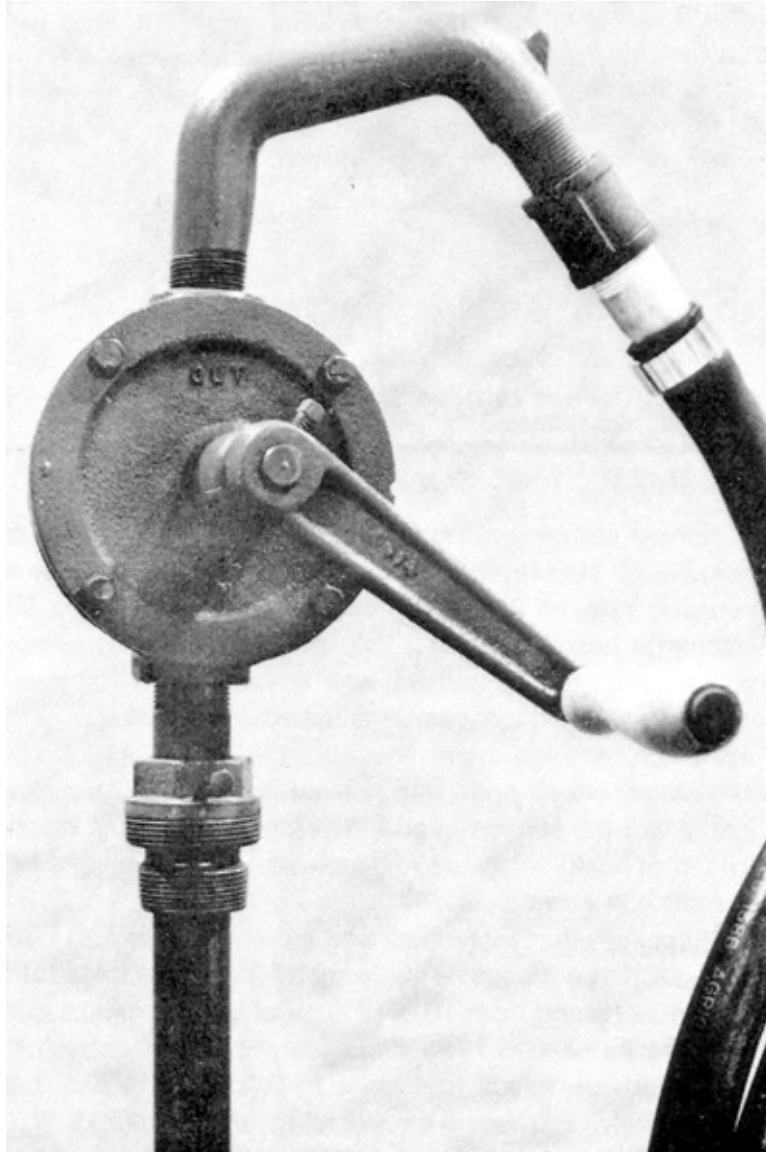


Evaluation Report

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Monarch V-200 Rotary Vane Hand Pump

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

MONARCH V-200 ROTARY VANE HAND PUMP

MANUFACTURER:

Monarch Industries Limited
889 Erin St.
Winnipeg, Manitoba
R3C 3E4

DISTRIBUTOR:

Oliver Industrial Supply Ltd.
236 - 36th St. North
Lethbridge, Alberta
T1J 4B2

RETAIL PRICE:

\$ 86.60 (January, 1979, f.o.b. Lethbridge)

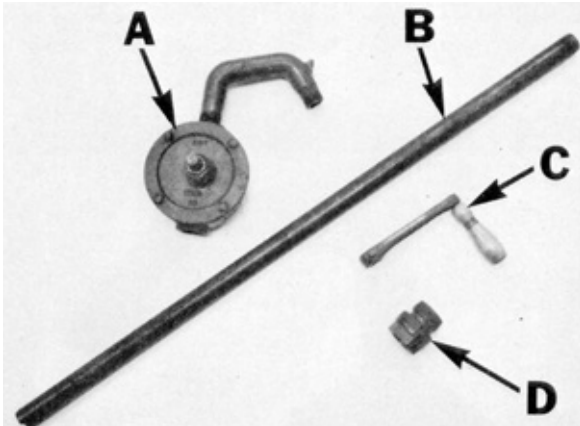


FIGURE 1. Monarch V-200 Hand Pump: (A) Pump Body, (B) Suction Pipe, (C) Pump Handle, (D) Bung Adaptor.

SUMMARY AND CONCLUSIONS

Normal pumping rates for the Monarch V-200 hand pump were from 60 to 100 revolutions per minute. The flowrate at an average pumping rate of 80 revolutions per minute, at zero suction and discharge heads, was 27 L/min (5.9 gal/min). A maximum flowrate of 47 L/min (10.3 gal/min) was obtained at 140 revolutions per minute but could only be maintained for about 30 seconds. The manufacturer's maximum flowrate of 57 L/min (12.5 gal/min) was not obtainable since it was humanly impossible to pump that fast. Increasing the suction head to 0.9 m (3 ft) and the discharge head to 1.8 m (6 ft), at 80 revolutions per minute, resulted in an 11% reduction in flowrate.

Pumping effort increased with increased pumping rates, suction and discharge heads. The required pumping force at the crank handle increased from 13 N (2.9 lb) at 60 revolutions per minute to 18 N (4 lb) at 100 revolutions per minute. Increasing the suction and discharge heads from zero to 0.9 m (3 ft) and 1.8 m (6 ft), respectively, increased the pumping effort from 15 N (3.4 lb) to 32 N (7.0 lb), when operating at 80 revolutions per minute.

The Monarch V-200 was very portable. The pump was easy to position in a fuel supply tank since it was equipped with a rotating bung adaptor.

The Monarch V-200 was relatively safe to operate. The crank handle could not be locked to the pump body to prevent theft. When filling a tank, care must be exercised to prevent overflow.

A well illustrated parts list and operating instructions were provided.

One mechanical problem occurred during the test. The bung adaptor thumb screw bent due to overtightening and had to be replaced.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying a stronger thumb screw or a capscrew to allow the bung adaptor to be adequately tightened.
2. Providing a means of locking the pump handle to prevent theft.

3. Supplying an outlet hose and nozzle as standard equipment and making available, as an option, an outlet nozzle with an automatic shut-off.

4. Supplying a receptacle for storing a nozzle when not in use.

Chief Engineer: E. O. Nyborg

Senior Engineer: E. H. Wiens

Project Technologist: L. B. Storzynsky

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The size of the thumb screw will be increased by 50%.
2. Design changes will be investigated to provide a means of locking with an ordinary lock.
3. We have always offered a suction hose and nozzle as an option. Many wholesalers and jobbers prefer to buy the pump only and fabricate their own hoses and nozzles. We will investigate the recommendation regarding an automatic shut-off and may offer it as an option.
4. Design changes are being made to provide a receptacle for storing the nozzle when not in use.

MANUFACTURER'S ADDITIONAL COMMENTS

Our present literature indicates a capacity of 12-15 US GPM (10-12.5 Imperial gallons per minute). This will be changed at the next printing to read 10-12 US GPM (8.3-10 Imperial gallons per minute).

GENERAL DESCRIPTION

The Monarch V-200 is a self-priming, hand operated, rotary vane pump. It is designed for pumping gasoline, diesel fuel, solvents or lube oil from above ground tanks or drums equipped with either 40 or 50 mm (nominal 1.5 or 2 inch NPT) openings. It is equipped with a 1016 mm (40 in) non-adjustable suction pipe and a 152 mm (6 in) pump handle. The pump handle is equipped with a rotating wooden grip. The 20 mm (0.75 in) inside diameter outlet spout was threaded for a 25 mm (nominal 1 inch NPT) hose connection. A 25 mm (1 in) outlet hose complete with an outlet nozzle is available as an option.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Monarch V-200 was evaluated for ease of operation and safety. Pump performance characteristics and pumping effort at various pumping rates, suction and discharge heads were determined with diesel fuel.

RESULTS AND DISCUSSION

PUMP PERFORMANCE

Pumping Rate: Pumping rates from 60 to 100 revolutions per minute were determined as the normal range a farmer could continuously operate the pump when filling a large tractor tank. A maximum pumping rate of 140 revolutions per minute was reached but was impossible to maintain for any reasonable length of time.

Flowrate: Pump performance characteristics with diesel fuel at two different suction and discharge heads are given in FIGURE 2. Suction head is the distance the fuel level is below the pump and discharge head is the height the outlet nozzle is held above the pump. Suction heads of 0 and 0.9 m (0 and 3 ft) correspond to full and empty levels of typical farm truck fuel storage tanks.

Flowrate at an average pumping rate of 80 revolutions per minute at zero suction and discharge heads was 27 L/min (5.9 gal/min). Increased pumping rates increased the flowrate significantly. At a pumping rate of 100 revolutions per minute, at zero suction and discharge heads, flowrate was 33 L/min (7.3 gal/min) compared to 20 L/min (4.4 gal/min) at 60 revolutions per minute.

Increasing suction and discharge heads reduced the flowrate. Increasing the suction and discharge heads from zero to 0.9 m (3 ft) and 1.8 m (6 ft), respectively, decreased the flowrate from 27 L/min (5.9 gal/min) to 24 L/min (5.3 gal/min), when pumping at

80 revolutions per minute. This combination of suction and discharge heads is more severe than would be encountered in transferring fuel to most farm machinery and represents an 11% decrease in flowrate.

The maximum flowrate obtained was 47 L/min (10.3 gal/min) at a pumping rate of 140 revolutions per minute. This pumping rate could only be maintained for about 30 seconds. The manufacturer's maximum flowrate of 57 L/min (12.5 gal/min) could not be obtained, since the average person could not pump that fast.

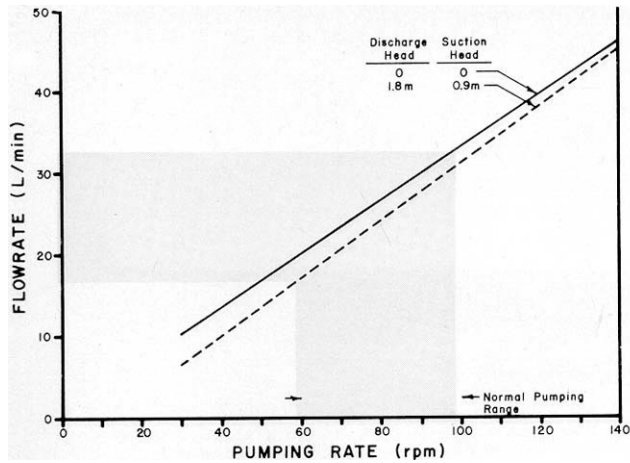


FIGURE 2. Flowrates with Diesel Fuel at Two Suction and Discharge Heads.

EASE OF OPERATION

Pumping Effort: Pumping effort is the hand force that has to be exerted, perpendicular to the end of the crank handle, to operate the pump. FIGURE 3 shows the hand force needed at various pumping rates, suction and discharge heads. Pumping effort increased slightly with increasing pumping rates, suction and discharge heads. At a pumping rate of 100 revolutions per minute, at zero suction and discharge heads, it was 18 N (4 lb) compared to 13 N (2.9 lb) at 60 revolutions per minute. At an average pumping rate of 80 revolutions per minute, pumping effort increased from 15 N (3.4 lb) at zero suction and discharge heads to 32 N (7.0 lb) with a suction and discharge heads of 0.9 m (3 ft) and 1.8 m (6 ft), respectively.

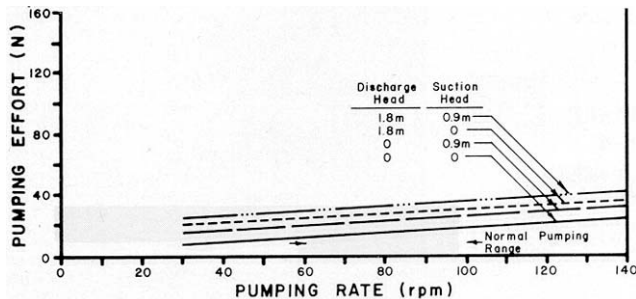


FIGURE 3. Pumping Effort with Diesel Fuel at Various Pumping Rates, Suction and Discharge Heads.

Fuel Tank Connection: The Monarch V-200 was portable and was equipped with both a 40 mm (nominal 1.5 inch NPT) and a 50 mm (nominal 2 inch NPT) bung adaptor to fit fuel tank openings. The bung adaptor turned relative to the pump body, making it very easy to install and position the pump in a fuel supply tank.

Filling A Fuel Tank: The Monarch V-200 was equipped with an outlet spout threaded for a 25 mm (nominal 1 inch NPT) outlet hose connection. An outlet hose complete with an outlet nozzle is available as an option. It is recommended a hose and nozzle be supplied as standard equipment and an automatic shut-off nozzle be made available as an option. It is also recommended the manufacturer supply a receptacle on the pump body or spout to store a nozzle when not in use.

Pumping at 80 revolutions per minute, it took from 9 to 10.5 minutes to fill a 225 L (50 gal) tractor fuel tank with filler opening typically located 1 m (3 ft) higher than the top of a typical farm truck fuel supply tank.

Servicing: The pump was not equipped with a suction or discharge strainer. Occasional lubrication of the moving parts was required. The pump was easily oiled through the discharge opening.

SAFETY

The pump handle could not be locked to the pump body. This could result in fuel being accidentally pumped which could be a safety hazard near running engines. It is recommended that the manufacturer consider a means of locking the handle to the pump body to prevent accidental pumping and theft. Care must be exercised to avoid overfilling of fuel tanks.

OPERATOR'S MANUAL

A well illustrated, comprehensive parts list and operating instructions were supplied with the Monarch V-200.

MECHANICAL PROBLEMS

The Monarch V-200 was operated for about 6 hours. The intent of the test was evaluation of functional performance and an extended durability evaluation was not conducted.

One mechanical problem occurred during the testing. The thumb screw that tightens the bung adaptor to the suction pipe (FIGURE 4) bent since a plier had to be used to adequately tighten it. It was replaced with a capscrew. It is recommended the manufacturer supply a capscrew or a thumb screw that will allow tightening of the bung adaptor to the suction pipe without bending.

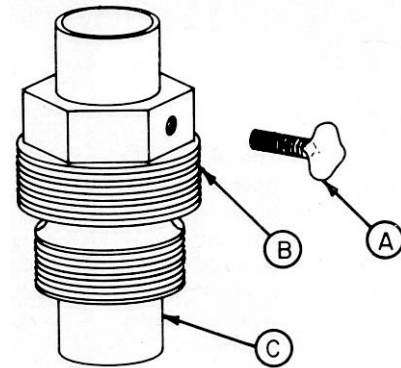


FIGURE 4. Barrel Nut Assembly: (A) Thumb Screw, (B) Bung Adaptor, (C) Suction Pipe.

APPENDIX I

SPECIFICATIONS

MAKE: Monarch Rotary Vane Hand Pump

MODEL: V-200

OVERALL DIMENSIONS:

| | |
|----------------------|------------------|
| - height | 300 mm (11.8 in) |
| - width | 152 mm (6 in) |
| - length | 260 mm (10.2 in) |
| - pump handle length | 152 mm (6 in) |

TOTAL WEIGHT:

12.7 kg (28 lb)

SUCTION PIPE:

| | |
|-----------------------------|---|
| - size | 25 mm (nominal 1 inch NP-T) |
| - standard length | 1016 mm (40 in) |
| - storage tank bung adaptor | 40 and 50 mm (nominal 1.5 and 2 inch NPT) |

OUTLET SPOUT:

| | |
|--------|--|
| - size | 20 mm (0.75 in) inside diameter, threaded for a 25 mm (nominal 1 inch NPT) outlet hose |
|--------|--|

APPENDIX II

METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversions may be used:

| | |
|-------------------------------------|--|
| 1 litre per minute (L/min) | = 0.22 Imperial gallons per minute (gal/min) |
| 1 metre (m) = 1000 millimetres (mm) | = 39.37 inches (in) |
| 1 Newton (N) | = 0.22 pounds force (lb) |
| 1 kilogram (kg) | = 2.20 pounds mass (lb) |



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