

Process Control in Adhesives, Sealants, and Resins



Introduction

Adhesives and sealants are some of the most commonly used products in the world, with applications ranging from corrosion protection to structural reinforcement. For each and every application, the industry is challenged by the need to produce high-quality, functional products. To ensure top quality, manufacturers perform a number of quality checks on finished products before shipment. In addition to final confirmations, almost all suppliers require a COA on product specifications, meaning some level of testing must also be completed in-process. Optimizing process control tests to ensure proper formulations improve yields and reduce rejected product, which helps increase profits for manufacturers. However, as more producers move to rapid analyses, the importance of accuracy and precision must not be lost.

CEM has spent the last 40 years developing process control equipment that has proven to significantly reduce analysis time, while maintaining the accuracy and precision typically found with industry ASTM standard methods. The SMART 6™ moisture and solids analyzer provides non-volatile content on aqueous and solvent-based products in 2-3 minutes, with results comparable to various ASTM methods. The Phoenix BLACK™ muffle furnace fulfills ASTM D5040-90, plus many other standard methods, with results in 30 minutes, as compared to the standard 8-hour test. Finally, the SAM 255™ drying system is the industry standard for draw-down drying to test hiding power and perform spectral analyses. Each system allows the user to greatly reduce analysis time, while maintaining confidence that the results are accurate and reliable.

SMART 6 Moisture and Solids Analyzer

The SMART 6 moisture and solids analyzer uses a proprietary combination of infrared and microwave energy to rapidly analyze any sample type, whether it is aqueous, solvent-based, or even in powder form. Most analyses are complete in less than 3 minutes, with results that will compare to the precision previously only obtainable by ASTM oven methods, without requiring hours to perform. With a number of safety protocols such as adjustable airflow to quickly remove hazardous volatiles, or a standard flame detection and extinguishing option, the SMART 6 guarantees good results as well as the safety of its operators. Results can be statistically reviewed and analyzed right on the system, producing SPC charts and even logging audit trails. Plants with LIMS networks or external storage databases can connect the system for quick and easy data management. Typical results for samples run on the SMART 6 were compared to ASTM oven results in **Table 1**.

Phoenix BLACK Microwave Muffle Furnace

Since the Phoenix platform's introduction to the market, it has revolutionized muffle furnace analysis by supplying users with a more rapid, safer technique for ashing samples. The Phoenix BLACK offers the fastest ashing times on the market. Utilizing dual magnetron microwave technology to quickly and efficiently generate heat, the Phoenix BLACK can reach optimal ashing temperature in less than 20 minutes and ash samples in accordance to ASTM D5040-90 in only 30 minutes, as compared to 8 hours in other muffle furnaces. With programmable methods that can set ramps and dwell times, the only steps required of the user is weighing the sample and placing it in the muffle furnace. The Phoenix will

ash the sample, and calculate the results, ensuring the right result every time. Fully ASTM, ISO, and USP approved, as well as part 21 CFR compliant, the Phoenix BLACK offers best-in-class performance for speed, safety, and ease of use. Typical results for samples run on the Phoenix Black were compared to traditional muffle furnace results, as shown in **Table 2**.

SAM 255

The SAM 255 has been used for draw-down analysis for over 20 years and is the preferred method of drying for the largest adhesive, sealants, and chemical manufacturers in the world. With the ability to run multiple draw-down cards, the SAM can meet the throughput needs of any production facility. By reducing dry times from 60 minutes with an air oven, to just 6 minutes with the SAM 255. Any user can easily remove the bottleneck of spectral analyses and release batches faster, without compromising results. The SAM 255 comes with accessory card holders and each analysis is run from start to finish at the touch of a button. There is no longer any reason to waste time waiting for your product to dry.

Table 1: Comparison of SMART 6 to ASTM Oven for Total Solids Analysis

	ASTM D2369		SMART 6	
	% Solids	STDEV	% Solids	STDEV
Adhesive	63.17	0.18	63.36	0.30
Phenol	46.11	0.09	46.11	0.17
Resins	74.30	0.11	74.44	0.22
Emulsion Polymer	31.60	0.03	31.56	0.10

Table 2: Comparison of Phoenix BLACK to Induction Muffle Furnace for Ash Content Analysis

	Induction Muffle Furnace		Phoenix BLACK	
	% Ash	Time (Min)	% Ash	Time (Min)
Adhesive	30.00	480	30.24	30
Laminate	17.40	480	17.37	30
Wax	0.005	480	0.0044	30

Conclusion

Keeping up with testing needs for process control saves money, as long as the results are reliable and available when decisions need to be made. With rapid systems that are simple to operate and as accurate as industry-standard traditional methods, CEM has the solution for your testing needs.

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