

# Air-Assisted Electrostatic Sprayers for Field Crops



## K - 450 Series

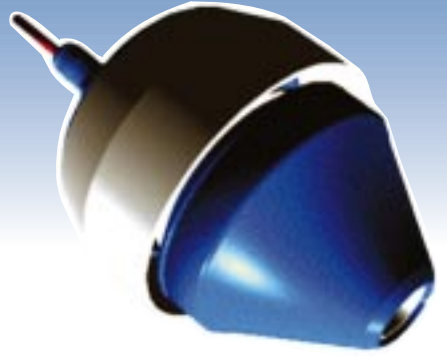
Electrostatic Spraying Systems, Inc.



# ESS MaxCharge™ Air-Assisted Electrostatic Sprayers

New ESS MaxCharge™ sprayers produce electrically charged spray droplets which are carried onto the plant canopy in a high-speed air stream. The charged droplets seek out plant material by electrostatic forces. The result is uniform spray coverage on hidden areas deep inside of the plant canopy where other sprayers miss. Testing shows that the electrostatic charging effect causes 4 to 5 times more spray deposition on the plant than conventional sprayers.

The MaxCharge™ spray nozzle uses compressed air to atomize the spray and carry droplets onto the crop in a turbulent cloud. Embedded inside the nozzle tip is a special electrode that induces a high concentration of electrons onto the liquid stream. The air moves through the nozzle at nearly the speed of sound, impacting the liquid stream and shattering it into small, uniform size droplets. The electrostatically charged droplets are pushed onto the crop by air energy and the electrostatic charge causes the droplets to attract to plant surfaces instead of being blown past the target, drifting away or falling to the ground.



The MaxCharge™ nozzle is easy to disassemble and clean. The ceramic tip, stainless steel electrode and chemical resistant plastics keep the nozzles performing efficiently. Most growers get over 800 hours use from a set of nozzles.

Small spray droplets with a high charge give the strongest electrostatic attraction. ESS MaxCharge™ systems create droplet charges in the realm of 4 to 5 mC/liter (millicoulombs per liter relates to the measure of the number of electrons on the spray) . This high charge level causes electrical attraction forces of over 75 times that of gravity. Because of the high charge, droplets will reverse direction and move upwards against gravity to uniformly coat leaf undersides, stems and other hard to reach plant parts.

Electrostatic “wrap-around” phenomenon occurs as droplets move quickly to the plant.

The level of charge is important for the electrostatic effect. Other electrostatic sprayers have not been able to produce a charge high enough to give a significant electrostatic benefit with all chemicals. MaxCharge™ nozzles produce the highest charge level of any electrostatic sprayer on the market and work with all classes of agricultural chemicals. ESS products have been evaluated by many universities and grower organizations. For more research information, ask us for the booklet “What Growers Should Know About Electrostatic Sprayers”.

The MaxCharge™ Spray Nozzle

A unique embedded electrode at the tip induces a high level of electrostatic charge onto the spray. This causes droplets to wrap around leaves as seen below.

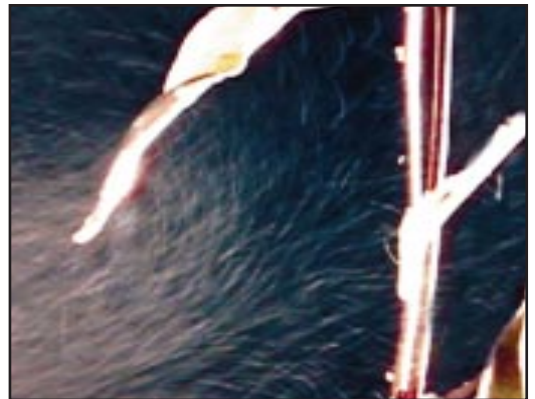
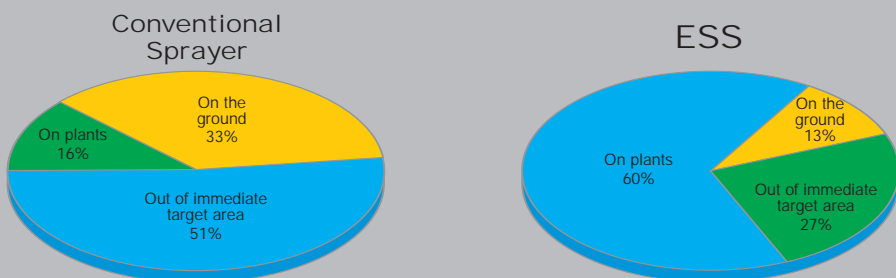


Photo credit - The University of Georgia

## Where does it go?



The University of California at Davis completed an extensive series of tests to investigate what happens to sprayed chemical after it leaves the nozzles. Tests were conducted comparing a conventional high-volume sprayer to the ESS sprayer. In conclusion of this study the UC researchers stated “If the chemical rate were reduced by 3-fold, when using the ESS sprayer, the amount onto plants would be greater than the conventional sprayer at full rate. But, the amount of chemical moving off-target would be 1/10th of that of the conventional sprayer”.

# The new ESS K-450 Series field sprayers:

## High-flow MaxCharge™ electrostatic nozzles:

- Capable of higher liquid flow rates
- Maximum electrical charge density on the spray
- Increased air-assist power for penetration into dense canopy crops

## Lobed-blower air compressor technology:

- Produces higher volumes of compressed air with less horsepower
- Uses rotating lobes rather than pistons and valves
- Smooth running and easy to maintain
- Over 500 hours maintenance interval
- Produces clean, oil-free air

## Tubular aluminum spray booms:

- Strong
- Light weight

## Low-volume spraying:

- 30 acres or more from a single tank fill



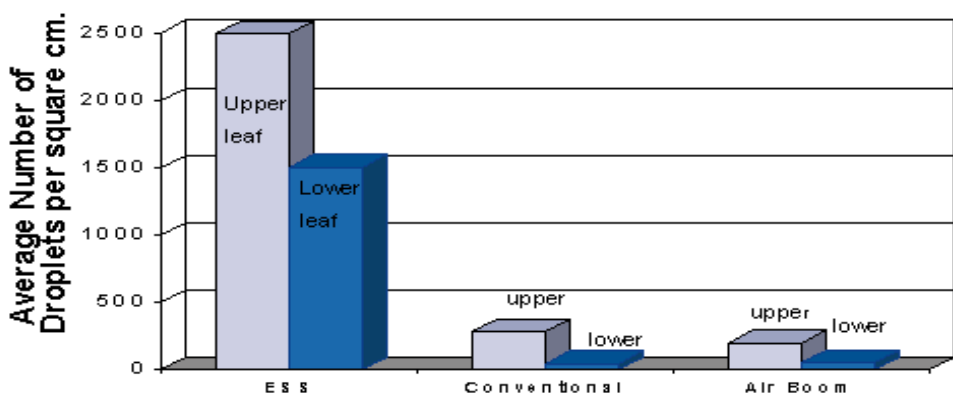
The K-450 Series is available with 40 to 72 nozzles on booms from 36 to 66 feet in length.

## The ESS Advantage:

The combination of optimized air-assist with high levels of electrostatic spray charge produces the highest spray transfer efficiency of any sprayer on the market. Get the most out of your chemicals at very low volume rates and cost with ESS MaxCharge™ technology.

## Spray Deposition on Leaf surfaces:

Droplets per sq. cm on leaf upper and lower surfaces by computer vision



This trial consisted of spraying full season potato foliage with a tracer using various types of commercial field sprayers. Tracer deposits on several hundred leaf samples from each sprayer plot were analyzed by a computer vision system which counts spray droplets per square cm. ESS sprays were done at 5 gallons per acre versus conventional and air boom tests which were done at 35-50 gpa. Results show an average increase in spray droplet deposit by ESS to be 10-times on top leaf surfaces and 30-times on lower leaf surfaces. Data courtesy of Cornell University, Dept. of Biological and Agricultural Engineering, Ithaca, NY



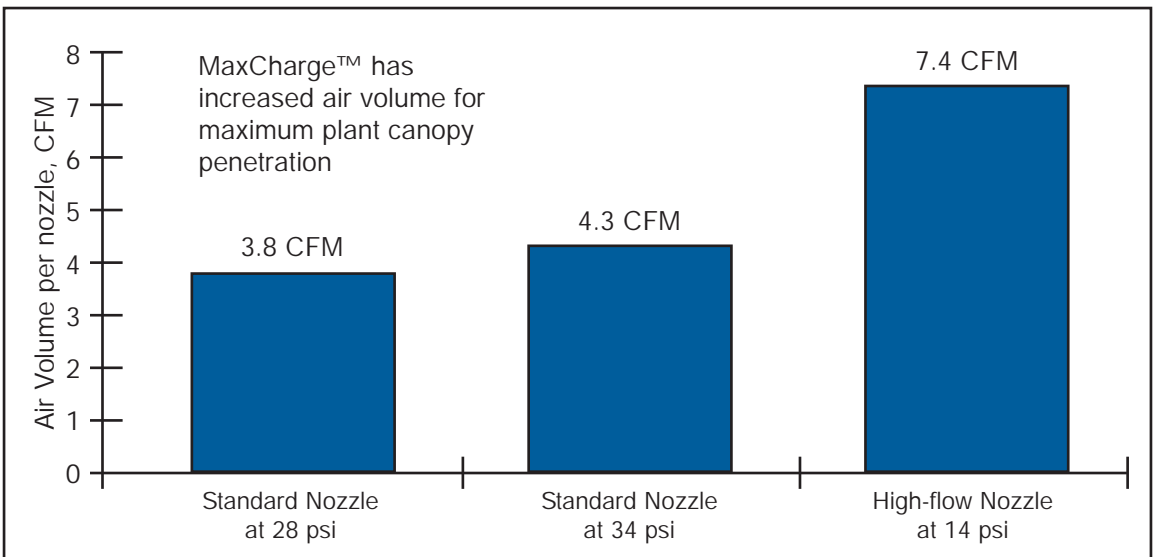
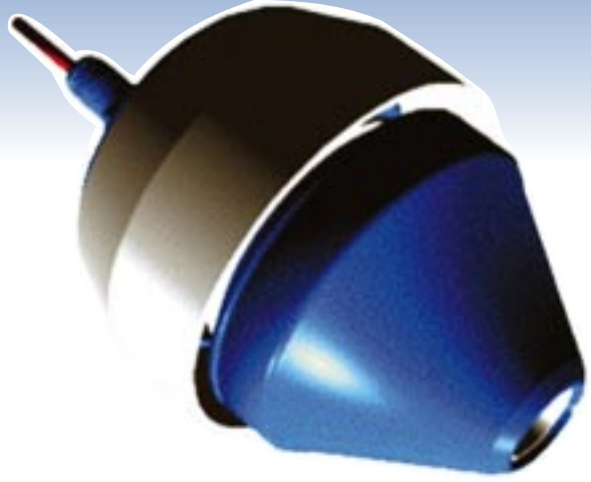
# New High-Flow MaxCharge™ Nozzle

## Increased Liquid Flow Rate

The new High-Flow nozzle has nearly double the liquid flow rate of previous air-assisted electrostatic spray nozzles. Liquid output per nozzle of 150 to 190 ml/minute is now possible. The higher liquid application rate aids in better tank mixing and improves spray coverage at higher ground speeds.

## Increased Air Volume Output

- Aids in crop penetration
- Helps in crosswind conditions
- Increases charging with all chemicals



# ESS Air-Assisted Electrostatic Sprayers for Field Crops

This recent case study was done to compare season-long pesticide expenses of a grower who uses both ESS and conventional sprayers on the same type of crop. The ESS application rate of chemical was generally 50% less than that of conventional sprayers. Additional savings came from one less application needed for insecticides on the ESS sprayer-treated fields.

Case Studies 1999      Crop: Specialty Lettuce      Acres: 275      Grower: Central Valley, Merced, CA.

Conventional Sprayer: 6 applic.

•Chemical usage

Number of Applications	Chemical rate	Chemical per 275 acres	Chemical cost per 275 acres
2	Lannate 0.9 lbs.	495 lbs.	\$ 10,865
2	Monitor 2 pts.	138 gals.	\$ 11,216
1	Pounce 0.75 lbs.	206 lbs.	\$ 12,360
2	Success 7 oz.	30 gals.	\$ 19,425
1	Provado 3.8 oz.	8 gals.	\$ 4,088
5	Mic.nutrients 6 pts.	1030 gals.	\$ 10,300
		<u>1285 gals.</u>	<u>\$ 68,254</u>

Conventional Sprayer:  
Chemical expense: \$ 68,254  
Cost per acre: \$ 248

ESS Air/Electrostatic Sprayer: 5 applic.

•Chemical usage

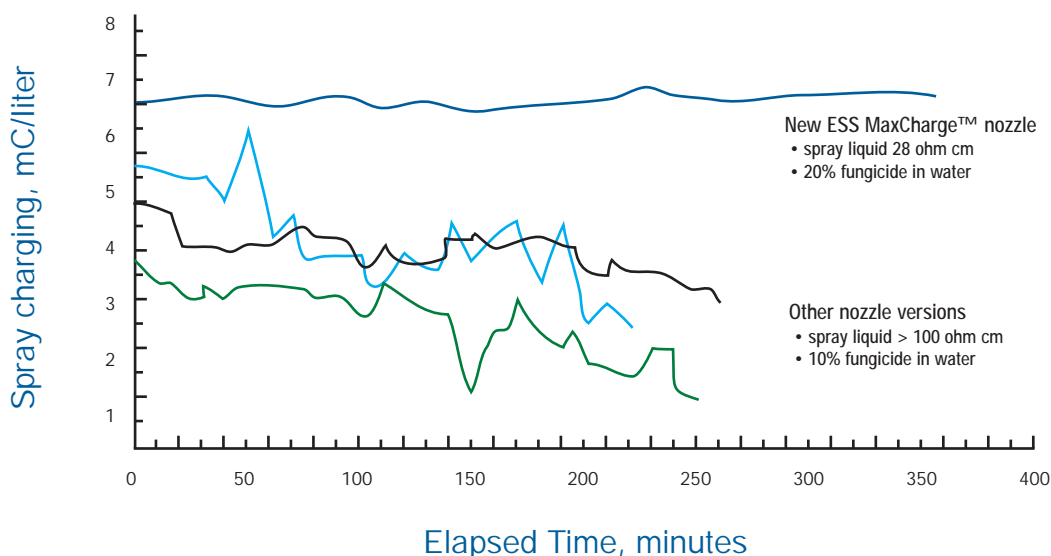
Number of Applications	Chemical rate	Chemical per 275 acres	Chemical cost per 275 acres
1	Lannate 0.4 lbs.	110 lbs.	\$ 2,414
1	Monitor 1 pts.	34 gals.	\$ 2,764
1	Pounce 0.5 lbs.	138 lbs.	\$ 8,280
2	Success 4 oz.	17 gals.	\$ 11,000
1	Provado 2 oz.	4.3 gals.	\$ 2,197
5	Mic.nutrients 3.5 pts.	600 gals.	\$ 6,000
		<u>683 gals.</u>	<u>\$ 32,655</u>

ESS Air/Electrostatic Sprayer:  
Chemical expense: \$ 32,655  
Cost per acre: \$ 119

•Season savings: 602 gals. of pesticide formulation and \$35,599 in costs

Significant improvements have been made in the charging and reliability of electrostatic spray-charging nozzles. This graph shows charging levels achieved while spraying heavy mixtures of electrically conductive fungicides. The new MaxCharge™ nozzle from ESS produced the highest and most consistent charging levels.

## Charging Performance Comparisons of Air-Assisted Electrostatic Spray Nozzles





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