Application Spotlight
Liquid Level Monitoring in Medical Equipment and Lab Automation Instruments

The trend towards more sophisticated medical equipment and lab automation instruments, which are expected to handle increasingly complex tasks, requires the most proven, repeatable, and reliable sensing technology available. The issues of potential end-product contamination, as well as safety regulations such as exposure of personnel to potential biohazards or toxic agents, must be carefully considered. All of these factors make it especially difficult for machine/instrument builders to acquire, in a noninvasive manner, essential real-time information about the machine or instrument’s state. Balluff offers SmartLevel™ capacitive sensors, which are a reliable approach to addressing these challenges in medical equipment and lab automation instruments.

Balluff’s Solution
- Designed to comply with strict medical standard IEC 60601-1-2 (2001)
- Prevents contamination in liquid level monitoring using a noninvasive approach
- Eliminates false triggering on foam and residue build-up

On-Board Monitoring on Heart-Lung By-Pass Instruments

In a heart-lung by-pass machine, blood is circulated through an oxygenation canister where blood levels are constantly monitored. It is of critical interest to the cardiovascular perfusionist to understand precisely what levels of blood are present in the oxygenator, to ensure proper instrument function, and to guarantee optimum peripheral oxygen saturation in the patient undergoing heart surgery. Monitoring blood in general can be challenging, as its naturally thick viscosity can cause residue accumulation on the inner wall of an oxygenator -- a common point of false alarms with ordinary sensing devices. Balluff SmartLevel capacitive sensors are designed to provide optimum performance without nuisance false alarms in the presence of difficult monitoring parameters like foaming, froth, and residue build-up, which are typically found in substances like highly conductive, electrolytic blood and blood products. Balluff SmartLevel sensors comply with all the stringent medical standards and, as an added bonus, they can detect target material through vessel walls and bulkheads up to 12 mm thick. They are self-adjusting, so there is no need to worry whether or not the sensor has been properly adjusted or tuned to compensate for the vessel or bulkhead wall thickness. Technician time and maintenance time is therefore reduced with SmartLevel sensors.

Process Fluid/Reagent Monitoring

Lab Automation equipment uses different reagents for sample processing and instrument cleaning throughout the process. The application offers three distinct challenges to the design engineer. First, the bottles are interchangeable with unpredictable changing liquid compositions. Second, cross contamination between reagents has to be minimized, which prevents the use of a measurement solution that is in direct contact with the reagents. Third, the sensing solution has to be robust enough for inexperienced lab technician and maintenance personnel. Balluff SmartLevel™ capacitive sensors solve each of the challenges described simultaneously. The sensor in this example is hidden inside of a plastic panel, for streamlined instrument aesthetics. The unique nature of capacitive sensors allows for sensing liquids noninvasively through two separate plastic walls – the instrument wall and plastic reagent container. Additionally, the self-adjusting nature of the SmartLevel sensor enables automatic sensor adjustment for bottle change-out and reagent changes without cross-contamination.

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