

FACTS & GENERAL INFORMATION ON

VENTURI AIR SPRAYERS

FOR STATE OF THE ART SPRAYING



**THE SPRAYER TO USE WHEN
TOTAL PLANT COVERAGE IS REQUIRED**

GEARMORE VENTURI AIR SPRAYERS

This booklet is designed to provide information on the many advantages of venturi air spraying and why, in today's environment, it is important to consider this spraying system.

In this booklet, we will go into great detail on venturi air spraying technology and how it relates to the GEAR-MORE VENTURI AIR SPRAYER.

The most common system of spraying is called Dilute (High Volume) spraying. Using this spraying technique, the liquid is forced, under high pressure, through a small diameter orifice. Traditionally, high pressure boom sprayers and air blast sprayers all use this system to atomize the spray.

Our method of spraying was developed using a venturi tube to atomize the spray liquid. Air is passed through the venturi and the liquid is sheared into extremely fine and uniform particles. Now, the air becomes the carrier of the spray instead of high volumes of water; we call

these sprayers Concentrate (Low Volume) Venturi Air Sprayers.

Laboratory tests show that there is substantial difference in the size of spray particles between the two methods of atomizing the liquid. With Dilute (High Volume) spraying, the droplets have a diameter of 250 to 300 micros. The sizes can not be reduced much even by increasing the pressure. The Venturi Air Sprayers reduce the liquid to diameters of approximately 50 microns i.e. fog size. Unlike the Dilute (High Volume) spray, the particles from the Venturi Sprayers do not run together and drip off the plant. Much less water is required because air is carrying the spray particles to cover the plants with a homogeneous fog like spray.

To sum up the above information, Venturi Air Sprayers require 25 to 50% less water with the same chemical concentration. This allows growers to spray longer between "fill-ups", thus more acres per day with a fine micron spray that engulfs the entire foliage with no chemical run-off.

TABLE OF CONTENTS

	<u>Page No.</u>
Questions and answers on sprayers -----	2-4
Why smaller droplets are more effective -----	5
Advantages of Venturi Air Sprayers-----	6
Comparison chart, Venturi Air versus Air Blast Sprayers -----	7
Features of Venturi Air Sprayers-----	8
Special Standard Unique Features-----	9-10
Repair and maintenance costs of sprayers-----	11
Review of Venturi Air Sprayer advantages over air blast sprayers-----	12
Testimonials on Venturi Air Sprayers -----	13
Venturi Air Sprayer cost savings-----	14

QUESTIONS & ANSWERS ON THE GEARMORE VENTURI AIR SPRAYERS

Q: *Why do you call your sprayers Venturi Air Sprayers?*

A: A venturi is the narrow reduced diameter of air tubes. When air is forced through the tubing it increases the velocity of the air. If liquid is then injected into the venturi, it creates suction and turbulence. The venturi effect is named after the discoverer, Giovanni Venturi (1746 - 1822) an Italian physicist. All our sprayers have built-in venturi's.

Q: *Just how does a Venturi Air Sprayer work?*

A: Our distribution heads are designed with venturi nozzles that have a liquid tube in the center. The air, at speeds up to 200 miles per hour (depending on the type of distribution head), literally shears the droplets to small micron size.

Q: *How is this possible when you use a centrifugal pump at pressures of only 15 to 40 PSI?*

A: We only need enough low pressure to get a steady even flow of liquid to the distribution heads, the air speed atomizes the liquid, not high pressure liquid.

Q: *How do you save on chemicals and water with Venturi Air Sprayers?*

A: The remarkable atomization of the liquid allows the air from the sprayer to carry the tiny droplets in suspension form. These fog size (50 micron) droplets adhere to the plant surface and deposit the chemical on the foliage instead of dripping and running off on the ground. Also, all the distribution heads we offer are adjustable to direct the chemical on the foliage, thus no wasted chemical.

Q: *What is the difference between concentrate (low volume) and dilute (high volume) spraying?*

A: Concentrate spraying application rates use less water than dilute, but both systems use the same amount of chemical per acre.

Q: *Should we follow the chemical percentage and required gallon per acre of the manufacturer's application rate?*

A: Yes, always follow the label requirements.

Q: *Then how do we save time, reduced chemicals, less gallons per acre?*

A: If the label has both concentrate and dilute rate charts. You will obtain all the above savings by concentrate spraying. If the rate chart only has dilute (high volume) rates, follow those directions. However, obtaining better coverage should result in fewer applications. Fewer applications will result in not only reduced chemical usage, but also savings on tractor wear, fuel, labor, soil compaction, etc.

QUESTIONS & ANSWERS ON THE GEARMORE VENTURI AIR SPRAYERS

Q: *Are there other advantages to Venturi Air if the chemical application rates are listed for concentrate spraying?*

A: Yes, there are many other advantages besides using less chemicals. There is less soil and water contamination, less container disposal, less exposure of personnel, etc.

Q: *How can you get by using up to 75% less liquid than standard sprayers?*

A: Because of the small micron size we produce, we use the air as the carrier to the foliage instead of liquid.

Q: *Why is micron size important?*

A: The smaller the chemical droplet, the better the coverage. High volume sprayers put out micron sizes of about 300, Venturi Air Sprayers about 50 microns. There are 216 - 50 micron droplets in one 300 micron droplet.

Q: *Just how small are the 50 micron droplets you produce with the Gearmore Venturi Air Sprayer?*

A: One micron is one millimeter divided by 1000, which equals .00004 of an inch. Thus, a 50 micron droplet is (.002) 2 thousandths of an inch, or about 10 times smaller than the period at the end of this sentence.

Q: *If Venturi Air Sprayers are so effective, why do grower still purchase air blast sprayers?*

A: First of all, air blast sprayers work, otherwise growers would not be using them. However, the technology is over 50 years old, with little improvement over the years. Growers usually change when they have problems with coverage such as the underside of leaves and tree tops. This is when they look for a more effective spraying system.

Q: *My high pressure air blast sprayer can be calibrated to apply concentrate (low volume) so why should I change to a Venturi Air Sprayer?*

A: It is true that some high volume sprayers can be adjusted to apply a low rate. The difference is the lack of uniformity of droplet size and the inability of the high volume sprayer to produce a significant quantity of droplets below 300 microns.

QUESTIONS & ANSWERS ON THE GEARMORE VENTURI AIR SPRAYERS

Q: *Why do your sprayers cost more than air blast sprayers?*

A: Air blast sprayer manufacturers purchase most of their components, such as fans, transmissions, pumps, tanks, etc. from component suppliers and just product the frame work and assemble. Our supplier, CIMA, manufactures the complete sprayer, as components to make their sprayers are not available in the marketplace. The components to produce fine micron droplets require close tolerances, which involves extremely costly molds and tooling. However, you will recover the additional cost over "air blasts" within the first year of operation, with less time in the field, less maintenance and by obtaining total plant coverage.

Q: *Why, in many cases, do chemical companies only have labels for dilute (high volume) application?*

A: Chemical manufacturers have had many bad experiences with improperly designed and poorly adjusted sprayers. They have found that by using higher amounts of chemicals and water to "flood" the plant, they can somewhat compensate for poor coverage. Also, it would cost chemical manufacturers a considerable amount of money to change the labeling of their products to include concentrate (low volume) rates. Most important to chemical companies, lower application rates means less sales and profits.

Q: *Don't growers also like to see the chemicals running off the foliage?*

A: This is true, but under present environmental conditions, we feel it is no longer acceptable to "flood" crops. Also, it is a very uneconomical way of spraying.

Q: *This may be true, but at concentrate (low volume) rates of say 25 gallons an acre, how do you tell you are getting coverage?*

A: True, it is difficult to see the coverage with the naked eye, but it is on the foliage. You will see the liquid coming out of the sprayer, but you will not see liquid running off the foliage. To assure yourself that you are obtaining total plant coverage, put out test papers.

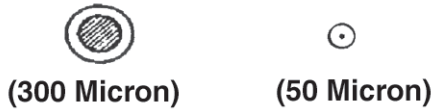
Q: *Sometimes I may want to dilute (high volume) spray. Can I use my Venturi Air Sprayer?*

A: We have designed the Venturi Sprayer to spray concentrate and dilute. By setting the "Dial-A-Rate" dials at (15), you can apply as high as 300 gallons per acre, however the droplet size will be larger and less effective, like air blast sprayers.

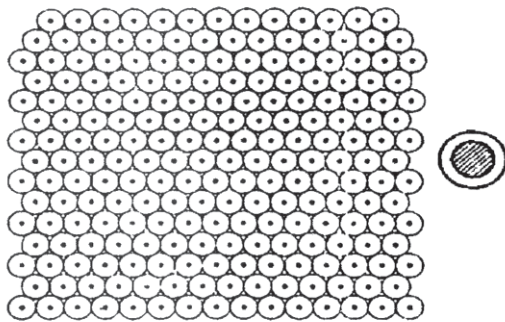
Q: *Why do you have over 30 different distribution heads when air blast sprayers usually only have a couple?*

A: First of all our Venturi Air Sprayers were developed to fit a large number of crops such as: grapes, berries, orchards, row crops, nurseries, etc. All these crops have different foliage profiles, so many different distribution heads are required to obtain total plant coverage.

WHY SMALLER DROPLETS ARE MORE EFFECTIVE



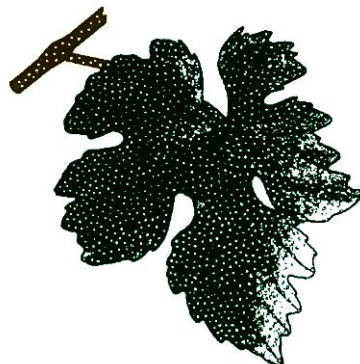
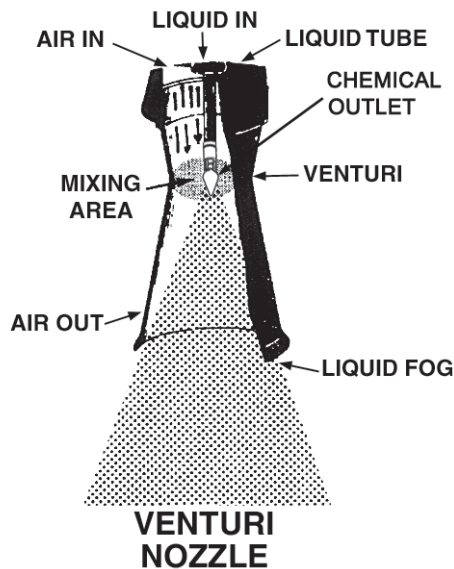
Inner circle or dot depicts the chemical, outer circle is the chemical kill zone.



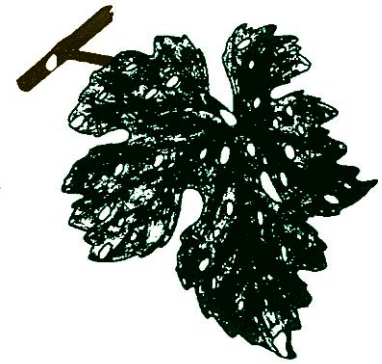
Magnified Approximately 10 Times

For each 300 micron droplet formed by a conventional sprayer, a Venturi Air Sprayer makes 216 fog sized droplets of 50 microns. The enlarged drawing at left represents a 300 micron droplet in proportion to another droplet of 50 microns. Each is surrounded by a zone of 100 microns representing the effective kill zone of the chemical.

In the drawing at left, 216 droplets of 50 microns and one droplet of 300 microns are shown each surrounded by a kill zone of 100 microns. It can be seen that the 216 droplets of 50 microns cover a considerably larger area than the single droplet of 300 microns. This is why substantially less water is required to carry the chemical on to the plants when using Venturi Air Sprayers. The fine uniformly sized spray droplets assure excellent coverage. This illustration gains impact because one gallon of liquid contains 268 million droplets of 300 microns and 58 billion droplets of 50 microns.



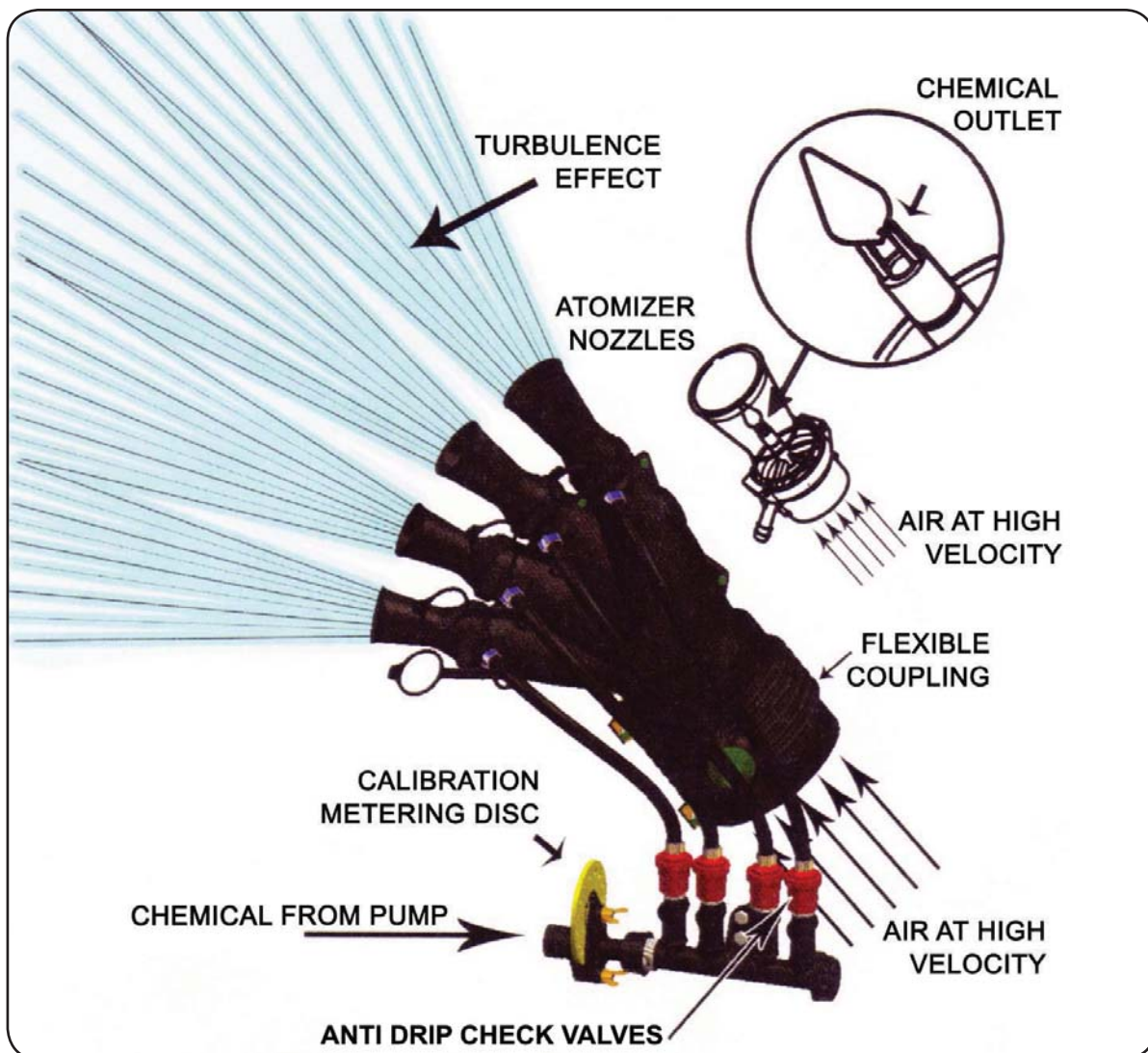
VENTURI AIR TREATMENT



CONVENTIONAL SPRAYERS

ADVANTAGES OF VENTURI AIR SPRAYERS

- Spray atomization is smaller and more uniform
- Low volume means less fill-ups
- Even distribution of concentrated spray
- Complete foliage coverage
- Better product utilization
- Nozzles adjust to direct spray only on the crop
- Less chemical waste and soil/water contamination
- Simple, accurate metering system with 15 hole discs



COMPARISON CHART

FUNCTION	AIR BLAST SPRAYERS	VENTURI AIR SPRAYERS
System of Spraying	High pressure pump and disc nozzles	Low Pressure pump and venturi nozzles
Droplet Distribution	Carried by high liquid pressure	Transported homogeneous with air
Working Pressure	50 to 300 PSI	15 to 40 PSI
Chemical Utilization	Because of dripping, only 75% of chemical reaches the vegetation, while remaining 25% falls to soil.	No dripping, all of the chemical is used. Theoretically, mixture could have 25% less chemical. With the venturi air sprayer, chemical treatment is applied to a specific area. Different distribution heads can be used for various crops. Air flow can be directed and adapted for various shapes and requirements of different plants. The chemical is distributed evenly over the entire plant.
Foliage Coverage	Partial coverage, since larger droplet sizes and the large quantity of water used to "wash" the surface of the leaves, results in spotted, uneven coverage, and run off. Also, with this type of sprayer, the high liquid pressure tends to push the leaves against each other causing a "shingling" effect. This makes it extremely difficult to get coverage on the underside of leaves and fruit blocked by foliage.	Liquid is atomized in fog size droplets, which remain in suspension with the air. All parts of the plant are touched by air and consequently chemical is distributed uniformly to all surfaces and in the more hidden positions. Droplets are very small, so they stick to plant surfaces homogeneously and deposit the chemical instead of dripping and running off onto the ground.
Refilling Time	Requires a lot of wasted time refilling, thus tend to use larger tanks, which increase cost and soil compaction.	Uses 1/4 to 1/2 the amount of liquid, which means less fill-ups and more time spraying.
Servicing	High pressure pumps wear out sooner and require continuous maintenance. Discs and hoses wear out quickly under high pressure. The metering discs wear and spray volume changes over time. Constant testing and maintenance are required to maintain accuracy.	With Gearmore Venturi Air Sprayers, the only service required is 3 grease points and lubrication of the fan support and pump. All parts in contact with the spray liquid are non-corrosive. There are no nozzle discs to wear under low pressure. The centrifugal pump requires little maintenance. The quantity of liquid sprayed stays constant field after field.

FEATURES OF VENTURI AIR SPRAYERS

- ◆ High performance, precision balanced all steel centrifugal fan.
- ◆ Special molded polyethylene fan housing.
- ◆ Translucent polyethylene tanks with lid, strainer basket and sump.
- ◆ Compact, rounded tank design permits traveling through vegetation without damaging it.
- ◆ Agitation is by liquid spraying and air tube from the fan.
- ◆ Simple, efficient "Dial-A-Rate", 15 position metering discs adjusts flow in less than a minute.
- ◆ Main drive and pump belt are automatically adjusted by spring loaded idler.
- ◆ Centrifugal pump produces 37 gallons per minute.
- ◆ Low pressure spraying system, 15 to 40 PSI spraying pressure means less maintenance for whole liquid system.
- ◆ Built in overrunning clutch to protect the tractor and sprayer drive train.
- ◆ Reachable controls from tractor seat, allows operator to switch liquid from off to right, left or to both sides spraying. Available in liquid or electro-valve controls for cabs on most models.
- ◆ Adjustable rear bumper helps to prevent damage to fan and distributor heads.
- ◆ Capable of applications of 10 to 300 gallons per acre.
- ◆ Tank capacities from 75 to 500 gallon.

SPECIAL STANDARD FEATURES UNIQUE TO OUR SPRAYER



Power Band Drive System



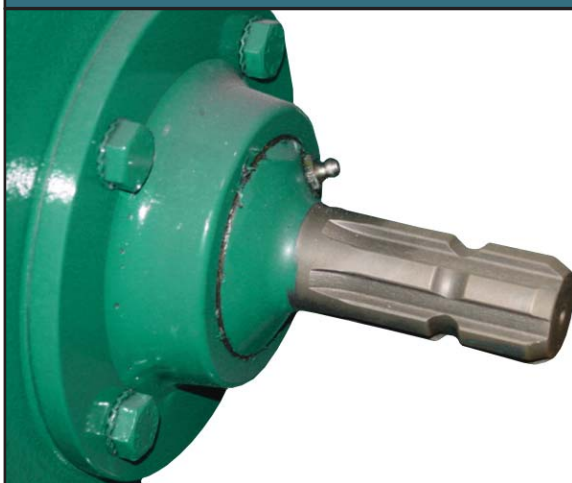
Polyethylene Centrifugal Pump



Dial-A-Rate Metering System



Shower Head Is Built Into Strainer Basket



*Built-in Overrunning Clutch To
Protect Drive Train*



One Piece Polyethylene Fan Housing

SPECIAL STANDARD FEATURES

UNIQUE TO OUR SPRAYER



Electro Valve Controls - Standard On Trailer Optional On 3-Point



5 Gallon Separate Fresh Water Tank For Cleaning Hands



Large 3" Diameter Glycerine Filled Gauge, Easy To See From Tractor Seat



Large Flip Top Hinged Cover With Built-in Vent



Over 30 Different Distribution Heads Available



Optional Electro Cylinders To Adjust Nozzles For Different Plant Heights

APPROXIMATE REPAIR & MAINTENANCE COSTS

GEARMORE VENTURI AIR SPRAYER VS. CONVENTIONAL AIR BLAST SPRAYER

Over 7 Year Period

OPERATION	*	VENTURI AIR SPRAYER	*	CONVENTIONAL AIR BLAST
Repair leaking pump	2	Parts - \$ 120 Labor - 1 hr. x \$ 90 = \$ 90 Total Cost = \$ 420	4	Parts - \$ 331 Labor - 4 hrs. x \$ 90 = \$ 360 Total Cost = \$ 2,764
Replace complete pump	1	Parts - \$ 524 Labor - 1 hr. x \$ 90 = \$ 90 Total Cost = \$ 614	2	Parts - \$ 1,156 Labor - 1 hr. x \$ 90 = \$ 90 Total Cost = \$ 2,492
Replace set of ceramic discs		D.N.A.	2	Parts - \$ 95
Replace gearbox	1	D.N.A. - Power belt only Part - \$ 150 Labor - 1 hr. x \$ 90 = \$ 90 Total Cost = \$ 240	1	Parts \$ 953 Labor 3 hrs. x \$ 90 = \$ 270 Total Cost = \$1,223
Repair and replace high pressure hoses		D.N.A. - 15-40 PSI system Little or no cost	◆	Parts - \$ 334
TOTAL REPAIR COSTS OVER 7 YEARS □		\$ 1,274		\$ 6,479
● <i>By subtracting \$ 1,274 from \$ 6,479 and dividing by 7 (years) equals \$ 743 savings per year</i>				

* Means the approximate number of times replacements made over the 7 year period, no labor was included on some repairs that can be performed by the tractor operator.

◆ Means the approximate total cost over the 7 year period.

DNA means the sprayer "Does Not Apply" to the repair operation.

The above chart is only to show the approximate repairs over a 7 year period. True repair costs will vary because of hours used, general maintenance performed, etc.

Study was based on 300 gallon trailer sprayers.

REVIEW OF VENTURI AIR ADVANTAGES OVER "AIR BLAST" SPRAYERS

- The Venturi Air Sprayer produces over 200 micro droplets for every average spray droplet produced by a traditional air blast sprayer.
- The Venturi Air Sprayer will spray from 2 to 4 times longer between fill-ups than air blast sprayers of the same tank size.
- The Venturi Air Sprayers efficiently operate at only 15 to 40 PSI, versus air blast air sprayers at 300 to 500 PSI. This low pressure greatly reduces maintenance costs.
- Venturi Air Sprayers feature a special built-in overrunning clutch to protect the drive train; air blast sprayer manufacturers do not furnish an overrunning clutch.
- Venturi Trailer Air Sprayers have a front mounted fan, therefore, there are no long drivelines that run through the tank, no extra universal joints or bearings to service and spray laden air is not recirculated through the air system.
- Venturi Air Sprayers have over 30 different distribution heads specially designed to fit/match your foliage profile. Air blast sprayers usually have only 2 to 3 heads.
- The Venturi Air Sprayer has a simple "Dial-A-Rate" disc to set application rates. There are no expensive orifice discs to change and replace as with air blast sprayers.
- Venturi Air Sprayers obtain a vast improvement on spray coverage over air blast sprayers.
- Over a thousand of these sprayers of all sizes currently operating just in California.

TESTIMONIALS

"We purchased a Gearmore Venturi Air Sprayer last year to control mite infestation in our avocado orchards and were able to obtain complete control of the mites with one spraying. In the past we sprayed by air at \$140/acre with little control. Our cost per acre with the Gearmore sprayer was \$50. To date approximately 600 acres have been sprayed by us and a couple of neighbors. We have also had great success using the Gearmore Air Sprayer for "foliar feeding". The feature we like best about the sprayer is how the fine micron droplets completely "fogs" the trees."

Escondido, CA

"We purchased a P50 and a T55-2000, 500 gallon trailer mounted Venturi Sprayer in 1994 and then another T55-2000, 500 gallon sprayer in 1995. We have sprayed 1000 acres of our wine grapes and are very pleased with the results. We use the P50 3-point sprayer for narrow rows and new plantings and the 500 gallon trailer sprayers, with over the row cannons, in the other vines. We get excellent coverage with the Venturi Sprayers. Because we can use low volumes of water, sometimes we spray all day without having to refill the tank. The superior coverage and extended operating time saves us a lot of operating costs. We are so pleased with the low maintenance, ease of operating, and effective coverage, we just purchased two more 500 gallon and one 300 gallon Venturi Trailer Sprayers."

Livermore, CA

"My Gearmore Venturi Air Sprayer allows me to cover more acres per day. I also like the simple design and easy calibration system."

Napa, CA

"The ability to get total plant coverage at low pressure is what I like most about my Gearmore Venturi Air Sprayer. The ease of operation and less "fill-ups" per day mean high production for my operation."

Temecula, CA

"Your P45 Venturi Sprayer is great. I'm able to cut my time in the vineyard in half, water usage to 1/5 and chemical usage to 1/5. Most growers using your Venturi Sprayers still don't believe what your amazing sprayers will do. They are afraid to risk getting powdery mildew by reducing recommended rates. The answer is significantly better coverage. Because of the 50 micron droplets, I have actually fogged in my vineyard when the dew point and temperature are close. So far my vineyard is free of powdery mildew. I'm going to make more applications of Rubigan at 2 oz. per acre along with 20 gallons of water."

Lompoc, CA

"I achieve much better coverage with my Gearmore Venturi Air Sprayer so it greatly reduces my chemical costs. The sprayer is extremely easy to operate and adjust. The efficiency and affordability of the sprayer made it one of my best purchases."

Acampo, CA

VENTURI AIR SPRAYER

COST SAVINGS

The Gearmore Venturi Air Sprayer reduces your spraying costs over "air blast" sprayers in four ways:

- 1. Less time in the field:** You will be using $\frac{1}{4}$ to $\frac{1}{2}$ the amount of liquid, so your costs will be reduced by approximately 50%*. Less fill-ups means more production..
- 2. Less maintenance:** Venturi Air sprayers have fewer parts and operate at low liquid pressure. This makes maintenance costs approximately 20% of high pressure air blast sprayers. See page 11 for information on repair costs.
- 3. Less spraying:** You obtain total plant coverage with venturi sprayers, this will increase timing between spraying, thus reducing the number of applications required. This should eliminate at least one spraying per year.
- 4. Higher yields:** Normally obtainable as total plant coverage should produce a bigger and better crop. However, no large scale studies have ever been done to definitely prove percentages of yield increase, so no dollar amounts will be used in this study.

Using the information above, we will show you an example of the savings obtainable based on 100 acres. Put in your numbers to calculate your savings.

1. Less time in the field:

Application cost, for labor, per acre \$ 12.00 X number of acres 100 X number of applications per year 5 = \$ 6000 X 50% less time in the field = \$ 3000 savings per year.

2. Less maintenance:

Using the maintenance chart on page 11, the yearly cost savings is \$ 743.

3. Less spraying:

Chemical cost per acre \$ 50.00 plus application costs per acre \$ 12.00 = \$ 62.00 X 100 acres = total cost \$ 6,200. (Based on one less application per year)

Gearmore Venturi Air Sprayer savings based on 100 acres (1) \$ 3,000 + (2) \$ 743
+ (3) \$ 6,200 = Total Yearly Savings of \$ 9,943.

**This percentage will vary based on how efficient your "nursing" operation is.*

VENTURI AIR SPRAYERS

**We hope this booklet gave you
a better understanding of
Venturi Sprayers.**

**For more details
and a demonstration
on our sprayers,
please contact the
dealer listed below.**



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