

Improve Quality with Loss-In-Weight System



The original system at Chenango Valley Pet Foods (CVPF) consisted of a stainless steel tank on legs with a dual hose peristaltic pump with an inverter drive. The pump discharged through a 2-inch sanitary tube line and passed through a 1-inch Coriolis-style flowmeter on its way to the mill/extruder.

At the time, the system pumped a homogenized slurry of fresh frozen meat, vegetables and water to the mill at rates of around 5 to 40 pounds/minute, depending upon the recipe and the production rate of the pet food. The speed of the pump was manually adjusted to achieve the desired rate, but the flow rate signal tended to be noisy, and maintaining a steady consistent feed rate was problematic.

Challenge

CVPF hoped to improve the quality and the range of products that could be produced by modifying the equipment to become more efficient, less noisy, more accurate and repeatable.

A Partial Solution

In order to meet this challenge, the team replaced the original peristaltic hose pump with a progressive cavity pump with an auger feed inlet. They selected the new pump for its ability to reliably pump much higher viscosity meat slurries at a

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higher back pressure than the original pump. They also replaced the original Coriolis flowmeter with a larger sanitary unit that would handle the higher flow rates and higher viscosities required. The new combination of pump and flowmeter was able to feed from 5 to 65 pounds/minute of meat and vegetable slurry with far less water having to be added.

A New Challenge Arises

The pump speed control was tied to a central control system that now allowed the operator to enter the desired flow rate from the recipe and the feedback from the flowmeter allowed closed-loop control of the pump speed. This system worked well at times, but very poorly at other times due to the inability of the Coriolis flowmeter to provide an accurate flow rate reading on the slurry. Since the slurry is quite viscous (similar to soft ice cream) and near the freezing point, the meter would not see the slurry as homogenous, and the flow through its two internal tubes was not equal.

The end result was that the signal from the flowmeter was erratic and resulted in poor operation of the system. A new, more consistent system needed to be implemented that would allow for a stronger, more consistent reading.

The Thayer Scale Solution

After looking into other types of flowmeters and not finding any that looked like they would provide an accurate and reliable output, the decision was made to go with a loss-in-weight approach. After having good results with a Thayer loss-in-weight powder feeder and five Thayer weigh belt feeders for the dry pet food ingredient batching system, the team decided to look at a Thayer cable-scale loss-in-weight system for the meat slurry.

Implementation

The exclusive Thayer Scale force measurement suspension system (FMSS) design provides extremely high sensitivity. The feeder and weigh hopper dead loads are mass-counterbalanced so that only material weight (live load) is measured. This feature helps assure excellent control in noisy environments.

All of the articulate parts of the scale mechanism are supported from “axially inextensible, but laterally yieldable” suspension elements (stainless steel pre-stressed aircraft cable), which are arranged to hang freely, thereby avoiding any appreciable spring or hysteresis effect, variation in mechanical advantage or binding due to imperfect leveling.

Because of this unique mechanical property of the force transmission system, any laterally directed forces and shock on the scale, or its supported feeder, cannot cause destructive shear and bending stresses to develop in the elements themselves or at the load cell junction. The system, being yieldable in the lateral direction, is therefore effectively and completely protected by using laterally placed stops in proximity of the weighed structure.

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Thayer's team removed the legs from the meat slurry tank and mounted the tank on the Thayer scale. The pump was supported off the bottom of the tank, and a piece of sanitary flex hose was installed from the pump discharge to the fixed 2-inch sanitary piping. The Thayer loss-in-weight controls are connected to the plant control system via an Ethernet connection, allowing the control system to set the desired feed rate and to monitor the operation of the system. Thayer loss-in-weight controls further provide a 4- to 20-mA signal to operate the pump at the required speed and control the automatic refilling of the meat slurry tank.

Today

The system was commissioned in July of 2010 and today remains in successful operation. The combination of the progressive cavity pump and the Thayer cable scale and controls provides a very steady and accurate flow of the meat slurry to the mill.

This has greatly reduced the variation in the pet food as it is produced, and allows for faster startups and less frequent adjustments by the mill operator. The system takes less than 60 seconds to get within a 1 percent accuracy of the desired feed rate after startup or changes in set point. The system has worked very well over the entire operating range of 5 to 65 pounds/minute, and is immune to changes in the flowability or makeup of the slurry.

For more information, please visit www.thayerscale.com [1].

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