

Pump Recommendations for Liquid Systems

This document includes general information and recommendations when selecting a pump for liquid control systems.

Pump Descriptions

Electric Diaphragm or Dual Electric Diaphragm

Reasons to use it

- Low Cost \$ (\$150–350 for a single pump, \$450 for PWM Driver)
- Can be a very simple system

Reasons not to use it

- Generally a less durable pumping system
- Reduced pump life when regularly used at a high PWM
- Pump can struggle to prime itself if mounted far away from the tank
- NOT compatible with vApply Base system

Requirements

- MUST be a “bypass” pump (Do NOT use “demand” pumps if PWM controlled)
- If 20/20 control of the pump is desired, a PWM electric motor driver must be used, adding cost to the system (example: MicroTrak P/N 18385)
- May require additional electrical generation capacity

Recommendations

- Generally application rate of 5 GPA maximum (16 row planter and smaller)
- Size at 50–60% of the open flow rating of the pump
- Use lower operating pressures (20–30 psi)
- Not for higher flow requirements
- Single pump is generally capable of 1–3.5 GPM (in-furrow on 12 row planter and smaller)
- Dual pump is generally capable of 2–6 GPM (in-furrow on 16 row planter and smaller)

Installation Considerations

- Mount the pump relatively close to the tank (within 10 feet)
- Best if the pump is mounted below the outlet of the tank
- May require additional electrical generation capacity, can require up to 25 amps per pump, see manufacturer specifications

Examples

- Remco FatBoy 5538–2L1–94A
- AgXcel
- Schaffert

Hydraulic Centrifugal Pump

Reasons to use it

- Low Cost \$\$ (\$800–2000 with motor and needle valve, \$3000–3500 with motor and PWM valve)
- It can be controlled through a 20|20 with a PWM controller, or a single, set speed by tractor SCV flow
- When controlled by SCV flow, it is a very simple system

Reasons not to use it

- Generally not a durable pump
- **Pump damage will result if the pump is run dry**— can be less than 15 seconds (new wet seal pumps are available to avoid this, at higher costs)
- Pump WILL NOT prime itself or draw well from a distance, it MUST be mounted directly below the tank
- Dual tank systems can be difficult to locate the pump far enough below the tank and supply sufficient flow to the pump

Requirements

- Mounting MUST be directly below the tank
- Sizing of the pump and hydraulic motor must be done in accordance with the system pressure that is needed, see manufacturer specifications
- Hydraulic need will vary based on the size of the pump and motor, smaller pumps are 4–6 GPM, larger pumps can be 15+ GPM of hydraulic demand

Recommendations

- Small models can supply up to 15 GPM of flow (in-furrow applications)
- Medium size models can supply 80 GPM
- Large models can supply 150 GPM (high nitrogen rates at high speed on large planters)

Installation Considerations

- Mounting MUST be directly below the tank
- Generally the pressure relief bypass hose needs to go back to the tank, returning to the pump inlet can cause priming issues

Examples

- ACE Pump
- Hypro Pump

Hydraulic Diaphragm Pump

Reasons to use it

- Generally considered durable
- Primes well (can draw longer distances from the tank or from dual tanks)
- AgXcel offers a direct drive model with built in shaft speed sensor for use with vApply Base systems

Reasons not to use it

- Higher cost \$\$\$\$ (one of the most expensive options, \$4000–7000)

Requirements

- Tractor must have enough hydraulic capacity, can be 10+ GPM of hydraulic need

Recommendations

- Small models can supply 0.5–11 GPM of flow (in-furrow applications)
- Large models can supply up to 55 GPM (nitrogen applications)
- Running these pumps at 100% of rated capacity may reduce the lifespan of the pump
- If pump is operated higher than rated maximum RPM, damage may result

Installation Considerations

- No special considerations

Examples

- AgXcel Pump
- Hypro Pump

Ground Drive Piston Pump

Reasons to use it

- No hydraulic need, use when tractor hydraulic flow is a concern or at capacity with other planter functions
- Generally considered durable
- Primes well (can draw longer distances from the tank or from dual tanks)

Reasons not to use it

- Higher cost \$\$\$ (pump without brackets and drive is \$1500–2800)
- Pump flow is set for a given planter speed, this can limit the application rate range
- Can have pressure fluctuations if pump stroke is long or pump speed is low
- Cannot perform health checks in the shop so the first pass of planting could be the first test of the system

Requirements

- No special requirements

Recommendations

- Make sure the pump is sized properly for the system need (a pump that is oversized can cause pressure instability and difficulty in vApplyHD hitting rate)
- Small models can supply 0.5–10 GPM (in-furrow applications)
- Large models can supply up to 68 GPM (nitrogen applications)
- Running these pumps at 100% of rated capacity may reduce the lifespan of the pump
- If pump is operated higher than rated maximum RPM, damage may result

Installation Considerations

- An old seeding motor can be used to convert the pump from ground drive to hydraulic drive, allowing for vApply Base use or the ability to test vApplyHD systems before field operation

Examples

- John Blue

Hydraulic Drive Piston Pump

Reasons to use it

- Generally considered durable
- Primes well (can draw longer distances from the tank or from dual tanks)

Reasons not to use it

- Higher cost \$\$\$\$ (one of the more expensive options, \$2800–5000)
- Can have pressure fluctuations if pump stroke is long or pump speed is low

Requirements

- Tractor must have enough hydraulic capacity, can be 10+ GPM of hydraulic need

Recommendations

- Small models can supply 0.5–10 GPM (in-furrow applications)
- Large models can supply up to 68 GPM (nitrogen applications)
- Many direct drive models are not able to be adjusted for stroke length, which can result in more pressure instability. Some users have reported these pumps are less desirable than the adjustable stroke models
- Running these pumps at 100% of rated capacity may reduce the lifespan of the pump
- If pump is operated higher than rated maximum RPM, damage may result

Installation Considerations

- No special considerations

Examples

- John Blue

Recommendation by Flow Rate

Note: Rates given below are the total demand of the planter

To calculate the GPM requirement:

- $\text{GPM per row} = (\text{GPA} * \text{row spacing} * \text{max speed}) / 5940$
- $\text{GPM for the planter} = \text{GPM per row} * \text{number of rows}$

Low Flow Rates — 2 GPM or Less

Example: 5 GPA up to 16 row planter at 5 MPH

- Electric Diaphragm Pump
- Small Centrifugal Pump
- Small Hydraulic Diaphragm Pump

DO NOT USE

- Oversized pumps (ie. large centrifugal, large piston, large diaphragm)

Medium Flow Rates — 2–10 GPM

Example: 5–15 GPA on 12 row high speed planter, 8 GPA on 24 row high speed planter

- Small Centrifugal Pump
- Small Piston Pump (ground drive or hydraulic drive)
- Small Hydraulic Diaphragm Pump

High Flow Rates — 10–40 GPM

Example: 25 GPA on 24 row planter

- Medium Centrifugal Pump
- Hydraulic Diaphragm Pump
- Piston Pump (ground drive or hydraulic drive)

Very High Flow Rates — 50–100 GPM (40–60 GPA)

- Large Centrifugal Pump

Note: Make sure to size the pump for the pressure the system will run at (may need higher pressures (80+ psi) for dual band Conceal systems at these rates)

DO NOT USE

- Generally other pump types are not recommended as they will be running at their top RPM range, which may reduce the lifespan

Pump Recommendation Based on Tank Location

Tank Mounted in Front of Tractor

- Piston Pump (ground drive or hydraulic drive)
- Hydraulic Diaphragm Pump
- Electric Diaphragm Pump (if low GPM needed and must be mounted with tank at the front of the tractor)

Saddle Tanks Mounted on Tractor

- Piston Pump (ground drive or hydraulic drive)
- Hydraulic Diaphragm Pump
- Centrifugal Pump

Note: This option needs additional consideration. Pump must be mounted low enough and have a large enough supply line to gravity feed the full output volume of the pump from the tank to the pump inlet.

Center Mounted Tank on Planter Frame

- Centrifugal Pump (must be mounted directly below tank)
- Piston Pump (ground drive or hydraulic drive)
- Hydraulic Diaphragm Pump
- Electric Diaphragm Pump (only use if low GPM is needed, mount the pump close to the tank)

Dual Tanks on Wings of Planter

- Hydraulic Diaphragm Pump
- Piston Pump (ground drive or hydraulic drive)

Towed Cart(s)

- Centrifugal Pump (must be mounted below the tank on the cart, do not mount pump on the planter)
- Hydraulic Diaphragm Pump
- Piston Pump (ground drive or hydraulic drive)