PumpLines
Innovation...Technology...Leadership
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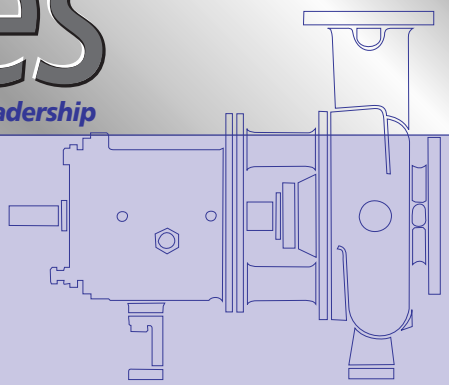

# Smart Technology for Pumps

## *Introducing PumpSmart™ The Future is NOW!*

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Over the past two years while doing research for a product that we were developing, we surveyed and interviewed dozens of customers regarding their vision, the future of industry, and what they will require from their vendor base in the future. Here's what you told us you wanted:

- Solutions, not just products.
- Increased versatility and functionality.
- Lower life cycle cost, not just initial cost.
- Quantitative measurement of results-reduced cost, higher efficiencies, increased productivity, payback, etc.

We've listened.


In November, in New York City, we will be introducing a new pumping system that we believe addresses these requirements, plus a few more. PumpSmart Process Systems, aggressively attacks all major portions of life cycle cost-initial capital cost, installation cost, operating cost and maintenance cost.

**PumpSmart™** is a pumping system that utilizes a standard centrifugal pump in conjunction with a "smart controller" and ITT Industries proprietary Pump Control Software*. The software, which resides on the controller microprocessor chip, is the "brains" of the system, allowing the pump to monitor and REACT to any system condition, As a result, PumpSmart...

- Will not cavitate
- Will not run dry
- Will not run against closed suction or discharge valves
- Eliminates flowmeters, starters, and flow control valves
- Significantly lowers life cycle cost
- Significantly increases MTBF

Let's take a quick look at the four major areas of life cycle cost and see how PumpSmart addresses each.

### Initial Capital Cost

Prior to shipment, PumpSmart is downloaded with all of the pump hydraulic information, the customer's specific control parameters (set points, alarms, shutoffs, trips, etc), and our Pump Control Software. The software allows the controller to continuously monitor both the system and pump conditions and will match the pump output to the exact system head required by the system. The automated flow control valve that was controlling the process is no longer required.

In addition, ITT Industries has developed a patented technique to measure flow internal to the pump casing. This eliminates the need for a flow measuring device, such as a mag meter. In addition, the PumpSmart controller has an integral starter, therefore, a separate starter is no longer required. PumpSmart also monitors and reacts to minimum flow conditions (slow down, shutoff, alarm, etc) so expensive recirculation lines and valves are not required.

Because PumpSmart integrates the functionality of this equipment, you can substantially decrease initial capital expenditures on a pumping system.

### Installation Costs

By getting rid of excess equipment in your system, you are also decreasing maintenance costs.

- Flow control valve-piping and wiring (power and communications lines) costs are avoided. Costs to run and maintain plant air can also be avoided for pneumatic valves.

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**patent pending*

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Goulds Pumps

ITT Industries
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# New Products...

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and the NPSHR for the pump will be higher, thus giving a smaller (or possibly negative) actual NPSH Margin. All pumping systems must be designed to have a positive margin throughout the full range of operation.

Optimum pump performance also requires that proper suction/inlet piping practices are followed to ensure a steady uniform flow to the pump suction at the requred suction head. Poor suction piping can result in separation, swirl and turbulence at the pump inlet, which decreases the NPSHA to the pump and causes added cavitation.

NPSHA Margins of two to five feet are normally required (above those shown in Table 1) to account for these uncertainties in the actual NPSHR and NPSHA values. This added margin requirement could be even greater depending upon the severity of the conditions, especially if the pump is operating in suction recirculation. If the application is critical, a factory NPSH test should be requested.

**Summary**

In summary, the following key points should be understood about cavitation in a centrifugal pump, NPSH Margin requirements, and how they are affected by the Suction Energy level of the pump:

- Cavitation exists at and substantially above the NPSHR of a pump.
- The Suction Energy level of a pump (as installed in a system) determines if the cavitation that frequently exists in a pump will cause noise, vibration and/or damage to the pump.
- High Suction Energy pumps are likely to be noisy with higher vibration and will possibly experience less than optimum pump life, if sufficient NPSH Margin is not provided.
- High Suction Energy pumps are more susceptible to problems from poor suction inlet piping, especially if they also operate in suction recirculation.
- Very High Suction Energy pumps will be noisy, will have high vibration and are likely to experience reduced pump life if sufficient NPSH Margin is not provided. Very High Suction Energy pumps are very susceptible to problems from poor suction inlet piping.

## *The Future is NOW! Smart Technology for Pumps*

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- Flowmeter-similar piping and wiring (power and communication lines) costs are avoided.
- Starter-The installation cost of the starter can be replaced by the cost to install PumpSmart.
- Recirculation line-costs associated with piping the line and installing valving is avoided.

**Operating Costs**

Since PumpSmart utilizes a unique variable frequency controller with our Pump Control Software, it will automatically match pump operation to the system head requirements. Energy consuming control valves are no longer required. Our most recent installation of PumpSmart is on a 100 horsepower cooling tower pump (Model 3196 XLT). The system was designed with two duplicate pumps and control valves. The pump running with the valve in operation is consuming 98 horsepower, while the PumpSmart System is consuming only 63 horsepower and is running over 300 RPM slower. At $0.60$/kW-hr, this represents over $12,000 in energy savings per year. And because PumpSmart continuously calculates savings (see Figure 1), the running total, in dollars, will constantly be in view in the DCS control room or on the PumpSmart keypad.

**Maintenance Costs**

Designing a pump that is heavier, with bigger bearings and a larger shaft does not automatically mean longer life. The primary components in pump failures are mechanical seals and anti-friction bearings. These are brought on not by general fatigue, but by excessive vibration, excessive loads and poor lubrication. These failures are caused primarily by the following upset conditions:

- Dry running-caused primarily by closed suction valves.
- Continuous operation below minimum flow.
- Cavitation due to insufficient NPSH available.
- Heat build-up and subsequent liquid vaporization due to a closed discharge valve.

PumpSmart detects all of these prior to the upset condition occurring and prevents the pump from operating during these transient conditions. The pump will react by stopping, slowing down, alarming or any combination of these actions, depending upon how you want PumpSmart to be programmed.
By utilizing the pump Reliability Factors seen earlier in this edition of Pumplines, we can quantitatively measure the anticipated increase in mean time between failure (MTBF) of PumpSmart as compared to a traditional pumping system. By running a pump at a slower speed, at or close to best efficiency and at a reduced impeller diameter, we will be able to calculate, with your help and input, the expected increase in MTBF for any given ANSI pump currently running in a process application.

PumpSmart is the next level of technology for our industry. This introduction to PumpSmart provides just a glimpse of the product's potential. Initially, this PumpSmart technology will be available on our ANSI models 3196 and 3298. Look for more information in the coming months.

*Figure 1*