CONTROL – FLOAT OPTIONS

Demand-Based Pump Control, the demand-controlled disposal of wastewater, is the traditional cost effective method of moving wastewater up a hill to a dispersal site or to a unit process. The volume of one cycle is based on the pump chamber size and the drawdown float settings. Demand based controls do not prevent excess flows from being transferred, what goes into the chamber goes out.

Timer-Based Flow Equalization Pump Control, the timer-controlled disposal of wastewater, increases field reliability and system life expectancy, while maximizing the utilization of available acreage. Peak flow events, such as church services or school functions, are measured out to increase drainfield and pump lives. In addition, many pretreatment systems also operate more efficiently with balanced regular dosing.

Two and Three Float Operation Options

The Two Float option may be used for demand or timer based control, simplex or duplex control operation. The drawdown is based on the tether of the “Off/Enable” low level switch. In the event of a pump fail the water would continue to rise until the alarm is activated. If this configuration were used for duplex operation, the alarm float should turn on the second pump and activate and latch in the alarm. The off float would turn off the pump. If this configuration is used for a timer control, the flow equalization volume is set by the distance between the “Off/Enable” low level switch and the “Alarm” switch.
Combo Redundant Off & Timer Enable: The “Short Cycle” Problem

Some controls are designed with a “Combo Redundant Off & Timer Enable” float switch. If this “Combo” float is provided, it will “short cycle” the final dose during each pumping sequence, which completely misses the purpose of the “Timer Enable” design for complete dose control. For example, consider a design having a morning flow of 130 gallons. If the control is designed to discharge 60 gallons per cycle, two 60 gallon doses will be followed by one 10 gallon dose when the system shuts down. For those systems depending on equal distribution or flow monitoring, the last short cycle dose is a problem. The “Combo Redundant Off & Timer Enable” float switch should not be specified.

The Three Float option may be used for demand- or timer-based control, simplex or duplex control operation. The drawdown is based on the distance between of the “Off” low level switch and the “On” second level switch. In the event a pump fails, the water would continue to rise until the alarm is activated. If this configuration is used for duplex operation, the alarm float should turn on the second pump and activate and latch in the alarm. The off float would turn off the pump. If this configuration is used for a timer control the flow equalization volume is set by the distance between the “On” level switch and the “Alarm” switch.

The Four Float w/ Override option is used for timer based control, simplex or duplex control operation. The drawdown is based on the distance between of the “Off” low level switch and the “On” second level switch. The timer control flow equalization volume is set by the distance between the “enable” level switch and the “override” switch. In the event of a pump failure, the water would continue to rise until the alarm is activated. If this configuration is used for duplex operation, the “override” float should turn on the second pump and activate and latch in the alarm. The override float would turn off the pump. Override control converts the operation from timer-based to demand based, therefore the excess water use alarm is lost.
Duplex timer control

There is an additional alarm indication requirement with duplex timer controls. Typically timer controls are set up to dose the design flow from a facility. In the event one pump fails and the facility generates less than half of the design flow, a high level alarm will not indicate a pump failure. This makes the duplex system no better than a simplex control.

To solve this problem controls should have a current sensor relay that initiates an alarm condition when one of the pump does not use any electricity when it is supposed to be in operation. The alarm should latch in until the owner silences the alarm with a switch.

The Four Float w/peak enable option is used for timer based control, simplex or duplex control operation. The drawdown is based on the distance between of the “Off” low level switch and the “enable” switch. The timer control flow equalization volume is set by the distance between the “enable” level switch and the “alarm” switch. In the event of a pump fail the water would continue to rise until the alarm is activated. This configuration may be used for duplex operation. The “peak” float should increase the dosing frequency to allow for design flow to be dosed instead of average flow. Peak flow control enables the operation from timer based to dose maximum design flow only, therefore you maintain the excess water use alarming.

The peak float should be located half way between the enable and alarm float elevation to provide some floa equalization for both average and peak flows.

TYPICAL TIMER BASED FOUR FLOAT OPERATION

The pump control panel is equipped with four float switches to control the timed doses to be discharged. The four float switches, "Redundant Off", "Standard Dose Enable", Peak Dose Enable" (optional), and "High Level" function as follows:

Redundant Off

The water level must be high enough to overcome the "Redundant Off" (first & bottom) float in order for the pump to be permitted to run. This float should be redundant to the timer to prevent excess run times that could run the pump dry.

Standard Dose Enable (Average Flow Setting)

When the water level rises high enough to activate the "Standard Dose Enable" (second from bottom) float and the rest time expires, the lead pump will activate. The pump will continue to run for the length of time as adjusted on the pump run timer and then shut off. The pump will remain off until the rest time again elapses after which the pump will again activate (as long as the "Standard Dose Enable" float is still up) and will run until the pump run timer finishes timing. This process will repeat until the water level drops below the "Standard Dose Enable" float and the pump run timer has timed out. The pump will continue to run after the "Standard Dose Enable" float de-activates until the timer times out and turns the pump off to prevent short cycles.

Peak Dose Enable (Design Flow Setting)

The control system may be equipped with a "Peak Dose Enable" circuit to manage peak flows and excess water use. If the rising water level activates the "Peak Dose Enable" (third) float, the "Pump - Off - Pump & Alarm" switch is set to "Pump", and the peak time delay has elapsed, the lead pump will be dosed. When the peak circuit has been deactivated the “standard” pumping cycle will resume.
If the rising water level activates the "Peak Dose Enable" (third) float and the "Pump - Off - Pump & Alarm" switch is set to "Pump & Alarm", and the peak time delay has elapsed the lead pump will be dosed and the alarm will be activated. The audio portion of the alarm may be silenced by pressing the Test-Normal-Silence switch to the silence position. When the "Peak Dose Enable" float has returned to the down position the alarm will be deactivated and the normal pumping cycle will resume. The alarm is an auto reset alarm (it goes off when the float goes down) thus an intermittent alarm may indicate excess water use.

**High Level**

If the water level rises enough to overcome the "High Level" (fourth) float, the audiovisual alarm will activate. The audio portion of the alarm may be silenced by pressing the Test-Normal-Silence switch (located on the outside of the control panel) to the silence position. The alarm circuit may auto reset when the "High Level" float returns to its normal (down) position.

**Latching vs Auto Reset Alarms**

Auto Reset Alarms will turn the alarm off when the float goes down. Wide angle floats are typically specified with this type of alarm control in order to eliminate the "wave action pulsing" of the alarm. In a typical simplex control an auto reset alarm is perfectly ok. For duplex controls however, latching alarms are necessary.

Latching alarms are necessary for duplex pump controllers to notify the owner that a pump problem has occurred. The purpose of a duplex control is for one pump to continue to operate after the first pump fails. The proceeding high level alarm is the indicator of a problem but if the “lag” pump clears the water from the chamber while the owner is not in hearing distance, without a locked in alarm (latching) the owner will not know a problem has occurred.

**TIME OF DAY OPERATION**

Time of day Simplex and Duplex equalization control panels are designed to equally distribute flow throughout the day during predetermined time frames, utilizing either a 24-hour Time-of-Day or 7-day 24-hour clock, coupled with a repeat cycle timer or demand dose control.

**COMBINATION CONTROL**

The “COMBINATION CONTROL” panel operates multiple separate but integrated pump stations such as the timed dosing of a pretreatment unit and a final lift pump to a dispersal site. Any combination of controls can be provided in either simplex or duplex configurations.

**TANK SIZING**

Keep in mind when sizing tanks and setting float depths that VDH regulations require a minimum quarter day’s storage above the high water alarm and 1-inch minimum clearance below the inlet invert. Also, “enhanced flow” doses are based on the length of percolation piping. In addition, VDH recommends as a “best practice” a 3-inch clearance between the pump “on” float and “alarm” float to prevent alarm “chatter”.