

Implementation of an integrated management system in calcium soda production

B Ametova^{1*}, *G Boboyev*¹ and *N Djumaniyazova*²

¹Tashkent State Technical University, 2, University Street, Tashkent, 100095, Uzbekistan

²Karakalpak State University named after Berdak, 1, Abdirova street, Nukus, 230112, Karakalpakstan, Uzbekistan

Abstract. By amalgamating these essential pillars, the integrated management system endeavors to revolutionize the calcium soda production paradigm, ensuring harmonious coexistence between economic progress and ecological responsibility. This manuscript will explore the key components, challenges, and potential benefits of integrating such a system while shedding light on the transformative impact it can have on the industry as a whole. As we embark on this journey towards a more sustainable and efficient future, the implementation of an integrated management system emerges as a cornerstone in shaping the trajectory of calcium soda production and contributing to a greener and safer world. This article highlights the significance of integrating standards in the soda ash production process, focusing on improving product quality, ensuring competitiveness, and meeting high demand in domestic and foreign markets. It also explores the development and implementation of a quality management system (QMS) based on the ISO 9001:2015 standard. Additionally, the advantages and disadvantages of obtaining SMT certification for compliance with international ISO standards are discussed.

1. Introduction

In the dynamic landscape of modern industrial processes, the pursuit of efficiency, sustainability, and safety remains paramount. In the domain of calcium soda production, a crucial sector supporting various industries, the drive to optimize operations and enhance overall performance has led to the advent of an integrated management system (IMS) [1, 2]. This manuscript delves into the intricacies of implementing an innovative IMS within the context of calcium soda production, focusing on its multifaceted approach that synergizes quality management, environmental stewardship, and occupational safety [3].

Nowadays, there is a significant demand for the implementation of an integrated management system in industrial sectors and enterprises involved in production. The reason behind this demand stems from the importance of introducing an integrated management system to enhance the demand, quality, and competitiveness of manufactured products in both domestic and foreign markets [4]. Considering these relationships, it becomes a priority to introduce an integrated management system to improve the quality of the main product, calcined soda, produced by one of the largest industrial enterprises in our country, and to increase the volume of exports and imports [5, 6].

An integrated management system (IMS) refers to the combination of two or more management systems within an organization that comply with the requirements or recommendations of national and/or international standards for management systems [7-10]. These integrated systems may have fully or partially integrated elements within the organization or production enterprises. Essentially, an integrated management system can be seen as a comprehensive package that consolidates various management systems and processes to ensure efficient and effective operations.

2. Materials and methods

The Kungirov soda factory, the only one in Central Asia and located in Uzbekistan, utilizes table salt extracted from the Barsakelmes salt mine situated on the Ustryurt plateau. The Barsakelmes mine holds a total reserve of 131

*Corresponding author: biybidas@mail.ru

million tons of table salt, with an average NaCl content of 96.32%. The upper deposits, with a thickness of up to 1.08 meters, are of superior quality and primarily intended for usage.

Calcined soda finds extensive applications in various industries, including the chemical industry, glass production, non-ferrous metallurgy, petrochemical industry, food industry, meat and dairy industry, light industry, medicine, pulp and paper industry, and ferrous metallurgy. It is widely employed in the manufacturing of synthetic detergents, everyday household use, water and saltwater purification, and more [1]. The "Kunkiro Soda Plant" produces calcined soda using the ammonia method. Until recently, the ammonia method held a monopoly in soda production, accounting for 100% of soda production worldwide. However, its current share has decreased to approximately 60%.

In today's global market, compliance with international standards is crucial for enterprises to enhance product quality, meet demand, and address various important aspects such as quality, ecology, energy efficiency, safety, social responsibility, and food safety. Integration of these requirements into the organization or enterprise is necessary for sustainable development and achieving goals. This involves implementing energy-saving measures, establishing ecology management systems, ensuring high-quality products through quality management systems, and ensuring work safety systems to achieve competitiveness.

Table 1. Production of calcified soda by ammonia method.

Advantages	Disadvantages
1) raw ingredient (salt and limestone) availability, distribution, large reserves and cheapness;	1) raw from the material low level use (sodium only from three two part, calcium and chlorine while in general not used)
2) the main reactions, in addition to burning limestone, continue at low (up to 100°C) temperatures and atmospheric pressure;	2) a large amount of solid and liquid waste requiring disposal, disposal or long-term storage;
3) stability of technological processes;	3) significant consumption of energy resources;
4) high quality products,	4) large specific capital investments, in connection with this, the payback period of the enterprises built is long.
5) relatively cheap soda water.	

In many cases, an Integrated Management System (IMS) is already in place and well-known. It combines various aspects such as quality management system, ecological system, and tools for analysis to meet the demands of the enterprise. However, in situations where the IMS is not effectively implemented in the organization, disadvantages and challenges may arise.

3. Results and discussion

The concept of an integrated management system combines or summarizes all aspects of an organization's activities into a common management system, addressing the indeterminate needs of the organization. This concept involves integrating different management systems such as quality management system, environmental management system, energy efficiency, and others. This process can be complex but is necessary in practice to align with international management standards. However, it should be noted that financial management, employee management, innovation risk management, and other specific areas are not covered by the integrated management system alone.

The implementation and utilization of management systems offer several advantages, including:

- **Increased production capacity:** By streamlining processes and optimizing operations, management systems can enhance productivity and output.
- **Development of a single coordinated management structure:** Integrating various management systems fosters a cohesive and unified structure within the organization, promoting effective communication and decision-making.
- **Cost reduction:** Implementing an integrated management system can lead to cost savings in terms of development, operation, and certification, as it eliminates duplication of efforts and reduces administrative burdens.
- **Process integration:** An integrated management system allows for the integration of multiple processes, such as planning, management analysis, document management, training, education, and internal audits. This integration enhances efficiency and effectiveness.
- **Enhanced adaptability:** Management systems facilitate greater mobility and adaptability to changing conditions, enabling organizations to respond effectively to evolving market demands and requirements.

For consumers, stakeholders, and investors, the joint implementation of a system of standards can significantly reduce costs and expedite the implementation of systems, leading to improved customer satisfaction and increased stakeholder confidence.

In the context of Uzbekistan's efforts to join the World Trade Organization and establish its position in the international community, it becomes imperative to create an Integrated Management System (IMS) in accordance with the requirements of relevant international standards.

To address specific management challenges and ensure compliance with international standards, the following management systems should be implemented by the enterprise (Fig. 1):

- Quality Management System (QMS) according to ISO 9001: This system focuses on solving quality management problems and ensuring consistent product quality, customer satisfaction, and continuous improvement.
- Environmental Management System (EMS) according to ISO 14001: This system helps the enterprise manage the environmental impact of its production processes, minimize pollution, and promote sustainable practices.
- Energy Management System (EnMS) according to ISO 50001: The EnMS enables the enterprise to improve energy efficiency, optimize energy use, and reduce energy consumption, leading to cost savings and environmental benefits.
- Occupational Health and Safety Management System (OHSMS) according to OHSAS 18001: This system ensures the creation of safe and healthy working conditions, reduces workplace accidents and incidents, and promotes employee well-being.
- Social Responsibility System according to SA 8000: The SA 8000 system addresses social aspects such as labor rights, social security, charity support, business ethics, and the implementation of social guarantees, thereby fostering a responsible and ethical work environment.
- Information Security Management System (ISMS) according to ISO 27001: This system safeguards the organization's confidential information, manages risks, and ensures data security and privacy.
- Food Safety Management System according to ISO 22000: Specifically applicable to food and pharmaceutical companies, this system ensures product safety, cleanliness, hygiene, and compliance with food safety regulations.
- Market Research and Customer Satisfaction System according to ISO 20252: This system focuses on studying consumer requirements, market trends, public opinion, and social issues to facilitate the production of competitive products that meet customer demands.

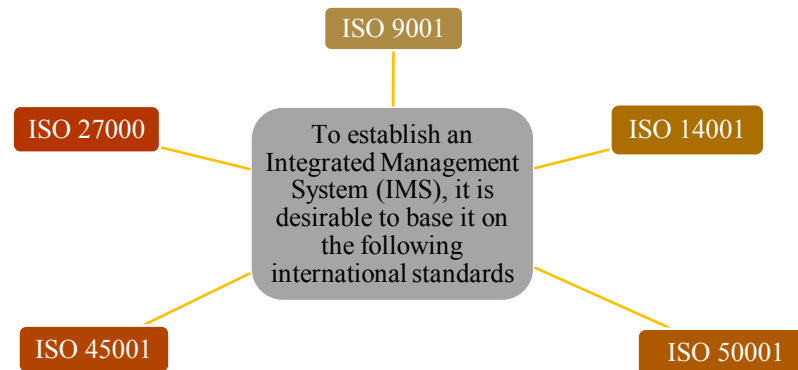


Fig. 1. Integrated Management System (IMS).

It is worth noting that positive dynamics in terms of financial stability and profitability are crucial factors for the sustainable development of any enterprise, although they are not directly tied to specific management systems. In practice, it is indeed uncommon to implement both ISO 9001 and ISO 14001 management systems simultaneously in a complex. This is mainly due to the historical precedence of the ISO 9001 series of standards and the stronger market influence on the need for quality management system certification. However, the emergence of the "green economy" has brought its own adjustments and highlighted the importance of environmental management.

Most international standards today emphasize the need for harmonious integration of various management systems within the overall framework of the enterprise. Among the commonly used standards, ISO 9001 (QMS) and ISO 14001 (EMS) are often considered for potential combination.

With the increasing globalization of supply chains and the complex nature of modern products, which often involve materials, components, and parts from various countries, the role of integrated management systems (IMS) for product quality, safety, and environmental compliance becomes more crucial. Such systems need to account for environmental requirements and legislation related to environmental protection.

Considering the aforementioned standards and aligning them with the requirements of the business development strategy, it is possible to create a modern integrated management system (IMS) for the enterprise that focuses on the concept of sustainable development. This integrated approach can help the organization effectively manage quality, environmental impact, and other aspects of its operations to ensure long-term viability and contribute to sustainable practices. In addition to the advantages of creating highly integrated management systems, there are several benefits for the internal environment of the organization:

- Ensuring consistency of actions: Integrated management systems promote coordinated actions within the organization, where the collective result of agreed-upon actions is greater than the sum of individual efforts.
- Minimizing functional fragmentation: Developing separate management systems can lead to fragmentation within the organization. Integrated management systems help minimize this fragmentation by aligning processes and functions.
- High level of employee participation: Integrated management systems foster a culture of employee engagement and involvement in improving the organization's activities. This leads to increased motivation, ownership, and collective commitment to achieving organizational goals.
- Reduction in document size: Compared to maintaining multiple parallel systems, integrated management systems typically require fewer documents. This reduces the overall size of the management system documentation and simplifies its management.
- Cost savings: Integrated management systems can result in cost savings in terms of development, operation, and certification. Consolidating multiple systems into one reduces the overall costs associated with maintaining and managing separate systems.

Furthermore, an integrated management system certificate brings several benefits in the external environment, enhancing the competitiveness and reputation of the enterprise:

- Protection from foreign competitors: A certified integrated management system provides reliable protection against foreign competitors, particularly as Uzbekistan enters the World Trade Organization (WTO).
- Positive public opinion: A certified integrated management system contributes to a positive perception of the enterprise, signaling reliability, stability, and a high level of development to the public.
- Enhanced reputation and status: The certification elevates the enterprise's level of respectability, positive image, and overall status in the business community.
- Access to investments and preferential loans: The enterprise with a certified integrated management system gains timely access to investments and preferential loans, meeting the requirements set by investors regarding quality management, environmental protection, and labor safety.
- Competitive advantage: An integrated management system certificate provides a significant advantage over competing organizations, all else being equal, in terms of reliability, compliance, and commitment to sustainable practices.
- Insurance contracts and municipal/state orders: A certified integrated management system enables the conclusion of insurance contracts at minimum interest rates and facilitates the receipt of municipal and state orders.
- Simplified regulatory processes: Organizations with certified integrated management systems benefit from simplified procedures for obtaining permits, licenses, and other necessary approvals.

The implementation of any enterprise development strategy, whether it involves increasing production volume, expanding sales geography, or establishing a network of mobile branches in domestic and foreign markets, requires a clear definition of objectives. This includes defining the desired output and establishing relationships between management and employees within the framework of strategic goals.

The quality management system plays a crucial role in this process. It encompasses activities that enable enterprises to set goals, identify processes, and allocate resources to achieve desired results. By optimizing the use of resources and considering both short-term and long-term consequences, the quality management system allows enterprise management to make informed decisions. It helps manage production processes and identify both intended and unintended outcomes in the delivery of products or services.

Quality, in this context, is a public assessment that reflects the level of consumer satisfaction under specific consumption conditions. It encompasses the overall characteristics that manufacturers intend for their products in these conditions.

Internal audits of the quality management system have the task of assessing the conformity of quality-related activities with planned indicators. They also involve systematic and independent analysis to evaluate the effectiveness of the quality management system and its ability to achieve the enterprise's goals and objectives. By continuously improving the quality management system, the management apparatus strengthens control over its operation, coordinates the work of departments and services, assigns responsibilities to executives, and identifies challenges in a timely manner.

In summary, the establishment of a comprehensive enterprise management system requires clear goal-setting, effective resource utilization, and continuous improvement of the quality management system. These measures enable better control, coordination, and problem-solving within the organization, supporting the achievement of strategic objectives.

The research findings indicate that the ISO 9000 series of standards should serve as the foundational basis for the creation of Integrated Management Systems (IMS). This is because the concepts and principles articulated in these standards align closely with general management principles. Of particular significance is the process approach, which directly reflects the real processes implemented in modern business, as opposed to the indirect approach taken by the functional approach. It is worth noting that the ISO 9000 series of standards were introduced prior to other international management system standards and essentially laid the groundwork for their methodology.

Presently, there is growing interest among enterprises in implementing integrated management systems. However, it is important to recognize that the primary beneficiaries of such integration are the enterprises themselves, rather than certification bodies.

The value that businesses expect to derive from integrating these systems is contingent on their diligent efforts in developing and integrating management systems. If an enterprise genuinely desires to enhance management quality and significantly improve the competitiveness of its products in the market, it should approach the development and integration of management systems as a rigorous and serious process.

Integration and standardization of process-oriented management systems are crucial trends in contemporary corporate management. The first trend involves the creation of integrated management systems that encompass quality management, environmental management, and occupational health and safety management, adhering to the ISO 9001, ISO 14001, and ISO 45001 standards, respectively [1].

The second trend focuses on the development of industry-specific modifications to the ISO 9001 standard, which incorporate specialized requirements for quality, safety, environmental cleanliness, and other relevant factors within a particular field. In the soda ash production industry, for instance, the ISO 9000 standard, along with ISO 14001, ISO 50001, and ISO 45001, may be applicable [2].

To fully realize the benefits of these trends, it is essential to have an effective quality management system (QMS) in place, as it serves as the foundation for modern corporate management systems. However, in the context of Uzbekistan's enterprises, there are challenges to be addressed. Local experts in the field of quality have observed that existing QMS in enterprises are utilizing no more than 10% of their potential [2]. Despite the declaration of commitment to the Total Quality Management (TQM) concept by many enterprises, the practical implementation of quality management principles falls short, as evidenced by the analysis of experiences of quality award winners [3]. Underutilization of components such as integration and standardization within the systems approach is one contributing factor.

The success of an organization hinges on meeting the needs of all interested parties, with the consumer being the primary stakeholder. However, it is important to recognize that different stakeholders have different needs. From the consumer's perspective, quality can be understood in three main dimensions (Fig. 2): timeliness (reliability), suitability for the intended purpose (safety), and potential for further development (value).

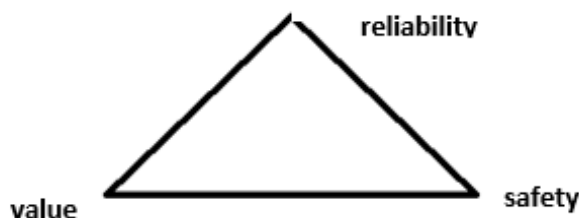


Fig. 2. Representation of quality for the consumer

Indeed, the aspects of quality mentioned earlier play a significant role in shaping the consumer's perception of an enterprise and influencing their attitude towards it. From the perspective of the enterprise, quality encompasses

various components that have direct implications for its overall performance, including profit, costs, and risk (Fig. 3).

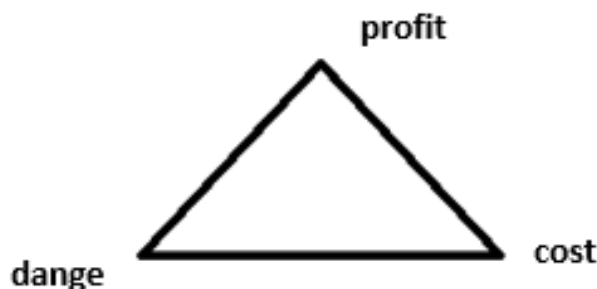


Fig. 3. Representation of quality for the enterprise.

The analysis highlights two main options for the practical creation of integrated management systems (IMT):

- Creation of IMT models of additions: This option involves integrating additional management systems, such as environmental management system (EMT), OHSAS system, SA 8000, HACCP, GMP, or FSC, into an existing quality management system (SMT). With this approach, the implementation of each system may occur separately over a period of time ranging from six months to several years. This incremental approach allows organizations to address specific management areas in a phased manner.
- Creating fully integrated models: In this option, all control systems, including SMT, EMT, OHSAS, SA 8000, HACCP, GMP, and FSC, are integrated into a single complex simultaneously. Although this option offers undeniable organizational and economic advantages, it is less common in practice. One of the main reasons for its limited adoption is the historical development of these management systems. The implementation of SMT began in 1987 with the ISO 9000 series standards, while other systems such as HAPPS, GMP, ISO 14000, OHSAS, SA, and FSC standards were introduced at different times during the 1990s.

4. Conclusions

In conclusion, it is important to emphasize that in order to enhance management efficiency and improve the quality of products and services, organizations should provide the necessary resources and foster a culture of readiness for change and acceptance. The integration of standards into management systems can be based on general requirements found in each standard, including policies, planning, performance and use, performance evaluation, improvement, and management review.

Improving the quality management system (SMT) should aim to ensure efficient production of quality products, fulfill state orders, engage employees, and establish a positive reputation among consumers. In many cases, it is possible to integrate multiple standards with similar structures into production enterprises, such as ISO 9001, ISO 14001, ISO 45001, ISO 22000, and ISO 50001.

Implementing integrated management systems based on these international standards offers several advantages, including increased resource efficiency, optimized costs, reduced response time to deviations and incidents, enhanced coordination within the organization, improved company image, alignment of policies and goals to reduce conflicts between management systems, risk reduction, and streamlined organizational processes.

An effective approach to creating an optimal integrated management system is to utilize a balanced scorecard (BSC) that focuses on four key components: finance, customer satisfaction, business process efficiency, and personnel training and development. By organizing appropriate business processes and providing employee training, organizations can demonstrate planned financial growth and the integration of customer-oriented quality management systems as a "chain of profitability" for the enterprise.

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