Alan McCracken and Cheryl of Yorkton Aircraft Service have had many visits about Rotary Atomizers. To note his experience, Alan wrote this article for Yorkton Aircraft Service.

ROTARY ATOMIZERS- THEIR STRENGTHS AND WEAKNESSES

by Alan McCracken for Yorkton Aircraft Service Ltd.

This rotary atomizer equipped Thrush of Benoit Flying Services in Illinois produces excellent coverage with fungicide on soybeans with an application volume of 2 gpa.

A famous Austrian born engineer named Edward Bals around 1960 developed the rotary atomizers concept. The concept of rotary atomization enables the production of a more uniform droplet spectrum than that produced by conventional hydraulic nozzles.

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Rotary Atomizer Strengths?

Less maintenance
Only few orifices are required, 8-10 atomizers on an aircraft instead of 40-90 hydraulic nozzles. This is one of the major advantages in that even for low spray volumes the pilot doesn't have to worry about blockages, which can be a major problem with the smaller hydraulic nozzles. Provided they are kept clean and lubricated they provide many years of service and do not change droplet size due to wear, which is a major problem with nozzles.

Operate with a range of flow rates
Rotary atomizers can operate within a broader range of flow rates than standard hydraulic nozzles. The droplets are produced by the centrifugal force that emits the spray liquid from a rotating screen and not by spray pressure. The flow rates may be easily changed by selection of the correct flow control orifice.

Adjustment of the droplet size
The droplet size is easily and quickly changed by adjustment of the angle of the atomizer fan blades that operate similar to the aircraft propeller. The higher the rotational speed the small the droplets, and vice versa, the slower the rotation the larger the spray droplets. The droplet size may be easily and quickly changed to ensure the right droplet size for the product and weather conditions.

Narrower droplet spectrum
Another major advantage of rotary atomizers is that the droplet spectrum is much more consistent than pressure nozzles as they use centrifugal energy to break up the spray liquid rather than hydraulic. This means that the droplet size can be better tailored to match the target pest or disease. For example for the deposition of a pre-emergent herbicide it is more desirable to produce large droplets and for the control of diseases or pests in a dense canopy we require a narrow droplet spectrum with smaller droplets.

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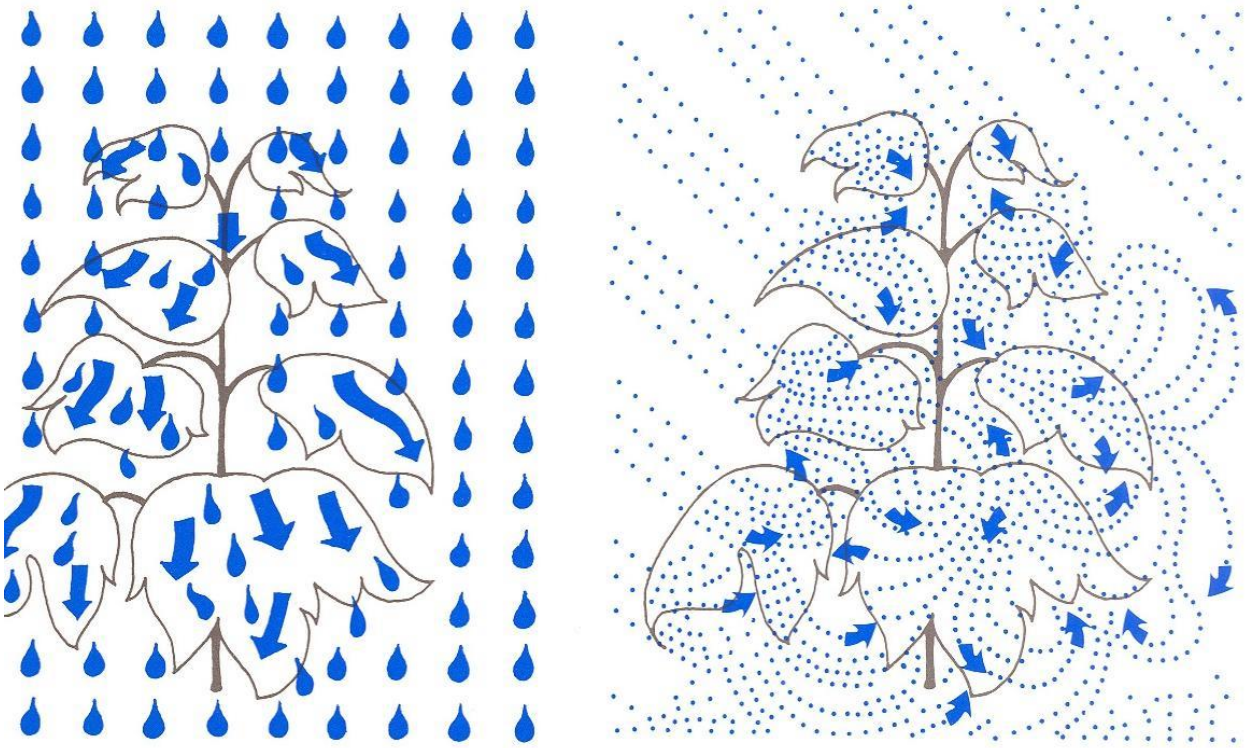
Fig: 1



zación de volumen normal con gotas grandes. Pulverización de UBV con gotas pequeñas.

As illustrated in the diagram above the larger droplets impact the upper leaves and can bounce off to end up on the ground while the smaller more uniform droplets give improved penetration of the crop canopy and are less likely to end up on the soil.

It is widely acknowledged amongst researchers that smaller droplets penetrate the crop better than large droplets, therefore when the applicator increases the flow through a nozzle he invariably selects a larger orifice size on the nozzle and inadvertently reduces crop coverage due to the production of a coarser spectrum with larger droplets.

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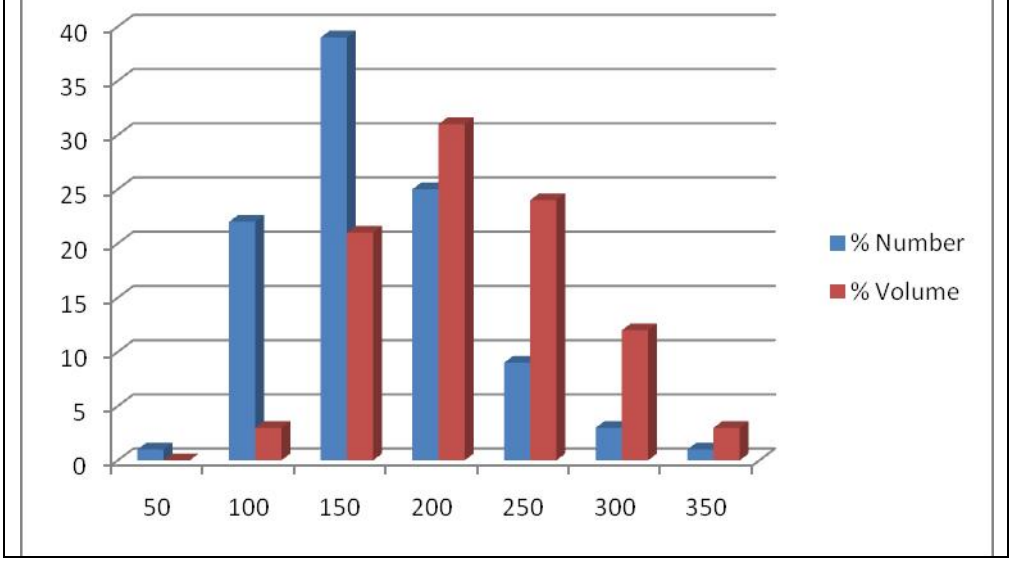
Fig 2: Comparison histogram of (NMD- 140) Number median diameter, with (VMD-194) Volume median diameter produced with the ASC rotary atomizers at an application volume of 1 gallon/acre.



Observations:
The droplet spectrum for the VMD and the NMD is fairly closely matched confirming relative uniformity of droplet size. Note the absence of extremely small droplets and also the absence of large droplets.

For best results with fungicides field experience has proven that the ideal droplet spectrum for crop penetration and coverage should be between 100- 300 microns.

Variable flow valves
Many aircraft are equipped with motorized electric ball valves that adjust the flow to maintain the desired application rate/acre according to the true ground speed of the aircraft. This is an excellent device for the application of pre-emergent herbicides, however when the speed difference means a change of 10% in the flow rate this often results in "streaking" of the field when applying fungicides or insecticides since hydraulic nozzles produce much larger droplets when the spray pressure is significantly reduced. Ideally the aircraft should also be equipped with rotary atomizers when utilizing a variable flow valve especially so when applying fungicides or insecticides that require more precise control of droplet sizes than for systemic herbicides.

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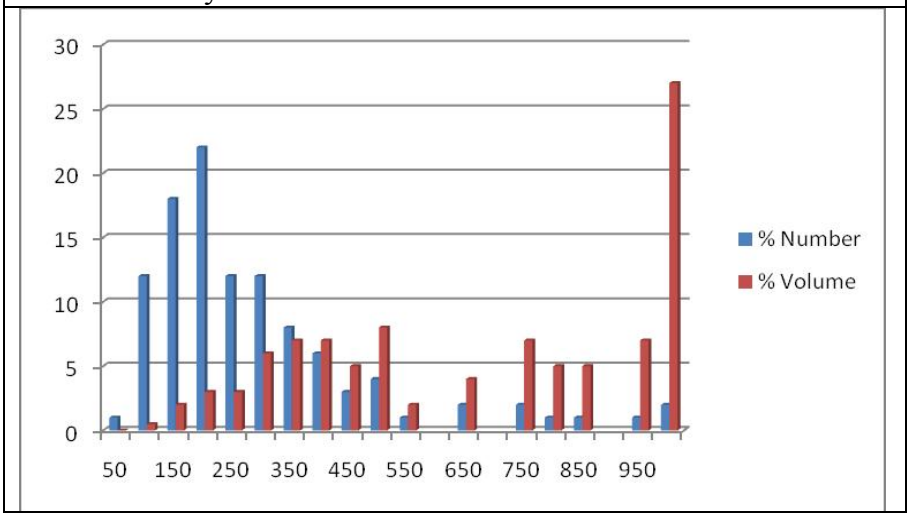
Table 3: Comparison histogram of (NMD) Number median diameter, with (VMD) Volume median diameter produced with conventional hydraulic nozzles.



Observations:
This is a typical broad spectrum and clearly illustrates that a very large proportion of the spray deposit will be wasted if used for the application of a fungicide. In practical terms we can observe that more than 40% of the spray volume over 350 microns will produce little or no coverage.

This graph also illustrates how meaningless it is to quote the average droplet size NMD 190 microns and VMD 235 microns.

Rotary Atomizer Weaknesses?

Rotational speed
The aerial applicator must have a sound understanding of the technical aspects and learn to adjust the fan blades [rotational speed] to match the products being applied and NEVER to adjust the blade angle to produce excessively small droplets that could cause drift problems.

Spray drift
When the atomizers are adjusted correctly it is possible to produce “less fines” than conventional nozzles, however there is a danger of extremely small droplets and excessive drift if not adjusted correctly.

Application volume
Although it may be feasible to pump high volumes through atomizers, all models of atomizers have a maximum flow rate, above which they become saturated and lose control of the droplet spectrum. Solution: Do NOT try to apply very high volumes.

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