A Process Tracking System of Quality Parameters for Dual Channel Forming Machine

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Abstract. By collecting various factors, such as process parameters of dual channel real-time equipment value, filter rod physical detection index, filter rod appearance detection index, using the principle and method of data analysis model, design of double channel equipment quality parameter tracking system. According to the time stamp shows the measured results, and through the control system to adjust the relevant parameters of the equipment, and then achieve the fine control of the filter rod process.

Introduction

Filter rod is one of the main factors affecting the sensory quality and tar stability of cigarette product, and its quality is related to many factors, such as raw materials, production equipment, molding process parameters and so on.

Double channel forming machine is the production equipment of filter rod, is a kind of high speed and super high speed rolling and assembling equipment for molding equipment, the production process quality parameters not only directly affect the quality of filter rod, also influence on the sensory quality of cigarette tar products and stability.

Characteristics and Process Quality of Dual Channel Forming Machine

Although most of the dual channel forming equipment has high automatic production and process control capability, its process control and electric control system are very complex. The equipment in electric control system design of a lot of process quality control system according to the process parameters, set the corresponding control standards in the production process, the unqualified products are eliminated, in order to ensure the production of filter rod with quality standards.

In the process of quality tracking and analysis of some process parameters, can only use artificial way, regular manual recording data over the past, parameter data combined with the external detection system of measurement data and artificial records were compared with analysis of molding machine, which may exist problems in the production process. The artificial way of collecting data, which may lead to wrong in mind and the omission etc., and lead to that data availability was low, and even lead to the final results of the analysis were completely wrong, unable to complete.

System Composition

A system for tracking machine process quality parameters of double channel, the system consists of dual channel forming machine, process quality acquisition equipment, application server, database server, real-time historical relational database server, site operation terminal and PROFINET network.
Process quality collection equipment and the double channel forming machine control network are connected through PROFINET Ethernet, according to data interface protocol, automatic acquisition time to read Oracle database of two channel forming machine implementation process quality parameters.

The application server is used to connect and process quality parameters when the data acquisition equipment, process quality parameters acquisition equipment acquisition equipment to produce the real-time, automatically data which sent to the application server; the application server based on the filter technology quality standard relational database server storage, monitoring and anomaly judgment of real-time data; and the application server will receive the real-time the original data and the data values stored directly into real-time database server.

The relational database server is used to store the filter process quality standards, and for the storage of process quality parameters and statistical data analysis model based on the analysis of large data. When the process quality parameter acquisition equipment collects the data generated by the equipment in real time, it is sent to the application server automatically. According to the quality standard of filter rod stored in the relational database server, the application server monitors the real time data and makes the abnormal judgment, if exceeded, it reports to production personnel alarm, fields operation terminal display, for which the production of inspection and timely adjustment, prevent the generation of production quality problems.

The history of real-time database server, used to process quality parameters of storing the collected raw data and change data according to the time stamp value, storage each process quality parameters change the values of stored data, avoid the mistakes and omission of data, effectively reproduce the production process.

On site operation terminal, which is used to monitor and analyze the results of the application server, to guide the production staff to adjust the quality of the equipment, and ensure the production of the filter rod to meet the quality control standard of the process.

PROFINET network, it is prepared for the construction of process quality parameter acquisition equipment, application server, real-time history database server, relational database connection, and for the realization of data fast communication.

**Acquisition of Process Quality Parameters of Equipment**

The process parameters acquisition equipment to dual channel forming machine ORACLE database that send instruction process quality parameters acquisition equipment, when the process parameter acquisition device receives the process quality parameters, it will be used in the design of the signal and data processing rules to achieve the effectiveness of the data processing, to ensure that the data is true and effective.

When the process parameters acquisition equipment effectively disposed of process quality parameters, the data will be sent to the application server; the application server receives the quality parameter acquisition device sends data, the first data will be forwarded directly to the real-time database server, real-time history database server data is stored directly according to time stamp, with the original ecological preservation process quality in the production process; Secondly, the application server compares the received data with the data in the control standard that Quality standard of filter rod stored in relational database server, when the received data are abnormal, results if the judgment is abnormal, the abnormal information to the application server immediately feedback to the on-site operation terminal.
Design of Process Quality Parameters of Dual Channel Equipment

According to the quality standard of the filter rod, the quality parameters of the production process of the equipment are collected by the process quality parameter acquisition equipment. The process quality of the general filter rod is the main parameters of the circle, roundness and resistance.

From Figure 2, in the system design, the characteristics of network architecture and industrial network considering the field application, the system adopts PROFINET network, for the construction process quality parameters acquisition equipment, application server, real-time database server, connection database, realize fast data communication. The client terminal uses TCP/IP access mode, and the use of smart handheld devices to collect the two basic data, through the powerful data analysis and data modeling capabilities of the system background, process management of process quality parameters of filter rod. The quality traceability management in the field, each stage of the filter rod products information connected together, can track the changes in quality of products in the production period of the whole process, so as to realize the filter rod production information acquisition and tracking.

- Quality parameter setting: provide the system process manager to set the parameter information of equipment process, check the list of process and equipment information, etc.

- The data acquisition: the definition of data management and real-time sampling strategy, and the realization of information acquisition strategy to open and suspend the implementation; control the operation of the sch Large data filtering transmission: providing a large data filtering and editing process, and drag and drop data filtering rules, you can define the standard of each type of data transfer process and related parameters.

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- Process quality standards for receiving and implementing: providing data message structure definition, and process quality standards on the ground down process, in order to service interface model configuration function.

- Analysis of data anomaly judgment: a kind of data feedback form that need to distinguish the quality of the process, and set the management function of different abnormal judgment to different quality type.

- Data alarm analysis: according to the data analysis of the data alarm feedback, release monitoring and analysis of the results, to guide the production of the equipment to adjust the quality of the process, the formation of the problem analysis table.

- Process quality monitoring: through the analysis of large data model, to provide a process of quality control chart, display the characteristics of the quality of the process through different ways.

- Process quality parameter process tracking display: according to the whole sample statistical technology, and the user needs to provide time and river map of the relevant quality process and performance status of the data tracking show.
System Implementation

In the system, the dual channel forming machine to the maximum speed, set circumference was 24.10 mm, 24.15 mm, 24.20 mm, 24.25 mm, 24.30 mm, 24.35 mm, 24.40 mm, the display value is consistent with the set value of sampling (20 cigarettes), and the detection of circle, test the linear compliance and accuracy of. Results before and after the circumference of linear compliance should be greater than 98%, mean = set value (display value) ± 0.05mm, single set value = ± 0.15mm, SD ≤ 0.05mm. The test results are as follows:

<table>
<thead>
<tr>
<th>Display value (mm)</th>
<th>average value (mm)</th>
<th>SD (mm)</th>
<th>The difference between the detection value and the display value (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.407</td>
<td>24.406</td>
<td>0.028</td>
<td>-0.001</td>
</tr>
<tr>
<td>24.353</td>
<td>24.359</td>
<td>0.018</td>
<td>0.006</td>
</tr>
<tr>
<td>24.303</td>
<td>24.302</td>
<td>0.025</td>
<td>-0.001</td>
</tr>
<tr>
<td>24.243</td>
<td>24.227</td>
<td>0.020</td>
<td>-0.016</td>
</tr>
<tr>
<td>24.202</td>
<td>24.221</td>
<td>0.032</td>
<td>0.019</td>
</tr>
<tr>
<td>24.165</td>
<td>24.181</td>
<td>0.023</td>
<td>0.016</td>
</tr>
<tr>
<td>24.102</td>
<td>24.128</td>
<td>0.026</td>
<td>0.026</td>
</tr>
</tbody>
</table>

Table 1.

From Figure 3 and Figure 4 and table 1, can draw a conclusion that the circumference of the linear meets the requirements, previous channel linear correlation coefficient R²=0.987, channel correlation coefficient R²=0.989, confirm to R² = 0.980, the display value is less than 0.040mm and the measured value. Generally considered to meet the requirements of linearity and accuracy.

In general, according to the sampling record of the time stamp, the standard mean of the double channel forming machine is respectively set circumference is 24.25, sampling (10 cigarettes), and the circle is detected, and the linear conformity and accuracy are tested. The mean value is set to float (display value) ± 0.05mm, single set value =± 0.15mm, SD ≤ 0.05mm. Test results as shown in Figure 5 (mean) Figure 6 (standard deviation).
Conclusion

Through the analysis of large data model and statistical techniques, to achieve the filter rod production process quality parameters of the changes in the situation, adjustment and abnormal situation of real-time monitoring and feedback. At the same time, the use of real-time history database according to the process quality parameters of timestamp stored real-time data, any changes to complete the tracking process quality parameters, so as to realize the original tracking and analysis system based on production process.

References


