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**DEVELOPMENT OF A MANAGEMENT AND MONITORING
SYSTEM FOR THE QUALITY OF AUTOMOTIVE LUBRICATING
OILS APPLICABLE TO THE ANGOLAN CONTEXT**

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Abstract. There is in the country the market scenario filled of this product, with several brands and players fruit of the dependence to 90% of imports and has been registered many drawbacks in its marketing process and sales. After a careful analysis, it was identified that this problem is caused by the lack of an adequate quality monitoring program for these products. In general terms the present study aimed to develop a quality management and monitoring system for automotive lubricant oils applicable to the Angolan context. Through a qualitative research study and as a result of an exploratory study, which involved interviews and field studies, to stakeholders in the areas of production, import, inspection, marketing and inspection of fuels and lubricants, this study presents a proposal for a monitoring program for automotive lubricant oils in order to ensure product quality. Having done this, the results allowed the identification of the drawbacks of the current model for fuel and lubricant quality management and consequently systematize a model proposal of an "Integrated System for Lubricant Quality Monitoring" with potential to be extended also to the monitoring and quality management of other classes of lubricant oils and fuels. After describing its functionality, its principles and structuring conditions for the functioning of the respective proposal, the study recommends the Ministry of Mineral Resources, Oil and Gas of the Republic of Angola to embrace the idea of creating and implementing the system proposed herein.

Key-words: Management, Monitoring; Quality, Lubricating oils, Consumption.

DESENVOLVIMENTO DE UM SISTEMA DE GESTÃO E MONITORAMENTO DA QUALIDADE DOS ÓLEOS LUBRIFICANTES AUTOMOTIVOS APLICÁVEL AO CONTEXTO ANGOLANO

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Resumo. Existe no país o cenário do mercado preenchido deste produto, com diversas marcas e players frutos da dependência à 90 % de importações e tem se registado muitos inconvenientes no seu processo de comercialização e vendas. Depois de uma análise cuidada, identificou-se que esta problemática é causada pela falta de um programa de monitoramento da qualidade adequado a estes produtos. De forma geral o presente estudo objectivou desenvolver um sistema de gestão e monitoramento da qualidade dos óleos lubrificantes automotivos aplicável ao contexto angolano. Por via de uma pesquisa do tipo qualitativa e como fruto de um estudo exploratório, que envolveu entrevistas e estudos de campo, aos intervenientes da área da produção, importação, inspeção, comercialização e fiscalização de combustíveis e lubrificantes, é apresentado neste estudo, uma proposta de um programa de monitoramento dos óleos lubrificantes automotivos a fim de garantir que o produto tenha qualidade. Feito isto, os resultados permitiram identificar os inconvenientes do modelo actual de gestão da qualidade dos combustíveis e lubrificantes e consequentemente sistematizar uma proposta de modelo de “Sistema Integrado de Monitoramento da Qualidade dos Lubrificantes” com potencialidades de se estender também para o monitoramento e gestão da qualidade das outras classes de óleos lubrificantes e combustíveis. Após descrição da sua funcionalidade, fundamentações sobre os seus princípios e condições estruturantes para funcionamento da respectiva proposta, o estudo recomenda ao ao Ministério dos Recursos Minerais, Petróleos e Gás da República de Angola, que abrace a ideia do criar e implementar Sistema que aqui é proposto.

Palavras-chave: Gestão, Monitoramento, Qualidade, Óleos Lubrificantes, Consumo.

DESARROLLO DE UN SISTEMA DE GESTIÓN Y CONTROL DE LA CALIDAD DE LOS ACEITES LUBRICANTES PARA AUTOMÓVILES APLICABLE AL CONTEXTO ANGOLEÑO

Resumen. Existe en el país el escenario de mercado lleno de este producto, con varias marcas y jugadores fruto de la dependencia al 90% de las importaciones y se han registrado muchos inconvenientes en su proceso de comercialización y ventas. Tras un cuidadoso análisis, se identificó que este problema se debe a la falta de un programa adecuado de control de calidad de estos productos. En términos generales, el presente estudio tenía como objetivo desarrollar un sistema de gestión y seguimiento de la calidad de los aceites lubricantes para automóviles aplicable al contexto angoleño. A través de una investigación cualitativa y como resultado de un estudio exploratorio, que incluyó entrevistas y estudios de campo, a las partes interesadas en las áreas de producción, importación, inspección, comercialización y fiscalización de combustibles y lubricantes, este estudio presenta una propuesta de programa de monitoreo de aceites lubricantes automotrices con el fin de garantizar la calidad del producto. Una vez hecho esto, los resultados permitieron identificar los inconvenientes del modelo actual de gestión de la calidad de los combustibles y lubricantes y, en consecuencia, sistematizar una propuesta de modelo para un "Sistema Integrado de Monitorización de la Calidad de los Lubrificantes" con el potencial de ser extendido también a la monitorización y gestión de la calidad de otras clases de aceites lubricantes y combustibles. Tras describir su funcionalidad, sus principios y las condiciones de estructuración para el funcionamiento de la respectiva

propuesta, el estudio recomienda al Ministerio de Recursos Minerales, Petróleo y Gas de la República de Angola que haga suya la idea de crear e implementar el sistema aquí propuesto.

Key-words: Gestión, Control, Calidad, Aceites lubricantes, Consumo.

Introduction

When observing the commitments of the global energy transition, studies indicate that in addition to the challenges such as the need to decarbonize the fuel matrix of the different countries in the world, environmental sustainability, the concern for the reduced margins of a good part of the world refineries, sometimes negative, for different reasons such as the control of the prices of derivatives in the different countries, there is also the gravity factor of the specifications of the products as an element that contributes to the global energy transition. In this context, Angola has a lubricants market full of various brands and players, as a consequence of its 90% dependence on imported lubricants and 80% of imported fuel, which has had many drawbacks in its marketing and sales process, from the point of view of quality assurance and consumer satisfaction.

In recent years, the market for the production, distribution and marketing of petroleum products in Angola has been noted for the low productivity and quality of services in this sector. Several studies and management policies of different sectors in the country point out that the need to meet the demand for products and service goods offered to the market with quality is a premise to be followed by suppliers and service providers. However, this action must be complemented with the management of the quality of the products or services provided. As a consequence of the country's industrialization phase, we continue to live off the income obtained from the oil sector, so we believe that in this sector there must be productivity at all levels and quality in all services, not only for internal consumers but also to attract more external consumers.

Given the high need for imported lubricating oils to meet consumption needs, the quality control of this product becomes vulnerable, so the study presents a management and quality control system for automotive lubricating oils consumed.

How to ensure the quality of automotive lubricants sold in Angola?

To solve this question, the following research hypothesis is deduced:

It is assumed that the implementation of a the system of management and control of the quality of automotive lubricating oils in Angola would guarantee the quality of the consumption of this product.

Therefore, the overall objective of this study was to develop a management and monitoring system for the quality of automotive lubricating oils applicable to the Angolan context.

To this end, we begin by presenting an introductory framework on lubricating oils, followed by some brief considerations on quality management.

Lubricating oils are petroleum products. The petroleum industry consists of five basic downstream segments, which are exploration, production, refining, distribution, and marketing, all of which are interspersed with the transportation segment (**Neto & Gurgel, 2018**). The following diagram presents the sequence of these activities.

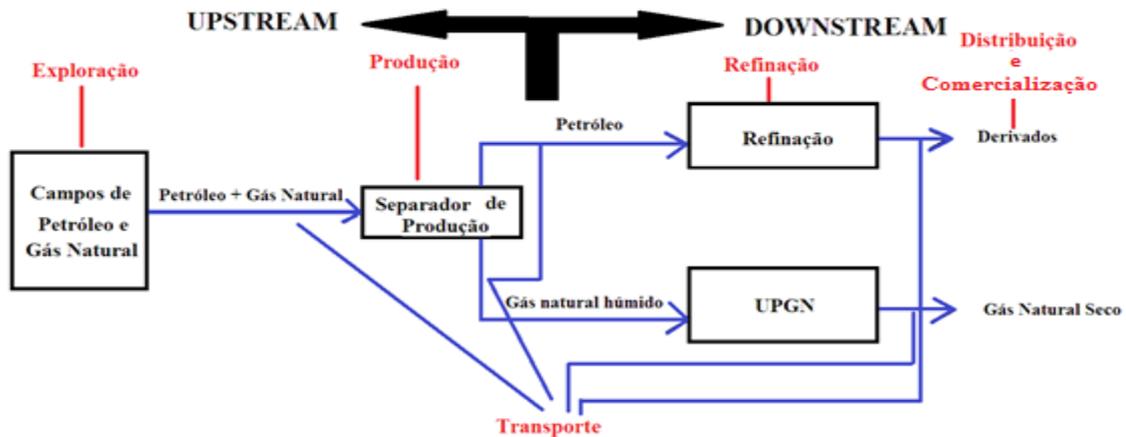


Figure 1. Segments of the oil industry
 Note: Adapted from Neto & Gurgel (2018)

As a brief description of the diagram (Figure 1), we can visualize that the Upstream part is composed of the oil activities that take place offshore, such as exploration and production, linked by transportation. And the Downstream part is composed of refining, distribution and marketing activities, also interconnected by transportation.

According to Gândara (Óleos lubrificantes minerais: uma análise das potencialidades da reutilização, 2000, p. 28) « Lubricating oil is used to provide a film between the bodies, reducing wear of the materials and increasing their service life.»

Based on SENAI - ES and CST (Lubrificação – Mecânica, 1997, p. 12) we can see that lubricants have the following main functions:

- a) Lubrication:
- b) Refrigeration:
- c) Cleaning and maintenance:
- d) Protection against corrosion:
- e) Sealing the combustion chamber:

In summary, the classes of automotive lubricating oils are schematized according to the applicability of the oils. Broadly speaking, the classes of automotive lubricating oils are as follows:

- a) Class of lubricating oils for engines;
- b) Gear lubricating oil class;
- c) Transmission lubricating oil class;
- d) Class of lubricating oils for brakes;
- e) Class of lubricating oils for penetration;
- f) Class of lubricating greases for wheel and chassis bearings; g) Class of lubricating greases for wheel and chassis bearings; h) Class of lubricating greases for wheel and chassis bearings;
- g) Class of lubricating greases for high-temperature wheel bearings;
- h) Class of white lubricating greases;
- i) Electronic lubricating grease class;
- j) Lubricating graphite class.

The set of properties must give the oil the following characteristics:

- Mobility at low temperatures;
- Oxidation resistance;
- Viscosity and its variation as a function of temperature.

All lubricating oils have special characteristics, but in general have the following properties in common:

- Viscosity;
- Viscosity index;
- Density;
- Mobility at low temperatures;
- Flash point;
- Pour point;
- Demulsibility and emulsibility;
- Detergency;
- Unctuousity

The quality management of a product or service leads us to adopt quality management systems. Management systems are understood as a set of tools and work practices that serve to manage a sector or product. A Management System (MS) serves to catalog the information of an organization in order to concentrate the data, providing more specific information, which helps to a better and correct decision making.

Adopting quality management systems follows models that start with the preparation of the organizations, extend to the implementation of the systems and to the verification of the conformities and the subsequent audits of the implemented systems.

In order to present a concept of quality, many authors have tried to present a satisfactory concept. Among them we have:

Quality is, by definition, a relatively broad and complex concept, and there is no consensus on its conceptualization. The most widely used definitions of quality worldwide are those issued by the main quality gurus at different times. Among them are:

Suitability for use - Joseph M. Juran;

Compliance with requirements - Philip Crosby;

Quality as a function of losses - Genichi Taguchi;

Quality means a predictable degree of uniformity and reliability at low cost, being suitable for the market. - W. Edwards Deming. (Berssaneti & Bouer, 2013, p. 22)

The definitions presented and daily practice lead us to understand that the fundamental premise of quality management of any marketable product is to ensure that it has properties that meet its quality specifications, and respects a chain of steps until it reaches the consumer, with operations that do not alter the same properties.

It is impossible to talk about quality without referring to the ISO 9000 family of standards.

The ISO 9000 family addresses various aspects of quality management. The standards provide guidance and tools to companies and organizations that want to ensure that their customers' needs are met, and that continuous improvement is achieved (Vilar, 2013, p. 18).

When implementing a quality management system in an organization, it is necessary to consider the following standards of the ISO 9000 family, which are presented in the following table:

Table 1
ISO 9000 Standards

Standard		
Number	Scope	Field of application
ISO 9000:2005	Quality Management System - Fundamentals and vocabularies	Describes the fundamental principles of quality management systems that are the focus of the ISO 9000 family of standards and defines related terms
ISO 9001:2008	Quality Management System - Requirements	Specifies the requirements of a quality management system in which an organization - You need to demonstrate your ability to provide a product that meets the customer's requirements and applicable regulations - It aims to increase customer satisfaction through the effective implementation of the system, including processes for continual improvement of the system and to ensure compliance with customer requirements and applicable regulations
ISO 9004:2019	Quality Management System - Managing for the sustainable success of an organization. Quality management approach	Provides guidelines that go beyond the requirements set forth in ISO 9001 to consider both the effectiveness and efficiency of a quality management system Compared to ISO 9001, the objectives of customer satisfaction and product quality are expanded to include stakeholder satisfaction and organizational performance. It is not intended to be used for certification purposes, nor as a guide for the implementation of ISO 9001
ISO 19011:2011	Guidelines for the audit of management systems	Indicates the guidelines for conducting management system audits

Note: Adapted from Vilar (2013)

The implementation of a quality management system in an organization to guarantee the quality of a product or service brings many advantages.

These stages are as follows:

- Organize and improve organizational effectiveness;
- Improved execution, coordination, and productivity;
- Increased focus on organizational objectives and customer expectations;
- Achieving and maintaining product quality to meet explicit and implicit customer needs;
- Holding people accountable;

- Internal and external communication;
- Systematization of tasks and procedures;
- Competencies and competency improvement;
- Demonstration to customers and potential customers of the organization's capabilities;
- Opening new market opportunities or maintaining market share;
- Certification with external visibility and internal and external recognition. (Pinto & Soares, 2018, p. 32).

Undoubtedly, these are benefits with an advantageous potential for any organization that wants to establish itself in any type of market. For this purpose, quality control systems must be used.

We understand by quality monitoring models, the mechanisms aimed at collecting data in order to provide managers and stakeholders with indicators that translate the status of a given service or product.

"There are many monitoring systems implemented in the world, with differences mainly in the mode of operation and objectives" (Lima, Assis, Raldenes, & Pereira, 2012, p. 12).

In general, in the quality monitoring programs the management of existing petroleum products in any way, the main systems of quality control of fuels and lubricants developed in the world, associated with inspection along the marketing chain of the final products, are valid.

By way of comparison, Figure 2 shows some of the main monitoring systems in the world.

País/Região	Tipo de sistema de monitoramento/fiscalização
Estados Unidos da América	Amostragem e ensaio, manutenção de registros, relatórios, auditoria, certificação, monitoramento voluntário pela indústria.
União Europeia	Amostragem seguindo norma EN 14274 e obrigatoriedade de emissão de relatório com dados anuais da qualidade dos combustíveis, segundo a Diretiva 98/70/EC ⁷ .
Austrália	Programa governamental de amostragem, manutenção de registros, automonitoramento pelas indústrias.
Cingapura	Amostragem voluntária de cada combustível destinado à comercialização e envio de relatórios ao governo.
Coreia do Sul	Programa de amostragem em refinarias, terminais e postos revendedores.
Japão	Programa governamental de amostragem anual em todos os postos revendedores.
Canadá	Envio de relatórios com dados das características definidas como sendo de monitoramento obrigatório pelo governo.
Argentina	Programa nacional de controle de qualidade dos combustíveis, de caráter fiscalizatório, mantido pela Secretaría de Energia.
Colômbia	Marcação de produtos para identificação e quantificação, análise em postos revendedores por equipamento portátil.
Chile	Ações de fiscalização, obrigatoriedade de envio de documentos declaratórios de conformidade de produtos, organismos certificadores, automonitoramento pelos postos revendedores.
Costa Rica	Verificação de certificados e ações de fiscalizações realizadas por empresa terceirizada.
Uruguai	Programa de monitoramento realizado por empresa terceirizada e manutenção de registros.
Peru	Programa de monitoramento e fiscalização pelo Organismo Supervisor de la Inversión em Energía y Minería – Osinergmin e automonitoramento pela PetroPeru.
Guatemala	Programa permanente de fiscalização mantido pelo órgão Dirección General de Hidrocarburos – DGH.
Brasil	Programa de amostragem, manutenção de registros, obrigatoriedade de envio de dados sobre comercialização e qualidade de produtos, ações de fiscalização.

Figure 2. Fuel quality control program - FQCP

Note: Lima, Assis, Raldenes, & Pereira, (2012)

Applying the management of refineries for the management and assurance of their quality, we classify them into two types of models, which are developed as follows.

Closed Models

They are based on monitoring the quality of a given product in which all parties involved, from producers and/or suppliers, distributors, retailers, regulators, inspectors and product defect claims managers, belong to the same market sector.

In emerging countries, and without the development of regulatory aspects, the quality aspect and its rapid means of measurement, this type of model is limited by the lack of other consumer protection tools in case of defects in the products purchased and/or consumed. According to Table 1.1, we can see that the models of the United States of America, South Korea, Peru, and Chile are in line with this type of monitoring.

Open Models

These, in turn, are based on monitoring the quality of a given product in which all the parties involved, from producers and/or suppliers, distributors, retailers, regulators, inspectors and product defect claims managers, do not all belong to the same market sector.

This type of model provides those involved with a greater capacity for rigor in their activities due to the flow of information to demonstrate, or not, the quality of a service or product purchased and/or consumed, with the limitation of the model of the possibility that this information is sensitive to the business. According to table 1.1 we can see that the models of the European Union, Singapore, Japan, Canada and Argentina are in line with this type of monitoring.

Analyzing in depth we can also verify the typologies of mixed quality control models. Due to their structure, these models can be applied to lubricating oils as well as to any other petroleum product.

Methodology

The study was a qualitative type of research and the modality of the project falls into the category of quasi-experiment. The data were collected using the instrument, the documentation, since it was started by making a literature review, on the quality control of petroleum products and their management, as well as the information instructions of the main stakeholders of the research universe and the interview method was also used.

The procedure used for data analysis is content analysis, since for the practical part of the project, an objective, systematic and quantitative description of the data collected during the research was carried out.

During the practical research, we conducted field visits between March 2018 and June 2019 to stakeholders in the lubricating oil monitoring sector, selected based on the representativeness of stakeholders with a potential fit with our proposed automotive lubricant quality monitoring and management system.

These stakeholders were:

- The Petroleum Derivatives Regulatory Institute and the National Directorate of Commercialization of the Angolan Ministry of Mineral Resources, Petroleum and Gas of Angola, as representative of the Angolan State and regulator of the sector, in the role of regulator and inspector;
- The IMUL lubricant factory in Angola belongs to the Sonangol Distributor company of the Sonangol Group, in the role of both producer and importer of the lubricating oil product;
- The Angolan Institute for Quality Standardization (IANORQ), as the Angolan State control body, in the role of supervising actor;
- The National Institute for Consumer Defense (INADEC), as a public consumer defense agency, in the role of intervening representative of the consumer market.

These field visits allowed us to learn about the status of quality control and management of automotive lubricants and other petroleum products marketed in Angola.

Results and Debates

Our product under study is automotive grade lubricating oil and the study seeks to establish its quality assurance at the commercialization stage, which naturally belongs to the distribution and marketing segment. This product in Angola is produced by IMUL (Instalação da Mulemba de Lubrificantes) and to supply market demand it is also imported.

Although the large refinery parks have the capacity to produce lubricating oils, the Angolan refinery (the only one to date), i.e. the Luanda Refinery, does not have a production line for this product.

In terms of operations and industrial structure, IMUL fits into the complementary facilities of the oil derivatives production chain. IMUL is the place where blending takes place and serves to produce the different families of lubricating oils that will be classified by density, composition and other characteristics. In turn, additives are added for the specific purpose of improving the properties required for lubricating oil quality, such as greasiness, detergency, demulsibility, viscosity, freezing point, color, stability and others.

In the domestic lubricants market, we have the following types of players:

- Brands: There are the brands Ngol, Vip, Vip Extra, Global, Galp, Castrol.
- Producer: There is only the IMUL facility;
- Importers: We have the companies Pumangol, Cosal, Jambo, Sonangalp, Total, Lubáfrica and others;
- Distributors: We have the companies Sonangol Distribuidora, Pumangol, Galp, Sonagalp, NGRC;
- Traders: We have the companies Sonangol Distribuidora; Pumangol, Galp, Sonagalp, Libiauto, Sonangalo, Cosal, Jambo, Impoleos, Lubiafrica and others.
- Prosecutor's Office: The Petroleum Derivatives Regulatory Institute and the Marketing Department of the Ministry of Mineral Resources, Oil and Gas.

To date, Angola has only one lubricating oil production plant (IMUL), and due to the low processing capacity of the country's existing refinery, Angola cannot produce base oils, so these are imported.

The current production capacity for lubricating oils is 20,000 MT/year, but the industry plans to increase its capacity to 40,000 MT/year, which shows that the 20,000 MT/year capacity is no longer sufficient to meet consumer needs. The company that produces Angola's lubricating oils is called IMUL (Instalação da Mulemba de Lubrificantes) and they appear on the market under the brand name NGOL.

In the third quarter of 2018, sales of lubricants in the domestic market, fell by 62% in volume compared to the analogous period of 2017.

Imports are permanently followed by PUMANGOL, SONANGALP, COSAL, JAMBO, IMPOLEOS and LUBÁFRICA.

According to the Sales Report of the Internal Marketing Department of the Ministry of Mineral Resources and Petroleum of the Republic of Angola, the quantities in metric tons (MT) of lubricants sold give the largest supply of the company SONANGOL DISTRIBUTOR, which supplied the market with 1,526.50 MT. And about 2513.02 MT of the supply of lubricating oils sold in Angola in that period (third quarter of 2018) depended on imports.

The following table shows in more detail the state of decline of the product in the domestic market, based on the MIRMPET report.

Table 2
Lubricant sales in the domestic market, third quarter 2018

BUSINESSES	AMOUNTS (TM)
SONANGOL DISTRIBUTOR	1,526.50
PUMANGOL	1,056.58
SONANGALP	325.00
COSAL	439.30
JAMBO	591.21
IMPOLEOS	33.79
LUBAFRICA	67.14
TOTAL	4,039.52

Note: Ministry of Mineral Resources, Petroleum and Gas (2018)

To regulate the quality of lubricating oils, there is the Angolan legal diploma, EXECUTIVE DECREE No. 536/15, for the purpose of the evaluation of their quality of automotive lubricants highlights the following standards:

In the case of lubricating oils for four-stroke gasoline engines, the API SJ or ACEA A3/B3 standard must be met.

In the case of lubricating oils for four-stroke diesel engines, the API CH-4 or ACEA B3/E3 standard must be met.

For automotive gear oils, except for automotive automatic transmissions, the following standard must be complied with standard API GL-4 o API GL-5.

In the case of lubricating greases, the degree of consistency corresponding to the applicable NLGI classification must be complied with.

For other classes of lubricating oils not provided for in Articles 3 to 9 of EXECUTIVE DECREE No. 536/15, including automotive automatic transmissions, the minimum specifications required by equipment manufacturers must be met.

Under Angola's current system, lubricating oils enter the Angolan market through imports in an amount corresponding to 62.21% of national consumption and 37.79% are produced by the Angolan company IMUL. Following the commercial authorizations, the importers have a fiscal license granted by the regulator, i.e. the Angolan Ministry of Natural Resources and Petroleum, to import and sell the product, and in turn the national producer has a license to produce the product. And in this way the lubricating oils enter the consumer market. In accordance with price regulatory policies, importers market the

product after providing the regulator with a certificate of quality of the imported product and the producer sends it to its counterpart within the Sonangol group, the subsidiary Sonangol Distribuidora, to market the oils. Sporadically and especially in case of relevant need (such as complaints of lack of quality) the regulator goes to the marketing market to certify the quality of the product, taking samples of the product and sending them to specialized laboratories for analysis based on, EXECUTIVE DECREE No. 536/15. Normally, the regulator sends them to IMUL (player of the segment) to check the quality and answer any questions. In case of infringement, suppliers found in such a situation are sanctioned, with measures ranging from fines, withdrawal of the product from the market and, in rare cases, reimbursement to customers affected by the lack of quality.

The following drawbacks are notorious in this system:

- Periodicity of surveillance, the measure of product flow into the market;
- Lack of involvement of the Angolan Institute for Quality Standardization (IANORQ), as it is a supervisory body of the Angolan State as a watchdog independent of the regulator;
- The lack of openness to independent quality certifiers;
- The scarce elaboration of an accurate report on the state of product quality and its dissemination to consumers;
- The lack of involvement of the National Institute for Consumer Defense (INADEC), being a public consumer defense agency with the creation of a correspondent in the quality control and management system to facilitate the process of consumer complaints.
- And finally, for the convenience of inspection and quality certification, the normative instrument should be more user-friendly and, in this regard, the Executive Decree 536/15, which regulates the specifications of lubricants marketed in the Republic of Angola, is not at this level, as it only refers to technical standards and does not present in detail the parameters, specifications and standardization methods of laboratory work.

In our analysis, these drawbacks are relevant to the extent that Angola continues to live on the income obtained from the oil sector, so we believe that in this sector there must be productivity at all levels and quality in all services, not only for internal consumers but also to attract more external consumers.

Hence, we present the following system to better promote the control and management of lubricant quality, with possible application to any petroleum product.

Based on the problem of the study, the research question and the solution hypothesis, the monitoring proposal involves the establishment of a system of operation around the chain of a product that outlines and identifies a functional circuit from the supply to the consumer. The functionality of this proposal is represented by the following flow diagram:

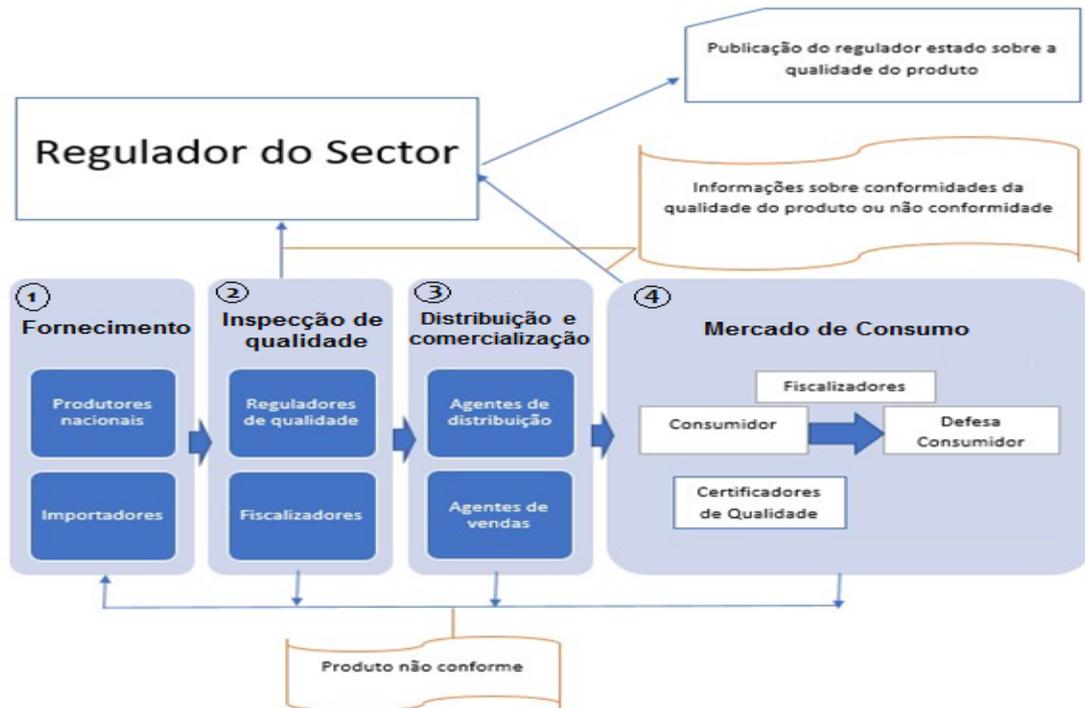


Figure 3. Systematization of the proposal for quality control and management of automotive lubricants

In this sequence we have:

The system starts with the delivery of the product to the system. The supply of the product to the system can be through import or domestic production and follows the quality inspection stage.

The quality inspection stage is carried out by the quality regulators (representative of the sector regulator), as they are the ones who have the quality standards and inspectors to safeguard the technical analysis of quality surveillance. The result of the inspection can provide two types of opinions, one of them is CONFORM and the product passes to the next phase of the product quality monitoring system, preceded by a documentary record for control purposes with the information that the batch or shipment of product is within specification, as well as the record of the destination of the possible point of marketing of the same batch or shipment of product. On the other hand, in this phase we can also have a NOT CONFORMED opinion, and the product returns to the supply phase for reprocessing. All opinions obtained at this stage are promptly communicated to the industry regulator for publication to satisfy the need for public information.

The product with a CONFORMED opinion goes on to the distribution marketing stage so that it can be effectively made available to the consumer market.

Once in the consumer market, the marketed product is certified for its quality, both by the quality certifiers and by the consumer himself, who will be represented by the Consumer Protection Agencies, through complaints in case anomalies are detected in the quality of the product. As in the quality inspection stage, at this stage the result of the quality certification can also provide two types of reports, being a CONFORM report accompanied by a documentary record for control purposes with the information that the batch or shipment of product is within specifications and we can also have a NOT

CONFORM report, and the product returns to the supply stage for reprocessing. All opinions obtained at this stage are also communicated in a timely manner to the industry regulator for publication to satisfy the need for public information.

Contextualizing the proposal to the Angolan reality, we have:

Regulator: Angolan Ministry of Natural Resources and Petroleum (Regulatory Institute of Petroleum Derivatives);

Suppliers: The Angolan production company Sonangol in its subsidiaries Sonangol Logística and Sonangol Distribuidora (IMUL) and Exporters;

Inspection: Angolan Quality Standardization Institute (IANORQ) and MINRMPET;

Distribution and marketing: Sonangol Distribuidora, Pumangol; Total, Lubafrika and others;

Consumer market: Consumers, independent quality certifiers such as Certified University Laboratories; National Institute for Consumer Defense (INADEC).

After the presentation of the proposal, for the subsequent management and its operability of the proposal, our idea of a monitored market, proposes the creation of a team that monitors the National System for Monitoring the Quality of Lubricants and/or Fuels, composed of the following working committees:

a) Working Committee, for the evaluation, quality certification and codification of the product, composed of sector regulators, certifiers and product quality inspectors, this committee must be divided into two subcommittees, which are:

(a.1) Working subcommittee, for product evaluation, quality certification and coding, upon product entry into the market prior to marketing. This committee would authorize the distribution or not of the product for sale;

a.2) Working subcommittee for product evaluation, quality certification and quality inspection in the consumer market (sale and consumption). This committee would monitor the quality of the product during distribution and consumption;

b) Working Committee, for technical and scientific research and drafting and control of product quality monitoring documentation, composed of industry regulators, quality certifiers, technical and scientific research professionals in the area of lubricant and fuel quality, quality standardizers and consumer representatives (Consumer Protection), this committee should be divided into two subcommittees, which are:

(b.1) Working subcommittee for technical-scientific research, for monitoring the technological evolution of product quality, adjustment of specifications and development of new product lines;

b.2) Working subcommittee for the drafting and technical control of product quality monitoring documentation, for the documentary treatment of the activities of the working team of the National System for Lubricants and/or Fuels Quality Follow-up.

The Integrated Quality Surveillance System follows the following dependency relationship:

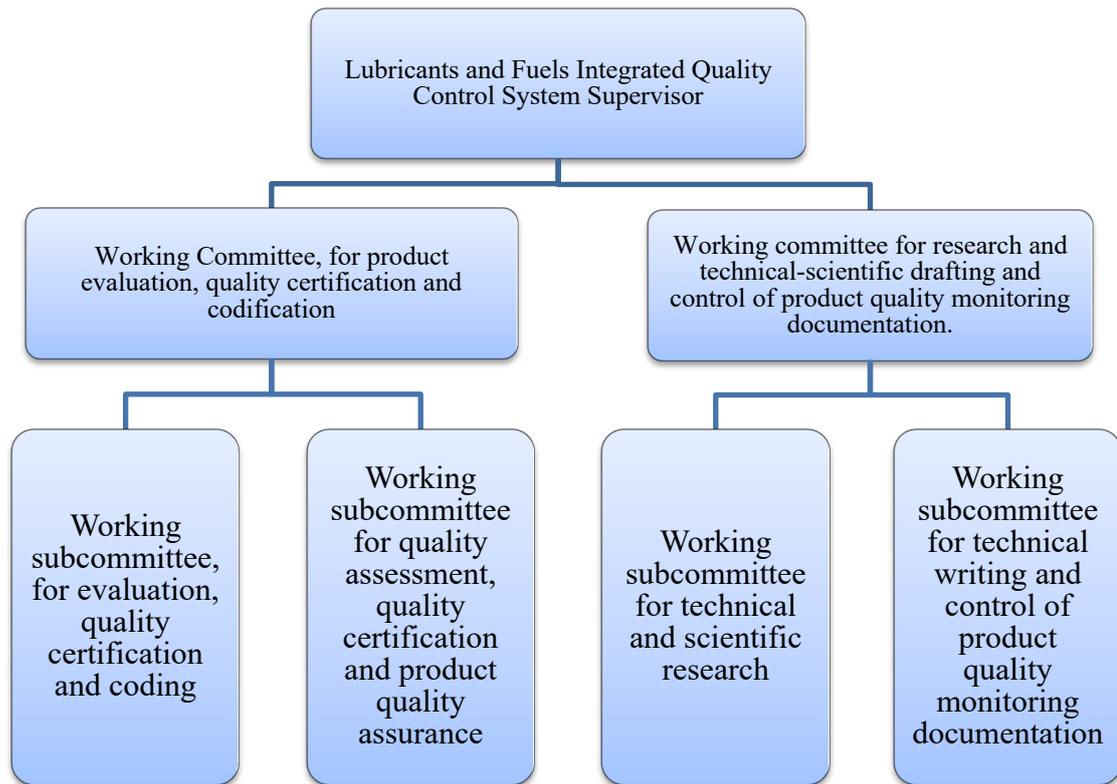


Figure 4. Hierarchical reporting structure of the Integrated Fuel and Lubricant Quality Control System

The working committee of the National System for Monitoring the Quality of Lubricants and/or Fuels will operate with representation from the 18 provinces of the country, in the points hereinafter identified as points of reception of the product, such as producing regions (where there are factories), port regions, customs regions of frequency of this type of product and regions of high consumption of the same.

With a work team for the Quality Control of Lubricants and/or Fuels, we will have a better guarantee of the quality of these consumed products. And its structuring can provide, among other advantages, the following results:

1 - Actions to verify and certify the quality of the product at the reception points before placing it on the market

Regardless of the information from the producer or importer of automotive oil, the National System for Monitoring the Quality of Lubricants and/or Fuels must have the technical conditions to be able to check samples of the product batch received, to certify that its quality complies with the specifications pre-established by the sector regulator so that the product can be consumed.

2 - Independent product coding and registration

Upon certification of good product quality, the working committee for the evaluation, certification, and coding of the National Lubricants and/or Fuels Quality Monitoring System will promote an action of coding the product lots with a generic code, such as a serial number or bar code in its monitoring documentation records, to identify that the product lot or shipment is within specifications. As well as a record of the destination of the potential trading post of the same batch or shipment of products.

3 - Inspection of product quality at the point of sale

Since storage conditions also represent a reason for loss of quality, it is necessary that the National System for Monitoring the Quality of Lubricants and/or Fuels also acts to certify that at the distribution points the product continues to maintain its quality. For this we also need a clearer Executive Decree, which regulates the specifications of the lubricants sold in the Republic of Angola.

4 - Existence of an integrated quality control model

We consider that the model presented is an integrated quality monitoring model, since it contemplates the contribution of organizations whose performance is not directly framed in the oil sector, namely IANORQ (Angolan Institute for Quality Standardization) and INADEC (National Institute for Consumer Defense) and the laboratories of educational institutions to contribute as independent quality certifiers and provide periodic reports on the quality status of the products analyzed in these laboratories.

For this purpose, the following conditions must be met:

- For IANORQ (Angolan Institute for Quality Standardization)
- Creation of an office within the Quality Policy Management, with technicians with technical and scientific capacity to research, monitor, update, recommend and propose standards to evaluate and/or guarantee the quality of lubricants and fuels, as well as other products of interest for the country's useful life.
- For INADEC (National Institute for Consumer Protection)
- Creation of a technical group, within the Market Studies Department, with the technical competencies to monitor the standards for evaluating and/or guaranteeing the quality of lubricants and fuels.
- For higher education institutions

Educational institutions must be part of the national network that produces studies on the quality of lubricants and fuels in the areas where they have their headquarters or some action.

This production is carried out through practical classes in laboratories linked to the disciplines of fuel and lubricant analysis. In this regard, the students periodically collected samples from the most diverse outlets of lubricants and fuels in a geographically defined area and took them to the laboratories to check their quality, based on the normative references that regulate the quality of these products for consumption in Angola, namely Executive Decree 288/14 and Executive Decree 536/15. After this analysis, a report is prepared by the technical guides of the discipline (professors and monitors) and sent to the coordination of the National System for Monitoring the Quality of Lubricants and/or Fuels, so that decisions are made to process the information and publish it for public knowledge.

For this, the institutions must propose two indispensable aspects, which are:

1. To have human capital with technical competence to evaluate and/or guarantee the quality of lubricants and fuels and to prepare reports;
2. To have certified laboratories for the analysis of lubricants and fuels, accredited and approved with confidence to perform the tests according to the rules of Executive Decree No. 288/14 and Executive Decree No. 536/15.

In addition, it is important to open the opportunity for independent quality certifiers, i.e. independent lubricant and fuel laboratories, with the assurance that they are certified for the purpose of analysis of lubricants and fuels, accredited as approved with

confidence to carry out tests according to the standards of Executive Decree No. 288/14 and Executive Decree No. 536/15 and produce reports for the coordination of the National System for Monitoring the Quality of Lubricants and/or Fuels.

Conclusions

It is notorious to observe that modern organizations are committed to high standards of commitment to policies for promoting and defining the quality of services and products. These play a crucial role in decision making at all levels of a simple organization or society. Therefore, depending on the sector in which each country operates, a quality management system must be defined to ensure the existence of this important decision-making factor for services and products. In this sense, this study presents a system for managing and monitoring the quality of automotive lubricating oils consumed in Angola. Our study allowed us to identify the actors, the strategies and interaction of the actors within the system, and the supporting notes to complement the Angolan legislation that assesses the quality of lubricating oils.

Based on the results of the study conducted, we make the following recommendations:

1. To the Ministry of Mineral Resources and Petroleum, on behalf of the Government of the Republic of Angola, to embrace the idea of creating a management and monitoring system for the quality of lubricating oils (also applicable to fuels) and to take advantage of the results presented in this research and enable the implementation of the Integrated System for Monitoring the Quality of Lubricants and/or Fuels (SIMQLC) and , in particular, to increase the allowances (*tables, where are presented, Characteristics, Units, Limit Values and Test Methods*) to the Executive Decree No. 536/15.

To correspond to their functions within the integrated quality control model (proposed in this study), we recommend the following to IANORQ (Angolan Institute for Quality Standardization) and INADEC (National Institute for Consumer Protection) and to the laboratories of educational institutions and research centers in the area of fuels and lubricants

2. For IANORQ (Angolan Institute for Quality Standardization), the creation of an office within the Quality Policy Management Department, with technicians with technical and scientific expertise to research, monitor, update, recommend and propose standards that evaluate and/or guarantee the quality of lubricants and fuels, as well as other products of interest to the life of the country.

3. For INADEC (National Institute for Consumer Protection), the creation of a technical group, within the Department of Market Studies, with the technical competence to supervise the standards to evaluate and/or guarantee the quality of lubricants and fuels.

4. For institutions of higher education and research centers in the area of fuels and lubricants, which have human capital with technical competence to evaluate and/or guarantee the quality of lubricants and fuels and prepare reports; And that have certified laboratories for the purpose of analysis of lubricants and fuels, accredited and approved with confidence to perform the tests, according to the rules of Executive Decree No. 288/14 and Executive Decree No. 536/15.

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