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Spray Boom Set-up on Field Sprayers

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Design attributes and expected costs of dry and wet field sprayer booms are compared and illustrated.

Field sprayer booms are an important part of the pesticide delivery system and can influence application accuracy and efficiency. Booms come in all shapes and sizes, depending on their use, and deliver the spray solution to the nozzles and tips at the desired pressure for the target. A small hand boom may be only a single nozzle while a large field sprayer could have a 120-foot or wider boom.

Stability and Strength — Boom Features

Two attributes to look for when selecting a boom are stability and strength. Stability, the factor of major concern, ensures that the boom maintains a constant orientation to the target. Field conditions may vary widely, but if a spray boom is expected to provide a uniform application, stability must be maintained. Also important is a boom's strength or its ability to withstand operating conditions without becoming damaged.

Two systems are used to control boom stability. Passive systems, which include trapeze suspensions, center pivots, and dampening suspensions, all use balance. They minimize the amount of deflection transferred from the sprayer to the boom through various linkage designs. Active systems, on the other hand, use sensors and actuators in stabilizing the boom. An active system will usually have a sensor on the boom which is set to distinguish any fluctuation in distance between the target and the boom. If a difference in height is observed, the sensor signals the actuator on the boom linkage and it makes the appropriate adjustment. This usually means raising or lowering the boom in relation to the original setting.

Wet and Dry Booms

There are two types of booms: wet and dry. A boom is considered a wet boom *(Figure 1, bottom)* if the pipe span is not only used as a support mechanism for the spray nozzles but delivers spray solution to them as well, hence the name "wet boom." A boom that is used merely as a span along which to space the nozzles, but which does not deliver the spray solution, is considered a dry boom *(Figure 1, top)*. The solution is delivered to the nozzles via a separate hose line which runs along the boom span using it as a support mechanism to mount each nozzle.

Figure 1. Sections of two booms — dry boom on top, wet boom on bottom.

The advantages of a wet boom are less plugging of nozzle tips since there is less area where particles could build up and the ease of flushing the boom. On the dry boom, hose and nozzle assemblies are much more subject to being contaminated with residues than stainless steel tubing or pipe. Some adjuvants used with pesticides provide excellent cleaning of the tank, hose, etc. and may cause the spray solution to become contami-

nated. Even though the tank has been cleaned the spray booms have not.

Unless the boom is really long or a small size pipe is used, the spray boom on a wet boom needs only to be fed with the spray solution on the end. Since the nozzle assemblies on a dry boom greatly restrict the flow rate, the boom must be fed every few nozzles to prevent a pressure drop.

Another advantage of a wet boom is that the angle of the boom can be changed *(Figure 2)* and in most situations it is easier to change the height of a wet boom than a dry boom. Additional nozzle assemblies to accommodate various row spacings on a wet boom do not restrict the flow rate *(Figure 3)* nearly as much as additional nozzle assemblies on a dry boom.

Figure 2. Angle of boom can be changed by rotating the boom within the clamps.

The two main disadvantages of a wet boom are initial cost and its potential for damage. If the boom contacts a non-moveable object, it may break or bend, destroying part of the boom.

Cost Comparison

The costs of a modern wet boom design versus a dry boom are summarized in *Table I*. The cost of 1-inch outside diameter 16-gauge stainless steel tubing is approximately $4 per foot. The ends of the tubing are compressed and 1-inch stainless steel pipe nipples (304) are welded to each end of the stainless steel tubing. The nipples cost approximately $2 and welding each one costs about $3. The hose that feeds the boom and the plug can be attached to these nipples. Both are quick attach couplers. Holes on the boom need to be precisely drilled at the nozzle spacing being used.

Table I. Comparison of wet and dry boom costs.

20-foot wet boom:		
20 feet of 1-inch OD 16-gauge stainless steel tubing - $4/foot	= $ 80.00	
2 nipples - $2 each	= $ 4.00	
Welding 2 nipples - $3 each	= $ 6.00	
Total	$ 90.00	
20-foot dry boom:		
20 feet of 3/4-inch braided hose - $0.70/foot		= $14.00
If 30-inch nozzle spacing, 16 stainless steel clamps - $0.75 each		= $12.00
To keep from losing pressure, each 10-foot section of hose is fed in the middle		
Extra hose is 7 feet + 17 feet = 24 x $0.70= $16.80		
4 more clamps at $0.75 each		= $ 3.00
Two fittings at approximately $5 each		= $10.00
		$55.80

This example assumes the connectors and nozzle assemblies for the hose and stainless steel tubing will be about equal to the additional hose and fittings needed on the dry boom.

If the dry boom is left outside and unprotected, the hose may need to be replaced every two or three years. The stainless steel tubing should last for many years if not damaged.

The following photos help illustrate differences between wet and dry booms *(Figures 4 - 10)*.

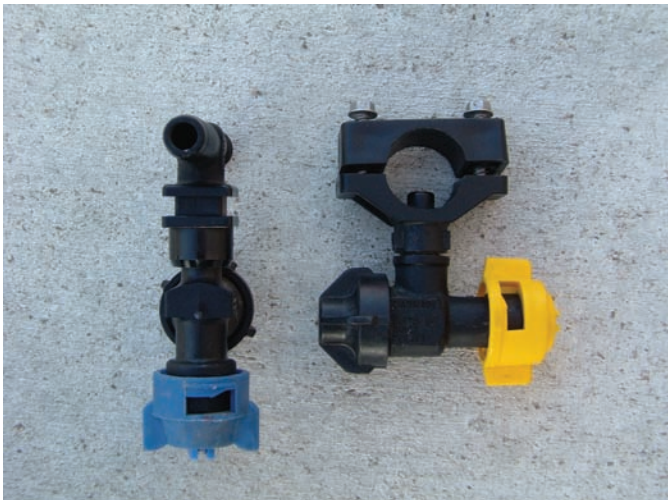

Figure 3. Nozzle assemblies for dry *(left)* and wet *(right)* booms.

Figure 4. The bracket to hold the wet boom. The rubber hose protects the boom and the stainless steel hose clamps hold the wet boom in place.

Figure 5. How dry boom is fed — note restriction to flow rate.

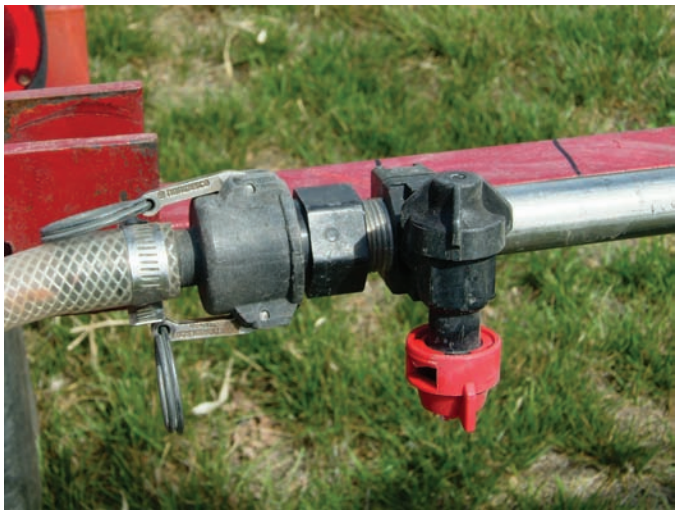

Figure 6. How wet boom is fed.

Figure 7. End cap on wet boom to drain and flush boom.

Figure 8. Wet boom nozzle body on and off boom.

Figure 9. Multiple nozzle body on wet boom.

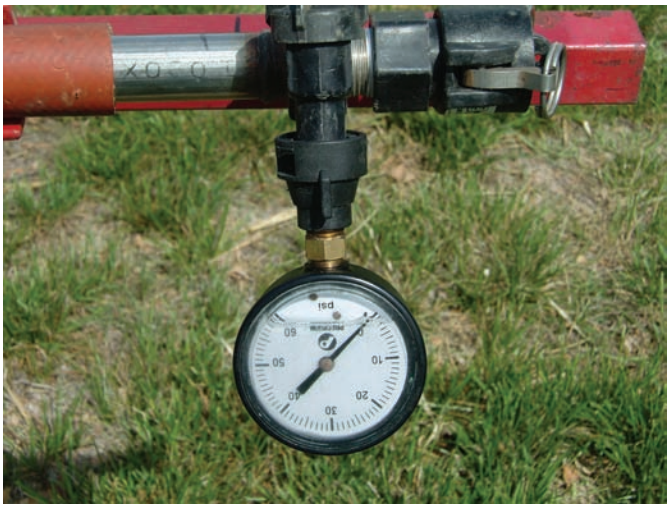

Figure 10. Gauge to check spray pressure on a wet boom.

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