

Precise Dispensing of Two-Part Materials

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Introduction

When dispensing small amounts of two-part adhesives or other materials, two key considerations are whether the material is mixed correctly and the accuracy of the amount dispensed.

There is a growing demand for the precise metering, mixing and dispensing of small amounts of two-part technical materials such as adhesives, potting compounds, encapsulants and sealants – including electrically or thermally conductive variants. This is driven by manufacturers in the electronics, medical device and automotive industries requiring increased functionality in seemingly ever smaller formats. In parallel, these engineers are looking for high accuracy material application in a robust and consistent process. They want precise quantities, uniformly mixed in the correct ratio, applied in exact locations.

Process Challenges

Two-part formulations can offer superior cured performance but can be difficult to process. A typical method involves weighing out the constituent parts, mixing in a container with a spatula and loading into a dispensing syringe barrel for application. There may be a vacuum degassing or centrifuge step to remove entrapped air. Some suppliers offer respite from this procedure by providing their materials in a pre-mixed, degassed and frozen packaging. However, there are extra costs associated with shipping and storage, which is ameliorated by the material being ready to use after thawing.



Figure 1 – Pre-mixed and frozen two-part adhesives supplied in syringes



Once the material is mixed (or thawed), curing starts and the material's viscosity will start to increase. The amounts dispensed directly from the syringe or through a dispensing valve using air pressure will vary with viscosity change and it is difficult to maintain an accurate deposition. Moreover, the mixed material will have a limited working life, and this can lead to waste as it cures too much to still be usable.

One solution is to use a metering and mixing machine, where measured amounts of material are fed through a mixing nozzle and can then be dispensed directly to the part. Systems operating with gear pumps or piston pumps are readily available but are more suited to larger material quantities, such as potting transformers.



Figure 2 – A metering, mixing and dispensing machine for larger quantities of materials

Progressive Cavity Pumps

If the requirement is for the application of a few millilitres or even fractions of a millilitre, then another technology can be considered – metering and mixing based on progressive cavity pumps. The pump comprises a specially shaped rotor inside an elastomeric stator, forming a series of tapering and overlapping spaces or pockets which progress through the pump as the rotor is turned, producing a pulseless material flow. Flow rate is directly proportional to the rate of rotation. Input pressure and material viscosity have no impact on the output of the pump and the system will achieve true volumetric output based on positive displacement. Dispensing at the point of mixing precludes variability due to viscosity change and reduces wastage. Materials may be purchased in larger package sizes, which can reduce purchasing costs.

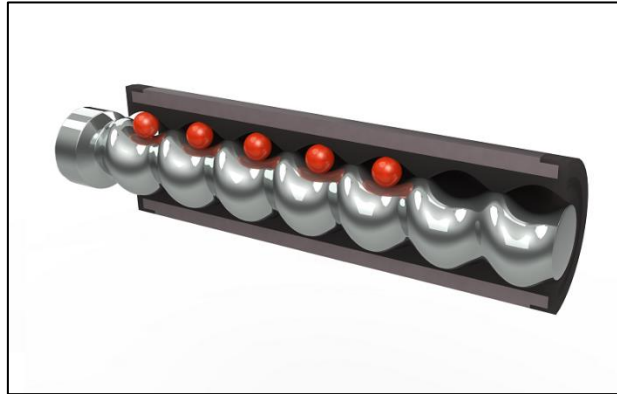


Figure 2 – Progressive cavity pump interior

One example of such technology is the preeflow eco-DUO, a highly precise volumetric metering, mixing and dispensing unit, which integrates two preeflow eco-PENs through a manifold and static mixing nozzle. Suitable for a wide range of materials with viscosities from water up to pastes, it enables flow rates from 0.1 to 32 ml/minute, with dispensed volumes as low as 0.005 millilitres. It also offers a mixing ratio of up to 10:1, which can be changed dependent on the project. The variable mix ratio means that unlike many other systems, the user is able to reconfigure it for different materials, rather than sending it back to the system manufacturer for modification.



Figure 4 – preeflow eco-DUO metering, mixing and dispensing machine with progressive cavity pump

The operator can control the flow to fine limits and calibrate the controller to the system for a very repeatable output. It is readily integrated into automation to ensure that as well as dispensing volume, positioning is extremely repeatable. One manufacturer using the preeflow eco-DUO reported a 16% material savings per part due to dispensing accuracy, worth £2,000 per month.¹

When metering, mixing and dispensing small amounts of two-part materials, consistent mixing and precise application to the correct location can impact a project's success and provide significant cost savings over the lifetime of production.

References

- 1) "preeflow eco-DUO volumetric adhesive dispensing helps ensure integrity of lifesaving medical device" – Intertronics Case Study, September 2016

Picture credits

Figure 1 – Polytec PT GmbH Polymere Technologien

Figure 2 – Intertronics

Figures 3, 4 – ViscoTec Pumpen- u. Dosiertechnik GmbH

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About INTERTRONICS

INTERTRONICS supplies adhesives, coatings, sealants and equipment to customers with high technology, high performance assembly applications. Our customers are manufacturers in industries such as electronics, medical devices, plastics, optical, automotive, energy, defence and aerospace.

We specialise in adhesives and adhesive systems, namely bonding, coating, sealing, encapsulating, potting, masking and gasketing products, together with the most appropriate equipment and accessories for surface preparation, mixing, application, dispensing, and curing them. The provision of insightful technical and applications guidance is a cornerstone of our business. We help you find the optimal materials and processes for the manufacture, assembly or repair of your products, safeguarding and enhancing performance and integrity and, in turn, your profitability and reputation.

Ever since being established in 1979, when our main market was the printed circuit board assembly industry, we have enjoyed a reputation for customer focus, excellent service and post-sales support. We now supply over 3,000 regular customers, including multinational manufacturers, production facilities, specialist design and development businesses, universities, training organisations and government establishments.

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