Air Classification for Low-ash Meal Processing

Of all the rendered poultry products produced annually, an estimated 25 percent is currently being processed into the key protein ingredient used in dry pet foods. Poultry protein meal, which can be up to 40 percent of the typical pet food formula, accounts for more than 85 percent of dietary protein and 30 percent of dietary fat in pet food nutrition. Necessary for proper digestion, the pet food-grade product must meet low ash/high protein parameters. In doing so, its value is approximately twice that of a regular ash/protein poultry meal material. As such, renderers continually seek the most effective processing solutions to increase the yield of a premium pet food-grade product.

In large part, it all comes down to the basics – employing the most cost-efficient methods of separating out the coarse material common to poultry meal and capturing the fine material for the premium product. As an alternative to conventional vibrating or high-frequency screens, which are often susceptible to binding, renderers are finding that air classification technology is ideally suited for this challenging application.

Sanimax Pursues New Pet Food-grade Market

Recently, Sanimax expanded into the pet food-grade meal market when it incorporated air classification technology into the heart of a series of plant upgrades in its Montreal, Canada, location. The company operates 15 facilities throughout Canada, the United States, and Mexico offering a range of by-product collection services and has long been a leading supplier of feed ingredients for agriculture and animal nutrition.

"Prior to acquiring the air classifier, we were producing poultry meal alone," noted Sanimax process specialist Jean-Luc Champoux. "However, our Canadian customers started asking for a high-quality pet food-grade product as well, so we decided to retool and expand to meet their needs."

As Sanimax researched its expansion approach, it was led early on to the concept of air classification. Ultimately, it found the technology would essentially allow the renderer to double its returns by making one product into two. By separating out the fines, the poultry meal could be converted into a high-value pet food grade. At the same time, the coarse fraction still contains enough protein that it can be processed as regular poultry grade feed.

Specifying the Right Classifier

Sanimax consulted with Sturtevant, Inc., a Hanover, MA-based company with more than 80 years of classifying experience in countless applications, among them a growing number of global installations within large poultry and protein meal production operations.

"We chose them due to their experience, engineering, and communications skills," said Champoux. "They also offer the ability to test our product specifications in their lab and to work with us onsite to ensure that the equipment is meeting our requirements."

The test phase began with the shipment of 2,000 pounds of material to the Sturtevant labs, where Champoux and his quality control manager joined the Sturtevant research team to observe the process and examine the results. First, the team wanted to determine which classifier model would be suitable for the application. Tests were conducted on both internal and external fan models.

"We needed a unit that would perform under abrasive conditions, with minimal clogging, and deliver the desired product yield," Champoux stated. Tests determined that processing parameters and end product requirements were met and even exceeded by the specification of a 4½-foot Whirlwind Classifier, a unit that does not require auxiliary equipment (baghouses, cyclones, or ductwork) to capture the lower ash and higher protein fine product. Since the model features an internal fan and air recycle design, the fluidized meal is resistant to clogging and there are minimal dead zones where high fat and sticky material can settle.

Testing Product and Processing Quality

A second round of testing generated specific data on ash reduction and protein increase in the production of pet food-grade meal as well as ascertain how product yields would correlate with overall product quality. The classifier was adjusted during the test process to target and refine desired specifications. To confirm and measure the levels of ash, protein, moisture, and fat, samples were shipped to Sanimax for analysis. This allowed the renderer to verify all the parameters in its own lab for assurance of the end result.

"We established a close working relationship during the testing process," explained Champoux. "Plus, being onsite for the research work allowed us to be trained on how to properly operate, adjust, and maintain the air classifier."

The third and final segment of testing involved placing a trial machine in the Sanimax facility along with a Sturtevant service technician to aid in proper setup and ongoing machine adjustments. As lab testing could only be conducted in ambient (70 degrees Fahrenheit, 21 degrees Celsius) temperatures, there was the concern that actual processing temperatures (up to 160 degrees Fahrenheit, 71 degrees Celsius) would cause the heated fat content in the meal to affect machine performance or cause clogging. Importantly, Sanimax wanted to determine whether the meal would become stickier, resulting in lower efficiency in the classifier's ability to separate the lower ash and higher protein fine fraction from the coarse fraction.

"We wanted to make sure that any machinery we bought would not clog, especially during the first week of operation, as we did expect the application to be somewhat sticky," said Champoux. "The test revealed only a slight accumulation of material and no problems in the separation of the product."

Processing Results

Convinced that the technology would meet all targets, Sanimax purchased and installed the Whirlwind Classifier. Champoux noted that although the machine is one of the more minimal capital expenditures amongst the entire plant upgrade, it is certainly the key component in processing the new higher-quality pet food-grade product.

"Our upgrades also included redoing electrical systems, establishing the controls, and adding transfer conveyors and storage silos," he stated. Once the classifier was in full production, Sanimax found that they could reduce ash content to as low as six to eight percent, which is suitable for an ultra-premium pet food-grade market.

"Our customers want product no higher than 12 percent ash content," Champoux explained. "So in our market, our goal is to come in a little lower, at 10.5 to 11 percent ash content."

Material feed to the classifier is an average of 4.5 metric tons per hour. Since air classification technology can produce differing grades of premium products, the yield of premium products can range anywhere from 10 to 50 percent. For Sanimax, the market demands result in an approximate 25 percent yield of pet food-grade product. The overall market average in pet food production is 25 percent of the feed rate.

As for maintenance, the classifier is engineered with easy access for cleaning and adjustments.

"Each week we check the classifier for any clogging," Champoux reported. "Any buildup is always very minimal even if we have a little more fat in the product. We do a simple cleaning each week as we don't want even a slight buildup to affect product quality." Cleaning involves opening the top access door and using a long brush to brush material from the inner side of the air vanes. After a few minutes of cleaning, operation of the classifier can continue until a more thorough maintenance for all processing circuits is scheduled.

Major Returns

"With the plant upgrades and the investment in air classification technology, we've been able to diversify and expand our customer base once again," Champoux declared. "When there might be slow times in the poultry meal market, having diversified product streams and customer bases help maintain higher value from the pet food-grade market. Our strategy is to eliminate potential downturns by pursuing new markets, new customers, and new profit centers."

How Does Air Classification Work?

Sturtevant engineers describe the Whirlwind Classifier as a mechanical, centrifugal air classifier that uses a single motor to drive three rotating components: a distributor plate, selector blades, and fan blades. Airflow through the classifier is self-contained and recycled by return air vanes. Unlike other classifiers, the Whirlwind Classifier requires no cyclones, dedicated baghouses, airlocks, external fans, or ductwork. Production models are compact and simple to install. End users realize a lower capital investment plus ongoing operating expense savings due to minimized energy consumption and maintenance needs.

The classifier features an internal fan that lifts fines out of the feed. Selector blades within the machine control the amount of fines to be removed. Fewer selector blades allow a greater quantity of fines removal. Once the optimum number of selector blades is established for a given application, the air classifier produces a consistent gradation every day and rarely needs to be adjusted. A variable frequency drive is utilized for fine-tuning in cases where there are minor variations in the feed.
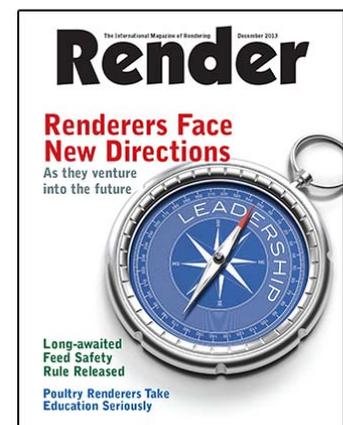
Air classification technology is not limited to poultry meal. Ash reduction has also been achieved with bovine, porcine, and lamb meat and bone meals and fish meal. **R**