

Proposing a Holistic Physical Asset Management Strategy to Implement in Food and Beverage Industries in South Africa

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Abstract

Due to the increased demand for high-quality products, quality has been identified as the key to success in many food and beverage manufacturing organizations. In order to fulfil the customer's/consumer's demand for high-quality products, not only quality, but delivery time and cost need to be considered as the production process of the food industry requires continuous operation of production line equipment. Thus, a good asset management system is important for a manufacturing organization to enhance its competitiveness. For this reason, ISO 55000 series of international standards are advised to provide a standardized framework for an asset management system. Although many food and beverage industries strive to continuously improve operations, external factors are outing the industry under pressure to maximize production capacity, improve product quality, and better align assets to market dynamics. Thus, responding to this pressure, a holistic asset management strategy that focus on asset care is suggested to the food and beverage industry, hence this study investigates this statement. In attempt of implementing ISO 55000 alongside total quality management (TQM), this study propose that a holistic physical asset management strategy will be achieved. This would enable the organizations to develop and sustain within this competitive environment by aiming to earn the status Best-in-Class. A business case for the holistic approach was developed, engaging the examination of the requirements, objectives, organization alignment, financial benefits and the impact that this approach will generate. This study therefore endeavour to improve overall organization excellence in developing countries as well as aims to inform relevant South African food and beverage organizations on the topic of the need and importance to implementing a holistic asset management strategy as it represents a potential source of improvement.

Keywords: Holistic strategy, physical asset management, TQM, food, beverage.

1. Introduction

Competitiveness has been identified by various authors as the driving force behind the revolution of global business (Kedar, *et al.*, 2008; Bello-Pintado & Merino-Diaz de Cerio, 2010; Islam & Haque, 2012). Due to the globalization of markets and increased competition, characterized by both technology push and market pull, has forced the manufacturing organizations, especially the food and beverage manufacturing sectors, to achieve abundant performance by continuously improving their processes and products (Nayak, *et al.*, 2013). Thus, the growth and survival of these manufacturing industries depend on techniques and management practices currently implemented by the organization (Kedar, *et al.*, 2008). In order for the organization to become cost effective, responsive in operation and meet the requirements of customers in the constantly competing environment, the techniques and management practices must be properly implemented (Kedar, *et al.*, 2008).

Since the last thirty years, quality has been classified as an important driver in the international market of food and beverages which forced manufacturing organizations to search for effective strategies to achieve optimal quality due to rigorous customer-defined quality thresholds and stricter regulatory requirements (Desai & Desai, 2006). Therefore, numerous researchers suggested that Total Quality Management, an improvement program, is a philosophy which is widely accepted for continuously achieving quality improvements in all aspects of business (Desai & Desai, 2006). Apart from TQM, various other quality driven practices such as Total Productive Maintenance (TPM), Just-in-Time (JIT), Lean, six sigma, etc., have been implemented globally. Although these quality improvement programs are currently adopted in many food and beverage organization in developing countries, such as South Africa, demanding customers and active market requirements are forcing these organizations to respond rapidly, with more options and at lower costs than their competitors. These developing countries currently fail to align themselves with forward thinking organizations in the leading market, globally (Desai & Desai, 2006). In order to achieve the product quality goals, manufacturers not only requires

ongoing efforts to improve the product and process quality, but it is also required that equipment operates at peak performance. Furthermore, the food industry may be defined as an asset intensive industry. Thus, reliability and productivity of capital assets is essential to the financial success of the organization.

During the manufacturing of food and beverage products, quality, cost and delivery time has to be considered as the production process in the food industry requires continuous operation of production line equipment (Tsarouhas, 2007). According to Raguram (2014) and Tsarouhas (2007), manufacturing equipment is a major concern of manufacturing organizations as equipment breakdown, repair or quality defects can affect the quality, cost and delivery time of the product. Therefore, considering this statement, it suggested that maintenance activity is important for overall performance and optimization of the asset life cycle (AberdeenGroup, 2006). This leads to an increase in regulatory compliance requirements. Thus these organizations has to urgently stride towards developing holistic and long term asset management strategies to ensure operational excellence (optimal manufacturing response) (AberdeenGroup, 2006).

2. Need of implementing physical asset management in the food industry

Currently, food industries in the developing country South Africa are implementing reactive maintenance strategies and are paying more attention to total productive maintenance (TPM) and total quality management (TQM) as they strive to continuously improve operations to ultimately satisfy customers/consumers (Beardsell & Dale, 1999; Desai & Desai, 2006; Tsarouhas, 2007; Yusuf, et al., 2007; de Villiers, 2014). During the past few years, external factors (such as global competitiveness) are outing the food industry under pressure to maximize production capacity, improve product quality, and better align assets to market dynamics. Thus, responding to this pressure, a holistic asset management strategy that focusses on asset health and fitness is suggested to the food industry. However, to optimize between these demands, manufacturers have to develop and extend best practices in asset management. Therefore, the objective of this study is not to determine which strategy will provide the best service and quality, but instead, the research question is as follows:

- Which strategy will provide better-than-required service and quality while maximizing financial performance?

However, implementing a holistic asset management strategy corresponds to challenges that need to be considered before a final solution may be proposed. The implementation challenges are as follows:

- The manufacturing organization's ability to manage change
- The lack of skilled and unskilled resources
- The lack of communication between departments

In order to make the correct decisions regarding the asset management strategy, this paper aim to clearly define physical asset management, outweighing the advantages and disadvantages of proposed strategies, and creating a business impact which can be sustained over time while considering the culture changes.

3. Understanding Physical Asset Management

In command of outweighing the advantages and disadvantages of four possible solution for understanding, implementing and sustaining a well-structured holistic physical asset environment (*please refer to section 4 – Proposed solutions to create a holistic asset management strategy*), the following discussion aim to give the best fitted definition for physical asset management. This section merely serves as the foundation for contributing to understanding the need for PAM.

3.1 Defining Physical Asset Management

Asset management has been defined by numerous researchers as a strategic and integrated set of comprehensive processes (such as financial, operating, maintenance and engineering) to gain lifetime effectiveness, return from physical assets and utilisation while considering risks (Schneider, *et al.*, 2006; Woodhouse, 2013). In general, asset management strive to focus on providing products or services by using the lowest total life-cycle (AberdeenGroup, 2006). Asset management's ultimate goal is to produce at lower costs than that of the organizations' competitors while delivering higher return on fixed assets (ROFA) to their shareholders. Furthermore, it enables the application of analytical approaches towards managing assets for its entire life cycle; including the conception of need for assets, through its disposal, and even managing the potential post disposal obligations or concerns.

Moreover, all departments within the organization have the responsibility to measure and control associated costs which can only be achieved when knowledge and resources are communicated across departments. This suggests that teamwork and support from top management is important.

In order to understand the physical asset management (PAM) concept, it is important to consider PAS 55 that reflects the publically-available specification to optimize the management of physical assets. This standard was published by the British Standard Institution (Minnaar, et al., 2013). In March 2014 in South Africa, the International Standards Organization (ISO) launched a new draft series of international standards, called ISO 55000, which is based on PAS 55.

For the purpose of PAS 55, asset management is defined as: “systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organizational strategic plan”. Furthermore, PAS 55 defines the strategic plan as the “overall long-term plan for the organization that is derived from, and embodies, its vision, mission, values, business policies, stakeholder requirements, objective and the management of risks”.

According to the ISO 55000 series of standards, Asset management “enables an organization to realize value from assets in achievement of an organizational objective”. Therefore it aims at managing assets to achieve a desired and sustainable outcome. In turn, ISO 55000 defines assets as follows: “An asset is an item, thing or entity that has potential or actual value to an organization”. Thereby this suggests that an asset is extremely important to take into consideration as it directly adds or has the potential to add value.

4. Proposed solutions to create a holistic asset management strategy

Total quality management, total productive maintenance (TPM), PAS 55 and ISO 55000 series of International standards are proposed strategies for obtaining a holistic asset management strategy. These strategies were specifically chosen as they are among the maintenance approaches that aid in improving the overall effectiveness, performance and maintenance functions in a manufacturing organization while it considers the demands of customers/consumers. The following sections define these strategies’ roles, goals and benefits.

4.1 Holistic management strategies

4.1.1 Total quality management

TQM is defined by Islam & Haque (2012) as a strategic tool for manufacturing organizations which aims at delivering high-quality products to their customers. It may also be defined as a holistic management philosophy that strives for incessant improvement in all functions of an organization including three fundamental principles: total – participation of all participants in the value chain; quality – meeting the customer demands and expectations; management – enabling conditions for Total Quality (TQ) (Kaynak, 2003; Yusuf, *et al.*, 2007). It is also emphasised that TQM suggests that customer requirements and business goals are inseparable (Yusuf, *et al.*, 2007). However, this philosophy can only be achieved if the quality concept is utilized from the acquisition of resources to customer service or consumer satisfaction post-sale (Kaynak, 2003).

Contributing to this, TQM is a popular topic amongst manufacturing organizations as it is commonly implemented in firms interested in enhancing their survival prospects by including incessant improvement and quality into their strategic preferences (Hoque, 2003). In general, TQM may be defined as a set of management concepts and tools that focuses on the involvement of managers, employees and workers to yield continuous performance improvements (Hoque, 2003). As summarized by Kynak (2003), management leadership is seen as an important factor in TQM implementation due to its influential factor on other TQM practices thereby improving performance. Additionally, TQM becomes a strategic tool for manufacturing firms to grow and sustain in the extremely competitive business environments as demanded by consumers (Islam & Haque, 2012).

Researchers have previously focused on factors of TQM and its dimensions, suggesting that TQM has hard and soft factors (Islam & Haque, 2012). The hard factors correlates with techniques and tools such as statistically control of processes and problem solving procedures; while the soft factors refers to management practices that correspond to TQM involving a set of principles such as culture, people and advanced improvement (Islam & Haque, 2012).

The application of TQM may vary depending on product category, organizational settings and management philosophies and practices. According to Islam and Haque (2012) in practical business settings, implementation of TQM requires change, resulting in a long term approach. This implies that it might take years to fully realize the results of implementing QM. Thus, several steps must be taken in the process of shifting to QM in an organization.

As mentioned earlier, TQM focuses on long term successes which imply that it takes time to adopt and it requires cultural change within the organization. In fact, in response to implementation of TQM greater responsibilities within the organization is acquired. There is evidence that many manufacturing organizations

attempted to implement the TQM philosophy, but have either abandoned it or failed to gain expected benefits, mostly due to poor knowledge and understanding of TQM, improper involvement of employees in implementing TQM and lack of communication (Islam & Haque, 2012; Jayaram *et al.*, 2010; Huq, 2005). Additionally, many companies have not implemented TQM, fearing that it involves additional investment resulting in production loss (Islam & Haque, 2012). For this reason it is important that the organization fully understand the basic foundation of the implementation process which may be described as the basic understanding on: how to launch the TQM philosophy within the existing culture; how to practice it; and how to sustain with it over time.

Various researchers have conducted empirical studies on the correlation between TQM implementation and organizational performance (Prajogo & Sohal, 2006; Kannan & Tan, 2005). Although these different authors emphasize different techniques and uses different terminology for TQM, all share three common ideas: quality, team work and process improvement. Therefore, Islam and Haque (2012) suggest that to successfully implement TQM, it requires eight pillars to strengthen the foundation of strategic methods. These pillars may be summarized accordingly:

1. Creation of quality management environment
2. Development of teamwork
3. Practice of quality control tools and techniques
4. Focus on customer
5. Focus on supplier relationship
6. Benchmarking
7. Improvement of process
8. Involvement of employee

These pillars must be implemented together for better cohesion (Islam & Haque, 2012). In addition to this, to successfully implement TQM based on these eight pillars, an effective change in an organization's culture is expected. It is almost impossible to change an organization without substantial effort by management aiming for continuous improvement, co-operation and open communication throughout the value chain (Kaynak, 2003 & Yusuf, *et al.*, 2007).

4.1.2 Total productive maintenance

The TPM programme is the cost-effective and proactive approach to maintenance as it stabilizes utilization of machine resources to ultimately reduce waste (Kedar, *et al.*, 2008). This programme is an integrated process, therefore it is required that all levels of the organization participate when implementing this approach; TPM maximizes equipment effectiveness through employee involvement, and integrates the use of autonomous maintenance and small group activities to advance equipment reliability, maintainability and productivity (Brah & Chong, 2004; Pun, *et al.*, 2002). Additionally, it has been found that TPM improves business performance in aspects such as safety and cleanliness, employee morale, customer satisfaction and operations performance (Brah & Chong, 2004). These aspects generally lead to significant improvements in the organization's bottom line. Numerous researchers concluded that maintenance is critical to a manufacturing organization to successfully compete in its market regarding quality, delivery and cost (Brah & Chong, 2004; Kedar, *et al.*, 2008). This clearly implies that maintenance is an investment in improved performance. Thus, the performance enhancements generated by TPM includes the following: improving quality; improving safety; improving dependability and flexibility; and improving lead time (Brah & Chong, 2004).

Contributing to defining the role of TPM, TPM is described by the relationship between maintenance and production to continuously improve product quality, operational efficiency, safety and assurance, and capacity (Tsarouhas, 2007). Another goal of TPM, as described by Tsarouhas (2007), is to improve the design and function of production equipment.

Within the TPM philosophy, general consensus exists and needs to be considered before TPM can achieve its goals. These consensuses include aspects of productive maintenance, the aim of TPM and the *six big losses* of TPM. Brah & Chong (2004) propose that organizations have to first master preventative maintenance, breakdown maintenance corrective maintenance and prediction maintenance in order to achieve productive maintenance. This concludes that a progressive stage of maintenance sophistication is needed in the order of reactive-, scheduled- and preventative maintenance before a TPM philosophy may be reached (Brah & Chong, 2004). Researchers has therefore contended that by achieving the main objective of TPM, will reduce the *six big losses* (Brah & Chong, 2004). The six losses draining productivity consist of set-up and adjustment loss, start-up and yield losses, breakdowns, stoppages, reduced speed, and rework and defects. Brah & Chong (2004) therefore suggests that by reducing these losses an increase of overall equipment efficiency may be expected.

The leadership of management plays a vital role in convincing the employees on the importance of TPM. Addition to this, strategic planning of developing TPM is required to ensure future success. Researches has explored the importance of managerial factors within the manufacturing industries, especially the food industry, and identified that the managerial factors play an important role in TPM implementation. Furthermore, they identified that organizations that have strong process focus, such as high operator involvement, efficient teams and good information tracking systems, are in a better position to implement TPM (Brah & Chong, 2004).

In addition to the performance aspects of TPM, morale and performance of employees is important. If operators and maintenance crew work together as a team, fewer breakdown and higher productivity is expected (Brah & Chong, 2004). Credibly, the morale of these groups of employees becomes even higher if ownership and responsibilities is appointed to the operators.

The approach of implementing TPM in business practices is a long-term process. According to Brah & Chong (2004) it will take years to fully feel the benefit of TPM and he also stresses that TPM will only operate smoothly after the pilot phase, promotion and consolidation phase, and the maturity of implementation phase. Thus, researchers contemplate that three main stages should be considered when implementing the philosophy. The three phases of TPM implementation are as follows:

- Preparation
- Implementation
- Stabilization

The preparation phase involves obtaining relevant top management support and establishing key TPM policies. During the implementation phase, activities such as developing and autonomous programme and extensive training are included (Brah & Chong, 2004). The success of TPM implementation may be described by critical success factors such as: the support of top management; teamwork (TPM teams); continuous improvement; and educating employees (Brah & Chong, 2004; Ragurum, 2014). The TPM manager acts as the product champion who assist in educating and asserting the programme to all levels of management. Moreover, early management training on the TPM approach may aid in generating sufficient support for the TPM implementation and ensures relevant knowledge for active involvement of management. In turn, this indulges employees' commitment. Brah and Chong (2004) stipulate that the stabilization phase perfect the activities in the TPM implementation phase and works forward to better productive maintenance. Furthermore, literature highlights that TPM benefits business performance in all aspects which justifies the long waiting period (Brah & Chong, 2004).

4.1.3 Relationships and differences of TQM and TMP

Total productive maintenance (TPM) and total quality management (TQM) share a common goal of reducing waste. Also, studies have linked TQM and TPM programmes with organizational performance. Some other common aspects that these two value systems include are continuous improvement, employee empowerment, process focus, information collecting and analysis, and the commitment of top management (Brah & Chong, 2004; Kedar, *et al.*, 2008). It is further implied that these commitments take the following interests into account: customers/consumers; employees; shareholders; competitors; and the society. TPM and TQM both stresses the importance of effective management (such as leadership of top management, process management, employee training and empowerment) of primary focus. Furthermore, researchers suggest that the results are achieved through secondary benefits. These secondary benefits include the following (Brah & Chong, 2004; Kedar, *et al.*, 2008):

- Lower costs
- Improved reputation and market share
- Increased employee motivation and satisfaction

Although that the philosophies' objectives do not clearly state that they contribute to profitability improvement, through objective execution they will unavoidably follow.

The most noticeable difference between these two philosophies is customer/consumer focus. TPM indirectly considers the customers'/consumers' dimension through reducing waste, improving productivity, activity planning, collecting and analysing data, and improving overall quality; whereas TQM directly considers the customer/consumer.

4.2 Series of international standards

4.2.1 PAS 55

PAS 55 is a publically available specification that was first published by the British Standards Institution (BSI) in 2004 as the industry demanded for a standard to aid in implementing and correcting physical asset management. Substantially it was revised in 2008 to increase the international consensus regarding good practices in managing physical assets. According to Woodhouse (2013), PAS 55 has successfully been globally adopted as a tool for integrating and improving business performance while increasing overall performance and assuring consistency and flexibility. The general scope for PAS 55 specification is primarily for optimal management of physical assets. Assets (all asset types) are inter-dependent and optimal management of physical assets requires good management practices of people, information, and finances. Thus, it is important to break-down the “silos” of asset management and to consider assets in the system, along with considering cross-functional optimization of asset life cycles. The latter of principles are required for maintaining good asset management.

PAS 55 obtains two different sections: PAS 55-1 and PAS 55-2. PAS 55-1 describes the requirements specifications while PAS 55-2 serves as a guidance tool for the application of PAS 55-1. Considering PAS 55 in general, the specification is constructed in accordance to the Plan-Do-Check-Act cycle for continuous improvement. Furthermore, this specification aligns with corresponding requirements of ISO 9001:2000, ISO 14001:2007 and OHSAS 18000:2007.

In order to implement and effective asset management strategy, PAS 55-1 stresses that it requires a disciplined approach which will enable an organization to maximize value as well as deliver its strategic objectives by successfully managing assets through their whole life cycle. This disciplined approach must however include the determination of appropriate assets to be obtained or created, how to maintain and operate it as well as adopting optimal renewal, decommissioning and/or disposal options (British Standard Institute, 2008).

The principle benefits, as described in section 0.1, of an optimized life cycle asset management include the following:

- Enhancing customer satisfaction by improving the performance and control of product or service delivery to required standards
- Optimizing return on investment and/or growth
- Planning for in the long-term, gaining confidence and performance sustainability
- Improving health, safety and environmental performance
- Improving risk management and corporate governance and creating a clear audit trail
- Improving the corporate reputation, the benefits of which may include enhanced shareholder value, greater staff satisfaction, more efficient and effective procurement from the supply chain and improving the marketability of products/service
- Demonstrating that sustainable development is actively considered when management is applied to the assets over their life cycles.

These benefits therefore associate with the application of a holistic asset management strategy. It is however extremely important to consider that the following enabling elements is essential for successfully implementing a holistic asset management strategy: an organization that facilitates the implementation of the principles of a holistic approach must have clear direction and leadership; staff awareness, commitment, cross-functional coordination and competency; acceptable knowledge of asset condition, risks and costs, and performance (British Standard Institute, 2008).

Moreover, PAS 55-1 clearly stipulates that this specification is applicable to any asset intensive business, where significant expenditure, performance dependency, risks and resources associates with creating, utilizing, maintaining and renewing/disposing assets. Contributing to this, PAS 55 is therefore suitable for the food industry as its manufacturing sector is asset intensive.

It is important to note the requirements for PAS 55 as its requirements are inextricably linked together. Therefore it is suggested that the document should be read in its entirety to get a full understanding of the PAS 55 document when implementing physical asset management.

4.2.2 ISO 55000

Given the popularity of PAS 55 and the demand from industries, the PAS 55 specification leads to the

development of the new ISO standard for asset management lead by the International Standards Organization. This resulted in the development of the ISO 55000 series of international standards which was published in South Africa in 2014.

The ISO 55000 series of International Standards can be used in combination with any relevant sectors, such as the food and beverage manufacture sector, or asset type-specific asset management standard and technical specifications. The ISO 55000 series comprises of three interrelated documents, named the ISO 55000 Asset management; ISO 55001 Asset management; and ISO 55002 Asset management. The ISO 55000 consists of the following sections: Overview, principles, and terminology. The ISO 55001 entails the requirements for the management systems whereas the ISO 55002 describes the guidelines for the application of ISO 55001.

The International Standard specifies that ISO 55000 is primarily intended for organizations who consider improving the realization of value for their organization from their asset base. It is also intended for those organizations who are involved in establishing, implementing, maintaining and improving an asset management system or those who are involved in planning, designing, implementing and reviewing of asset management activities (British Standard Institute, 2014). The adoption of the ISO 55000 series of standards will enable the organization to achieve its objective by effectively and efficiently managing its assets. According to the ISO 5500 standard, by applying an asset management system it will provide the organization with the assurance that the objectives can be achieved consistently and sustain over time.

When aiming to establish, implement, maintain and incessantly improve asset management, four influencing factors need to be considered (British Standard Institute, 2014). These factors are as follows: the nature and purpose of the organization; the organization's operating context; the organization's financial constraints and regulatory requirements; and the needs and expectations of the organizations and its stakeholders. Also, the effective control and governance of assets by the food and beverage manufacturing organizations is essential to realize value through managing risks and opportunities (British Standard Institute, 2014). This is required in order to achieve the desired balance of cost, risk and performance. Contributing to what was mentioned before, the regulatory and legislative environment in which the food and beverage organization operate is increasingly challenging and the characteristic risks that many assets present are continuously evolving.

The fundamentals for achieving a holistic asset management strategy in the food and beverage industry, may contribute to obtaining tangible benefits and leverages opportunities. The ISO 55000 standard further explains that asset management will enable the organization to realize value from its assets by achieving the organization's objectives. Also, asset management will support the realization of value while balancing environmental, financial and social costs, quality of service and performance. Thus section 2.2 of ISO 5500 stipulates the following benefits of asset management (British Standard Institute, 2014):

- Improving return on investments by reducing costs, while supporting asset value without sacrificing organizational objectives
- Improving asset investment decisions by enabling the organization to improve decision making procedures and balancing costs, risks, opportunities and performance
- Managing risk through reducing financial losses, good will and reputation, improving health and safety, minimizing social and environmental impact and finally reducing liabilities
- Improving the organization's ability to demonstrate social responsibility
- Enhancing the organization's reputation through improving customer satisfaction, stakeholder awareness and confidence
- Improving organization sustainability by effectively managing short and long-term effects, expenses and performance which can improve sustaining operation and the organization
- Demonstrating compliance by conforming to legal, statutory and regulatory requirements as well as adhering to the asset management standards, processes and policies
- Improving efficiency and effectiveness through reviewing and improving processes, procedures and asset performance

It has been confirmed by researchers that the international co-operation in the preparation of the ISO 55000 series of international standards allows common practices to be applied to the broadest range of assets in the broadest range of industries across a wide variety of cultures (Woodhouse, 2013). Thus it is believed that the ISO 55000 series can and will make a positive contribution to a food and beverage organization's competitiveness.

4.2.3 Relationships and differences of PAS 55 and ISO 55000

Both the PAS 55 and ISO 55000 series of international standard share one significant benefit; this benefit is that they both provide the organization with the ability to determine themselves how the minimum set of requirements for an operative asset management system can be implemented to fulfil their needs (Minnaar, et al., 2013). If an asset management system adheres to these requirements, dependable decision-making procedures regarding activities that impact asset-related cost, risks and performance profiles will be generated. However, it is required that management should be educated and well-appointed to make adequate decisions that involve short-term and long-term effect, and combinations of correlated and contradictory benefits (Minnaar, et al., 2013).

The most evident difference between PAS 55 and ISO 5500 is the significant change in scope of application. PAS 55 overtly focusses on physical asset with the acknowledgement of the dependencies on and applicability to other asset types; whereas ISO 55000 is designed in such a manner to be able to apply to any asset type, though recognising the applicability to physical asset management (Woodhouse, 2013). The terminology (core definitions) also differs among these two standards as the ISO 55000 standard's definitions are simplified and generalized.

5. Business case for implementing a holistic physical asset management strategy

In order to achieve Operational Excellence (OE) productivity and profits, the food and beverage industry must first be capable to deliver OE results. This may be achieved by designing the business system through using a holistic physical asset management strategy to deliver success. This implies that those organizations that have a business-wide, life-cycle system for reliability will succeed in OE. After the advantages and disadvantages of the four proposed strategies were outweighed it may be concluded that both ISO 55000 and PAS 55 are useful to focus on generating a holistic physical asset management environment. However, by only using the standards as foundation for implementing asset management will not always aid in giving the appropriate solution as the food and beverage industry is complex and still are lacking exclusive maintenance knowledge. Therefore it is proposed to use the ISO 55000 series of International Standards in combination of either total productive maintenance (TPM) or total quality management (TQM). It is however suggested to rather use TQM as it directly focusses on the demands of the customer/consumer and is already known to most South African food and beverage manufacturing organizations.

In this section a business case will be presented to present the financial benefits associated with the investment of implementing TQM and ISO 55000 in the food and beverage industry.

5.1 Assumptions

To be able to identify the key objectives for implementation and its strategic alignment with the organization's objectives, assumptions were made. The business case is based upon these assumptions. The following table presents the assumptions related to the food and beverage industry prior to developing the business case (Table 1).

Table 5. Assumptions

#	It is assumed that:	Effect on investment:	Reliability level:
1	The organization is currently implementing TQM.	The organization is already focussing on achieving a holistic approach and no training regarding TQM is required.	High
2	The organization aims for a holistic approach.	The organization wishes to improve quality, its competitive advantage and productivity.	High

In order to clearly define the investment of implementing TQM and ISO 55000, the following table was constructed (Table 2).

Table 6. Defining the investment

Business environment	Food and beverage manufacturing organizations are in dire need for achieving a holistic physical asset management strategy.
Business objectives	To achieve a successful implementation process and to sustain a holistic asset management strategy.
Business needs	The food industry requires new standards that need to be implemented to obtain the holistic environment.
Key requirements	Extensive training regarding ISO 55000 for management and employees is required to achieve a holistic environment.

Upon this, the objectives of the implementation process will be discussed shortly.

5.2 Implementation requirements, objectives and strategic alignment

Section 4.1.2 of ISO 55002 states that when the intended asset management system is established or reviewed, it is important to ensure the approach is consistent and aligned with internal and external context of the manufacturing organization. It is important since it can influence the scope and design of the asset management system. Therefore, the following implementation objectives are considered:

- **Creating value:** The ISO 55000 series identifies that managing the asset will create value to the organization. Thus it is required of the organization to make a clear statement how the asset management objectives will align with the organization as well as establish a decision-making process that reflects stakeholder need and define value.
- **Creating alignments:** It is proposed that asset management related decisions (technical, financial and operational) will enable the organization to achieve its objective. Thus it is required to implement a risk-based, information-driven, decision-making and planning process to transform the organizational objectives into asset management plans. Also, the organizations must strive to integrate the asset management processes with the functional management processes.
- **Establishing leadership:** Leadership and a constructive workplace culture contribute to realizing the value. Thus it is required from the organization to establish leadership and commitment from all managerial levels to successfully establish, operate and improve asset management within the organization. Therefore, the roles, responsibilities and authorities must be defined, the employees must be informed and empowered, training as well as consultation with employees and stakeholders will be required.
- **Assuring that asset will perform optimally:** It is proposed by the ISO 55000 series of standards that asset management will assure that assets fulfil their required purpose. It is therefore required to develop and implement processes to connect the performance and purpose of assets to the organizational objectives, implementing these processes to assure capability across the life cycle of assets, providing monitoring and continuous improvement and providing necessary resources and competent personnel to demonstrate assurance by commissioning asset management activities while operating the asset management strategy.

5.3 Financial analysis

In attempt to achieve the requirements and objectives as discussed in section 5.2, a financial analysis was done to map out the best-, realistic- and worst case financial scenarios for implementing ISO 55000 with a TQM approach.

Table 7. Average costs of relevant courses used during implementation

Course name	Average costs per person attending a course		
	Worst case	Practical case	Best case
ISO 55000 series of International standards	R3 554.00	R3 554.00	R3 554.00
Introduction to ISO 55000 course	R 7 410.00	R 7 410.00	R 7 410.00
Risk management course for the food industry	R 5 510.50	N/A	N/A
Continuous business improvement - Methodology and tools course	R 9 416.00	R 9 416.00	N/A
Total	R 25 890.00	R 20 380.00	R 10 964.00

This table gives a good indication of what it would roughly cost the organization per person when attending these relevant courses (Table 3). Regarding the best case financial scenario, it is assumed that the organization has succeeded in implementing the necessary and accompanying processes, policies and standards to the ISO 55000 series of international standards; which clearly imply that the organization is currently successfully implementing TQM. Thus the costs of the holistic asset management strategy are a lot less than the worst financial scenario. In addition to understanding the purpose of each course, please refer to Table 6 for a detailed description of relevant courses. From an asset management perspective, the approach of implementing ISO 55000 and achieving a holistic physical asset management strategy will help the food and beverage manufacturers to be proactive in nature while moving away from the break-fix approach. This can be done by gaining real-time visibility into equipment failures before it occur (AberdeenGroup, 2008). In order to achieve this holistic approach, the food industry has to try to become the Best-in-Class.

Aberdeen (2009) has found that Best-in-Class companies gains competitive advantage when compared to the Industry Average and Laggard. The following table gives an indication of the average performance of Best-in-Class, Industry Average and Laggard organizations.

Table 8. Top performers earn Best-in-Class status

Definition of Maturity class	Mean Class Performance
Best-in-Class: Top 20% of aggregate performance scorers	<ul style="list-style-type: none"> • 93% OEE • 2% unscheduled asset downtime • 99% production compliance • 12% reduction in maintenance costs • +24% Return on Assets vs. Plan
Industry Average: Middle 50% of aggregate performance scorers	<ul style="list-style-type: none"> • 86% OEE • 6% unscheduled asset downtime • 97% production compliance • 17% reduction in maintenance costs • +6% Return on Assets vs. Plan
Laggard: Bottom 30% of aggregate performance scorers	<ul style="list-style-type: none"> • 6% OEE • 13% unscheduled asset downtime • 85% production compliance • 2% increase in maintenance costs • -5% Return on Assets vs. Plan

Source: Aberdeen Group, March 2009; Aberdeen Group, December 2011

As seen in Table 4, the three criteria's that was used to measure and classify the performance of the respondent organizations are as follows (AberdeenGroup, 2009; AberdeenGroup, 2011):

- Overall Equipment Effectiveness (OEE) measure as a percentage by multiplying availability times performance times
- Asset downtime measured as the amount of time the asset is offline against total asset availability
- Production compliance measured as a percentage of products produced that were in compliance to processes against the total products produced
- Return on Assets (ROA) measured as the percentage of return on assets (new income/total asset) goal achieved versus corporate goal
- Maintenance cost measured as year over year reduction in total maintenance costs

From this table it may be concluded that Best-in-Class organizations has a higher asset performance with 14% more production compliance and 11% lower unscheduled asset downtime when comparing to the Laggard maturity class. This 11% unscheduled downtime may result in significant losses which are worth millions of rands for an asset intensive organization. As previously stated, the manufacturing sector of food and beverages is asset intensive; therefore this amount of loss is extremely risky in terms of finances. In contrast to this, an improvement of 14% in compliance rate will result in direct cost savings. Furthermore, this table clearly indicates that Best-in-Class organizations also achieve higher performance by reducing their maintenance expenditures (AberdeenGroup, 2011). Thus, it is suggested that the food and beverage industry take note of this as it contributes to the need of implementing the holistic asset management strategy to advance its competitiveness while benefiting from return on assets (ROA) and improving its profitability in the competitive environment.

In order to achieve the Best-in-Class status within the competitive quality driven market, a combination of strategic actions, organizational capabilities and business process capabilities need to be considered. Responding to this, the Best-in-Class PACE framework is constructed (Table 5).

Table 9 The Best-in-Class PACE framework

Pressures	Actions	Capabilities	Enablers
<ul style="list-style-type: none"> • Maximize ROA 	<ul style="list-style-type: none"> • Optimize asset utilization • Executive focus on creating continuous improvement initiatives for asset management • Improve the visibility of asset performance into production 	<ul style="list-style-type: none"> • Executive ownership and sponsorship for asset management strategies throughout the entire organization • Using asset management data to analyse, predict, plan and schedule maintenance activities • Standardized processes for reliability and maintenance • The asset management system is combined with predictive failure data analysis 	<ul style="list-style-type: none"> • Reliability Centered Maintenance (RCM) • Predictive maintenance • Manufacturing analysis • Risk management • Corrective and Preventative Actions (CAPA)
<ul style="list-style-type: none"> • Maximize production capacity, availability, flexibility 	<ul style="list-style-type: none"> • Preventive and preventative maintenance programs 	<ul style="list-style-type: none"> • Real-time monitoring • Calculation and alerts of OEE (KPIs) 	<ul style="list-style-type: none"> • CMMS with integrated analytic tools • The ability to monitor equipment in real-time
<ul style="list-style-type: none"> • Product quality 	<ul style="list-style-type: none"> • Implement continuous improvement programs as well as condition 	<ul style="list-style-type: none"> • Technological capability to collect and monitor SPC and other data 	<ul style="list-style-type: none"> • CMMS integrated to MES and/or SPC – ability to detect and diagnose issues

	monitoring technologies	<ul style="list-style-type: none"> Facilitate root cause analysis 	in real time
<ul style="list-style-type: none"> Align assets in response to market dynamics 	<ul style="list-style-type: none"> RCM (reliability Centered Maintenance Program) 	<ul style="list-style-type: none"> Monitor equipment performance Develop plans to avoid probable failures and loss of performance 	<ul style="list-style-type: none"> Condition monitoring Diagnostic solutions such as analytics services and diagnostic instruments
<ul style="list-style-type: none"> Asset reliability and longevity 	<ul style="list-style-type: none"> Develop long-term asset strategy focused on reliability lifecycle and health needs 	<ul style="list-style-type: none"> Maintain asset history, configuration and documentation 	<ul style="list-style-type: none"> EDM (engineering document management) Configuration and data exchange for capital projects

Source: Aberdeen group, April 2006; Aberdeen group June 2008; Aberdeen group, December 2011

By using this framework as a baseline for implementing a holistic asset management strategy, it is expected to achieve continuous improvements, operational excellence, minimizing costs and most importantly receive Return on Assets (ROA).

Table 10. Description of relevant courses

Course	Description	Who should attend
ISO 55000 series of International standards	In order to achieve a holistic physical asset management strategy, the food industry is required to obtain the ISO series of International Standards.	This standard should be implemented throughout the entire organization. Top management support is therefore extremely important.
Introduction to ISO 55000 course	<p>This course entails giving the participants a good frame of reference of what asset management is about. It also will aid in determining the organisation's current asset management maturity by performing a self-assessment. Addition to this, it will help the organization with the following:</p> <ul style="list-style-type: none"> Select asset management best practices applicable to the organisation Define key performance indicators to measure the asset management function Develop an action plan to ensure sustainable improvement. Establish world-class work planning and control best practices within the organisation in order to grow the maturity of the organisation Clarify and resolve roles and responsibilities of members of the planning and executions functions Develop key performance indicators to measure the performance of the planning function Develop essential WPC knowledge management 	<p>Leaders/managers who are implementing an ISO 55000 initiative.</p> <ul style="list-style-type: none"> Senior Engineering and technical managers Maintenance managers and engineers Production or operational managers Maintenance planners Managers who want to improve the condition and performance of their physical assets to optimize the return on their capital investments

	capability to ensure sustainable improvement.	
Risk management course for the food industry	Risk assessment and management are significant components of any food safety initiative. The food industry is under increasing pressure demanded from consumers as well as the media to implement risk management strategies to avoid incidents related to food safety as well as quality. This course merely serves to ensure that the organisation is not missing out. Thereby it aids in educating relevant staff members on how to effectively manage risks to ensure the organization is compliant.	Those members or personnel in the Food Industry who have a responsibility towards food safety and quality. Including: <ul style="list-style-type: none"> • Senior managers • Risk managers • Front line management • Food safety practitioners • HACCP team members • Food and hospitality industry • Executive managers • Foods safety and quality auditors
Continual business improvement - Methodology and tools course	This course focussed on taking the participants through each of the four phases of the Plan Do Check Act cycle (PDCA). This course aims at enabling the participant to be able to define continual business improvement as well as analyse data to support continuous improvement initiatives.	Those interested in process improvement

Sources: (Woodhouse, 2012; CentreBlue, 2012; Anon, 2013; Anon, 2014a; Anon, 2014b)

6. Proposed impact after implementing a holistic physical asset management strategy

It has been proven by numerous industries and environments that extensive benefits will be obtained through improved asset management by continuously focussing on the whole life cycle value realization (Woodhouse, 2013). Also, the implementation of the holistic physical asset management strategy will generate an effective work environment where all departments function inter-dependently in an effective manner while it proposes to increase organizational profitability by meeting and exceeding customer expectations.

The implementation of a holistic asset management strategy using the ISO 55000 series of International Standards and TQM as foundation, by obtaining the Best-in-Class status by will reap significantly larger benefits from improved maintenance practices than those organizations that are still classified as Average or Laggards. These benefits include:

- Substantial improvement of asset reliability
- Lower costs of servicing assets
- Greater uptime and availability
- Less downtimes and outages
- Higher return on assets as well as in invested capital

Additionally, this implementation procedure will allow the organization to adhere to the following objectives which are expected for the future:

- The organization will be able to develop cross-functional teams, consisting of operators, maintainers, engineers and managers which directly add value to employee ownership and performance as well as equipment performances.
- The organization will be able to be proactive in the dynamic market and move away from the break-fix

approach

- The organization will be able to successfully manage risks, improve services and outputs, make informed asset investment decisions, improve its financial performance and demonstrate its social responsibility as well as compliance.
- The organization will be able sustain OE over time while improving their organization's reputation.
- The process of creating a holistic asset management system will bring new perspectives to the organization and new ideas on value creation from the use of assets. These perspectives will stimulate improvement in other organizational functions (e.g. purchasing, finance, information technology and human resource) (ISO 55001, section 2.5.2, p. 5).
- Top management will be able to recognize the need to improve communication and interaction across functions which will ensure that assets are managed in an integrated manner. Thus the asset value are said to be improved (ISO 55001, section 2.5.2, p. 5).
- Management will be able to communicate with employees, suppliers and contracted service providers which will increase the improvements on quality of asset information and create asset awareness amongst individuals (ISO 55001, section 2.5.2, p. 6).
- The organization will be aware of robust financial information, which is based on integrated processes between the asset management and finance functions. Therefore this will allow the organization to improve assessment of financial position and funding requirements in relation to assets (ISO 55001, section 2.5.2, p. 6).

According to Aberdeen (April, 2006), manufacturers that are implementing or aim to implement holistic asset management programs are better positioned to proactively react to dynamic markets, increasingly stringent regulatory pressures, and demanding shareholders.

When referring only to these mentioned benefits, it is clear that this approach will aid in establishing a constructive working environment while achieving quality driven success, overall performance and financial success.

7. Conclusion

With regard to customer/consumer expectations, only high-quality food and beverage products are allowed to be manufactured, supplied and distributed. In order to sustain within these expectations, management practices such as asset management must be in working agreement with the value chain of a food and beverage manufacturing organization. Therefore it is required that a holistic asset management philosophy must be implemented throughout the entire value chain to conquer a quality orientated and productive environment. Although many South African manufacturing organizations already implement or aim to successfully implement a TQM philosophy, they often fail to exercise productive maintenance strategies. According to literature, South African food and beverage manufacturing organizations lack the knowledge of importance of physical asset management within the manufacturing sector of food and beverages. Contributing to the need of implementing physical asset management, manufacturers require equipment to operate at peak performance in order to aid in improving the product and process quality. Also, the reliability and productivity of capital assets is essential to the financial success of the organization. Thus, this investigation suggests that food and beverage industries in South Africa should implement the ISO 55000 series of international standards which integrates well with the TQM philosophy. Referring to the literature review and business case, it is proposed that a holistic asset management strategy will be achieved if all stipulated requirements and implementation procedures are adhered to. After implementing this holistic asset management strategy the organization may expect to proactively react to the dynamic market, stringent regulatory requirements and stakeholder needs while at the same time satisfying their customer's/consumer's needs. In this context, the study aims to extend the knowledge of South African organizations on the importance of asset management to ultimately produce quality products with a high profitability. Upon researching the topic of the need and importance to implementing a holistic asset management strategy, sustaining with this holistic approach may become uncertain as change within the organization is expected. For this reason, teaching relevant participants to sustain with the requirements of a holistic asset management approach is necessary to conquer operational and organizational success; therefore extended research will be advised.

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