

KOCSIS TECHNOLOGIES, INC.

HYDRAULIC STARTING SYSTEMS



Principles of Operation

Hydraulic starting systems use the energy of high pressure hydraulic fluid to quickly and effectively start engines in the harshest of environments. Hydraulic fluid is stored in hydro-pneumatic accumulators at pressures up to 3,000 psi. The fluid, when released, translates into the energy needed to drive the starting motor. This transfer of fluid from the accumulator through the starter is measured in two ways: flow and pressure. As with pneumatic systems, pressure translates into torque and the volume of flow translates into speed and horsepower. The kinetic energy released from the accumulator results in the fastest delivery of torque and horsepower when compared to other forms of engine starting. This immediate delivery of torque and horsepower means faster starting times, and in an emergency, every second counts. This combination means that hydraulic starting systems are amongst the most efficient methods of engine starting available anywhere in the world. Because hydraulic starting systems are self-contained and constantly lubricated in hydraulic fluid, they are designed and manufactured for years of trouble free and reliable service.

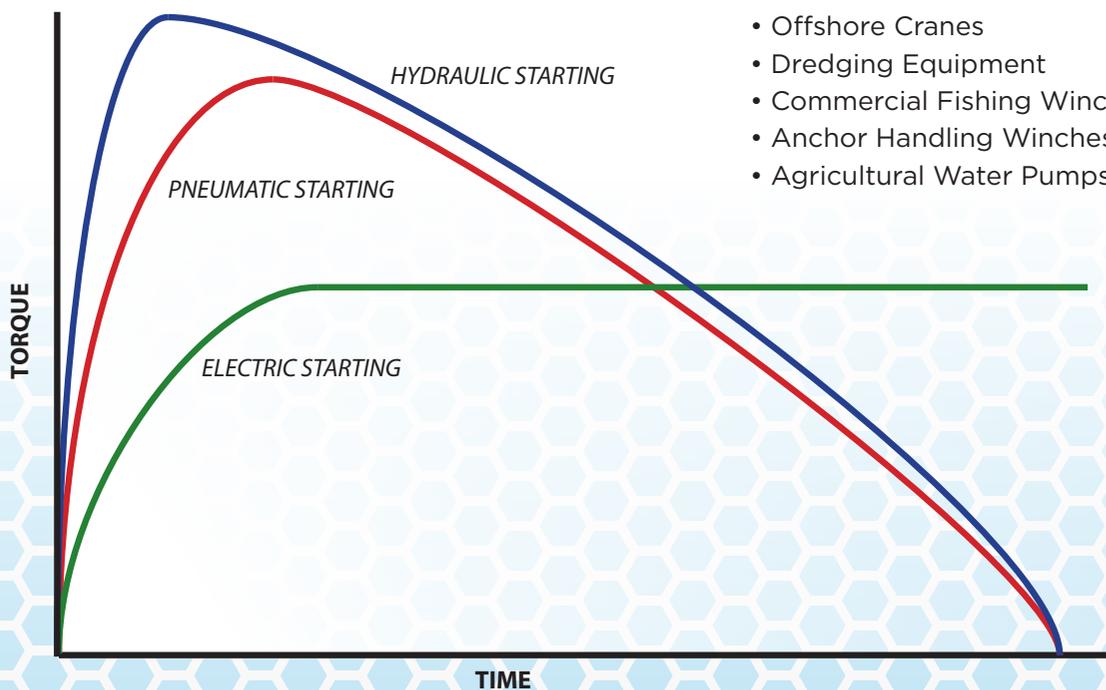
Features and Benefits

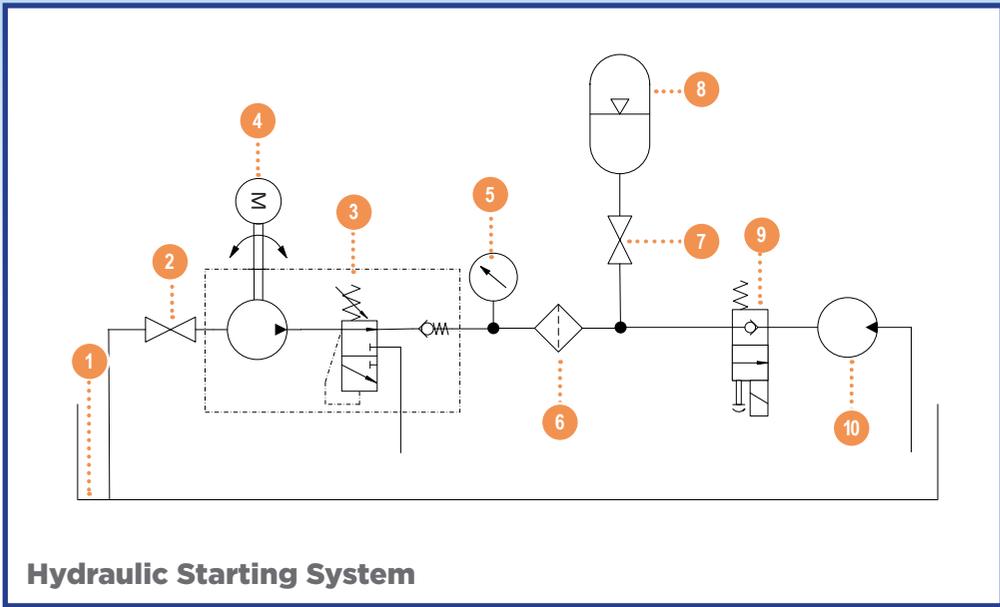
- Higher torque and faster speeds result in more efficient starting versus air or electric starters.
- With the addition of a Beryllium Copper pinion, hydraulic starting systems can become a truly “sparkless” starting system which can be used in Class 1 Division 1 applications.
- Unlike air and electric starters, hydraulic systems are nearly unaffected by cold weather.
- With the manual recharging pump (hand pump) that is included in every system, hydraulic starting systems do not rely on any external source of power to start your engine. This “black start” feature is exclusive to hydraulic starting systems.
- Extended life expectancy due to the constant lubrication of components in hydraulic fluid.
- Longer life expectancy translates into lower maintenance costs as well as lower “lifetime” costs when compared to electric or air.
- All Kocsis Technologies’ starters and accessories are proudly manufactured in the United States.

Common Applications

- Fire Pumps
- Generator Sets
- Bilge Pumps for Hazardous Cargo
- Underground Locomotives in Mining Applications
- Hydraulic Fracturing Applications – Pumps, Blenders, Hydration Units, Nitrogen Pumps
- Wireline Units
- Lifeboats
- Offshore Cranes
- Dredging Equipment
- Commercial Fishing Winches
- Anchor Handling Winches
- Agricultural Water Pumps

Faster Engine Starting with Hydraulic Starting

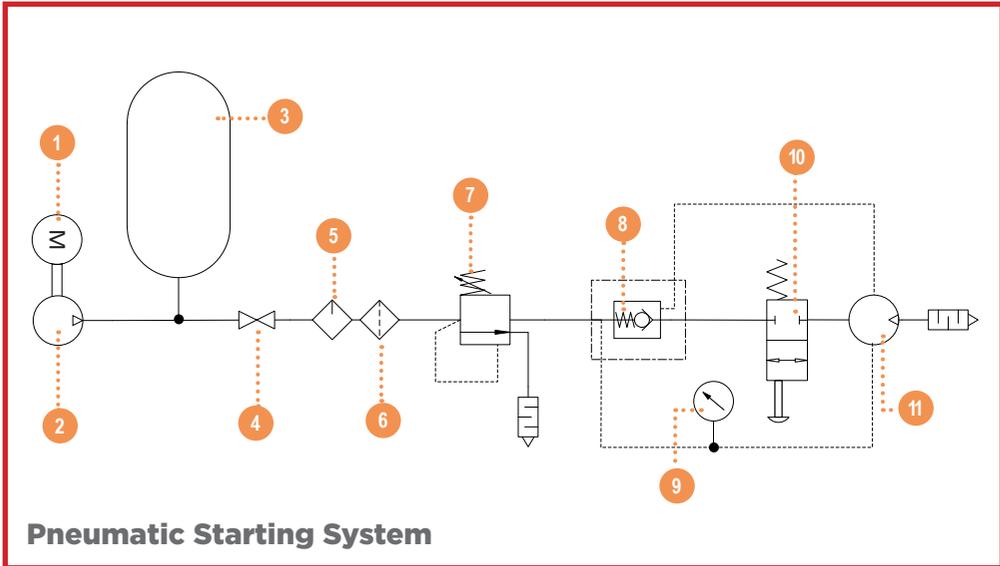




Hydraulic Starting System

Item	Description	Cost
1	RESERVOIR	\$\$
2	BALL VALVE	\$
3	RECHARGE PUMP	\$\$
4	ELECTRIC MOTOR/ ENGINE PTO	\$\$
5	PRESSURE GAGE	\$
6	FILTER	\$
7	BALL VALVE	\$
8	ACCUMULATOR	\$\$\$
9	FOOT VALVE	\$
10	HYDRAULIC STARTER	\$\$\$

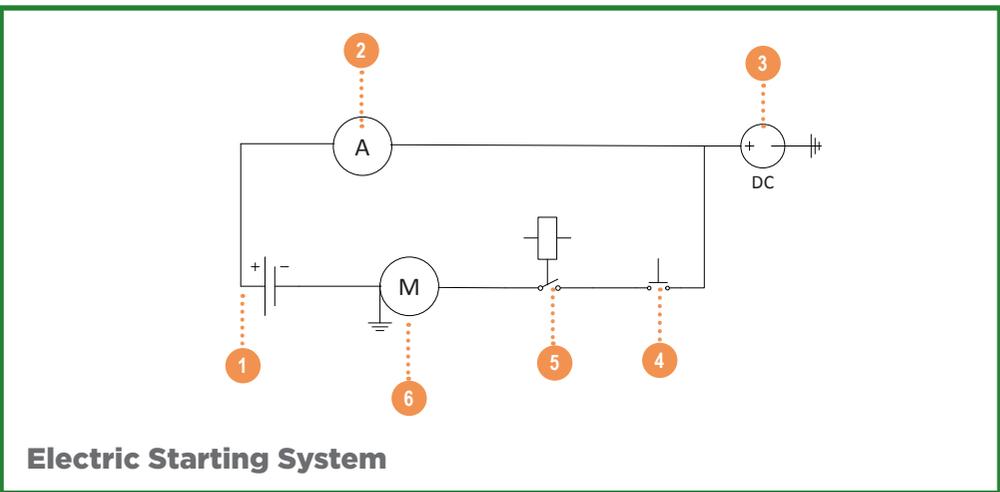
Long-term maintenance costs for Hydraulic Starting System. \$



Pneumatic Starting System

Item	Description	Cost
1	ELECTRIC MOTOR	\$\$\$
2	COMPRESSOR	\$\$\$\$
3	AIR RECEIVER	\$\$
4	BALL VALVE	\$
5	LUBRICATOR	\$
6	FILTER	\$
7	RELIEF VALVE	\$
8	RELAY VALVE	\$\$
9	PRESSURE GAGE	\$
10	PUSH BUTTON VALVE	\$
11	PNEUMATIC STARTER	\$\$\$

Long-term maintenance costs for Pneumatic Starting System. \$\$



Electric Starting System

Item	Description	Cost
1	BATTERY	\$\$
2	AMMETER	\$
3	ALTERNATOR	\$\$
4	START SWITCH	\$
5	MAGNETIC SWITCH	\$
6	ELECTRIC STARTER	\$\$

Long-term maintenance costs for Electric Starting System. \$\$\$

Explanation of parts on reverse side

Starting System Products



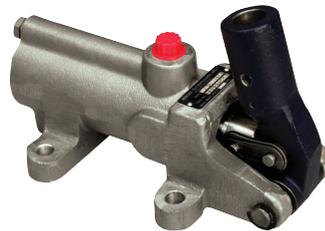
Recharging Pump

Various models including pulley, electric motor and PTO driven pumps that recharge hydraulic energy used for starting attempts. Standard features include an integrated unloading/relief valve.



Hydraulic Starter

Various models of fixed displacement piston motors capable of effective hydraulic starting of engines up to 80 liters of displacement.



Hand Pump

Manual driven pump capable of regenerating hydraulic energy for emergency starting attempts. Meets the "black start" requirement of the US Coast Guard.



Reservoir

Standard and custom tanks with fully removable tops for ease of service. Standard features include a high quality chrome plated filler breather and sight level gage.



Control Valve

Various models including pedal, cable, and solenoid actuated valves that can meet explosion proof requirements.



Filter

Standard and custom filters available in multiple beta ratings and capable of being used on both the suction and high pressure lines.



Accumulator

Piston or bladder type accumulators in various capacities which can be provided with multiple approvals including: ASME, ABS, DNV, CRN, etc.



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