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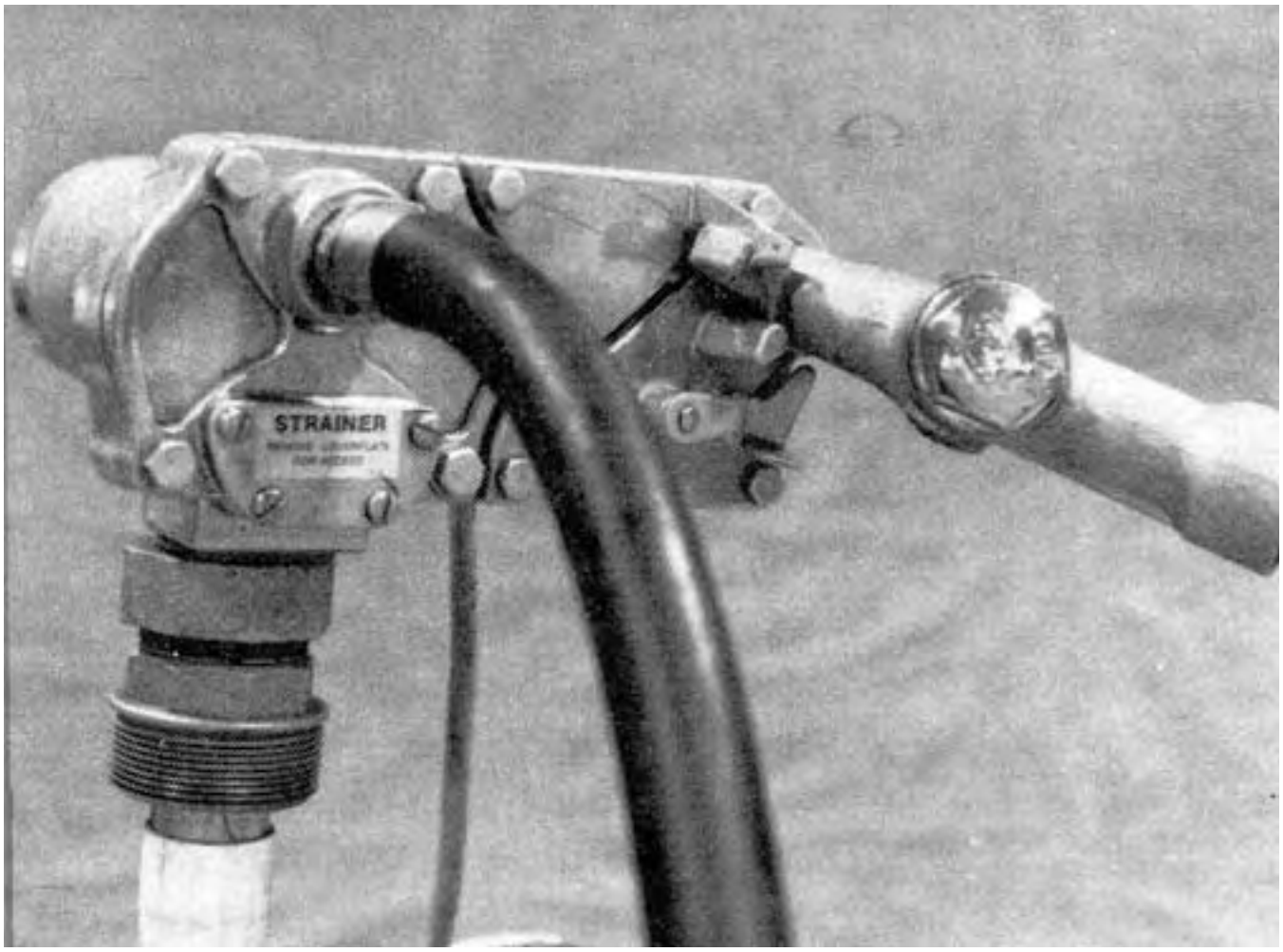

GIP Model 120 Fuel Transfer Pump

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

GPI MODEL 120 FUEL TRANSFER PUMP

MANUFACTURER:

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U.S.A.

DISTRIBUTOR:

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RETAIL PRICE:

$197.00 (January, 1979, f.o.b. Lethbridge)

FIGURE 1. GPI Model 120 Fuel Transfer Pump (A) Battery Cable, (B) Bung Adaptor, (C) Pump Body, (D) Dust Shield, (E) Outlet Hose, (F) Fuse Holder, (G) Battery Clamps, (H) Outlet Nozzle, (I) Suction Pipes.

SUMMARY AND CONCLUSIONS

The flowrate for the GPI Model 120 fuel transfer pump, when pumping diesel fuel with a fully charged 12 volt battery at zero suction and discharge heads was 40 L/min (8.8 gal/min). Increasing the suction head to 0.9 m (3 ft) and the discharge head to 2.7 m (9 ft) resulted in a 20% reduction in flowrate. Maximum measured flowrate was 13% less than the manufacturer's stated capacity. It took from 6 to 6.5 minutes to fill a 225 L (50 gal) tractor fuel tank located about 1 m (3.3 ft) above a fuel supply tank.

Power consumption at 12 volts was 168 watts with a corresponding current draw of 14 amps. A fully charged 12 volt battery could operate the pump for several hours without recharging.

The GPI 120 was very portable and was very easy to position in a fuel supply tank since it was equipped with a rotating bung adaptor. Electrical connections were simple. The motor had a 30 minute-on, 30 minute-off duty cycle. As a result, from 960 to 1200 L (211 to 264 gal) could be continuously pumped before the motor had to be allowed to cool.

The GPI 120 was equipped with a suction strainer that was easily serviced by removing the strainer cover plate.

The GPI 120 was safe to operate if normal safety precautions for transferring fuel were observed.

A well illustrated parts list and comprehensive operating instructions were provided.

Two mechanical problems occurred during the test. The fastener on the fuse holder broke off and the nozzle dust shield frequently fell off.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying, as an option, a pump nozzle that can be locked open and which is equipped with an automatic shut-off.
2. Modifying the dust shield to prevent it from coming off.
3. Modifying the fuse holder to prevent the fastener from breaking off.

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THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Great Plains Industries, Inc., does not recommend the use of an automatic nozzle with the Model 120 fuel transfer pump. The pressure drop across most automatic nozzles on the market today is excessive to the point of reducing the Model 120 flowrate to about six U.S. gal/min (23 L/min).
2. The method of attaching the dust shield to the main casting has been revised and since the change Great Plains Industries, Inc., has received very few complaints.
3. An investigation into the extent of this problem has been initiated.

GENERAL DESCRIPTION

The GPI Model 120 is a self-priming, positive displacement gear pump driven by a 12 volt DC electric motor adaptable to either negative or positive ground vehicle electrical systems. It is designed for pumping gasoline, kerosene or diesel fuel from above ground tanks and drums equipped with 50 mm (nominal 2 inch NPT) openings. It is equipped with an 613 mm (32 in) suction pipe, a 4.3 m (14 ft) outlet hose with standard fuel pump nozzle and a 3.7 m (12 ft) battery cable with alligator clamps. Additional suction pipes may be added to accommodate tank depths up to 2.1 m (7 ft). It is supplied with an automatic bypass valve to permit intermittent pumping while the motor is running. The pump nozzle when not in use is stored within a dust shielded receptacle on the pump body.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The GPI Model 120 was evaluated for ease of operation, power consumption and safety. Pump performance characteristics at various voltages, suction and discharge heads were determined with diesel fuel.

RESULTS AND DISCUSSION

PUMP PERFORMANCE

Flowrates: Pump performance characteristics with diesel fuel at two suction heads over a typical range of 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. The 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. The flowrates in FIGURE 2 are for a pump powered with a fully charged 12 volt battery.

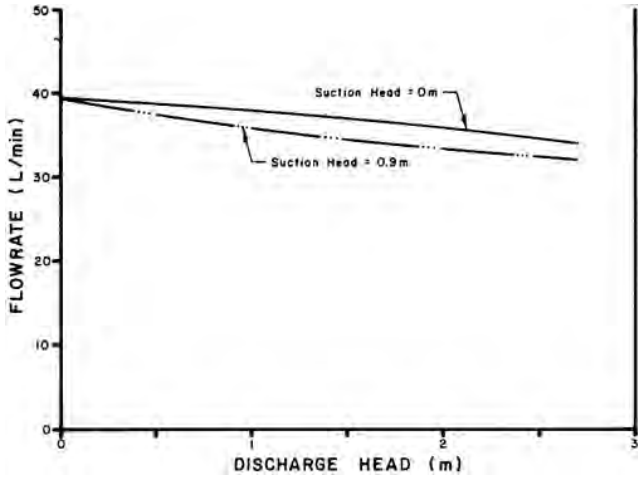

FIGURE 2. Pump Performance Characteristics with Diesel Fuel when Powered with Fully Charged 12 Volt Battery.

The maximum flowrate of 40 L/min (8.8 gal/min) was obtained at zero suction and discharge heads. Increasing suction and discharge heads reduced the flowrate. For example, increasing the suction head to 0.9 m (3 ft) and the discharge head to 2.7 m (9 ft), resulted in a flowrate of 32 L/min (7.0 gal/min). This combination of suction and discharge heads is more severe than would be encountered in transferring fuel to most farm machinery and represents a 20% decrease in flowrate.

In filling a typical farm tractor, with filler opening about 1 m (3.3 ft) above the top of the fuel supply tank and with the fuel supply tank one-half full, flowrate would be about 37 L/min (8.1 gal/min). The maximum flowrate of 40 L/min (8.8 gal/min) was 13% less than the manufacturer's stated flowrate of 46 L/min (10.1 gal/min).

Duty Cycle: The pump had a 30 minute-on, 30 minute-off duty cycle. Tests showed that running the pump longer than 30 minutes resulted in the motor getting very hot which could result in motor burnout. Since the pump was not equipped with a thermal overload protector, the operator must pay close attention to the running time of the pump.

POWER CONSUMPTION

FIGURE 3 shows the effect of battery voltage on flowrates and also indicates the corresponding current draw. A fully charged 12 volt battery will deliver 12 volts. Since the current draw at 12 volts was only 14 amps, the maximum flowrate of 40 L/min (8.8 gal/min) can be expected for several hours operation with a good battery, without recharging. There should, therefore, be no need to consider charging a truck battery by running the truck motor while refueling. The operator's manual warns against running engines while pumping fuel for the reason that the exhaust may ignite fuel vapours.

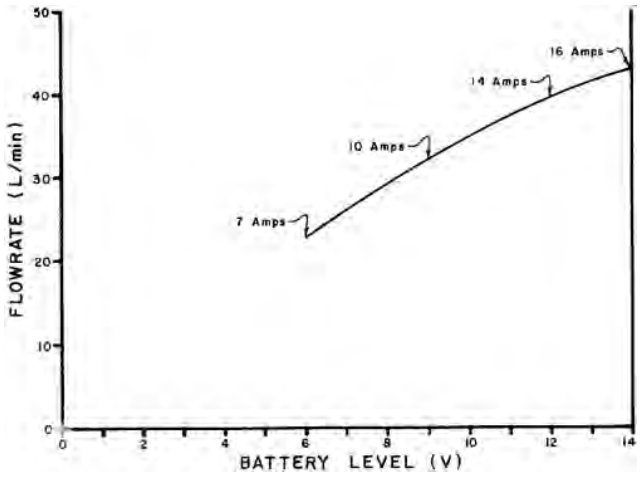

FIGURE 3. Flowrates with Diesel Fuel at Zero Suction and Discharge Heads for Various Battery Voltages.

A typical battery under charge will deliver more than 12 volts. At 14 volts the flowrate increased to 43 L/min (9.5 gal/min) with corresponding current draw of 16 amps. This means that the flowrate increased only 8% but the current draw increased 14% while charging the battery during pumping. As a result, power consumption was increased from 168 watts at 12 volts to 224 watts at 14 volts. Since most of the additional power has to be dissipated as heat in the pump motor, operating the pump with the battery under charge would serve to decrease the pump duty cycle, due to motor overheating, with only negligible increase in flowrates. This further substantiates the manufacturer's recommendation that the pump not be operated while vehicle engines are running.

EASE OF OPERATION

Fuel Tank Connection: The GPI Model 120 was portable and was equipped with a 50 mm (nominal 2 inch NPT) bung adaptor to fit standard 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 tank.

Electrical Connection: Electrical connections were simple. The GPI 120 was supplied with two battery clamps and a fuse holder, which had to be connected to the pump battery cable. The pump could be operated on either positive or negative ground vehicle electrical systems. Care had to be taken to install the fuse adjacent to the battery clamp on the ungrounded battery terminal.

Filling A Fuel Tank: The outlet hose was equipped with a standard lever operated fuel nozzle. It took about 55 N (12 lb) hand force to hold the nozzle valve open. The automatic bypass valve in the pump permitted intermittent closing of the nozzle valve while the motor was running.

It took from 6 to 6.5 minutes to fill a 225 L (50 gal) tractor fuel tank with filler opening typically located 1 m (3.3 ft) higher than the top of a typical farm truck fuel supply tank. An optional fuel supply nozzle that could be locked open, equipped with an automatic shut-off when the tank is filled, would be beneficial for large tractors as it would free the operator to do other servicing while refueling. The pump motor had a 30 minute-on, 30 minute-off duty cycle. As a result, from 960 to 1200 L (211 to 264 gal) could be continuously pumped before the electric motor had to be allowed to cool.

Servicing: The GPI 120 was equipped with a suction fuel strainer. The mesh strainer could be serviced by removing a cover plate on the pump body. The pump and motor required no lubrication.

SAFETY

The GPI 120 was equipped with a safety switch. The pump motor could be turned on only when the outlet nozzle was removed from its storage receptacle. The nozzle could not be returned to the storage receptacle unless the pump motor switch was turned off. A padlock ring was supplied to permit locking the nozzle in storage position.

The operator's manual clearly warned against running engines, when using the pump, to prevent possible ignition of fuel vapours from engine exhaust. Since the current draw of the pump was only 14 amps at a battery voltage of 12 volts, there was no need to charge the battery while pumping. A fully charged battery would provide several hours of pumping before recharging was necessary.

OPERATOR'S MANUAL

The operator's manual contained clearly illustrated installation, operation, maintenance, and safety instructions. A comprehensive, well illustrated parts list was also provided.

MECHANICAL PROBLEMS

The GPI 120 was operated for about 4 hours. The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted.

Several problems occurred during the functional evaluation. The fastener on the fuse holder broke off (FIGURE 4) and required replacement. The nozzle dust shield (FIGURE 1) was insecurely fastened and fell off frequently. It is recommended that the manufacturer make modifications to prevent the fuse holder fastener from breaking off and the nozzle dust shield from falling off.

FIGURE 4. Broken Fuse Holder.

APPENDIX I
SPECIFICATIONS

MAKE:	Great Plains Industries Fuel Transfer Pump
MODEL:	120
SERIAL NUMBER:	16384
DUTY CYCLE:	
-- normal operation	30 minutes-on, 30 minutes-off
-- on bypass valve	10 minutes-on, 30 minutes-off
OVERALL DIMENSIONS:	
-- height	178 mm (7 in)
-- width	2.29 mm (9 in)
-- length	210 mm (8.27 in)
TOTAL WEIGHT:	9 kg (20 lb)
SUCTION PIPE:	
-- size	25 mm (nominal 1 inch NPT)
-- standard length	813 mm (32 in)
-- maximum recommended length	2134 mm (84 in)
-- storage tank bung adaptor	50 mm (nominal 2 inch NPT)
DISCHARGE HOSE:	
-- size	20 mm (0.75 in)
-- length (with nozzle)	4.3 m (14 ft)
MOTOR:	
-- power requirement	12 V DC
-- polarity	either negative or positive
-- battery cable length	3.7 m (12 ft)
-- battery connectors	alligator clamp

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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