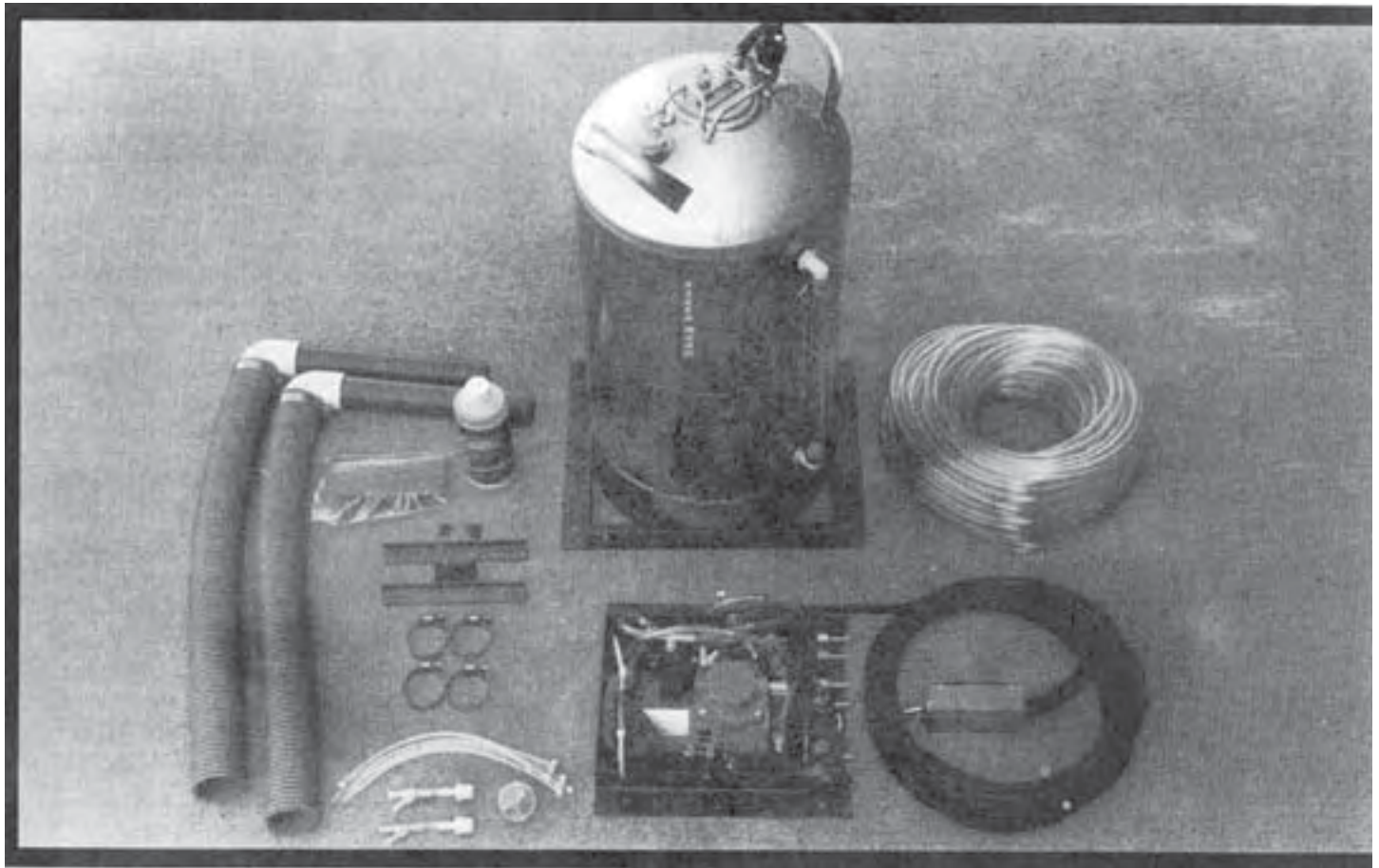


Evaluation Report

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Smucker Fieldmark Model FMII10 Foam Marker

A Co-operative Program Between



SMUCKER FIELDMARK MODEL FMII10 FOAM MARKER

MANUFACTURER AND DISTRIBUTOR:

Smucker Manufacturing, Inc.
22919 North, Coburg Road
Harrisburg, Oregon
USA 97446
Phone: (503) 995-8000

RETAIL PRICE:

\$1,450.00 U.S. (December, 1993)



FIGURE 1. Smucker Fieldmark Model FMII10 Foam Marker: (1) Foam Discharge Tubes and Chambers, (2) Foam Tank, (3) Vinyl Tubes, (4) Foam Control Switch and Power Cable, (5) Foam Regulator Valve, (6) Compressor and Solenoid Valve Housing, (7) Hardware and Fasteners.

SUMMARY AND CONCLUSIONS

QUALITY OF WORK

Mark visibility was good. Marks were closely spaced nearly forming a line down the field. The foam marks were easy to see without searching. The foam marks were less visible in cereal crops over 7 in (180 mm) tall and stubble fields. Foam mark durability was good. The foam lasted 20 minutes in temperatures above 20°C. In cool weather and thick crop canopies, the foam marks lasted over an hour. Foam mark placement was good. Foam discharge hoses were long and could be placed near the crop canopy.

Quality of foam was good. The foam was fluffy after the system was operated for 100 ft (30 m).

One tank of foam solution marked an average of 100 ac (40 ha) using a 90 ft (27 m) sprayer at 7 mph (11 km/h). Operating cost for foam was 10 cents/ac (25 cents/ha).

Marker component performance was good in the dust and moisture common to spraying operations.

EASE OF OPERATION AND ADJUSTMENT

Ease of refilling the foam tank was good. The tank opening was easy to access from the ground when installed on the sprayer hitch. A pressure relief vent needed to be opened to depressurize the foam tank before opening the lid.

Easy of operating the controls was good. The toggle switch for controlling the foam to the booms was easy to use. The foam regulating valve was difficult to use. Small adjustments to the foam regulating valve resulted in large changes in the amount of foam solution used and mark spacing.

Ease of cleaning was good. Two dust filters and one foam solution strainer needed cleaning.

Ease of sprayer alignment was very good. The marks were spaced closely making it easy to check sprayer alignment frequently.

Ease of adjusting foam marks was fair. Mark spacing varied 0.5 to 60 ft (0.2 to 18 m) and depended on sprayer speed and regulator valve opening. With the regulator valve opened a half a turn, mark spacing averaged 6 ft (1.8 m) at 7 mph (11 km/h). Mark spacing averaged 10 ft (3 m) with the regulator valve opened a quarter turn. Mark size was not adjustable. Mark width was the size of the foam discharge hose inside diameter. Mark length average 4.5 in (115 mm),

EASE OF INSTALLATION

Ease of installation was good. The foam tank, compressor housing and foam chambers were equipped with mounting stands. Installation time was 3 hours for one person.

OPERATOR SAFETY

The foam tank was under pressure. Care was exercised during foam tank maintenance and refilling.

OPERATOR'S MANUAL

The operator's manual was good. It was useful but didn't contain current information on connecting the air and liquid tubes.

MECHANICAL HISTORY

Dirt lodged inside the foam tank air and liquid couplers making them difficult to open.

RECOMMENDATIONS

The Alberta Farm Machinery Research Centre (AFMRC) recommends the manufacturer:

1. Make it easier to regulate the desired amount of foam.
2. Modify the operator's manual to include current installation information and more information on foam durability.

Manager: R.P. Atkins, P.Eng.

Project Technologist: L.B. Storzynsky

MANUFACTURER'S REPLIES

The manufacturer states that with regards to recommendation number:

1. Boots and socks (collector assemblies at the end of the discharge tubes) are now standard on all of our foam markers. These give you the ability to put out a larger mark. We still use the same needle valve.
2. The operator's manual has been fully updated with new diagrams and modified text. Foam durability is driven by so many variables including: temperature, sunlight, wind, humidity and placement that we choose to only make brief mention of it in the manual.

Additional Manufacturer Replies

The addition of water softener as you noted, will not extend the life of the foam. It should, however, improve the quality (thickness) of the foam without having to double the foam concentrate rate as you indicated seemed to be necessary. This leads to a decrease in per acre cost (potentially as low as \$0.05/ac).

GENERAL DESCRIPTION

Smucker Fieldmark Model FMII10 foam marker mounts on field sprayers to aid in aligning successive passes in the field. An 8.3 gal (38 L) stainless steel tank stores water and soap concentrate. A stainless steel box encloses a compressor, motor, four solenoid valves and foam regulating valve.

The 12 V motor runs a small diaphragm compressor that pressurizes the foam tank and delivers air to foam chambers at the boom ends. Air and soap solution are delivered to the foam chambers by 0.25 in (6 mm) diameter vinyl tubes. Foam chambers mix the air and soap solution to form foam. The foam discharges through 2 in (50 mm) diameter hoses that hang from the foam chambers. A control switch turns power on and controls foam discharge to either boom end. Size of the foam mark is not adjustable.

FIGURE 1 shows marker components and detailed specifications are given in APPENDIX I.

SCOPE OF TEST

Smucker Fieldmark foam marker was mounted on an Inland 90 ft (27 m) trailing field sprayer. The marker was used for 105 hours to spray cereal crops. The Alberta Farm Machinery Research Centre (AFMRC) evaluated the foam marker for quality of work, ease of operation and adjustment, ease of installation, operator safety and

suitability of the operator's manual.

The machine evaluated by the Alberta Farm Machinery Research Centre (AFMRC) was configured as described in the General Description, FIGURE 1 and the Specifications section of this report. The manufacturer may have built different configurations of this machine before or after AFMRC tests. Therefore, when using this report, be sure to first check that the machine you are considering is the same as the one shown here. If not, assistance can be obtained from the manufacturer or AFMRC in determining how this new machine will perform compared to the one tested.

RESULTS AND DISCUSSION

QUALITY OF WORK

Mark Visibility: Foam mark visibility was good. FIGURE 2 shows foam marks placed on a cereal crop. The foam marks were easy to see because the foam discharged frequently, forming a line down the field. A foam mark was quickly spotted for aligning the sprayer. Foam marks were easy to see on green crops less than 7 in (180 mm) high. The marks were less visible in stubble fields. In stubble and tall cereal crops, most of the foam dropped below the canopy. Doubling soap concentrate to 32 oz (910 mL) per tank, made the marks fluffy. Fluffy foam marks stayed on top of the field canopy making the marks easier to see.



FIGURE 2. Foam marks on cereal crop.

Mark Durability: Foam mark durability was good. Foam marks lasted less than 20 minutes in temperatures above 20°C. In temperatures below 20° C, foam lasted over an hour. FIGURE 3 shows a typical foam mark immediately after discharge and 20 minutes later.

Foam durability depended on soil temperature and crop canopy. The foam remained stable until soil temperatures increased above 27° C. Foam that stayed on the crop canopy lasted longer than foam that touched or landed on the ground.

Using a water softener did not improve mark durability.

Mark Placement: Foam mark placement was good. Foam marks landed directly below the 24 in (610) foam discharge hoses. The foam marks drifted a little in breezy weather conditions. Lowering or using longer discharge hoses reduced foam drift. The long discharge hoses were stiffened with a steel rod to prevent the hoses from moving.

Extra foam marks could not be placed at the field ends. At field ends foam was discharged from the alternate boom before turning. This ensured some foam markings at the field ends.

Quality of Foam: Foam quality was good. Foam quality varied from partially watery to fluffy. Foam was partially watery after refilling and immediately after switching to the alternate foam discharge hose. The foam turned fluffy after using the system for 100 ft (30 m).

Foam quality improved using 32 oz (910 mL) of soap concentrate per tank than the recommended 16 oz (450 mL).

Quantity of Foam Used: Quantity of foam solution used depended on sprayer size and foam regulator valve opening. One foam tank averaged 100 ac (40 ha) using a 90 ft (27 m) sprayer at 7 mph (11 km/h). Acres marked varied from 85 to 110 ac (35 to 45 ha) per tank with the regulator valve adjusted half and quarter turn, respectively. For refilling convenience, the regulator valve was opened a half turn so the foam tank emptied when the sprayer tank emptied.

Operating cost for Smucker's foam averaged 10 cents/ac (25 cents/ha).

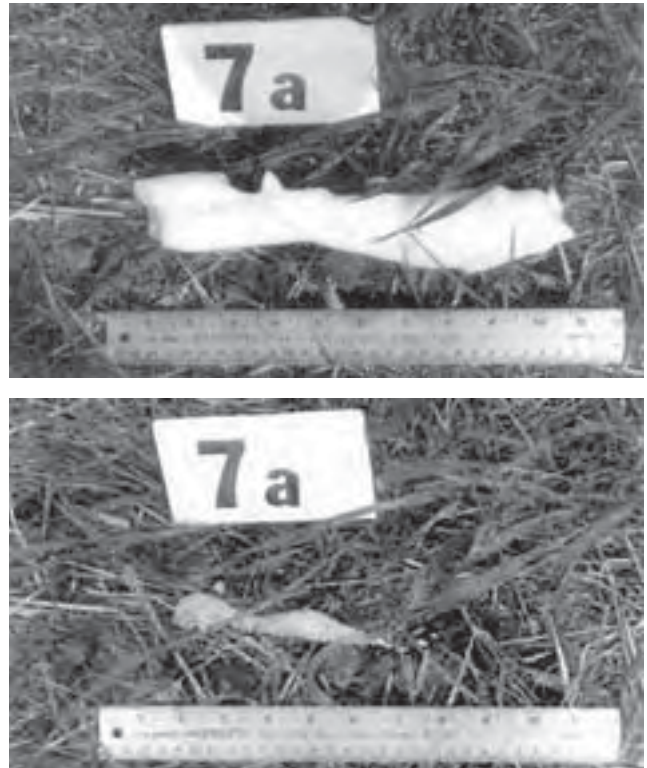


FIGURE 3. Typical foam mark after discharging (upper) and 20 minutes later (lower).

Environmental Effects: Smucker foam marker component performance in field conditions was good. Control switch, foam tank, compressor, solenoid valves and wiring harness were not affected by dust and moisture common to spraying operations. Inside of the foam tank valves clogged with dust, making the valves difficult to open. The foam had no adverse effect on the crop or operator.

EASE OF OPERATION AND ADJUSTMENT

Refilling: Ease of refilling was good. The foam tank was installed on the sprayer hitch. The foam tank lid was easy to access from the ground. Before filling, a pressure relief vent on the foam tank lid was opened to depressurize the tank. Water and soap concentrate were both added through the top of the tank. Soap concentrate was added after the water to prevent foaming. The supply hose used for adding water to the sprayer tank was used. A valve was needed on the supply hose to regulate water to the foam tank. After filling, the marker required up to two minutes to pressurize the tank and lines before fluffy foam was discharged.

Controls: Ease of operating the controls was good. FIGURE 4 shows Smucker foam discharge control. The toggle switch controlled foam to either the left or right foam discharge hoses. The foam control toggle switch was mounted on the tractor and very easy to use.

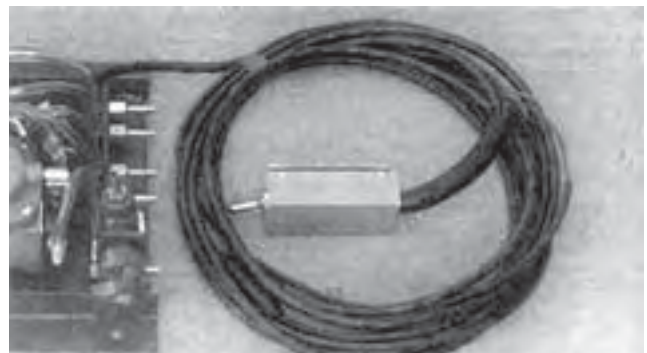


FIGURE 4. Control Toggle Switch.

The foam regulator valve was the other control. The valve

was part of the compressor and solenoid valve system. The valve regulated the amount of foam used and affected mark spacing. The valve was difficult to use because small adjustments resulted in large changes in the amount of foam used. At spraying speeds between 5 and 7 mph (8 and 11 km/h), the valve was opened a maximum three-quarters of a turn. Opening the valve too much resulted in watery foam that emptied the tank quickly. The valve could be opened seven turns. The AFMRC recommends the manufacturer make it easier to regulate the desired amount of foam.

Cleaning: Ease of cleaning was good. The foam tank couplers plugged with dust and required cleaning frequently. Compressor and motor filters were very dirty after marking 3000 ac (1200 ha). The dirty filters did not effect foam quality or durability during the test.

Sprayer Alignment: Ease of aligning the sprayer boom end to the mark was very good. FIGURE 5 shows the foam marks allowed successive passes of the sprayer to be properly aligned. Marks left at the outer edge of the previous pass were used on the next pass to align the sprayer boom end with the marks. The sprayer boom ends were over 45 ft (14 m) from the tractor. Alignment of the boom ends was not possible by sighting down the row of marks. The operator judged the distance the tractor was from the mark and then used the mark to check whether the sprayer was properly aligned. Checking sprayer alignment was easy because foam marks were closely spaced.

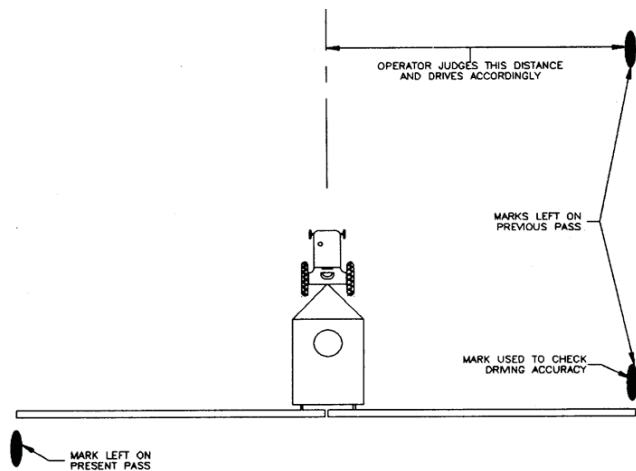


FIGURE 5. Schematic illustrating Smucker foam marker operation.

From the tractor seat, the sprayer boom end looked properly aligned with the foam mark. However, first time users found the mark was a couple of feet outside the boom end. Checking mark distance from the sprayer boom end was done several times before the boom end was over the mark. The sprayer was properly aligned when the boom end looked like it was 3 ft (1 m) beyond the foam mark.

Mark Adjustments: Ease of adjusting foam mark spacing was fair. Mark spacing varied from 0.5 to 60 ft (0.2 to 18 m) and depended on regulator valve opening, tractor speed, foam quality and boom end vibration. At 7 mph (11 km/h) mark spacing averaged 10 ft (3 m) with the regulator valve opened a quarter turn. It was very difficult to reset the regulator to the same position. Therefore, average mark spacing changed.

Opening the regulator valve decreased mark spacing. Mark spacing averaged 6 ft (1.8 m) with the regulator valve opened a half turn, and varied from 0.5 to 15 ft (0.2 to 4.6 m). Opening the valve more than one turn resulted in watery foam.

Mark size was not adjustable. The foam marks were small averaging 4.5 in (100 mm) in length. Mark length depended on foam quality, flow, discharge hose size and vibration. Mark width was 2.2 in (55 mm). Mark width depended on the foam discharge hoses inside diameter.

EASE OF INSTALLATION

Installation Time: Ease of installation was good. Smucker marker system was easily installed on an Inland sprayer in three hours by one person. The major components installed on the sprayer included a foam tank, compressor housing and two foam

discharge hoses.

Foam Tank and Compressor Housing: The foam tank and compressor housing were the largest of the marker components. Both were equipped with a mounting stand. The stands were bolted to the sprayer hitch. FIGURE 6 shows the foam tank was installed at a location easily accessible for refilling.



FIGURE 6. Foam Tank and Compressor Housing.

Foam Chamber and Discharge Hoses: The foam chamber and discharge hoses were mounted on the boom ends. The foam discharge hoses were easily installed 10 in (250 mm) from the end nozzles with the brackets provided.

The 0.25 in (6 mm) inside diameter vinyl tubes were soft. Care was taken to prevent the vinyl tubes from pinching when fastened to the sprayer boom with plastic ties.

Control Switch and Wiring Harness: The control switch was mounted near the operator on the tractor. The unit was small, light and used Velcro for mounting on a tractor cab window. The switch box had to be removed from the tractor when unhitching the tractor. Length of the wiring harness was adequate.

OPERATOR SAFETY

No safety hazards were observed when normal safety precautions were adhered to. The foam tank was under pressure, therefore, care was exercised during refilling and maintenance.

OPERATOR'S MANUAL

The operator's manual was fair. The operator's manual included useful information on operation, service, troubleshooting and parts. Some installation instructions and schematics were not compatible with the foam marker tested. Instructions on connecting the liquid and air tubes to the solenoid housing tubes were unclear. The foam did not discharge properly after the liquid and air tubes were connected as instructed in the manual.

Some information on foam quality and spacing were indicated which helped produce quality foam quickly. Information on how long the foam lasted was vague. The AFMRC recommends the manufacturer consider modifying the operator's manual to include current installation information and more information on foam durability.

MECHANICAL HISTORY

TABLE 1 outlines the mechanical history of the Smucker foam marker during 105 hours of field operation, while marking 3397 ac (1375 ha). The intent of the test was evaluation of the functional performance. An extended durability evaluation was not conducted.

TABLE 1. Mechanical History

Item	Operating Hours	Equivalent Field Area ac	(ha)
Foam failed to discharge. Foam tank couplers removed and cleaned at	29, 90	820, 3050	330, 1230

DISCUSSION OF MECHANICAL PROBLEMS

Foam Tank Couplers: Foam failed to discharge a couple of times during testing. Cleaning and checking the tubes and solenoid valves did not solve the problem. The problem was solved by accidentally disconnecting the foam tank couplers. Dirt was found lodged inside the couplers. The couplers were also difficult to remove when dirty.

In cool conditions, the foam tank couplers plugged with the soap solution.

**APPENDIX I
SPECIFICATIONS**

MAKE: Smucker Fieldmark Foam Marker
MODEL: FMII10
MANUFACTURER: Smucker Manufacturing, Inc.
 22919 North, Coburg Road
 Harrisburg, Oregon
 USA, 97446
 Phone: (503) 995-8000

ELECTRICAL POWER REQUIREMENTS:
 -- volts 12 V-DC
 -- current draw 8 amps, compressor motor

CONTROL SWITCH:
 -- size 1.5 x 5.5 x 2.3 in (38 x 140 x 57 mm)
 -- controls toggle switch for power off

MARKING SYSTEM:
 -- type foam
 -- marker fluid soap concentrate and water
 -- tank capacity 8.3 gal (38 L)
 -- soap concentrate 16 oz (450 mL) per tank

MARK DELIVERY SYSTEM:
 -- tubes two vinyl; air and solution
 -- diameter 0.25 in (6 mm) I.D.
 -- length 106 ft (32 m)
 -- discharge tubes
 -diameter 2 in (50 mm) I.D.
 -length 24 in (610 mm)
 -regulating valve heavy duty PVC needle valve

-- solenoid valve
 -number four
 -manufacturer Automatic Switch Co.
 -serial number 540731
 -power 12 V
 -- compressor
 -make Thomas
 -type diaphragm
 -model 107CDL20-152A
 -serial number 0192000628

COMPRESSOR HOUSING:
 -- includes compressor, motor, solenoid valves, regulator valve
 -- size 11.5 x 11.3 x 7 in (290 x 285 x 178 mm)

WIRING HARNESS:
 -- power cable 12.8 ft (3.9 m)
 -- solenoid valve cable 16.8 ft (5.1 m)

WEIGHT:
 -- foam tank (full) 109.0 lbs (49.5 kg)
 -- foam tubes 10.3 lbs (4.7 kg)
 -- compressor and valve housing 20.3 lbs (9.2 kg)
 -- hardware 1.4 lbs (0.6 kg)
 TOTAL 141.0 lbs (64.0 kg)

**APPENDIX II
MACHINERY RATINGS**

The following rating scale is used in Alberta Farm Machinery Research Centre Evaluation Reports.

Excellent	Very Good
Good	Fair
Poor	Unsatisfactory

**SUMMARY CHART
SMUCKER FIELDMARK MODEL FMII10 FOAM MARKER**

RETAIL PRICE: \$1,450.00 U.S. (December, 1993)

QUALITY OF WORK:
 mark visibility **good**; foam discharged frequently
 mark durability **good**; 20 minutes to 1 hour
 mark placement **good**; near boom end
 quality of foam **good**; fluffy after using system
 quantity of foam used
 -area marked 100 ac (40 ha) per tank
 -cost 10 cents/ac (25 cents/ha)
 environmental effect **good**; components not affected, foam had no effect on crop

EASE OF OPERATION AND ADJUSTMENT:
 refilling **good**; add soap then water
 controls **good**; toggle switch easy to use, regulator valve difficult to adjust
 cleaning **good**; two dust filters, one liquid strainer
 sprayer alignment **very good**; easy to check sprayer alignment
 mark adjustments **fair**; mark size was not adjustable

EASE OF INSTALLATION: **good**; three hours for one person

OPERATOR SAFETY: foam tank under pressure

OPERATOR'S MANUAL: **good**; installation information was not current

MECHANICAL HISTORY: Foam tank couplers plugged with dirt



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