

# DRIFT CONTROL 2016: A SPRAY ODYSSEY

David Brackmann- TeeJet Technologies  
TPSA -2016



# Agenda

- Intro to TeeJet Technologies
- Nozzle evolution
- Nozzle design for drift control
- Ag. Industry involvement/cooperation
  - Working with all in the ag. industry
- The future...
  - New products
- Q & A



# Technology and R&D Leader

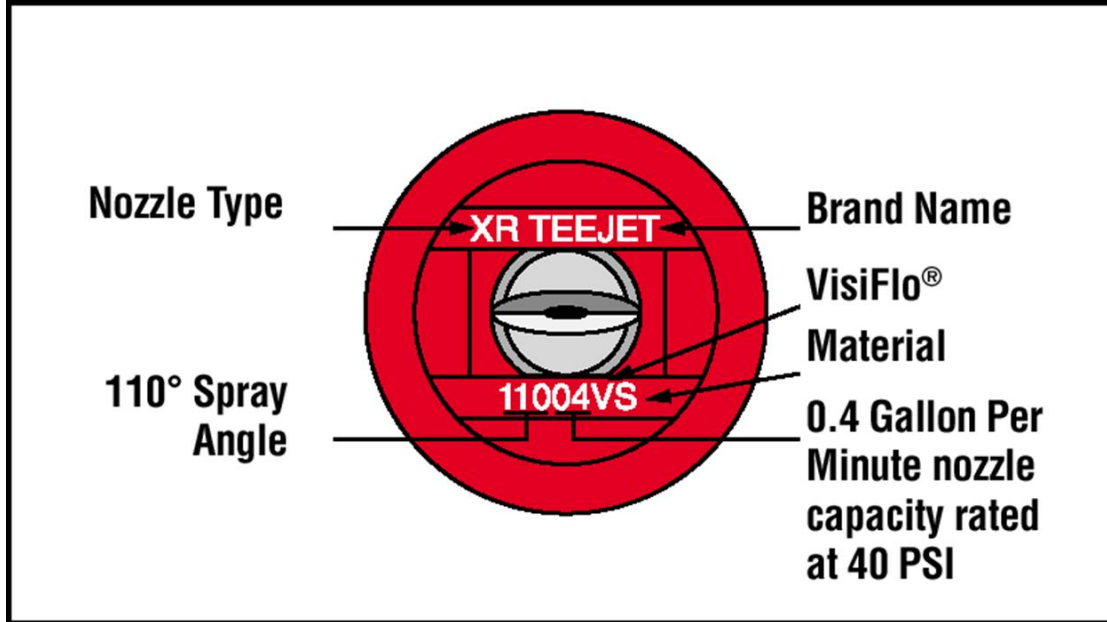
- Frequently first to market with new technology
  - First modern agricultural nozzle
  - Invented the Quick TeeJet® system
  - Set the standard in VisiFlo® color coding and design
    - Scheme adopted by ISO
  - First remotely operated valves
  - Innovated first ball valve manifold system
  - Patented Turbo TeeJet design for drift reduction



# NOZZLE EVOLUTION



# Basic Nozzle Nomenclature



# Nozzle Evolution

- Metal body with precision drilled orifice
  - Flat fan pattern
  - Med.- fine droplet sizes
  - Drift not much of a concern





# Nozzle Evolution

- Glyphosate days...
  - Drift more of a concern
  - Non-GM off target kill
  - Larger droplets needed
    - Particle
    - Vapor



# Nozzle Evolution

- Injection molding
  - Flexibility in design
  - Multiple styles of patterns/tips
  - Combinations of design principals





# Nozzles Today...



TwinJet®



Drift Guard  
TwinJet®



Turbo  
TwinJet®



Air Induction  
3070



Air Induction  
Turbo TwinJet®



XR  
TeeJet®



Turbo  
TeeJet®



Air Induction  
XR



Air Induction  
Turbo TeeJet®



Quick Turbo  
FloodJet®



Fine

Coarse

# VisiFlo® Color Coding System

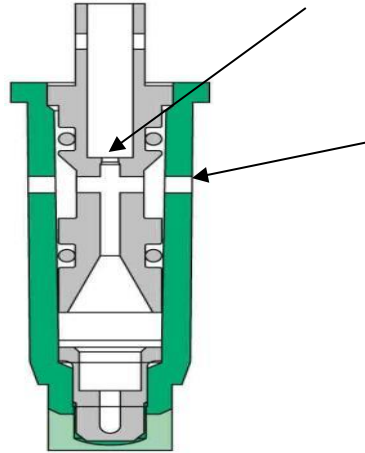
VisiFlo Color Coding	Liquid Pressure	Capacity One Nozzle
01	40 PSI (2.8 bar)	0.10 GPM (0.38 l/min)
015	40 PSI (2.8 bar)	0.15 GPM (0.57 l/min)
02	40 PSI (2.8 bar)	0.20 GPM (0.76 l/min)
025	40 PSI (2.8 bar)	0.25 GPM (0.95 l/min)
03	40 PSI (2.8 bar)	0.30 GPM (1.14 l/min)
04	40 PSI (2.8 bar)	0.40 GPM (1.52 l/min)
05	40 PSI (2.8 bar)	0.50 GPM (1.89 l/min)
06	40 PSI (2.8 bar)	0.60 GPM (2.27 l/min)
08	40 PSI (2.8 bar)	0.80 GPM (3.03 l/min)
10	40 PSI (2.8 bar)	1.00 GPM (3.79 l/min)
15	40 PSI (2.8 bar)	1.50 GPM (5.68 l/min)
20	40 PSI (2.8 bar)	2.00 GPM (7.57 l/min)



# NOZZLE DESIGN FOR DRIFT CONTROL



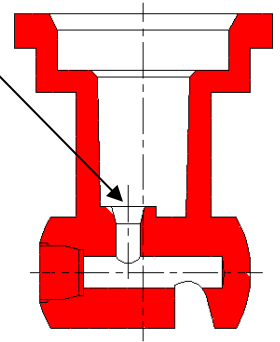
# Drift Reduction Technology



1. Pre-orifice to create pressure drop

2. Venturi effect to produce air-induced, larger droplets =

Air Induction Technology



# Developing Nozzles for Drift Control

- What are the market needs?
- What spray pattern, droplet size spectrum, sizes, etc?
- Maintaining efficacy
- Testing Testing Testing





# Market Needs- New Tip Design

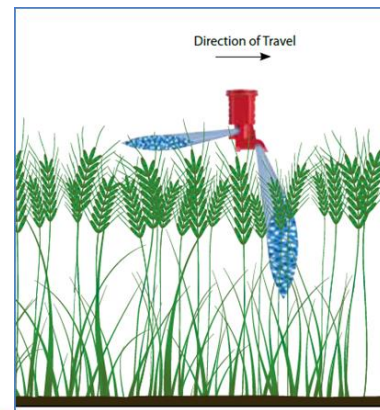
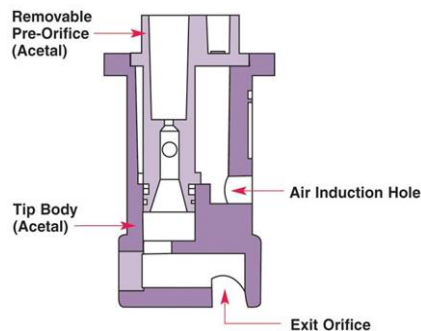
- New Chemical Formulations
  - Potential Issues
  - Chemical Compatibility
- Machinery
  - Bigger, Faster, Stronger
- Responsibility
- Just spray tips?



# Nozzle Design Features

- Drop Size
- Air induction
- Pre-Orifice
- Combination
- Spray angle(s)
- Material

Category	Symbol	Color Code	Approximate Dv0.5 (VDM) (microns)
Extremely Fine	XF	Purple	≈ 50
Very Fine	VF	Red	< 136
Fine	F	Orange	136 – 177
Medium	M	Yellow	177 – 218
Coarse	C	Blue	218 – 349
Very Coarse	VC	Green	349 – 428
Extremely Coarse	XC	White	428 – 622
Ultra Coarse	UC	Black	> 622



# Maintaining Efficacy/Quality - Testing

- Drop size testing
  - Standards
    - ASABE S572.1
  - Laser
    - Oxford Laser
      - Visisizer- PDIA - (Particle Droplet Image Analysis)
  - TeeJet reference nozzles



# Maintaining Efficacy/Quality - Testing

- Distribution
  - JKI institute





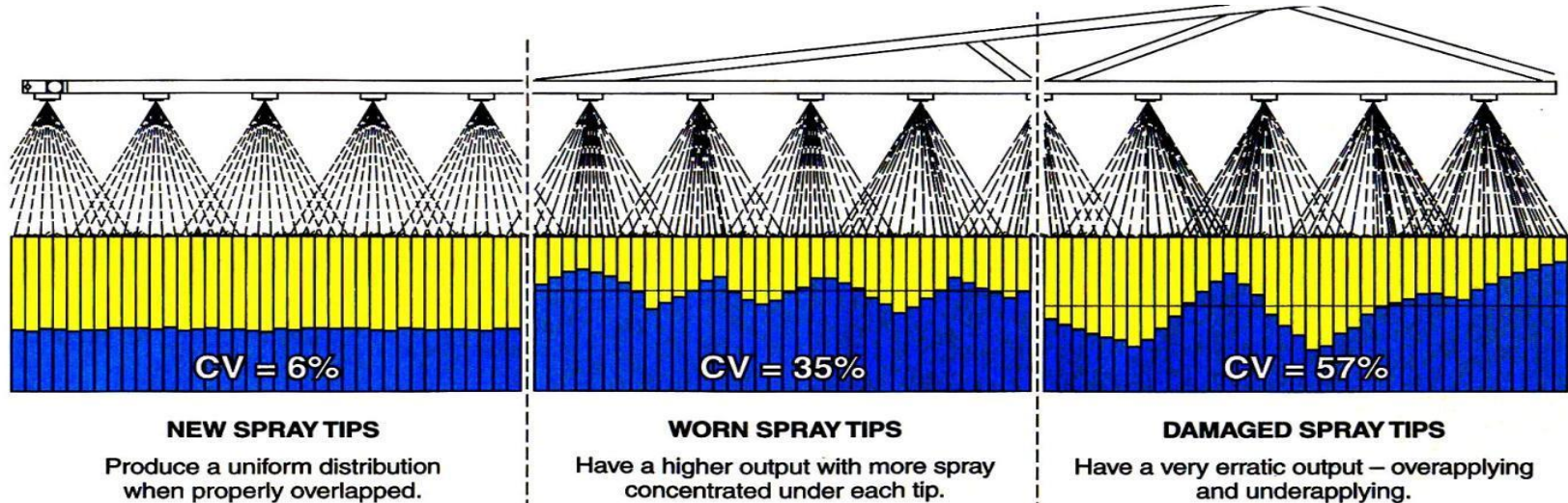
# Tip/Nozzle Wear

## Distribution Test

**New Nozzles**

**Worn Nozzles**

**Damaged Nozzles**





# Nozzle Selection is Key for Efficacy!!

Coverage Vs. Drift Management

How much coverage can I sacrifice for drift control?

Look at your variables

- Product

- Plant

- Speed

- Winds



- Pressure

- Density





# TeeJet® Broadcast Nozzle Selection Guide

	HERBICIDES			FUNGICIDES		INSECTICIDES		DRIFT MANAGE- MENT	PWM NOZZLE CONTROL
	SOIL APPLIED	POST-EMERGENCE		CONTACT	SYSTEMIC	CONTACT	SYSTEMIC		
		CONTACT	SYSTEMIC						
 <b>Turbo TeeJet™</b> Reference page 7		VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	EXCELLENT
 <b>Turbo TeeJet™</b> at pressures below 30 PSI (2.0 bar) Reference page 7	GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	VERY GOOD	EXCELLENT
 <b>Turbo TwinJet™</b> Reference page 16	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	VERY GOOD	EXCELLENT
 <b>Turbo TwinJet™</b> at pressures below 30 PSI (2.0 bar) Reference page 16	VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	EXCELLENT	EXCELLENT
 <b>Turbo TeeJet Induction™</b> Reference page 11	EXCELLENT		EXCELLENT		EXCELLENT		EXCELLENT	EXCELLENT	
 <b>Air Induction Turbo TwinJet™</b> Reference page 17	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	
 <b>AI3070™</b> Reference page 18		VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	
 <b>XR, XRC TeeJet™</b> Reference pages 12–13		EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	GOOD	EXCELLENT
 <b>XR, XRC TeeJet™</b> at pressures below 30 PSI (2.0 bar) Reference pages 12–13	GOOD	GOOD	VERY GOOD	GOOD	VERY GOOD	GOOD	VERY GOOD	VERY GOOD	EXCELLENT
 <b>AIXR TeeJet™</b> Reference page 8	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	





# AIC TeeJet® Air Induction Flat Spray Tips

## Typical Applications:

See selection guide on page 4 for recommended typical applications for AIC TeeJet tips.

## Features:




- Produces a 110° tapered edge flat spray pattern for uniform coverage in broadcast spraying applications.

- Available with a polymer insert holder with stainless steel (015–15 capacities), ceramic (025–05 capacities) or polymer (02–10 capacities) inserts.
- Larger droplets for less drift.
- Depending on the chemical, produces large air-filled drops through the use of a Venturi air aspirator.

- All TeeJet nozzle molded into Quick TeeJet® cap provides automatic spray alignment.
- Includes tightly fitting washer that stays put and assures a good seal.
- Recommended pressure rating 30–115 PSI (2–8 bar).



**Note:** Due to the pre-orifice design, this tip is not compatible with the 4193A check valve tip strainer.

		PSI	DROP SIZE	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	 20°															
						GPA								GALLONS PER 1000 SQ. FT.							
						4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH	15 MPH	20 MPH	2 MPH	3 MPH	4 MPH	5 MPH				
AIC110015 (100)	30	UC	0.13	17	9.7	7.7	6.4	4.8	3.9	3.2	2.6	1.9	0.44	0.29	0.22	0.18					
	40	XC	0.15	19	11.1	8.9	7.4	5.6	4.5	3.7	3.0	2.2	0.51	0.34	0.26	0.20					
	50	XC	0.17	22	12.6	10.1	8.4	6.3	5.0	4.2	3.4	2.5	0.58	0.39	0.29	0.23					
	60	VC	0.18	23	13.4	10.7	8.9	6.7	5.3	4.5	3.6	2.7	0.61	0.41	0.31	0.24					
	70	VC	0.20	26	14.9	11.9	9.9	7.4	5.9	5.0	4.0	3.0	0.68	0.45	0.34	0.27					
	80	VC	0.21	27	15.6	12.5	10.4	7.8	6.2	5.2	4.2	3.1	0.71	0.48	0.36	0.29					
	90	C	0.23	29	17.1	13.7	11.4	8.5	6.8	5.7	4.6	3.4	0.78	0.52	0.39	0.31					
100	C	0.24	31	17.8	14.3	11.9	8.9	7.1	5.9	4.8	3.6	0.82	0.54	0.41	0.33						
AIC11002 (50)	30	UC	0.17	22	12.6	10.1	8.4	6.3	5.0	4.2	3.4	2.5	0.58	0.39	0.29	0.23					
	40	XC	0.20	26	14.9	11.9	9.9	7.4	5.9	5.0	4.0	3.0	0.68	0.45	0.34	0.27					
	50	XC	0.22	28	16.3	13.1	10.9	8.2	6.5	5.4	4.4	3.3	0.75	0.50	0.37	0.30					
	60	VC	0.24	31	17.8	14.3	11.9	8.9	7.1	5.9	4.8	3.6	0.82	0.54	0.41	0.33					
	70	VC	0.26	33	19.3	15.4	12.9	9.7	7.7	6.4	5.1	3.9	0.88	0.59	0.44	0.35					
	80	VC	0.28	36	21	16.6	13.9	10.4	8.3	6.9	5.5	4.2	1.0	0.63	0.48	0.38					
	90	C	0.30	38	22	17.8	14.9	11.1	8.9	7.4	5.9	4.5	1.0	0.68	0.51	0.41					
100	C	0.32	41	24	19.0	15.8	11.9	9.5	7.9	6.3	4.8	1.1	0.73	0.54	0.44						
AIC110025	30	UC	0.22	28	16.3	13.1	10.9	8.2	6.5	5.4	4.4	3.3	0.75	0.50	0.37	0.30					
	40	XC	0.25	32	18.6	14.9	12.4	9.3	7.4	6.2	5.0	3.7	0.85	0.57	0.43	0.34					
	50	XC	0.28	36	21	16.6	13.9	10.4	8.3	6.9	5.5	4.2	0.95	0.63	0.48	0.38					
	60	XC	0.31	40	23	18.4	15.3	11.5	9.2	7.7	6.1	4.6	1.1	0.70	0.53	0.42					



# INDUSTRY INVOLVEMENT AND COOPERATION

Who, what, when, where, why



# Who Does TeeJet Cooperate With???

- Distributors/Dealers
- Equipment Manufacturers
- Universities
  - Profs., Research staff, etc.
- Chemical Companies
- Professional Organizations
- Note: All involvement done globally





# What We Do To Cooperate

- Lab/Field Testing
- Sprayer Upgrades
- Dealer Days
- Plot Experiments
- Co-Branding Marketing
- Host/Participate in Trainings



# When...

All Year Round



# Where???

All over the world



# Why Cooperate?

- Educating the market is more important than ever
- Ag. Industry feeds the world's population
- We're proud of what we do
- It's good business



# Cooperation with Influential Personnel





# Current Issues/Trends

- New Formulations/Seed Traits
  - Potential Concerns for drift
  - Glyphosate/Dicamba Mixes
  - Glyphosate/2,4-D




# What Drove This?

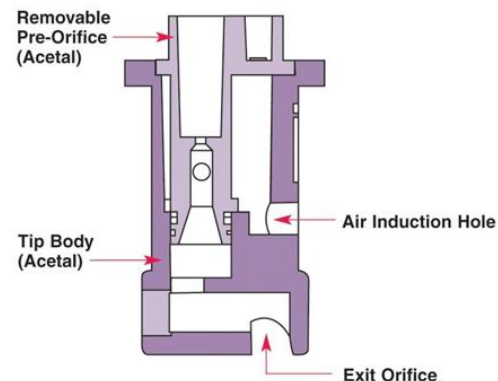
- Potential Problems
  - Drift
    - Particle and Vapor
  - Tank Rinsing
  - Non-tolerant varieties
  - Lack of applicator knowledge (and industry)



# Enter Drift Reduction Nozzles

## 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 (TTI)




XR Flat Fan Nozzle






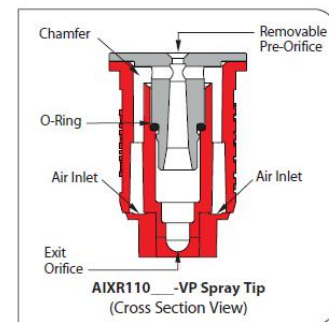
# AIC and AIXR Nozzles

AIC TeeJet® (AIC)

	PSI										
	30	35	40	45	50	55	60	70	80	90	100
AIC110015	UC	XC	XC	XC	XC	XC	VC	VC	VC	C	C
AIC11002	UC	UC	XC	XC	XC	XC	VC	VC	VC	VC	C
AIC110025	UC	UC	XC	XC	XC	XC	XC	VC	VC	VC	C
AIC11003	UC	UC	XC	XC	XC	XC	XC	VC	VC	VC	C
AIC11004	UC	UC	XC	XC	XC	XC	XC	VC	VC	VC	C
AIC11005	UC	UC	XC	XC	XC	XC	XC	VC	VC	VC	VC
AIC11006	UC	UC	UC	XC	XC	XC	XC	XC	VC	VC	VC
AIC11008	UC	UC	UC	UC	XC	XC	XC	XC	VC	VC	VC
AIC11010	UC	UC	UC	UC	XC	XC	XC	XC	XC	VC	VC
AIC11015	UC	UC	UC	UC	XC	XC	XC	XC	XC	VC	VC

AIXR TeeJet® (AIXR)

	PSI										
	15	20	25	30	35	40	50	60	70	75	90
AIXR110015	XC	XC	VC	C	C	C	C	C	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





**NEW NOZZLE TECH.**



# Variable Rate Applications –Liquid Fert.

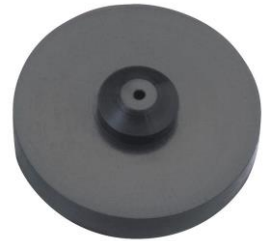
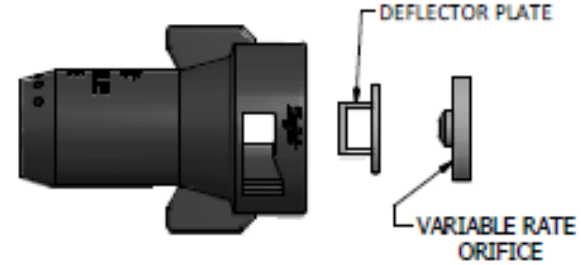


# Variable Rate Tech.

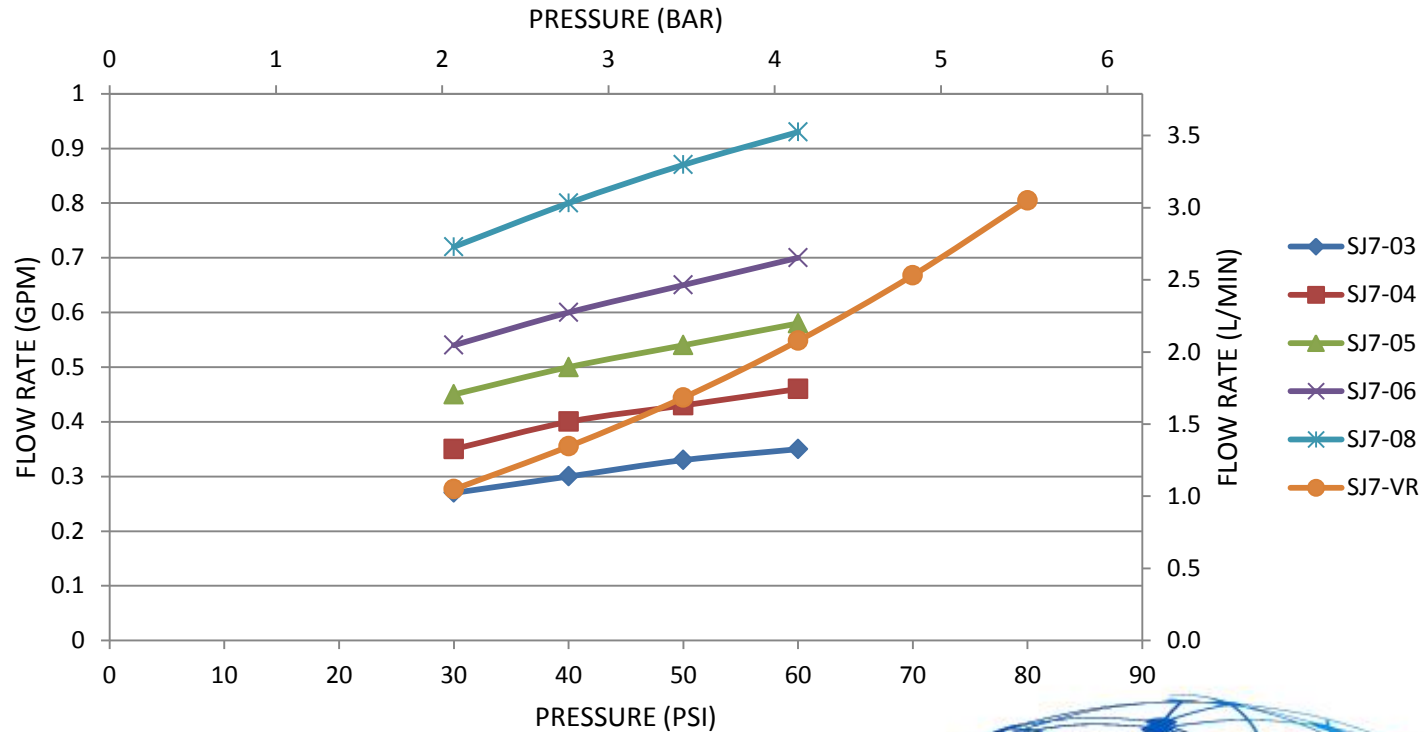
- Increasing in popularity
- Tech services companies growing
- Mapping in GPS



# SJ7-VR –Variable Rate Nozzle



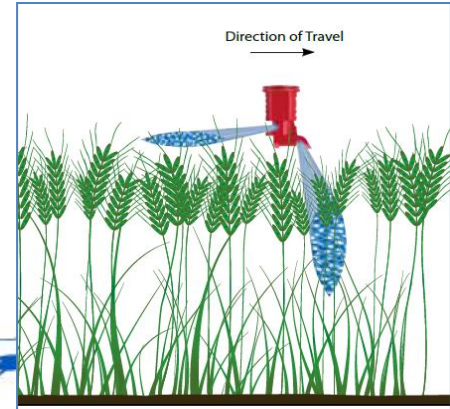
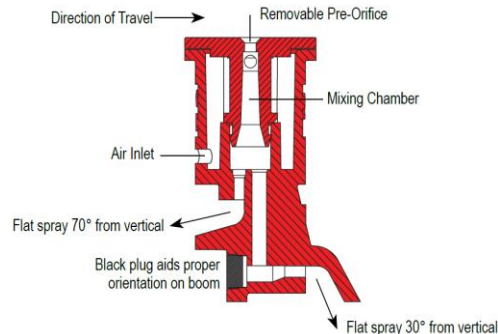
# SJ7-VR VS STANDARD SJ7





# Air Induction 3070

- Applications
  - Broadcast spraying, fungicide applications in cereal crops, targeted at seed head diseases, (i.e. Fusarium Head Blight)
- Features and Benefits
  - Dual Air Induction spray patterns: 30° forward, 70° backward
  - Wide operating pressure 20 - 90 psi (1.5 - 7 bar)



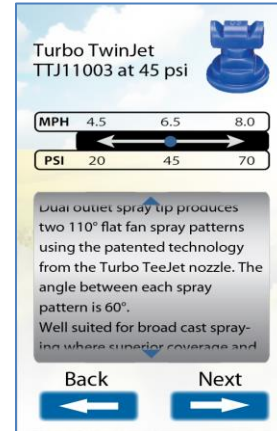
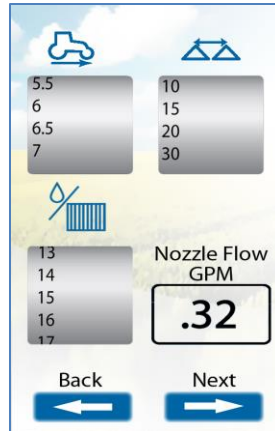
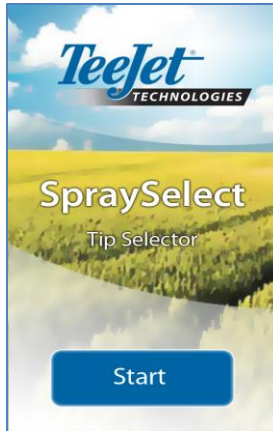
# High Capacity Tips- Big Potential

- Turbo TwinJet:
  - TTJ60-11008VP
  - TTJ60-11010VP
- Turbo TeeJet: Coming Soon!
  - TT11010-VP
  - TT11012-VP



# SpraySelect- nozzle selection app

- User inputs speed, spacing, target rate
- Input fertilizer density, where applicable
- User selects droplet size or application type
- Outputs top tip recommendations with pressure



# IT'S NOT JUST NOZZLES!

New tech. for modern spraying



# Limitations of Sprayer with Rate Controller

- Inconsistent droplet size application
- Narrow application speed range
- Narrow choice of application rate for variable rate application

<b>TT11004 (50)</b>	15	XC
	20	VC
	30	C
	40	C
	50	C
	60	C
	75	M
	90	M





# Introducing...DynaJet Flex 7120

- Maintains droplet size at changing speeds or application rates
- Sprayer control maintains application rate via regulating valve.....  
.....and DynaJet maintains pressure via changing nozzle flow



# Application Rate Technology

Type of Spraying	Constant	Speed Range	Rate	Pressure	Droplet Size
Speed & Pressure	Pressure	Fixed	Constant	Constant	Constant
Rate Controller	Rate	2:1 Range	Constant	Changes with speed	Changes with Pressure
DynaJet	Rate & Pressure (Droplet Size)	8:1 Range	Constant	Constant	Constant



**CAN WE DO MORE?**



# Yes and we want to...

- Trade Shows, Seminars, Symposiums, Conferences
- Support Calls
- We want to know everyone
  - Application specialists, product managers (technical), agronomists, sales reps
  - Researchers, consultants, university personnel



# What we Discussed...

- Nozzle evolution
- Nozzle design for drift control
  - Pressure Drop/ Air Induction
- Ag. Industry involvement/cooperation
  - Working with all in the ag. industry
- The future...
  - It's more than nozzles





# Thank You

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