JACK-PINE BUDWORM CONTROL: III. CONVERSION OF A FOREST FIRE WATER PUMPER FOR INSECTICIDE SPRAYING

by

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INTRODUCTION

Applications of insecticides for control of forest insect defoliators is a requirement of good forest management in the protection of foliage on valuable trees. Insecticides usually are applied by aircraft where extensive infestations occur (DeBoo and Hildahl 1967, Webb 1959). Often, however, only small and isolated areas warrent treatment, and contracted treatments by aerial applicators may be very expensive. In such cases, ground applications by field personnel of the responsible agency (e.g., Parks Branch, Forestry Branch) offer the best economic solution. Since reassignment of permanent staff for short periods may be discounted as contributing to operational expenses, major cost factors will be the purchase of the insecticide and the acquisition of suitable spray equipment.

Commercial spray equipment for forest use is priced from $2,000 to $10,000 or more per unit, depending upon design, load capacity, delivery rate, etc. For one or more reasons, acquisition of this specialized equipment may be economically infeasible, particularly for use in the protection of trees or stands of predominately aesthetic value. However, in Manitoba, as in most other provinces, many 200-500 gal. forest fire water pumpers (Fig. 1) are strategically located throughout forested areas. The availability of this equipment suggested the possibility of its use for low-acreage treatments in keeping with minimal cost expenditures. As part of a study on the jack-pine budworm[1], an important defoliator of pines in central Canada (DeBoo and Hildahl 1968), the conversion of these trailer-type water pumpers to high-pressure sprayers was investigated during 1969. Major objectives were to utilize existing equipment and available personnel to minimize costs in the establishment of regional pest control programs as required in park and recreation areas and in valuable forest stands.

This report discusses only the mechanics for one method of conversion of a common water pumper in Manitoba (200 gal. (U.S.) capacity tank, 3 H.P. Briggs and Stratton gasoline engine, model PF-12 E.P.M. pump) to obtain increased pressure at the point of delivery (nozzle) in reaching tops of tall trees. A paper in preparation (DeBoo and Hildahl 1970) discusses optional ground application equipment for low-acreage treatments. In keeping with policies of this Department, mention of specific products is not intended as exclusive endorsement.

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[1] Choristoneura pinus pinus Freeman (Lepidoptera: Tortricidae)

MATERIALS AND METHODS FOR CONVERSION

A typical 200 gal. (U.S.) water pumper originally located at the Canadian Forestry Service Riding Mountain Field Station was selected for modification. The description of component parts of the original pumper and the converted sprayer are found in Table I; details concerning the mechanics of conversion and operational procedures are found in Table II and III, respectively. Figure 2 shows details of plumbing changes and addition of new parts necessary for high-pressure conversion.

Table I. Components of original forest fire water pumper and sprayer conversion

Item	Original pumper	Sprayer conversion[1]
Basic unit	Westeel 2-wheel trailer Westeel 200 gal. tank Westeel hose reel	Same
Engine	Briggs and Stratton, 3 h.p., 4-cycle	Same
Pump	E.P.M. Bronze gearless Model PF-12, adaptor kit included	Yoshii horizontal triplex model Y-81G (built-in gear reduction, pressure gauge, by-pass valve, pressure regulator) $192.00
Delivery hose	100 ft - 1 inch low pressure (180 psi)	100 ft - 3/8 inch wire-braided (2,000 psi) $96.00
Miscellaneous parts	None	In-line strainer, pipe, hose, fittings. $50.00
Delivery nozzle	Conventional fire nozzle	John Bean Spraymaster $115.00
Extra labor charge	None	5 hrs. at $5.00 = $25.00
Cost of conversion	-	$478.00

[1] Prices as of 1969.

Table II. Procedures for converting water pumps to high-pressure sprayer

Step		Procedure
1	(Removal)	Disconnect E.P.M. pump, low pressure inlet and outlet hoses at pump, delivery hose, fire nozzle.
2	(Replacement)	Connect Yoshii Y-81G pump to engine; connect high-pressure hoses, including delivery hose; attach John Bean Spraymaster spray gun.
3	(Addition)	Weld 18 inch drop-pipe into top of tank; connect pipe by hose to bypass port of pump; add strainer to intake line of pump; add necessary valves and fittings as shown in Fig. 2B

OPERATIONAL PROCEDURES

A. WATER PUMPER

1. Tank filling from:

   (a) Available pressure system - through filler hole (F1) in top of tank.

   (b) Open water source - place inlet line (F2) in water, open V1 for direct flow to inlet port (I), close V2 to shut off flow to delivery hose (D) redirecting flow into tank.

2. Delivery from:

   (a) Filled tank - Close V1 to direct flow from tank to inlet port (I), open V2 to direct flow through delivery hose (D) (as illustrated by directional arrows).

   (b) Open water source - place inlet line (F2) in water, open V1 for direct flow to inlet port (I), open V2 to direct flow through delivery hose (D).

B. SPRAYER CONVERSION

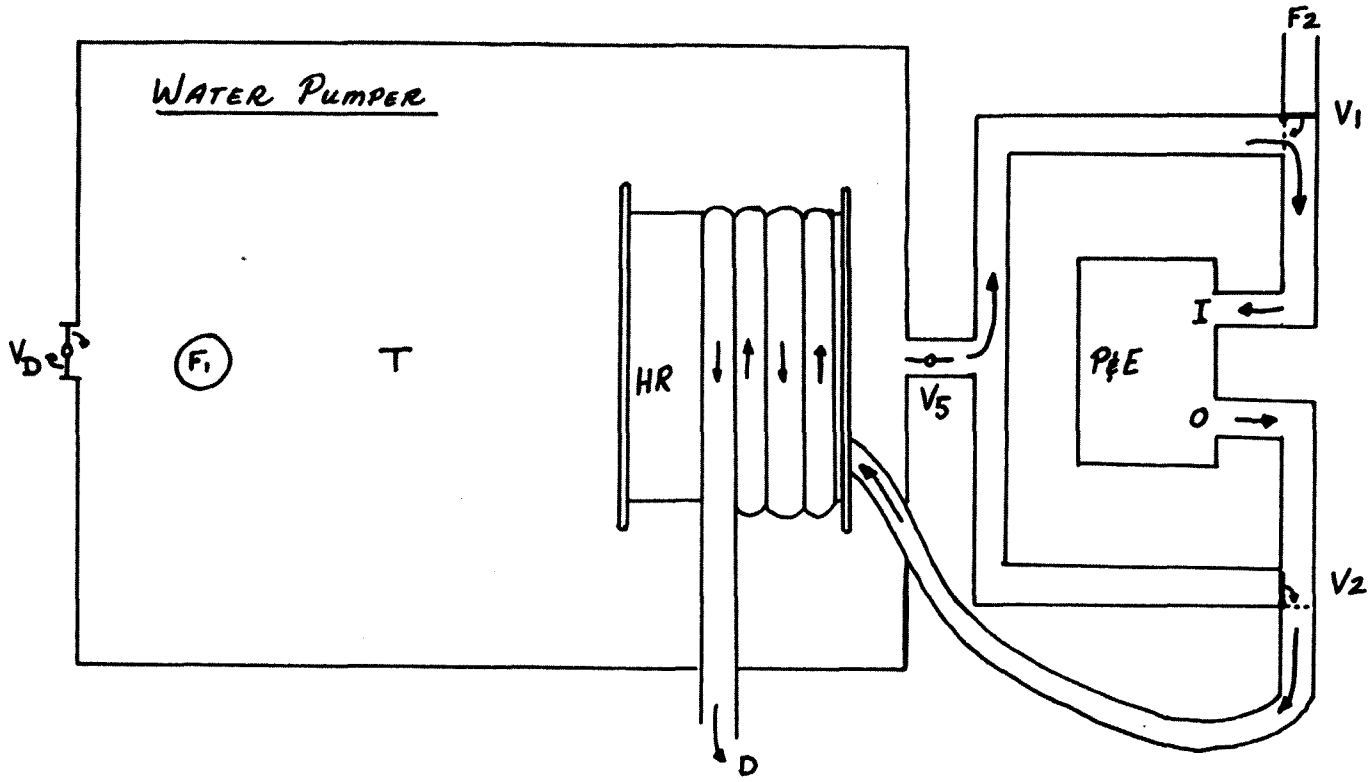
1. Tank filling from:

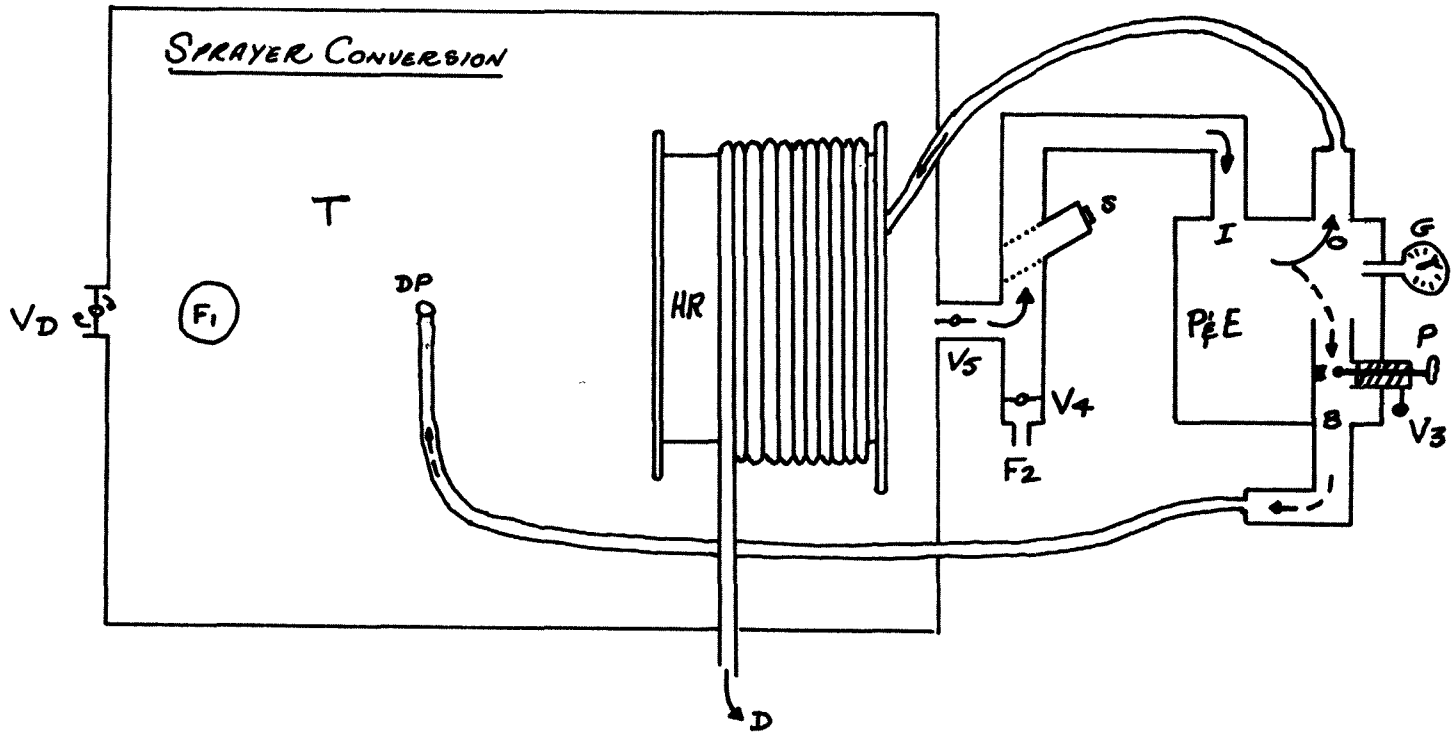
   (a) Available pressure system - as for pumper.

   (b) Open water source - place inlet line (F2) in water, open V4, close V5, to direct flow to inlet port (I), open V3 to direct flow through bypass port (B).

2. Delivery from:

   (a) Filled tank - open pressure regulator (P); open V5, close V4 to direct flow to inlet port (I); close pressure regulator (P) gradually to desired operating pressure, main flow will be through outlet port (O) to delivery hose (D) (as illustrated by directional arrows).





LEGEND

B - Bypass Port
D - Delivery Hose
DP - Drop Pipe
F1 - Tank Filling Hole
F2 - Self-Filling Inlet Line
G - Pressure Gauge
HR - Hose Reel
I - Inlet Port
O - Outlet Port
P - Pressure Regulator (& Automatic Bypass Valve)
P & E - Pump & Engine Unit
S - In-Line Strainer
T - Tank
V1 - 2-way Inlet Valve
V2 - 2-way Outlet Valve
V3 - Manual Bypass Valve
V4 - Inlet Gate Valve
V5 - Tank Outlet Gate Valve
VD - Tank Drain Valve

Table IV. Locations of 200 gal. forest fire water pumpers (500 gal. pumpers in brackets)

Location	No.	Location	No.
Northern Region		Western Region	
Channing	1	Birch River	2 (1)
Cranberry Portage	2	Boggy Creek	3
Lynn Lake	1	Garland	2
Moose Lake	1	Grandview	2
Snow Lake	1	Mafeking	3
The Pas	4	Minitonas	2 (1)
Thompson	3	Swan River	2
Wabowden	2	Winnipegosis	3
Southern Region		Whiteshell Provincial Park	
East Braintree	2	Big Whiteshell	1
Hadashville	2	Falcon Lake	- (1)
Marchand	2 (2)	Nutimik Lake	1 (1)
Piney	3	Rennie	- (1)
Richer	2	West Hawk Lake	1
Sprague	2		
Whitemouth	2	Western Parks	
Woodridge	2 (2)	Spruce Woods	2
		Turtle Mountain	1
Eastern Region			
Ashern	1	TOTAL	81 (9)
Bissett	2		
Grand Rapids	2		
Gypsumville	3		
Hodgson	3		
Lac du Bonnet	6		
Oak Point	1		
Riverton	3		
Stead	3		

man in less than two hours utilizing the original pump and plumbing design. Thus, the rarely used stand-by pumpers become more useful in regional equipment inventories by expanding their range of utilization (Fig. 3).

The pumper converted by us has been used for approximately 100 operating hours in experimental and demonstrational insecticide applications without a single problem arising. Other components such as larger capacity pump-engine combinations may be necessary to reach tops of trees greater than 50 ft. in height. For this purpose, suitable pumps for the larger engines on the 500 gal. units may be the only extra equipment requirements at certain locations.

In summation, experiences in Manitoba between 1967-69 have shown that:

1. Ground applications of insecticides are required for the protection of valuable trees where aerial spraying is impractical.

2. The adaptation of forest fire water pumpers, presently distributed throughout the commercial and recreation forests of Manitoba, for insecticide applications offers an immediate and inexpensive alternative to the acquisition of expensive commercial equipment.

3. Modifications and conversion possibilities are innumerable, but the retention of most of the original components of the existing pumpers will minimize costs. The conversion as outlined in this paper followed this objective.

ACKNOWLEDGEMENTS

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Fig. 3. 200-gal. pumper converted for insecticide spraying in use at Rocky Lake Provincial Campground for control of the spruce budworm, Choristoneura fumiferana (Clemens).

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