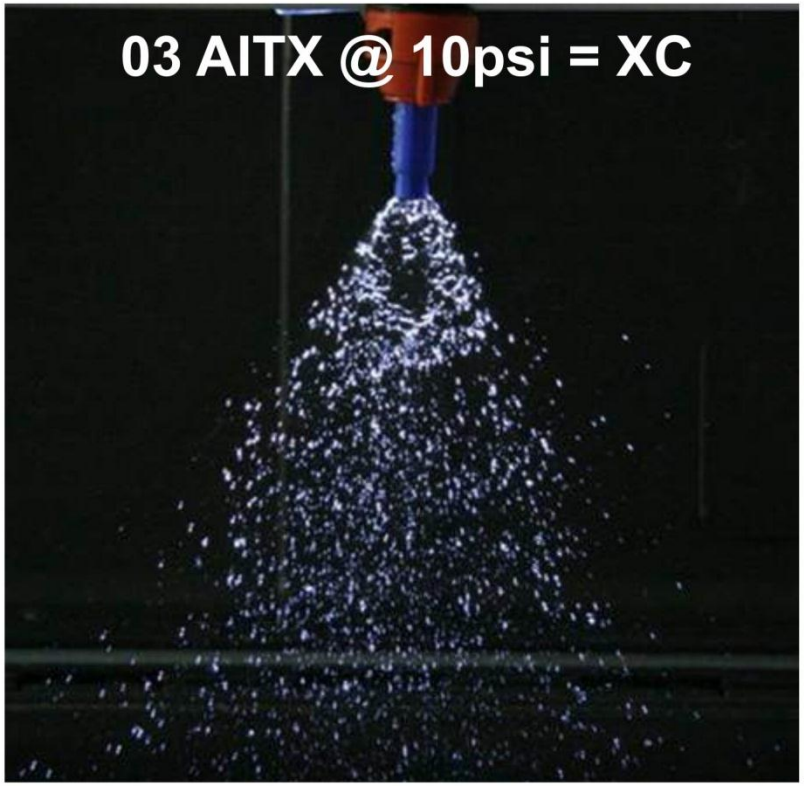
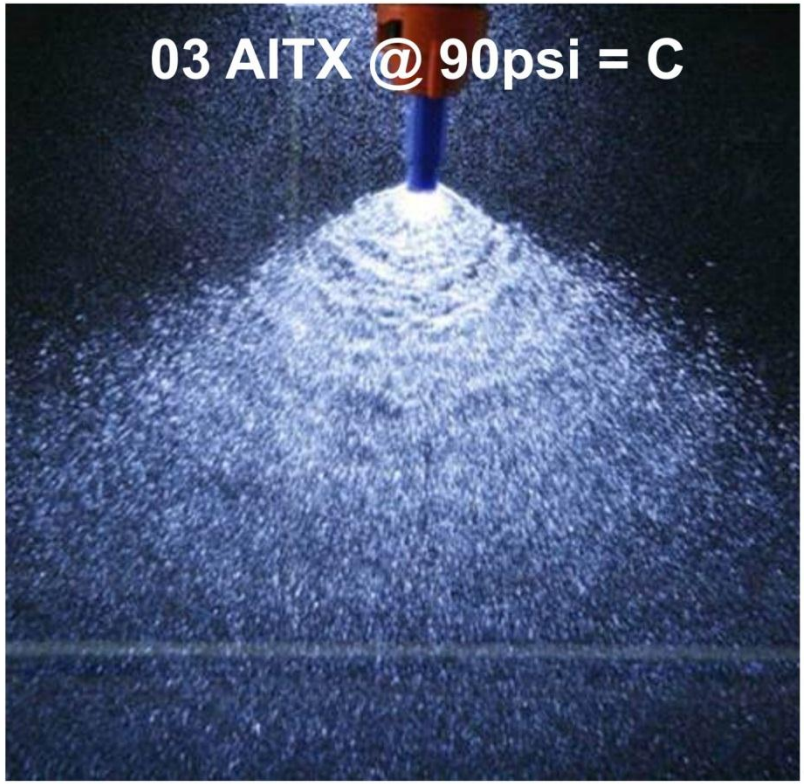
Under Pressure

The impact of pressure on spraying





Photos: Dr. Tom Wolf, Agrimetrix Research & Training

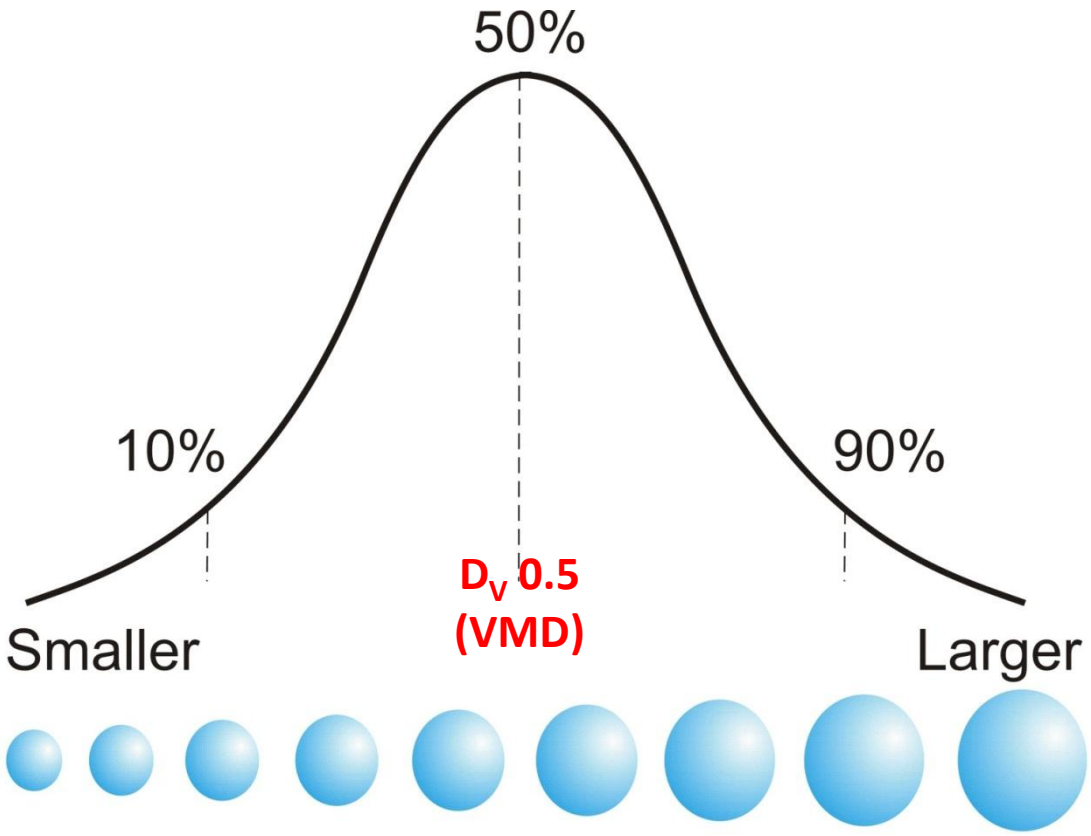
Jason Deveau

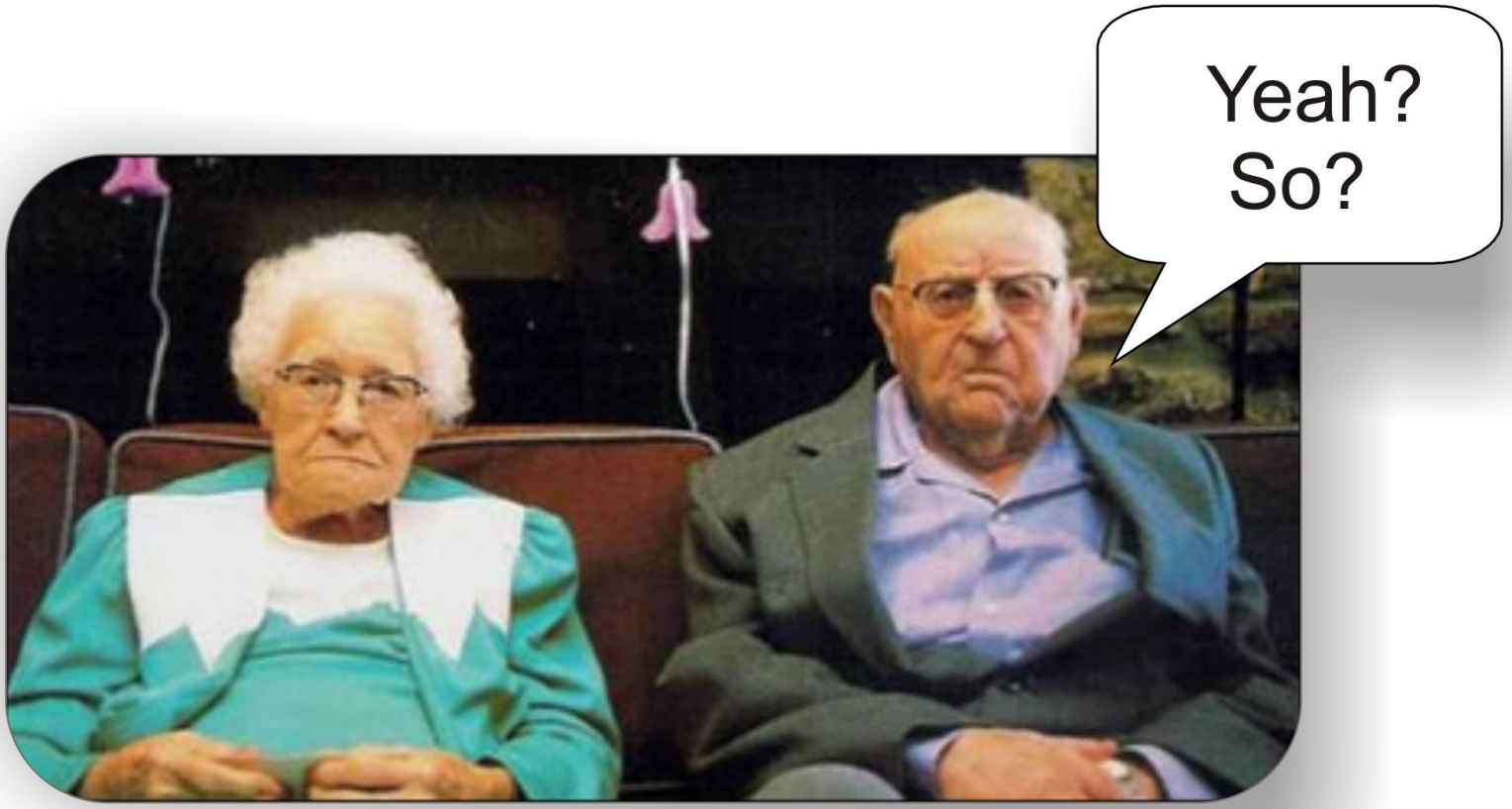
OMAFRA, Simcoe

@spray_guy

Droplet sizes

- A single nozzle produces a range of droplet sizes
- The median droplet size (VMD) changes with pressure
- Rate controllers adjust pressure according to travel speed…





- You've heard it before, but it's more important than ever

Droplet size and the label: Enlist Duo

Dow AgroSciences

Enlist Duo™ Herbicide

GROUP	4	9	HERBICIDES

Ground Application - Cropland

Apply 50 to 200 L of spray solution per hectare depending on the type of application equipment used. Use sufficient water for even distribution. Spray at low pressures (200 to 275 kPa) when the weeds are actively growing.

Droplet Size: Apply as a coarse to extremely coarse spray (ASABE S-572 Standard). Use drift reducing nozzle tips in accordance with manufacturer directions that produce a droplet classification of coarse to extremely coarse to significantly reduce the potential for drift.

Refer to the Product Use Guide for further information.

coarse to extremely coarse spray

Droplet size and the label: XtendiMax

PMRA Approved Label
2013-6791
2015-06-18

GROUP	4	HERBICIDE

XtendiMax™ with VaporGrip™ Technology

HERBICIDE

SOLUTION

COMMERCIAL (AGRICULTURAL)

GUARANTEE: Dicamba, present as diglycolamine salt ..... 350g a.e./L

REGISTRATION NO. 31896 **PEST CONTROL PRODUCTS ACT**

extremely coarse to ultra coarse

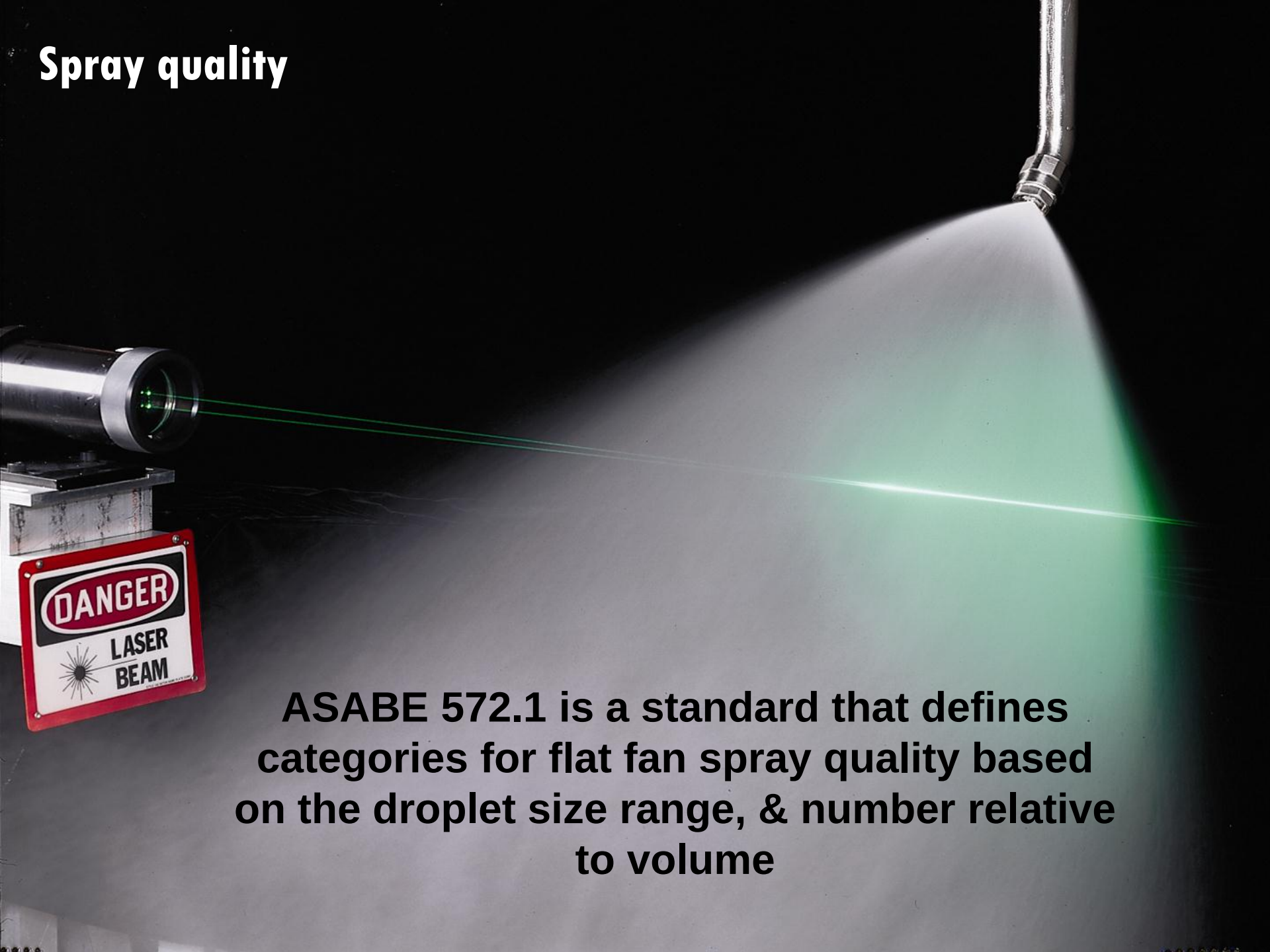
Controlling Droplet Size

The most effective way to reduce drift potential is to apply large droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if the application is made improperly, or under unfavorable environmental conditions (see the **"Wind Speed and Direction", "Temperature and Humidity"** and **"Temperature Inversions"** sections of this label).

- **Nozzle type**. Use only spray nozzles that produce ~~very coarse~~ to ultra coarse spray droplets and minimal amounts of fine spray droplets as defined by the American Society of Agricultural and Biological Engineers (ASABE S-572.1). Do not use conventional flat fan nozzles that produce medium droplets.

  Check nozzle manufacturer's recommendations to determine the proper droplet spectrum, operating pressure, boom height, nozzle spacing and ground speed that will deliver the desired droplet size and spray volume of at least 100 L/ha for the very coarse to ultra coarse nozzle that is selected.

Spray quality



ASABE 572.1 is a standard that defines categories for flat fan spray quality based on the droplet size range, & number relative to volume

Spray quality categories

- Most nozzle manufacturers voluntarily comply with this standard and provide spray quality information

CATEGORY	SYMBOL	Dv0.5 (VMD) µm
Extremely Fine	XF	~50
Very Fine	VF	<136
Fine	F	136 - 177
Medium	M	177 - 218
Coarse	C	218 - 349
Very Coarse	VC	349 - 428
Extremely Coarse	XC	428 - 622
Ultra Coarse	UC	>622

TeeJet AI TwinFan

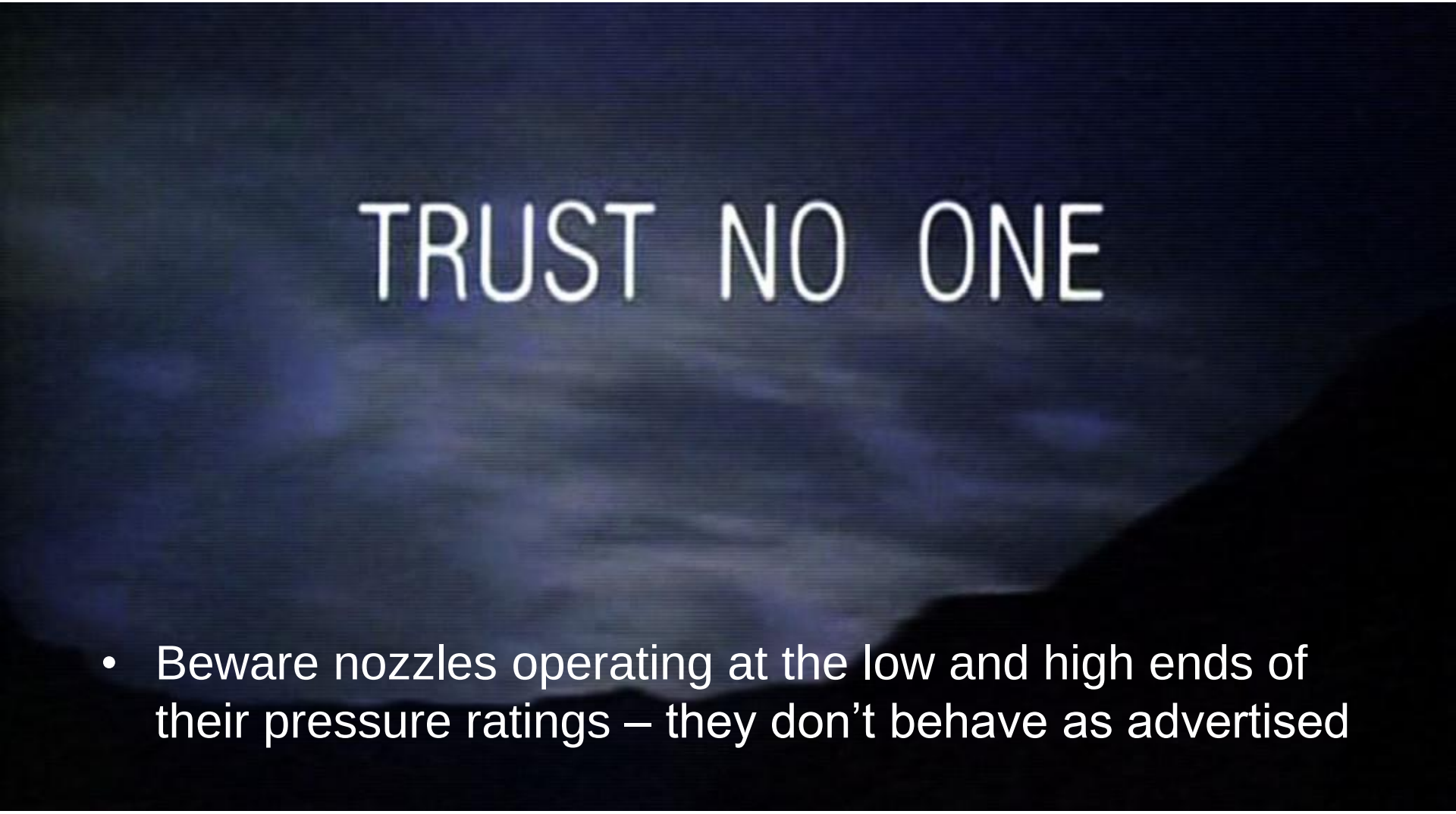
- ID may be hidden under cap

- Note AI spray quality vs. conventional

TIP NO. (strainer screen size)	PSI	DROP SIZE FOR AITTJ60	DROP SIZE FOR TTJ60	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	20" GPA 4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH	15 MPH	20 MPH	GALLONS PER 1000 SQ. FT. 2 MPH	3 MPH	4 MPH	5 MPH
06 GRAY (50)	20	UC	XC	0.42	54	31	25	21	15.6	12.5	10.4	8.3	6.2	1.4	0.95	0.71	0.57
	30	XC	VC	0.52	67	39	31	26	19.3	15.4	12.9	10.3	7.7	1.8	1.2	0.88	0.71
	40	XC	C	0.60	77	45	36	30	22	17.8	14.9	11.9	8.9	2.0	1.4	1.0	0.82
	50	VC	C	0.67	86	50	40	33	25	19.9	16.6	13.3	9.9	2.3	1.5	1.1	0.91
	60	VC	C	0.73	93	54	43	36	27	22	18.1	14.5	10.8	2.5	1.7	1.2	0.99
	70	C	C	0.79	101	59	47	39	29	23	19.6	15.6	11.7	2.7	1.8	1.3	1.1
	80	C	C	0.85	109	63	50	42	32	25	21	16.8	12.6	2.9	1.9	1.4	1.2
	90	C	C	0.90	115	67	53	45	33	27	22	17.8	13.4	3.1	2.0	1.5	1.2

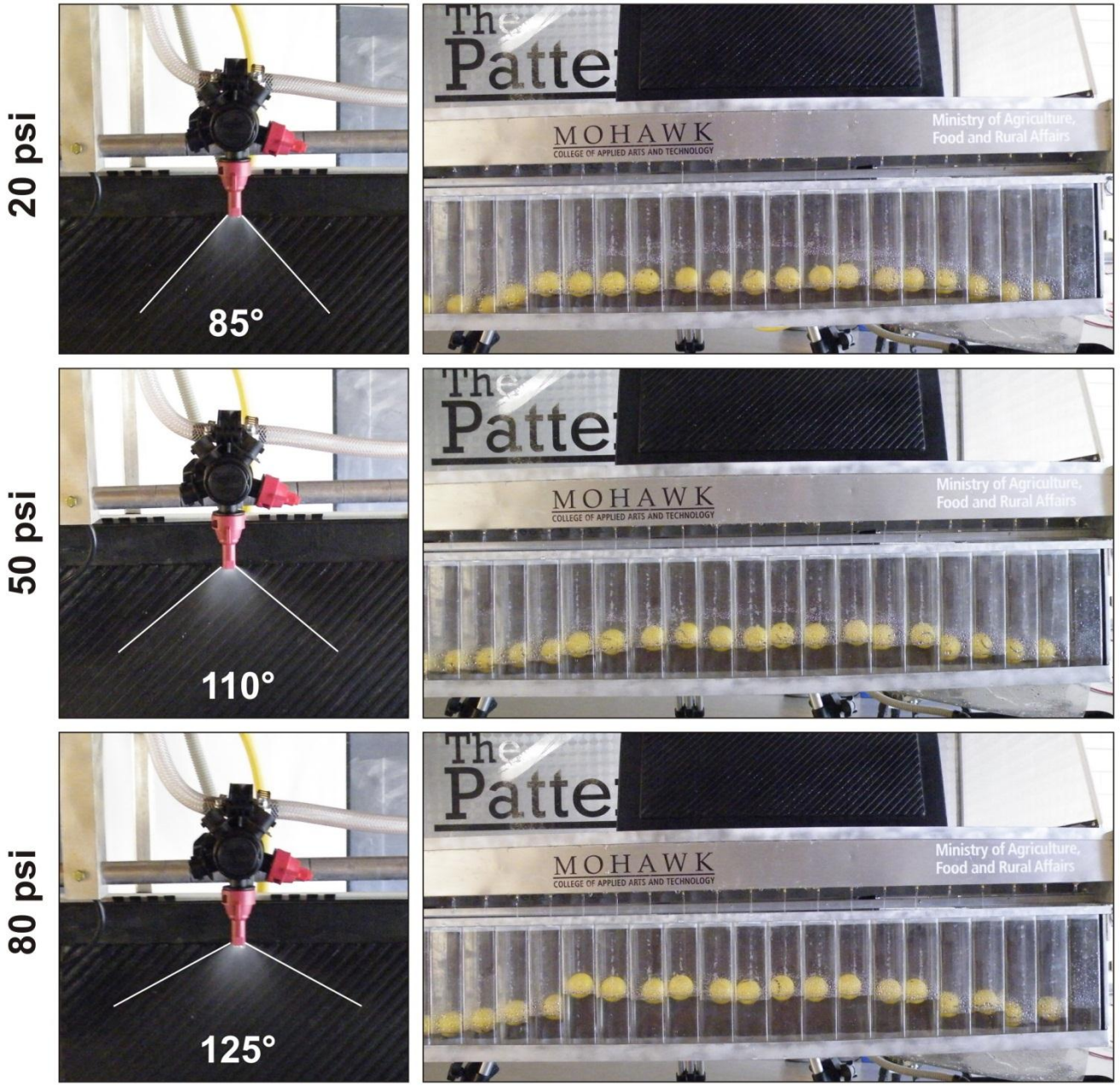
EF	VF	F	M	C	VC	XC	UC	Droplet Size Categories
EXTREMELY FINE	VERY FINE	FINE	MEDIUM	COARSE	VERY COARSE	EXTREMELY COARSE	ULTRA COARSE	may vary with nozzle capacity, spray angle and spray pressure

However, the X-Files was right…

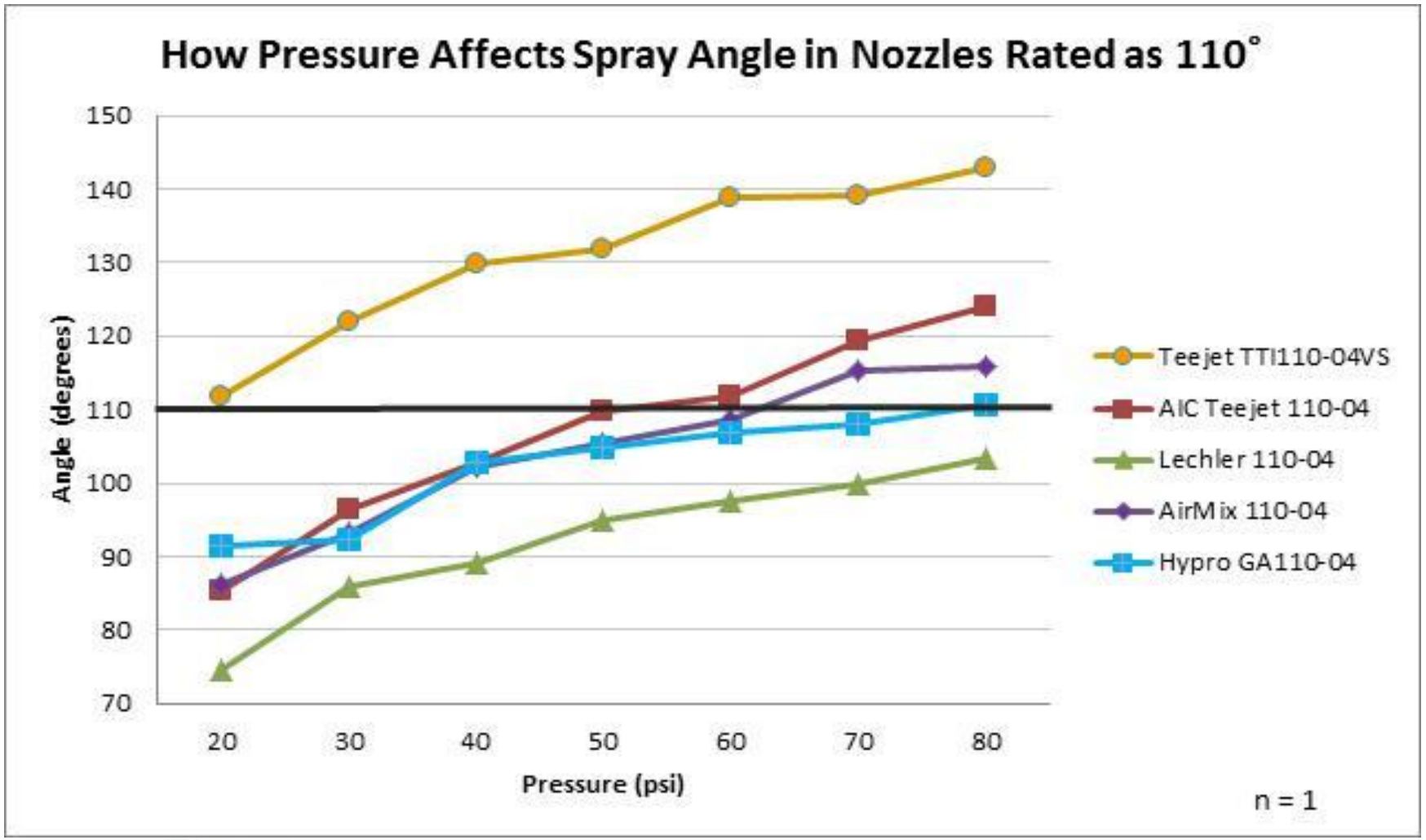


- Beware nozzles operating at the low and high ends of their pressure ratings – they don’t behave as advertised

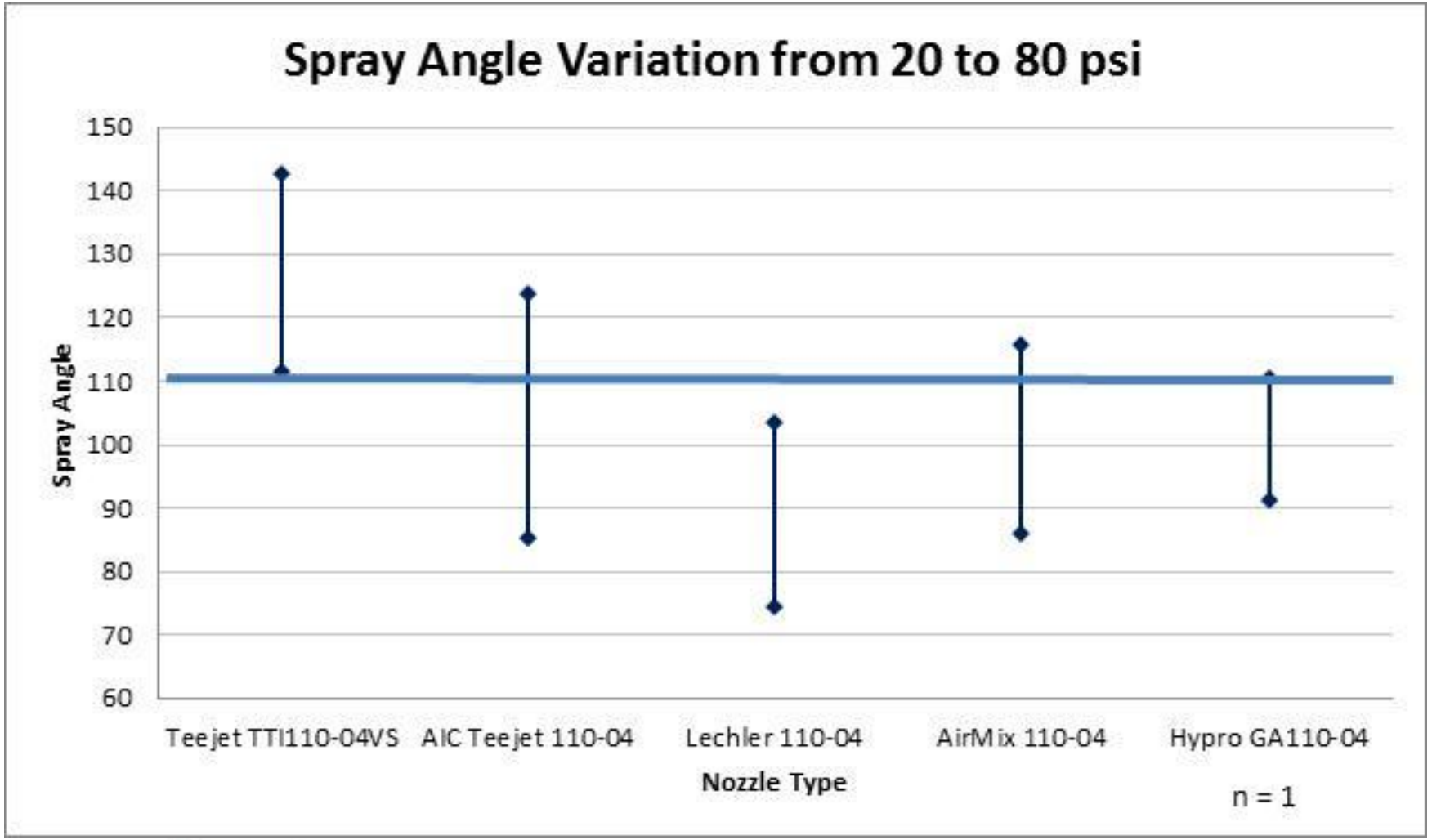
- Most 110° AI nozzles rated from ~30 psi
- Fan angle changes a lot over pressure range
- Nozzle spacing / boom height does not



TeeJet AIC 110 04 – work performed by Victoria Radauskas, OMAFRA summer student



- These are all “110’s”…



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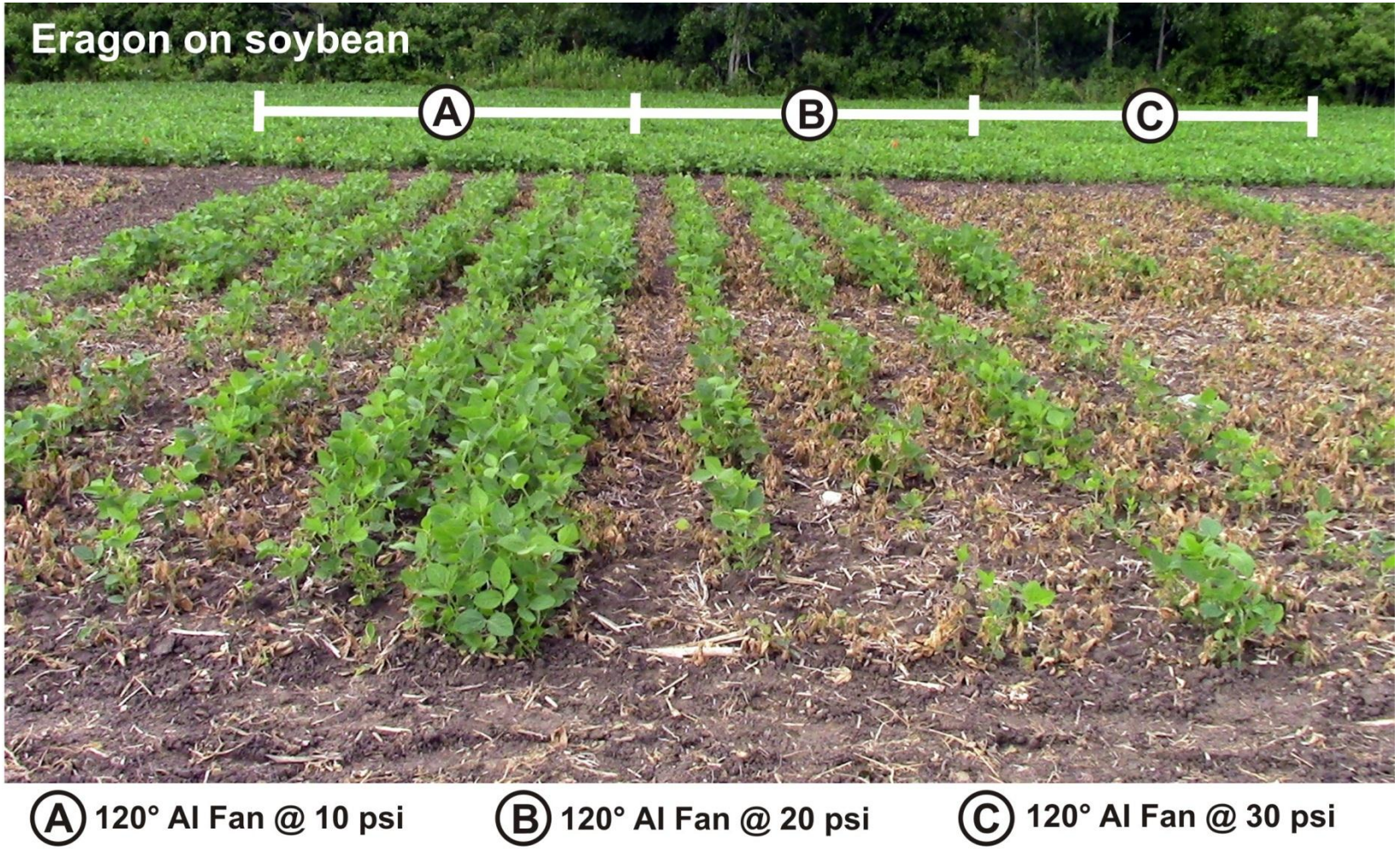
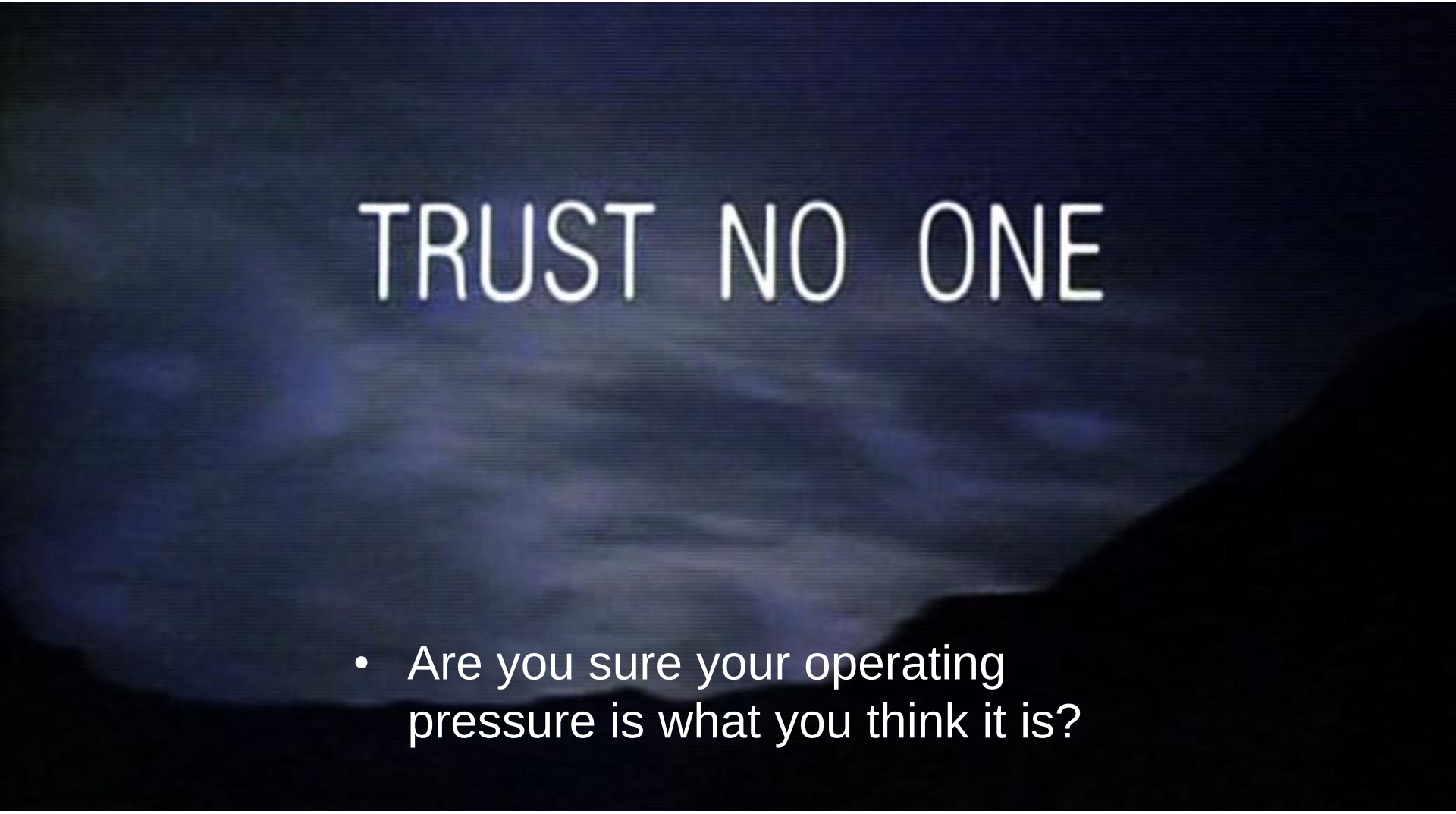


- Nozzle spacing, boom height and fan overlap matter
- Even at 100% overlap, spray quality & volume matter, too

So, to get good coverage

- Determine typical spray pressure range for driving speed
- Check nozzle tables to confirm nozzle is in middle of pressure range and producing desired spray quality
- Eyeball the boom - less than 100% overlap at low end of range? Adjust pressure & boom height, or maybe switch nozzle rates
- Failing that, consider re-plumbing the boom to adjust nozzle spacing

Again? Seriously…?



- Are you sure your operating pressure is what you think it is?

Friction = Pressure Drop

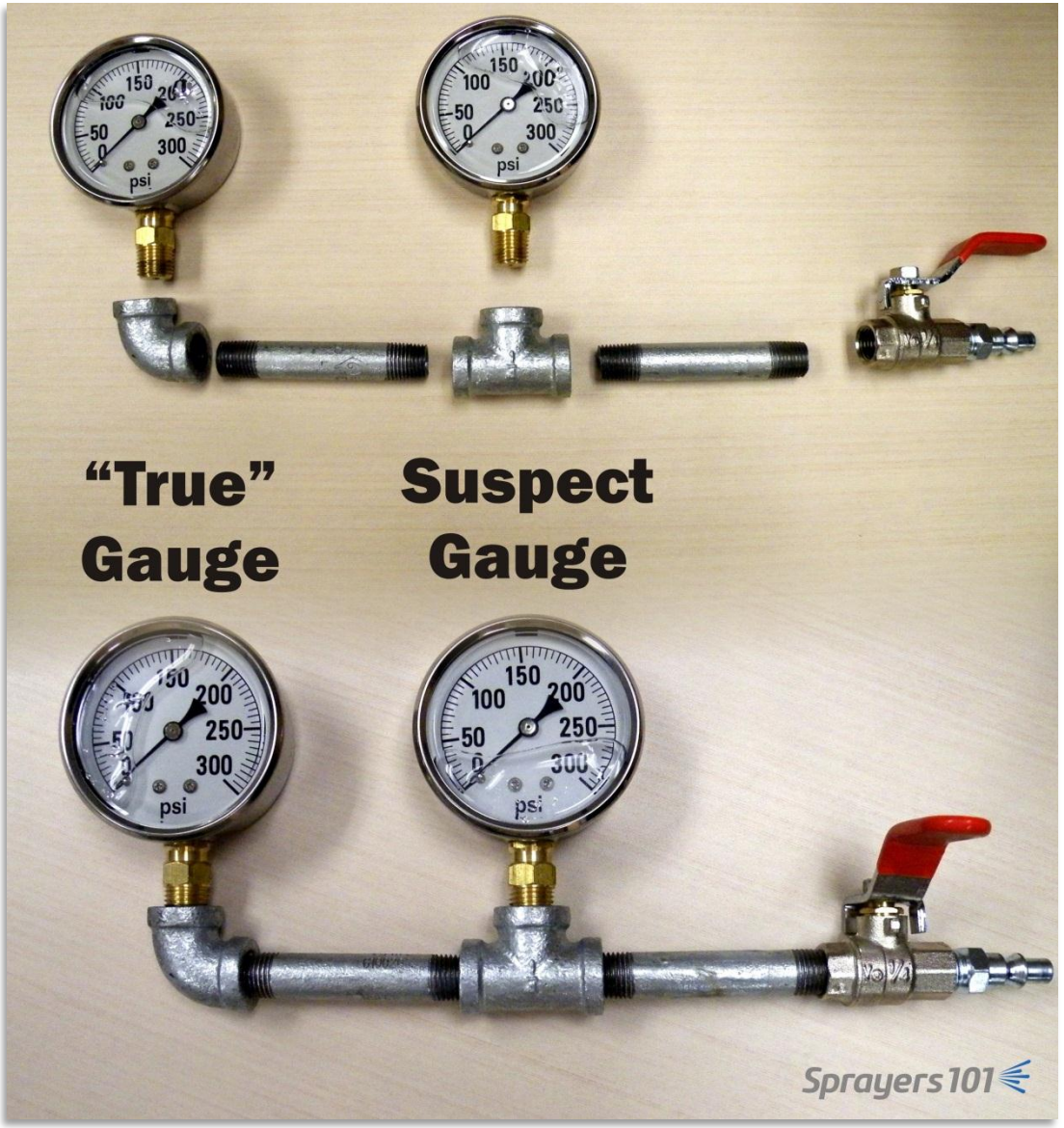
Friction = Pressure Drop

- PWM can create up to 10 psi drop, although manufacturer says it's accounted for

Photo: Dr. Tom Wolf, Agrimetrix Research & Training

Test your gauges

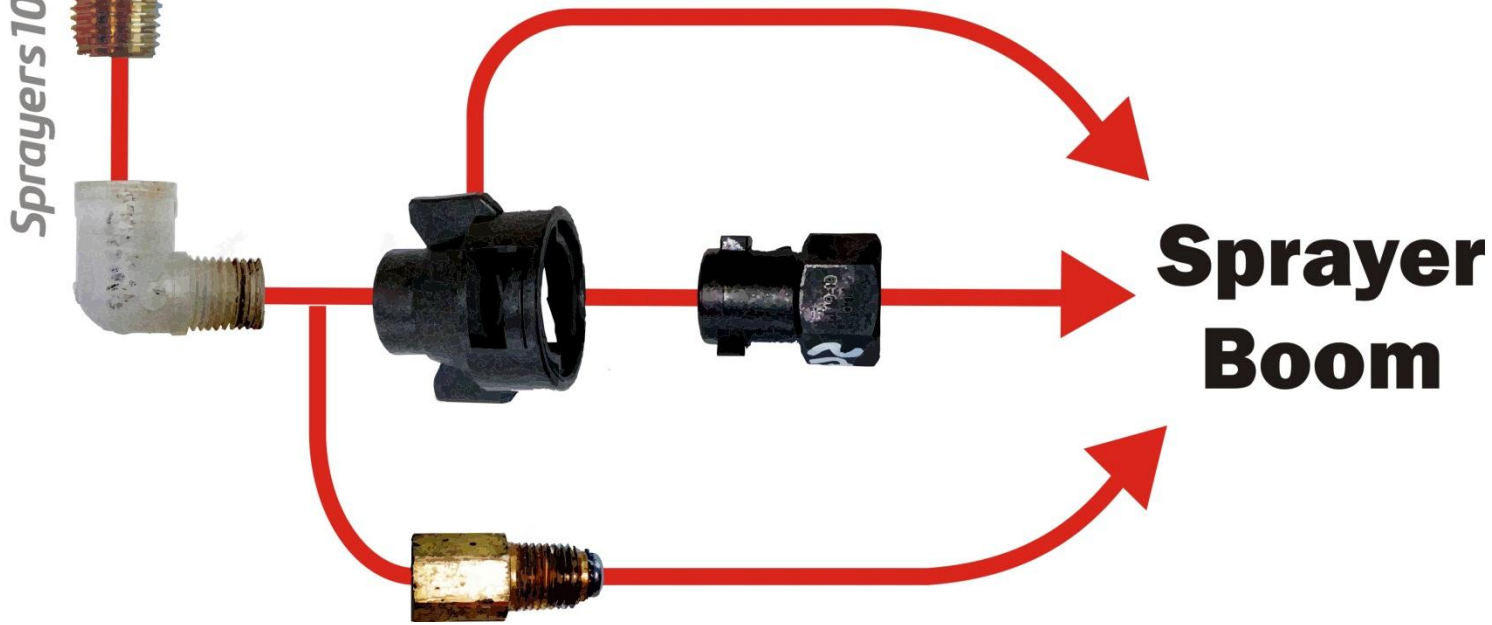
- Build your own cheap and easy pressure gauge tester



http://sprayers101.com/confirm-sprayer-pressure/

Test your boom / section pressure & correct it

1. Select highest flow nozzles
2. Set typical operating pressure (target output / travel speed)
3. Test each section
4. Average and account for difference (minimum?)



"Punk'in" sprayer – New Hampshire

- We set the regulator at 160 psi
- Tested relative nozzle output
- Output on one section made no sense…
- Tested section pressure = only 150 psi
- Hose / barb diameter?

So, to get good coverage – v.2

- Confirm and correct for pressure gauge accuracy / section pressure
- Determine typical spray pressure range for driving speed
- Check nozzle tables to confirm nozzle is in middle of pressure range and producing desired spray quality
- Eyeball the boom - less than 100% overlap at low end of range? Adjust pressure & boom height, or maybe switch nozzle rates
- Failing that, consider re-plumbing the boom to adjust nozzle spacing

To learn more about spraying,
subscribe to
www.sprayers101.com

Sprayers101

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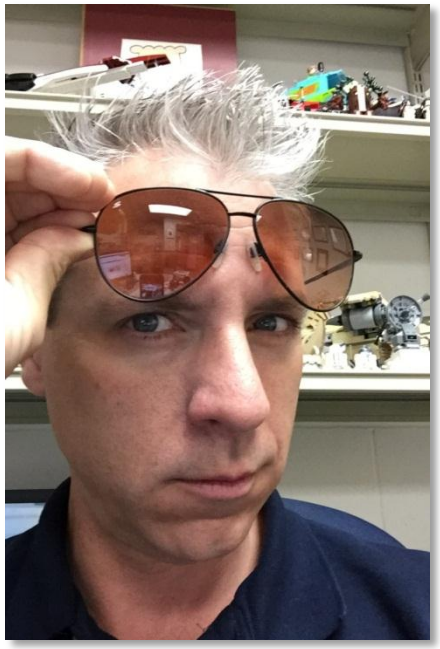

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