Assessing Air Quality Around Cotton Gins

Cotton ginners are beginning to face opposition from prospective neighbors when they undertake construction of new gins to remove valuable fibers from cotton seed.

But, Agricultural Research Service engineers at USDA's Southwestern Cotton Ginning Research Laboratory in Mesilla Park, New Mexico, are showing that gins are not a threat to the environment.

"We've tested a commercial, handheld meter to measure the particle concentration coming out of exhaust air from gins. This is the first time such an instrument was shown to provide reasonable measurements," says engineer Ed Hughs, who is at the Mesilla Park laboratory.

"Called HAM, for handheld aerosol monitor, it was previously used to measure dust inside processing plants like textile mills. It gets a reading by measuring how much light is scattered as a beam hits particles."

HAM can provide rapid field measurements without the need for costly laboratory analysis of hand-collected air samples. As a result of this research, the instrument has the potential to be used by industry engineers to monitor and evaluate changes or improvements in their gin emission controls.

Of particular concern are particles that are less than 10 micrometers in diameter. That's about one-seventh the diameter of a strand of hair. These tiny, nearly invisible dusts known as PM-10 are so light they can stay suspended in air for a long time and are thought to pose respiratory health risks to susceptible individuals. PM-10 concentrations can reach high levels in congested cities, industrial areas, construction sites, and some farming communities.

The ARS engineers have modified the two most popular gin emission control devices known as the 2D2D and 1D3D cyclones. While these devices enable cotton gins to meet most regulatory requirements, air quality standards are becoming more stringent. So improvements are going to be needed.

Using 12-inch-diameter models in their lab, the engineers devised modifications to the inlet and body designs that made the cyclones more efficient than current models. Some commercial-size units 36 inches in diameter are now being built and evaluated.

Since some people feared gins emitted high levels of hazardous materials like arsenic, lead, and mercury—elements found in soil that clings to cotton bolls—the scientists also determined exactly what materials gins emitted from their processing systems. They used both proximate and X-ray fluorescence analyses that disclosed very low levels of these elements—as well as 16 other elements—coming from gins in Alabama, Arizona, Arkansas, California, Georgia, Mississippi, Missouri, New Mexico, South Carolina, Tennessee, and Texas.

"None of 19 elements tested for occurred at levels of any concern in meeting federal clean air regulations established by both the U.S. Environmental Protection Agency and the U.S. Department of Labor's Occupational Safety and Health Administration," says Hughs.

The scientists concluded the only emission of concern was inert particles—cotton leaves, stems, and fibers, as well as soil particles—with diameters of 10 micrometers or less, of which cotton gins are generally a minor source compared to many other industries.—By **Dennis Senft,** ARS.

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BILLY ARMIJO

This commercially built monitor has the potential to rapidly measure dust around cotton ginning operations by showing how much light is scattered as a beam hits dust particles in the air.