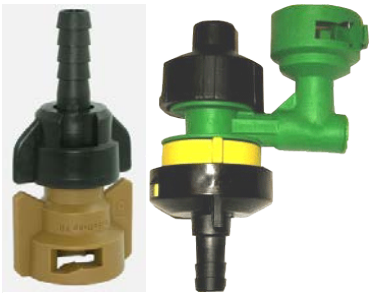
Nozzle Control Components for Crop Canopy Sensor-Based N Management

During the 2015 growing season, target application rates in gallons per acre (GPA) were monitored during 120 acres of Project SENSE applications at one second intervals. These data indicated that target flow rates ranged from the minimum (set by the operator) 8.6 GPA to a maximum of nearly 70 GPA. Approximately 95% of the data points fell between 8.6 GPA and 30 GPA which indicated that a turndown ratio of approximately 4:1 would be required to meets this range in flow rates. Since the 2015 SENSE applicator used fixed orifice nozzles (generally capable of a 2:1 turndown ratio for operating pressures), the operator was forced to change ground speed often to meet system demands for the flow ranges seen in 2015. This can place additional demand on the rate controller to maintain target rates during application.

To minimize changes in travel speed required in the field, adopters of crop canopy sensor-based variable rate technologies may need to consider adopting more advanced nozzle control systems. These systems are capable of providing additional turndown (exceeding 4:1) across a range of typical sprayer operating pressures. Extended flow range nozzles may cost from $40 to $60 each, but are a simple replacement for fixed orifice nozzles on the spray boom.



The TurboDrop nozzle (left) may extend flow rates up to 4:1 while the VeriFlow nozzle (right) may extend flow rates up to 8:1 across the range of operating pressures.

Extended flow range nozzles are currently known to be available from two manufacturers:

- TurboDrop nozzles from Greenleaf Technologies: www.greenleaftech.com
- VeriFlow nozzles from Delavan AgSpray Products: www.delavanagspray.com

Pulse width modulation (PWM) nozzle control systems provide an active method for controlling nozzle flow. These systems can operate as a standalone solution for rate control and provide turndown ratios over 6:1, but must be integrated with the crop canopy sensing systems to receive target rates for N during field application. These systems generally control both boom flow or product pump speed with the PWM rate of the nozzle solenoid valves to achieve greater flow ranges. The cost for these systems vary greatly depending on hardware needs, individual nozzle control valves may cost up to $100 per nozzle body plus additional flow rate control components.

The Capstan Ag PWM nozzle control system may extend flow rates over 6:1 across the range of typical operating pressures.

PWM nozzle control systems are currently known to be available from four manufacturers:

- PinPoint from Capstan Ag Systems: www.capstanag.com
- Hawkeye from Raven: www.ravenprecision.com
- AIM Command from Case IH: www.caseih.com
- DynaJet Flex 7120 from Teejet: www.teejet.com

Additional information about Project SENSE can be found at:

- UNL CropWatch: http://cropwatch.unl.edu/farmresearch