

Application of Data Analysis Methods to Different Quality Management Roles

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Abstract: In recent years, the demand for iron and steel products in all fields of society is increasing day by day, and the requirements for product quality are getting higher and higher. In this context, iron and steel production enterprises are increasing the quality control efforts of each process of iron and steel production, and the application of data analysis in quality management. The purpose is to use data analysis tools to accurately analyze and process the data generated by each process of steel production, so as to achieve the expected purpose of improving product quality and reducing the rate of defective products. Based on this, this paper will focus on the data analysis methods used by quality operators, quality control personnel and quality designers and their specific application effects.

1. Introduction

For iron and steel production enterprises, in the quality management work, different work content, post personnel Settings also have obvious differences, such as quality operators mainly refer to the standard technical specifications and internal production process of the enterprise, to complete the quality control and management process of iron and steel products. Quality control personnel are responsible for the supervision of the product quality of each process of steel production, so as to improve the qualified rate of products. The quality designer is based on customer needs, to design and research and development of steel products, design quality will be directly related to the quality of steel products. These different quality management roles can adopt data analysis methods in practical work to strictly control the quality of steel products, thus laying a solid foundation for the improvement of economic benefits of enterprises.

2. The Application Value of Data Analysis Method in Quality Management of Iron and Steel Enterprises

Iron and steel products mainly include profiles, plates, pipes and metal products and other types, different types of products, their specifications and models, the use of processing technology also have significant differences, which increases the difficulty of quality management. In order to seek an efficient and quick quality control method, quality management by collecting data generated by all production procedures steel products information, and then to focus on these information,

analysis and screening, then keep some has the reference value to the data, and combined with the inherent law of the data, to determine and find the steel product quality defects, This method can not only quickly and accurately identify the quality problems of steel products, but also provide real and reliable reference data for quality control, and a series of analysis, identification and judgment processes are the application principle of data analysis [1].

However, in the iron and steel enterprise quality management work, due to the complexity of steel production process, operation conditions, so that the data acquisition work is extremely difficult, especially in the application of data analysis, different quality management role if the same kind of analysis method, not only affect the work progress, and accuracy of data analysis will be severely affected. In this case, the quality of the different management roles should adopt different data analysis, thus, can be targeted to find out the problems of quality steel products, this is for the quality control and management of follow-up provides a lot of convenience, at the same time, also make the quality of the iron and steel enterprise management level to achieve a qualitative leap.

3. Data Analysis Methods and Practical Application Results Applied by Quality Operators

Quality of operator is the implementation of quality control and management of the direct participants, in the actual production process, quality of operator in combination with design personnel to provide drawings and operation scheme, some raw materials or semi-finished products processing ChengGangTie products, quality of operation personnel need to every machining process on a tight leash, in order to ensure the quality of the products conform to the requirements of the standard. In the analysis of raw materials, production equipment, processing technology and other quality factors, quality operators usually use some convenient graphic analysis tools to carry out data analysis, among which, the more commonly used graphic tools include permutation chart, histogram and control chart.

3.1 The Specific Application of the Permutation Chart

The arrangement chart is also known as the “82 rule”, which can be used to directly find some of the main reasons affecting the quality of steel. However, quality operators often underestimate the practical value of permutation charts when they are used for data analysis. Such as a domestic iron and steel production enterprises in the recent production of iron and steel products, each production batch of products are the following quality problems: product surface rendering corrugated shape, weight, such as leather, crack and scarring due to quality defects sort is more, the quality of operation personnel can't find out the main defects and the principal causes of quality defects. In this case, it is completely possible to draw these quality defects of the product into a chart, and then find out the main problems affecting the quality of steel products from the chart. If the defect chart analysis method is used, the main causes of quality defects can be quickly analyzed, which provides important reference data for formulating effective quality control measures in the next step.

3.2 The Specific Application of Histogram

Histogram is mainly the use of a series of rectangles with different heights and equal widths to show the dispersion of data and the central trend. Through the observation and analysis of the histogram, it can quickly and accurately determine whether the state of each process of steel production is normal. If the data is abnormal, Quality operators can directly refer to the histogram to analyze the main causes of quality defects, and then formulate targeted solutions. In addition, in the analysis of the data shown by the histogram, the performance indicators of steel products can also be determined according to the relationship between various variables. With the number 1 on behalf

of nonconforming product, for instance with the number 2 represent nonconforming, three variables respectively by X1, X2, X3, through the analysis of the relationship between the two variables and performance index, which can determine where each variable is an interval can produce qualified products, and can achieve the purpose of improving steel product percent of pass [2].

3.3 The Specific Application of the Control Chart

Control chart is also a data analysis tool commonly used by quality operators. With the control chart, operators can quickly find out the out-of-control points, and then through the mining of out-of-control causes, effective coping strategies can be adopted in time to solve the quality problems of steel products in the production process. Operators such as in manufacture process, quality through observation and analysis of control chart, find the chart above there are multiple control points, and then, quality of operation personnel through to the production team and consider factors such as raw material production batch, to determine whether out of control, and the “production batch” and the “volume” as hierarchical information added to the control chart, In this way, it is easy to judge the strength upper limit of cold rolled plate, and the quality operator can clearly show the cause of out of control according to the volume number of the strength upper limit control point.

It can be seen that quality operators, as the executor of quality control of steel products, often use data analysis tools to analyze the causes of quality defects of steel products. This analysis method is not only clear and intuitive, but also has significant effects on eliminating quality risks and solving quality problems of steel products.

4. Data Analysis Method and Practical Application Effect Applied by Quality Control Personnel

Different from the post management responsibilities of quality operators, quality control personnel mainly control and manage the production quality of each process in the production process of iron and steel products effectively, and ensure the quality of end products by controlling the quality of raw materials. When to perform quality control responsibilities, quality control personnel generally requires a combination of the sales contract execution, equipment performance, production cost, production efficiency, and personnel deployment and allocate factors, then according to the steel products production technology and technical standard, real-time supervision and management of specific implementation, if in the process of production, If a process is found to be abnormal, the quality control personnel will analyze and study the problem in time to find out the main cause of the problem and ensure that the rectification work can be completed in the shortest time. In the data analysis stage, quality control personnel not only use graphical analysis tools, but also use methods such as hypothesis testing and regression analysis to verify the determined conclusions, thus paving the way for the formulation of targeted solutions and providing more accurate data. When verifying the conclusion, quality control personnel usually use process capability index and process performance index to analyze, so as to accurately evaluate the quality control level of the whole production process. The process capability index mainly includes Cp, Cpk and Cpm. Cp mainly describes an important indicator of process capability and reflects the potential capability of the process. The larger the value of this indicator is, the stronger the potential capability of the process is. Cpk reflects the deviation degree of the process center. The larger the gap between this index and Cp, the farther the process mean deviates from the tolerance center. Cpm reflects the quality loss caused by process center deviation from the target. The greater the gap between Cpm and Cp, the greater the quality loss. In addition, the process performance index usually includes Pp and Ppk, and Pp reflects the long-term control level of process quality. Ppk

reflects the deviation degree of the process center. The larger the gap between Ppk and Pp, the farther the process mean deviates from the tolerance center.

For example, the value of Cp index is 1.5, Cpk is 1.48, Cpm is 1.50, Pp is 1.45, and Ppk is 1.43, which indicates that the whole production process is in an ideal state. In this case, the process control is good, the process potential is high, the long-term control effect is good, and the quality loss is small. The best ideal numerical keep an equal relationship, and long-term and short-term performance of normal distribution curve overlapping, therefore, ideally have been the target of quality control personnel, according to the state, in the actual work, quality control personnel will work on the process and the method shall be improved continuously, to gradually reduce and the gap between the ideal state.

5. Data Analysis Method and Practical Application Effect of Quality Designer

Quality designers play the role of direct dialogue with customers. According to customers' needs, designers need to combine their own work experience and professional knowledge to design products that can meet customers' personalized needs. In general, quality designers decide the subsequent production quality of steel products. Therefore, the following methods need to be adopted in data analysis of factors affecting product design quality.

First, in the product development stage, quality designers need to prepare a set of product standards, and according to the product standards to predict and analyze the production process of the product. This step will have important practical significance for quality control personnel and quality operation personnel. Secondly, quality designers need to collect and sort out historical data, then build models based on these data, analyze models, and set standards and tolerances. Finally, the formulated standards are issued to each job post for implementation [3].

For example, in the early stage of data analysis, designers first determine three independent variables: X1, X2, X3, these three independent variables are the key factors affecting the performance of steel products Y. Through the collection of various data, the quality designer obtained 118 sets of data. When analyzing the data, it was found that the control ability of product performance Y was low, and the long-term nonconformity rate reached 99,793ppm. By establishing the relationship model between performance Y and three independent variables, designers can find the optimal setting range and allowable standard deviation of independent variables from the model. In this way, the performance of steel products can be effectively improved. Firstly, an analysis model is established by analyzing the screened response surface regression. Then, the predictive descriptor is used to find the optimal setting combination of the independent variables, and combined with the production process, equipment running state, cost and other restrictive conditions, the respective variables can be adjusted at any time, so that the performance Y can be optimized and improved. Next, quality designers need to allow the standard deviation of the independent variables were analyzed, and the analysis results show that the main factors influencing the product performance Y is associated with the variation of the independent variable X, and therefore, in order to effectively control the influence of error transfer, must allow the standard deviation for effective control of the independent variable X, out of consideration for cost savings, Designers can use monte Carlo simulation method to select an appropriate independent variable standard deviation, which can not only reduce the cost of process optimization, but also improve and optimize product performance. Through this control measure, the pass rate of steel products will be greatly improved.

6. Conclusion

To sum up, the quality control work of the whole production process of iron and steel enterprises

is undertaken by different roles, and the entry point and analysis process of data analysis method applied by each role are quite different. Therefore, different quality management roles in enterprises should constantly improve their professional and technical level, and through learning from successful experience and cases, improve the accuracy of data analysis, so as to ensure the quality of steel products, and create more economic and social benefits for enterprises.

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