Application

In many pumping applications, two pumps are installed. Two pumps are necessary in critical applications, such as municipal water systems, in order to keep the water flowing when one pump breaks down or has to be taken offline for maintenance purposes. In other installations, a second pump may have to be brought online to assist an operating pump at times when conditions are changing more rapidly than normal. Although there are a number of different methods of employing pumps, generally users try to equalize run time between the pumps by alternating the primary pump duty from one to the other. This application note will consider five pump alternating control schemes, one in which one pump is on at all times, two in which one pump is turned on based upon switch inputs, and two in which one or two pumps are turned on based upon float switch inputs (level control).

Overview

Descriptions of the five control schemes:

1. One pump is on at all times. Alternation from pump A to pump B and back occurs at a specific time of day, such as midnight.
2. One pump is on for the duration of an event. Pump A turns on when a switch closes, and remains on until the switch opens. The next time the switch closes, pump B turns on.
3. Simplex level control. Pump A turns on when two switches have closed, and turns off when both switches have opened. Pump B handles the next switch cycle. The switches are float switches, which are set at specific levels in the vessel.
4. Lead/lag, first on-first off (FOFO). With the level at the Off switch level, all pumps are off. When the level reaches the Lead set point, pump A turns on. If the level continues to drop (filling) or rise (emptying) to the Lag set point, pump B turns on. Once the level reaches the Lead set point, pump A turns off, leaving pump B on. Pump B turns off when the Off level is reached. The next time the level returns to the Off set point, pump A turns on.
5. Lead/lag, sequential on– simultaneous off (SOSO). Pumps turn on in the same order as in scheme 4. However, once both pumps are on, until the level returns to the Off set point. If pump A was the lead pump in the latest pump cycle, pump B will be the lead pump in the next pump cycle.

For control scheme 1, the EZ configuration programs associated with this document are written to respond to switch closures to initiate pump turn-on. The float switches used in control schemes 3, 4 and 5 must have contacts which close when:

1. The level is above the switch in emptying installations.
2. The level is below the switch in filling installations.
3. Initiating pump turn on.

The last two control schemes are duplex level control, which require three float switches, designated as Off, Lead and Lag.

Two of the EZ inputs are used to disable the pumps. There are separate Bypass A and Bypass B input terminals that turn off pump A or pump B, respectively, for as long as they are connected to hot (dc powered controls), or plus (dc powered controls). The connection may be made through a switch.

The EZ relay also provides an additional function necessary in pump applications for maintenance purposes. It has built-in pump run timers to keep track of and display the hours each pump has run. Press the "^" (up arrow) pushbutton on the EZ front panel to view the run timers. Press the "_" (down arrow) pushbutton to return to the status screen. These times are presettable, and will trigger an alarm output from the EZ when a preset has been reached. The run time presets in configuration programs "Alternating 2 pumps.e60," and "Duplex pump lead/lag.e60" (see links to these programs on Page 2) are set to two hours for initial checkout purposes. Once installation is complete and checked out, set run timers O1 and O2 to appropriate preset values for pumps A and B respectively.

Detailed Procedure

Hardware

EZ512-xx-Rx (Any EZ512 relay with display and relay output. The display is necessary to view run times)

Wiring

For control schemes 1 – 3.

<table>
<thead>
<tr>
<th>EZ INPUTS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>Switch input for control scheme 2. Switch input for control scheme 1, if used for control scheme 1.</td>
</tr>
<tr>
<td>I2</td>
<td>Switch input for control scheme 3. Not used for control schemes 1 and 2.</td>
</tr>
<tr>
<td>I3</td>
<td>Not used.</td>
</tr>
<tr>
<td>I4</td>
<td>Bypass pump A. I4 will turn off, and hold off pump A when this switch is closed. Pump B, if used, will handle all pumping during this period, unless it is also bypassed.</td>
</tr>
<tr>
<td>I5</td>
<td>Bypass pump B. I5 will turn off, and hold off pump B when this switch is closed. Pump A will handle all pumping during this period, unless it is also bypassed.</td>
</tr>
<tr>
<td>I6</td>
<td>Control scheme select 1. Hardware input to hot or plus (dc powered controls), or leave open (off) per the table below to select control scheme 1, or 2, or 3.</td>
</tr>
<tr>
<td>I7</td>
<td>Control scheme select 2. Hardware input to hot or plus (dc powered controls), or leave open (off) per the table below to select control scheme 1, or 2, or 3.</td>
</tr>
<tr>
<td>I8</td>
<td>Run timers reset. Momentary switch activation will reset any run timer that has reached its preset value. Holding I8 closed for three seconds will reset both run timers, regardless of their preset values.</td>
</tr>
</tbody>
</table>

For control schemes 4 and 5.

I7 and I8 are left open (off) for these control schemes.
Commissioning

Once installation and checkout is completed, use EZSOFT to modify the following values to meet the specific requirements of the installation.

Control Scheme 1

Default time for pump alternation is midnight. If this needs to be changed, set the alternation time in H01 parameters channel A on time. Then set the off time for one minute later. H01 is in line 24 of the ladder diagram of “Alternating 2 pumps.e60.”

Control Schemes 1, 2 and 3

Default run time set points are 2 hours. To change these values in “Alternating 2 pumps.e60”, go to ladder diagram lines 34 (O01 for pump A), and 35 (O02 for pump B). Set the run presets in the set point field under the Parameters tab.

Control Schemes 4 and 5

Default run time set points are 2 hours. To change these values in “Duplex pump lead-lag.e60.” go to ladder diagram lines 33 (O01 for pump A), and 34 (O02 for pump B). Set the run presets in the set point field under the Parameters tab.

All Control Schemes

Password protect as appropriate.

Supporting Documentation

In the event additional help is needed, please contact the Technical Resource Center at 1-877-ETN-CARE (386-2273).

EZ INPUTS DESCRIPTION

I1 Off switch input.
I2 Lead switch input.
I3 Lag switch input.
I4 Bypass pump A. I4 will turn off, and hold off pump A, when this switch is closed. Pump B, if used, will handle all pumping during this period, unless it is also bypassed.
I5 Bypass pump B. I5 will turn off, and hold off pump B, when this switch is closed. Pump A w ill handle all pumping during this period, unless it is also bypassed.
I6 Control scheme select. Hardwire to hot or plus to select control scheme 4 (FOFO), or leave open to select control scheme 5 (SOFO).
I7 Not used
I8 Run timer(s) reset. Momentary switch activation will reset any run timer that has reached its preset value. Holding I8 closed for three seconds will reset both run timers, regardless of their present values.

EZ OUTPUTS DESCRIPTION

Q1 Pump A
Q2 Pump B
Q3 Not used
Q4 Maintenance alarm (run timers)

CONTROL SCHEME SELECTION (INPUTS 16 AND 17)

<table>
<thead>
<tr>
<th>SCHEME 1</th>
<th>SCHEME 2</th>
<th>SCHEME 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>17 Off</td>
<td>Off</td>
<td>Off</td>
</tr>
</tbody>
</table>

Programming

Using EZSOFT programming software:

1. Download "Alternating 2 pumps.e60" for control schemes 1, 2 and 3.
2. Download "Duplex pump lead-lag.e60" for control schemes 4 and 5.

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