

## Field Application of a Level Transmitter Calibration in a FTL

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### 1. Introduction

The FTL(Fuel Test Loop) is the facility in HANARO that is designed in order to test a nuclear fuel at a very high temperature and pressure with the same condition as the primary system of a nuclear power plant. There are many process values in the FTL and particularly very sensitive values that should be controlled precisely need to be measured by an accurate method.

Though the calibration of the instruments, it was found that the measurement at the field test was in discord with the bench test value. This is because there were unexpected conditions due to a field status. In the case of a few level transmitters installed, several offset are also found to some degree. Through many trials, we can find the cause of this offset. This problem is in the reference line position and detail content about this is described lower. And applied calibration method is also introduced.

### 2. Methods and Results

#### 2.1 Problem in the method to measure the level

The way to measure a liquid level in a FTL is to use the differential pressure. This is the pressure gap generated from high pressure line and low pressure line of a LT(level transmitter). The pressure of a low pressure line is commonly equal to an atmosphere pressure. The welding line of tank that represents the level value "0" is located at same horizontal position with a transmitter reference line.

Because a high pressure line is filled with the liquid and a low pressure line is filled with an air, an air compressed fluid cause the uncertainty of a level measurement. For this reason, a treatment is needed to cancel the error described above. Figure 1 shows that a level transmitter and the tank in the equipment room that are examples in this paper.

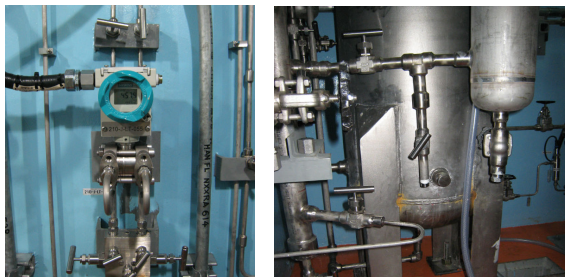


Figure 1. Level Transmitter and Degasifier Tank

#### 2.2 The method to cancel this offset

The first step of cancelling offset is to fill the low pressure line with water. Fortunately it is verified that the low pressure line is coincident horizontally with the high pressure line. The second step is to install the level stand pipe fitted with the tank welding line and to fill the tank with water fully in this pipe. The discrepancy between a reference line and a tank welding line are made an actual value was in discord with design values.

The next step is to vent all the line and to set the value of LT in this point to zero pressure. An insufficient vent causes noise effect. To set value zero is achieved by following the manual of manufacturing company. Finally a field loop test is conducted to verify the reliability by Hart communicator for loop test.

In the dry leg type, the evaporation in a low pressure line hardly happens, the wet leg type need a condenser to prevent a condensation from a low pressure line as shown Figure 2.

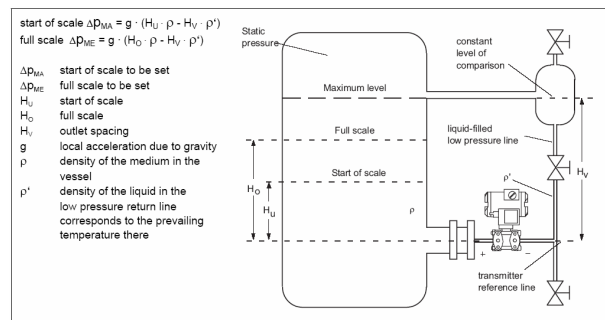


Figure 2. The Structure of Level measurement type

The level measurement in a FTL adopts the wet leg type and it is most important to compensate the offsets due to the elevation gap between the transmitter reference line and welding line as referred above. The detailed method about this is introduced in the followings.

#### 2.3 Steps to zero calibration

The value of LT without water of the tank was 3.5~7mmWG when it measured first time. The offset and the fluctuation were found and these problems resulted from the facts described above. First, it takes several steps to vent the air perfectly in the reference line and also high and low pressure line. First of all, it should be preceded to verify that line stand pipe(LSP) is full of water.

This work removes the air in all the pressure lines. The air may cause the actual pressure value to reduce. In particular a condensation pot verifies whether the sufficient circulating works that serve water and vent air

are conducted. If this procedure is perfectly performed, the drain valve (blow out valve in Figure 3) of the level transmitter is opened to vent the air in a low pressure line. Soon after this treatment, the shutoff valves to the level stand pipe at a tank below should be closed.

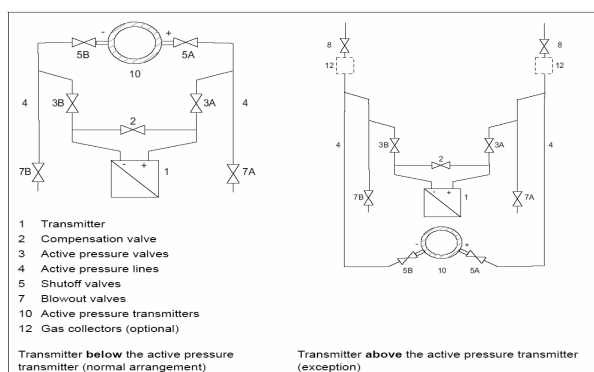


Figure 3. The level transmitter and valve position

At the second step the active valve of high pressure line connected to the level transmitter from LSP should be closed and open the drain valve of LSP. It makes an internal pressure of the LSP vanished. The active valve of a high pressure line is opened and transmitter is manipulated to set the value of this point to the zero. This calibration should be followed by the manual procedures according to method adjusting the zero and span. Finally, through the loop test we could verify that the value is saturated at 0.01mmWG when the tank level is "0" and this value is considered as a satisfied result.

### 3. Conclusion

The actual calibration of the level transmitter in the FTL was conducted successfully by removing the offset by the difference of the reference pressure line and field pressure line. It can be confirmed that the suggested method is easily and effectively applied to the field.

### REFERENCES

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