MASTERBOND®
CASE STUDY

EP42HT-2FG: Used in Precision Measurement of Pharmaceutical Powders

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Introduction

Food grade epoxies find use not only in their customary role in food production and distribution but also in applications like pharmaceuticals where sensors and other production materials come into contact with materials destined for human consumption. In one such application, researchers[1] relied on Master Bond's food grade EP42HT-2FG epoxy in developing a novel approach for ensuring precise measurement of pharmaceutical powders for reliable production of pharmaceutical tablets.

Application

In the pharmaceutical industry, tablet press equipment produces prescription and over-the-counter medicinal tablets by compressing powders comprising active pharmaceutical ingredients and inactive excipients like coloring agents, preservatives, and fillers. In this production process, the ability to dispense the precise amount of these blended powder mixtures reliably and repeatedly is critical for ensuring production of tablets of uniform composition.

To achieve this precision, a tablet press uses a vertical feed tube that directs blended compounds of pharmaceutical powders and excipients to the dies used to form the tablets themselves. The feed tube's ability to retain the optimum amount of powder, known as mass holdup, is critical for repeatable, precise tablet production. Accordingly, careful design of the feed tube and associated measurement system is essential for proper function of the tablet press. Invasive measurement systems that place sensors in the path of the powder within the feed tube can obstruct free flow of material and complicate cleanup of material that accumulates around obstructing surfaces. Similarly, designs that cannot provide instantaneous and continuous precise measurement of powder mass as it flows from hoppers into the feed tube will be unable to maintain mass holdup at the required level through a sustained production process.

Further complications arise if materials like the epoxies used to construct the feed tube itself alter powder moisture content, dielectric properties or other characteristics that factor into accurate measurement of powder mass. Worse, failure to use food grade epoxies during feed tube fabrication could cause production of contaminated tablets as epoxied bonds and coatings come into indirect contact with the pharmaceutical powder itself.

Looking to overcome limitations of traditional tablet press feed tubes, researchers designed a novel feed tube assembly designed to enhance measurement accuracy—and, accordingly, ensure precise mass holdup in the feed tube. In this design, a feed tube and associated probes were built out of food grade 316 stainless steel, using Master Bond's food grade EP42HT-2FG epoxy to bind and insulate capacitance sensor instrumentation embedded in specially shaped surfaces in the feed tube wall itself.

Designed specifically to meet the broad performance and non-cytotoxic requirements of food and pharmaceutical applications, Master Bond EP42HT-2FG epoxy is particularly effective in serving diverse needs for food-safe adhesives, sealants and coatings. Master Bond EP42HT-2FG not only complies with the rigorous FDA175.300 and NSF/ANSI 51.4.1 (2009 standard for food equipment) as well as the FDA175.105 requirements, but also meets the USP Class VI requirements for biocompatibility testing and ISO10993-5 requirements for cytotoxicity testing.

Results

Using its capacitance measurement approach, the research team was able to meet its objectives in ensuring non-invasive, continuous, quantitative detection of powder level and mass holdup in a metal feed tube. The resulting design successfully demonstrated integration of this instrumented feed tube design in the feedback control system of a tablet press able to change composition of blended pharmaceutical powders.

Conclusion

Unlike earlier feed tube designs, this design's capacitance measurement technique enabled continuous monitoring of powder content during the tablet production process. By comparing the measurement and reference sensors built into the feed tube, the design achieves self-calibration operation, enabling accurate measurement even as the volume, composition, and moisture content of the powder mass changes.

Because the feed tube itself is built with food grade materials including 316 stainless steel and Master Bond EP42HT-2FG epoxy, the design meets pharmaceutical good manufacturing practices (GMP) requirements while ensuring consistent, precise delivery of pharmaceutical powders for tablet production.

References

[1]Louge, M. Y., Mandur, J., Blincoe, W., Tantuccio, A., & Meyer, R. F. (2021). *Non-invasive, continuous, quantitative detection of powder level and mass holdup in a metal feed tube.* In Powder Technology (Vol. 382, pp. 467–477). Elsevier BV. https://doi.org/10.1016/j.powtec.2020.12.068