

Evaluation Report

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Valmar Model CM240 Granular Applicator

A Co-operative Program Between



ALBERTA
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CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

VALMAR MODEL CM240 GRANULAR APPLICATOR

MANUFACTURER AND DISTRIBUTOR:

Valmar Airflo Inc.
Box 34, Hwy. #1 East
Elie, Manitoba R0H 0H0

RETAIL PRICE:

\$6,445.00 (November, 1985, f.o.b. Lethbridge, Alberta.)

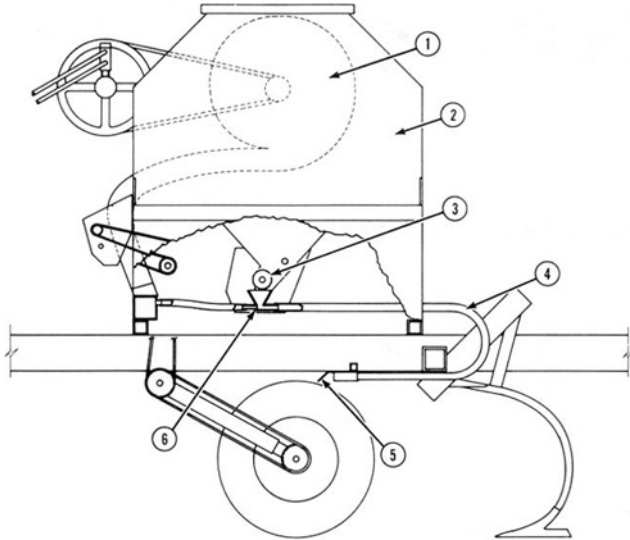


FIGURE 1. Schematic View of Valmar Model CM240 Granular Applicator Mounted on Cultivator: (1) Fan, (2) Hopper, (3) Meter Feed Rotor, (4) Outlet Hose, (5) Deflector, (6) Venturi.

SUMMARY

Meter Calibration: The manufacturer's metering system calibration charts were accurate for Avadex BW. The manufacturer's calibration charts for Heritage 5G and Treflan QR5 were about 10% high over the normal range of application rates.

Metering Uniformity: Delivery rates across the machine width were uniform. Delivery rate from individual metering outlets only varied from 12.0 to 14.7 lb/ac (13.4 to 16.5 kg/ha) when applying Avadex BW at 13.7 lb/ac (15.4 kg/ha) and 5 mph (8 km/h), resulting in a CV of 3.8%. The variability in delivery rates from individual outlets was similar over the normal range of application rates.

Distribution Uniformity: Acceptable distribution uniformities could be obtained when the deflectors were mounted horizontally at 16 or 20 in (405 or 510 mm) spacings and when the deflectors were mounted vertically at 16 in (405 mm) spacings, increasing the length of straight hose preceding the deflector plates improved distribution uniformity. Variations in deflector discharge height, application rate and fan speed did not seriously influence distribution uniformity.

Effect of Field Variables: Field bounce, field slopes or level of material in the hopper did not affect metering rates. Application rate was independent of forward speed.

Mounting on Tillage Tool: The Valmar CM240 mounted easily on an International Harvester 40 ft (12.2 m) heavy duty cultivator. It took 2 people about 4 hours to initially mount the Valmar. No problems occurred when transporting the cultivator and Valmar.

Hopper: The hopper was convenient to fill with an auger. Manual loading was not as convenient. The hopper held about 1260 lb (573 kg) of Avadex BW. The hop-

per was weathertight. No moisture entered the hopper during the test.

Ease of Operation and Adjustment: Application rate was easily adjusted by setting the meter gear box and the sprocket ratio on the ground drive wheel. The meter feed rotor could be started and stopped from the tractor cab. Raising the cultivator also stopped the meters. There was no meter rotation indicator. The fan speed could be adjusted by adjusting the hydraulic oil flow rate. The fan control indicated fan speed.

Operator Safety: The Valmar was safe to operate provided normal safety procedures were followed. All moving parts were well shielded.

Operator's Manual: The operator's manual clearly outlined applicator operation, maintenance and set up and contained a well-illustrated comprehensive parts list. All calibration charts supplied were in both Imperial and SI (Metric) units of measure.

Mechanical Problems: No mechanical problems occurred during the 70 hours of testing.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to provide adequate distribution uniformity for all recommended deflector plate spacings.

Senior Engineer: E. H. Wiens

Project Engineer: M. V. Eliason

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Satisfactory distribution uniformities (C.V.'s of 10% or less) can readily be obtained for the 15 inch to 24 inch range of deflector spacings with proper delivery hose routing. Horizontal (side) curves in the hoses directly behind the deflectors can cause uneven dispersion of the product. Additional written instructions on hose routing will be provided by Valmar Airflo Inc. to ensure that all operators can obtain optimum product distribution uniformities.

GENERAL DESCRIPTION

The Valmar model CM240 is an implement mounted granular applicator designed for tillage implements ranging in width from 32 to 48 feet (9.8 to 14.6 m). Granules are metered from a 30.0 ft³ (0.85m³) hopper into 24 venturi assemblies by two feed rotors located at the bottom of the hopper. Each feed rotor meters product into 12 venturies. A hydraulically driven fan located at the side of the hopper provides air which pneumatically conveys granules from the venturies to 24 outlets. Granules from each hose are spread by deflectors located across the width of the implement. The deflectors can be spaced at intervals ranging from 16 to 24 in (405 to 610 mm) resulting in spread widths ranging from 32 to 48 ft (9.8 to 14.6 m).

Application rate is controlled by adjusting the speed of the meter feed rotors. Meter feed rotor speed is varied by setting the meter gear box and the sprocket ratios of the ground drive wheel mechanism. The meter feed rotors are driven by the ground drive wheel through two electro-magnetic clutches. Lifting the cultivator, which raises the ground drive wheel, or shutting off the electro-magnetic clutches, stops the meter feed rotors. Stopping the feed rotors stops the application of material. A fan tachometer and control box mounted in the tractor

cab monitors the fan speed and controls the electro-magnetic clutches. A hydraulic flow control valve, located near the fan, controls fan speed.

The test machine was mounted on a 40 ft (12.2 m) International Harvester heavy duty cultivator using 20 in (510 mm) deflector spacing.

FIGURE 1 shows a schematic view of the hopper while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Valmar CM240 applicator was operated for about 70 hours while spreading Avadex BW on 610 ac (247 ha) and Treflan QR5 on 620 ac (251 ha).

The applicator was evaluated for quality of work, ease of operation and adjustment, power requirements, operator safety and suitability of the operator's manual. Metering and distribution accuracy and the effect of field and machine variables on metering and distribution were evaluated in the laboratory.

RESULTS AND DISCUSSION

QUALITY OF WORK

Calibration Chart Accuracy: The metering system was calibrated in the laboratory with Avadex BW, Treflan QR5 and Heritage 5G. The manufacturer's calibration charts were accurate for Avadex BW. The manufacturer's calibration chart for Heritage 5G and Treflan QR5 was about 10% high over the normal range of application rates.

Application rates were not seriously affected by field roughness, field slopes, or level of material in the hopper.

Since the meter feed rotors were driven by a ground drive wheel, application rate was independent of forward speed. This was considered a desirable feature, since application rate remained constant, regardless of forward speed.

Metering Uniformity: Delivery rates across the width of the machine were uniform for all granular materials used throughout the test. FIGURE 2 shows typical delivery rates from 24 metering outlets while applying 13.7 lb/ac (15.4 kg/ha) of Avadex BW at 5 mph (8 km/h). Application rates from individual outlets only varied from 12.0 to 14.7 lb/ac (13.4 to 16.5 kg/ha), resulting in a coefficient of variation¹ of 3.8%. The variability in delivery rates from individual outlets was similar over the normal range of application rates.

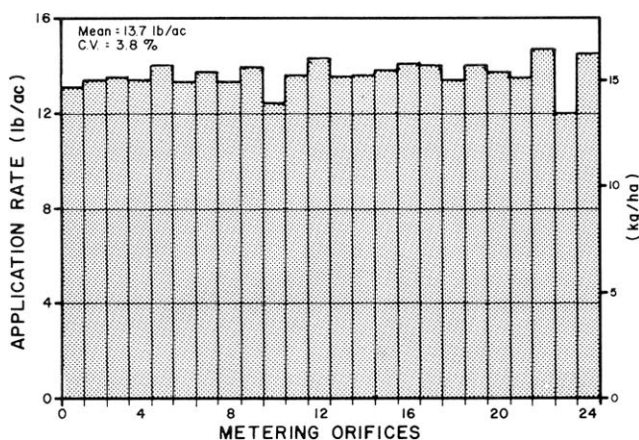


FIGURE 2. Typical Variation in Delivery Rates from Individual Outlets when Applying Avadex BW at 13.7 lb/ac (15.4 kg/ha) and 5 mph (8 km/h).

¹The coefficient of variation (CV) is the standard deviation of the application rates expressed as a percent of the mean application rate. A low CV represents uniform application whereas a high CV indicates non-uniform application. One granular herbicide manufacturer has suggested that the CV should be no greater than 10%. A CV of 10% is used throughout this report as a dividing point between acceptable and unacceptable uniformity.

Spreading Uniformity: Granules delivered by the feed rotors were pneumatically conveyed across the width of the machine and were discharged onto deflector plates (FIGURE 3). The deflector plates could be mounted either horizontally or vertically, depending on the mounting requirements of the particular tillage implement. The deflectors could be spaced at intervals ranging from 16 to 24 in (405 to 610 mm), depending on the width of the tillage implement.

Recommended deflector plate discharge height depended on deflector plate spacing. For deflector plate spacings of up to 21 in (535 mm), recommended deflector plate discharge height ranged from the deflector plate spacing interval to 24 in (610 mm). For deflector plate spacings greater than 21 in (535 mm), recommended deflector plate discharge height ranged from the spacing interval to 25 in (635 mm) for the 22 in (560 mm) interval and from the spacing interval to 26 in (660 mm) for spacing intervals greater than 22 in (560 mm). For optimum distribution uniformity, the manufacturer recommended a deflector plate discharge height equal to the deflector plate spacing. Deflector plate discharge heights of less than the deflector plate spacings were not recommended.

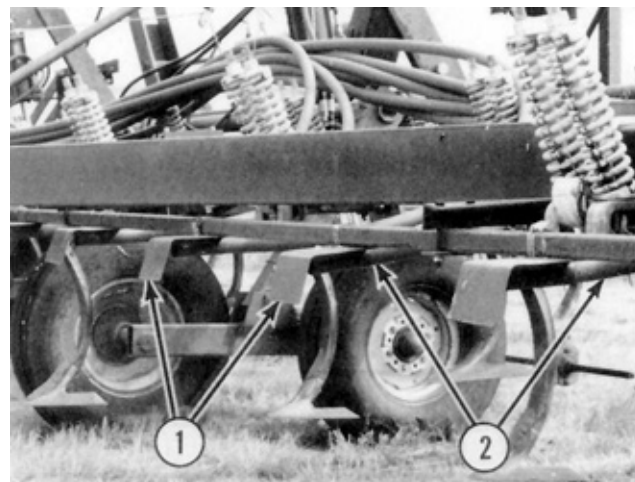


FIGURE 3. Distribution System: (1) Deflector Plate (Mounted Horizontally), (2) Outlet Hose.

The deflector plate spacing and the deflector mounting orientation affected the distribution pattern uniformity. When the deflectors were mounted horizontally, satisfactory distribution uniformities (CV's of 10% or less) could be obtained at 16 and 20 in (405 or 510 mm) deflector plate spacings. Inadequate distribution uniformities (CV's greater than 10%) were obtained at 24 in (610 mm) deflector plate spacings. When the deflectors were mounted vertically, satisfactory distribution uniformities could be obtained only at a 16 in (405 mm) deflector plate spacing. Distribution uniformities at other spacings were inadequate. Variations in deflector plate discharge height, application rate and fan speed did not seriously influence distribution uniformity. Modifications to provide adequate distribution uniformity for all deflector plate spacings are recommended.

FIGURE 4 shows a typical distribution of Avadex BW when applying 12.8 lb/ac (14.3 kg/ha) at 5 mph (8 km/h), with deflectors mounted horizontally, using a 20 in (510 mm) deflector spacing and a 20 in (510 mm) discharge height. Application rates varied from 10.3 to 15.0 lb/ac (11.5 to 16.8 kg/ha) across the spreading width, resulting in an acceptable pattern with a CV of 8.7%. Spreading uniformity of Avadex BW was not influenced by the application rates over the normal range of application rates.

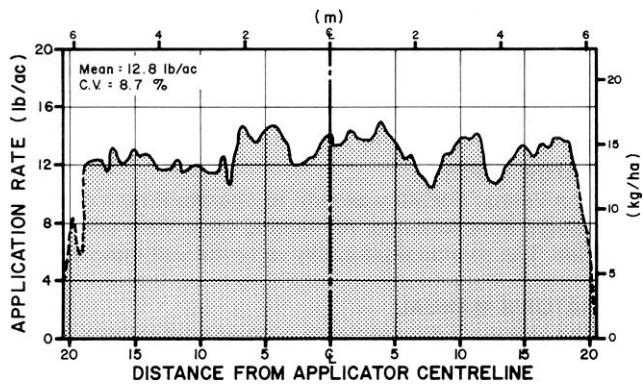


FIGURE 4. Typical Distribution Pattern when Applying 12.8 lb/ac (14.3 kg/ha) of Avadex BW at 5 mph (8 km/h) using 20 in (510 mm) Deflector Spacing and a 20 in (510 mm) Deflector Discharge Height.

FIGURE 5 shows a typical distribution pattern of Treflan QR5 when applying 17.6 lb/ac (19.8 kg/ha) at 5 mph (8 km/h), with deflectors mounted horizontally, using a 20 in (510 mm) deflector spacing and 20 in (510 mm) deflector discharge height. Application rates varied from 12.2 to 22.8 lb/ac (13.7 to 25.5 kg/ha) across the spreading width, resulting in an unacceptable distribution pattern with a CV of 12.2%. Distribution uniformity was not influenced by the application rate over the normal range of application rates.

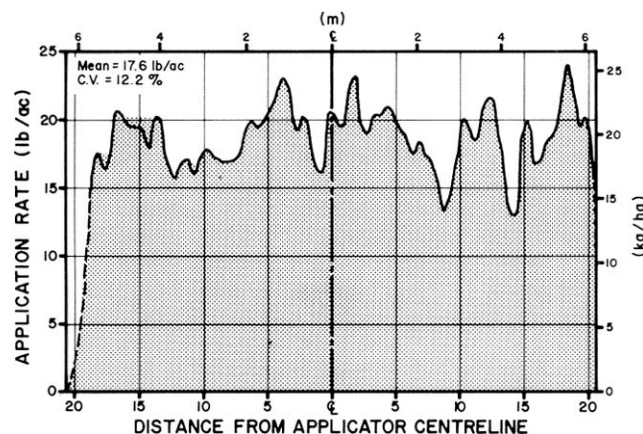


FIGURE 5. Typical Distribution Pattern when Applying 17.6 lb/ac (19.8 kg/ha) of Treflan QR5 at 5 mph (8 km/h) using a 20 in (510 mm) Deflector Spacing and a 20 in (510 mm) Deflector Discharge Height.

Outlet hose length and position with respect to the deflector plate also affected distribution uniformity. The distribution patterns shown in FIGURES 4 and 5 represent patterns which could be expected with hoses positioned like they would be when the Valmar CM240 was mounted on a cultivator. Using longer lengths of straight hose before each deflector plate resulted in improved distribution patterns.

For example FIGURE 6 shows a typical distribution with Treflan QR5, using 72 in (1830 mm) of straight outlet hose before each deflector plate, when applying 16.6 lb/ac (18.6 kg/ha) at 5 mph (8 km/h), with deflectors mounted horizontally, using a 20 in (510 mm) deflector spacing and a 20 in (510 mm) deflector discharge height. Application rates varied from 14.0 to 20.0 lb/ac (15.7 to 22.4 kg/ha) across the spreading width, resulting in an acceptable distribution pattern with a CV a 8.1%.

The distribution patterns shown in FIGURES 4, 5 and 6 represent operation on smooth level fields on calm days. High winds could result in patterns different than those shown. Deflector height variation due to rough fields was not a problem with the cultivator mounted applicator.

Distribution in the direction of travel was uniform with no detectable surging.

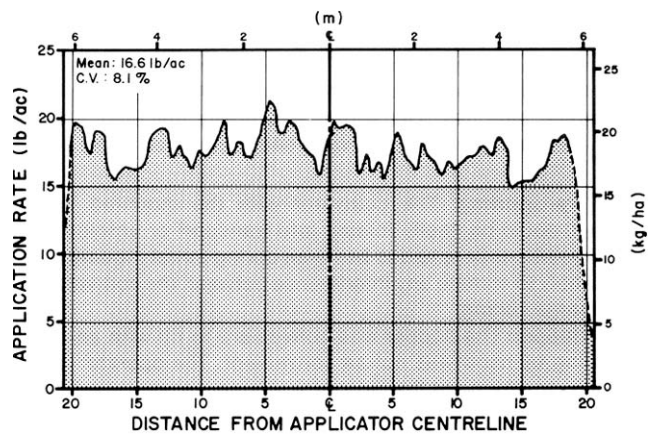


FIGURE 6. Typical Distribution Pattern with 72 in (1830 mm) of Straight Outlet Hose before Each Deflector, when Applying 16.6 lb/ac (18.6 kg/ha) of Avadex BW at 5 mph (8 km/h) using a 20 in (510 mm) Deflector Spacing and a 20 in (510 mm) Deflector Discharge Height.

EASE OF OPERATION AND ADJUSTMENT

Mounting the Applicator: Mounting the Valmar CM240 on an International Harvester heavy duty cultivator (FIGURE 7) took 2 people about 4 hours. Removal and subsequent mounting would take less time. The applicator was easily mounted using the bar clamps provided. The deflectors were spaced at 20 in (510 mm) and at a 20 in (510 mm) discharge height, resulting in a 40 ft (12.2 m) spreading width. Although 5 deflector mounting bars were provided, only 4 were required. The deflector bars were mounted using the hanger straps and bar clamps provided. Slight modifications to the deflector bars were required to properly mount the bars on the International Harvester cultivator. Additional mounting supports were required.

The manufacturer supplied 600 ft (181 m) of plastic distribution tubing. This was ample to mount the Valmar CM240 on the International Harvester 40 ft (12.2 m) cultivator. Distribution tubes were secured to the deflectors and the venturies by friction fit.

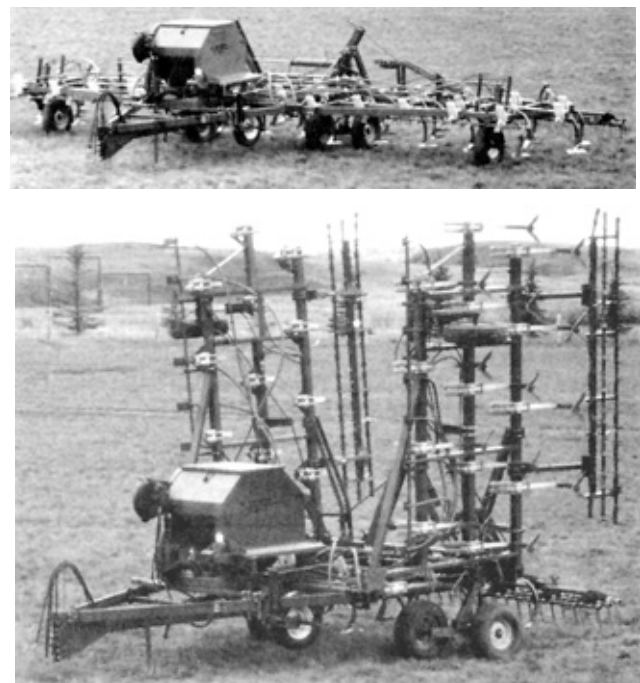


FIGURE 7. Valmar CM240 Mounted on an International Harvester Heavy Duty Cultivator (Upper: Field Position, Lower: Transport Position).

No hydraulic hoses were supplied with the Valmar CM240. Required hydraulic hose length would depend on the particular tillage implement and the hopper mounting location.

Sufficient electrical wiring was supplied for the electro-magnetic clutches. The wiring was easily installed. The fan tachometer and control box were easily mounted in the tractor cab.

Transporting: The cultivator with the mounted Valmar 0M240 could be easily folding into transport or unfolded into field position. Care had to be taken during initial mounting and assembly to eliminate any interference between the cultivator and discharge tubing.

Hopper: The hopper was convenient to fill with an auger. Loading by hand was not as convenient. The operator had to step on the frame of the cultivator. A step was mounted on the side of the hopper to aid filling. A mesh screen in the hopper opening prevented foreign material such as paper from entering the hopper.

The hopper held about 1260 lb (573 kg) of Avadex BW which was sufficient to apply granules to about 105 ac (43 ha), before refilling, when applying 12 lb/ac (13.5 kg/ha). The hopper would empty uniformly but not completely.

The hopper lid was weathertight. No leakage of rain into the hopper occurred during the test.

Setting the Application Rate: The application rate was adjusted by varying the speed of the feed meter rotors. Feed meter rotor speed was adjusted with the meter gear box and the ground drive wheel sprocket ration (FIGURE 8). Adjusting the ground drive wheel sprocket ratio was easy but required wrenches.

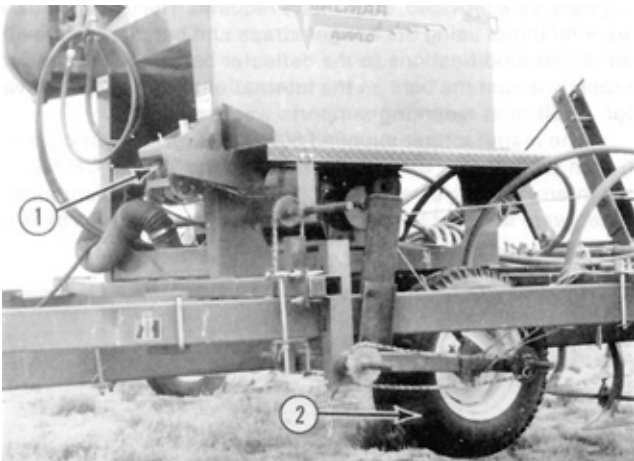


FIGURE 8. (1) Meter Gear Box, (2) Ground Drive Wheel.

Field Operation: The valmar CM240 performed well in all field conditions. The deflector bars remained stable throughout the test with little movement due to field vibration.

One half of the applicator could be conveniently stopped or started by using the electro-magnetic clutch control switches located in the tractor cab. This was useful to avoid double application when finishing fields. Raising the cultivator raised the ground drive wheel. This was useful to avoid double application when turning on headlands.

Granules falling from the feed rotors were visible through the plastic windshield when the shield was clean. Dust build up on the shield, however, made visibility of the feed rotors difficult.

The fan tachometer provided an adequate check on fan operation. Fan speed was easily adjusted with the hydraulic flow control valve when used with an open center hydraulic system. When using a closed center hydraulic system it was recommended to open the valve and use the tractor flow control to adjust the fan speed.

Lubrication: The meter gear box had to be oiled periodically.

POWER REQUIREMENTS

The power required to drive the distribution fan was about 10 hp (7.5 kW). The two meter feed motor electro-magnetic clutches required approximately 7.0 amps when operating under normal conditions.

OPERATOR SAFETY

The Valmar CM240 was safe to operate if normal safety procedures were followed. All moving parts were adequately shielded. The shields were easily removed and installed.

OPERATOR'S MANUAL

The operator's manual clearly outlined applicator operation, maintenance and set up and contained a well-illustrated, comprehensive parts list.

MECHANICAL PROBLEMS

The intent of the test was evaluation of the functional performance. An extended durability evaluation was not conducted. No mechanical problems occurred during 70 hours of operation.

APPENDIX I

SPECIFICATIONS

MAKE: Valmar Granular Applicator
MODEL: CM240
SERIAL NUMBER: 8424574
OVERALL DIMENSIONS:
 Hopper - height 55.5 in (1410 mm)
 - width 105 in (2670 mm)
 - length 63 in (1600 mm)
METERING SYSTEM:
 - type feed rotor
 - drive chain from ground drive wheel
 - adjustment meter gear box
 - transfer to ground outlet hoses to deflectors
 - number of discharge tubes 24
 - deflector spacing 16 to 24 in (405 to 610 mm)
 - deflector height variable
 - effective spreading width 32 to 48 ft (9.8 to 14.6 m)
WEIGHTS:
 - hopper 890 lbs (405 kg)
 - hopper with accessories 1210 lbs (550 kg)
HOPPER CAPACITY: 30.0 ft³ (0.85 m³)
NUMBER OF LUBRICATION POINTS:

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:
 Excellent
 Very Good
 Good
 Fair
 Poor
 Unsatisfactory

APPENDIX III

CONVERSION TABLE

acres (ac) x 0.40 = hectares (ha)
 feet (ft) x 0.305 = metres (m)
 horsepower (hp) x 0.75 = kilowatts (kW)
 inches (in) x 25.4 = millimetres (mm)
 miles/hour (mph) x 1.61 = kilometres/hour (km/h)
 pounds (lb) x 0.45 = kilograms (kg)

SUMMARY CHART
 VALMAR MODEL CM240
 GRANULAR APPLICATOR

RETAIL PRICE: \$6,445.00
 (November, 1985, f.o.b. Lethbridge)
METER CALIBRATION:
 - Avadex BW - accurate
 - Treflan QR5 - 10% high over normal range
 Heritage 5G - 10% high over normal range
METER UNIFORMITY: - CV = 3.8% when applying Avadex BW at 13.7 lb/ac (15.4 kg/ha) and 5 mph (8 km/h)
DISTRIBUTION UNIFORMITY: - acceptable uniformities could be obtained for horizontally mounted deflectors spaced at 16 and 20 in (405 or 510 mm)
 - acceptable uniformity could be obtained for vertically mounted deflectors spaced at 16 in (405 mm)
EFFECT OF FIELD VARIABLES ON METER RATES:
 - field roughness - no effect
 - level of material in hopper - no effect
 - side slopes - no effect
 - fore and aft slopes - no effect
 - ground speed - no effect
MOUNTING ON TILLAGE TOOL - 2 people about 4 hours
HOPPER: - conveniently filled with auger
 - weathertight
 - emptied uniformly
EASE OF OPERATION AND ADJUSTMENT: - application rate was easily adjusted
OPERATOR SAFETY: - all parts were well shielded
OPERATOR'S MANUAL: - complete and informative



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