ElectroStatics-Progress Report

David Eby-AgriFlite Services, Inc.
AeroFlow Systems, Inc.
Why should ES be seriously studied by Aerial Applicators?

- US farmers (our customers) in 2006 will be faced with projected rising inputs of 13% for fertilizer and up to 50% for fuel. Meanwhile commodity prices are far below actual production costs.
- Aerial Applicators fixed costs have doubled since 1990 also.
- Ag aircraft burn more fuel per acre than ground applicators.
- If ElectroStatics is proven effective-aerial applicators can help their customers by reducing application fees as well as improving pesticide efficiency.
- With ag aircraft more productive-more CPP’s sold.

WIN-WIN-WIN-WIN
Typical Installation

- Power Supply
- Control Panel
- Volt/Amp Meter
Installed System

SPRAY BOOM ATTACHED TO AN AT-602
How ES Works

A typical uncharged water droplet with the oxygen molecule covalently bonded to the hydrogen molecule.
Approximately 8000 volts is applied to the stainless steel ring (see photo) inducing an electric field in the region where the droplet is formed. Resulting in a positive charged droplet on the left wing and a negative charged droplet on the right wing.
Since the droplets on each wing have similar charges they are repelled from each other. This effect is especially noticeable when the spray droplets land on the leaf surface of a plant. The repelling effect of like charges causes the spray droplets to spread out surrounding the plant forcing more uniform coverage. One benefit is that since opposites attract the spray coverage under the center of the center of the aircraft is filled in resulting in a very uniform pattern.
Electrostatics spray is applied at 150 microns
While conventional sprays are between 250-350 microns

<table>
<thead>
<tr>
<th>Droplet Size</th>
<th>Number</th>
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<tbody>
<tr>
<td>150 microns</td>
<td>2,141,866,848</td>
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<tr>
<td>300 microns</td>
<td>267,733,356</td>
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There are 8 times more droplets in a gallon of water of 150 micron droplets when compared to 300 micron droplets.
Coverage vs. Droplet Size?

- How much coverage is necessary for control?
- How much of the plant needs to be covered with the pesticide to effect control?
- What is more important small number of large drops (250-300 micron) on a plant, or a large number of small drops (150 micron)?
Spectrum ES system proves itself in Indiana

David Elly of Agrifiles Services in Wakarusa, Indiana makes a pass over soybeans during evaluation of Spectrum Electrostatic spray system. Purdue University scientist, Sungpaek and Pioneer Seed Company representatives are on hand to review results. Read the whole story on page 8.

- Air Tractor adopts Lean Manufacturing
- Operators participate in “On Condition Maintenance”
- Need a new loading facility?
- Smart Drop Technology
On the following 3 slides of conventional 2 & 5 gallon air applications note the droplet size, spacing, coverage, canopy penetration and under leaf coverage.
2 GPA(AIR CONV.) FLAT FAN- Soybeans
5 GPA (AIR CONV.) FLAT FAN-Corn
2 GPA (AIR CONV.) FLAT FAN-\textit{Corn}
Ground Applications—what really happens.

SOURCE: THE FURROW FEB. 2005
Research conducted by John Deere using two different nozzles at two different settings in late-season soybeans shows a tremendous difference in the amount of lower-canopy spray coverage necessary to treat Asian Soybean Rust.
The high volume spray covers the exposed top leaves of the canopy, then congeals to a droplet and falls to the ground. Almost no coverage on plant underneath the canopy and on the underside of the leaf.
20 GPA TWIN TEE JET
FLAT FANS—Ground Application.

Additional photo of ground application showing little penetration below the canopy.
On the following 6 slides of ElectroStatic applications note the more uniform coverage with penetration below the canopy and on underside of the leaves.
ES (1 GPA-AIR)  Soybeans
ES (1 GPA-AIR)  *Corn*
ES (1 GPA-AIR)  Corn
ES (1 GPA-AIR)  Corn
ES (1 GPA-AIR) VS. 5 GPA-Corn
ES (1 GPA-AIR) VS. 5 GPA-Soybeans

ELECTROSTATICS
1 GPA

CONVENTIONAL
5 GPA
SOYBEAN SPRAY COVERAGE DATA

From Dr. Shawn Conley, Purdue University.

Note: Data is for upper leaf surface only. No account was made for under leaf coverage from aircraft applications.
RESEARCH NEEDED FOR 2006

- Correlation between spray density and optimum control
- Fungicide studies (reducing 5 gpa applications to 1 gpa ES)
- CPP—which ones are effective with ES and which are not
CREDITS

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