Get Insight into the SepaBean Machine with Engineer: Liquid Level Sensor and Its Application

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In modern liquid chromatography instrument, a large number of parameter detectors are generally used for real-time monitoring of instrument operating parameters during experiments. For example, leakage sensor which is used for monitoring of possible leakage inside the instrument, pressure sensor which is used for monitoring of the back pressure at a specific point in system pipelines, bubble sensor which is used for monitoring whether there are bubbles in the system pipelines, etc. In this post, we will introduce the liquid level sensor used in SepaBean machine series, including the working principle and how to correctly set it.

Everyone must have encountered these situations during the daily experiment. When running a separation for a sample by a Flash chromatography system, operator forgets to add enough solvent into the solvent bottle before a run has started, resulting air entering the system pipelines during the running process and causing system pump idling, which is harmful to the system pump. Another issue is letting some air enter the column and thus causing the resin packed in column to lose its wetting state, which is an especially serious problem for reversed phase columns. In addition, the waste liquid in the waste bottle is not emptied in time, resulting overflow of waste liquid and pollution of the laboratory environment. In severe cases, it might even lead to irreparable consequences such as injury to people due to electric leakage. Therefore, a modern chromatography system with built-in feature of liquid level monitoring in real time can avoid the above situations.

Next, we will introduce the working principle of the liquid level sensor built into the SepaBean machine. The liquid level sensor used in the instrument is a type of hydrostatic level sensor, which is a submersible pressure transmitter that has a pressure diaphragm where the inner side of the diaphragm is vented to atmospheric pressure through a vent tube in the cable and the outer side is in contact with the liquid and measuring the static pressure of the liquid column above the transmitter. This static pressure is basically caused by the weight of the fluid on top of the transmitter and is used to calculate the level of the liquid. When the liquid level sensor is put into a certain depth in the measured liquid, the equation for calculating the pressure on the liquid facing side of the sensor is as follows:

$$P = \rho \cdot g \cdot H + P_0$$

Where P is the pressure on the liquid facing side of the sensor, ρ is the density of measured liquid, g is the local gravity acceleration constant, P0 is the atmospheric pressure on the liquid surface, H is the depth of the sensor in the measured liquid. When the liquid level sensor is working, the pressure on the liquid facing side of the sensor P is measured. Since ρ, g, and P0 are constants in the above equation, the depth of the sensor in the measured liquid H can be calculated accordingly.

In the following part, we will introduce how to set the parameters of the liquid level sensors in SepaBean machine via SepaBean App. Please follow the below steps.

Figure 1. The main screen of SepaBean App.

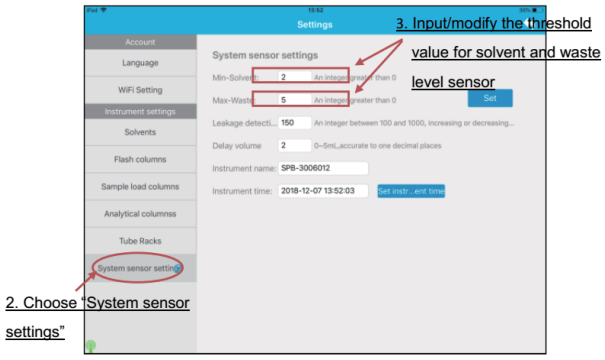

Figure 2. The system sensor settings page of SepaBean App.

1.Setting the liquid level sensor

The warning of liquid level sensor in SepaBean App can be divided into the following two cases:

1.1In case when the solvent is in shortage:

When the liquid level in the solvent bottle is lower than 2 times the preset value for alarm, the instrument will indicate that "the solvent is running out". As a warning, the instrument will continue with the current running but user should refill the solvent bottles.

1.2In case when the solvent is used up:

When the liquid level in the solvent bottle is lower than the preset value for alarm, the instrument will prompt "the liquid level in the solvent bottle is low". The instrument will stop the current running. When the user have finished refill the solvent bottles, the current running can be continued.

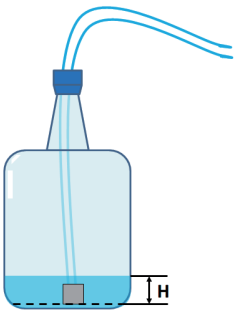

Figure 3: Schematic diagram of solvent level monitoring

As shown in the Figure 3, when the liquid level height H (cm) in the bottle is lower than the preset minimum value for alarm, the system will stop running. If the liquid level height H (cm) is less than 2 times the preset value (2H), the user will be notified with an early warning message.

Suggestion: When using 4 L solvent bottles, it is recommended to set the minimum value for alarm to 2. When using other solvent bottles, the minimum value for alarm should be set according to specific bottles used.

2.Setting the waste level sensor

"Waste bottle overflow" alarm: when the liquid level in the waste bottle is higher than the preset maximum value for alarm, the instrument will stop running and the current running can be continued only if the waste bottle is emptied. The schematic diagram of waste level monitoring is shown in Figure 4.

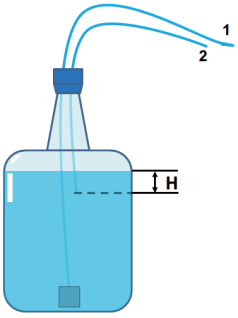

Figure 4: Schematic diagram of waste level monitoring

As shown in Figure 4, air tubing with tag No. 2 is used for the liquid level monitoring. When the waste liquid is collected during the run, the height of waste liquid in the bottle will continuously rise. In case the height difference H (cm) between the level of waste and the end of air tubing with tag No. 2 reaches the preset value for alarm, the system will stop running until the waste bottle is emptied by the user.

Suggestion: It is recommended to keep at least 10 cm or more distance between the end of air tubing with tag No. 2 and the waste bottle mouth. It is recommended to use a liquid container with a capacity of 4 L or more as the waste bottle.

3.Exception handling advice

When the liquid level sensor is not working properly, the preset values in the system sensor settings page should be checked. If there is no problem with the preset values, then the tubing connectors for liquid level monitoring should be checked (as shown in Figure 5). If problem still exists after all the checking, please call your local service for further advice.

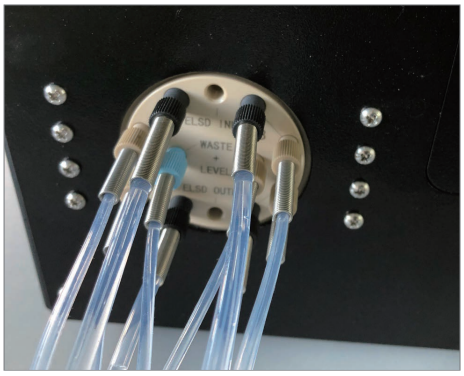

Figure 5: The tubing connectors for liquid level monitoring.

When the liquid level sensor is not working and the user wish to bypass this level monitoring feature, set the value of Min-Solvent or Max-Waste to 0 and the liquid level sensor will be manually turned off. The liquid level of solvent bottle or waste bottle should be checked in time by the user to prevent any accidents from happening.

For further information on detailed specifications of SepaBean machine, or the ordering information on SepaFlash series flash cartridges, please visit our website: www.santaitech.com/index/.

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