~~METHOD FOR CONTROLLING A PUMP~~METHOD FOR AUTOMATIC MUTUAL ALTERNATION BETWEEN PUMPS

Technical Field of the Invention

The present invention relates generally to a method for controlling a pump. In particular, the present invention relates to a method for automatic mutual alternation between an arbitrary number of pumps by the control of an individual pump, which makes use of a start condition for a state change from an inactive state of the pump into an active state of the pump to be performed, as well as makes use of a stop condition for a state change from said active state into said inactive state to be performed.

Background of the Invention and Prior Art

Traditional fundamental control of a pump station comprising one or more pumps is based on a pump being activated when a start condition is satisfied and is switched off when a stop condition is satisfied. Usually, there is a level instrument arrangement that detects when a pump start liquid level in the sump of the pump station is reached as well as when a pump stop liquid level is reached. According to law and custom, pump stations are almost always equipped with at least two pumps arranged in parallel, where a secondary pump just is a security in case the primary pump breaks or if the inflow to the pump station for the moment is unusually high.

Some manufacturers/users only use the primary pump in normal pumping, but this gives a large wear of the primary pump at the same time as the disposal of faultless function of the secondary pump is uncertain when the same is indeed needed. On the contrary, it is more common to alternate between the primary pump and the secondary pump when emptying of the sump is required.

A simple way of alternation, in view of control, includes that the pumps are active every second time, another way of alternation is to let them be active equally

long as measured over a certain time, a third way to alternate the activation of the pumps is to let the pumps be active, for instance, every second day. However, all of said ways of alternation require that the control unit of the pump station, or the respective control unit of the pumps, has knowledge about the number of pumps that are arranged in the pump station and/or that communication takes place between the pumps.

One way to try to avoid communication between the pumps is shown in US 7,195,462, wherein each one of several pumps of one and the same pump station has at least two predefined pump start liquid levels, and wherein the pump that was active most recently assumes the higher pump start liquid level and the other pumps keep the lower pump start liquid level, with the purpose of one of the most recently inactive pumps instead of the most recently active pump being to be activated the next time the liquid level in the sump rises sufficiently high. However, this publication shows that each pump has to be aware of how many other pumps being arranged in the sump.

Common to the previously known solutions is that, at least as regards waste water applications, a considerable tidal mark of grease and dirt will be built up at the fixed pump start liquid level, which is not desirable.

Brief Description of the Objects of the Invention

Embodiments of t~~T~~he present invention seek to obviate~~aims at obviating~~ the above-mentioned disadvantages and failings of previously known methods and at providing an improved method for controlling a pump. Embodiments~~A primary object~~ of the invention seek~~is~~ to provide an improved method of the initially defined type, which may result~~s~~ in that alternation of the active pump will take place without the need of neither direct nor indirect communication between the pumps.

EmbodimentsAnother object of the present invention also seekis to provide a method that results in that the individual pump does not need to know if or how many other pumps that are installed in the sump.

EmbodimentsAnother object of the present invention also seekis to provide a method that results in that building up of a tidal mark of grease and dirt on the inside of the sump may beis prevented.

Brief Description of the Features of the Invention

According to an aspect of the invention, there is provided a method for automatic mutual alternation between an arbitrary number of pumps by the control of each individual pump, which makes use of a start condition for a state change from an inactive state of the pump into an active state of the pump to be performed, as well as makes use of a stop condition for a state change from said active state into said inactive state to be performedat least the primary object is achieved by the initially defined method, whereinwhich is characterized in that the methodsame comprises, for the control of each individual pump, a sub method (Find start condition) that comprises the step of, after a predetermined stage, arbitrarily changing the start condition of the individual pump within predetermined limits regardless of the number of other pumps.

Accordingly, embodiments of the present invention areis based on the understanding that, by, for several independent pumps, randomly/arbitrarily changing the respective start condition of the pumps, an alternation of the activation of the pumps will take place, since they over time randomly will obtain start conditions corresponding to the lowest pump start liquid level in an alternating way.

Preferred embodiments of the present invention are furthermore defined in the depending claims.

In a preferred embodiment, the step of arbitrarily changing the start condition of the pump comprises the step of determining a pump start liquid level h_{start}, which preferably is changed within an interval, which is limited by and which comprises a lower pump start liquid level $h_{start,min}$ and an upper pump start liquid level $h_{start,max}$. This embodiment is preferred in those pump stations that comprise so-called dynamic level instruments that dynamically can determine the liquid level in the sump.