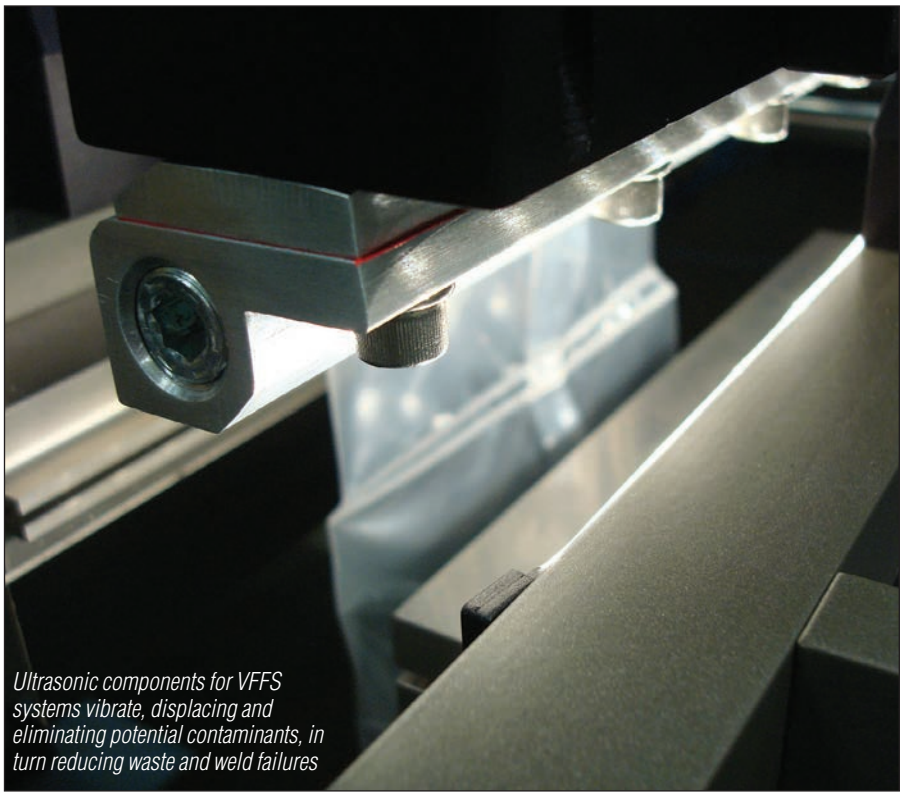
Environmentally-conscious manufacturers are using biodegradable or compostable bio-based plastics to produce everything from straws, drinks containers, snack-food and beverage packages, to bubble-wrap and films to protect e-commerce shipments. In fact, more than 250 major manufacturers have pledged that 100 per cent of their plastics packaging will be reusable, recyclable or compostable by 2025.

Central to the success of sustainable plastics packaging is the continued development of materials such as polylactic acid, polybutyrate and polyhydroxyalkanoate to replace conventional plastics materials. For these materials to be used successfully for pouches, bags or other containers, the next generation of sustainable packages will have to perform with the same integrity, safety, attractiveness and convenience as current conventional packages.

However, adapting current packaging designs and traditional package-sealing equipment to bond newer bio-based plastics materials, with commercial-grade quality and reliability, poses challenges. First, bio-based plastics are more difficult to seal because they contain lower amounts of thermoplastic polymer. These composite resins generally incorporate 20 per cent or more of biological-based materials to aid in biodegradability or compostability.

Second, the traditional heat-sealing equipment used for current-generation packaging does not provide sensitive process control. Typical heat-sealing equipment provides only basic controls such as time, temperature and pressure, so it can be difficult to process challenging materials more prone to degradation. Accordingly, more machine builders are offering – and more manufacturers and packagers are considering – a different option for sealing: ultrasonic welding technology.

Ultrasonic welding systems are capable of multiple sealing modes, offer fully-programmable controls and data-gathering capabilities, and produce more precise and repeatable bonding within the narrower processing 'window' of bio-based resins. They replace the basic thermal sealing method with the ability to bond bio-based materials using the options of weld-by-energy, peak power, weld-by-distance or weld-by-time modes. They allow for the adjustment of amplitude – the frictional heating potential – using sensitive, digital controls. They also collect performance data for every weld, measuring actual performance against specified parameters.



Ultrasonic components for VFFS systems vibrate, displacing and eliminating potential contaminants, in turn reducing waste and weld failures

As weld data is collected, it is compared to high/low limits on selected parameters and if outside the programmed range for individual packs, this triggers an alarm. Because these signals are 'latchable', they can be used to automatically data-log and eliminate bad packages from processing.

Ultrasonic welding technology not only helps manufacturers and packers accelerate the development of products from bio-based materials, it also provides the means to ensure and manage package quality and integrity, as new designs are tested and rolled out to market.

Beyond its ability to seal bio-based plastics materials, ultrasonic welding can contribute to the sustainability of plastics packaging in other ways. One of these is the reduction in materials wastage during production. Various foods and beverages, powders, leafy produce, oils, cereals or feeds — when packaged — can leave residue on the sealing surfaces. With conventional heat sealing, this residue can transfer to within the seal, resulting in product contamination or package leaks and failures. Ultrasonic welding eliminates this potential problem because, before the high-frequency vibratory motion of welding heats the sealing surfaces, it first vibrates and displaces potential contaminants – solids, fluids or moisture – out of the seal interface. The result is less package and product waste due to contamination, failure or rejects.

Another way it supports sustainability is by reducing consumption of packaging materials. Because of its precision, ultrasonic welding can provide strong seals using significantly thinner materials than typical heated tool seals. Narrower sealing bands reduce the amount of plastics

The Bosch VIS flavour protection valve allows degassing of coffee packages while preventing the influx of damaging oxygen

Pocket Shot is a 50ml pouch containing various spirits that is made of three-layer filn with ultrasonically welded seals

material needed, whether conventional or bio-based, to complete each package.

A third sustainability benefit is reduced energy consumption. Because conduction heat-sealing must maintain a specific operating temperature, it consumes higher amounts of energy than ultrasonic welding systems of comparable capacity. Ultrasonic welders consume electricity only in short bursts, typically under one second. This results in substantial process energy savings, conservatively estimated at 25-75 per cent.

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

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