Electronic Information Technology Processing System for Intelligent Metal Tube Float Flow Relying on Mixed Normal Distribution Parameters

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Abstract. The sensor of the intelligent metal tube float flow is a method of installing the flow directly by bundling the sensor directly on the outer surface of the pipe under the test. It solves the problem that other flows must be disconnected from the pipe and stopped when they are installed, Is the basic installation method of the flow meter, has the characteristics of irrelevant to the pipe diameter, the simple installation, no need to stop production, no pressure loss and so on. In this paper, a Gaussian normal distribution is used to analyze the fault phenomenon and cause and a set of methods for diagnosing and troubleshooting flow faults are summarized.

Keywords: Mixed Normal Distribution, Intelligent Flow, Electronic Information

1. Introduction
The intelligent metal tube float flow meter is currently a more accurate and widely used measurement tool and its performance is significantly better than other types of flow meters. However, in the process of installation and use, it is necessary to operate strictly in accordance with technical regulations, regularly check, the test and maintain to ensure safe and stable operation and measurement accuracy, so it needs to be studied and optimized by mathematical methods.

2. Mixed normal distribution analysis
In probability and statistics, if we have a random variable set containing multiple random variables and then generate a new random variable based on the set, the distribution of the random variable is called a mixed distribution. Specifically, first, a random variable is randomly selected from the set according to a given probability and then the value of the random variable is realized. The random variables in the set can be random real numbers or random vectors (the dimensions of each vector are
the same). In this case, the mixed distribution is a multivariate distribution. If the random variables in the set are continuous, the generated random variables will also be continuous [1]. The probability density function is sometimes called mixed density. Cumulative distribution functions (and probability density functions, if any) can be expressed as convex combinations of other distribution functions and density functions. The single distributions are combined to form a mixed distribution. We call these single distributions mixed components and the probability (or weight) corresponding to each component is called mixed weight[2]. The number of components in a mixed distribution is usually limited, although in some cases the number of components may be infinite. A distinction needs to be made between the two cases. In the first case, the distribution function or density of a random variable is the sum of a set of components (for example, a mixed distribution); in the second case, the value of a random variable is the sum of two or more basic random variables. Use a convolution operation to give the distribution. For example, the sum of joint normal distribution random variables with different mean values still satisfies the normal distribution. However, with two normal distributions with different mean values, as long as the two means are sufficiently far apart, the distribution will have two peaks, indicating that this distribution is fundamentally different from the normal distribution. Through this distribution, we can observe and identify abnormal data to determine whether it is faulty. The normal distribution mode is shown in the figure below.

![Mixed normal distribution analysis](image)

**Figure 1.** Mixed normal distribution analysis

3. Application Analysis of Intelligent Metal Tube Float flow

3.1. Flow verification

To ensure the quality of the intelligent metal tube float flow, before the start of the verification work, you should carefully observe the operating status of the on-site intelligent metal tube float flow. By observing the rotation of the meter head and the sound of the rotor, the flow's mechanical Check whether there is a fault in some parts; at the same time, carefully check whether the connection parts of each component are secure and whether they are connected with shielded wires and check and sort out all kinds of situations that affect the verification result due to the quality of the flow[3]. When selecting a flow meter, a flow meter that matches the actual measurement flow rate should be selected. Under normal circumstances, in order to meet the normal production and verification requirements of the site, two transfer flows are installed on the field of the oilfield. During the installation, flows of the
same accuracy level with different measurement ranges are required to ensure the accuracy in the range of 30% -80%.

The verification of intelligent metal tube float flows requires online verification methods, working conditions such as temperature and pressure, which have a greater impact on the verification errors of volumetric flows. Among them, the change of the temperature to the flow error is that for every degree Celsius change in temperature, the error of the flow changes 0.07 percentage point; and for every 1 MPa change in working pressure, the error change of the flow changes 0.0008 percentage point. Therefore, when calibrating the smart metal tube float flow, high precision thermometers and pressure gauges are required. Among them, precision pressure gauges are used to replace ordinary pressure gauges and standard division mercury thermometers are used to replace ordinary alcohol thermometers. Pressure and temperature are at the flow rate[4]. It is not allowed to increase arbitrarily during the verification process, otherwise the verification personnel may refuse to carry out the verification work.

3.2. Flow meter failure causes and solutions

The intelligent metal tube float flow meter will cause some failures during actual use, including inaccurate zero adjustment instructions, unstable measurement processes, large fluctuations in measured values and lagging values in the numerical display.

(1) Problems during installation. It is necessary to meet the technical requirements for the installation of the flow meter before it can be installed horizontally. Therefore, the installation technician needs to install it properly according to the actual situation, otherwise it will cause the failure of the intelligent metal tube float flow meter.

(2) Problems of electromagnetic interference. Due to the structure of the intelligent metal tube float flow meter, the electrical signal measured by the sensor is very weak, so surrounding equipment and instruments will generate electromagnetic interference to the measured value of the sensor. Therefore, in order to avoid electromagnetic interference from other facilities, the intelligent metal tube float flow needs to be grounded. Secondly, the intelligent metal tube float flow needs to maintain a scientific distance from the motor and power cables to ensure that the electromagnetic field around the flow will not be affected by other equipment. This can reduce the probability of failure of the smart metal tube float flow.

(3) The quality of the intelligent metal tube float. The smart metal tube float is the main body of measurement, so its quality standard will directly affect the measurement results, including the conductivity of the smart metal tube float, pH value, bubble content, particle size, scale and other factors will affect the measurement results Large fluctuations, so we must ensure the quality of smart metal tube floats and use high-quality smart metal tube floats as energy sources[5]. This can reduce the flow failure to a certain extent. Such problems will produce skewed distribution as shown in the figure below.
(4) Electrode polarization. During the use of the smart metal tube float flow, solid particles in the smart metal tube float will cause friction and collision with the sensing electrode through the flow. These problems will not only cause the measured value of the flow to fluctuate greatly without a period. We can choose electrodes with relatively small volume and surface area, which can reduce the probability of collision; or use electrodes with smooth surfaces, which can reduce the collision force and reduce the amplitude of the measured value. Second, it is best to check the condition of the electrode periodically to ensure that the electrode is intact[6]. By ensuring the quality of the electrode, the frequency of failure of the intelligent metal tube float flow is reduced.

4. Electronic flow based on mixed normal distribution parameters

4.1. Leakage inspection based on mixed normal distribution parameters
If there is a change in the amount of oil during the ball passing of a test point, the number of pulses recorded by the volume tube will also change and the data interval of the test point will be inaccurate and change. The data in the verification process will have an impact. Similarly, during the flow verification process, the increase of flow rate will also affect the change of the flow’s display value. Therefore, in order to obtain accurate flow coefficients, it is necessary to ensure that the entire verification and measurement system is not leaky and that all the oil that passes through the entire verification process enters the flow verification system.

4.2. Pressure correction based on mixed normal distribution parameters
One of the measures in flow measurement is the correction of pressure coefficient. This shows that in the operation of the flow meter, the measured oil will be affected by the pressure difference and the pressure it measures is not standard atmospheric pressure. When the saturated vapor pressure of the liquid is greater than the atmospheric pressure, the measured oil will inevitably affect the verification pressure. The oil volume value measured below has an influence, so the pressure must be corrected. It can be seen that when calibrating the flow, the pressure at the outlet of the flow and the pressure difference at the inlet and outlet of the volume tube have a direct impact on the cumulative value of the flow being tested and thus the flow coefficient. Therefore, it is necessary to perform pressure
correction to correct the working pressure under standard conditions. Both actual and theoretical proofs indicate that the larger the average pressure at the inlet and outlet of the volume tube, the larger the flow coefficient and vice versa. The greater the pressure at the flow outlet, the smaller the flow coefficient and vice versa. When the outlet pressure of the flow is greater than the average pressure at the inlet and outlet of the volume tube, the flow coefficient decreases; otherwise, it increases.

5. Conclusion
Based on different principles, the adjustment of the mixed normal distribution parameter can make its measurement accurate, and it also makes it the preferred tool for measuring the flow rate in the chemical industry. In actual production, the intelligent metal tube float flow meter will have various problems and we need to do the following: First, based on the actual situation, establish a reasonable maintenance system and check the ultrasonic transducer for half a year Use software inspection for half a year. The second is to reserve an appropriate amount of spare parts and configuration, which can be replaced and updated in case of problems. The third is that the technical staff needs to continuously strengthen their learning, improve their skills and solve problems. Only in this way can the impact caused by the failure of the smart metal tube float flow be minimized and the operating costs of the enterprise can be reduced.

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