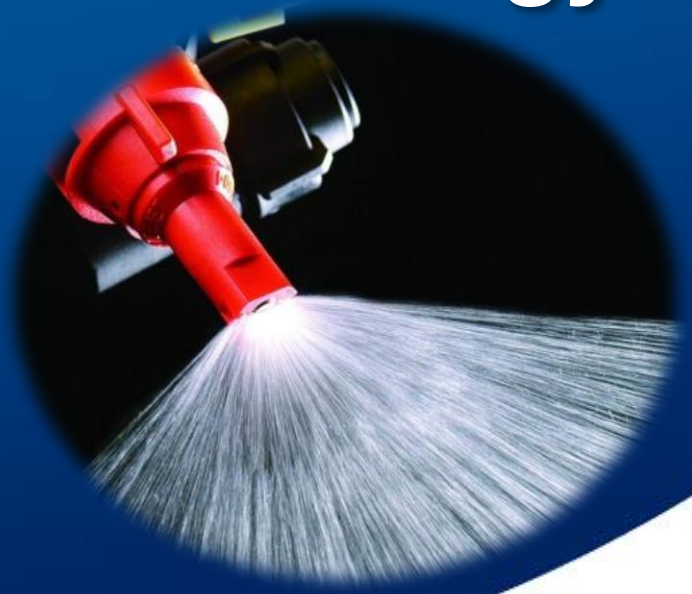
TeeJet TECHNOLOGIES

Spray Nozzle Technology



A Subsidiary of Spraying Systems Co.

NAICC

Drop Size Classification

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

A SYSTEM FOR CLASSIFYING HYDRAULIC NOZZLES AND OTHER ATOMISERS INTO CATEGORIES OF SPRAY QUALITY

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Droplet Size Measurement and Classification

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

American Society of
Agricultural and Biological Engineers

Droplet Size Categories

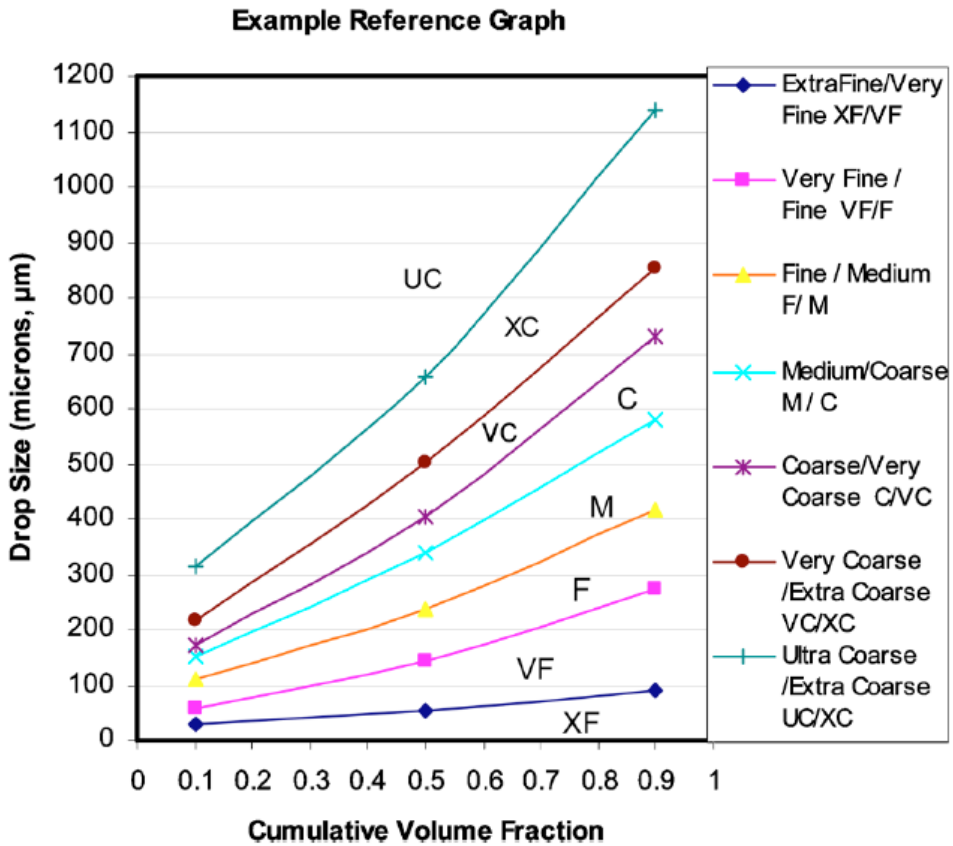


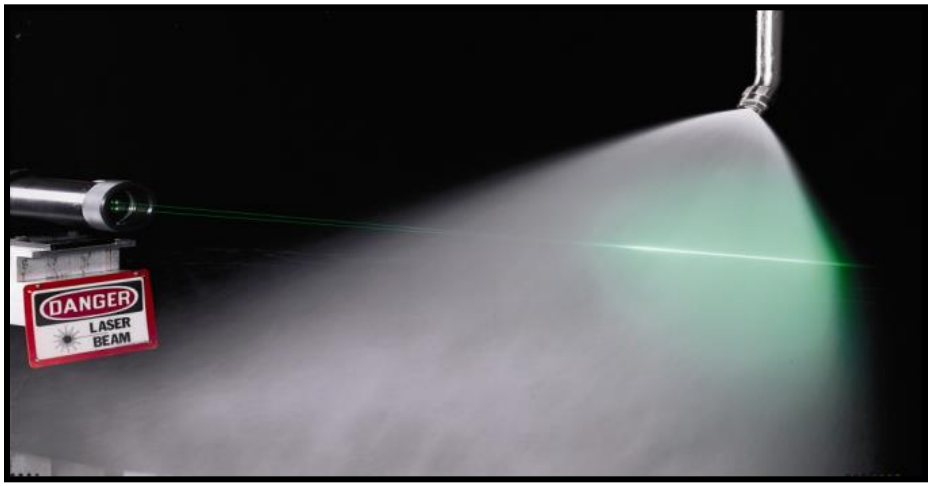
Figure 1 – Sample reference graph developed from measurements averaged from three types of laser instruments. NOTE: To view figure in color please go to http://www.asabe.org/standards/images/s572images.html

Category Border	Reference Test Nozzle	Approx. VMD (572.1)
UC / XC	TP6515-SS	670
XC / VC	TP6510-SS	510
VC / C	TP8008-SS	405
C / M	TP11006-SS	335
M / F	TP11003-SS	235
F / VF	TP11001-SS	150
VF / XF	MeeFog IP-16	70

***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

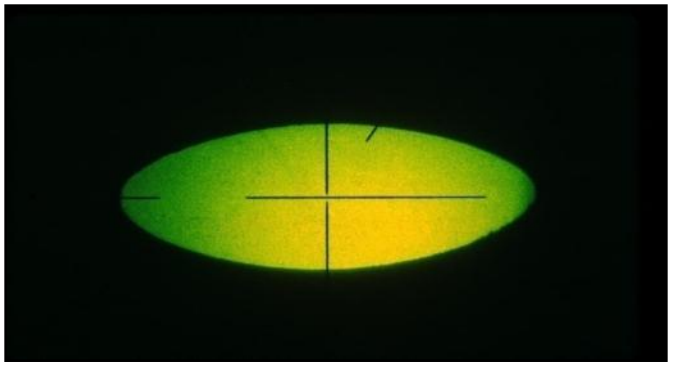
Poor wear life; susceptible to corrosion, especially with fertilizers

Nozzle Material Comparison

Material	Example Tip	Wear Resistance Ratio
Brass	TP8004	1
Celcon Polymer	XR11004-VP or TT11004VP	2 to 6
Stainless Steel	XR8004VS	4 to 6
*UHMWPE	AIXR11004VP	8 to 10
Ceramic	XR11004-VK	12 to 14

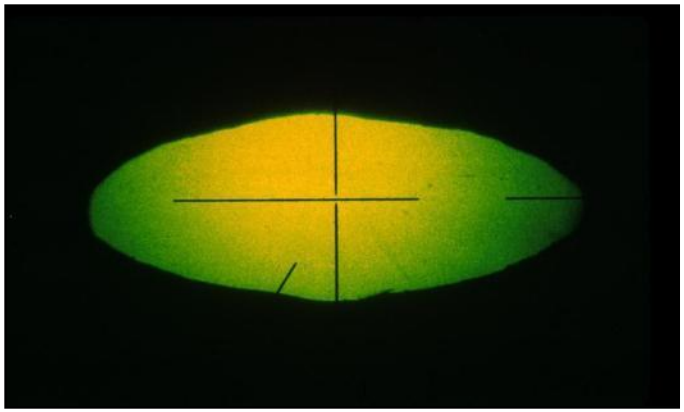
*Ultra High Molecular Weight Polyethylene

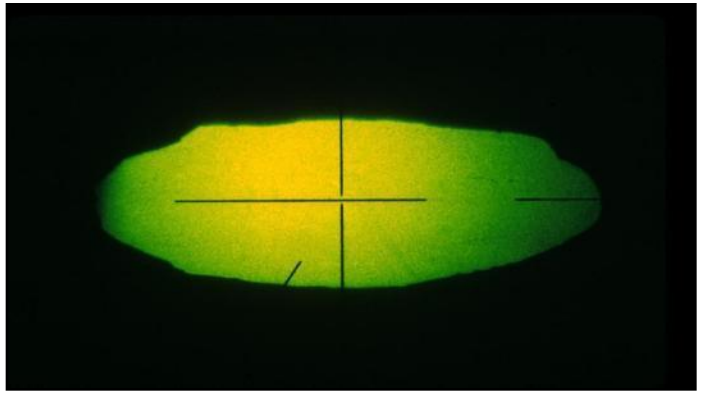
Nozzle Wear



New Flat-Fan Nozzle

Worn Nozzle

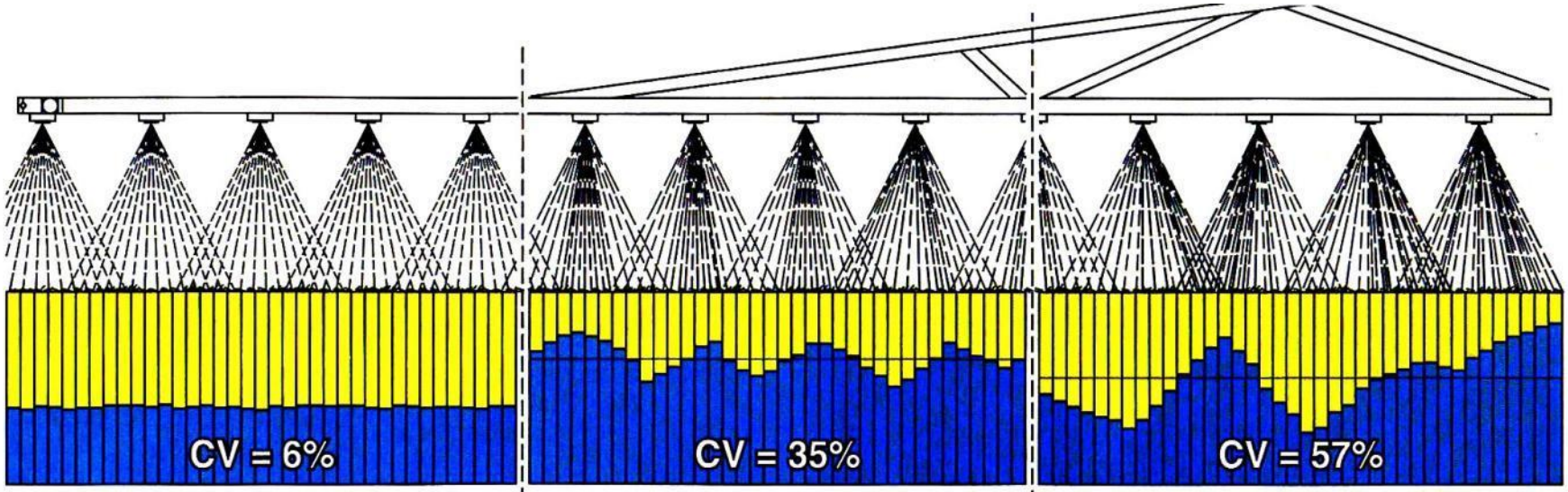




Improperly Cleaned

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

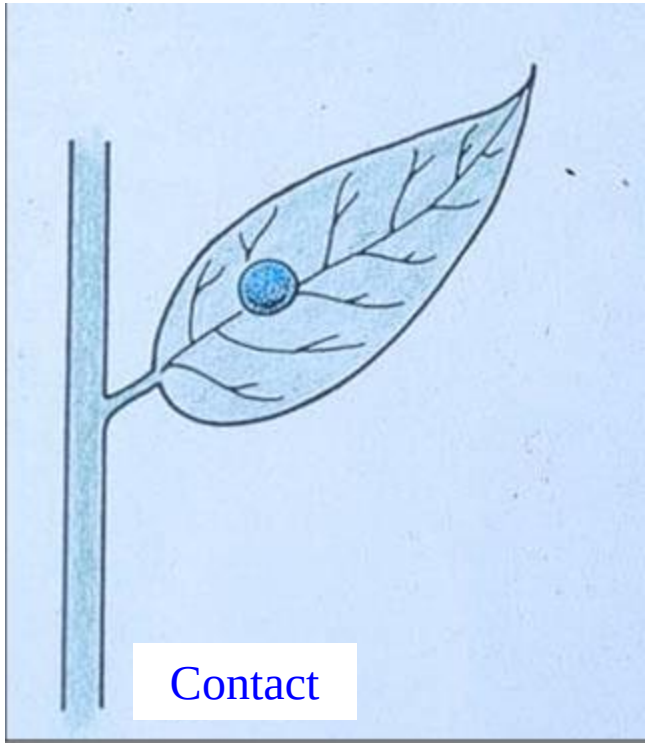
- When do I need to replace my tips?
  - When flow rates are 10% over nominal flow

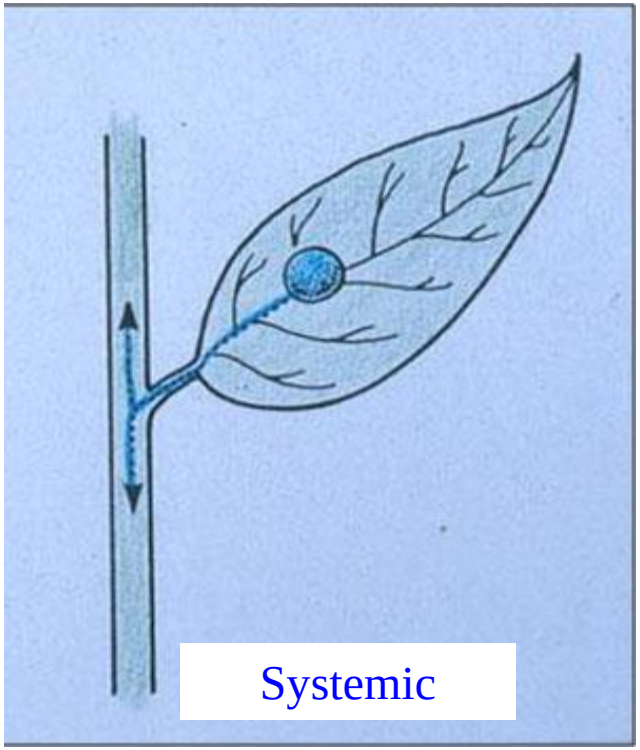
- Wear rates depend on:
  - Tip material (stainless, polymer, ceramic)
  - Chemicals used
  - Operating pressure
  - Care used when cleaning

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®

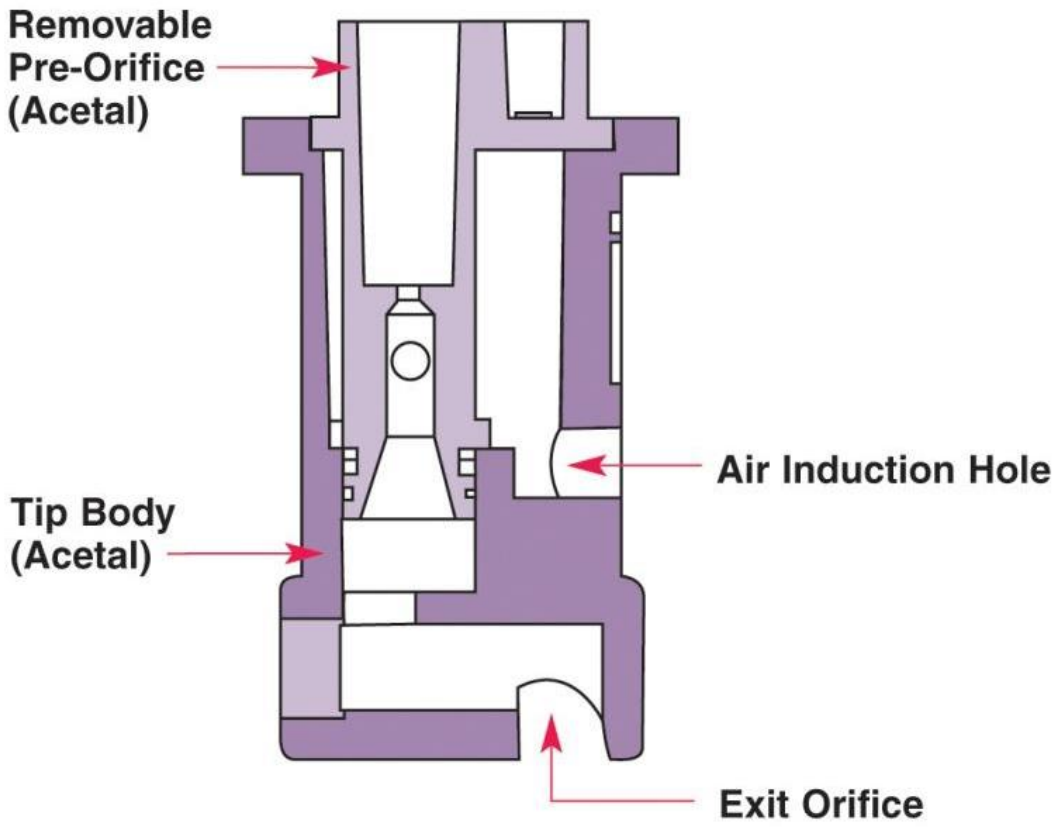
Air Induction XR TeeJet®

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)

	PSI						
	15	20	25	30	40	50	60
XR11001	F	F	F	F	F	VF	VF
XR110015	F	F	F	F	F	F	F
XR11002	M	F	F	F	F	F	F
XR110025	M	M	F	F	F	F	F
XR11003	M	M	M	F	F	F	F
XR11004	M	M	M	M	M	F	F
XR11005	M	M	M	M	M	M	F
XR11006	C	C	M	M	M	M	M

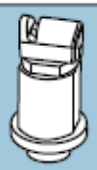
AIXR TeeJet® (AIXR)

	PSI										
	15	20	25	30	35	40	50	60	70	80	90
AIXR110015	XC	XC	VC	C	C	C	C	M	M	M	M
AIXR11002	XC	XC	XC	VC	VC	C	C	C	C	M	M
AIXR110025	XC	XC	XC	XC	VC	VC	C	C	C	C	C
AIXR11003	XC	XC	XC	XC	VC	VC	C	C	C	C	C
AIXR11004	UC	XC	XC	XC	XC	XC	VC	VC	C	C	C
AIXR11005	UC	XC	XC	XC	XC	XC	VC	VC	C	C	C
AIXR11006	UC	XC	XC	XC	XC	XC	VC	VC	VC	C	C

AIXR TeeJet®

TTI Drop Size Classification

Turbo TeeJet Induction (TTI)

	PSI											
	15	20	25	30	35	40	50	60	70	80	90	100
TTI110015	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC	XC
TTI11002	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI110025	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11003	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11004	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11005	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11006	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC

Turbo TeeJet® Induction

Droplet Size

Coarse

(Driftable “Fine” Droplets)

Fine

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

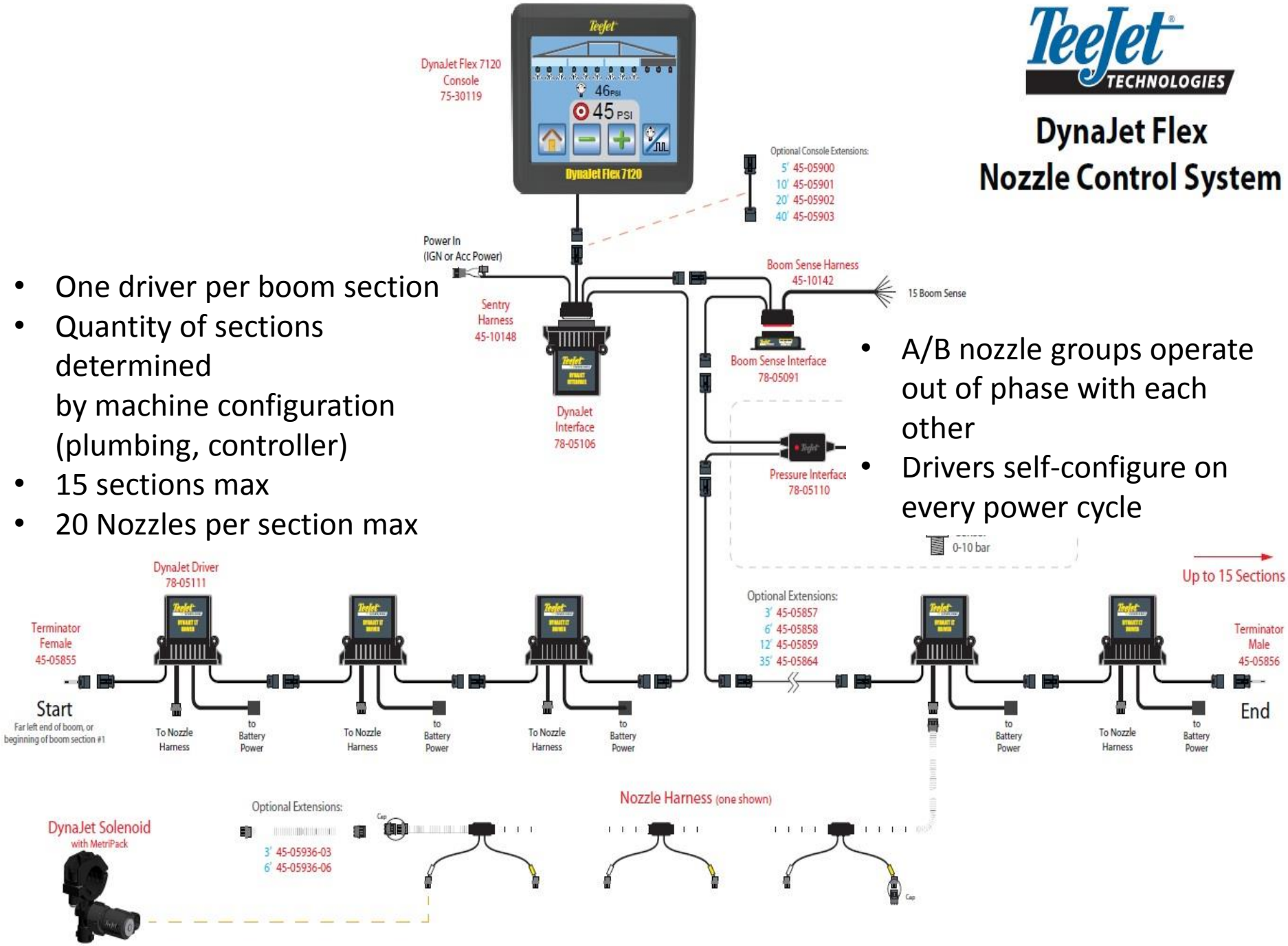
DynaJet

Pressure Regulating System

DynaJet Flex Nozzle Control 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