CASE HISTORY

POWER PLANT COAL & BIOMASS BLENDING SYSTEM

Project required exact weight measurement from material streams and tight control of proportions

The Background

A major Energy company in the Coal Fired Steam Generating business presented an application where the precise control of Biomass to a coal stream was required. This customer chose a steam plant within their system to be the beta-site. An existing 36" wide conveyor, 108' long, installed at 13.5°, running at 600 ft/min with 35° troughing rolls at 48" spacing was used. The rate of coal was 600 TPH and the maximum addition of Biomass was determined to be 25% of coal capacity. The most important element of the project was the need for exact weights from both material streams and tight control of the proportions due to the involvement of State regulatory agencies.

The Challenge

The company turned to Thayer Scale to supply and install two high accuracy belt scales in a single conveyor system that satisfied the requirement to accurately control the proportioning of Biomass in the form of sawdust to the wild flow of a Coal stream feeding a silo at the plant. The system utilized two high accuracy belt scales, capable of 0.25% to 0.5% accuracy with their controls configured in a Master-Slave relationship.

The first belt scale was the Master; it measured the flow rate of the Coal stream. The second belt scale was the Slave; it measured the additional weight of the Biomass added to the Coal stream by a screw feeder. The Master transmitted its mass flow rate to the Slave; the Slave then used this to control the speed of the feed screw to deliver the desired proportioning of Biomass to Coal set by the operator.

Power Plant Coal Yard

The Solution

Founded in 1949, Thayer Scale is a pioneering developer of continuous weighing and feeding equipment for the dry solids conveying and processing industries. Thayer's Belt Scales and Weigh Feeders of both the Weigh Belt and Loss-in-Weight types, cover an extremely wide range of applications in virtually all industries.

After reviewing the application and design parameters, Thayer Scale's Model 2RF-6A Belt Scale was chosen for the project. The choice was driven by the accuracy requirement of the customer and the space available on the conveyor to install two belt scales and also accommodate the introduction of the Biomass between the scales.

The Installation

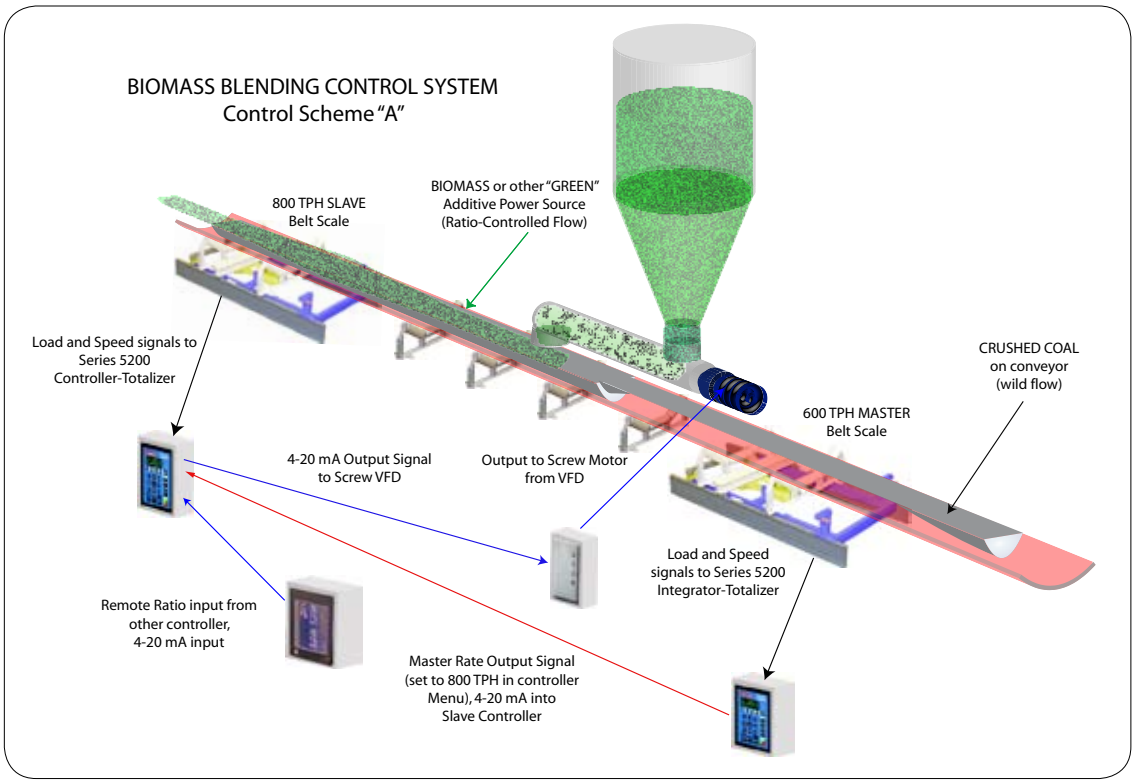
One very important element of the installation was the fact that the up-stream in-feed of material (Biomass), added between the two scales, could not affect the measurement accuracy of either device.

Thayer's advance capability Series 5200 Instrumentation was used on both scales to provide the highest level of accuracy through a wide range of environmental extremes. It was selected based on its configuration ability and ease of use.

Biomass Handling System

The Control Scheme

The prerequisite for this project was to offer a system that was uncomplicated for operators to use and simple to manipulate the ratio percentages of Biomass addition. In the final configuration, the flow rate signal from the Master becomes the Master Demand input for the Slave. From another, easy to use controller, the operator can enter the necessary percent addition of Biomass and the Slave instrument will receive a second 4-20 mA as the Ratio Demand percentage (see control scheme #A). In some configurations at other facilities, belt scale systems have been provided where the User's PLC or DCS completes the control and ratio function (see control scheme #B).

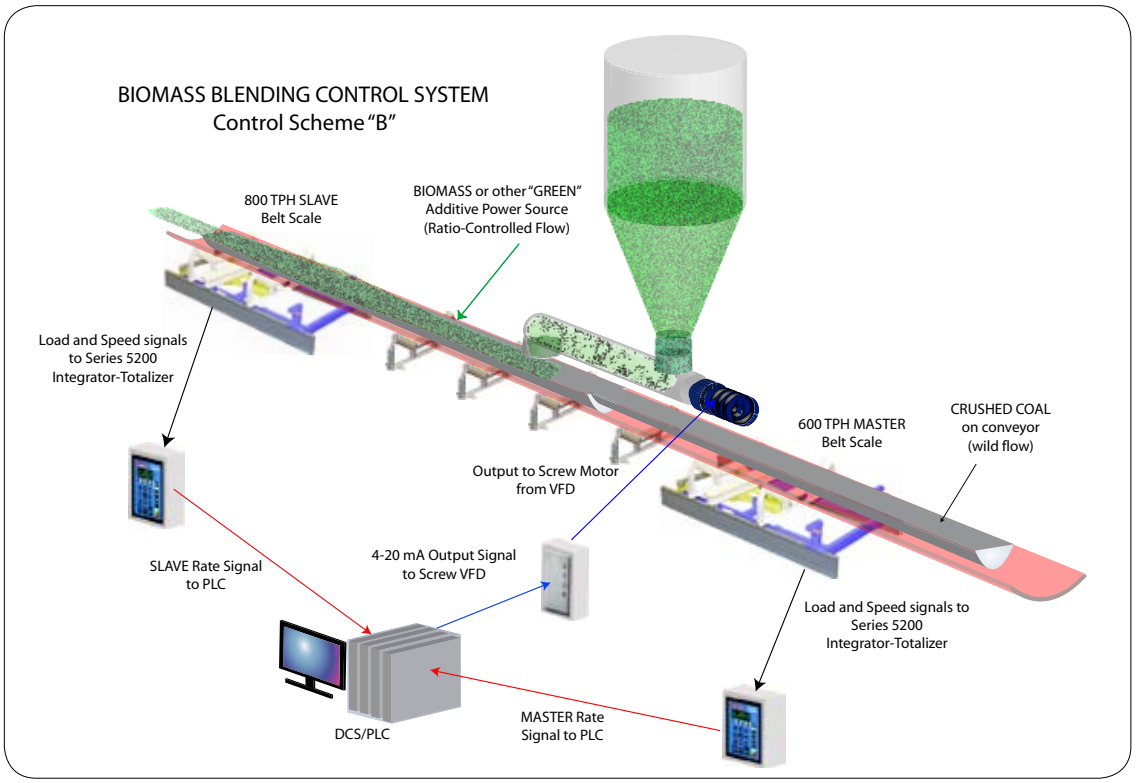


The Critical Start-up Process

Both scales were placed into the single conveyor system using precision alignment techniques to ensure a proper mechanical installation, a critical step that must be taken, regardless of the superior quality of the scale. No amount of electrical manipulation or K factoring can overcome a poor mechanical installation. Without this step, the project could have resulted in failure.

System Test and Validation

After completing the installation and performing the necessary routines to establish measurement parameters and precise design data, both scales were calibrated using Thayer Scale's movable poise test weight system. Material testing was accomplished by running coal over both scales and comparing their totalizer readings to a downstream certifiable six idler Thayer Belt Scale.



Several tests of long duration were run to establish and confirm “K” factors on both scales and the system was accepted by the customer after the completion of several repeatability checks that confirmed the accuracy of the scale measurements as well the blend proportioning percentages. The multiple runs confirmed the system accuracy to be well within tolerance and in some cases as close as 0.11%.

Another reassuring fact was that the “K” factors for the two newly installed belt scales were extremely close, thus proving the exactness of the mechanical installation, consistency of the belting and stability of the conveyor system. These are all essential factors when installing a high accuracy belt scale.

Today

Today the weighing equipment is capable of attaining high accuracy and maintaining extremely good repeatability. It is able to send and store the necessary information to various devices for state auditing purposes.

Conclusion and Final Thoughts–

With the advent of Mandatory Green-House Gas Reporting as defined and described in the Federal Register Volume 74, No. 209, blending systems are and will become more prevalent in other industries besides Power and Co-generation plants. A primary example is the Pulp and Paper industry where sludge generated by the paper making process is burned off in the plant boiler and is often mixed with other ingredients such as shredded tires, hogged fuel or other “green” products. Many other plants create their own power as well and blending fuels at specific ratios to the total input to a boiler offer an opportunity for these manufacturers to dispose of nasty, difficult to landfill by-products of their process, earn so called “Green” credits for producing power by using alternative materials and provide flexibility for surrounding communities to rid themselves of piles of “waste” that can be converted to a useful purpose. Blending Biomass to Coal, Sludge to Rubber Chips or other blending arrangements are systems that typically come under state supervision and EPA regulation, especially now because of the Green-House Gas Reporting Law. Due to these facts the weighing equipment needs to be capable of high accuracy, have extremely good repeatability and be able to send and store the necessary information to whatever device will display it or log it for state audit purposes. Single idler belt scales and low cost instrumentation will not make the grade here. Spending the time and money to do the job right up front will save the end user countless headaches and unnecessary pain down the road and long after the project is considered complete.

Thayer Scale has a long standing reputation for building rugged, durable and reliable equipment that holds its accuracy and repeatability for years after installation and has provided both four idler and two idler ratio blending systems for various customers with excellent results.

Series 5200 belt Scale Controller and Integrator used for “Master-Slave” ratio of Coal and Biomass

Model 2RF-6A Belt Scale

Belt Scale Test Weight and Manual Test Weight Lifter

Coal and Biomass blend

The basis for this case history was a paper given at the February 2010 technical meeting of the National Weighing and Sampling Association which meet in St. Louis every year. The author, Peter Sirrico (B.A and M.A.) is the Sr. Regional Sales Manager for Thayer Scale who covers much of the eastern half of the US. He has had numerous technical positions within the company including several years as service manager before entering the Sales Department in 2002. Peter is a member of the US National Weighing Group that reviews, refines and revises Section 2.21 (Belt Conveyor Scale Systems) of NIST publication Handbook – 44 and also serves as a Technical Advisor to NTETC, the National Type Evaluation Technical Committee.

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