brain block ...

QUESTION 8 *(Courtesy: L Enrico Bossart, Product Management, WIKA Alexander Wiegand SE & Co. KG)*

What is a float switch and how does it actually work?

Answer

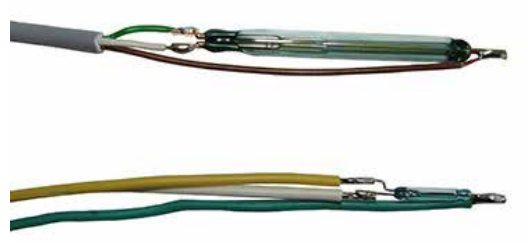
Float switches are simple, universally applicable and exceptionally reliable. It is not a coincidence that, today, float switches still represent the most frequently used principle for level monitoring. But how does a float switch actually work?

Float switches, in a simple mechanical form, have already been in use for the control of water flows in mills and fields for centuries and today still represent the most frequently used technology. A hollow body (float), due to its low density and buoyancy, lifts or drops with the rising and, respectively, falling level of the liquid. If one uses this movement via a mechanical lever, e.g. as a simple flap control for an irrigation channel, one has implemented a mechanical float switch.

Modern float switches, of course, are used for switching an electric circuit and feature a clearly more sophisticated design. In its simplest form, a float switch consists of a hollow float body with a built-in magnet, a guide tube to guide the float, adjusting collars to limit the travel of the float on the tube and a reed contact located on its inside (see Figure A).

How does the float switch function?

Reed contacts (see Figure B) feature contact leaves within the hermetically sealed glass body, which move together or apart from each other when a magnetic field is applied. In the case of a reed contact with a normally open function, on applying a magnetic field, the leaves are brought into contact. When the contact between the leaves is made, a current can flow via the closed leaves and a switching signal will be detected.



In the case of a normally closed switching function, the contact or circuit is interrupted on applying a magnetic field. If one selects a change-over contact, the glass capsule will contain three contact leaves, with which, at all times, a normally closed and a normally open contact are simultaneously made in every operating state.

Since the contact leaves are under a mechanical preload, a magnetic field must be applied in order that the contact leaves close or open in order to generate the desired switching signal (monostability). The adjusting collars fitted by the manufacturer serve as a limitation for the float body in the correct position, to ensure / maintain the desired switching signal on reaching the defined filling level.

How does one specify a float switch?

The following parameters should be defined:

- *Number of switch contacts / switching outputs*
- *Position and function of each switching output*
- *Guide tube length*
- *Electrical connection (e.g. PVC cable outlet)*
- *Process connection*
- *Material (stainless steel, plastic, ...)*

QUESTION 7 *(Courtesy: Anton Jacobsz, Managing Director of Networks Unlimited)*

Do you know that storage time travel in your network is a fact?

Answer

Travelling between time and space has fascinated humans since possibly the beginning of time. Popular novels and films – think of the Back to the Future trilogy - often focus on the theme of time travel as it resonates with a wide audience. Scientific theories also centre on it, with, for instance, Einstein's 1905 theory of relativity showing that time passes at different rates for people who are moving relative to one another – although the effect only becomes large when you get close to the speed of light.

It's pretty cool stuff. "But did you know that storage time travel in your network is a fact?" asks Anton Jacobsz, managing director at value-added distributor, Networks Unlimited.

He is referring in particular to Tintri SyncVM, which accelerates application development with efficient copy data management, at a VM-level, in minutes, regardless of the VM size and with no loss of performance history.

What this means is that users can move backwards and forwards through snapshots of VMs, restore individual files, and update hundreds of 'child' VMs from a single master VM in seconds.

"This innovation is allowing application development teams to work at the speed of light – in particular it accelerates the team's development and test cycles," comments Jacobsz.

This is especially beneficial as application development teams today experience a slow and inefficient process when trying to refresh their VM-based environments with new production data, as it requires copying data on the entire LUN, identifying target VMs within the snapshots, and reconfiguring existing VMs to use new data sets.

"There are five gears, so to say, inherent to Tintri SyncVM," continues Jacobsz. These are:

- *Time-travel between point-in-time versions of a VM for instant and efficient restores;*
- *Preserve snapshot and performance history of the VM when going back and forth in time;*
- *Recover VMs in five clicks via the UI or automate via PowerShell and REST APIs;*
- *Simplify data protection and recovery process with no additional storage; and*
- *File-level restore provides a new level of granularity and flexibility if only one or a few files need to be restored.*

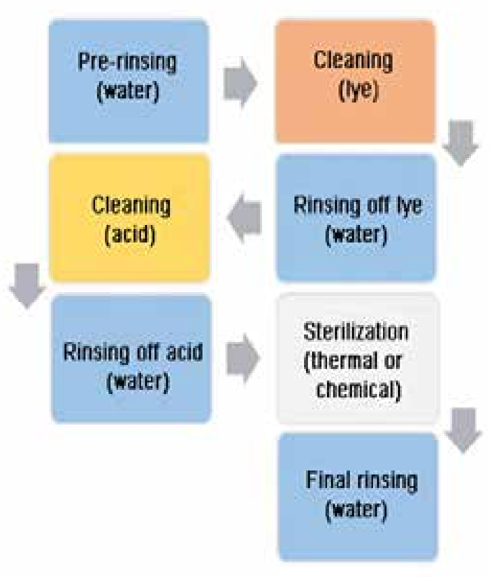
"Imagine as a development team no longer scheduling weekends for planning updates to develop, test and production. Days become mere minutes thanks to Tintri SyncVM, showing that storage works brilliantly at the VM level...in addition it's pretty geeky and reminiscent of Back to the Future's Marty McFly, so it's right up Networks Unlimited's alley," concludes Jacobsz.

Enquiries: Email nigel.wynne@nu.co.za

QUESTION 6 *(Courtesy: Jochen Gries, WIKA)*

Are CIP and SIP the same thing – what are the differences?

Answer



Up until the Fifties, sealed systems such as pipes or process equipment in technical process plant had to be dismantled and cleaned by hand. This was invariably a time-consuming process. Especially in industrial sectors such as pharmaceuticals, food and beverage, where frequent and regular cleaning was required, manual cleaning of a system consumed an enormous amount of time.

CIP – Clean-In-Place

These industrial sectors benefited greatly from the arrival of CIP processes. This is because a cleaning method had been created that is still in use today, one which enables the internal surfaces of sealed systems to be cleaned without the need for disassembly (or only to a limited extent). For the most part, the CIP process is an entirely automatic one, to comply with defined process times and parameters. The cleaning operation is performed in a series of defined steps, as the flow diagram illustrates. Depending on the application, cleaning temperatures may be as high as 90°C. A turbulent flow is also required, with flow rates usually between 1,5 and 2,1 m/s, to remove all impurities. Speeds above or below these limits generally fail to deliver a satisfactory cleaning result.

SIP – Sterilization-In-Place

The SIP process is an extended form of the CIP process, one that adds a sterilisation step, and it is usually operated from the same installation. The sterilisation of hygiene-critical processes takes place at the end of the actual CIP process. This ensures that any micro-organisms still active in the system are killed off with hot water or with saturated pure steam at high temperatures (typically 140°C). The effectiveness of this can be further enhanced by the addition of chemical disinfectants. Of course, WIKA offers appropriate measurement technology for CIP and SIP for a comprehensive range of measurement parameters.

Enquiries: WIKA Instruments
Tel. +27 (0) 11 621 0000
Email: greg.rusznyak@wika.com
Visit www.wika.co.za

QUESTION 5 *(Courtesy: Rob Melaia, Marthinusen & Coutts (a division of ACTOM (Pty) Ltd*

Does only direct current (dc) flow in a dc motor or generator?

Answer

No, and in fact the fundamental operation of a dc motor relies on alternating current (ac) in the armature.

The field winding (normally situated on the stationary part of the machine) has dc in its windings, but the armature only has ac – created by the commutator.

The commutator is effectively a mechanical switch that reverses the current direction continuously so that it alternates polarity at regular intervals (fractions of a second).

So the current in the armature windings of a dc machine is approximately a square/ rectangular wave ac wave - more correctly a trapezoidal ac wave.

So in effect, the dc motor does not function at all without the ac in its armature - with no dc at all flowing in the armature.

QUESTION 4 *(Courtesy: Rob Melaia, Marthinusen & Coutts (a division of ACTOM (Pty) Ltd*

What are the preferred types of rotating electrical machines for Battery Electric Vehicles (BEVs) and why are they specifically termed 'electrical machines' and not 'motors'?

Answer

Squirrel Cage Induction Machines (SCIMs), Permanent Magnet Synchronous Machines (PMSMs), and Wound (Field) Rotor Synchronous Machines (WRSMs or WFSMs)

- *Tesla Motors, and others, use Squirrel Cage Induction Machines for their simplicity, ruggedness, high-speed capabilty, and low cost*
- *Chevy Bolt, Nissan Leaf, and many others use Permanent Magnet Synchronous Machines for their high torque, high power to mass ratio, high power density - despite their higher cost and inability to control the rotor field excitation. It is worth emphasising here that so-called 'Brushless dc machines' are not dc machines at all; they are Permanent Magnet Synchronous Machines with built-in power electronics that allows them to behave like dc machines as far as their ultimate connection terminals are concerned*
- *Renault uniquely uses Wound Rotor Field Synchronous Machines for their controllable rotor field excitation, the flexibility that comes with variable field excitation, and their generally lower cost than PMSMs - despite the additional maintenance implications of sliprings and brushes*
- *Peugeot-Citroen have used a brushed traditional dc machine for their Berlingo BEV, but use of traditional brushed dc machines is very rare - almost certainly due to their relative high cost and maintenance requirement because of brushes and commutators*
- *Synchronous Reluctance Machines are also very rare, with Holden making use of these in some of their BEVs. These units are termed 'machines' because they function equally as motors and generators in BEV's - in order to regenerate braking energy. Calling them only motors is therefore incorrect. Worth mentioning related to BEV motors are Axial Flux Permanent Magnet Machines: These machines are very expensive but have high power densities. Not yet used in BEVs, they have however been applied in prototype form to aircraft, with Siemens proving a 260 kW 2 400 r/min prototype motor weighing just over 50 kgs. Imagine that in a BEV!*

QUESTION 3 *(Courtesy: Glyn Craig, Techlyn)*

An audio amplifier in an office block drives the audio reticulation system signal at 70,7 V. Each loudspeaker is connected via a transformer.1 Why are the loudspeakers simply not connected in parallel?2 The 70,7 V seems a strange value. Can you offer an explanation?

Answer

A. *Each loudspeaker will offer an impedance to the drive signal of 4 to 15 Ohms. Several speakers in parallel, will present an intolerably mall load which will overload the current amplifier's current drive ability. In addition, reasonably sized cable will have a resistance which will result in large voltage loss to the speakers furthest from the amplifier.*

B. *A 70,7 Vac signal will have a peak voltage of:*
70,7 X 1,414 (the square root of 2 which is 100 V
This means that an amplifier with +100 V and -100 V supply can function without a transformer

QUESTION 2 *(Courtesy Rob Melaia, Marthinusen & Coutts (a division of ACTOM (Pty) Ltd)*

What do the abbreviations 'kW', 'kWe' and 'kWm' mean and relate to, in terms of power in generators, and why do we use these terms?

Answer

Everyone should know that 'kW' is the abbreviation for 'kilowatt' which is one thousand watts of power, where 'W' is the abbreviation for 'Watt'.

'kWe' and 'kWm' are less well known - even to the more experienced people in this field.
In generators - one needs to discriminate between the electrical power produced by the generator and the mechanical power produced by the prime mover (diesel drive engine or turbine etc.) .

The term 'kWe' is used to specifically refer to electrical power produced by the electrical generator.
The term 'kWm' is used to specifically refer to the mechanical power produced by the prime mover or transferred into the diesel generator so that it can convert most of this (there are some losses) into electrical power (kWe).

The terms can of course be extended to 'We', 'MWe', 'Wm', and 'MWm'; in the same way as we use 'W', 'MW' etc. - not just 'kW'.

Although not commonly done - these terms can be extended to motors to discriminate between the electrical input power to a motor - which would be defined by 'kWe' - and mechanical shaft power delivered by the motor to the mechanical load (such as a pump, fan, mill etc.) - which would be defined by 'kWm'. This may seem either superfluous or obvious to many, but so often even specialists confuse motor power terminology between electrical input power or mechanical output power. The simple addition of an 'e' or 'm' to the power abbreviation will prevent any ambiguity without having to use the full terminology every time. For example - a motor power is rated at 10 kWm and 10,7 kWe - meaning that (at full load) it produces 10 kW of mechanical power using 10,7 kW of electrical input power. One automatically knows the efficiency from these two figures? 10/10,7 = 93,45%.

QUESTION 1 *(Courtesy: Glyn Craig of Techlyn)*

In a practical examination a student is presented with an unknown voltage source and an oscilloscope. The student is asked to estimate the RMS (Root Mean Square) voltage and the frequency. A sine wave of 30 Volts peak-to-peak and a period of 16,6 milliseconds is measured.

What are the correct conclusions?

Answer

The peak-to-peak voltage of an ac (alternative current) signal is twice the peak value. (Half the sine wave is positive and the other half is negative).

The RMS value for a sine wave is the peak voltage divided by the square root of 2. (1,414)
The answer is therefore:

$V_{rms} = Vp_{pk}/2 \times 1{,}414$
$= 30/(2 \times 1{,}414)$
$= 10{,}6$ V (approximately a third of $V_{pk\text{-}pk}$)

The frequency is:

f = 1/t Where f is in Hertz (Hz)
t is in seconds

f = 1/16. X 10-3
= 60,2 Hz