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MULTI SENSORS CONTROL MOISTURE FOR BEST VALUE AND LOWER OPERATING COSTS

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Abstract

Recent developments effort in the field of moisture sensing have provided increased accuracy and consistency in determining moisture of bales and modules. Having reliable moisture measurement enables the ginner to modulate the drying machinery for best results. By doing so he can maintain desired moisture levels and conserve energy (fuel). A system consisting multiple moisture and flow sensors, throughout the drying portion of the gin, provides the data needed to modulate the drying such that the outgoing moisture levels are kept at a desired levels. This also elevate the residual moisture level at the gin stand, and spare the lint from excess damage.

Introduction

Gins use dryers to dry incoming seed cotton to eliminating the possibilities of gin chocking and slow downs. It has been practically impossible to control the moisture of the seed cotton without the use of reliable moisture sensors which provide early moisture readings of the incoming seed cotton. The introduction of module microwave sensors, and multi sensing control algorithm makes it possible to monitor and control the seedcotton moisture before the ginning. This test describes a first step of investigation towards the automation of the drying and moisture control of seedcotton with the objective of reducing ginning costs and improving product value.

Test Description and Results

The purpose of the test was to verify the concept of modulating the heat demand as function of the incoming and residual moisture. It also intend to evaluate system stability and potential fuel savings. A microwave moisture sensor was mounted at the module station. A resistive sensor was mounted at the bin above the gin stand. Three dryers controllers were monitored and controlled by the system master CPU. A monitoring and recording processor collected temperature, settings and moisture reading. The CPU was adjusting the temperature set point, in an open loop mode as shown in figure 1. The three set points, for the three burners were profiled as follows: Burner #1 was set to the algorithm calculated temperature, burner #2 was set 30 degF below #1 and burner #3 was set 30 degF below burner #2. This profile was arbitrarily set as the ginner recommendations. The algorithm deployed measured the incoming and outgoing moisture level and calculated a new set point with the objective of maintaining a fixed, ginner selected moisture level at the output (above the gin stand).

Discussion

The gin was operated under the moisture control algorithm. The output moisture setting was set to approximately 6%, and actual burner temperatures were modulated in a close loop control to maintain the set moisture level. It was noticed that the system temperature set point were significantly lower than the defaults used normally by the gin operator. The moisture of the seed cotton was maintained with in a range of +/- 1 % under the varying incoming moisture conditions. A time response is included in figure 2 below.

Conclusions

The reduction of the demand for heat can be executed with the careful monitoring of the moisture and temperature of the burners. Test performed demonstrate stable respond of final moisture readings as a function of the temperature of the dryer. Increase in ginning moisture, when properly monitored and controlled will reduce fuel costs, improve fiber qualities and increase bale moisture. Additional test will be performed in the coming season to determine the benefits of the system under control, as well as its performance.

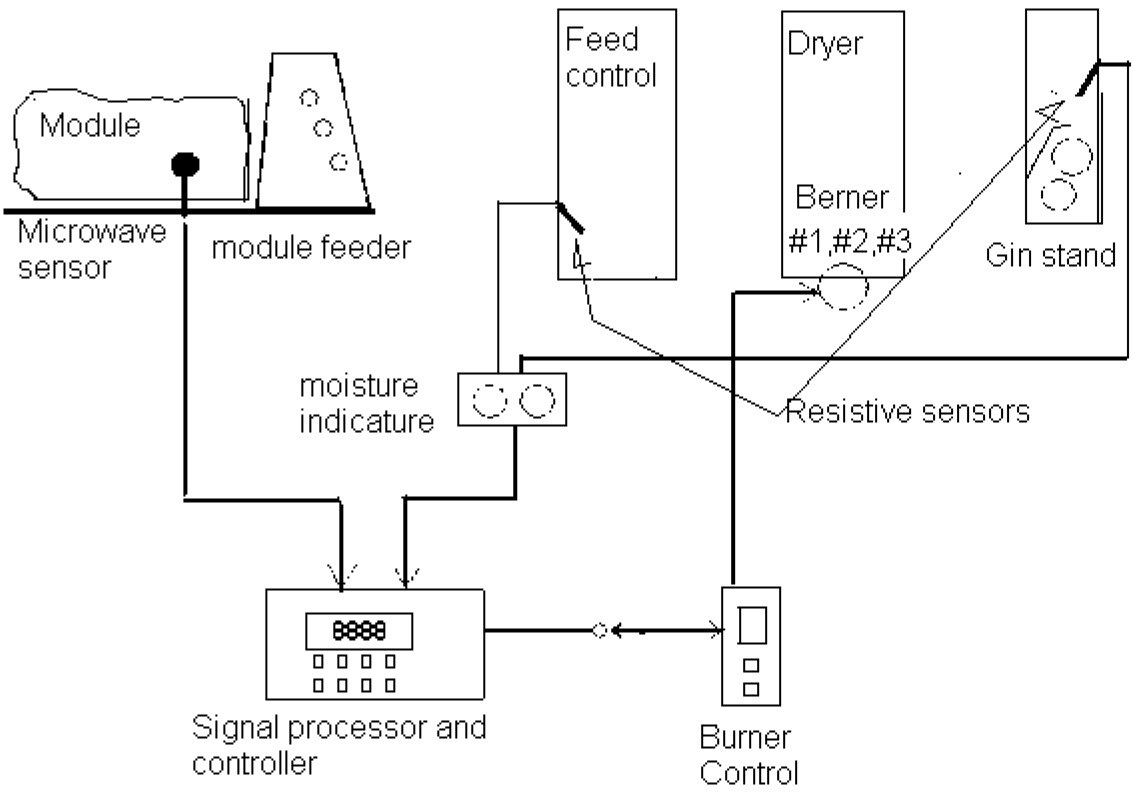

Figure 1. System diagram.

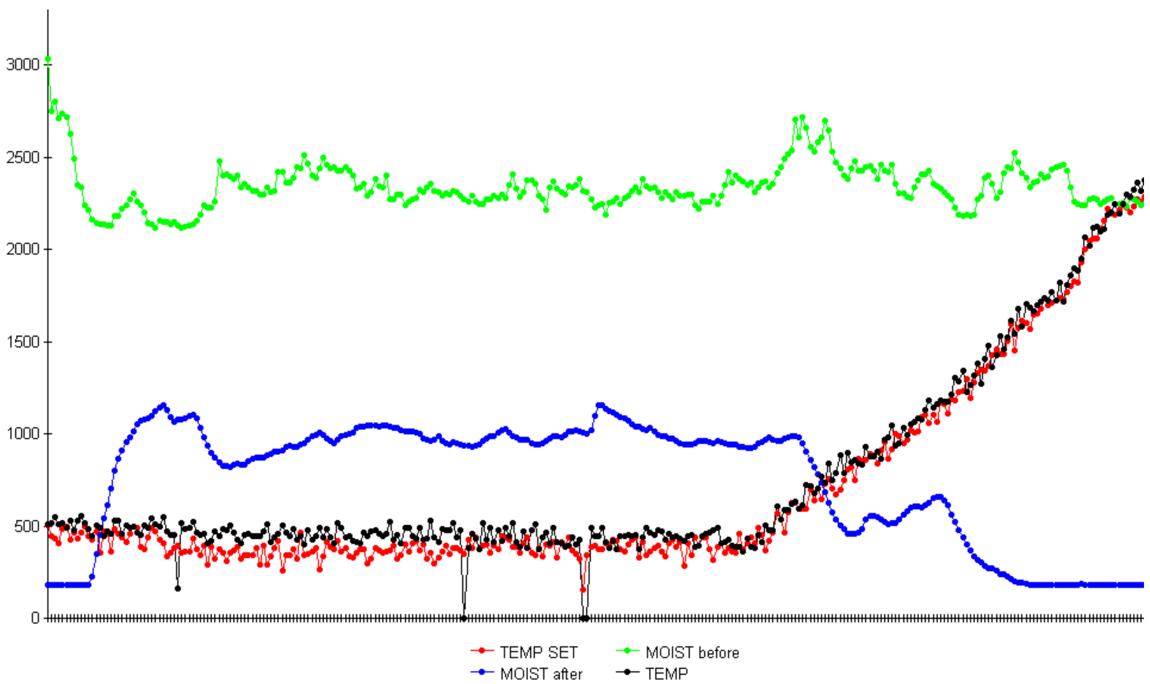

Figure 2. Moisture time response.