

EVALUATION REPORT

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LLOYD'S MODEL RE-40 SUBMERSIBLE SLUDGE PUMP

A Co-operative Program Between



LLOYD'S MODEL RE-40 SUBMERSIBLE SLUDGE PUMP

MANUFACTURER AND DISTRIBUTOR:

Lloyd's Manufacturing Ltd.
 P.O. Box 850
 Wadena, Saskatchewan
 S0A 4J0

RETAIL PRICE:

\$1763.00 (December 1983, f.o.b. Lethbridge, Alberta, with 50 ft (15.2 m) of rubber hose and two hose clamps.)

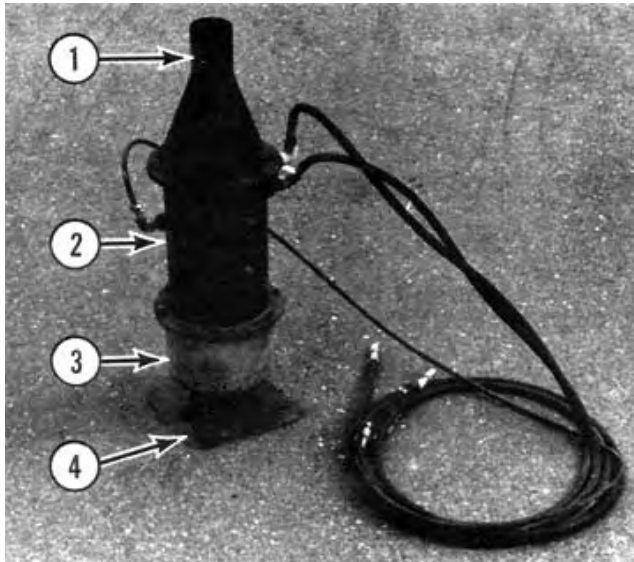


FIGURE 1. Lloyd's Model RE-40 Submersible Sludge Pump: (1) Discharge Tube, (2) Hydraulic Motor, (3) Impeller, (4) Support Stand.

SUMMARY AND CONCLUSIONS

Performance Characteristics: Performance of the Lloyd's model RE-40 submersible sludge pump was very good. Measured water flow rate at 7.7 gal/min (35 L/min) hydraulic motor flow rate varied from 400 to 170 gal/min (1820 to 775 L/min) over a range of total heads from 15 to 30 ft (4.6 to 9.1 m). A peak efficiency of 21% occurred at a 7.7 gal/min (35 L/min) hydraulic motor oil flow rate and a 300 gal/min (1365 L/min) water flow rate. Maximum power to operate the Model RE-40 at a 7.7 gal/min (35 L/min) hydraulic motor oil flow rate was 10.0 hp (7.5 kW).

The Lloyd's model RE-40 could be used to pump liquid manure provided there was no straw in the manure.

Ease of Operation: Two people could easily install the model RE-40 at a pump site. The support stand provided only marginal stability when used in a vertical position.

Operator Safety: The pump was safe to use if common sense was exercised.

Operator's Manual: No operator's manual was supplied with the pump.

Mechanical Problems: No mechanical problems occurred during testing.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to the support stand to provide adequate stability when used in a vertical position.
2. Supplying an operator's manual.

Senior Engineer: E. H. Wiens

Project Engineer: M. V. Eliason

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The support stand will be made larger to provide adequate stability when used in the vertical position.
2. An operator's manual complete with a descriptive parts list has now been prepared.

GENERAL DESCRIPTION

The Lloyd's model RE-40 submersible sludge pump is a 4 in (100 mm) diameter hydraulically drive pump designed for either vertical or horizontal use. It consists of an impeller, hydraulic motor and discharge tube mounted on a support stand.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Lloyd's model RE-40 was operated for about 20 hours while pumping water and liquid manure. Performance characteristics were determined with water over a range of discharge heads and speeds. Ease of operation, operator safety and suitability of the operator's manual were also evaluated.

RESULTS AND DISCUSSION

PERFORMANCE CHARACTERISTICS

Flow Rate: Pump performance characteristics of the Lloyd's model RE-40 when pumping water are given in FIGURE 2 for a range of total heads and hydraulic motor oil flow rates. Performance curves were determined with the pump in the vertical position.

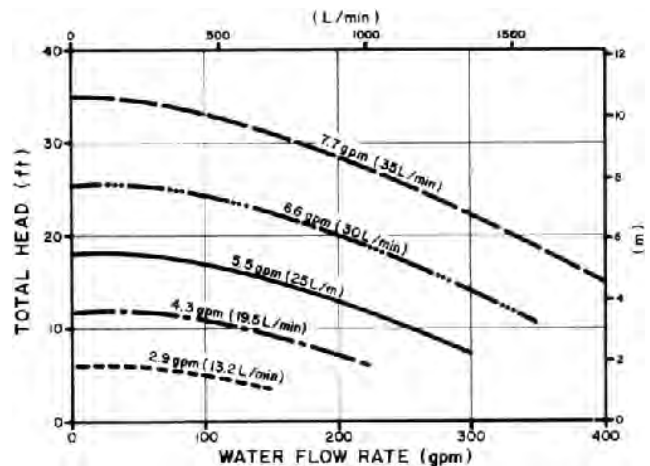


FIGURE 2. Lloyd's Model RE-40 Pump Performance Curves when Pumping Water at Various Hydraulic Motor Oil Flow Rates.

Maximum water flow rate at 15 ft (4.6 m) total head was 400 gal/min (1820 L/min) at a 7.7 gal/min (35 L/min) hydraulic motor oil flow rate. This hydraulic oil flow rate is typical of what could be expected from farm tractors when connected to the Lloyd's pump. The maximum water flow rate of 400 gal/min (1820 L/min) compares to the manufacturer's stated capacity of 600 gal/min (2730 L/min).

Pump flow rate increased for increasing hydraulic motor oil flow rates. For example, water flow rate at 15 ft (4.6 m) total head increased from 160 to 400 gal/min (730 to 1820 L/min) when the hydraulic oil flow rate was increased from 5.5 to 7.7 gal/min (25 to 35 L/min). Increasing hydraulic motor oil flow rates also increased the head at which water flow ceased. For example, at a 4.3 gal/min (19.5 L/min) hydraulic motor oil flow rate, water flow ceased at 12 ft (3.7 m) while at a 7.7 gal/min (35 L/min) hydraulic motor oil flow rate, water flow ceased at 35 ft (10.7 m) total head.

Power Requirements: FIGURE 3 shows the power required to operate the Lloyd's model RE-40 pump at various water flow rates and hydraulic motor oil flow rates. Increasing hydraulic motor oil flow rate increased the power required to operate the pump. Maximum power required to operate the pump at a 7.7 gal/min (35 L/min) hydraulic motor oil flow rate was 10.0 hp (7.5 kW).

Pump Efficiency: FIGURE 4 shows the pump efficiency of the Lloyd's RE-40 at various water flow rates and hydraulic motor oil flow rates. A peak efficiency of 21% occurred at 7.7 gal/min (35 L/min) hydraulic motor oil flow rate and a 300 gal/min (1365 L/min) water flow rate. Peak efficiency at other hydraulic motor oil flow rates were less and occurred at lower water flow rates.

Liquid Manure: The Lloyd's RE-40 could be used to pump liquid manure, provided there was no straw in the liquid manure. When used in liquid manure containing straw, straw would enter the inlet and plug the impeller centre (FIGURE 5). Removal of the straw blockage was inconvenient and required removal of the impeller

housing.

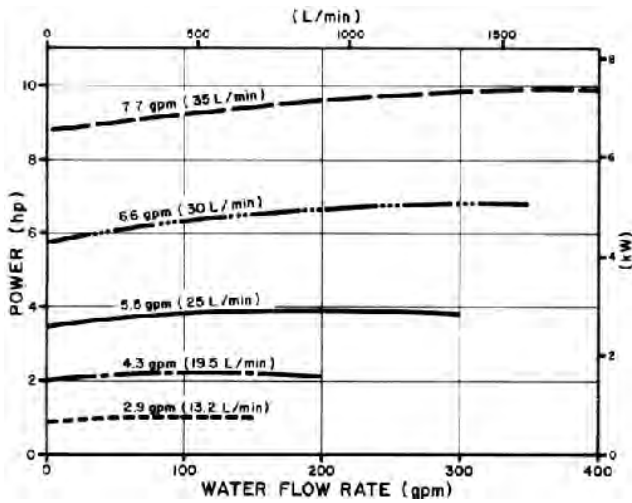


FIGURE 3. Power Requirements to Operate the Lloyd's Model RE-40 Pump at Various Water Flow Rates and Hydraulic Motor Oil Flow Rates.

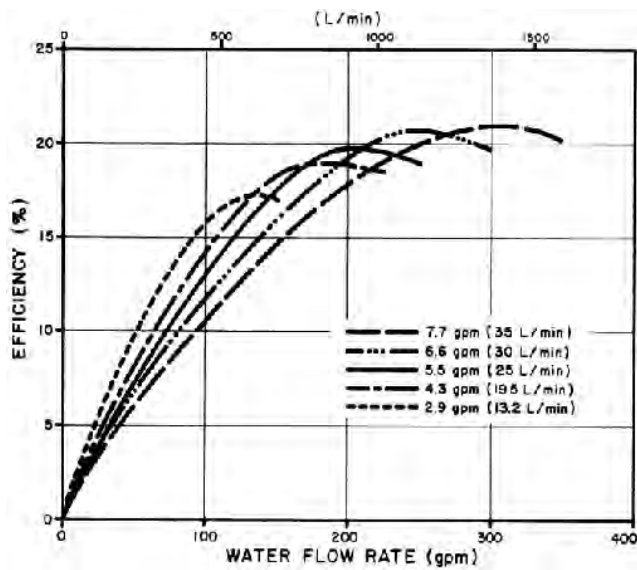


FIGURE 4. Pump Efficiency of the Lloyd's RE-40 at Various Water Flow Rates and Hydraulic Motor Oil Flow Rates.

EASE OF OPERATION

The Lloyd's model RE-40 could be easily positioned by two people. Handles were conveniently located to assist in pump positioning. When installed in a vertical position, the support stand provided only marginal pump stability. Modifications to the support stand to provide adequate stability are recommended.

The Lloyd's model RE-40 required three hydraulic line connections. Two connections were required for the hydraulic motor supply and return lines while a third was needed for the hydraulic motor drain. The Lloyd's RE-40 could be used on tractors equipped with a single set of remote couplers provided that the hydraulic motor drain line was returned directly to the hydraulic system reservoir. When used on tractors equipped with dual remote couplers with "float" capability, the drain line could be connected to the second set of remote couplers.

OPERATOR SAFETY

The pump was safe to operate if common sense was used. Care had to be exercised when priming the discharge system to prevent excessive shock loads and possible discharge hose whipping.

OPERATOR'S MANUAL

No operator's manual was supplied with the pump. It is recommended that an operator's manual be supplied.



FIGURE 5. Straw Plugging the Impeller Centre.

MECHANICAL PROBLEMS

The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted. No mechanical failures occurred during the 20 hours of operation while testing the Lloyd's model RE-40 pump.

**APPENDIX I
SPECIFICATIONS**

MAKE:	Lloyd's
MODEL:	RE-40
MANUFACTURER:	Lloyd's Manufacturing Ltd. P.O. Box 650 Wadena, Saskatchewan S0A 4J0
HYDRAULIC MOTOR:	
-- make	Vickers
-- serial number	16841Y
OVERALL DIMENSIONS:	
-- length	17.5 in (440 mm)
-- width	14.6 in (570 mm)
-- height	45.5 in (1100 mm)
INLET DIAMETER:	3.5 in (90 mm)
IMPELLER:	
-- number of vanes	3
-- diameter	8 in (205 mm)
OUTLET DIAMETER:	4 in (100 mm)
TOTAL WEIGHT:	141 lb (64 kg)

**APPENDIX II
MACHINE RATINGS**

The following rating scale is used in PAMI Evaluation Reports:

- Excellent	- Fair
- Very Good	- Poor
- Good	- Unsatisfactory

**APPENDIX III
CONVERSION TABLE**

feet (ft) x 0.505	= metres (m)
imperial gallons (gal) x 4.55	= litres (L)
horsepower (hp) x 0.75	= kilowatts (kW)
inches (in) x 25.4	= millimeters (mm)
miles/hour (mph) x 1.61	= kilometres/hour (km/h)
pounds (lb) x 0.45	= kilograms (kg)



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