Generally, accumulators are thought of as a convenient method of storing energy on mobile equipment. The same benefits and value that mobile equipment manufacturers find in accumulators also pertain to many industrial applications.

Creating value for the end-user can often be accomplished by incorporating an accumulator into a system. Accumulators present a unique opportunity to compete against low-ball competitors without sacrificing profit, or possibly even losing business.

Evaluating the application is the first step in determining the feasibility of using an accumulator. The primary indicators are:

A) The application is not a continuous-duty system. Between work periods, the system must have some time available to recharge the accumulator. This is commonly referred to as “dwell time”. Dwell time allows the pump to recharge the accumulator while the actuator is not performing work. A greater dwell time results in greater work potential from the actuator due to the pump having more time to fill the accumulator with oil.

B) Instantaneous, on demand, hydraulic energy is required or can improve the production on the machine. Pumps are unable to go on-stroke at full pressure instantly. The ramp time for a pump varies across pump families, but even the fastest pumps fall well short of the speed of a charged accumulator. The limiting factor becomes the shift limit of the valve, which can be as short as 15 ms for Parker Hannifin Corp’s DIN Throttle Valves. Because the accumulator is already at full or desired pressure when the work cycle begins, the potential energy is instantly ready to be used.

C) Energy cost savings present an opportunity for value-creation. Once the accumulator is charged with oil, the hydraulic power unit can be turned off. This is easily automated with a pressure transducer and relay. The energy in the accumulator is stored until released by a valve. There is no need to continue to operate the pump/motor set after the accumulator has been charged, thus a significant cost-savings can be realized in energy consumption.

The two schematics on the left demonstrate alternate approaches to system design. The system requires 10 gpm for 2 seconds at 1000 psi. Cylinder retract time is 1 second (2:1 cylinder). Time between work cycles is 10 seconds (dwell time).

In the first schematic, a 10 gpm hydraulic pump is used. In the second schematic, a 5 cc (2.2 gpm) pump is used with an accumulator. Though the application requires 10 gpm to make a part, the total oil volume needed is only 1/3 gallon, or 77 cubic inches, making it an ideal application for an accumulator. A 7 cc pump will pump 122 cubic inches of oil in 10 seconds. If 77 in³ are needed on extension for a 2:1 cylinder, then 39 in³ are needed for retract, totaling 116 in³ of oil needed (77+39) for the entire system. The pump has enough flow to extend and retract the cylinder in the desired time, and the accumulator will be charged during the dwell time to be able to deliver 77 in³ in 2 seconds during extension. The cost of a PVP23 and 7.5 HP motor is roughly 2 times the cost of a PGP505A0070 gear pump, 2 HP motor, A4N0578 piston accumulator, and DV10 unloading valve.

As illustrated, an accumulator in this circuit reduces overall cost of the system. If the competitor is quoting a standard power unit without an accumulator, the accumulator system now has a distinct cost and performance advantage, thus creating value for your customer. Your engineered solution is difficult to displace, and you have demonstrated technical competency that the customer will rely upon again for future projects.