

Research on Simulating Rumen System Automatic Control and PH Value Detection

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Abstract. Because of ruminants with rumen this unique digestive organ, and utilization of roughage has a strong procession, so how to make the feed utilization, that is the first to solve the problem with this design. The subject of this item is in Jilin agricultural university college of animal science of the artificial rumen continuous culture system in vitro based on the design of the electric control part, in order to make the artificial rumen continuous culture in vitro system of automation degree and precision. His system can complete simulation of ruminant stomach mixing function, makes the artificial detection in the process of digestion of feed digestion and absorption of nutrients, such as for future breeding method and feed nutrition to provide important basis thesis.

Introduction

In the design of analog device were introduced in this paper, the existence of dynamic performance indicators, in order to make users more accurate and convenient to use numerical simulation device reads the PH sensor, then with a good HMI interface. So in the design we need to introduce a good hardware, and transparent to the configuration screen. So in this design, we use the embedded touch-screen of omron and its configuration software, make the device in the process of simulation, the user can be more detailed and clear observed simulating rumen and its parameters, the index of the whole simulation system and dynamic data. After the construction of the HMI man-machine interface, making the fermentation tank PH value by PLC, in the configuration screen to display, and it has the function of data report and report to the police, if match with the printer, the dynamic parameter can be a variety of ways such as images or digital preserved, convenient to users because of oversight and ignores the dynamic parameters, call the previous report, make the experiment more accurate finished. [1], The Paper Mainly Purpose and Significance:

- (1) Realization of multi point measurement of pH value in rumen system;
- (2) Sensor measurement and error theory and data analysis;
- (3) The design of the configuration project and the production of WINCE system;
- (4) Sensor signal acquisition and data analysis. Image processing technology development present situation [2]

The Working Principle of This System

The design by the main control module of PLC and 12 fermentation tank connected sensors communicate software used by the human machine interface of embedded system wince and configuration software real-time display the pH value of the 12 in the fermentation tank, the main hardware circuit using EPLAN design, software combined with bubble method and mean filtering method to improve the precision processing method.

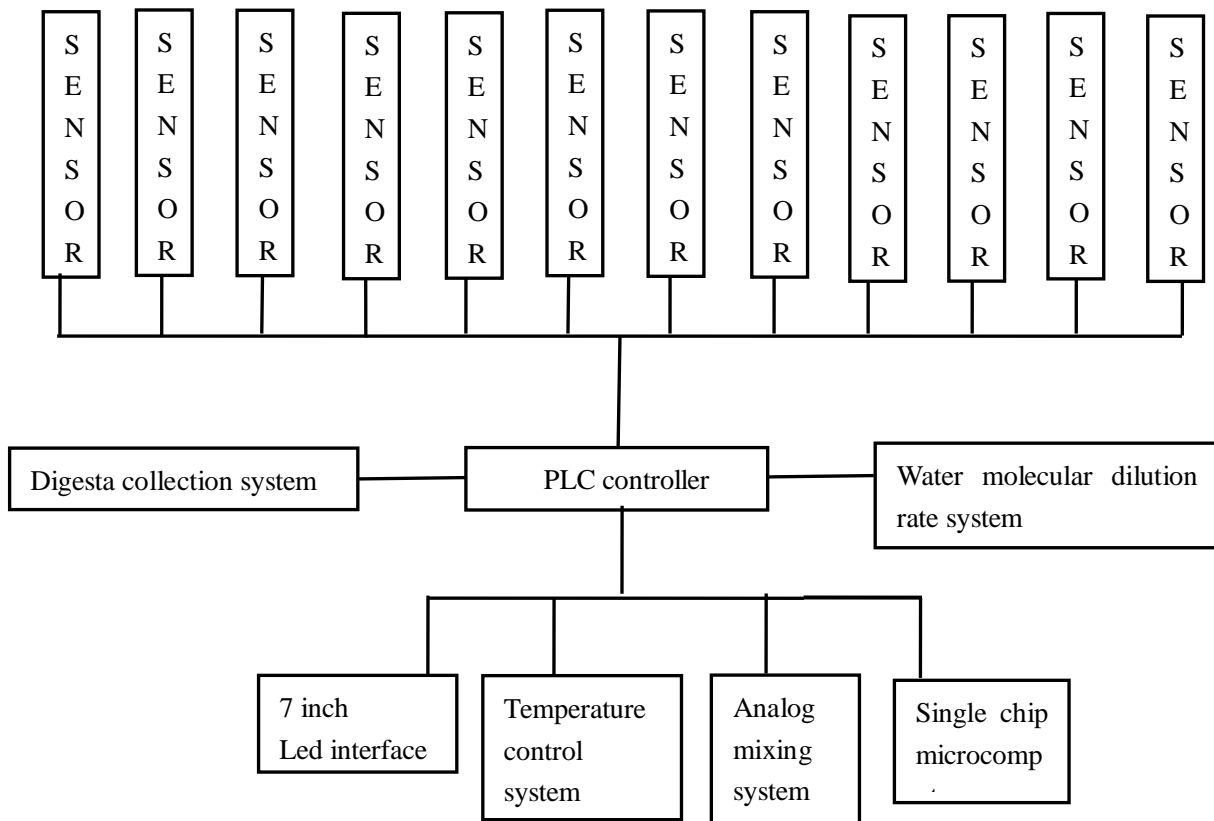


Figure 1. The method of PLC design method

The Introduction of S7-200 PLC

S7--200 series CPU221--226 each have two types of relay and transistor CPU, to match the different power supply voltage and output voltage control.

- (1) s7 --200PLC digital input / output point
- (2) the machine analog input / output point
- (3) the way of communication
- (4) memory EEPROM module
- (5) PLC power supply battery module

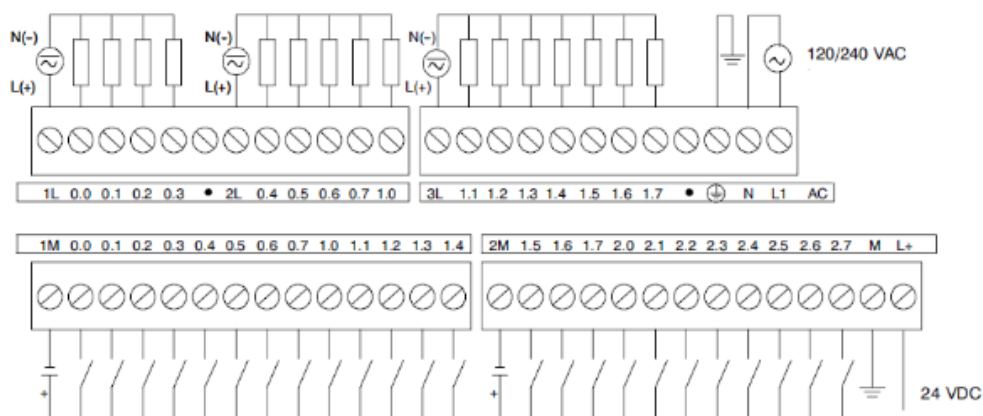


Figure 2. The method of PLC connection

The EM 231 I/O Port Description

Module EM231 upper, a total of 12 terminals, each of the three points for a group (such as re, a +, a)

can be used as a road analog input channel, a total of four groups, for voltage signal using only two terminals, the current signal need three terminal, wherein R should be on the + side short circuit for unused input channel should be shorted. The lower part of the left M module and L+ ends should access DC24V power, the right to calibrate the potentiometer and DIP switch, terminal wiring diagram as follows[4]:

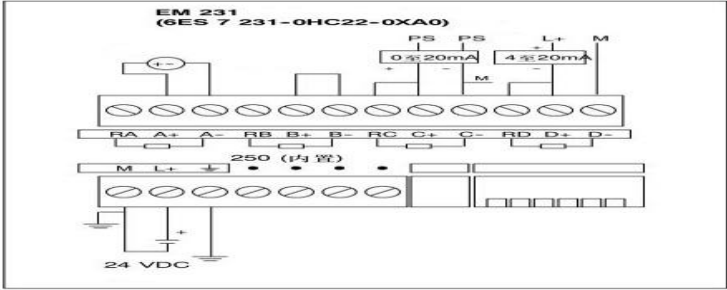


Figure 3. The method of EM 231 connection

The Introduction of NTZ - Designer NT Link

The basic function key of the software is "button, indicator light, graphics library [5]" and so on. It also has the function of "history curve, trend curve, real time alarm" and so on. Of course, each software has its own unique features, Designer - NT Link NTZ software with a variety of alarm settings, and there are online simulation functions, and provides a variety of macro functions, to facilitate the user's programming [6]. The communication interface diagram as shown in Fig. 4.

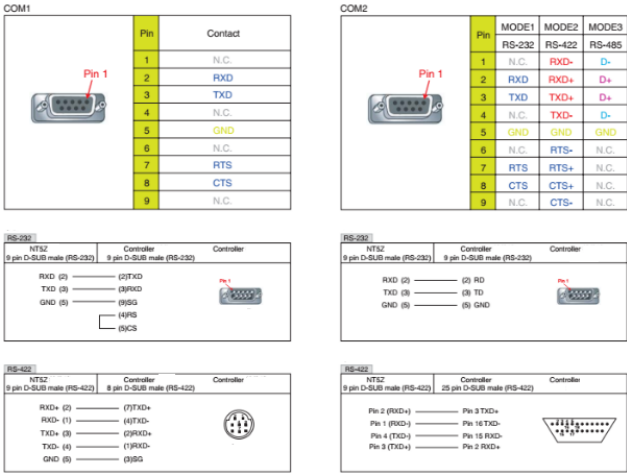


Figure 4. NTZ - Designer connection

Analysis of Experimental Results

From the chart we can see our power by civil 220V AC power supply, leads to the ends are known as l, n two power lines, the zero line and FireWire and after knife switch to ensure can at any time for manual power outages [7]. The second step is to access the fuse, if below circuit overload or short circuit, the fuse can be automatically fuse, if conditional can join can automatically fix the fuse, so you can better the protection circuit [8], and connected to the air switch can not only control the manual off section of the circuit, but also can fuse and the circuit to double insurance and dual closed off. And then access the 220V AC to 24V DC switching power supply, the circuit of the transformer and rectifier[9]. The four lines are respectively connected with an air switch to ensure that each line can be controlled to ensure the safety of the equipment [10]

Figure 5-7. Zoom in two times-four times.

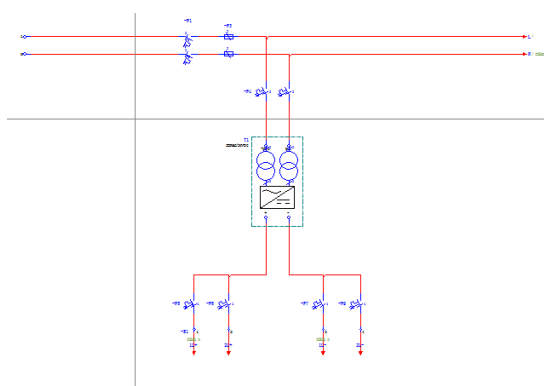


Figure 5. Primary circuit

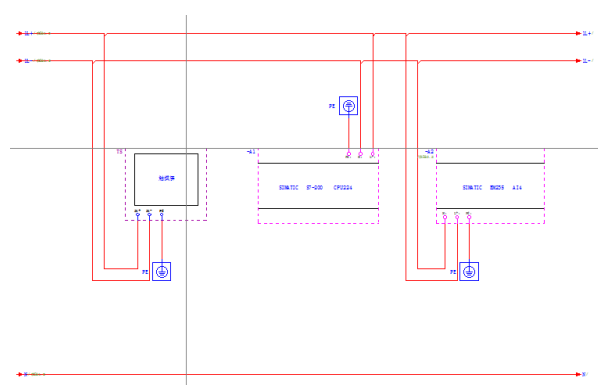


Figure 6. Power circuit

Acknowledgements

The 199th [2016] No.of JI Jiao Ke He Zi
The 221th [2015] No.of JI Nong Yuan He Zi

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