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NEW SENSORS, CONTROLS AND GPS TECHNOLOGY OFFER NEW PRODUCTS TO ENHANCE PERFORMACE AND PRODUCTIVITY FOR COTTON GROWERS AND GINNERS

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Abstract

IR sensor technology, DGPS, and microwave signals are used in several new products offered by Advanced Sensing and Controls (formerly AGRIPLAN). These technologies are used to help track module and navigate module trucks, control the flow of cotton in the gin, measure and control lint and seedcotton moisture, measure seed and trash weight on the fly, and provide real time account of the gin performance (the Monitor™). For cotton growers ASCI has introduced a low cost, hands free yield monitor. A high accuracy IR weight monitor for test plot and precision yield evaluation purposes. Each of these products.

Gin Systems

Moisture Sensor

Using microwave signaling, a new generation of moisture sensing devices were designed for gin applications. ASCI is offering a non contact microwave moisture sensors for bales and modules. The sensing technology is using advanced digital signal processing techniques. The sensor measures the water contents in the module or in the bale by scanning through the mass from sided to side. The sensors are capable of detecting the presence of moisture inside the module or bale. The sensor calculates the amount of moisture in the module, and determine the demand for heat required to dry it. It can also calculate the amount of moisture in the bale and determines the correction signal for a moisture restoration system.

Accuracy of the sensor is within the single percentage point of moisture. [1] A photo of the sensors is enclosed below Figure 1. The system was developed in cooperation of the USDA/ARS Lubbock TX. [2]

Module Location and Tracking

Using DGPS and computer technology, a module locating system for ginners has been introduced. The system provides a measure of improved efficiency and control to the module transport operation.

The system utilizes the Global Positioning System (GPS) with "Moving Map Display" for the module trucks to help the driver navigate to the modules in the fields, day or night. It also includes a PC based mapping and data recording system at the gin office to coordinate the transport operation.

A photo showing the moving map display for is in module trucks is enclosed below, figure 2. Additional information is detailed in an article published by the author [3].

Seed and Trash Weight Monitors

Infra-red sensors are used to monitor the flow of seed and trash. Multiple sensors are mounted on the air stream conveyer system to monitor and estimate the amount of seed or trash passing through. The sensors do not make contact with the material, and do not interfere with the flow. Accuracy of 98.5% was measured. With optional secondary set of sensors a 99% accuracy can be achieved. The readings can be associated to the actual module and bale being processed and the figures integrated in the system process report as described in greater details in an article by the author [1]. A photo showing a sensor installation is included with this document, figure 3.

Seedcotton Flow Monitoring and Control

Optical flow sensors use Infra-red light to measure flow of seed cotton in air conveyors. The flow sensor measurements are used to control and regulate the module feeder motors so that a constant flow rate is maintained regardless of the size and density of the module.

Optical level sensors are used to monitor the level of the cotton in a feeding bin or in an overflow bin. The signal produced by the level sensor is used by the flow controller to regulate the flow of the cotton such that a desired level is maintained. Figure 4 is showing sensor installation on the incoming seedcotton feed pipe. Few percentage point improvement in gin flow is expected,; see results at a TX gin, figure 5.

The Monitor – Process Monitoring System

The Monitor collects multiple gin process parameters: flow, temperature, cotton moisture, trash contents, moat, seed contents, gin configuration and other sensors inputs together with the modules and bales serialization. It then displays the information in real time and stores the data in a database format for easy access and processing.

The MONITOR correlates the specific bale and module to the process and byproducts of the gin. A comprehensive report about the cotton condition and composite with process parameters can be created and analyzed. It also provides the ginner the opportunity to optimize the gin parameters for best performance.

Cotton Harvesting Yield / Weight Monitors

Low Cost Cotton Yield Monitor

Low cost, under $3,000/system, hands free cotton yield monitor was developed for use on popular cotton pickers. The new 2000LT utilizes the field proven AGRIplan sensors which have been in use for five years. The system also includes the new WAAS DGPS (Wide Area Augmentation System) to provide continuous, accurate position information needed to calculate yield and to print maps. The sensors with the DGPS position data is stored on a Compact Flash Card in the Data Recording Unit for post processing and map printing. Operation cannot be easier. The system is turned on when the harvester's power is engaged. There is no user interface, no display and no controls. System status is indicated by three color LED's (light emitting diodes).

Precision Cotton Yield/Weight Monitor

High precision weight monitor was developed for use on precision test plots were accurate weight (or yield) measurement of the picked crop is required.

Accuracy obtained, for 40lb plot weight size 1.5% and correlation factor, r^2=.917

See photo of the system installed on a cotton picker below, figure 6.

References

[1] Gvili M. National Cotton Council 2003 Beltwide Conference. Integrated Gin Sensing and Monitoring System

[2] Pelletier M. et al, National Cotton Council 2003 Beltwide Conference. Microwave Moisture Sensing for Cotton Modules and Bales.

[3] Gvili M. National Cotton Council 2003 Beltwide Conference. Module Locating System

[4] Gvili M. National Cotton Council 2003 Beltwide Conference. Optical Systems Measure Flow in Gins and on Cotton Pickers

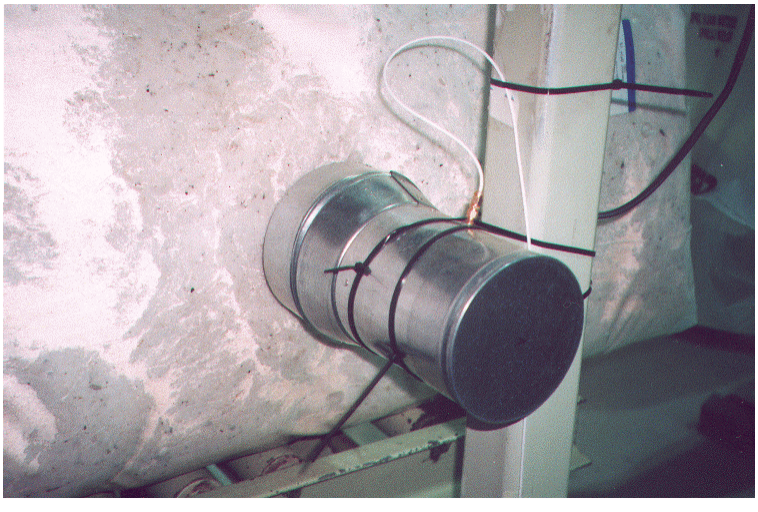

Figure 1. Microwave Moisture Sensor.

Figure 2. Moving map display in module truck cab.

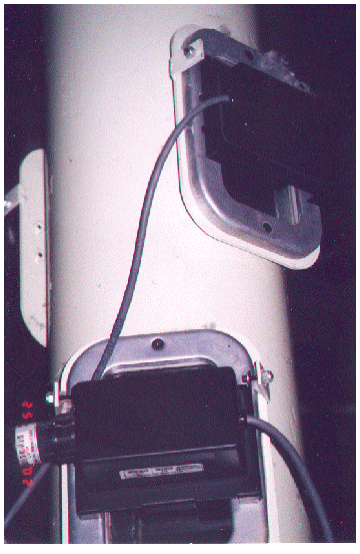

Figure 3. Optical sensors mounted on a seed conveyer.

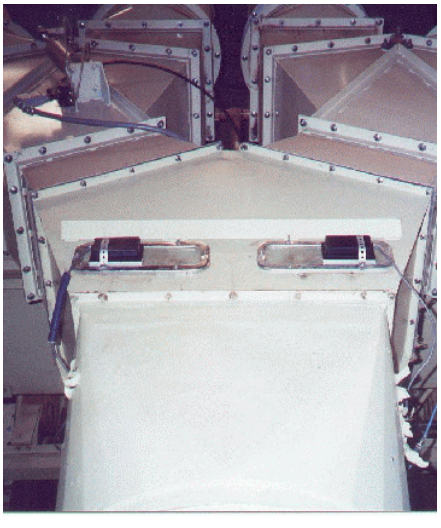

Figure 4. Optical sensors mounted on seedcotton incoming pipe.

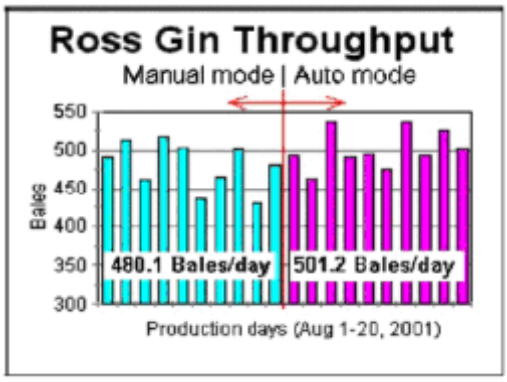

Figure 5. Flow improvement in gin flow when using module feeder flow control.

Figure 6. Precision weight/yield monitor installation.