

California Strawberry Commission Update Fall 2018

Dan Legard – VP Research and Education

Topics

- Sprayer Calibration Program Update
- Strawberry Center Automation Program Update
 - Spray Rig Optimization
 - Lygus Vacuum Improvement

Sprayer Calibration and Maintenance



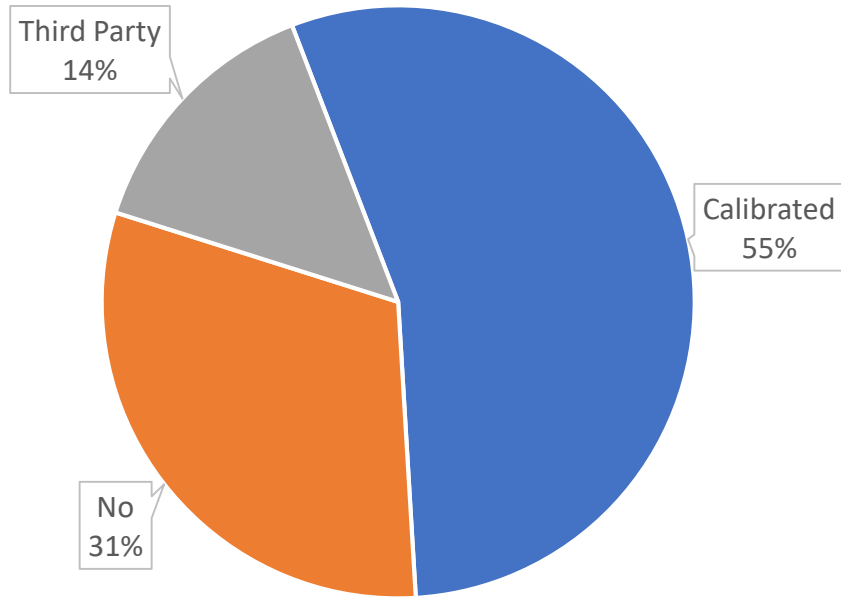
Sprayer Calibration Program

- Changed program from large group trainings to on-farm training and calibration for individual growers.
- Goal is to get 90% of the industry's sprayer's calibrated
- Develop tools to enable growers to calibrate and maintain sprayer's themselves
 - Develop a strawberry specific calibration APP (BASF)
 - Create training videos showing calibration and maintenance procedures (YouTube)
 - Worksheets and reminder stickers for use in field

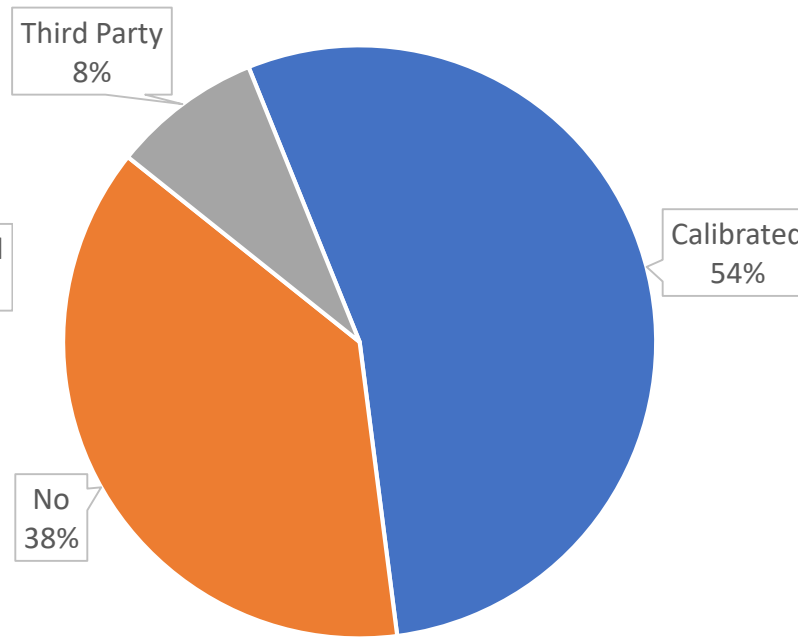
Current Status of On Farm Calibration

Ranches Calibrated in Each District

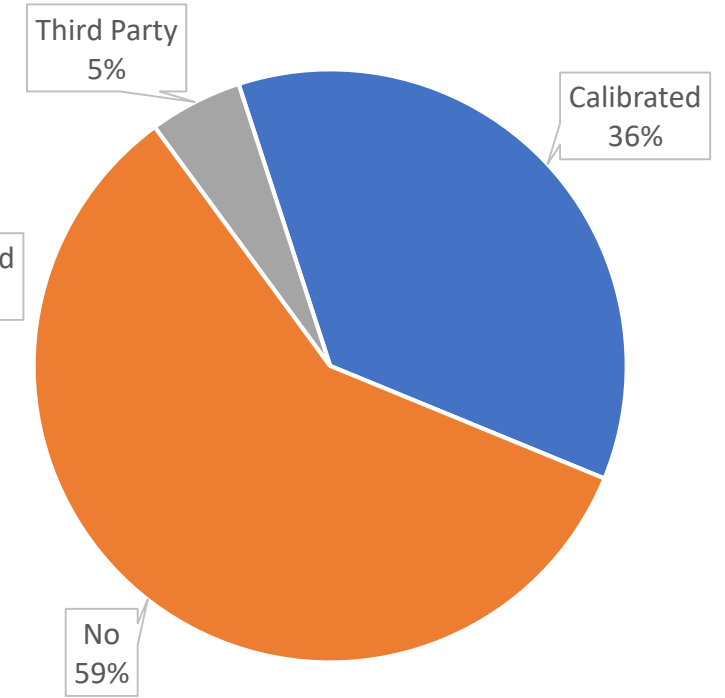
Oxnard



Santa Maria

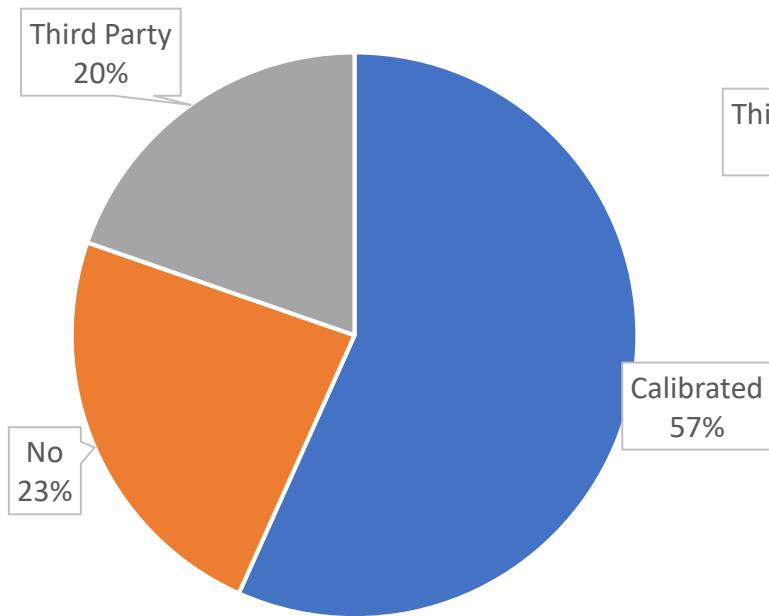


Watsonville

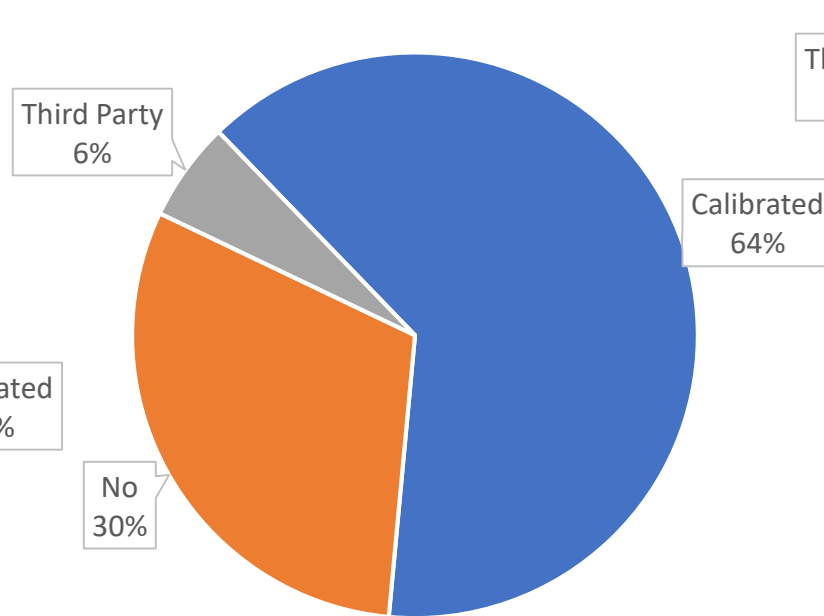


Acres Covered by Calibrated Sprayers

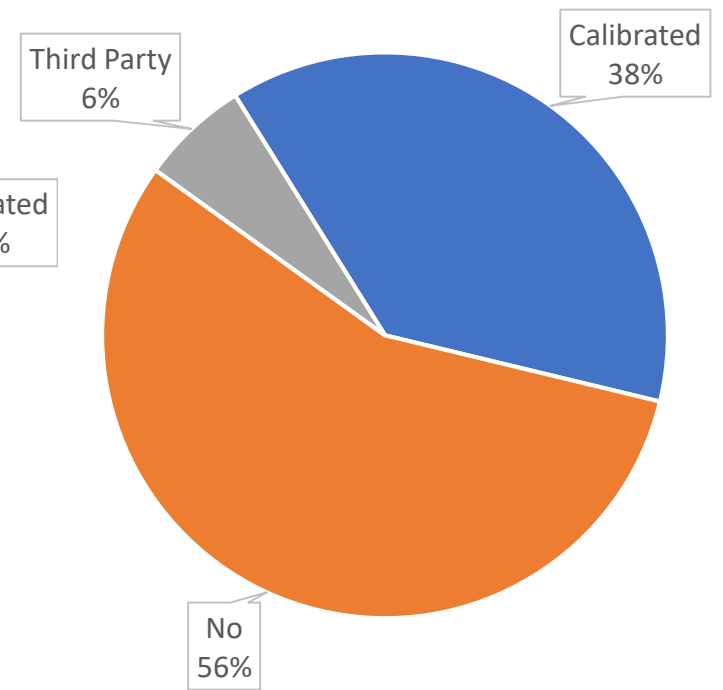
Oxnard



Santa Maria



Watsonville



Tools Development for Calibration Program

BASF QuickCalc App

- Collaboration with BASF
- English/Spanish
- Specific for strawberry industry in CA
- Walks through SOP for calibration
- Tells when to replace nozzles
- GPA results

Sprayer Calibration App

AT&T Wi-Fi 3:33 PM 69%

BASF
We create chemistry

Load Clear Save

Step 1. Nozzle Types ▾

Please enter the number of nozzles per bed and pressure level used for each nozzle type.

Number of Nozzles per Bed

Operating Pressure (PSI)

Mean Output (fl oz/min)
0

Albus ATR80 - Green

Number of Nozzles per Bed

Operating Pressure (PSI)

Mean Output (fl oz/min)
0

Albus ATR80 - Lilac

Number of Nozzles per Bed

← Back Next →

AT&T Wi-Fi 3:33 PM 68%

BASF
We create chemistry

Load Clear Save

Step 3. Nozzle Output ▾

1. Run sprayer and wait until a pressure gauge on the boom reaches the appropriate operating pressure.
2. Using containers that measure in ounces (oz.), collect water from collection points at each section of the boom (right, middle, left) for 30 seconds. If you are collecting output from a single nozzle, please double the amount collected for 30 seconds to get to fl. oz. per minute. A minimum of 3 collections should be made across all sections.

Measurements (fl oz/min)

Catch Number	Number of Nozzles (in catch)	Volume caught (fl oz/min)
1	-- ▾	<input type="text"/>
2	-- ▾	<input type="text"/>
3	-- ▾	<input type="text"/>
4	-- ▾	<input type="text"/>

← Back Next →

AT&T Wi-Fi 3:36 PM 68%

Albus ATR80 - Lilac

There is a 20.65% difference between your nozzle output and the manufacturer specifications. It is suggested that the nozzles be replaced.

Close

200

Mean Output (fl oz/min)
20.32

Nozzle Output (fl oz/min)

Don't know your nozzle output? Click here.

← Back Next →

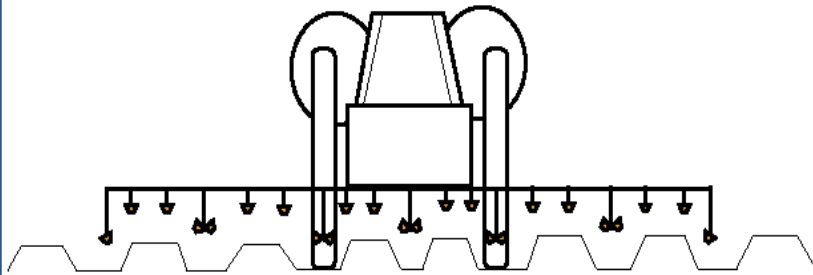
Sample Montage of Explainer Video



Manual

Sprayer Calibration Manual

August 2018



CALIFORNIA
STRAWBERRY
COMMISSION

Sticker

Preparation

Personal protective equipment, rinse sprayer, assign roles to team

System Check

Check, clean, & replace filters, hoses, cabin pressure regulator

Boom Check

Check, clean & replace nozzles, filters

Confirm Pressure Uniformity

Right, middle, and left sides of boom are consistent with cabin pressure

Calculate Nozzle Output

Run sprayer, collect water from each boom section (R,M,L), compare output to factory specifications

Calculate Tractor Speed

Average time to drive 100 ft while spraying

Calculate Application Rate

Enter Data into app or formula



Automation Program: Spray Rig Optimization

Dr. John Lin

Caleb Fin

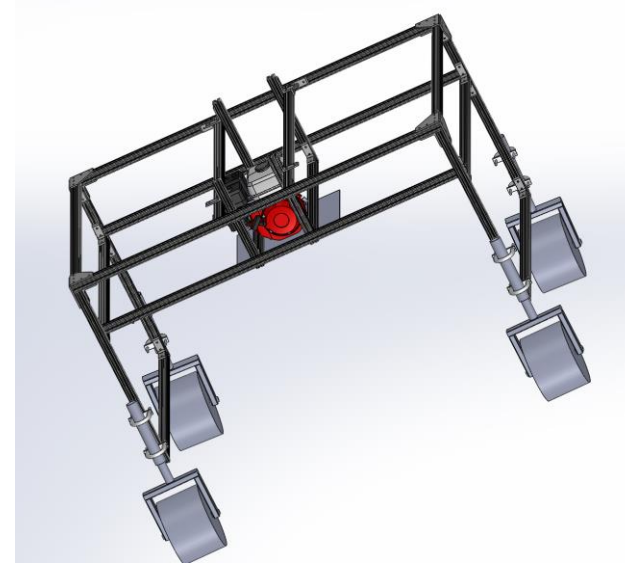
Cal Poly Strawberry Center Automation Program

Sprayer Optimization Objectives

- Reduce Drift and Improve Stabilization:
 - Drifting particles – smaller particles susceptible to being taken by winds
 - Particles should be in the canopy or on the ground but not in the air
 - Boom stabilization – reducing variation in boom height across field.
 - Consistency in spray across beds and field
- Evaluate in grower fields with spray card trials

Test Rig Design

- Gas Engine Powered
- Pressure Compensated
- 2 Spray Booms
- 20 nozzles
- Pulled by tractor
- Balloon wheels to dampen vibrations



Spray Rig vs Grower Standard 8/30/2018

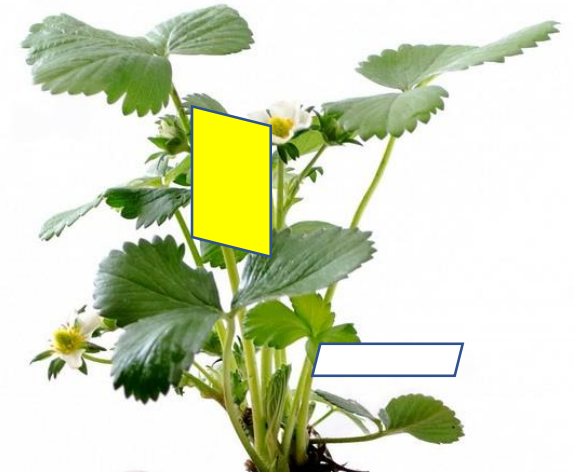
CP	vs	GS
		XXXXXXXXXX
250	psi	
133	GPA	133
16	# Nozzles	18
XR Teejet 11001VS	Nozzle	
Flat Fan	Type	Flat Fan
2	# Booms	1
8	Nozzles/Boom	18
45° inwards (booms toward each other)	Boom Angle	NA
inwards	Boom Direction	NA
0" (at top of canopy)	Boom Height	~7" above canopy
	Tractor Speed	3.4mph



Spray Card Trials

- Cards determine canopy coverage
- Water sensitive cards
- Sensitive side placed away from approaching boom, challenging the sprayer

Vertical and Horizontal Cards



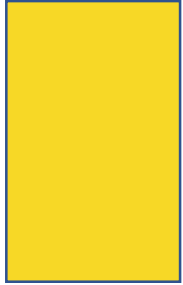
Mid Card Placement

Edge Card Placement



Grower Standard Sprayer (8/30/2018)

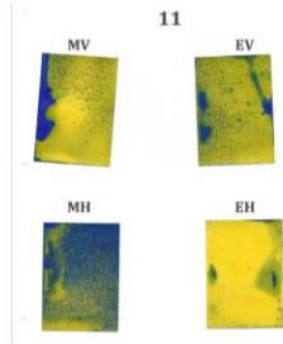
0 %



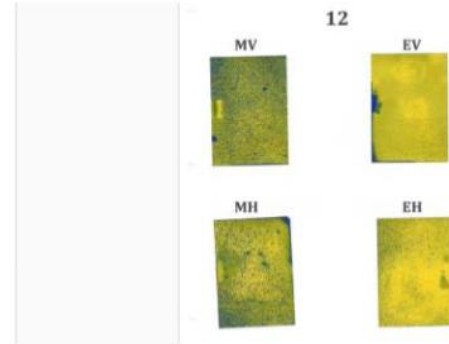
100 %



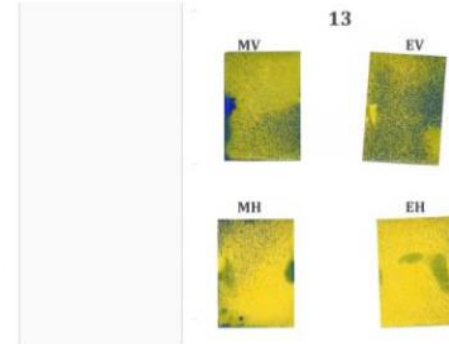
Middle Edge



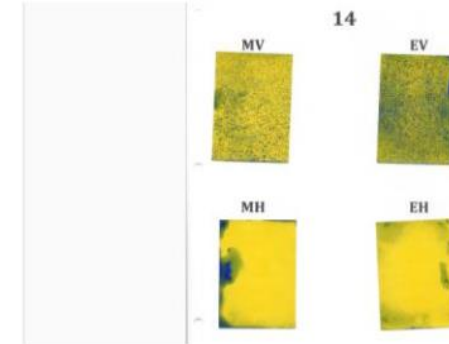
Middle Edge



Middle Edge



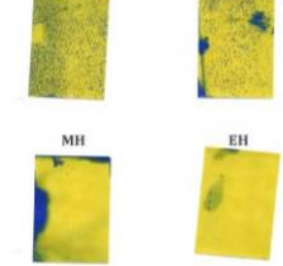
Middle Edge



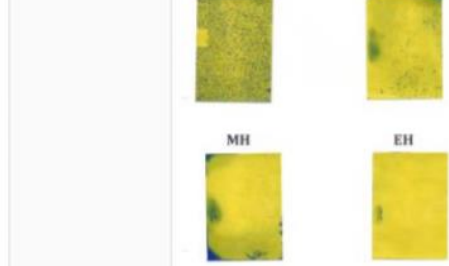
Vertical

Horizontal

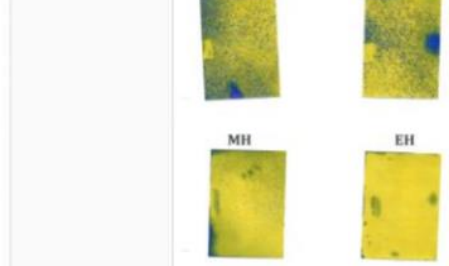
Middle Edge



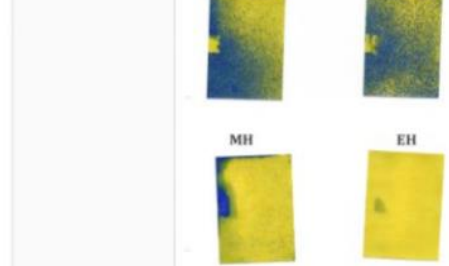
Middle Edge



Middle Edge



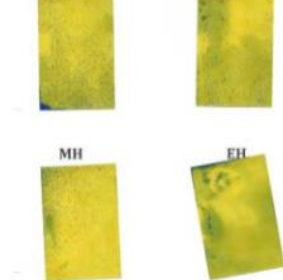
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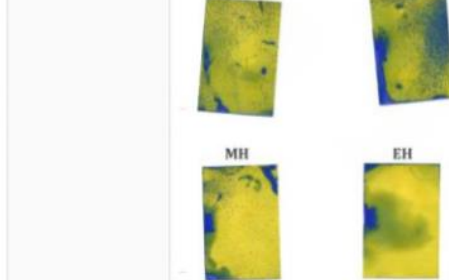
Vertical

Horizontal

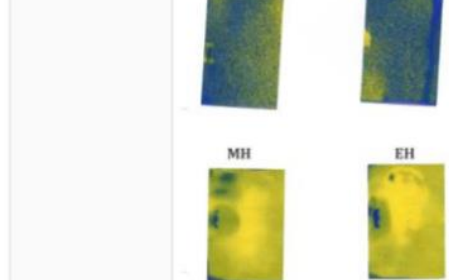
Middle Edge



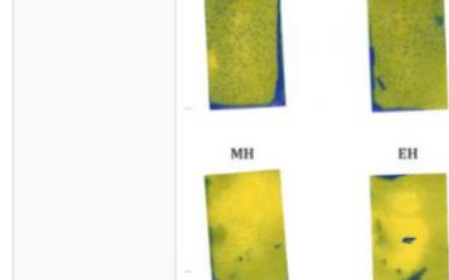
Middle Edge



Middle Edge



Middle Edge

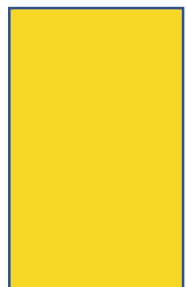


Vertical

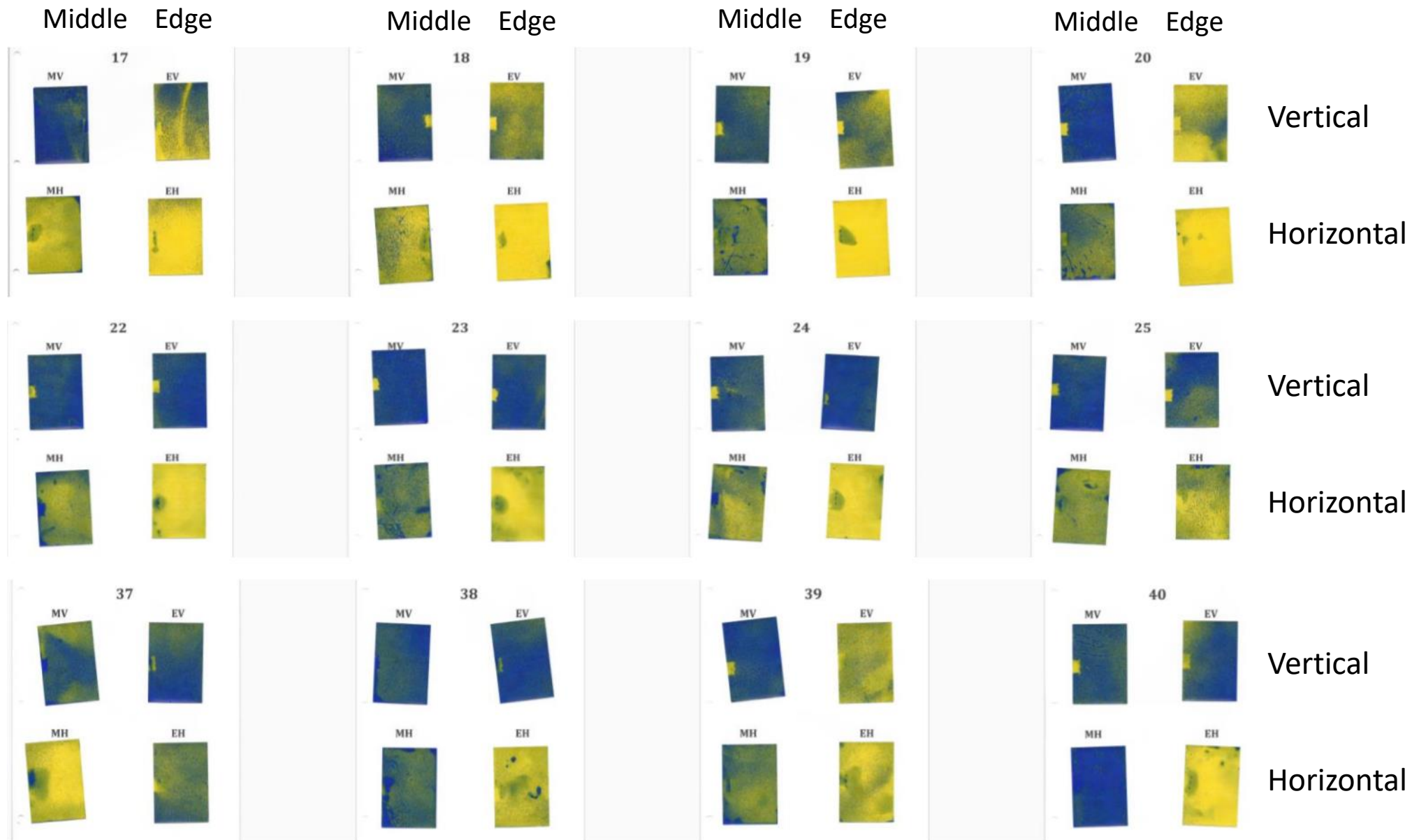
Horizontal

Strawberry Center Test Rig (8/30/2018)

0 %



100 %



Timeline

- Field tests of new designs will continue into next year
- Develop full size prototype for field testing in fall 2019

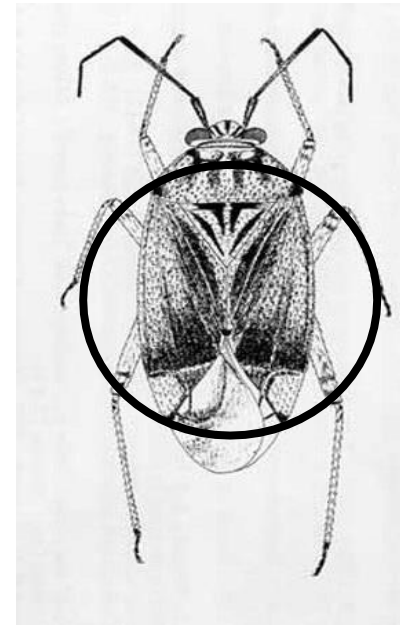
Automation Program: Lygus Vacuum Opt.



Lygus Vacuum Theory

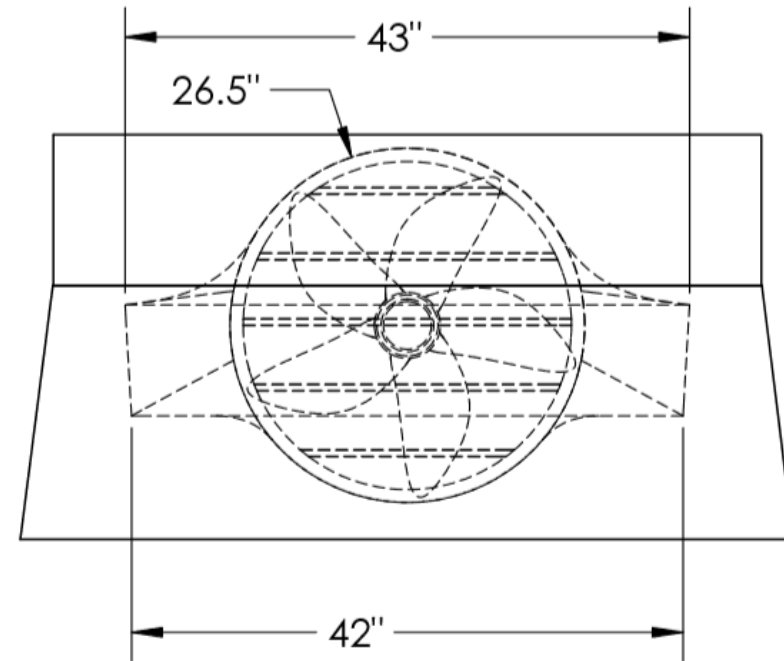
$$V_t^2 = \frac{2m g}{C_d \rho_a A}$$

- Assume lygus bug to be a sphere
- Determined terminal velocity of spherical lygus bug

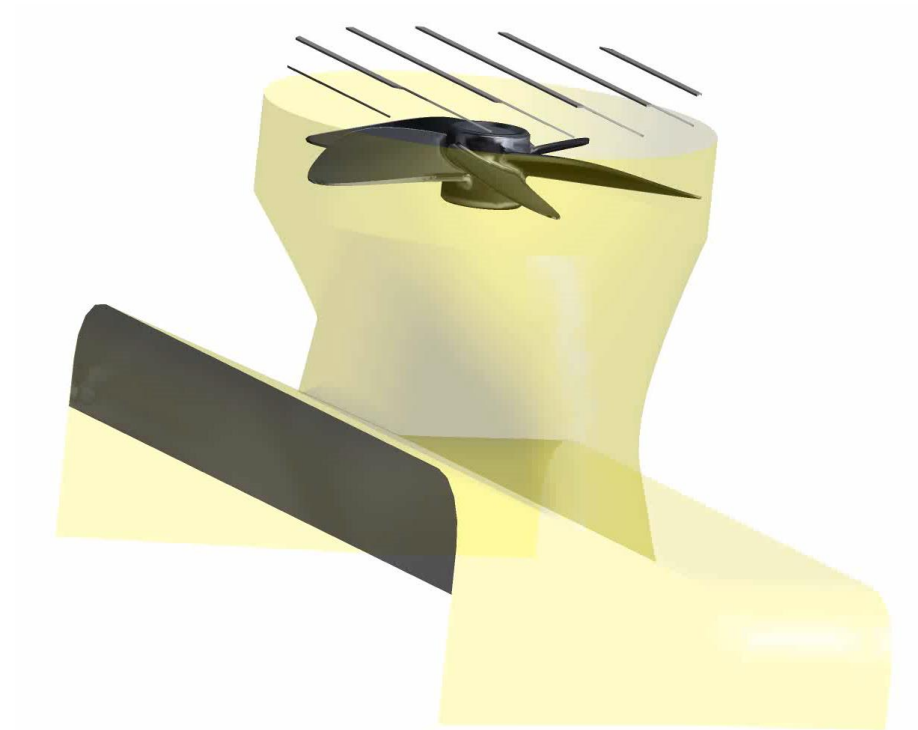
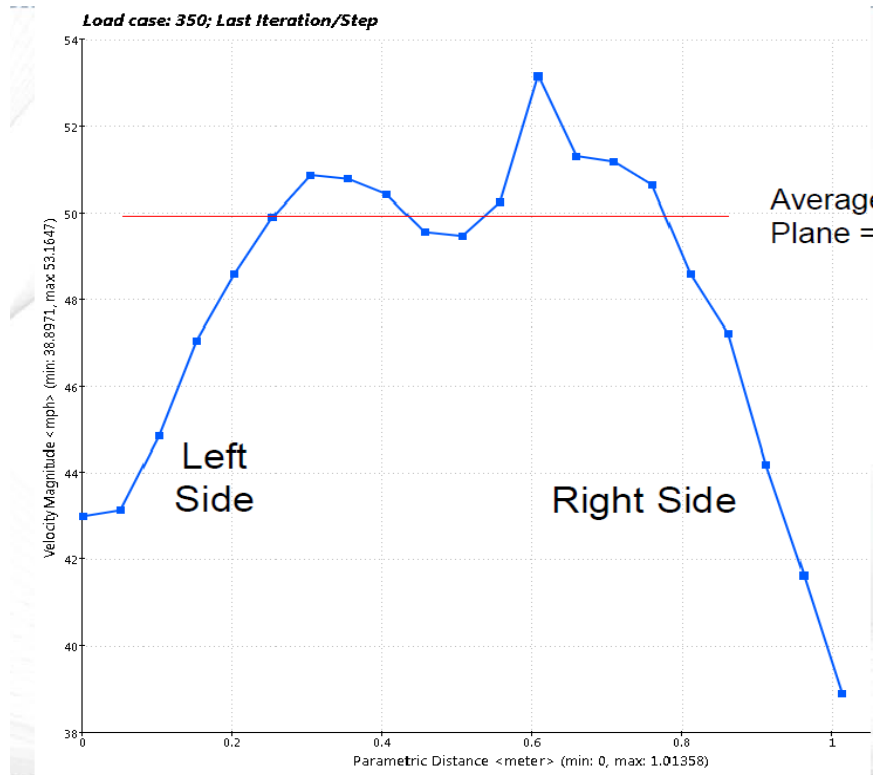


Conventional C&N Vacuum Dimensions

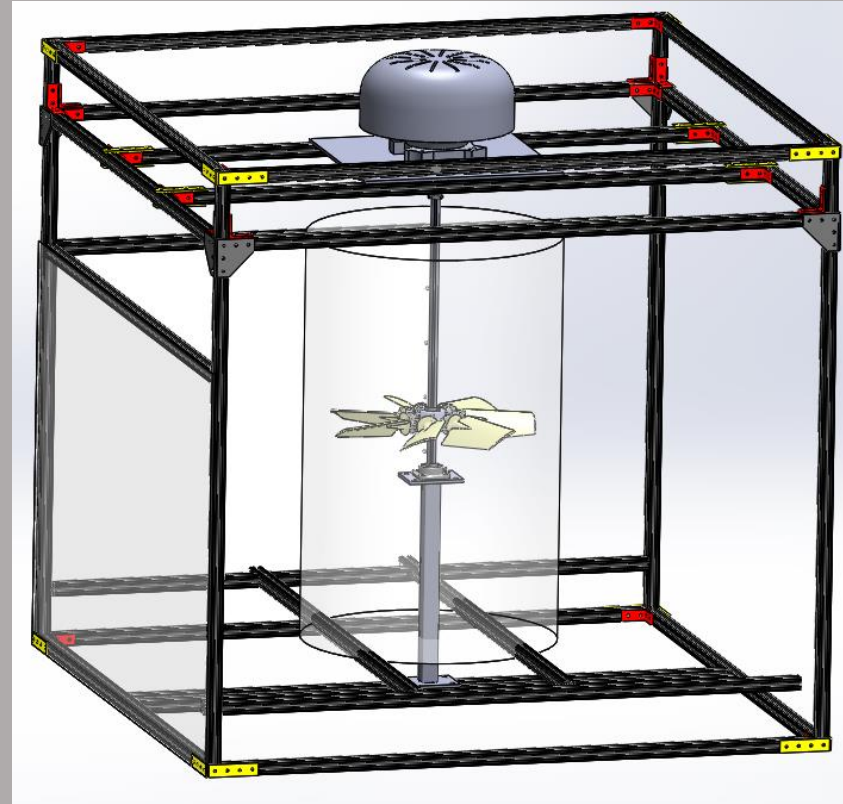
- Fan diameter smaller than the inlet size



Conventional C&N Vacuum Velocity

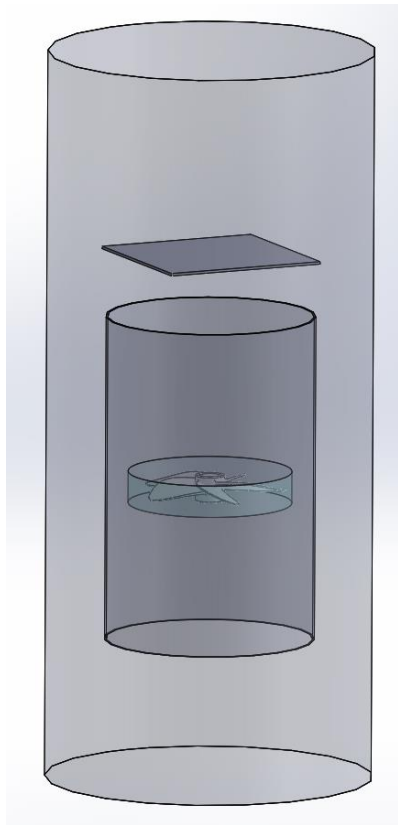




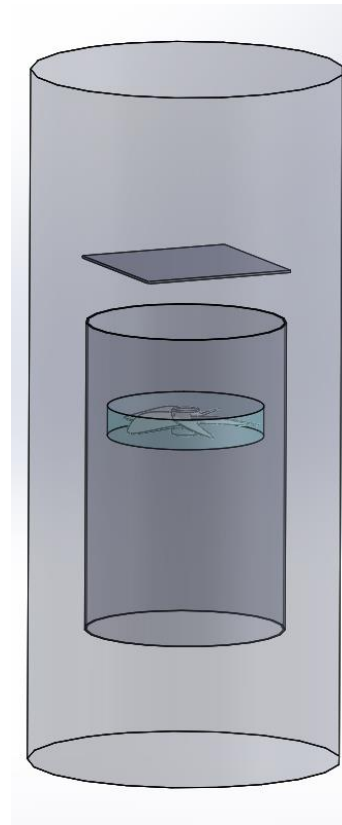


Lygus Vacuum Design

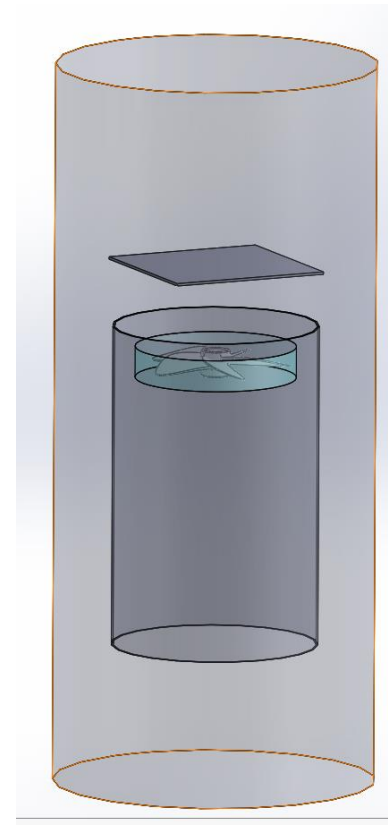
Details



1.0



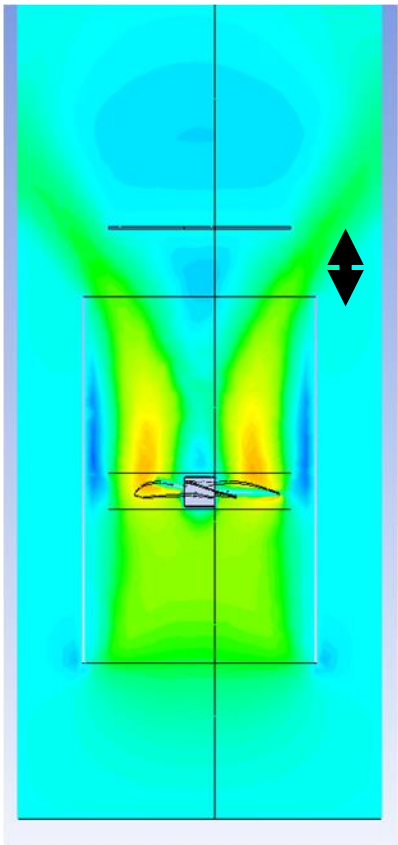
1.1



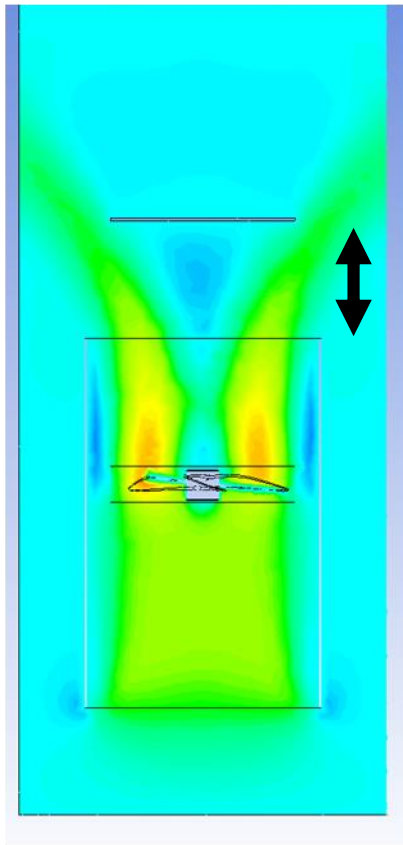
1.2

Parameter 1

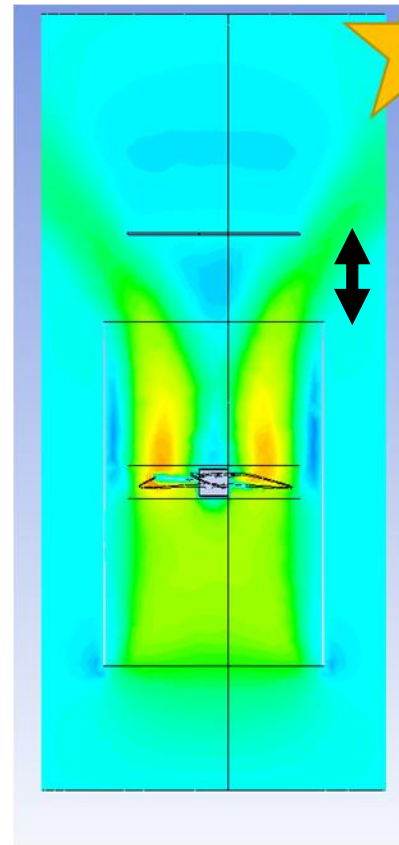
- Fan location in tube
- Fan distance from tube varied from 32 inches to 12 inches



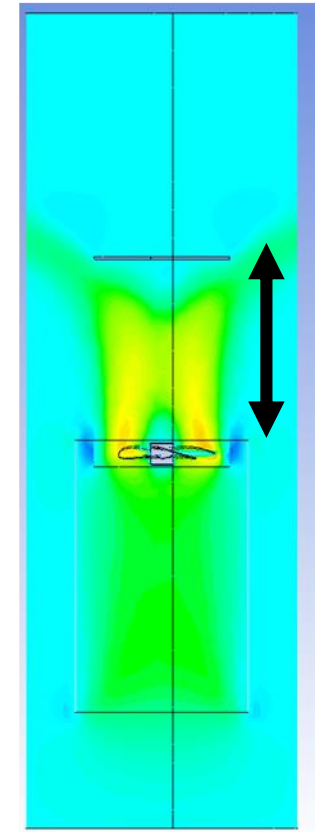
2.0



2.1



2.2



2.3

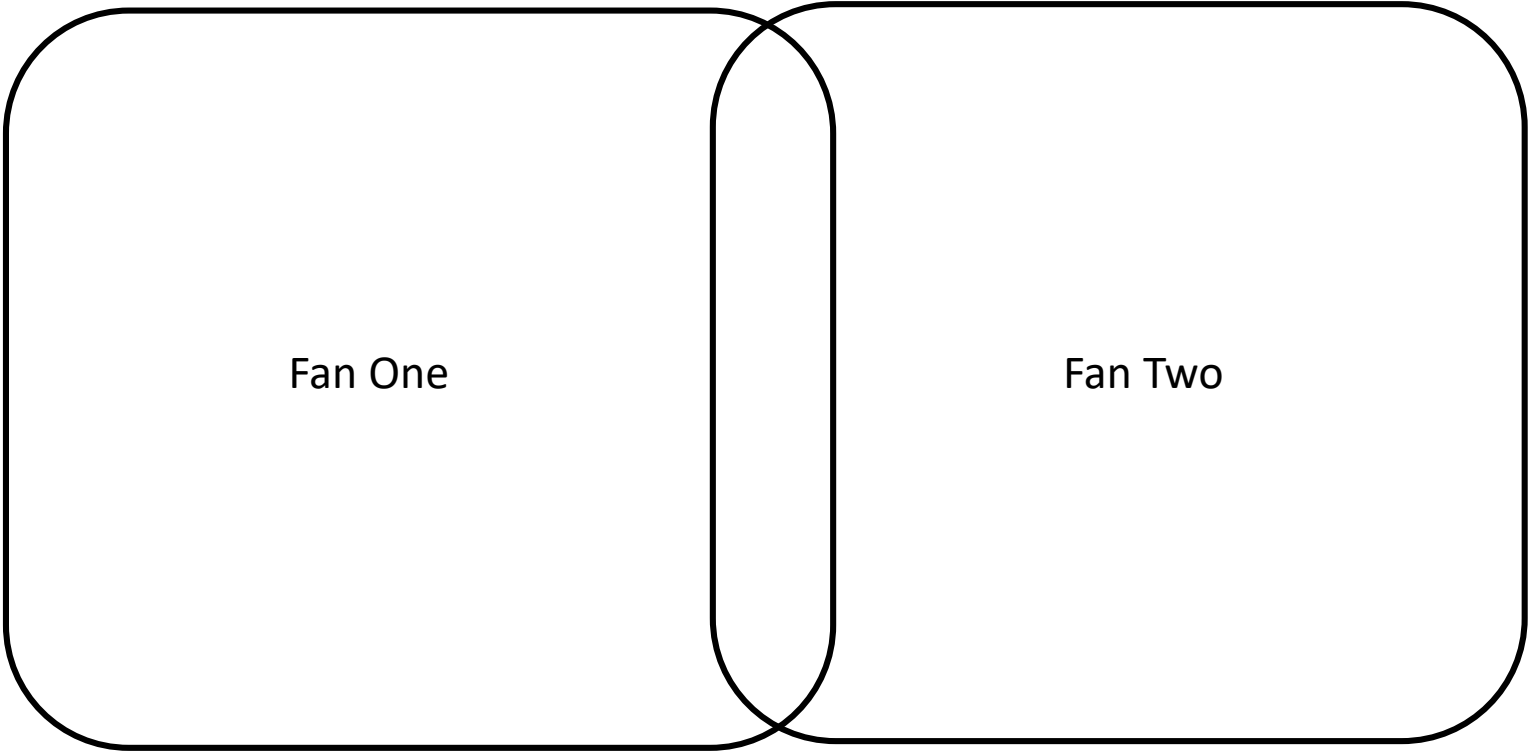
Parameter 2

- Tube distance between ground and plate
- Fan to plate distance held constant

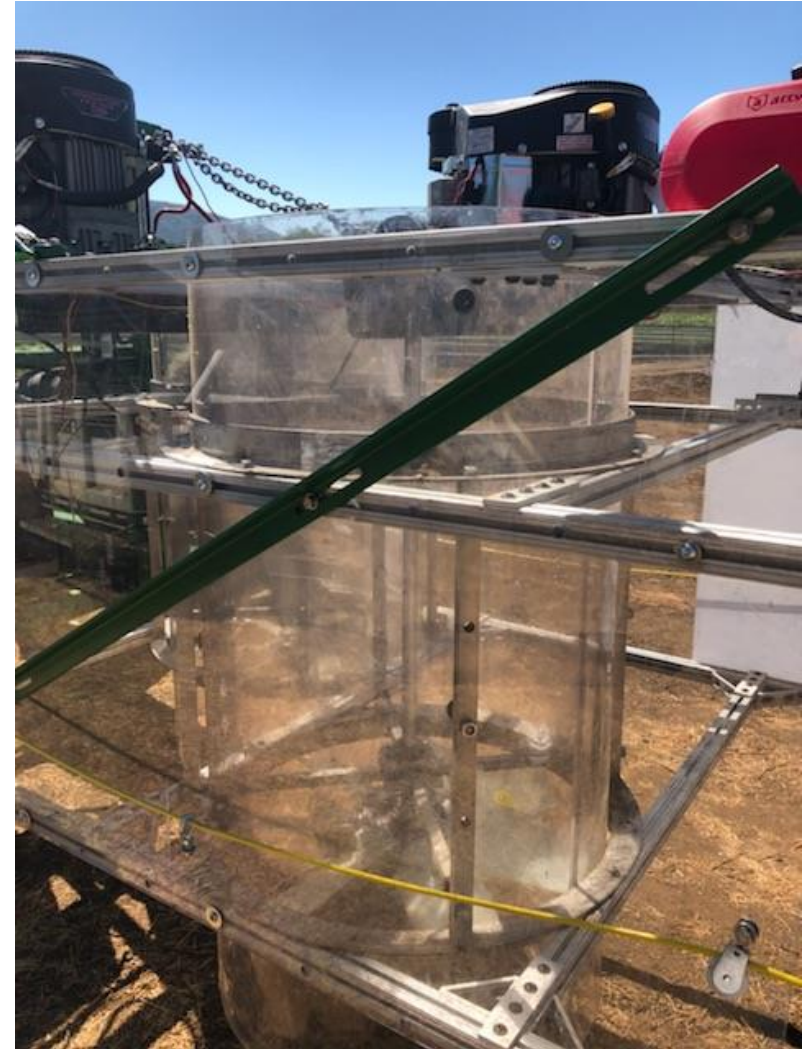


Lygus Vacuum Design 2





Lygus Vacuum Design 2



Lygus Vacuum Design 2



Timeline

- Are testing prototype in grower fields this fall
- Build full size commercial prototype for testing by fall 2019
- Goal is to double to performance of the current lygus vacuum