# Application Spotlight



### **Central Cleaning Washdown Systems**

#### Operation

Many food processing production sites use centralized cleaning systems that feature one or more high-pressure pumps feeding a variety of wash-down guns and lances. Using high-pressure water significantly reduces cleaning time and water consumption compared to low pressure (under 250 psi) water. A high-pressure stream of water directed toward a surface provides increased kinetic energy, yielding a higher impact force and agitation on the surface being cleaned. Steady flow from the nozzle then flushes the contamination, resulting in a completely cleaned surface.

In this plant, the original systems were installed at a time when energy consumption was not a major consideration, so the use of a rotary pitot tube pump was common. Pitot tube pumps are generally recognized as being very inefficient, typically running below 45 to 60% mechanical efficiency even at its optimum operating point. A further disadvantage of pitot pumps is the high speeds required to achieve desired flow rates.

#### Problem

The pitot style centrifugal pump operates at high speeds (in this case, 5,000 rpm) to achieve needed flow rate. At these speeds and with contamination build-up, the rotor is prone to going out-of-balance, leading to early seal and bearing failure. Often, the pitot tube pump requires servicing at its manufacturer's site, resulting in a lengthy and expensive repair. This means the pump must be removed from the system and worked on offline or sent out for service, which can take six to eight weeks or longer.

#### Solution

The Cat Pumps model 6831 pump was selected for a rating of 28 gpm at 2,300 psi, achieved at a shaft speed of just 440 rpm. The Cat Pumps power unit system also resulted in a significant reduction of required footprint area. Cat Pumps offers a variety of pumps suitable for central cleaning systems, including models 67070 (65 gpm to 2,000 psi) and 67102 (100 gpm to 1,000 psi).

#### Benefits

- In year 1, the Cat Pumps system reduced energy costs from \$50.6K to \$14.8K
- Maintenance costs decreased from \$33.5K per year to \$3.1K.
- Payback for the Cat Pumps system upgrade was just 9.9 months.
- Given the reliable performance of the Cat Pumps product, the customer decided that a standby (backup) pump was not required.





#### **Application Specifications**

at Pumps Model 6831		
Pressure	Rated to 2,300 psi / 159 bar	
Flow	28 gpm / 106 lpm @ 440 rpm	
Fluid	Water	
Duty Cycle	Continuous Duty	
Drive	Belt	



## Summary of Case Study Results (See Page 1)

Decision Factor	Pitot Style Pump	Cat Pumps Triplex	Net Saving
Energy Cost (Year)	\$50.6K	\$14.8K	\$35.8K / 70%
Maintenance Cost (Year)	\$33.5K	\$3.1K	\$36.6K / 92%
Annual Operating Cost	\$84.1K	\$17.9K	\$66.2K/78%

### Pump Comparison

Pump/System Variable	Positive Displacement Triplex Pump	Pitot Tube Centrifugal Pump
Pump Type Description and Principle of Operation	Positive Displacement Reciprocating Plunger	Kinetic Rotordynamic Rotating Casing
Overall Pump Efficiency	85%	45% to 60%
Typical Power Source (Industrial Applications)	Electric Motor; Direct or belt drive with or without Variable Frequency Drive (VFD)	Electric Motor; Uses a gearbox speed increaser with or without VFD; Switched Reluctance Motor (SRM) option
RPM Range (Typical)	100 to 3,450 Note: pressure is independent of motor rpm.	Up to 10,000 Note: high speeds required to produce higher pressure.
Operating Pressure (Typical)	100 to 10,000 psi	25 to 3,000 psi
Flow Range (Typical)	1 to 240 gpm	1 to 800 gpm (or greater)
Horsepower Requirement (100 gpm at 1,000 psi)	68.6 hp (85% pump efficiency)	129.6 hp to 97.2 hp (45% to 60% pump efficiency)
Energy Consumption Example: 100 gpm @ 1,000; 60 hrs/wk; \$0.07 kWh	kWh/Month: 12,289 (42% to 88% less) Vearly Cost: \$10.3K	<b>45% Efficiency</b> kWh/Month: 23,212 (88% more) Yearly Cost: \$19.4K Additional cost of \$9.1K per pump
	Savings: \$4.3K to \$9.1K per pump	<b>60% Efficiency</b> kWh/Month: 17,409 (42% more) Yearly Cost: \$14.6K Additional cost of \$4.3K per pump
Pump Maintenance*	In-plant service; pumps can be serviced without disturbing plumbing or mounting removal; no special tools required	Often pump must be returned to manufacturer for servicing; cannot be serviced in-place

\*Cat Pumps standard service kit requires only (1) seal kit, (1) inlet valve kit, and (1) discharge valve kit. Based on industry feedback, Cat Pumps can be serviced for 1/8 of the cost compared to a pitot tube pump.



#### CAT PUMPS

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