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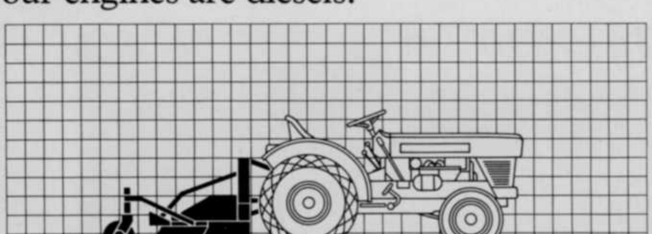

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SERVICING TRACTOR HYDRAULICS — SIMPLE YET VITAL TO OPERATION

By John Kerr, Assistant Editor

The hydraulics of your tractor provide the muscle for otherwise burdensome manual work. They assist you in many of the basic functions a tractor performs, such as braking and steering. With just a touch of a lever, you can lift, fold, and power attachments and implements weighing up to several thousand pounds. Hydraulics are the lifeblood of your tractor, yet they are very vulnerable to contamination and negligence. It is essential to maintain them.

There are two types of hydraulic systems on tractors: open-center and closed-center. Historically, tractor hydraulic systems have been open-center, in which the main pump produces a continuous flow of oil that must be returned to the reservoir when a hydraulic function is not in operation. Because the number of hydraulic functions increased so much— from power steering, power brakes, a three-point hitch, and independent remote cylinders to include control of power-shiftable transmissions, the PTO clutch, transmission clutch, and the differential lock—closed-center systems were introduced. In these, the pump contains standby pressure which is always maintained at a given specification. When a tractor demands more power, the pump kicks it out without using extra engine horsepower. Some manufacturers prefer one system over another for their equipment; some use both types.

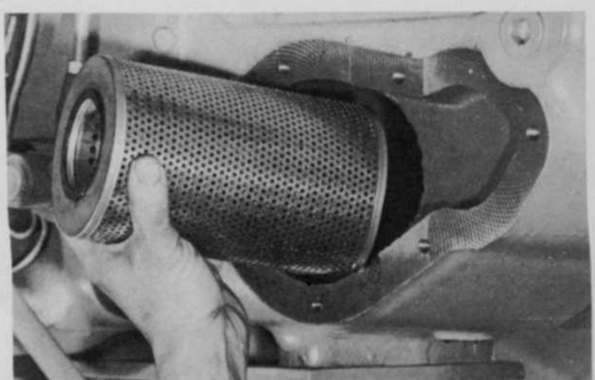
As tractors continue to increase in size and complexity, it becomes more and more important to keep the hydraulic system working well and free from breakdowns. The smallest particle of dirt, if it gets inside the system with its close-fitting parts, acts like an abrasive, scoring cylinder walls, destroying seals, and rapidly wearing the components. Maintenance of the system is very similar for older tractors with a separate hydraulic system and late models with a transmission-hydraulic system. Arlen D. Brown, associate professor of agricultural mechanics at Purdue University, lists 11 rules of maintenance that every owner or operator of a tractor should follow:

1. Change the hydraulic oil filter after the first 10 hours and first 100 hours in a new tractor.
2. Change the hydraulic oil filter at the recommended intervals after the first 100 hours of operation.
3. Check the hydraulic oil level periodically, at least every 200 hours, after the tractor is broken in.
4. Drain and refill the hydraulic system at the intervals recommended by the manufacturer.
5. Do everything possible to keep dust and dirt out of the system. Dirt is the worst enemy of the hydraulic system because of the damage it can do to pump parts and seals.
6. Take care to keep couplings clean when connecting remote cylinders.
7. Keep dust caps and dust plugs on all hydraulic cylinder couplings to help protect them from dirt and grit when couplings are disconnected.
8. Keep hydraulic oil containers absolutely clean, and use extreme care when adding oil or refilling so that no dirt can get into the system from around the filter cap, funnels, or from dust in the air.
9. Keep the hydraulic oil cooler clean to help prevent overheating of the hydraulic oil. If the hydraulic oil has been overheated, check with the tractor dealer. It may be advisable to drain and refill the system with new hydraulic oil and change the filter.
10. Operate the hydraulic units on the tractor correctly and carefully.
11. Always use the hydraulic oil recommended by the manufacturer. The wrong oil in the system can damage seals and lead to premature failure of parts of the hydraulic system.

Although tractor operators may be aware of many of these points or have read similar aids in their owner's manual, they are remiss in acting upon them. Manufacturers always stress hydraulic maintenance.

"Operators usually have problems because they let contamination get into the system," says Don Liller, assistant national service manager for Kubota Tractor Corp. "Only the large construction concerns that have been exposed to hydraulics for a long time and to whom the downtime is all important, only those types of individuals, pay close attention to the cleanliness of a system. The average operator around small grounds, nurseries, and those types of areas usually lets his tractor alone as long as everything is working OK. They don't bother doing any preventive maintenance."

"Changing filters, checking oil, and adding oil when necessary is extremely critical on hydraulic systems," says Don Borgman, supervisor of technical services at the John Deere Horicon Works. "We have a hell of a problem educating our customers that it is not something we tell them to sell more oil and filters; it's something we want them to do to give them better service out of their equipment. It's like anything else; if it's maintained



Filters should be replaced at recommended intervals. (Photo courtesy J I Case) properly and not abused, it's going to last a long time."

Robert Snopko, product performance manager of the Agricultural Equipment Div., J I Case, tells owners: "Good hydraulic maintenance begins when you purchase the tractor. Your dealer will go over the system with you, pointing out special features. He will also explain what you as an owner must do to properly care for the system.

"Read your owner's manual thoroughly. In the manual, the manufacturer will give detailed instructions on taking care of the hydraulic system. Pay special attention to any instructions on servicing filters and any recommendations on the type of hydraulic oil to use.

"The really smart operators write out their own check list of maintenance procedures. They keep this list taped inside the cab, where it serves as a constant reminder. Some manufacturers provide self-adhesive maintenance charts which can be fastened to the cab."

Tractor manufacturers agree that most hydraulic problems occur because of the use of wrong or contaminated hydraulic oil and unclean filters. It is important to use the oil recommended by the manufacturer. "Saving money by buying the cheapest oil and filters you can find may turn out to be a very expensive bargain," says Snopko.

The hydraulic oil must transmit power, lubricate all moving parts, protect the metal parts of the system from rust and corrosion, resist oxidation and foaming, and separate itself readily from air, water, and other contaminants. The oil must also be stable over a long period of time and maintain the proper viscosity through a wide range of temperatures.

In order to have all these properties, various additives are incorporated into the oil. These include viscosity index improver, an "extreme pressure" additive, oxidation inhibitor, rust and corrosion inhibitors, and foam inhibitors.

The additives in the hydraulic oil help hold contaminants in suspension and protect the system but will eventually lose their effectiveness after a certain period of time. The hydraulic oil must be drained while the contaminants are still in suspension and the additives are still protecting the system. The oil change interval recommended by the manufacturer indicates the maximum number of hours of operation that the hydraulic oil can be expected to maintain its ability to protect the system. This information and some of the following tips on changing oil and filters can be found in Arlen Brown's book, *Tractor and Small Engine Maintenance*.

Recommendations vary some between makes of tractor, but the hydraulic oil should usually be drained at least once a year. The hours of operation will vary from 600 to 1,000 or 1,200 hours with different manufacturers. Regular drainage of the entire hydraulic system is extremely important to remove products of oxidation, such as acids and sludge, water which tends to accumulate in the system, minute metal particles, and other contaminants. Drain the system when the hydraulic oil is warm, and more of the contaminants will be removed.

If the drained oil has sediment and sludge in it, the hydraulic system should be flushed before refilling. Follow the manufacturer's recommendation carefully, or have this done at the dealer's service department. Probably the only safe flushing agent to use is the hydraulic oil regularly used in the system. Change the filter and fill the system with the recommended hydraulic oil and operate the equipment to cycle the oil through the system until the hydraulic equipment operates satisfactorily. This may take several hours. Drain the flushing oil, replace the filter or filters, and refill with the recommended hydraulic oil.

J I Case's Snopko suggests making frequent visual inspections of the hydraulic systems to anticipate dirty oil. "Some people argue that a small leak is not a serious problem because you are only losing fluid, which can be replaced," he says. "A leak, however, is also a possible source for contamination, because where fluid can get out, dirt and water can get in."

If the fluid appears milky, water has entered the system, says Snopko. This is time to drain and flush. It also helps to smell the oil. A burnt odor indicates the fluid has overheated, usually from an overbearing workload. "A dirty hydraulic oil cooler or a damaged line may also cause overheating," says Snopko. "Any implement or attachment mounted on your tractor must not block the flow of air around the cooler."

If, after all these checks of the hydraulic oil your equipment still does not operate correctly, there are probably gum and lacquer deposits present, and the system will have to be taken apart and cleaned manually. This should probably be done by the tractor dealer service department and certainly only by a qualified mechanic. Regular draining and servicing of the hydraulic system should reduce the formation of gum and lacquer.

A magnetic drain plug is ordinarily used in hydraulic systems. The plug collects small particles of metal and keeps them from circulating the system. The drain plug should be thoroughly cleaned before it is replaced.

Even with careful maintenance, contaminants can accumulate in the hydraulic system. The filter or filters remove them as the oil circulates but the filter must be changed before it has absorbed all the dirt and contaminants it can hold and stops working. Since the filter has a by-pass valve, according to John Deere's Borgman, once the filter becomes plugged, the oil does not go through it any more but continues circulating. "Then you have unfiltered oil going through the system and it gets

Both coupling parts should be clean before attaching equipment to hydraulic system.

abrasive and does damage," Borgman says. The filter should also be changed under abnormally dusty conditions or high temperature operation.

Kubota Tractor's Liller says the rules are simple for hydraulic maintenance. "The single most important thing is you have to keep it clean. That's really the name of the game on hydraulics." He suggests cleaning the all-cylinder rods and valve spools and all the exposed parts. Dirt wiper seals which keep dirt from getting in valves and components have to be periodically inspected to make sure they're resilient and conform to the shape they should be. That keeps dirt from entering the system.

"On any hydraulically-operated mechanical implement you have to keep all the pivot points lubricated," Liller says. "Every part is constantly lubricated and wear is negligible if you keep the dirt out." He warns about repairing hydraulic leaks in the field, which often end up contaminated and cause worse problems than you had.

Hydraulics were originally introduced to provide control of an integral implement. They now hook up on most tractors to operate mowers, tree trimmers, loaders, and a variety of different implements that mount on the front, rear or both ends of a tractor.

The primary means for driving implements is a power take-off (PTO) which is attached to the power train of the tractor. Another means is to mount a hydraulic pump on the PTO as a mechanical link with the power input from the PTO's rotating shaft. Depending on what operation you want performed determines whether you are better off with a hydraulic drive or a PTO drive for your implement.

The advantage of the PTO drive is that it is less expensive, provides a simple means of transfering large horsepower loads, and is easy to hook up. The hydraulic system works better around corners and when pulling implements far behind the tractor because there is no shaft to worry about supporting. Also, you do not have to bring the tractor to an equivalent rpm of the implement to drive it.

Practically all tractors are now manufactured with some arrangement for a "live" PTO—the ability to stop forward motion of the tractor without stopping the rotation of the PTO. This is very desirable and has led to much greater use of power take-off driven equipment.

New tractors, of moderate to large size, are equipped so that the new 1,000 rpm power take-off shaft may be installed. The new standard speed permits more efficient operation. The 1,000 rpm shaft has more, and smaller splines, than the standard 540 shaft. The tractors are designed so that the speed can be changed to correspond to the type of shaft being used. The power take-off standards are established by the American Society of Agricultural Engineers (ASAE) and the Society of Automotive Engineers (SAE), according to Brown.

He also says that on most tractors there is an adjustment for increasing or decreasing the speed of lifting or dropping implements. As a general rule, the heavier implements should be lifted more slowly to avoid undue strain on the system. Never overload the system. Most implements have auxiliary springs to assist in lifting. These should be adjusted to take as much load off the system as possible.

Because a tractor often is hooked up and then disconnected from implements, the hydraulic system is often exposed at these links. It is advisable to cap all connections securely when they are not in use. An uncovered connection collects dirt and when the component is then hooked up, the dirt is forced into the system.

"Be especially careful to avoid dropping or dragging hydraulic lines on the ground," says Snopko. "This damages the connections and greatly increases the risk of contamination."

"A lot of people do not wipe off the lines before they hook them back up," says Liller. "They might blow them a little or pass a rag over them. Once you start getting dust and dirt into the system, it's the beginning of the end. If a chronic problem, you can damage, even fail, the hydraulic pump. Scratched cylinders and failed pistons can really create some havoc. And it can get expensive. Hydraulic components are high priced."

The implements can be a good indicator of the condition of your hydraulic system. As Snopko says: "As you work with the tractor, watch the action of the hydraulic-powered implements. If their movement is slow or jerky, something is wrong with the hydraulic system. Stop working until you have determined and corrected the problem."

To make a smooth interchange of tractor and implements, one essential part of the hydraulic system is added, a remote cylinder. Interchangeability of cylinders between different makes of tractor and implement is accomplished by standardizing the stroke length and the cylinder mounted dimensions, according to John Deere. If the tractor is used with an implement or machine of another make, the tractor-matched cylinder can be readily installed on the competitive machine.

Remote cylinders may be single acting or double acting depending upon their construction and method of attachment, says Brown. It is usually best to attach the cylinder to the implement so that the heaviest load is on the cylinder when it is extending, because more piston surface is exposed to the hydraulic pressure. Stops are provided on the piston rod to adjust the length of stroke to the requirements of the implement. Clamp the stop securely so it does not work and damage the piston rod.

Today's hydraulic systems are very sophisticated. They have to be in order to meet the growing demands placed upon them. Your tractor, with its hydraulic system, provides a great deal of power and control.

Manufacturers are doing their part to provide the most efficient, up-to-date equipment for your particular operation. But once a tractor and implements become your tools for maintaining grounds, the responsibility, especially with the hydraulic system, is yours. **WTT**

You can purchase the book, *Tractor and Small Engine Maintenance*, by Arlen D. Brown from Harvest Book Publications, 9800 Detroit Ave., Cleveland, OH 44102. The price is $11 plus $1.25 for shipping.

CONTROLLING SPRAY DRIFT THROUGH PROPER PESTICIDE APPLICATION

By S. W. Bingham, Professor of Plant Pathology and Physiology, Virginia Polytechnic and State University, Blacksburg, VA

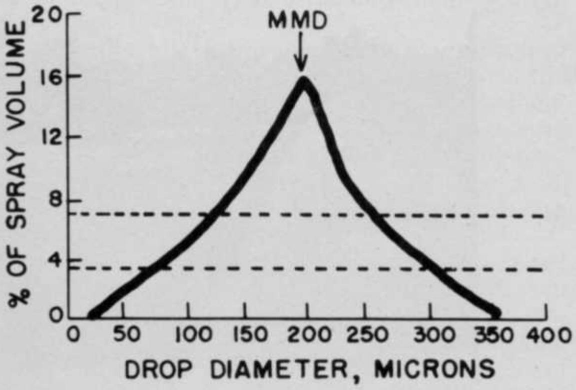
Spray drift, the movement of droplets to areas other than the intended site of application, causes many problems for the sprayer and his neighbor and is of utmost importance to control. In some cases, even a small amount of drift can be dangerous. It may damage sensitive crops nearby, produce unpleasant odors, and is generally undesirable in the environment. It also wastes chemicals too expensive to spread over non-target areas. To solve these problems and control drift, we must look at the size of spray droplets, a major factor.

On one hand, the size droplet containing a pesticide may be excessively small (less than 20 microns in diameter—a micron is 1/25,000 inch) and float in the air until evaporated. This pesticide may be carried high in the atmosphere and so widely dispersed that a concentration necessary to cause a response is never attained. The area adjacent to the pesticide application site may receive enough deposits from droplets of this size (or slightly larger) to be detected on sensitive species. On the other hand, droplets may be so large (greater than 1,000 microns) that they will only cover a percentage of the pests or site.

In general, insecticides and fungicides are applied using smaller droplets and sometimes larger spray volumes to obtain the desired coverage of the pest (droplet size around 70 microns). Herbicides appear more likely to show up in symptoms on adjacent areas and it becomes extremely important to utilize larger droplets (200 to 500 microns) with very low numbers of fine droplets in the spray application. The large heavier droplets fall from the spray boom more directly to the ground or plant surface while small droplets require long periods to fall and may float to greater distances in the air.

Spray droplets are generally smaller for insecticides or fungicides than for herbicides to obtain the desired coverage of the pest.

Three major means exist to produce the proper size droplet and control drift as well as possible during the application of pesticides. These are the equipment, chemicals, and environmental conditions.



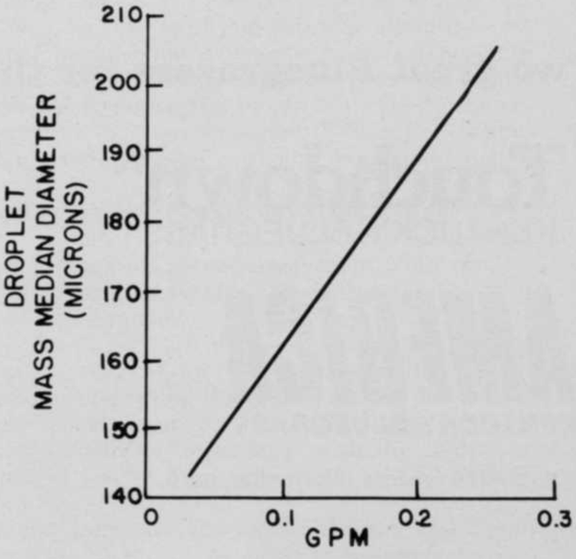


Figure 1. The typical nozzle orifice produces a wide range of droplet sizes. Overall, the spray is described by the mass median diameter, the top of the curve.

Figure 2. Mass median diameter increases as the flow rate is increased by changing to larger orifices and maintaining the same pressure. (Both graphs are modified from Tate and Janssen, 1966).

The largest droplet size that provides consistent control of the pest will be most practical for drift control. Use as large a nozzle orifice as possible and as low a pressure as consistent with spray pattern.

Equipment influences spray drift

The typical nozzle orifice on boom sprayers gives a wide range of droplet sizes and is a good place to begin seeing the effects equipment has on spray drift. Figure 1 shows the typical distribution from an orifice under 40 psi. In herbicide applications with drift hazard situations, a larger orifice size may be necessary to reduce the amount of fine droplets (less than 100 microns) below levels that may cause effect on non-target plants.

Since a wide range of droplet sizes comes out of a nozzle orifice, it is important to have a good way to express the amount of spray in various size droplets. If you double the diameter of a droplet, you must increase the volume of spray eight-fold to achieve the same amount of spray. For example, in figure 1, about 7 percent of the spray volume is in 130 micron diameter droplets and 7 percent in 260 micron droplets. Yet, at 130 microns there are eight times as many droplets as at 260 microns. In another comparison, 3½ percent of spray is in 75 micron droplets and the same amount is in 300 micron droplets. There are 64 times as many droplets having the small diameter. These are too small in most herbicide applications, even in still air. Then, the term used to describe the droplet distribution from various orifices frequently is "mass median diameter" (MMD), which refers to the diameter with ½ of the spray in droplets larger and ½ of the volume in droplets smaller. There may be many times more small droplets in comparison to large droplets.

The angle of spray pattern is also important to consider. Generally, cone and flat fan type orifices provide about the same droplet spectrum if the spray angles are about equal. At the same pressure, the flow rate increases with larger nozzle orifices (equal spray angle) and droplet size rate increases in almost direct proportions (Figure 2). A wide angle spray pattern (80 degrees) has more small droplets than narrow patterns (65 degrees). For example, at a 0.2 gallon per minute (GPM) flow rate using 40 psi, the MMD is about 380 microns for 80 degree flat fan nozzle orifice and about 450 microns for 65 degree flat fan (Figure 3) orifice. The operating pressure is regulated by a pressure regulator through returning excess spray back to the tank. If the operator uses larger nozzle orifices and reduces the pressure to obtain the same flow rate, the MMD is also increased. Figure 3 shows that reducing pressure to 10 psi provided a MMD of 490 microns compared to 380 microns using an 80 degree spray angle and 40 psi.

Assuming the boom has a fixed nozzle spacing or the flow rate per unit of boom length is to remain the same, an orifice providing a larger spray angle (80 degrees) would necessitate a low boom height (about 18 inches) compared to an orifice with narrow angle (65 degree) pattern (about 22 inches high). The importance of nozzle height and distance a droplet must travel to the target will be discussed under environmental effects later.

Since droplet size is a major factor in spray drift control, let us describe these related equipment aspects. First, the nozzle orifice size has a great impact on droplet size. Additional pressure, especially using a smaller orifice to provide a similar flow rate, will result in larger numbers of small droplets. As the spray angle from the orifice becomes larger at a given flow rate, it will produce more small droplets.

The speed of the sprayer and the orientation of the nozzle orifice to the direction of travel will also have an impact on droplet size. If the nozzle is spraying in the direction of travel, the droplets will be small. When spraying perpendicular to travel direction, a median droplet size is obtained. And spraying backward from the travel direction, with all other conditions the same, results in the largest droplets.

Some developments in nozzle design have greatly improved drift control. Nozzles are designed to reduce the number of small droplets in the spray pattern. The nozzles utilize a core and disc for swirling and metering the spray passing through the system. The secondary swirl chamber in the nozzle cap alters the flow of liquid, resulting in few fine droplets being discharged from a secondary large orifice in the cap. This is further improved by a special passageway extending from this orifice in the nozzle cap. Thus, nozzle design has been improved to reduce the range of droplet sizes and effectively reduce the number of fine droplets delivered from the boom.

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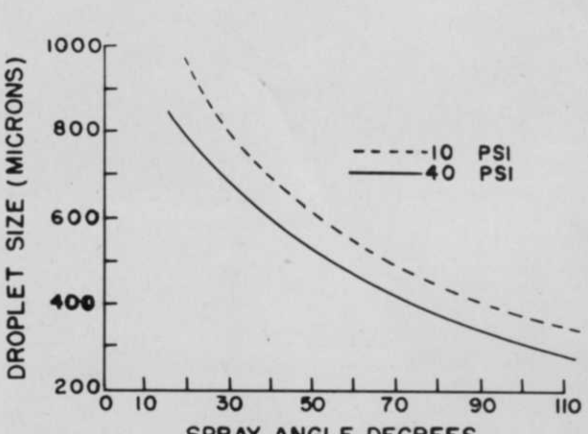

Figure 3. Droplet size gets smaller as the spray angle increases. Lower pressure provides larger size droplets. (Modified from Spraying Systems Co., 1967)

Drift *from page 27*

Hooded sprayers are available for many types of pesticide application; for example, herbicides to turfgrass areas. In this case, the hood contains somewhat rigid flaps hinging from about 10 inches above the soil level to provide cover rubbing along the top of the turfgrass. Gauge wheels maintain the hood and boom under the hood at a uniform height. These sprayers are generally mounted on a three-point hitch and are raised for turning (stop spray during turning because drift occurs from lifting hood).

Wick applicators are designed to apply pesticide through ropes rubbing on the plants (Figure 4). The rope is usually mounted through holes in the boom containing the spray material and trails along the bottom of the boom. Droplets are not formed until on the plant surfaces. Therefore, spray drift is almost completely controlled. This type of applicator is used primarily for weeds that are taller than the crop or desirable plants.

There is also a recirculating sprayer which utilizes streams of spray material directed from nozzles on one side of a row to trap on the other side. Weeds must be taller than the crop for effective coverage with less pesticide on the crop. There are very few fine droplets from this application except when the stream of spray splatters as it hits the target plants.

With equipment, it is important to remember that droplet size and distance from droplet release to target are prime factors in drift control. Nozzle orifice size and pressure utilized are also essential. Less spray drift comes from a large orifice, low pressure boom sprayers, and low boom height. Operators should utilize the largest droplet size that will provide the desired control of the pest in order to reduce spray drift.

Chemical aspects influencing spray drift

A pesticide formulation contains many ingredients to improve the final application results.

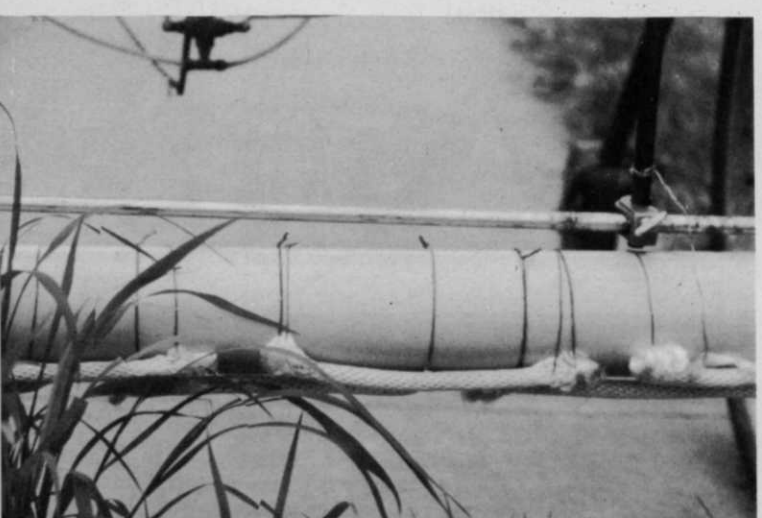

Figure 4. Wick applicator boom showing rope which applies the herbicide to weeds that are taller than the crop.

Surfactants, emulsifying agents, and other additives affect the droplet size during application. Any change toward larger droplets usually reduces drift potential. Generally, formulation ingredients increase viscosity of the spray and increase droplet size during application.

During the last several years, thickeners have been widely evaluated and used in reducing spray drift during pesticide application. One thickening agent is a polyvinyl polymer material which provides some increase in mass median diameter of the spray droplets during application, but the major improvement lies in the fact that it effectively reduces the number of small droplets through elastic surface properties (Figures 5 and 6). The addition of anti-drift thickeners provides a greater margin of safety from spray drift; however, acceptable results must be attainable with slightly larger droplets. These compounds are particularly suited for drift control while applying auxin-type herbicides.

Even with polyvinyl polymers included in the spray mix to reduce the chances for significant spray drift, drift can still occur. Then, it continues to be important to use common sense in regard to pesticides that are particularly proned to produce bad effects or residues on nearby sensitive plants.

Droplets as large as 200 microns drifted 15 feet or more in a 7½ mph wind while falling 7½ feet from a nozzle tip in a wind tunnel (Figure 5). Using 1 pint of Nalco-Trol (polyvinyl polymer from Nalco Chemical Co.) per 100 gallons of water reduced drift to barely detectable levels using a dye to determine droplet deposits on glossy paper at 5 feet down wind under similar conditions.

In addition to drift control, the polyvinyl polymer formulations provide spreading properties on the leaf surface and improve uptake of several herbicides. Thus, herbicide effectiveness may be improved by keeping the droplet on the foliage, spreading, and improving absorption for longer periods (droplets dry on leaf surface much slower).

Environmental conditions influence spray drift

Wind speed is usually considered the major factor in drift of spray. For water spray solutions, droplets of 100 micron diameter will fall about 1 foot per second and in a 3 mph breeze will drift about 40 feet in a second. A droplet of 500 micron diameter will fall 1 foot in 0.15 seconds and drift less than 1 foot during this time in a 3 mph breeze. Even in a 15 mph wind, these large droplets will drift only about 3 feet while falling 1 foot. Wind significantly reduces the number of days to spray herbicides in the spring because of drift problems.

Temperature and humidity are also factors in drift control. Evaporation of spray droplets presents some problem when they are released several feet from the target surface. During warm weather, considerable drying down of droplets occurs and rising heat currents may become buoyant to the spray. Evaporation of the droplet eventually will give rise to particulate (wettable powder or salt crystal) pesticide which is readily carried through the atmosphere for periods of two or three days. Spray droplets evaporate during fall under

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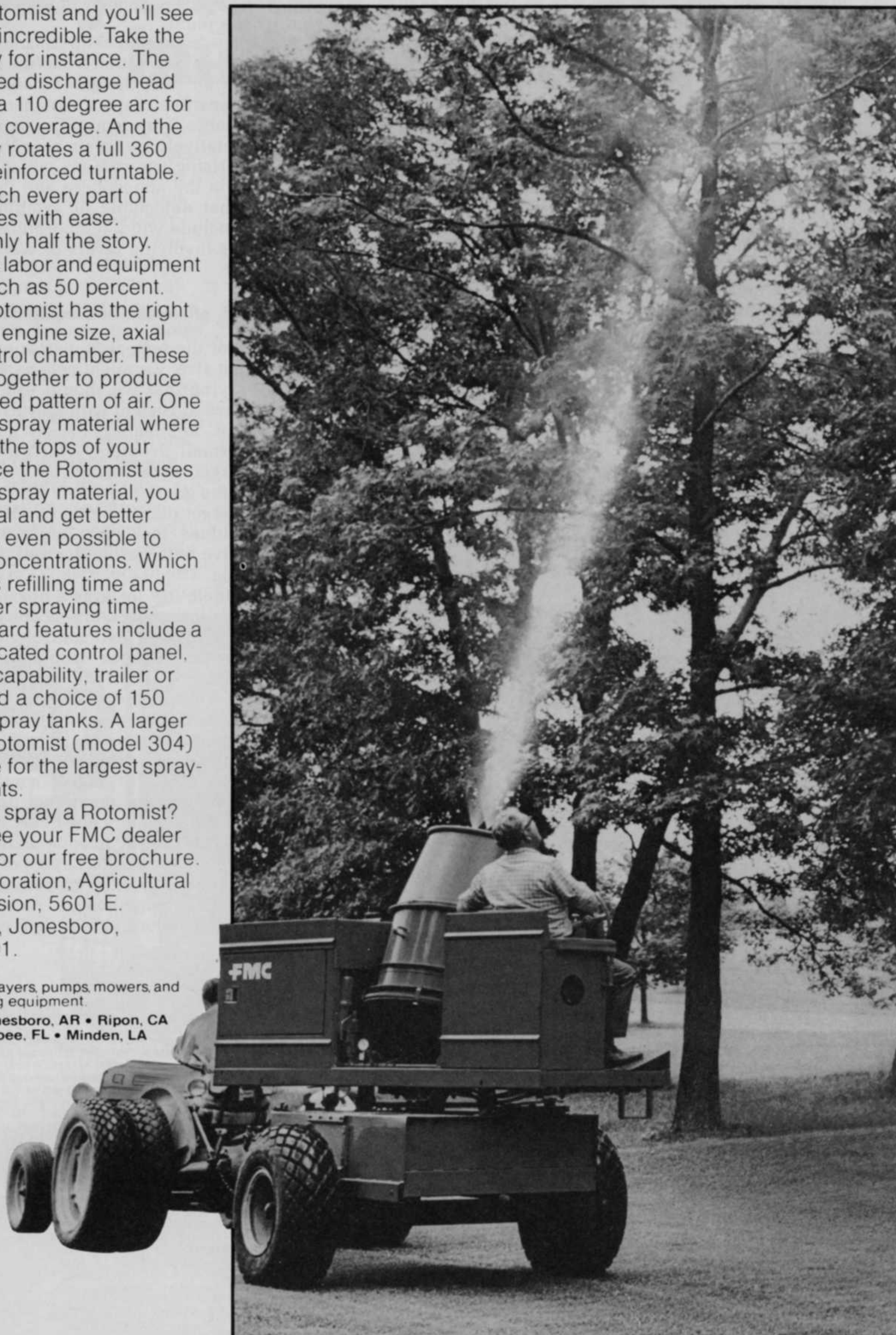
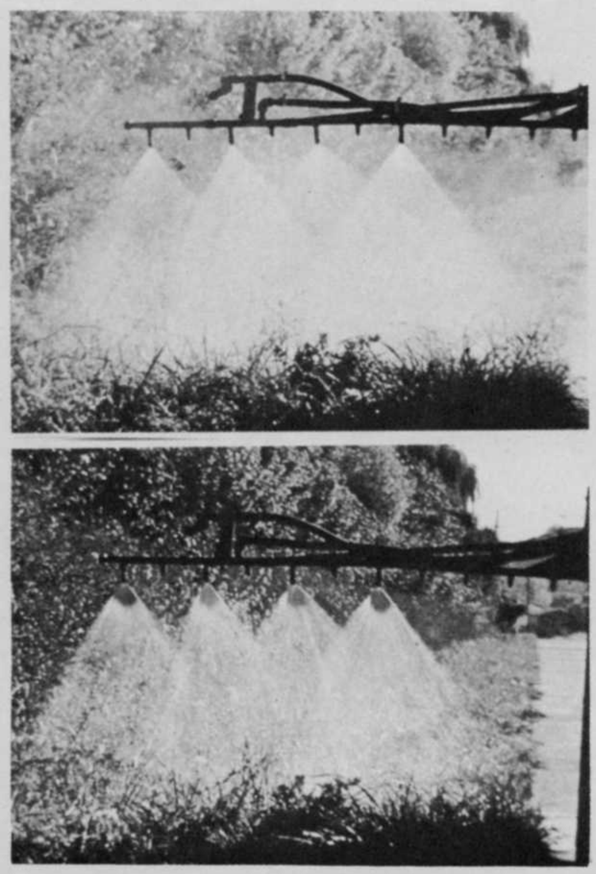


low humidity conditions and rate of fall will slow as size becomes small (Figure 7). The small spray droplets evaporate fast because of large surface area per unit volume and so the rate of evaporation increases during fall to the target.

For evaporation to occur, the water molecules must migrate away from a droplet and heat toward the droplet. Thus, the largest droplet size that provides consistent control of the pest will be most practical for drift control. As mentioned earlier, small droplets are quite effective for insect applications and in large droplets require more of the pesticide which increases environmental contamination. In general, herbicides are applied to the leaf and are retained until translocation to other plant parts. Not until spray volume becomes extremely low (less than 5 gallons per acre) does one find decreasing droplet size below 100 microns improve herbicidal effectiveness using foliarly applied compounds. Exceptions may include compounds which are very poorly absorbed and translocated by the plant.

Thickening agents added to pesticides increase the diameter of spray droplets and decrease the amount of drift. Added to this sprayer, a polyvinyl polymer material also provides good spread and better absorption by leaves.



An inversion condition with stagnate layers is conducive to cloud formation from fine spray in the relatively cool air near the ground and eventually may fall on sensitive crops a distance away, producing detectable symptoms. The opposite may also occur—relatively warm air near the ground is conducive to rising convections which carry fine droplets high in the atmosphere and they become so disperse that detectable or symptomatic conditions must include wind, temperature, humidity, and conditions involving layers of warm and cool air.

Environmental, chemical, and equipment aspects

Since most of the factors in drift control centers around droplet size, we might summarize this discussion by saying that we should use the largest droplets that are consistent with the desirable level of pest control. Remember, insects and diseases may require small droplets, which are likely to drift to non-target areas during application. Herbicides present the greater problem since small residues on non-target plants yield as well as produce unwanted residues. However, larger droplets are notably effective with herbicides and drift control is quite possible.

We would, then, use as large a nozzle orifice as possible and as low a pressure as consistent with spray pattern to provide drift control and best control. Reducing the distance droplets must travel reduces the distance wind will carry droplets off target and the time for droplets to dry to smaller size. Drift control chemical agents can be added to the spray mix to reduce the fine droplets in the application. Applications during morning hours or later afternoons affect drying of small droplets. Avoid windy weather for maximum drift control. Even when all other factors are being considered, wind will still carry spray to some extent (drift is never completely controlled). Layers of warm and cool air can cause unwanted movement of pesticide fine droplets a long distance. As you can see, common sense is a major factor in drift control.

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