

washoff. We know because showers have come up unexpectedly right after spraying without adverse effect. Resistance to washoff has enabled us to spray dew-covered weeds and brush in early morning with good kill. Fog is not uncommon during the day in the southeastern Minnesota valleys. Our crews using the invert never have to wait for it to lift; they go right on spraying.

Our crews have observed that the sticky invert droplets better control some species of weeds or brush that characteristically have a waxy or thick outer cuticle. Because of their oily nature, the invert droplets seem to stick and penetrate these leaf surfaces more effectively.

There is no better proof of drift control than the fact that we have had no damage claims from our invert spraying during the three-year period that it has been in use. And, each year we have used this equipment to cover an average of 230 miles of roadside adjacent to farmland.

#### Cost Comparison

We have continued to keep and use our conventional spray equipment on a limited basis when wind conditions permit. However, the invert equipment has proved so satisfactory that we are using the conventional less and less each season. Comparing costs between the two methods, we have found that the cost per acre is about the same. Even though the invert chemical costs slightly more, the reduced labor time per acre with the invert offsets the additional chemical costs.

#### About the Equipment

We learned from Cliff Schrader of Lyon Chemicals, Inc., that the idea of spraying invert formulations had been under development for some time. The major problem had been to engineer a spray system that could pump the thick invert emulsion to nozzles and release it with a uniform pattern.

The Wanner Roadside Sprayer does this with a bifluid system that pumps the water and herbicide from separate tanks to the

nozzle, where a thick emulsion is simultaneously formed and sprayed. Figure I gives a schematic drawing of this bifluid system.

The Wanner Roadside Sprayer that we use is a complete spray unit mounted on a two-wheel trailer. It is also available skid mounted for installing on a truck bed.

The tank has two compartments: the large tank holds 260 gal. of water and the small tank holds 40 gal. of herbicide formulation. The unit is equipped with a 10-gal.-per-minute positive displacement pump on the water side, and a 3-gal. piston pump on the chemical side. For optimum operation of the booms, pressures are maintained at 30-35 p.s.i. The handgun performs best with pressures of 100-125 p.s.i.

Invert roadside spray units are now available with a handgun and one or two booms that break-away for poles and other roadside obstructions and that are adjustable in height. The standard single boom is 13 ft. long with two nozzles and gives a 16 ft. to 20 ft. swath. This boom can be extended to 17 ft. which adds the third nozzle and increases the swath to 24 ft. to 30 ft. The double-boom units have a 9-ft. boom and a 3-ft. stub boom. The single nozzle on the longer boom is faced outboard and reaches 16 ft. to 20 ft. The stub boom nozzle faces inboard and covers an 8-ft. to 12-ft. swath.

The Hercules Low Volume nozzles are supplied to Minnesota Wanner from Hercules Incorporated, manufacturers of the herbicide formulations. The nozzle and special tips used in the bifluid spray system have been engineered and field tested to give the optimum spray pattern for weed and brush control with regulated drift.

#### Application Rate

The roadsides of Wabasha County are infested with a wide variety of brush including plenty of sumac and boxelder as well as a number of annual and perennial broad-leaved weeds. We have found that  $\frac{3}{4}$  lb. of 2,4-D and  $\frac{3}{4}$  lb. of 2,4,5-T acid equiva-

lent per acre gives good weed and brush control.

The "Visko-Rhap" formulations used in the Wanner Roadside Sprayer, as well as the equipment, are distributed by Lyon Chemicals, Inc., of St. Paul. "Visko-Rhap" formulations containing 2,4-D and 2,4,5-T are recommended for normal spraying of a variety of weeds and brush. "Visko-Rhap" formulations containing 2,4,5-T are used for fall spraying and for hard-to-kill woody plants.

The recommended uniform travel speed for the Wanner Roadside Sprayer is 3 to 7 m.p.h., depending on the height, density and type of weeds and brush. For dense brush or heavy infestation of noxious weeds, additional chemical may be applied with the handgun.

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### Heated Turf Grows Faster, Is Frost-Free, More Popular

With the installation of underground heating cables in the football field turf of the U. S. Air Force Academy's Falcon Stadium, The Singer Co., whose Climate Control Division made the cables, predicts increasing popularity of turf heating.

Cables were installed 1' apart at 8" below the surface, and are said to be designed for frost- and snow-free football, with fewer injuries from frozen field surfaces. A similar installation is planned for the new Civic Center Busch Memorial Stadium in St. Louis, and interest has reportedly been expressed in other areas. If used for baseball field turf, Singer says, heating cables would encourage faster growth, cut down on seeding and sodding, and allow the use of sturdy, southern grasses.

Experiments in turf heating have been conducted since 1962 at the varsity practice football field at Purdue University in Lafayette, Ind. Singer adds that heated playing fields have been in existence in Europe since 1959.

Write the Singer Co., Climate Control Div., Box 7047, Cleveland, Ohio 44128, for additional data on heating cables.