

Chapter 5

Conclusions, Discussions, and Recommendations

Conclusions

Through a combination of qualitative and quantitative analyses, this paper has identified the key factors that significantly influence the quality and product competitiveness of silver powder produced by ABC Company. Based on qualitative findings obtained from literature reviews and in-depth interviews, three primary factors were identified as major contributors to ABC Company's product competitiveness: burning reduction ratio, specific surface area, and particle size diameter.

Building upon the qualitative analysis, this paper proceeds to delve into the specific impact of these three factors on ABC Company's product competitiveness through quantitative linear regression analysis. This analysis is conducted in conjunction with relevant data, including the proportion of ABC Company's products in the product portfolios of major customers, product production costs, profit margins, and market share.

1. Quality of silver powder before and after the implementation of X technology

The research findings focus on evaluating the quality of silver powder before and after the implementation of X technology. After the introduction of X technology, improvements in the quality of silver powder products are evident. The qualified rate increased by 1.16%, and the direct yield improved by 0.39% compared to the first six months of 2022. These findings corroborate insights gained from interviews, highlighting the importance of specific surface area, particle size distribution, and ignition loss in assessing silver powder quality. Specific surface area represents the surface area per unit mass of silver powder, affecting oil absorption in slurry systems. Particle size distribution characterizes the size and distribution of silver powder particles. Ignition loss is a crucial indicator of silver powder's antioxidant performance.

Experts emphasized the significance of these factors, including:

- 1) The larger the specific surface area, the smaller the particle size of silver powder, which impacts the subsequent customers' silver slurry's oil absorption. Ignition loss affects silver powder purity, and particle size distribution reflects dispersibility.

2) It's essential as a control indicator in our production process.

3) Specific surface area affects the oil absorption rate in the slurry system, and particle size distribution is vital for dispersion. Ignition loss is crucial for conductivity and antioxidant performance.

The relationship between these indicators and silver powder quality is substantial. A larger specific surface area increases photoelectric conversion efficiency in solar cells but should be controlled within limits. Smaller particle size distribution enhances slurry conductivity, but extremes can affect battery performance. Managing ignition loss is essential for conductivity, oxidation resistance, and photoelectric conversion efficiency.

Control over specific surface area and particle size distribution has improved after implementing X technology, resulting in a more stable product quality. However, there are no clear industry standards or guidelines for specific surface area, particle size distribution, and ignition loss in silver powder. ABC Company establishes its own technical control standards based on customer requirements and product performance.

2. Production cost and profit margin of silver powder products after the application of X technology by the ABC Company

1) Production Cost

After the application of X technology by ABC Company, there was a slight increase in the production cost of silver powder products. The key factors influencing production costs include the price of metal silver, the cost of auxiliary materials, product quality, production processes, equipment, energy consumption, and production efficiency. The manufacturing cost per 1kg of silver powder increased from RMB 152.79/kg in 2022 to RMB 157.88/kg in 2023. However, it is expected that production supply improvements will lead to a decrease in manufacturing costs throughout 2023. X technology primarily optimized the reduction ratio in the burning process to reduce production costs, aligning with customer safety requirements and achieving cost savings alongside enhanced customer appeal.

2) Profit margin

ABC Company experienced an increase in profit margins for silver powder products after implementing X technology. The sales price of silver powder increased by 20 RMB per kilogram, resulting in a 33.82% year-on-year increase in profit margins.

Sales data indicated consistent growth in ABC Company's sales, and the application of X technology contributed to an increase in market share. Initially, challenges in cost management and profitability were encountered during the implementation of X technology, which included R&D investments, increased production costs, and

lengthy customer verification cycles. However, ABC Company successfully addressed these challenges through collaboration with customers like Guangzhou Ruxing, resulting in the creation of a new growth point in the solar photovoltaic field for the company.

In conclusion, the adoption of X technology led to increased profitability and market share for ABC Company's silver powder products, despite the initial cost challenges.

3. Benefits of applying X technology to ABC Company competitiveness, in terms of customer product system, production cost, profit margin and market share

The research findings emphasize the benefits of integrating X technology into ABC Company, particularly regarding its effects on customer product systems, production costs, profit margins, and market share.

1) Customer Product System

The adoption of X technology has led to significant changes in the impact of ABC Company's silver powder products on the customer's product system. The reduction ratio has gained prominence, indicating its increased importance and effectiveness, while the significance of specific surface area and particle size diameter has diminished. Customers now prioritize safety aspects, reflecting their trust in ABC Company's product quality.

X technology has reduced customer complaints and lowered return and exchange rates, contributing to enhanced customer satisfaction. Improvements include higher product quality levels, a stable supply, reduced inventory occupation, and a decreased retest rate. The stability of the production process and an increased product qualification rate have been noted.

2) Production cost and profit margin

X technology has had a positive impact on the production cost and profit margins of silver powder products. The influence of the reduction ratio on profit margins has increased significantly, making it a primary driver of profitability. The market's focus on particle size diameter differs from the preferences of ABC Company's main customers, suggesting room for further optimization

3) Market share

The adoption of X technology has led to various changes in ABC Company's market share. The influence of the reduction ratio on market share has increased, signifying its recognized value in optimizing product performance. The influence of the specific surface area on market share has remained consistent, while the particle size diameter has gained importance. ABC Company has gained new customers, such as

Wuxi Ruxing and Wuhan Shuomite, resulting in increased sales volume and an expanded market share. Collaborative efforts with customers have addressed challenges, leading to rapid product research and development.

4) Overall impact

X technology has improved product quality, reduced production costs, increased profit margins, and expanded market opportunities. The application of X technology has had a positive impact on ABC Company's competitiveness in the silver powder industry. This research employs quantitative analysis methods to measure the effects of X technology on various indicators, including burn reduction ratio, specific surface area, and particle size diameter. The findings illustrate how the technology enhances product quality, cost-effectiveness, profitability, and market positioning, establishing it as an asset for ABC Company in the competitive silver powder industry.

Discussions

1. Discussion of quality of silver powder before and after the implementation of X technology

The research findings shed light on the noteworthy improvements in the quality of silver powder products following the introduction of X technology. This section primarily focuses on evaluating the quality of silver powder both before and after the implementation of X technology, offering valuable insights into the enhancements observed.

One of the key findings highlighted in the research is the significant increase in the qualified rate of silver powder products. The qualified rate experienced an impressive boost of 1.16% after the introduction of X technology. Additionally, the direct yield, a crucial indicator of production efficiency, exhibited an improvement of 0.39% when compared to the first six months of 2022. These results unequivocally demonstrate the positive impact of X technology on the quality and efficiency of silver powder production processes.

These findings align with the insights gleaned from interviews with industry experts. The interviews underscored the critical role played by specific surface area, particle size distribution, and ignition loss in assessing silver powder quality. Specific surface area, which quantifies the surface area per unit mass of silver powder, was identified as a key factor influencing oil absorption in slurry systems. Particle size distribution, on the other hand, characterizes the size and distribution of silver powder

particles, with significant implications for dispersibility. Ignition loss, an indicator of silver powder's antioxidant performance, emerged as a vital parameter.

Industry experts emphasized several dimensions of these factors:

1) Specific Surface Area, these research findings and expert opinions concur on the importance of specific surface area. A larger specific surface area enhances photoelectric conversion efficiency in solar cells, a critical consideration in the solar energy industry. However, experts caution that this parameter should be controlled within defined limits to optimize performance effectively.

2) Particle Size Distribution, smaller particle size distribution was identified as a factor that enhances slurry conductivity, a critical factor in battery performance. However, extremes in particle size distribution can adversely affect battery performance. This highlights the need for careful control and optimization in silver powder production.

3) Ignition Loss, the role of ignition loss in conductivity, oxidation resistance, and photoelectric conversion efficiency was underscored by experts. This parameter is integral to ensuring the desired performance of silver powder products in various applications.

The research also acknowledges that control over specific surface area and particle size distribution significantly improved after the implementation of X technology. These improvements contribute to a more stable product quality, making the silver powder products more reliable and consistent in their performance.

However, it's worth noting that the research points out the absence of clear industry standards or guidelines for specific surface area, particle size distribution, and ignition loss in silver powder. Instead, ABC Company relies on its own technical control standards, which are tailored to meet customer requirements and optimize product performance.

In support of these findings, previous research articles have similarly emphasized the critical role of specific surface area in enhancing photoelectric conversion efficiency in solar cells (Chen, et al., 2023, pp. 18592-18604; Lim, et al., 2015, p. 11922). Additionally, studies by Jeon (2021, p. 100976) have highlighted the importance of controlling particle size distribution in improving battery performance. These findings corroborate the present research's emphasis on these quality parameters.

The implementation of X technology has brought about substantial improvements in the quality of silver powder products, as evidenced by increased qualified rates and enhanced direct yield. The research underscores the significance of specific surface area, particle size distribution, and ignition loss in assessing silver

powder quality and demonstrates the positive impact of X technology in optimizing these parameters. While industry standards may be lacking, ABC Company's commitment to establishing its own technical control standards ensures that its silver powder products meet the highest quality standards and customer requirements.

2. Discussion of production cost and profit margin of silver powder products after the application of X technology by the ABC Company

The research findings indicate that the application of X technology has significant implications for both the production cost and profit margin of silver powder products produced by ABC Company. In this discussion, we delve deeper into these aspects while drawing insights from other relevant research articles to contextualize the findings.

After implementing X technology, ABC Company observed a slight increase in the production cost of silver powder products. This increase can be attributed to various factors, including the price of metal silver, auxiliary materials cost, product quality, production processes, equipment, energy consumption, and production efficiency. These findings align with the research conducted by Plotkin, et al. (2017, pp. 4064-4071), who emphasized the multifaceted nature of production costs in the manufacturing industry. Their study highlights that the cost of raw materials, production processes, and equipment maintenance can all impact production expenses.

The specific focus on optimizing the burning reduction ratio through X technology is noteworthy. This optimization aimed to reduce production costs, aligning with customer requirements. This observation aligns with the study by Scherrer-Rathje, et al. (2009, pp. 79-88), which emphasized the importance of process optimization in reducing manufacturing costs while meeting customer demands for product safety.

Despite the initial increase in production costs, it is encouraging to note that the research anticipates a decrease in manufacturing costs throughout 2023. This expected decrease is likely due to the improved production supply resulting from the application of X technology. This observation corroborates with the findings of De Treville, et al. (2004, pp. 613-627), who stressed the importance of supply chain improvements in reducing manufacturing costs over time.

ABC Company experienced a notable increase in profit margins for silver powder products following the implementation of X technology. This increase was primarily driven by a higher sales price per kilogram of silver powder, resulting in a substantial year-on-year profit margin growth of 33.82%. Such a profit margin boost is indeed remarkable and indicates the effectiveness of X technology in enhancing the market value of ABC Company's products. This finding aligns with the research by

Löfsten (2014, pp. 61-84), which explored the relationship between product innovation and profit margins. Their study found that companies that introduce innovative technologies into their products can command higher prices, leading to improved profit margins.

The sales data reflecting consistent growth in ABC Company's sales is also in line with the study by Ahearn, et al. (2004, pp. 297-310), which discussed the positive impact of technology adoption on sales performance. In their research, they observed that companies that embrace advanced technologies often experience increased sales and market share.

The challenges faced during the initial implementation of X technology, such as R&D investment, increased production costs, and long customer verification cycles, are not uncommon in technological transitions. These findings echo the insights provided by Bhatnagar, et al. (2022, pp. 1-45), who emphasized the need for companies to navigate initial challenges when adopting new technologies. Successful collaboration with customers, as exemplified by ABC Company's partnership with Guangzhou Ruxing, is crucial in overcoming these challenges.

The application of X technology has yielded substantial benefits for ABC Company in terms of production costs and profit margins. While there were initial cost challenges, the long-term advantages, including increased profitability and market share, outweighed these obstacles. This research underscores the importance of technological innovation in enhancing the competitiveness of manufacturing companies in the ever-evolving market landscape.

3. Discussion of benefits of applying X technology to ABC Company competitiveness, in terms of customer product system, production cost, profit margin and market share

The research findings on the benefits of applying X technology to ABC Company's competitiveness offer valuable insights into how technological advancements can impact various aspects of a company's operations. This discussion will delve deeper into these findings, drawing upon other research articles to provide additional context and support.

The research reveals that the adoption of X technology has led to significant changes in ABC Company's silver powder products' impact on the customer's product system. The increased prominence of the reduction ratio highlights its effectiveness in improving product quality and safety. This observation aligns with studies in materials science, where optimizing particle properties, such as reduction ratios, has been shown to enhance product performance (Yancey, et al., 2013, pp. 85-94). The reduced customer complaints and lower return and exchange rates post-X technology adoption

underscore the technology's positive impact on customer satisfaction. This resonates with research on customer relationship management, where improved product quality and fewer defects are linked to higher customer satisfaction levels (Matzler & Hinterhuber, 1998, pp. 25-38).

The research findings emphasize that X technology has positively affected production costs and profit margins. The increased influence of the reduction ratio on profit margin signifies its role as a primary driver of profitability. This phenomenon is consistent with studies on cost optimization in manufacturing, where refining production processes can lead to cost reductions and improved margins (Van & Vis, 2007, pp. 282-292). However, the difference in market emphasis on particle size diameter compared to ABC Company's main customers raises interesting questions. Further research could explore market segmentation and preferences in the silver powder industry to understand these variations in emphasis.

The research findings suggest that the adoption of X technology has resulted in varying changes in ABC Company's market share. The increased influence of the reduction ratio on market share indicates that the market recognizes its value in optimizing product performance. This corroborates previous studies on the importance of product quality in gaining market share (Porter, 2011, p. 148). The acquisition of new customers, such as Wuxi Ruxing and Wuhan Shuomite, highlights the technology's role in expanding market opportunities. The collaborative efforts with customers resonate with studies on supply chain partnerships, emphasizing how cooperation can lead to mutually beneficial outcomes (Chakraborty, et al., 2014, pp. 676-694).

The research underscores that X technology has multifaceted benefits for ABC Company, including improved product quality, reduced production costs, increased profit margins, and expanded market opportunities. These findings align with the broader literature on technology adoption and innovation, where the successful integration of technology can drive competitive advantage (Betz, 2003, pp. 68-72). This study demonstrates the significant role of technology in shaping competitiveness within the silver powder industry. While it emphasizes the importance of the reduction ratio, it also hints at the need for a nuanced understanding of market dynamics. Future research could explore the long-term sustainability of these benefits and delve deeper into the interplay between technology, customer preferences, and market share.

Recommendations

1. Practical Recommendations

1) Further optimize the burning reduction ratio process

It is evident from the results of quantitative analysis that ABC Company's primary customers were particularly interested in the combustion ratio technology. Furthermore, this technology had the potential to optimize costs and profits for the company. Therefore, in the current era of rapid changes in the silver powder product market, ABC Company should consider further refining this process to capture product orders from its major customers and to accrue sufficient capital for the company's future development. ABC Company should focus on ongoing process improvement efforts, particularly in terms of the combustion reduction ratio. Regularly assessing and optimizing this ratio can lead to reduced production costs and increased profitability over time.

Simultaneously, ABC Company should aim to establish a more robust technical advantage by breaking through and optimizing this technology. This will enable the company to possess a stronger technological competitive edge as it enters broader markets in the future. As technology evolves, ABC Company should invest in ongoing research and development efforts to stay at the forefront of innovation. This includes exploring new technologies that can further improve product quality and production efficiency.

2) Formulate the future market development strategy

ABC Company's future development strategy cannot rely solely on securing product orders from major customers. To expand the company's market presence, it is imperative to transform its own products into offerings that align with market demand and exhibit competitive advantages. Quantitative analysis results indicate that the market continues to prioritize product particle size and diameter. Therefore, in ABC Company's future development efforts, it is essential to both proactively address evolving market demands for product characteristics and make timely enhancements to the production process. This approach will enable the company to gain a stronger competitive edge over industry rivals and increase its market share for its own products.

The successful collaboration with customers like Guangzhou Ruxing highlights the importance of strong customer relationships. ABC Company should continue to engage with customers to understand their evolving needs and preferences, which can drive product innovation and strengthen market share.

To address the variation in market emphasis on particle size diameter compared to customer preferences, ABC Company should conduct market segmentation analysis. This will help tailor product offerings to different customer segments and capture a broader market share.

2. Future Research Recommendation

1) Due to my knowledge level, cognitive ability, and experience in the process of market analysis of silver powder products at ABC Company, as well as the limited time and other factors, there may be a certain lack of primary data on major competitors' business data, market share, and specific marketing strategies when analyzing the influencing factors. Although it is possible to predict relevant data through the official website, field visits, and on-site consultation data, the availability of data in this area should be further enhanced in the future.

2) Investigating the role of supply chain optimization is imperative for ABC Company to reduce production costs and enhance production efficiency. This endeavor involves a comprehensive assessment of the supply chain, identification of cost drivers, implementation of lean principles, closer collaboration with suppliers, adoption of advanced demand forecasting tools, technology integration, logistics optimization, risk mitigation strategies, and a continuous improvement culture. By optimizing the supply chain, ABC Company can streamline processes, reduce waste, and negotiate favorable terms with suppliers, resulting in significant cost savings and improved competitiveness in the silver powder industry.

3) Future follow-up research should further strengthen the research and analysis of the silver powder product market and then formulate more accurate, practical, and competitive marketing strategies according to the available resources. This will provide a better theoretical basis and practical experience for the development strategy of silver powder products with differentiated market positioning and precise target marketing. Investigate the long-term sustainability of the benefits brought by X technology. Analyze how these improvements evolve over several years to ensure that they contribute to the company's long-term competitiveness and are not short-lived.