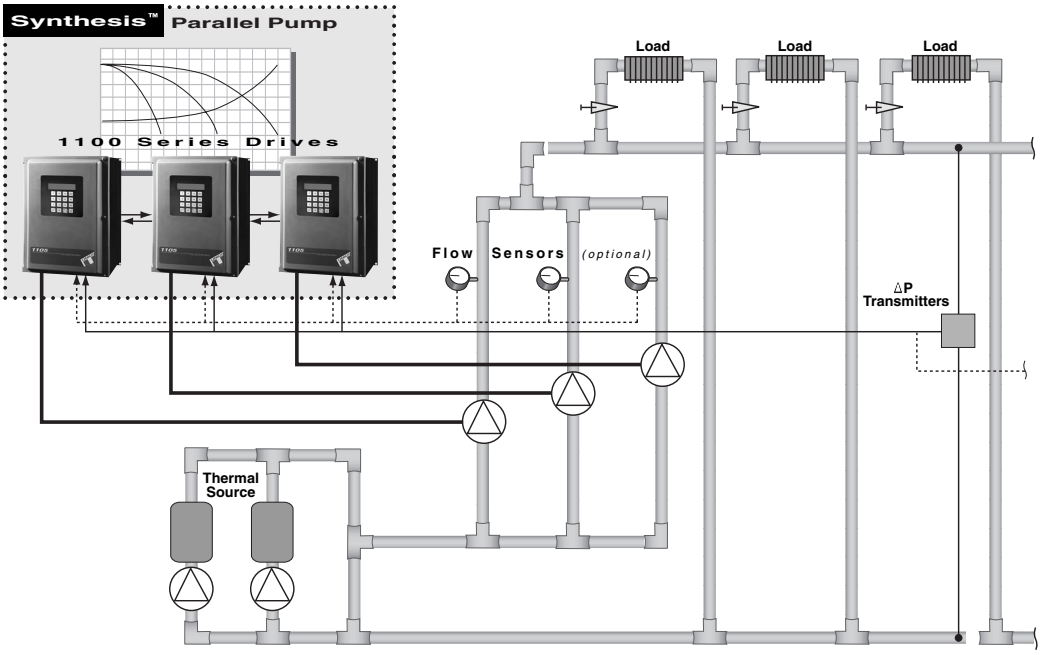
Synthesis™ Parallel Pump Control for Recirculating Fluid Systems



Overview

Synthesis™ Parallel Pump Control regulates the pressure of a recirculating fluid system using multiple pumps that operate in unison. The program seamlessly integrates motor-control, logic, and process-control functions into a single, compact solution. With its sophisticated pump-modeling technology, the controller leverages the computing power of its digital signal processor (DSP) to provide superior control, optimal efficiency, and comprehensive protection for the pumping system.

Features

Synchronization

The application can coordinate up to three pumps in parallel, each of which is controlled by a separate drive. One pump is the master of the system and responds to multizone differential pressure and flow feedback. The remaining slave pumps are synchronized with the master so that all pumps run at the same speed. As demand fluctuates within the system, the master stages the slaves as necessary to maintain constant pressure and maximize efficiency.

Pump Curve

UNICO's Pumping System Intelligence™ (PSI) technology mathematically models pump operation to achieve optimal performance, efficiency, and pump life. With just a few points from a pump's published performance curve, the drive can dynamically calculate key variables such as developed head, flow, and efficiency to determine the most efficient staging under all operating conditions. By knowing the pump curve, the controller inherently protects against end-of-curve, cavitation, deadheading, and other damaging conditions by avoiding them altogether.

Smart Staging

Unlike traditional controls, which turn pumps on and off based solely on speed, the master can stage the slave pumps based upon speed, flow, power, efficiency, or a combination of these conditions. Intelligent staging eliminates needless cycling and provides smooth, efficient performance.

Control Redundancy

All drives operate from identical control software and receive the same inputs. Each drive continually monitors the status of the others. If the master should fail, one of the slaves will assume its role so that operation continues without interruption.

Multiple Zone Control

For distributed systems, up to four pressure zones may be defined, each with its own setpoint. The control always identifies and caters to the zone with the greatest demand.

Smooth Flow

The system transitions smoothly between pressure setpoints to eliminate the abrupt pressure changes that can cause overshoot, water hammer, and cavitation.

Features *(continued)*

Programmed Alternation
The lead/lag relationship between pumps can be switched automatically based upon the length of time each has been running. This distributes pump and motor wear evenly to maximize reliability and prolong the life of the system.

Instinctive Tuning
An advanced tuning feature automatically calculates the optimal closed-loop pressure gains by identifying the pressure and flow characteristics of the system. This eliminates the trial and error associated with tuning traditional systems and ensures stable performance without troublesome pressure overshoot or hunting.

Automatic Bypass Control
The controller can monitor and automatically direct an electrical bypass circuit for each drive in the system to sustain flow in the event of a drive failure. The conditions under which the bypass is initiated are programmable. While in bypass mode, the drive continues to display system status, respond to remote start/stop inputs, and actively monitor the system for overpressure conditions.

Pump Status Monitor
The drive is equipped with a backlit liquid crystal display that continuously shows pump pressure, flow, speed, current, and power as well as the running and fault status of each pump in the system.

Fault Tolerant
The program is capable of automatically recovering from many types of fault conditions to ensure continuous operation in unattended installations. If a nuisance fault or power interruption occurs, the system will, depending upon user-selectable settings, attempt to clear the fault and restart automatically.

NPSH Monitor
The control can continuously monitor suction pressure and automatically adjust to ensure that the pump operates with adequate net positive suction head (NPSH) over its entire flow range. This prevents cavitation that can damage the pumping system.

Communications
Several industry-standard serial protocols are available for communicating with a building automation system (BAS), including Modbus RTU, ANSI, N2, LonWorks, and BACnet. An input-selectable analog output is also provided for sending specific values to the BAS. A SCADA interface is optionally available for remote operation.

Inputs & Outputs

The following inputs and outputs are provided for interfacing the pump controller with the pumping system:

Inputs
- local start
- remote start
- bypass 1 contactor
- bypass 2 contactor
- bypass 3 contactor
- pump 1 pressure switch
- pump 2 pressure switch
- pump 3 pressure switch
- partner A OK
- partner B OK
- slave enable
- communication bit 1
- communication bit 2
- communication bit 3

Analog Inputs
- pump 1 flow
- pump 2 flow
- pump 3 flow
- zone 1 pressure
- zone 2 pressure
- zone 3 pressure
- zone 4 pressure
- slave speed
- suction pressure

Outputs
- pump 1 bypass
- pump 2 bypass
- pump 3 bypass
- drive OK
- pump 2 start
- pump 3 start
- alarm

Analog Output
- analog communication

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1000.21(001) 7/05