

Auditing Gas Production and Extraction Companies Compliance with Quality Standards ISO an Applied Research in the South Gas and Basra Gas Companies

Haider Adel Abbas Ali and Khawla Hussein Hamdan

Post Graduate Institute for Accounting and Financial Studies, University of Baghdad, Baghdad, Iraq
Haideradel28@gmail.com, +9647828817879, kawla@pgiafs.uobaghdad.edu.iq

Abstract: The research aims at identifying the quality standards related to the gas production and extraction industry. The product of the company, research sample is filled with impurities and does not conform to the standard specifications. The research has come up with a number of conclusions. The most important of which is non-compliance of the research sample with the requirements of quality standards. Thus, the companies incurred high costs without reaching the set goals. ISO (14001) which includes environmental and health guidelines related to natural gas processing operations has not been complied with the same is true for ISO (10006) project quality management. There were halts of operations and poor storage for materials. Also, ISO 18001 requirements related to occupational health and safety have not been met. Maintenance programs were not good enough as well. The company's management has not complied with the measurement and calibration protocol (PMP) within the requirements of standard (603000-1). No field laboratories are in place in the gas extraction fields as provided for in ISO 17025. The training programs implemented by the company, subject of research were not in accordance with ISO (10015). The company internal auditors have not been trained to apply quality management systems as per ISO 19011. Contrary to the requirements of ISO (10002) that is related to the guidelines on how to handle customers complaints and increase customer satisfaction, licensing rounds companies were lagging behind in addressing customers complains. ISO (5500) requirements related to measurement and classification of fixed assets have not been adopted.

Key words: Quality standards, ISO, gas, auditing, assets, customers

INTRODUCTION

Of the research that included the quality of the study conducted by Luchars and Hinkin (1996) explains that a service-quality audit is the initial step in determining whether a quality-management program should be implemented. The audit provides managers with an estimate of the cost to the organization of common service errors. In conducting the audit, management should make clear that its purpose is not to punish anyone but instead to identify specific service errors that cost the company money and to improve work processes that will benefit both internal and external customers. The audit helps to attract the attention of all management levels and all employees should be aware of the audit and its results. Depending on the results of the audit, the data gathered may be used in a quality-management program to improve the overall level of service quality. So as study by Ann and Owen (2002) stresses the fact that the current need for performance measurement and quality of user's services requires suitable performance indicators for

libraries to use. This study looks at the self-assessment audit tool for catalogue quality developed by UKOLN in collaboration with Essex libraries. For the tool a reference of errors was drawn up to be used for assessing the quality of records within a catalogue by means of a sample of library stock. The tool can be used to assess the quality of catalogue records for studies and non-book materials or for complete collections or parts of collections and for records created at different periods. This study describes the tool and the process of carrying out the assessment and reports on the results of the pilot study carried out at the University of Bath Library in 2000.

The study by Kirchner aimed at increasing companies market share, profitability and improving their competitiveness through excellence of goods service quality. The study identifies 12 steps that enable companies to achieve a competitive feature if accurately followed, the most important of which is engaging employees in the strategic planning and decision making. The ideas of employees can often have value more than

those of managers. Also, enabling employees to take certain decisions within their work. Appropriate training and clear instructions at the responsibility level can help first line employees to avoid dissatisfaction of customers more often, improving satisfaction and maintaining customers loyalty. In addition, paying attention to continuous improvement of the services that are rendered to customers. Certain companies deal with improvement activity as a current event in light of the economy dynamics and the change in customers taste, market structure and competitiveness size. This situation makes it necessary for companies to keep looking for means of excellence over competitors and coping with customer needs. As for study by Hamdan (2011), it was conducted on the Central Organization for Standardization and Quality Control (COSQC) performance audit reports issued by FBSA for the period 2005-2007. The study aimed at defining quality and its tools, highlighting the quality management systems and developing a program for quality control. The most important conclusions drawn by the study is that FBSA verifies, whether products delivered by the economic entity meet the standard specifications issued by COSQC and comply with production costs and loss and damage rates. The study has come up with a set of recommendations most important of which are that auditors need to be fully aware of the quality management and environment management systems and that a quality control system that operates in accordance with ISO needs to be in place within the auditees. FBSA auditors need to be familiar with quality costs, classifications and ways for measurement. Study by Shawky and Hamza (2013) was conducted in Midland oil refineries company (Dura refinery). The significance of the study lies in the fact that this study has been conducted in the time when many oil producing countries has made a prominent progress in the field of environment protection in collaboration with oil and gas companies operating in those countries whereas Iraq is still lagging behind in this aspect. The research problem, thus is-are there specific clear audit programs with which audit offices comply to conduct environmental audit of oil and gas companies work in Iraq and do oil and gas companies operating in Iraq comply with the programs and obligations to protect environment components. Another study by Aflaq (2007). The study aims at defining the role of the internal auditor in public economic institutions that have obtained (ISO/TS29001, 2010) certificate. It also explores the relationship between internal audit and quality control. The most important result the study comes up with is that there are different roles to be played by internal audit beside the functions and duties of quality control in Algerian public economic entities after obtaining (ISO/TS29001, 2010) certificate. Internal audit

carries out new tasks that are related to quality management system (internal quality control) when evaluating quality management in Algerian public economic entities that have obtained the (ISO/TS29001, 2010) certificate.

The problem of the research: South gas and Basra gas companies still produce gas that is full of impurities, thus, posing a threat to both workers and customers, in addition to pollution. Despite the vast government expenditure on natural gas investment projects, the ISO standards are not being complied with and this fact is not disclosed in the auditor report.

Importance of the research: Disclosing the extent to which the two companies, sample of the study, comply with the standards of gas extraction and production quality standards and identifying the impact of non-compliance on the product, workers and environment.

Research objectives: To introduce quality audit and quality standards as well as disclosing the extent to which the company, subject of the research complies with quality standards relating to gas production and extraction industry.

Research hypothesis: Auditing compliance with quality standards contributes to control of fund misuse through observing quality standards and producing the kind of gas that meets the specifications.

Theoretical framework

What is quality?

There are multiple definitions proposed by researchers and those interested in this topic. Many attempts to define quality were made. Evans (1987) defines quality as conformance for use, i.e., the product or service quality must meet the expectations of the customers. AQFI defined it as “performing well from the first time and relying on the customer’s assessment to know whether performance is improving”. They define quality as a dynamic state associated with products, services, people, processes and environments that meets or exceeds expectations (Goetsch, 1997). The American Quality Control Association (ASQC) and the European Organization for Quality Control (EOQC) defined quality as “the total sum of the advantages and characteristics that affect the ability of a product or service to meet certain needs” (Arora, 2008). Boeing company defined it as “providing customers with goods and services that exceed their expectations” (Anonymous, 2008). American Society for Quality ASQ defined quality as “the overall

characteristics and features of the product or service manufactured or performed according to specifications to satisfy customers at the time of purchase and during use” (Horngren *et al.*, 2009).

Quality audit: It is an audit that determines the extent to which quality requirements are met. Therefore, quality audit will independently examine processes, products and services to determine whether they meet the specific requirements of their inherent characteristics, for example, dimensions, functions, safety and responsiveness. Quality audits can therefore be considered as process audits, product audits, service audits or quality management system audits (Vikram and Tech, 2018). The process of systematic examination of the quality system carried out by the quality auditor at the internal or external levels or conducted by an audit team is a particularly important part of the quality management system and a key element in ISO 9001 quality system standards.

International Organization for Standardization (ISO) standards

ISO 14001 (2015) environment management system: It includes guidelines to support environment management techniques and to ensure that industry does not affect it negatively.

Project quality assessment (10006-2010): The standard aims at assessing the existing project quality compared to standard requirements and the status of quality system of the company.

Customers complaints handling (ISO 10002, 2010): This standard deals with customers complaints and increasing of customer satisfaction. Customers often seek the best services. ISO 10002 (2010) on customers satisfaction will help you develop a system to effectively handle complaints. It also helps you to identify complaints and the way to deal with and resolve them gradually as well as the way they are received and recorded. Product quality related complaints emerge from customer's. Thus, these complaints might not be systemically and reliably communicated by customers. An enterprise should find a way that enables it to identify all customer complaints including those communicated orally.

Occupational health and safety ISO (18001-2010): It includes guidelines to obtain the certificate of occupational health and safety in light of international specifications.

Competence of testing and calibration laboratories-ISO/IEC 17025 (2005): It deals with the competence of testing and calibration laboratories. Entities concerned with applying the standard seek to obtain a formal accreditation via. an internationally acknowledged accreditation body. All testing and calibration laboratories, industrial companies, water and food factories, oil and gas companies and public laboratories can obtain (ISO/IEC 17025, 2005) certificate.

ISO 10014 (2012) management of economic and financial benefits of the entity: It is directed to top management of an organization to achieve financial and economic benefits through the effective application of quality management principles. The benefits realized are: (improving profitability, revenues, budget performance, reducing cost, increasing cash flows, improving return on investment, increasing competitiveness and retaining customers and increasing their loyalty).

ISO 60300-1-2012 dependability: It is a tool for maintenance support, reliability and maintainability of a product. These analyses are carried out during the design, development, operation and maintenance phases. Also, it is used for planning of logistical and maintenance services to estimate the frequency rate of maintaining and replacing of a certain part. These estimates often determine the life cycle cost of devices and software, in addition to human factors and regulatory aspects. It should be carefully applied, so as to achieve meaningful results.

ISO 9000 (2015) quality management: It provides for a quality assurance model in design, development, production, inspection installation and servicing.

ISO 10015-2015 quality of training: It aims at developing a program for granting a training quality manager certificate to enable training managers and facilitators to lead their organizations and obtain ISO 10015 certificate as well as managing and following up compliance in a way that ensures evaluating training in their organizations as per best world quality standards.

ISO 55000 (2015) fixed asset measurement and classification: This standard gives the ability to accurately classify and measure fixed and intangible assets owned by the company via. verifying the processes of acknowledging, recording and classifying fixed assets as well as reporting them accurately in a way compatible with the nature of the company activity.

ISO 27001 (2015) information security management:

It deals with the information security management. The basic notion of this standard is based on total quality management principles. The benefits are (Controlling all information, procedures, security tasks and responsibilities, reducing human errors, contributing to securing material areas, facilitating information processing, controlling access by staff into the information system and protecting the IS from web hacking.

ISO 19011 guidelines for auditing quality management systems or environment management system: The standard provides guidelines for internal and external audits on quality management systems as well as guidelines for auditor's competence evaluation.

Standards relating to gas production extraction industry ISO/TS29001 (2010) design and development of petroleum, petrochemical and natural gas industries: It defines the requirements for quality management system of the design, development, production, installation and servicing of petroleum and petrochemical products and natural gas. It applies to all companies operating in oil and gas sector. The standard has been developed as a direct result of partnership between ISO and petroleum international industry and the related risks.

American quality standards (API): API represent the measure of any liquid lighter than water. Oils are classified according to IPA standards into three types: gas, namely natural gas, liquid and solid: including coal and oil. IPA gravity is calculated by means of specific gravity of oil and gas at 60°F. IPA measurement adversely proportionate to gravity value.

MATERIALS AND METHODS

Data and method

Auditing compliance of South gas and Basra gas companies with quality standards

Background: Basra gas company is an Iraqi public/private joint venture with limited liability established according to the Iraqi Law No. 21 (1997). South gas company holds 51% while shell and Mitsubishi hold 44 and 5%, respectively. BGC aims at the optimal capturing of associated gas and to avoid flaring it in the future. The purpose behind is to meet the local demand of liquid gas, selling all processed products (dry gas, LPG, condensate). As for access products that are not needed by local market are exported to global markets via. SOMO.

The extent to which the sample of the research complies with quality standards: The following are the cases in which quality standards mentioned in the theoretical part are not being complied with.

ISO 14000 environment management systems

Gas flaring: Shell estimated the loss incurred by Iraq due to associated gas flaring as being \$60/sec, i.e., \$5184000/day. Non adoption of ISO 14001 which includes guidelines on treatment of natural gas. Licensing rounds should have included the requirement of investing the natural gas and not to waste it through flaring. Foreign investment should be increased. Companies must be forced to have infrastructures for associated gas treatment.

ISO 10006-2010 evaluating project quality; The gap in the organizational structure: The procedures include verifying the existence of quality management within the organizational structure of the company, subject of the research and that it is documented, maintained and its effectiveness improved continuously. Table 1 depicts the gap in the organizational structure.

Table 1 the company organizational structure gap analysis and the requirement listed in the standard specification of ISO 10006 project quality management. There is a gap of 0.36 and the compliance average was 0.64.

Scrap: (Audit procedure) auditing the costs incurred by the company, subject of the research, due to the existence of stock that is defected because of poor storage, in addition to the stockpiling of such items. Defected and stagnant items found in the company stores were 2089 up to 31st of December, 2013 with a value of 8617 billion IQD. Items disbursed during 2014 were 3918 with an amount of 125 million IQD. The company incurred costs due to storing such items that were occupying space and becoming obsolete. Also, those items were no longer needed, therefore, it is necessary to verify whether store management reported the stagnant and defected items that reach the point of reorder. The cost of keeping such access items in the company stores is estimated to be 7% of the items cost.

Production operations halts: The auditor here performs measures to audit the costs associated with repair, maintenance, fixing, replacement of production equipment or changing those operating them. The auditor also audits the cost of the continuous shortage of spare parts required for the maintenance of most operating units. In addition, the power supply is not secured on a constant

Table 1: The company organizational structure gap analysis and the requirement listed in the standard specification of ISO 10006 project quality management

	Fully applicable and fully documented	Fully applicable and partially documented	Fully applicable and unannounced	Partially applied and fully documented	Partially applied and partially documented	Partially and notarized	Not applicable and not documented
Develop the organizational structure of the company				X			
The organizational structure encourages effective and efficient communication and cooperation between the employees of the company				X			
The structure is designed according to the company's business scope, size, team, processes and conditions	X						
The job description is to identify and document authority and responsibilities	X						
The company's management is keen to establish relationships with other employees, customers and beneficiaries				X			
Be sure to build the scope of the project quality, implementation and continuity management					X		
The organizational structure is constantly revised to ensure its appropriateness and effectiveness				X			
Weights	6	5	4	3.00	2	1	0
Repetition	2			3.00	1		
The result	12			9.00	2		
Arithmetic mean				3.83			
Percentage				0.64			

Table 2: Halt due to contingencies

Products	Measuring units	Loss due to low gas feeder		Loss due to emergency maintenance		Loss due to power outage		The total amount of losses thousand dinars	
		2013	2014	2013	2014	2013	2014	2013	2014
Crude gas	Million m ³	3379	-	7075	-	2130	-	251680	-
Liquid gas	Thous. tons	16895	8760	45475	18840	14878	4499	5237544	3068182
Dry gas	Million m ³	2916	1527	6077	3225	1819	689	475728	175532
Casinos	000 m ³	7797	4043	16375	8696	30754	2045	1353176	585728
Total								7318128	3829442

basis, thus, production fluctuates and equipment is negatively affected and its productive life is shortened. Table 2 depicts the losses incurred by the company due to halts.

Ministry of oil needs to provide the power supply required to get to self-sustainability of power and to avoid suspensions taken place in the company and damage caused to environment and the financial loss resulting from those halts. The company needs to comply with ISO 10006 "project quality management" requirements (Anonymous, 2016).

RESULTS AND DISCUSSION

ISO 10002 (2010) guidelines on handling customer's complaints and increasing satisfaction

Handling customers complaints: A lot of complaints against the company, subject of the research were submitted by gas filling company because the quality was deteriorating and became below the required limit given the fact that gas filling company is responsible for marketing liquid gas that is produced by Basra and South gas companies. Although, the company spent JD in 2014. Table shows the number of complaints despite the fact that an amount of 4320000 IQD was disbursed to handle complaints.

Liquid gas sales returns: The gap between the real quality of the company, subject of research and the requirements of ISO 10002 (2010) which include guidelines to handle the consumers complains and increasing the customers satisfaction has not been identified.

Compensation claims due to lack of quality: The company, subject of the research, holds itself unaccountable against the compensation claims, due to the high percentage of impurities in liquid gas production of the marketing entities namely gas filling company and the citizen. Instead of having a cylinder filled with standard liquid gas, they get a cylinder filled with liquid gas with high percentage of C₂-C₅. This constitutes a violation of customer protection law.

LPG sales losses: Due to non-meeting of customer's expectations and needs regarding LPG and non-meeting the specification of the LPG produced by the company, the letter of MoO/the technical office exempts gas filling company from repayment for LPG quantities supplied by Basra and South company in case the quantities supplied by the said company do not meet the specifications. The letter also considers the C₂ and C₅ set percentages are 0.5 and 25, respectively and when

exceeded they are not considered as gas components. Gas filling company claimed that it will not accept any quantity of gas in which the percentages of C₂ and C₃ are doubled.

ISO 18001 occupational healths and safety: Despite the fact that the company has spent an amount of 437 million IQD, it has not reduced the risks to occupational health and safety such as (Operation safety, oxygen rich gases release, chemical risk, giving safety license to tanker trucks that transport LPG). In addition, setting a mechanism to coordinate with licensing contracts operators to train and develop the staff responsible for safety and firefighting in the company, subject of the research.

ISO 17025 (2005) competence of testing and calibration laboratories

Laboratories quality department plan preparation and implementation: The company addressed the COSQC to obtain ISO certificate for the lab department for 50 million IQD for 1 year, so that, the COSQC can approve the labs. No field labs are found in the gas fields, thus, violating the requirements of ISO 17025 (2005).

ISO 10014 (2012) financial and economic benefits management of the entity

Reducing selling price due to poor quality: The auditor procedures in this stage are auditing and checking costs incurred through selling of the LPG that does not meet the specification with a less price. A great difference is identified between the prices of the gas sold to gas filling company. The company's price of a ton of LPG is 210 thousand dinar, i.e., it is 120 thousand higher than that of last year. Yet, the prices of other similar kind of LPG remained unchanged as depicted in Table 3 "selling prices of LPG from production sources".

This, in turn, constitutes a burden on the gas filling company and citizens. The latter gets the LPG cylinder full of impurities with higher price contrary to the set procedures of supplying the product in a reduced price as per its set quality. Also, following this procedure of selling gas will lead to an increase in the shortage from which the gas filling company suffers, thus, negatively affecting the company's balance.

Table 3: Selling prices of LPG from production sources

Sources of production	Proportion of impurities		Price/ton in dinars	
	2013	2014	2013	2014
South Gas Company	1.2%	7%	100000	210000
North Gas Company	Zero	Zero	100000	100000
South Refineries Company	1.7%	3%	70000	70000
North Refinery Company	-	-	100000	100000
Middle Refineries Company	3%	1.9%	70000	70000
Central Oil Company	0.2%	0.04%	100000	100000
Pipeline Company	1%	1%	100000	100000

ISO 60300-1-2012 dependability: The company has not depended on the guidelines of the international specifications of ISO 60300-1 within the dependability techniques of supporting maintenance procedures and improving reliability and ability of those procedures.

Preventive maintenance procedures: The maintenance of the company was not as good as required. Thus, leading to production fluctuation and affecting the condition of equipment and shortening its productive life despite the huge amounts of money that were spent in this regard (Inspector General reports submitted to MoO).

Testing maintenance and calibration equipment: The company management has not complied with measurement and calibration protocol (Petroleum transfer agreement) that was signed in BP company site at Alrumela on 18th of October 2015. It recommends installing modern meters to measure the received and delivered quantities in standard conditions by reading the temperature and gravity gauges to facilitate tallying and financial accounting.

Maintaining LPG testing equipment: The report of IG of MoO explained that the management fails to develop a plan to have the works of calibration LPG meter completed. The reason behind is the overlap and similarity of the production maintenance sections and the mechanic department sections of the engineering body. Therefore, many problems ensued when maintenance are carried out. In addition, absence of coordination is identified between licensing contract operators in terms of engaging engineering testing representative in enterprises committees related to licensing rounds fields.

ISO 10015 (2015) training quality: The training courses on quality and related activities held by the company in 2013/2014 are depicted in Table 4.

Table 4: Training activities

Courses	In (2014)	Year (2013)	Cost in IQD	
			2014	2013
Courses carried out within the company	382	250	900,000	1100000
Participating courses within the oil sector	110	85	750000	500000
Co-courses outside the oil sector	555	202	27 million	15 million
The de Rat Co where outside of the country	152	222	350 million	120 million
Total	-	-	621650000	271600000

Table 5: Summary of expenditure versus quality standards in 2014 (thousand IQD)

Items	Quality standards	Amount
Planning and designing quality and developing its system	(9001-2015)	
	A (19011) (10013)	130,000
Planning and implementing the quality plan for the laboratory department	(17025)	50,000
Safety and environment plans	OHSAS-18001 occupational safety	437,000
Training of quality workers and related activities		271,600
Information security	And (27001)	35,100
	Management of information security and safety	
Insurance	(5500)	630,400
	Measurement and classification of fixed assets	93,000
	Endocrinology	
Internal audit	ISO (19011) quality audit activities	250
Inspection of maintenance equipment and calibration	-	144,000
Staff skills	ISO quality standard (10015)	216,000
Other audit procedures		17,000
Preventive maintenance	ISO quality standard (1-603000)	944,986
	Reliability Support maintenance procedures	
Evaluation of materials and parts processed by others	ISO 9001 quality standard (10006) the	9,600
Maintenance of inspection equipment scrap	choice of the optimum method in evaluating	50,218
Costs of halting production processes	materials and parts processed by others	594,482
	ISO quality standard 10006) quality management	3,829,442
	projects	
Gas burning processes	ISO quality standard (14001)	283,606
Failure analysis	(10014) improved return on investment	-
Costs of selling price reduction		
Customer complaints	(10002) guidelines for consumer complaints	4320
Sales returns	(10002)	
	A (10014) Where this standard provides guidance	
	for improving Erdat	
	(10019). Ensure customers stay and win other	
	clients. Improve operational efficiency and	
	competitiveness	
	(10002)	
Warranty procedures		
Compensatory claims		
Loss of sales	ISO quality standard (29001)	15395427
	ISO quality standard (10004)	

The training programs implemented by the company, subject of the research did not meet the required level despite the disbursement of large amounts of money. If things remain untreated, more money will be spent in vain. A program must be developed to qualify the company to obtain the certificate of the of training quality manager.

ISO 55000 (2015) fixed assets measurement and classification: The company incurred the insurance costs of its assets and employees against accidents due to risks arising from its operations. However, the requirements of ISO 55000 (2015) measurement and classification of fixed assets were not met.

Information security and safety management ISO 27001 (2015): Despite the importance of the e-Governance system and its multiple benefits and ease of use in addition to the fact that it is affordable; the information security management guidelines have not been implemented according to the requirements of the quality standard. The system benefits are as follows: control of gas movement, ease of detection of deviation be it negative or positive, controlling the quantities of gas

and preventing cases of manipulation. This will help to accurately control the financial revenues of the company.

ISO 19011 quality or environmental management system audit guidelines: Internal audit procedures involve procedures to ensure that the quality management system (ISO/TS29001, 2010) is properly implemented and quality standards are met. Four quality management section employees-the internal audit unit were engaged in training courses held by COSQC to enable them to obtain an internal audit certificate the fee of which was (250) thousand IQD for each year (2013 and 2014).

It is necessary to train and educate the internal auditors of the company on the quality management systems in accordance with ISO 19011. Table 5 shows a summary of expenditure versus quality standards in 2014 (thousand IQD).

CONCLUSION

The company incurred a loss due to the associated gas flaring of 60\$/sec (equivalent to 5184000\$/day).

Standard 14001 which contains environmental and health guidelines for natural gas processing has not been adopted.

The company incurred costs due to delays in operational processes, stock items that were defected because of the poor storage, stagnant items and storage of access materials that are not needed by the company.

This is because the company fails to comply with the requirements of ISO 10006 projects quality management. The company production does not meet the needs and expectations of LPG customers.

The requirements of the occupational health and safety standard ISO (18001) were not complied with although, the company has spent 437 million IQD. However, the occupational health and safety risks (Oxygen rich gases, chemical hazards, safety certificates for tankers trucks) remained uncontrolled.

The company did not follow the guidelines of ISO (603000-1). The maintenance programs were not at the required level and the company management did not comply with the measurement and calibration protocol (PMP). Absence of field laboratories in the fields of gas extraction contrary to the requirements of ISO 17025 (2005).

The training programs implemented by the company are not of the required level despite the disbursement of large amounts of money. A program must be developed to qualify the company for obtaining the training quality manager certificate, according to ISO (10015).

The company has incurred insurance costs on its assets and employees against accidents resulting from its operations. They were 723 million. However, the requirements of ISO 55000 (2015) measurement and classification of fixed assets have not been adopted.

The auditors of the company have not been trained and made aware of the quality management systems in accordance with ISO 19011.

Licensing rounds companies failed to handle complaints of citizens and to take action in this concern. Thus, it violates the requirements of the ISO 10002 (2010) which includes guidelines for addressing customers complaints and increasing customer satisfaction.

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