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Retraction

Retracted: Development of Quality Information Management System for Alumina Ceramic Tube Manufacturing Process

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Y. Huang, "Development of Quality Information Management System for Alumina Ceramic Tube Manufacturing Process," *Advances in Materials Science and Engineering*, vol. 2022, Article ID 5816221, 13 pages, 2022.

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Research Article

Development of Quality Information Management System for Alumina Ceramic Tube Manufacturing Process

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This paper is based on the alumina ceramic manufacturing process and its quality to build a quality information management system to study alumina ceramics and its quality factors such as physical properties, chemical properties, and other pieces of related information to find a kind of alumina ceramics. The management of quality management brings efficiency and guarantee to the management system. Obviously, this research is based on the two parts of alumina ceramic tube and quality management information system for data acquisition and analysis. One part is based on the production and performance analysis of alumina ceramic tube and summarizes the quality problems that occurred in this process. This paper constructs an information management system to count these issues and conducts research on information dominance and management; among them, exponential smoothing calculation methods, linear trends, convolutional neural algorithms, and so on are applied for methodological analysis. The experimental results show that the lack of corners and uneven corners in alumina production has been greatly reduced, and the maximum probability of uneven corners has been reduced from 9.27 to 5.27. The scrap rate of ceramic tube quality decreased from the highest value of 5.82 to 3.17, and the maximum value of unqualified quality was changed from 5.76 to 3.03.

1. Introduction

With the rapid development of the national economy, the demand for bauxite resources is increasing, especially for high-altitude bauxite [1]. My country's bauxite resources are increasingly scarce, the resource reserves are declining, the contradiction between the supply of high-alumina-rich ore is becoming increasingly prominent, and the bauxite resources restrict the development of the aluminum processing industry. Alumina ceramic material is one of the ceramic materials with the largest production scale and the largest consumption in the world [2]. Alumina ceramics is a kind of ideal heat dissipation and packaging material with excellent performance and is suitable for large-scale integrated circuits and high-power electronic devices. However, its application and development are affected by problems such as difficulty in sintering and easy oxidation. Alumina ceramic material is the best type of material currently developed and used, which have good chemical stability, wear resistance, heat resistance, and excellent mechanical properties, and are used in machinery, wind power, electrical, and construction-electrical engineering. There are many toolkit applications, which have great development and practical value. The preparation of aluminum alloy is one of the first developments in the future [3, 4]. On the one hand, it is to find low-cost raw materials, reduce product costs, improve manufacturing processes increase output, and shorten metabolism; on the other hand, it is to improve its efficiency and high-temperature equipment [5]. Oxide ceramic materials have excellent strength, hard breaking, absolute dimensionality, heat conduction, high temperature, carving oxidation, and financial loss. The characteristics of Mu Peng and Gao Group are strong. Under the environmental conditions of Yan Meng, F has good high temperature stability and mechanical properties. It attracts attention at the Murake Industrial Building. Oxide ceramic materials mainly include binary oxides, glass ceramics, titanate ceramics, and hydroxyapatite ceramic materials. Binary oxide ceramic materials mainly include silicon oxide, oxide drink, alumina, zinc oxide, and barrel oxide. These

ceramic materials are widely used as ordinary daily ceramics and high-tech water ceramics.

Information is the main component of the quality management system documents. The technology-based quality information management system also covers the entire life cycle of the product and can effectively use quality information to meet customer needs and expectations for products in a timely manner [6]. The development process of the manufacturing and information industry is an important development process formulated by the 18th National Congress of the Communist Party of China. Information construction mainly serves the medium and long-term development process of enterprises, screening and identifying macro and microdata, regularly understanding market opportunities, and using relevant competitive actions [7]. Under normal business development conditions, informatization management will become the first choice for the main indicators of the enterprise in the long-term competition [8].

Alumina ceramics is a ceramic material that has been widely developed and used at present, and it has good chemical stability. In the process of Shukla M's research, X-ray diffraction analysis confirmed the formation of Ti-based compounds at the interface of the base material-filler alloy of the microwave and traditional brazing joints. The basic shape of the joint cross section is determined by X-ray energy analysis. The Vickers microhardness measurement shows that the microwave-assisted brazing joint has a reliable joint function in the practical application of electric tubes. The brazing force measurement and helium leak test provide evidence for the alignment of the alumina-alumina joint [9, 10]. Since there is no universal standard to evaluate the quality of process information, it is necessary for document producers to design appropriate process descriptions to provide practical solutions. In order to achieve the main purpose, Grudzien and Hamrol created a method to examine the characteristics of the influence of the process on the user's information needs of the process documentation and introduced the results of the survey conducted in the enterprise process, aiming at finding the relationship between the attributes of the description information and the process characteristics [11]. Khalilpourazary and Salehi aimed to study the effect of using alumina nanoparticles on the final surface characteristics of Al7175 cylindrical specimens manufactured by the tumbling process. In order to compare the results, the input parameters of the two groups, including workpiece diameter, speed, feed rate, and polishing tool, are all selected the same. In addition, dry and nanofluid polishing, number of passes, and penetration depth are considered as variable parameters in this study [12]. Ryabchikov discussed the organization-related issues of sintering quality management by rationed fuel in a full-cycle steel plant. This work considers the model structure for calculating agglomerate quality index values and shows that one of the most important interference factors that interfere with the effective management of agglomerate quality is the low authenticity of the genotype and chemical composition information of iron currently used. The work gives the possible reasons for this situation, which are related to the consistency of the mine base of the metallurgical plant, the characteristics of the material supply, and their preparation for aggregation [13]. Current methods for modeling such information manufacturing systems (IMS) lack the ability to systematically represent the dynamic changes involved in manufacturing (or creating) IP. Thi and Helfert aim to solve these limitations and propose a modeling method, the IASDO model. It represents a framework for evaluating the quality of the IMS modeling metamodel, comparing the IASDO model with current methods [14]. Shrivastava research explored the current status of Indian cement company green manufacturing (GM) strategy and provided industrial ecology, methods to reduce energy consumption, environmental impact data collection, manufacturing system design and control, and product and manufacturing system integration. It also reveals the problems in the decision-making system due to the influence of green product design [15]. Waple et al.'s response to NCA3's information management challenges means balancing relevance and authority, complexity and accessibility, and inclusiveness and rigor. Improving the traceability of the data behind the numbers and graphics, designing the public-facing website, managing the hundreds of technical inputs to the NCA, and developing IAQA-compliant guidelines for the 300+ participants were all well thought out, which in many ways embodies a strategic information management approach [16]. Although these studies have certain research significance and value in terms of experimental data and experimental process, from the data point of view, the experimental methods are too simplistic, resulting in the fact that the practicality of the experimental data is still worth discussing; in addition, for alumina ceramic tubes, there are few researches on the quality information management system of the manufacturing process.

Observe the appearance of each sample of high-content alumina ceramic material after 20 cycles of freeze-thaw experiments, and start production; collect, store, and analyze the quality information circulating in the process network and the execution information of each process. Supervise and manage the operation of the quality system to provide information support for the effective operation and continuous improvement of the quality system; on the basis of system identification, quality information entry, storage, requirements, and services are combined to develop a process-based information management system. The basis of institutional changes lies in the analysis and extraction of basic services and related components that are part of the company's system quality. The system administrator should form a detailed change plan. The director of the information center shall approve the change—boutique-boutique—scheme according to the change proposal. The implementation process shall be carried out in accordance with the provisions of the software development process. Establish a basic production team in a standardized way; role-based role management and modeling are used to design role-based safety management systems.

2. Alumina Ceramic Tube and Its Quality Information Processing

2.1. Alumina Ceramic Tube. The content of each oxide in the ceramic material will affect the comprehensive performance of the ceramic material [17]. With the deepening of scientific

research and the gradual maturity of the preparation process of alumina ceramics, people can prepare denser and higher-strength alumina ceramics and use them as structural materials. By the end of the high growth period of ceramics, the commercial status of ceramic material production has changed from traditional manuscripts or automated services to linear and automated manufacturing processes. With the successful preparation of transparent ceramics, General Electric successfully used alumina ceramics to manufacture high-pressure sodium lamps. Alumina ceramic lamps are more resistant to high temperatures than traditional quartz tubes and have much better performance. They are widely used in medical, engine wear parts, tool cutting, and other fields [18]. It is limited to the promotion and application of ceramic alumina. Therefore, solving the brittleness problem of ceramic alumina materials is one of the important ways to promote the application of ceramic alumina materials and solve the brittleness problem of ceramic alumina materials [19]. The alumina ceramic structure is shown in Figure 1.

The microscopic morphology of ceramics has undergone tremendous changes, from the accumulation of small disordered grains to a large ordered oriented sheet-like stacked structure. When the texture degree is low, ceramics are mainly composed of closely coupled fine-grained matrix grains, in which some oriented large flaky grains are embedded. The particles are tightly combined, and there are no defects such as delamination and large pores. In the fine-grained matrix, the existence of large-size, parallel, and uniformly arranged flake-shaped microcrystalline templates can be clearly observed, indicating that the template has good orientation, which can lay a solid foundation for obtaining high-quality alumina textured ceramics [20, 21]. Although the general isostatic press is equipped with a pressure gauge or pressure sensor, it can only observe each pressure process and cannot collect continuous pressure change data and the highest pressure and pressure holding time of each pressure process. The pressure of the medium (liquid or gas) in a closed container can be transmitted equally in all directions. Information feedback lags behind, quality problems are not easy to find, and there are other shortcomings. Through the measurement of porosity, bulk density, and water absorption, the compactness and sinterability of ceramic materials can be roughly reflected. Density is not only the basic characteristic of ceramic materials but also an important parameter of the microstructure of ceramic materials. Effectively preventing or reducing the quality problems of unqualified product compactness and providing an effective guarantee for the smooth production of products is a problem that needs to be solved urgently. During the preparation of ceramic materials, due to the presence of moisture and air in the blank, some pores will inevitably be generated during sintering. The location of the pores has a significant impact on the performance of the ceramic material. It is very brittle and very sensitive to blemishes and has strong elasticity [22]. This determines its reliability and poor destructive resistance and restricts its further development and high-tech applications. Increase the material strength σ, reduce the elastic modulus E, and increase σ/E. In the isostatic pressing process, the highest pressure value and the holding time during the pressing process become the key parameters. The holding time is set as a constant sequence, and the exponential smoothing calculation is performed on it:

$$\begin{aligned} Q_t^i &= ul_1 Q_{t-1}^i, \quad 0 < u < 1,\ 1 \le t \le k, \\ Q_t^i &= ul_1 + (1-u)\left[ul_{i-1} + (1-u)Q_{t-1}^i\right], \end{aligned} \tag{1}$$

where Q_t^i is the exponential smoothing value at t and u is the smoothing coefficient. This series of exponential smoothing values include the weight of the data during the preparation of the alumina ceramic tube, which decreases with the increase of i and finally becomes 1; that is,

$$\begin{aligned} \sum_{i=1}^{i} u(1-u) + (1-u)' &= 1, \\ \overset{\bullet}{l}_{i+1} &= \frac{Q_i}{ul_i}(1-u)\sum_{i=1}^{o}\overset{\bullet}{l}_{i+1}, \end{aligned} \tag{2}$$

where $\overset{\bullet}{l}_{i+1}$ is the predicted average value and the recursive formula for correcting the linear trend of time series $l_1, l_2, l_3, l_4, \ldots, l_n$ is

$$Q_t^1 = ul_1 + (1-u)Q_{-1}^i. \tag{3}$$

A time series refers to a series of numerical values of the same statistical indicator arranged in the chronological order of their occurrence. The main purpose of time series analysis is to predict the future based on existing historical data.

$$Q_t^2 = uQ_t^1 + (1-u)Q_{t-1}^2, \quad a < u < 1,\ 1 < t < m, \tag{4}$$

where Q_t^2 is the prediction made on the basis of Q_t^1, m is the number of time points for forward prediction, and the establishment of the initial value can be calculated using a formula

$$\begin{aligned} \overset{\bullet}{l}_{a+B} &= a_i + u_i \bullet B + l_i \bullet B^2, \\ u_i &= \frac{u}{2(1-u)^2}\left[(2-u)Q_t^i - (4-3u)Q_t^3\right], \\ l_i &= \frac{u^2}{2(1-u)^2}\left(Q_i^1 - 2Q_i^2 + Q_t^3\right), \end{aligned} \tag{5}$$

where a_i is the level value, u_i is the increase in the predicted vector value, l_i is the increase in the complexity, and the comparison basis for the initial value is

$$\begin{aligned} Q_\mu &= \sum_{i=1}^{v}\frac{2i}{v(v+1)}(u_i - v_i)^2, \\ Q_o^\mu &= \frac{\alpha}{1-(1-\alpha)}\sum_{i=1}^{u}(1-\alpha)' Q_o^{\mu-1}, \end{aligned} \tag{6}$$

where μ represents a fully adaptive value, Q_o^v is a dynamic index, where v is the convergence speed of the data, and α here is the best smoothing coefficient value.

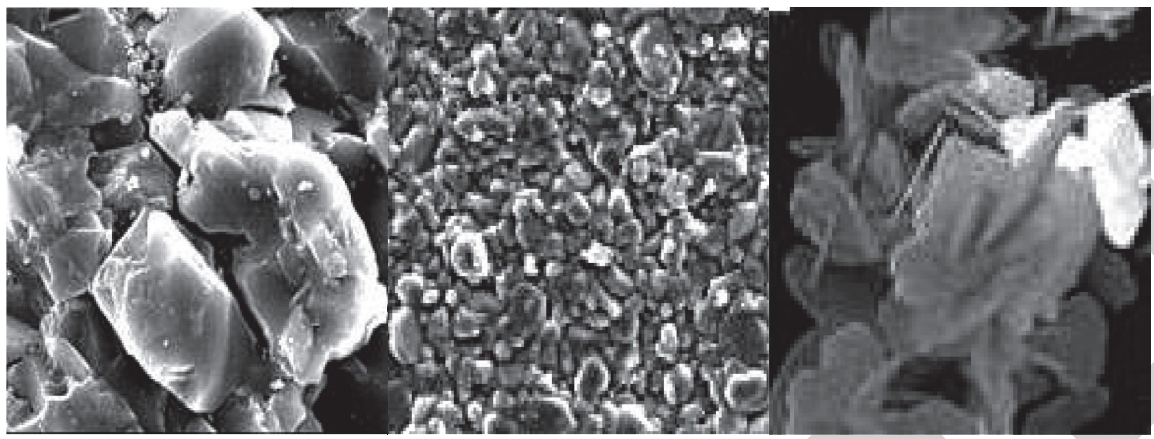

Figure 1: Alumina ceramics.

The exponential smoothing method further strengthens the role of recent observations in the observation period on the predicted value and gives different weights to the observations at different times so as to increase the weight of recent observations so that the predicted value can quickly reflect the actual changes of the market.

2.2. Quality Information Management System. Manufacturer quality control plays an important role in chain supply chain management. The quality control stage determines the determination, cost, and delivery date of the purchased product [23]. Therefore, it determines the competitiveness of industrial products in the market. After continuous research and update on quality management, its ideas and methods are also constantly upgraded and gradually developed to a higher level. In the enterprise, the original production management and quality management have not existed. It is the original situation, but these two situations have now been upgraded to the management level. With the widespread application of information management systems, its quality problems have become increasingly prominent [24]. In fact, in the construction of a management information system, its quality is an important content throughout the whole process of life information system development. The management information system model is shown in Figure 2. The quality of the management information system depends on the quality of development and maintenance of the management information system. People improve the efficiency of software design and the quality of software development through the development and update of technology. People continue to research and develop technology and at the same time transfer the focus of software quality control to the field of control and manage software products and software through effective control of software products. The concept of total quality control has led to a broader definition of quality, that is, the combination of product quality and service quality [25]. Work quality refers to many quality-related activities, that is, methods to ensure product quality and a wide range of quality-related activities to demonstrate product quality metrics [26]. To obtain good product quality, we must focus on quality work and use traditional manual and automatic asset loading to collect quality information through sensors or test equipment, usually represented by descriptive clauses or intellectual property rules, which are difficult to quantify and have low reliability and efficiency. Service is the foundation of service marketing, and service quality is the core of service marketing. Whether it is a production enterprise of tangible products or a service industry, service quality is the magic weapon for an enterprise to win in the competition.

Product process information is mainly recorded in process cards and other documents, and enterprises can trace back to the specific content of each process of the product, process developers, and reviewers through inquiries on these documents [27]. The accuracy and attractiveness of the information automatically collected by search tools have been greatly improved. It can be described by specific numbers to help people roughly understand the quality situation. This is the development of knowledge-quality information machines. Based on mathematical statistics and control charts as tools, monitor the status of the manufacturing process, analyze abnormal changes that occur, help staff understand the production process, take timely measures to solve problems, and keep the product under continuous and stable control during the process to achieve continuous improvement of quality [28]. According to the logistics interface relationship between the manufacturing logistics network nodes, it can be classified, and the information features are processed through convolutional nerves; then, there are

$$a_i^e + d_i^e = f(d)_{ie} \bullet \sum_{i \in m_{ie}} a_i^{i-1} * h_{ie}^i + d_i^e,$$
$$d_i^e = \delta_i^e \min\left(a_i^{i-1} + d_{i=1}(a-d)\right), \tag{7}$$

where d_i^e is the feature value extracted from a_i^e, $f(d)_{ie}$ represents the form of sampling and weighting processing, h is a constant, and half of it is calculated by probability; that is, δ_i^e is used to form image classification, and the linear

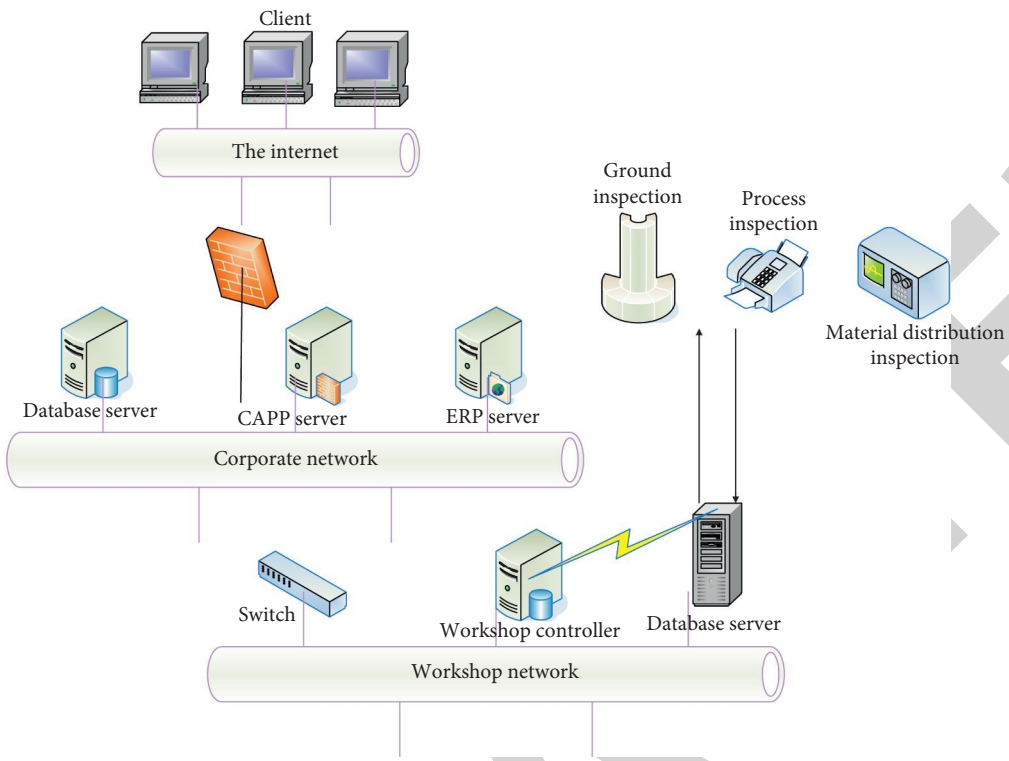

Figure 2: Management information system.

relationship between each quality measurement index can be expressed as

$$R(x, y, p, q) = \frac{1}{2}\sum_{i-1}^{I}\left\|t_i - a_i\right\|^2, \chi^i = y_e^{i+1}\left(g'\left(a_i^e\right) \bullet \max\left(\chi_e^{i+1}\right)\right), \tag{8}$$

where a_i represents the vector value input for the i-th sample information, $R(x, y, p, q)$ is the loss function, χ^i is the calculation of the sensitivity, g' is the partial derivative trend of the process, and the degree of freedom of the classification process can be calculated by the formula

$$\begin{aligned} \chi_i^e &= g'\left(a_i^e\right) * V^2\left(\chi_i^{e+1}\varepsilon\left(b_{i+1}^e\right), \text{all}'\right), \\ \text{all}' &= \frac{\left(\alpha_{ie}x_i + \beta y_i + \chi\right)}{i} + 1, \\ r_{a,b} &= \frac{\sum_{i=1}^{m}\left(A_i - \overline{A}\right)\left(B_i - \overline{B}\right)}{\sqrt{\sum_{i=1}^{m}\left(A_i - \overline{A}\right)^2 \sum_{i=1}^{m}\left(B_i - \overline{B}\right)^2}} \longrightarrow [-1, 1]. \end{aligned} \tag{9}$$

The correlation of degrees of freedom is calculated by $r_{a,b}$, $\overline{A}, \overline{B}$ are the average value of samples a and b, respectively, α is the minimum value that the quality factor must reach, and x_i, y_i are the input sample, which is optimized for processing:

$$\begin{aligned} P &= \sum_{i=1}^{m}\sum_{e=1}^{n} y_e x_{ie} + p_i + \cdots + p_n, \\ P_n &= \sum_{e=1}^{n} y_e x_{1e} + \phi_{12}p_2 + \cdots + \phi_{n-1,n}p_n, \end{aligned} \tag{10}$$

where p_n is the cost budget for quantification of quality, ϕ is the limiting condition for it, and the impact of the cost and time investment of each stage on the system quality is determined by n.

3. Experiment Related Work and Data Analysis

3.1. Relevant Data for the Production of Alumina Ceramic Tubes. With the rapid development of social science and technology, the efficiency and load of machinery used in industrial production are getting higher and higher, and many parts and components fail faster and faster due to wear. Ceramic has excellent mechanical properties, good corrosion resistance, and excellent chemical stability, but its thermal shock resistance is often poor, which limits its application in the preparation of ceramic/s metal elements through casting and inlay systems. Weigh dichloromethane and pour it into a clean beaker, then weigh a dose of anhydrous aluminum chloride and pour it into the beaker, then weigh a dose of isopropyl ether and pour it into the beaker, stir well, and put it in the oven for coagulation. After gelation treatment, an alumina xerogel is obtained, as shown in Figure 3.

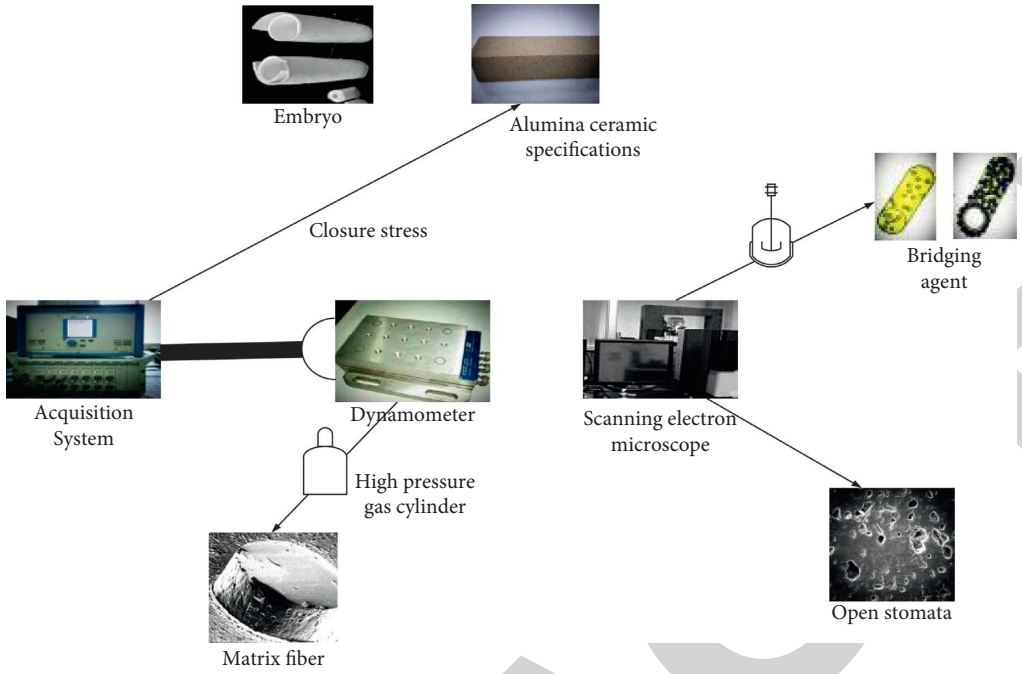

Figure 3: Preparation of alumina ceramics.

Alumina ceramic materials are widely used as ceramic casings in vacuum capacitors in electric power and power plants. The casting methods of alumina ceramic tube include grouting, molding, gel injection molding, isostatic pressing, and other molding methods. The product density of isostatic pressing is high, generally 5–15 higher than that of one-way and two-way pressing. The density of the compact is uniform. Because the density is uniform, the length-diameter ratio can be made unlimited, which is beneficial to the production of rod-shaped and tubular thin and long products. Through the technological advantages of informatization construction, change the traditional control position, improve the key competitiveness, and maintain a good development culture. Therefore, the structural problem of the ceramic tube in the manufacturing process is raised. The structure and performance of alumina ceramics are shown in Table 1, and the dimensions of some alumina ceramic tubes are shown in Table 2. The volume measurement value of alumina ceramics increases with the increase of the erosion angle, reaching the maximum value at 90° and the minimum value at 30°, reflecting the characteristics of typical brittle materials. At small angles, cutting wear is the main cause. The energy of the abrasive is sufficient to cause the alumina ceramic to fracture in the grain boundary area, which makes the small alumina grains easy to fall off and cause volume loss. Due to the different expansion coefficients of the embedded whiskers/strings and the matrix, when the welding wire is encountered during the crack propagation process, the propagation direction of the crack is blocked, rotation or bifurcation occurs, and the extension of the welding process increases the rigidity.

Alumina injection molding provides powdery materials according to different product requirements and different brewing processes. The particle size of the powder is below

Table 1: Composition and properties of alumina ceramics.

Chemical composition	Parameter (%)	Physical properties	Parameter
Aluminum	>94	Density	3.42
Silica	<2.4	Apparent porosity	0.31
Iron trioxide	<1.9	Compressive strength	277
Monovalent oxide	<0.6	Refractoriness	1721–1810

1 μm. If high-alumina ceramic products are manufactured, in addition to 99.99% alumina matrix, ultrafine coating and uniform particle size distribution are also required. During extrusion or injection molding, clay and plasticizer must be injected into the powder, usually a thermoplastic or resin with a density ratio of 10–30%. The organic mixture should be at a temperature of 150–200 degrees, and the mixed mixture is at the bottom to facilitate work. The oxidation of alumina at different temperatures varies with time, as shown in Figure 4. The applied pressure will vary with the amount of filling powder, which can easily cause the difference in shrinkage after softening, which will affect the quality of the product. Generally speaking, the smaller the particle size of the mineral, the better the mechanical properties of the filler material. For example, for the particle added to the rubber, the smaller the particle size, the greater the tear strength. But at the same time, the smaller the particle size is, the more difficult it is to achieve its uniform dispersion. In addition, the smaller the particles, the greater the oil absorption value, the more the additives required, and the higher the processing cost. The filling of the mold is uniform during the dry pressing process. The normal sintering amount of ceramic alumina has a great influence on the size control. Although the alumina ceramic tube has met the requirements in

Table 2: Dimensions of some alumina ceramic tubes.

Model	Inside diameter of	Length	Wall thickness	Maximum outer diameter
NC240	6.29 ± 0.1	89.7 ± 1	0.69 ± 0.05	7.13
NG390	7.27 ± 0.1	105.3 ± 1	0.70 ± 0.05	8.12
NG600-3	8.13 ± 0.1	176.2 ± 2	0.74 ± 0.04	9.01
NG600-4	7.08 ± 0.1	181.2 ± 2	0.74 ± 0.04	7.96
NG999	10.24 ± 0.1	186.9 ± 2	0.74 ± 0.04	11.12

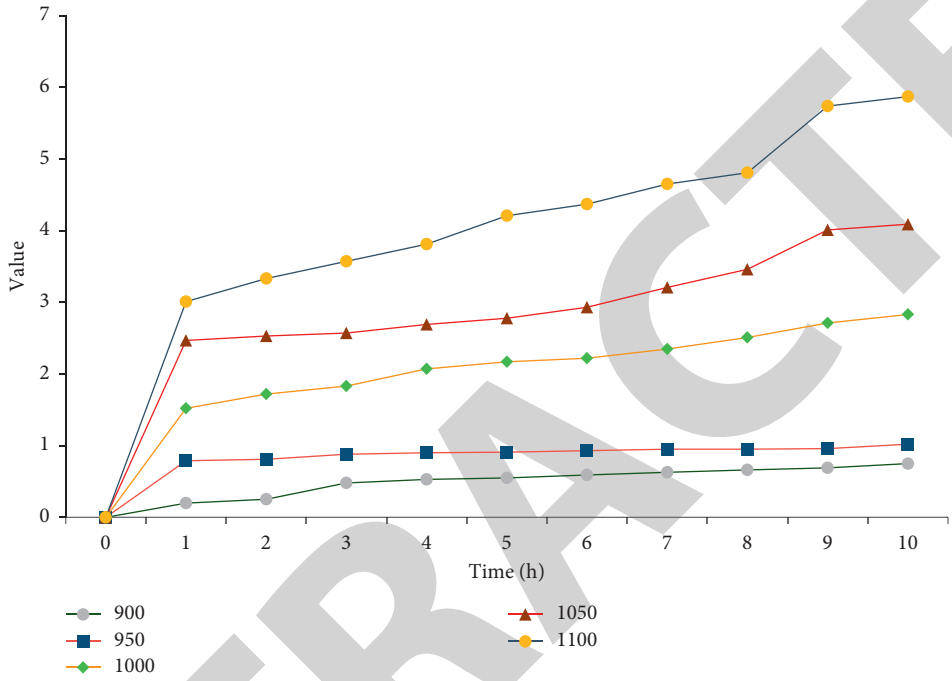

Figure 4: Oxidation of alumina at different temperatures.

structure after sintering, it still does not meet the application requirements. It needs to be processed by size correction, polishing, and so on to make the surface of the ceramic tube more dense and smooth and further enhance the performance. The final product is formed. The relevant data of general alumina ceramic formulations are shown in Table 3.

The ceramic alumina body is decomposed at 600°C and then sintered at different temperatures (1200°C to 1500°C) to allow the ceramic bone to pass through. The higher the temperature, the lower the porosity of the ceramic process and the larger the average grain size. In addition to relying on electrostatic precipitation between particles to prevent particles from approaching and invading, it can also build a material barrier around the particles to increase the space between the particles to achieve stable dispersion.

The increase in porosity will increase the overall flux, which corresponds to the increase in suction capacity, but its flexural strength will decrease, which will affect the service life of the support. In addition, due to the high cost of raw materials and the high cost of high-temperature firing, the price of ceramic supports has been high, which has led more and more researchers to pay attention to the research on the preparation process of high-performance and low-cost ceramic supports. To this end, this study tested four types of alumina ceramic samples, the basic conditions of which are shown in Table 4.

Through the detailed analysis of the above-mentioned formula of ordinary alumina ceramics and the four formulas of the test alumina ceramic samples, we can make an inference about the specific formula components so as to improve the actual formula ratio. As the ceramic particles approach each other, the polymer molecules distributed on the surface of the particles will also be distributed. This distribution is unstable in terms of force, and the two particles must overcome the potential barrier to achieve perfect stability. The mechanical method of granular ceramic body weight and solid material casting is called sintering. Sintering is the process of removing the gaps between the particles in the green body, removing a small amount of gas and impurities, and making the particles grow and combine with each other to form a new substance. The data on the interoperability, correctness, reliability, efficiency, and completeness of the alumina ceramic tubes made by these four formulas are shown in Figure 5.

The traditional grinding process is difficult to process ceramic structural parts with high efficiency. With the increase of ball milling time and the smashing of large-size particles, there is a better particle gradation between ceramic

Table 3: Formulation of general alumina ceramics.

Aluminous rock (%)	Kaolin (%)	Quartz sand (%)	Alumina (%)	Water content (%)	Resting time (day)
52.14	13.67	23.47	11.24	0	1-4
58.37	33.24	31.98	1.39	0	1-4
58.91	30.29	317.4	1.47	6.55	1-4
66.29	27.01	41.53	1.54	18.24	1-4

Table 4: Four formulations of alumina ceramic samples for testing.

Sample	Dry weight	Wet weight	Bulk density	Porosity	Water absorption
A	321.67	322.57	2.37	0.59	0.23
B	358.24	360.17	2.57	0.88	0.48
C	311.29	322.87	2.05	3.74	2.36
D	317.89	333.39	1.78	5.92	3.94

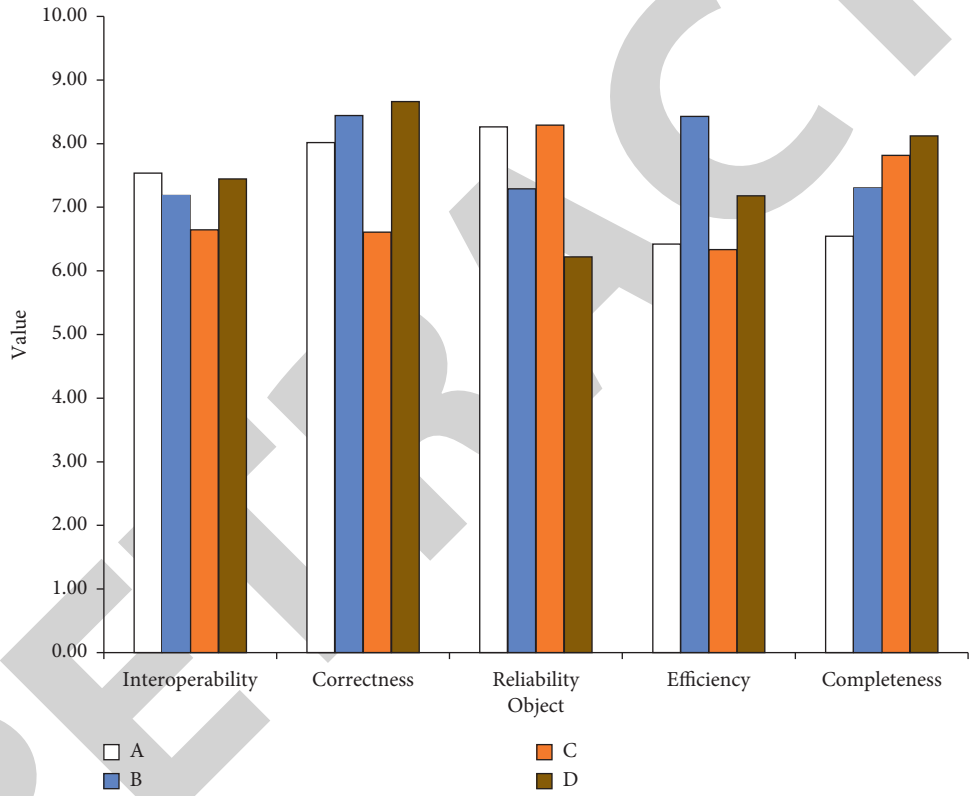

Figure 5: The performance of the four formulations.

particles, which reduces internal friction and viscosity when the slurry flows; in addition, another main function of ball milling is to mix materials. As the milling time increases, the components of the slurry become more uniform, and the viscosity decreases. Therefore, research on stone grinding wheels with good performance is of great significance for improving the quality and efficiency of ceramic materials and promoting the reputation and application of this technology. Use big data regression technology to analyze the performance of 20 alumina ceramic tube samples from a factory, as shown in Figure 6.

The data in the above figure is mainly for the maintainability, adaptability, usability, testability, and so on of alumina ceramics, showing that it can still maintain good stability, wear resistance, high temperature resistance, high hardness, and so on, and when cutting, there will be no chemical reaction with the workpiece.

3.2. Construction and Application of Quality Information Management System. The quality chain has been further developed under the integrated environment of the global technology system and the rapid development of information technology. With the increasing promotion of the concept of total quality control and the implementation of ISO9000 standards, traditional quality control will surely pass regulations. Due to globalization, different regions, cultures, companies, and companies around the

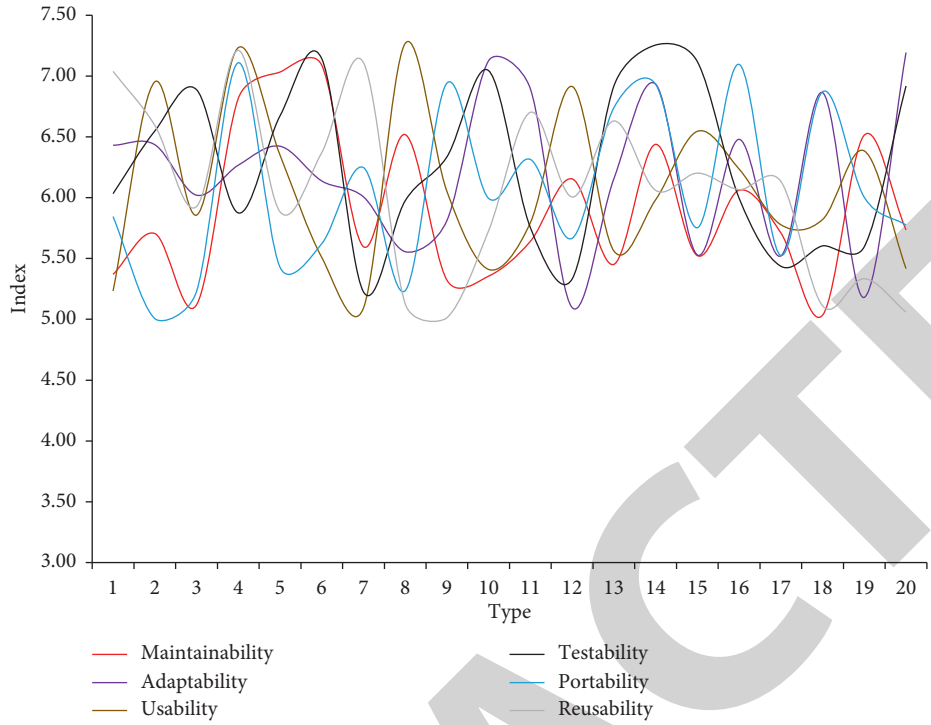

Figure 6: Performance of alumina ceramic tube.

world can establish partnerships to improve progress and speed response to customer needs. The plan for arranging improvement standards is mainly to adopt a development perspective to deal with the obtained test results, that is, to preserve the experience that can achieve good results and to form a standardized guidebook to set a benchmark for future work. The statistical data is to aim at the satisfaction of major customers, product sales, market share, and so on, with the help of this information to obtain good product quality judgments. Before starting a new business, you first need to judge whether to use project management well. After the project is launched, organization, planning, and project management can only follow the basic and basic methods of project management in order to achieve the success of the project. Quality assurance is the basis for all the concepts and performance of the implementation plan to meet the requirements of the quality plan. It is a reliable guarantee for the normal operation of the project quality system and should run through the entire process of project implementation. There is a causal relationship between quality and cost. Quality is one of the life elements of an enterprise, and continuous improvement of product quality is the eternal theme that most enterprises strive for. There is a price to be paid for improving quality, whether it is improving tangible products (physical products) or intangible products (services or jobs). The frequency of product replacement is accelerated, and the continuous investment in quality cost is inevitable. Quality cost exists objectively in all aspects of production and operation of an enterprise. The input of quality cost should not only meet the relative needs of customers but also meet the internal requirements of enterprises to increase profits. These two factors restrict each other and constitute the basic contradiction of the development and change of quality cost. The data before and after the application of the constructed information management system are compared and analyzed. First, statistics are made on the production overview of alumina ceramic tubes, such as missing corners, size differences, and uneven corners, as shown in Figure 7.

The data in the above figure shows that the lack of corners and uneven corners in the production of alumina has been greatly reduced. The maximum probability of uneven corners has been reduced from 9.27 to 5.27; the key to preparing high-purity alumina ceramics is to control the number of impurities introduced, and the grinding media is one of the main sources of pollution of the raw materials; therefore, how to overcome the brittleness of the material and improve the toughness has become the main issue in the production of alumina materials. During the sintering process, the number of grain boundaries and the area of grain boundaries will gradually decrease, resulting in a relative increase in the impurity composition at the grain boundaries, resulting in a decrease in the eutectic temperature of the microdomains, and liquid phases are prone to appear. The liquid phase enters the particles to provide lubrication for the reconstitution of the particles in the initial stage of dissolution. However, during the production process, process-related information also needs to be studied, such as furnace plate collapse and unreasonable process. The comparison of data before and after is shown in Figure 8.

A large number of studies have shown that adding Ni as a binder phase will increase the plasticity of ceramic materials,

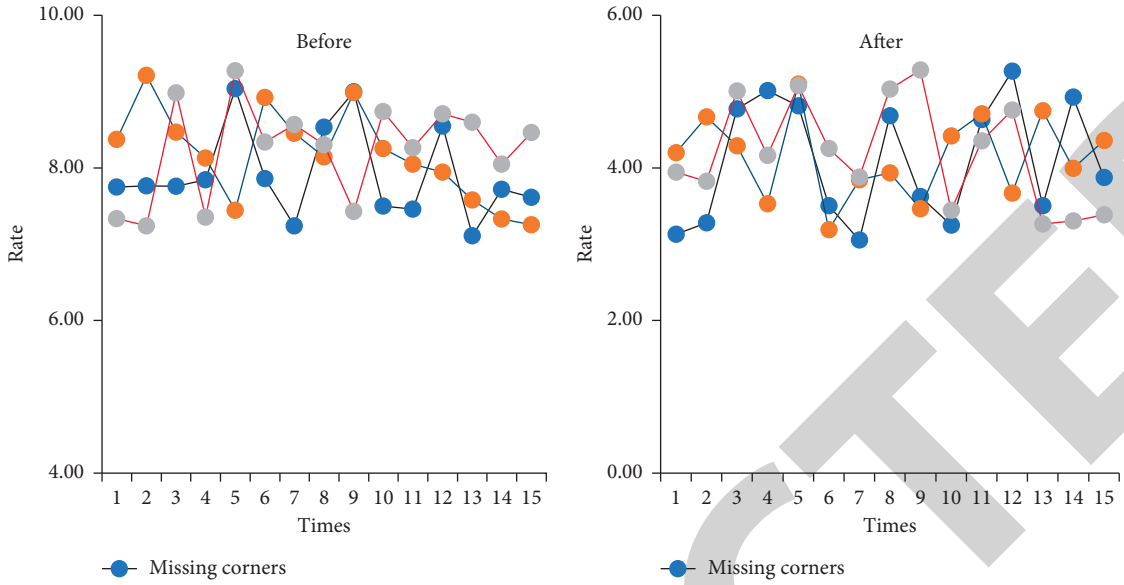

Figure 7: Overview of alumina production.

and the flexibility of ceramic materials has a great relationship with the added value. As the amount of Ni increases, the tensile strength of ceramic materials will also increase. At the same time, the hardness of the ceramic material will gradually decrease. However, if the content of Ni is excessive, brittle phases will be formed in the ceramic material. Therefore, after the experiment is carried out on this basis, the quality of the alumina ceramic tube will be counted for cracks, intercalation, and so on, as shown in Figure 9.

The generally constructed quality system framework is based on the life cycle of the product, from the material entering the factory, production, leaving the factory, and delivery links, and lacks the construction of information system for quality management activities. In addition, the construction of a systematic quality system is mainly based on the use of products. Because the existing quality records of the factory have not been fully electronically managed, it is difficult to process paper record information. If you want to count the quality information, you need to manually check a large number of paper files. The quality information on the file data also needs to be manually entered into the computer system to facilitate analysis and statistics, and these tasks will cost a lot of manpower and material resources. The main method of management information quality technology is control. Only when accurate and complete information is grasped in time, project management and decision-making personnel have a reliable basis to implement effective control and management of the project. From the data of reject rate and unqualified quality, the application of quality information management system is generally effective, as shown in Figure 10.

European and American countries are in a leading position in terms of quality information management systems. Research started early, and practical applications are relatively extensive. Since China's reform and opening up, the western advanced management experience has been gradually applied, and the term information system has also begun to appear in China. With the deployment of computers and the establishment of local corporate networks, a central application platform for quality inspection information is provided. In order to meet the needs of rapid growth of enterprises and the pursuit of product quality, the quality inspection information system has become an important part of the rapid growth of enterprises. From these 15 tests, the scrap rate of alumina ceramic tubes has decreased from the highest value of 5.82 to 3.17, and the maximum value of unqualified quality has changed from 5.76 to 3.03.

4. Discussion

For quality management, it is a large-scale, complex, and systematic project. At present, there is still a big gap between the alumina ceramic tube production technology and foreign advanced technology. It is on the eve of continuous exploration, improvement, and breakthroughs, and the problems faced are more and more complicated. At the same time, with the rapid development of information technology, the application of computers in the field of quality control has received widespread attention in the world, and it is an important way to improve the efficiency of enterprise quality control. Due to the rapid development of technology and craftsmanship, products have become more and more complex and multiplied. The failures and failures of these products always bring huge losses to users and society. Speed is needed to improve quality and reduce failure rates. Quality improvement is the foundation for the growth and stability of corporate strategic interests. For enterprises, improving product quality can increase product share and form a virtuous circle. The main areas of project quality control include quality, time, and cost.

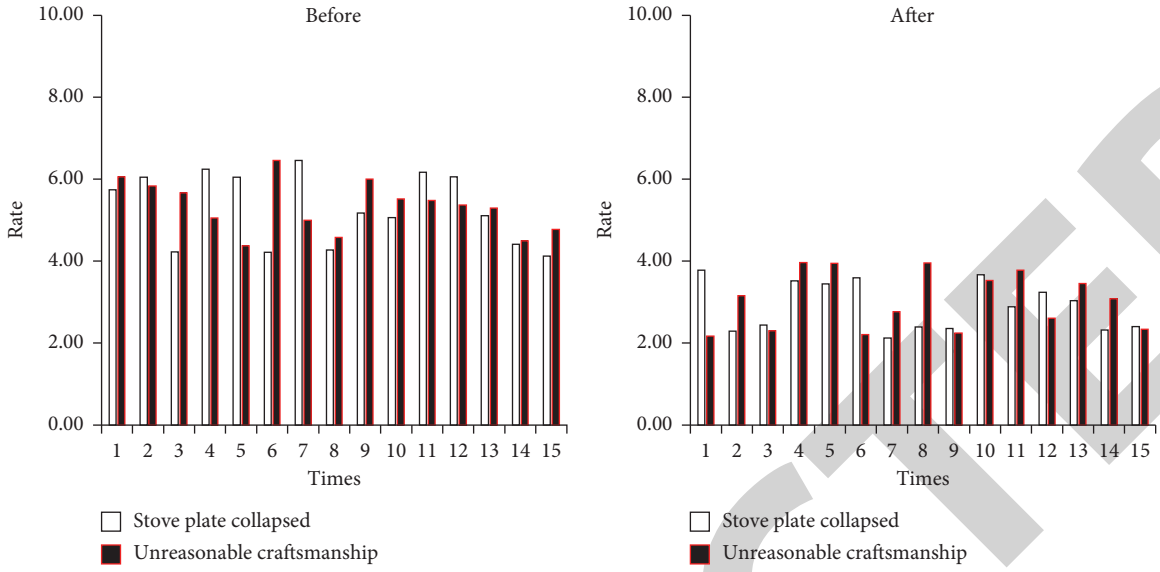

Figure 8: Alumina ceramic tube process.

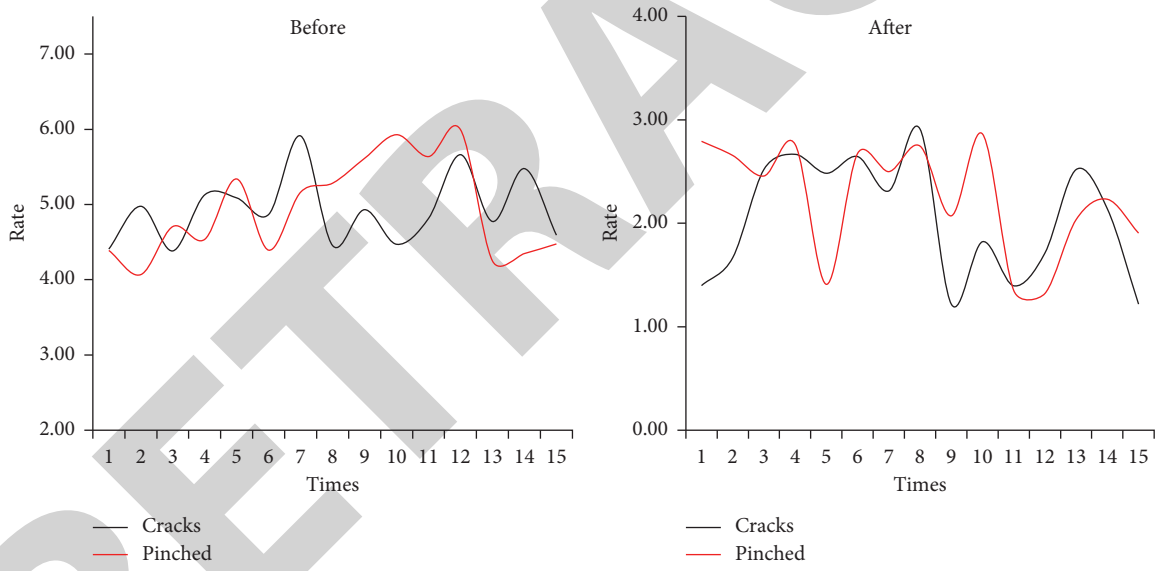

Figure 9: Finished alumina ceramic tube.

Project quality assurance is one of the main areas of project management. The quality control of the project is very important to ensure the successful completion of the project in accordance with the requirements set by the model and to enable all tasks of the project to be carried out in accordance with the original quality and quality requirements. Quality management is based on quality and quality control. Quality assurance and quality improvement are the success of the quality assurance system.

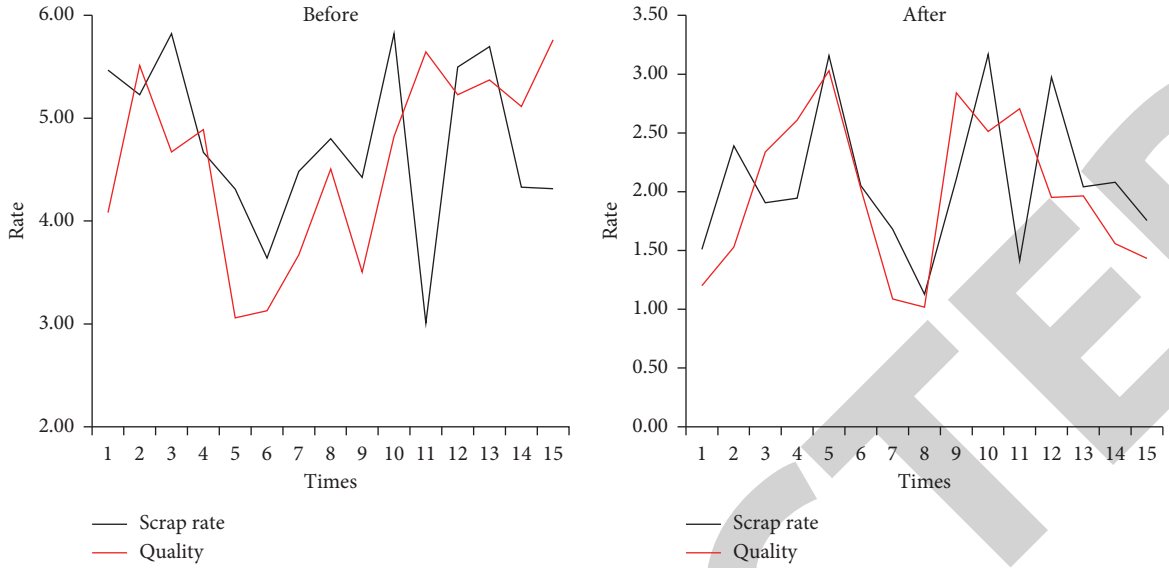

Figure 10: The quality of alumina ceramic tube.

5. Conclusion

With the development of information technology, computers and networks are slowly used in factories to automatically store process information, and it can be promoted and applied. With the rapid development and progress of science and technology, especially computer and network technology, people continue to adopt more advanced methods to improve work performance, to obtain or maintain competitive opportunities in order to maintain sustainable survival and development capabilities. The development of the global economy is a transition from growth to growth. The quality control function of the current system is very weak, and it can only manage and analyze the quality after the fact, and it is difficult to prevent the quality beforehand. It is impossible to achieve continuous improvement of the quality system. The information provided by the quality control system can be used to adjust and manage the production process to ensure that the production meets the required product quality. In general, the most fundamental reason why oxide ceramics are difficult to sinter is that the oxide itself has large lattice energy and a relatively stable structure, so the high activation energy barrier must be overcome during the sintering process. The combination of information technology and the operation of ceramic enterprises has itself become an important part of the improvement of ceramic enterprises' technical capabilities. A degree of sharing, transparency, openness, and exchanging distinguishes the traditional departmental function management structure.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares that they have no conflicts of interest.

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