Spray Nozzle Technology
Drop Size Classification

- 1985: BCPC
- 1989: TeeJet Cat 41M published tables
- 2004: ASAE S572
- 2009: ASAE S572.1
- 2012: ISO WG13
Droplet Size Measurement and Classification

ANSI/ASAE S572.1 MAR2009
Spray Nozzle Classification by Droplet Spectra
Droplet Size Categories

Example Reference Graph

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<th>Category Border</th>
<th>Reference Test Nozzle</th>
<th>Approx. VMD (572.1)</th>
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Figure 1 – Sample reference graph developed from measurements averaged from three types of laser instruments. NOTE: To view figure in color please go to http://www.asabe.org/standards/images/s572images.html

*Data extracted from American Society of Agricultural and Biological Engineers (ASABE) Standard S-572.1.*
Measuring Equipment

- Malvern
- PMS-OAP (Particle Measuring System – Optical Array Probe)
- PDPA (Phase Doppler Particle Analyzer)
- Oxford Visisizer-PDIA (Particle Droplet Image Analysis)
Nozzle Materials

**Ceramic**
Superior wear life; highly resistant to abrasive and corrosive chemicals

**Polymer**
Good wear life; good chemical resistance; orifice susceptible to damage when cleaned improperly

**Stainless Steel**
Good wear life; excellent chemical resistance; durable orifice

**Brass**
Poor wear life; susceptible to corrosion, especially with fertilizers
## Nozzle Material Comparison

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<th>Material</th>
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<th>Wear Resistance Ratio</th>
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*Ultra High Molecular Weight Polyethylene*
Nozzle Wear

New Flat-Fan Nozzle

Worn Nozzle

Improperly Cleaned
Spray Pattern Check

New Nozzles  Worn Nozzles  Damaged Nozzles

NEW SPRAY TIPS
Produce a uniform distribution when properly overlapped.

WORN SPRAY TIPS
Have a higher output with more spray concentrated under each tip.

DAMAGED SPRAY TIPS
Have a very erratic output – overapplying and underapplying.
Nozzle Wear

• When do I need to replace my tips?
  – When flow rates are 10% over nominal flow

• Wear rates depend on:
  – Tip material (stainless, polymer, ceramic)
  – Chemicals used
  – Operating pressure
  – Care used when cleaning
Selecting a Tip

• Coverage vs. Drift Control
• How much coverage can I sacrifice for drift control?
• Look at your variables
  – Product
  – Plant
  – Speed
  – Winds
  – Pressure
  – Density
MODE OF ACTION IS A MAJOR FACTOR IN NOZZLE SELECTION
Droplet Size
Standard Flat Spray

XR TeeJet®
Turbo TeeJet®
Air Induction XR TeeJet®
Turbo TeeJet® Induction
New Chemical Formulations

USE AIR INDUCTION TIPS!!!!
Air Induction Technology
Air Induction Technology

TP11003  

TTI11003
AIXR vs. XR Drop Size Classification

**XR TeeJet® (XR) and XRC TeeJet® (XRC)**

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**AIXR TeeJet® (AIXR)**

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AIXR TeeJet®
## TTI Drop Size Classification

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Turbo TeeJet® Induction
Droplet Size

(Drifttable “Fine” Droplets)

XR TeeJet®
(>30%)

Turbo TeeJet®
(>15%)

Air Induction XR TeeJet®
(>10%)

Turbo TeeJet® Induction
(>2%)
PWM for Sprayers
DynaJet Products

• DynaJet Flex
  – Works with external rate control
  – Not compatible with nozzle flow sensors
  – Designed for relatively fast OEM adoption
  – Console has ram mount for easy mounting
DynaJet

Pressure Regulating System
• One driver per boom section
• Quantity of sections determined by machine configuration (plumbing, controller)
• 15 sections max
• 20 Nozzles per section max

• A/B nozzle groups operate out of phase with each other
• Drivers self-configure on every power cycle
DynaJet Operating Modes

• Manual Mode
  – Operator adjusts duty cycle (% on time) directly
  – Duty cycle = flow capacity = nozzle size
  – Rate controller regulates normally

• Auto Mode
  – Operator sets droplet size category
  – DynaJet system monitors pressure and adjusts duty cycle to maintain droplet size
  – Rate controller regulates normally
DynaJet

- Lab testing in process
- Field testing to happen this Spring
- Customer testing began this past fall
- Expected to release during 2014