Rapid Analysis throughout the Plastic Manufacturing Process

Introduction

Plastic compounders are the first step to creating the world of plastic that we currently live in. The millions of molded and extruded plastics products that we interact with on a daily basis all start with compounders and masterbatchers, and CEM has been a trusted companion for quality control testing for over 40 years. Regardless if you are a producer of masterbatch raw materials, recycled material provider, or focus on production of finished goods, determining and carefully monitoring the ash content of your products is a critical stage of ensuring the quality of your products.

CEM has spent the last 40 years developing process control equipment that has proven to not only reduce analysis time, but to do so while maintaining the accuracy and precision typically found with industry standard methods. This combination allows users of the Phoenix BLACK™ to see ROI's of less than a year in many cases, easily justifying one or more systems as a part of any plastic compounder's quality control lab.

Technology

The Phoenix BLACK uses innovative technology for rapidly determining ash in plastic manufacturing facilities. What previously took operators hours can now be accomplished in minutes with this 1200 °C ASTM conforming muffle furnace. Most plastic and masterbatch analyses can be performed in 10-15 minutes, versus 8+ hours, using standard muffle furnaces. This added speed can provide a variety of benefits to any manufacturer, including "Just-In-Time" production for rushed or specialized orders, faster batch release for increased batch production on a daily basis, and easier new product optimization, allowing a real time adjustment to make changes without losing excessive product to waste.

In addition to the fastest ash test currently available on the market, the Phoenix BLACK with Airwave™ option is also one of the safest muffle furnaces. The ashing of plastic materials creates a large amount of viscous volatile material. If not properly exhausted, this volatile can build up on the inside of a furnace and obstruct moving parts for fan-based exhaust systems. If the exhaust system is compromised, hazardous volatiles can build up in the furnace and lead to fires or leaking noxious fumes. The Phoenix BLACK with Airwave option uses negative air pressure to move air and volatiles out of the furnace. It has no moving exhaust parts that can get damaged and a higher flow rate than standard fan exhaust systems. This creates a safer environment with less regular cleaning and maintenance, allowing technicians to focus on running samples and not maintaining equipment.

Experimental

To demonstrate the performance of the Phoenix BLACK, a variety of polymer samples were analyzed. **Table 1** highlights the time savings of Phoenix BLACK compared to traditional muffle furnaces, providing up to 97% time savings. **Table 2** demonstrates the repeatability of Phoenix BLACK, which is comparable to industry standards.

Table 1: Typical Ashing Times

Material	Conventional (min)	Phoenix BLACK (min)	Time Savings (%)
Butyl Rubber	90	20	78
Carbon Black	960	90	91
Polyester (Filled)	480	15	97
Polyethylene (Unfilled)	30	5	83
Polyethylene (% Carbon Black)	30	7	77
Polypropylene	30	5	83
Silicon Carbide Mixture	120	10	92
Stearates	90	5	94

Table 2: Ashing of Plastics and Rubber

Material	Sample 1 (%)	Sample 2 (%)	Sample 3 (%)	Average (%)
PET Masterbatch	4.88	4.85	4.89	4.87
HDPE	2.35	2.38	2.28	2.34
Carbon Black 1	0.524	0.539	0.564	0.542
Carbon Black 2	0.235	0.255	0.255	0.248
Butyl Rubber	9.32	9.47	9.43	9.41
Filled Plastic	65.54	65.40	65.67	65.54
Phenolic Resins	2.40	2.38	2.39	2.39
PE Black	2.70	2.77	2.76	2.76
Pellet Resin	22.26	22.56	22.66	22.49

Conclusion

The Phoenix BLACK provides accurate results with significant time savings compared to traditional muffle furnaces, while conforming to ASTM, ISO, and DIN norms. It also provides a safer work environment with active ventilation and no hot external surfaces.

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