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TECHNICAL REVISION TO ANGOLAN EXECUTIVE DECREE NO. 536 - 15 OF AUGUST 28, 2015 ON THE SPECIFICS OF LUBRICANTS CONSUMED IN ANGOLA - SUBSIDIES AND NORMATIVE UPDATES

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Summary. The study focuses on the issue of quality assurance of lubricant oils in Angola, whose normative that regulates this quality is the Executive Decree No. 536/15 of August 28, which describes the specifications of the lubricants sold in the Republic of Angola (attached). Chapter II of the aforementioned Executive Decree points to the minimum standards of API, SAE, NLGI and ACEA as international specification references for compliance in terms of consumption quality of the different lubricant oil families, but with little depth in terms of control instruments (reference tables) or monitoring of this compliance. This scenario is aggravated by the fact that there is a crowded market for this product, with several brands and *players*, as a result of the 90% dependence on imports. The legislation applied in Angola is described and with recourse to the comparative study is based on the technical specifications of reference by the decree, its limits, methods and regulatory updates, with the aim of enriching the Executive Decree n.no. 536/15 of August 28, the result is the segmentation of classes and standards with specifications described in the form of tables, where they present the characteristics, units, limit values and test methods in which they can easily be used at the time of their tests for product quality certification (lubricating oil) and therefore,it is recommended that these tables are attached as a subsidy to that Decree.

Keywords:Quality; Lubricants and Executive Decree No. 536/15.

REVISÃO TÉCNICA AO DECRETO EXECUTIVO ANGOLANO N.º 536 - 15 DE 28 DE AGOSTO DE 2015 SOBRE AS ESPECÍFICAÇÕES DOS LUBRIFICANTES CONSUMIDOS EM ANGOLA - SUBSÍDIOS E ACTUALIZAÇÕES NORMATIVAS

Resumo. O estudo centra-sena problemática da garantia da qualidade dos óleos lubrificantes em Angola, cujo normativo que regula a referida qualidade é o Decreto Executivo N.º 536/15 de 28 de Agosto que descreve as especificações dos lubrificantes comercializados na Republica de Angola (em anexo). O capítulo II do Decreto Executivo supracitado, aponta para referências de especificações internacionais os padrões mínimos da API, SAE, NLGI e ACEA para cumprimento em termos de qualidade de consumo das diferentes famílias de óleos lubrificantes, mas com pouca profundidade a nível de instrumentos de controle (tabelas de referência) ou monitoramento deste cumprimento. Este cenário é agravado pelo facto de existir um mercado preenchido deste produto, com diversas marcas e *players*,fruto da dependência à 90 % de importações. Descreve-se oa legislação aplicada em Angola e com recurso ao estudo comparativo fundamenta-se as especificações técnicas de referência pelo decreto, seus limites, métodos e actualizações regulamentares, com o objectivo de enriquecer oDecreto Executivo n.º 536/15 de 28 de Agosto, resultado é asegmentação das classes e normas com as especificações descritas na forma de tabelas, ondese apresentamCaracterísticas, Unidades, Valores Limite e Métodos de Ensaio no qual facilmente utilizáveis na altura dosseus testes decertificação da qualidade do produto (óleo lubrificante) e por isso,recomenda-se que estas tabelas sejam anexadas como subsídio ao referido Decreto.

Palavras-chave:Qualidade; Lubrificantes e Decreto Executivo N.º 536/15.

REVISIÓN TÉCNICA DEL DECRETO EJECUTIVO ANGOLEÑO N.º 536-15 DE 28 DE AGOSTO DE 2015 SOBRE LAS ESPECIFICIDADES DE LOS LUBRICANTES CONSUMIDOS EN ANGOLA - SUBSIDIOS Y ACTUALIZACIONES NORMATIVAS

Resumen. El estudio se centra en la cuestión de garantizar la calidad de los aceites lubricantes en Angola, cuya normativa que regula dicha calidad es el Decreto Ejecutivo nº 536/15, de 28 de agosto, que describe las especificaciones de los lubricantes comercializados en la República de Angola (adjunto). El capítulo II del citado Decreto Ejecutivo señala las normas mínimas de API, SAE, NLGI y ACEA como referencias de especificación internacional para el cumplimiento en cuanto a la calidad del consumo de las diferentes familias de aceites lubricantes, pero con poca profundidad en cuanto a instrumentos de control (tablas de referencia) o seguimiento de dicho cumplimiento. Este escenario se ve agravado por el hecho de que existe un mercado abarrotado de este producto, con varias marcas y actores, como consecuencia de la dependencia del 90% de las importaciones. Se describe la legislación aplicada en Angola y con el recurso al estudio comparativo se basa en las especificaciones técnicas de referencia por el decreto, sus límites, métodos y actualizaciones reglamentarias, con el fin de enriquecer el Decreto Ejecutivo N º 536/15 de 28 de agosto, el resultado es la segmentación de las clases y las normas con las especificaciones descritas en forma de tablas, que presentan Características, Unidades, Valores Límite y Métodos de Prueba en la que fácilmente utilizable en el momento de sus pruebas para la certificación de la calidad del producto (aceite lubricante) y por lo tanto se recomienda que estas tablas se adjuntan como un subsidio a ese Decreto.

Palabras-clave: Calidad; Lubricantes y Decreto Ejecutivo N.º 536/15.

Introduction

To be available and consumed in the market, every product must meet quality standards that are standardized in organizations, specialty centers, and concomitantly in the countries in general to regulate such products and their consumption.

These standards are designed under specific conditions influenced by factors such as the types of raw materials used to obtain the product and/or the origin of the product,

the production chain, the climate at the place of consumption, and the means or forms of consumption of the respective product.

In the case of lubricating oils, in Angola, there is at the production level a facility that mixes and makes available several lines of lubricating oils of one brand, namely the *NGOL*brand. The remaining brands, are imported by several companies to satisfy the national consumer needs, making the consumer market full of several brands. This scenario naturally makes the certification of the quality of this product indispensable.

This leads us to think that on the one hand Angola needs to import this product to meet consumption needs and on the other there is the legal Executive Decree 536/15 of August 28 that regulates the specifications of lubricants sold in the Republic of Angola, in its Article 3 the decree points to international specification references such as the minimum standards of API, SAE, NLGI and ACEA for compliance in evaluating the quality of the different families of lubricant oils. But a close look at it shows how little depth there is at the level of control instruments (reference tables).

In light of this, and also because of the concern to ensure the quality of the lubricating oils sold, the following research question arises:

How to enrich the Executive Decree No. 536/15 of August 28, on the quality of lubricating oils marketed in Angola?

In order to solve this question, the following research hypothesis is deduced:

To enrich the Executive Decree No. 536/15 of August 28, on the quality of lubricating oils marketed in Angola is necessary to gather the reference tables of international specifications with the standards of API, SAE, NLGI and ACEA, for compliance in the different families of lubricating oils as guarantee the quality of lubricating oils consumed in Angola and annex them as a subsidy to the aforementioned Decree.

Therefore, the research was carried out with the general objective of present subsidies for the Executive Decree No. 536/15 of August 28, 2015, on lubricants consumed in Angola.

From the study's problematic to the public interest

As already mentioned, there is in the Angolan legal system executive Decree No. 536/15 of August 28, 2015, which has no means of instrumentalizing its objective, which is to regulate the quality of lubricants consumed in Angola. To monitor the quality status of this product, in addition to referencing only the standards API, SAE, NLGI and ACEA standards for compliance, it should bring the reference tables for the exercise of verification of such standards, especially in the context context of the need to control the quality of this product when it remains on the market, at the risk of being difficult to ascertain the quality of the same, since the technical standards API, SAE, NLGI and ACEA, are not freely available for public consultation, and some series referenced in the Decree are obsolete.

This premise falls under general administrative law, which has as its task the legal protection of citizens in general from the measures, rules and plans of the public administration, the protection of equality, proportionality, predictability, freedom from arbitrariness and corruption, and the legal control of administrative activity (Sousa, 2016). Contextualized to our study is raised here to the public interest in favor of the Natural Resources Law, with field of action of the Oil and Gas Law, and this intervention seeks

to solve the problem raised in this study, in ways that the standard meets better public interest.

To be made available for the subsequent stages and segments, the fuels and non-fuel finished products are sent to the other chemical processing and/or para-chemical plants, and in the case of the Chemical Industry Intermediates, these must strictly meet the specifications required for such, in order to be absorbed by chemical industries as raw material. In this sense the primary objective is to meet the product specifications, required for each case.

The specifications of a product are the characteristics required by the market (commercial specifications) or by law (legal specifications) for certain qualities determined through *standard* laboratory analysis.

It is important to note that the specifications of a given product can be:

Legal specifications, these are subdivided into Fiscal: Their purpose is to classify a product, in order to define the manufacturing tax. Sanitary: They aim to limit the content of harmful products and substances. Example: Sulfur in Liquefied Petroleum Gas (LPG).

Commercial Specifications: Their purpose is to guarantee, as far as the finished products are concerned, a quality that meets the market's requirements. Example: The octane number of gasolines.

Technical Specifications: The technical specifications refer to the basic products. Their purpose is to guarantee to the base products, certain characteristics that correspond to the requirements of the production programmer's work program based on legal and commercial specifications.

Ensuring that these specifications are observed in the manufacture of which consumer good goes against the international reality that is the globalization of consumer law.

The theme of Consumer Law has been widely discussed nowadays and in this sense, according to (Durovic, 2019, p. 129)

> The year 2020 is an important year for international consumer law. Thirty-five years have passed since the adoption of the first version of the UN Guidelines for Consumer Protection.Thirty-five years later, the UN Guidelines remain the most important global instrument in the area of consumer protection, contributing to building the confidence of both consumers and traders operating in the marketplace. Consequently, the two main questions are what contribution the UN Guidelines have made to the development of consumer law, and to what extent the UN Guidelines have contributed in practice to the internationalization of consumer law during the thirty-five years of their existence.

In 2016, the United Nations established Guidelines for Consumer Protection, and according to (United Nations, 2016), in the field of Standards guidelines for the safety and quality of consumer goods and services, it brings the following principles:

> Member States should, as appropriate, formulate or promote the development and implementation of standards, voluntary and otherwise, at the national and international levels, for the safety and quality of goods and services and give them adequate publicity.National standards and regulations for the safety and quality of products should be reviewed from time to time to ensure their

> conformity, where possible, with generally accepted international standards.Where a standard lower than generally accepted international standards is being applied because of local economic conditions, efforts should each be made to raise that standard as rapidly as possible.

These guidelines emphasize the responsibility of the producer and the regulator to formalize a satisfactory market environment for the availability of any product.

Lubricants production in Angola and applicable legislation to regulate quality

"Lubricating oil is used to provide a film between bodies, reducing wear and tear on materials and increasing their life span" (Gândara, 2000 apud Morais & Kurtz, 2021, p. 102). The identification of the types of lubricating oils is arranged in several categories, among which the following are the main ones, ranging from the type according to the origin, to the way of separation during its production, to the service mode and the use.

To date, Angola has only one lubricant oil producing plant (IMUL), and due to the low processing capacity of the Angolan refinery, the country is unable to produce the base oils and therefore they 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 lubricating oils from Angola is called IMUL (Instalação da Mulemba de Lubrificantes) and appear on the market under the brand name NGOL.In the third quarter of 2018, sales of lubricants on the domestic market fell by 62% in volume compared to the analogous period in 2017.Imports are permanently followed by PUMANGOL, SONANGALP, COSAL, JAMBO, IMPOLEOS and LUBÁFRICA (Morais & Kurtz, 2021).

The legal norms that parameterize the specifications of lubricating oils establish the limit values of the possible results of a quality test, to define whether it can be commercialized or not.

In legal matters, in the field of quality assurance of lubricant oils, there are the following legal diplomas in Angola:

Law No. 28/11: It is an Act passed on September 1, 2011, which to determine the standards for the activities of crude oil refining, storage, transportation and marketing of petroleum products.

Executive Decree No. 536/15: It is a decree issued on August 28, 2015, which regulates the specifications of lubricants sold in the Republic of Angola. In its article 3 to 9, it points to international specification references such as the API, SAE, NLGI, and ACEA minimum standards.

These standards refer to:

API*(American Petroleum Institute*): The API standard was developed by the American Petroleum Institute in the United States of America and is based on performance levels of lubricating oils, that is, on the type of service the machine will be subjected to. They are classified by two letters, the first indicating the type of engine fuel and the second the type of service.

API categorizes oils into classes, with terminology that tends to follow the behavior of evolving engines (Gestroil, 2017).

ACEA*(Association des Constructeurs Européens d'Automobiles* / European Automobile Manufacturers Association): ACEA compiles and makes available the service oil sequences that define different lubricant categories. Usually the term ACEA is preceded by one or two letters, being A, B, C, D and E. The letter A indicates that the oil is for gasoline engines of light-duty vehicles, the letter B indicates that the oil is for diesel engines of light-duty and commercial vehicles, the letter C indicates that the oil is for light-duty vehicles with diesel particulate filters, and the letter E indicates that the oil is for diesel engines of heavy-duty vehicles. Since 2014 the standards of the ACEA A and ACEA B sequences have come together, becoming ACEA A/B which is the indication that the oil is suitable for gasoline engines and diesel engines of light vehicles,(Lubritejo, 2008, & ACEA, 2016).

NLGI (National Lubricating Grease Institute): The NLGI has established a scale for the classification of greases. NLGI, has a standardized numerical scale for the consistency of greases, based on ASTM D 217, with a penetration range of 000 for semi-fluid greases to 6 for rigid greases. (Exxon Mobil Corporation, 2009). The following table shows the classification of greasesification of lubricating greases.

Table 1

NLGI Grade Definition

NLGI Degree of Consistency	000	00	0	1	2	3	4	5	6
Penetration Scale by ASTM standard at 25°C (1/10 mm)	445 - 475	400 - 430	355 - 385	310 - 340	265 - 295	220 - 250	175 - 205	130 - 160	85 - 115

Note: Source: Adapted from Exxon Mobil Corporation (2009)

Based on (Lubritejo, 2008) nLGI 000 and NLGI 00 grades refer to fluid lubricating oils and are used in gearboxes and centralized systems. NLGI 0 and NLGI 1 grades are semi-fluid and are used in centralized lubrication systems. NLGI grades 2 and 3, are consistent and used in bearings. And finally, NLGI grades 4, NLGI 5 and NLGI 6 are very strict and rarely used.

Methodology

The study observed careful documentary analysis, starting with the Angolan legislative package which presents the technical standards that guide the quality required for petroleum products sold in Angola in general, and with a focus on the regulation of the quality of lubricating oils. After identifying insufficiencies in the regulations, and in particular in Executive Decree no. 536/15 of August 28, thetechnical standards indicated for compliance by the decree itself were reviewed, and through comparison, reference tables were built, as a tool that can easily be used when applying the Decree.

Results and Discussion

To be commercialized the product must comply with the specifications. The specifications of a product, are the characteristics required by the market (commercial specifications) or by laws (legal specifications) for certain qualities determined through *standard* laboratory analysis.

The *standard* analyses that Executive Decree 536/15 refers to are predetermined by API, ACEA and NLGI technical standards. They establish a set of classes, standards that categorize lubricating oils, the analysis of which according to such standards is carried out using ASTM test methods.

These methods prescribe procedures to be employed in performing the tests, and allowable results to be found.

Below we detail the specifications of these standards and suggestions for improvement:

For lubricating oils for four-stroke petrol engines, the API SJ or ACEA A3/B3 standard must be met (Decreto Exectivo n.º 563/15 de 28 de Agosoto, 2015)**.** For ease of inspection follow the proposed Properties and Specifications.

For API SJ: As a subsidy to Executive Order No. 536/15, it is proposed to add the following Properties and Specifications(For laboratory testing) benchmark:

Table 2

API SJ standard for lubricating oils for four stroke gasoline engines

Features	Units	Amount / Limit	Testing Methods
SEA Viscosity Grade 5W -30			
Kinematic Viscosity at 100°C	mm2 /s	11.32	ASTM D 445
Flashpoint °C	c	237	ASTM D92
Pour point °C	c	- 38	ASTM D 5950/15468
SEA Viscosity Grade 5W - 40			
Kinematic Viscosity at 100°C	mm2 / s	13.79	ASTM D 445
Flashpoint °C	c	230	ASTM D92
Fluid Point °C	c	- 35	ASTM D 5950/15468
SEA Viscosity Grade 10W - 30			
Kinematic Viscosity at 100°C	mm2 / s	10.62	ASTM D 445
Flashpoint °C	c	226	ASTM D92
Fluid Point °C	c	- 30	ASTM D 5950/15468
SEA Viscosity Grade 10W - 40			
Kinematic viscosity at 100°C	mm2/s	14.28	ASTM D 445
Flashpoint °C	ºC	237	ASTM D92
Fluid Point °C	ºC	- 39	ASTM D 5950/15468
SEA Viscosity Grade 15W - 40			
Kinematic viscosity at 100°C	mm2/s	15.41	ASTM D 445
Flashpoint °C	ºC	230	ASTM D92
Fluid Point °C	ºC	- 30	ASTM D 5950/15468

Note: Source : Infneum (2015)

For ACEA A3/B3: As a subsidy to Executive Order No. 536/15, it is proposed to add the following Properties and Specifications benchmark (For laboratory testing):

Table 3
Standard A3/B3 for lubricating oils for four stroke gasoline engines

Features	Units	Limits A3/B3 (2016)	Testing Methods
1. Laboratory Testing			
Viscosity class according to SAE J300 - latest standard update		No restrictions except as defined by HTHS and shear stability requirements. Manufacturers may indicate specific viscosity requirements related to ambient temperature	
Kinematic viscosity at 100°C after 30 cycles	mm2/s	≥ 3.5	CEC L-014-93 Or ASTM D6278 Or ASTM D7109
Dynamic viscosity at 150°C and shear rate for^{105s-1}	mPa-s	≥ 3.5	CEC L-036-90
Dynamic viscosity at 100°C and shear rate for^{105s-1}	mPa-s	–	CEC L-036-90
Maximum weight loss after 1h at 250ºC	%	≤ 13	CEC L-040-93
Basic Number Total	mgKOH/g	≥ 8.0	ASTM D2896
Sulfur Compounds	%m/m	Report	ASTM D5185
Phosphorus Compounds	%m/m	Report	ASTM D5185
Sulfated Ash	%m/m	≥ 0.9 e ≤ 1.5	ASTM D874
Chlorine	ppm m/m	Report	ASTM D6443
Maximum variation for characteristics after immersion for 7 days in fresh oil without pre-aging: Tensile strength Elongation at Break Volume Variation	Elastomer % % %	RE6 Report -70/ +20 -5.5/ +2.1	CEC L-112-16
Trend-stability	ml	Sequence I (24ºC) 10 - 0 Sequence II (94ºC) 50 - 0 Sequence III (24ºC) 10 - 0	ASTM D892
Trend-stability	ml	Sequence IV (150ºC) 100 - 0	ASTM D6082 High temperature foam test
MRV	mPa-s	–	CEC L-105-12
Stress Yield	Pa	–	

(MRV at SAE J300 temperature, Applicable to fresh oil viscosity grade)			
Oil oxidation at 168h (DIN51453)	A/cm	≤ 120	
Oil oxidation at 216h (EOT) (DIN51453)	A/cm	Report	
Viscosity increase, relative to 168h (Delta KV 100)	%	≤ 150	CEC L-109-14
Viscosity increase, relative to 216h (Delta KV 100 to EOT 216h)	%	Report	

Note: Source: Association of European Automobile Manufacturers (2016)

For lubricating oils for four stroke diesel engines should meet API CH-4 or ACEA B3/E3 (Decreto Exectivo n.º 563/15 de 28 de Agosoto, 2015)**.**For ease of inspection follow the proposed Characteristics and Specifications(For laboratory testing):

For API CH-4: As a subsidy to Executive Order No. 536/15, it is proposed to add the following Properties and Specifications benchmark (for laboratory testing):

Table 4

API CH - 4 standard for lubricating oils for four-stroke diesel engines

Features	**Units**	**Limits**	**Testing Methods**
1. Laboratory Testing			
Viscosity class	SAE J300	Depends on the oil grade	Manufacturer's specifications and target viscosity within the SAE J300 specification
Copper Increase	Ppm	max. 20	
Lead increase	ppm	max. 120	ASTM D6594
Tin augmentation	ppm	Report	
Copper strip classification (D130)		max. 3	
Sequence I		max. 10/0	
Sequence II	tend/stab	max. 20/0	ASTM D892
Sequence III	ml	max. 10/0	
After SAE xW-30 shear viscosity	cSt	min. 9.3	ASTM D6278
After SAE xW-40 shear viscosity	cSt	min. 12.5	
Noack evaporation loss (SAE 10W-30)	% loss	max 20	ASTM D5800
Noack evaporation loss (SAE 15W-40)	% loss	max 18	ASTM D6417

Note: Source : Infneum (2015)

For ACEA B3/E3 : As an allowance for Executive Order No. 536/15, it is proposed to move to the E4 standard, since it is for four-stroke diesel engines. According to ACEA (2018) in the revision of the latest publication of the ACEA sequence of standards does not contemplate the E3 class, as it has been obsolete since October 2004.

On the other hand, according to (Lubritejo, 2008),

E3: They are universal application engine oils for heavy-duty diesel vehicles in severe service that meet EURO 1 and EURO 2 emission levels, with extended change intervals.

E4: These are universal application engine oils for heavy-duty diesel vehicles in severe service that meet EURO 1, EURO 2, EURO 3 and EURO 4 emission levels with extended change intervals, according to the manufacturer's standards. Compared to the E3 it has superior performance in cleaning the piston and soot.

In this sequence of recommendations a (Association des Constructeurs Européens d'Automobiles, 2016),

The Class indicates oil intended for one type of engine, currently there are:

A / B = Light Duty Gasoline and Diesel engines;

C = Catalyst compatible oils for gasoline and light duty diesel engines with aftertreatment devices;

E = Heavy-duty diesel engines;

Other grades may be added in the future if, for example, natural gas engines may require characteristics of the oil that cannot be readily incorporated into existing grades.

In this context, it is suggested to include ACEA E4 in place of ACEA B3/E3 for four-stroke diesel engines.

Accordingly, as a subsidy to Executive Order No. 536/15, the following Properties and Specifications benchmark is proposed to be added:

Table 5

ACEA Standard E4 for lubricating oils for four-stroke diesel engine vehicles

Features	Units	Limits E4 (2016)	Testing Methods
1. Laboratory Testing			
Viscosity class according to SAE J300 - latest standard update		No restrictions except as defined by HTHS and shear stability requirements. Manufacturers may indicate specific viscosity requirements related to ambient temperature	
Kinematic Viscosity at 100°C after 30 cycles	mm2/s	Depends on the grade of the oil	CEC L-014-93 Or ASTM D6278 Or ASTM D7109
Kinematic Viscosity at 100°C after 90 cycles	mm2/s	Depends on the grade of the oil	CEC L-014-93 Or ASTM D6278 Or ASTM D7109
Dynamic viscosity at 150°C and shear rate for^{105s-1}	mPa-s	≥ 3.5	CEC L-036-90
Dynamic viscosity at 100°C and shear rate for^{105s-1}	mPa-s	_	CEC L-036-90
Maximum weight loss after 1h at 250ºC	%	≤ 13	CEC L-040-93
Sulfated Ash	%m/m	≤ 2	ASTM D5174
Phosphorus Compounds	%m/m		ASTM D5185
Sulfur	%m/m		ASTM D5185
Chlorine	ppm m/m	Report	ASTM D6443
Maximum variation for characteristics after immersion for 7 days in fresh oil without pre-aging: Tensile strength Elongation at break Volume Variation	 % %	RE6 Report -70/ +20	CEC L-112-16
	%	-5.5/ +2.1	
Trend-stability	ml	Sequence I (24ºC) 10 - 0 Sequence II (94ºC) 50 - 0 Sequence III (24ºC) 10 - 0	ASTM D892
Trend-stability	ml	Sequence IV (150ºC) 200 - 50	ASTM D6082 high temperature foam testing
Oxidation induction time	min	≥ 65	CEC L-085-99
Total Basicity Number (TBN)	mg KOH/g	≥ 12	ASTM D2896
		According to SAE	CEC L-105-12

MRV	mPa-s	J300 for new oil	
Stress Yield (MRV at SAE J300 temperature, Applicable to the fresh oil viscosity grade)	Pa		
Oil oxidation at 168h Increase in kinetic viscosity 100°C, after 168h (Delta KV 100)	A/cm %	≤ 90 ≤ 130	CEC L-109-16

Note: Source: Association of European Automobile Manufacturers (2016)

For automotive gear oils except for automotive automatic transmissions the API GL-4 or API GL-5 standard must be met (Decreto Exectivo n.º 563/15 de 28 de Agosoto, 2015). For ease of inspection follow the proposed Properties and Specifications.

For API GL-4: As a subsidy to Executive Order No. 536/15, the following Properties and Specifications benchmark is proposed to be added:

Table 6

API GL - 4 for automotive gear oils except for automotive automatic transmissions

Features	Units	Value/ Limits	Testing Methods
SEA Viscosity Grade 80			
Color (ASTM)	-	L1.5	ASTM D1500
Density (15° C)	g/cm3	0.885	ASTM D4052
Kinematic viscosity at 40°C	mm2/s	79.8	ASTM D 445
Kinematic viscosity at 100°C	mm2/s	9.75	ASTM D 445
Viscosity Index		100	ASTM D 2270
Flash point (COC)	c	230	ASTM D92
Pour Point	c	- 30.0	ASTM D 5950/15468
SEA Viscosity Grade 90			
Color (ASTM)	-	L2.0	ASTM D1500
Density (15° C)	g/cm3	0.894	ASTM D4052
Kinematic viscosity at 40°C	mm2/s	185.6	ASTM D 445
Kinematic viscosity at 100°C	mm2/s	17.3	ASTM D 445
Viscosity index		99	ASTM D 2270
Flashpoint (COC)	c	234	ASTM D92
Fluid Point	c	- 22.5	ASTM D 5950/15468

Note: Source: JXTG Nippon Oil and Energy Corporation (2011)

For API GL-5: As a subsidy to Executive Order No. 536/15, the following Properties and Specifications benchmark is proposed to be added:

Table 7

API GL - 5 for automotive gear oils except for automotive automatic transmissions

Features	Units	Amount / Limit	Testing Methods
SEA Viscosity Grade 80			
Color (ASTM)	-	L1.5	ASTM D1500
Density (15° C)	g/cm3	0.888	ASTM D4052
Kinematic viscosity at 40°C	mm2/s	75.8	ASTM D 445
Kinematic viscosity at 100°C	mm2/s	9.44	ASTM D 445
Viscosity Index		101	ASTM D 2270
Flash point (COC)	c	234	ASTM D92
Pour Point	c	- 30.0	ASTM D 5950/15468
SEA Viscosity Grade 90			
Color (ASTM)	-	L2.0	ASTM D1500
Density (15° C)	g/cm3	0.897	ASTM D4052
Kinematic viscosity at 40°C	mm2/s	184.6	ASTM D 445
Kinematic viscosity at 100°C	mm2/s	17.2	ASTM D 445
Viscosity Index		100	ASTM D 2270
Flashpoint (COC)	c	234	ASTM D92
Pour Point	c	- 25.0	ASTM D 5950/15468
SEA Viscosity Grade 140			
Color (ASTM)	-	L2.5	ASTM D1500
Density (15° C)	g/cm3	0.903	ASTM D4052
Kinematic viscosity at 40°C	mm2/s	386.7	ASTM D 445
Kinematic viscosity at 100°C	mm2/s	28.5	ASTM D 445
Viscosity Index		101	ASTM D 2270
Flash point (COC)	c	236	ASTM D92
Pour Point	c	-12.5	ASTM D 5950/15468
SEA Viscosity Grade 75W - 90			
Color (ASTM)	-	L1.5	ASTM D1500
Density (15° C)	g/cm3	0.892	ASTM D4052
Kinematic Viscosity at 40°C	mm2/s	75.9	ASTM D 445
Kinematic Viscosity at 100°C	mm2/s	13.8	ASTM D 445
Viscosity Index		189	ASTM D 2270
Flash point (COC)	c	208	ASTM D92
Pour Point	c	- 45.0	ASTM D 5950/15468

Note: Source: JXTG Nippon Oil and Energy Corporation (2011)

For Greases must meet the degree of consistency corresponding to the NLGI classification Applicable, (Decreto Exectivo n.º 563/15 de 28 de Agosoto, 2015)for ease of inspection follow the proposed Properties and Specifications.

For NLGI: As a subsidy to Executive Order No. 536/15, the following Properties and Specifications benchmark is proposed to be added:

Table 8

NLGI for greases must comply with the degree of consistency corresponding to the NLGI classification

Features	Units	Amount / Limit	Testing Methods
NLGI 000			
Color (ASTM)	-	Brown	Visual
Kinematic Viscosity at 40°C	mm2/s	320	ASTM D445
Drop point	c	0	ASTM D566
Welding load, by four-ball test	kgf	_	ASTM D2596
Extreme pressure of the welding spot by the four-ball test,	kgf	250	ASTM D2596
Mass wear diameter, by the four-ball test,	mm	0.4	ASTM D2266
Wear Protection, four-ball test Max.40kg, 1200 rpm, 1h, 75°C,	mm	_	ASTM D2266
Penetration, 60X, 0.1mm	mm	460	ASTM D217
NLGI 00			
Color (ASTM)	-	Brown	Visual
Kinematic Viscosity at 40°C	mm2/s	160	ASTM D445
Drop point	c	0	ASTM D566
Welding load, by 4-ball test	kgf	250	ASTM D2596
Extreme pressure of the welding spot by the four-ball test,	kgf	_	ASTM D2596
Mass wear diameter, by the four-ball test,	mm	_	ASTM D2266
Wear Protection, four-ball test Max.40kg, 1200 rpm, 1h, 75°C,	mm	0.5	ASTM D2266
Penetration, 60X, 0.1m	mm	415	ASTM D217
NLGI 0			
Color (ASTM)		Brown	Visual
Kinematic Viscosity at 40°C	mm2/s	160	ASTM D445
Drop point	c	190	ASTM D566
Welding load, by four-ball test	kgf	250	ASTM D2596
Extreme pressure of the welding spot by the four-ball test,	kgf	_	ASTM D2596
Mass wear diameter, by the four-ball test,	mm	0.4	ASTM D2266
Wear Protection, four-ball test Max.40kg, 1200 rpm, 1h, 75°C,	mm	_	ASTM D2266
Penetration, 60X, 0.1mm	mm	370	ASTM D217
NLGI 1			
Color (ASTM)		Brown	Visual
Kinematic Viscosity at 40°C	mm2/s	160	ASTM D445
Drop point	c	190	ASTM D566
Welding load, by four-ball test	Kgf	_	ASTM D2596
Extreme pressure of the welding spot by the four-ball test,	kgf	250	ASTM D2596
Mass wear diameter, by the four-ball test,	mm	0.4	ASTM D2266

Wear Protection, four-ball test Max.40kg, 1200 rpm, 1h, 75°C,	mm	_	ASTM D2266
Penetration, 60X, 0.1mm	mm	325	ASTM D217
NLGI 2			
Color (ASTM)		Brown	Visual
Kinematic Viscosity at 40°C	mm2/s	160	ASTM D445
Drop point	c	190	ASTM D566
Welding load, by four-ball test	kgf	_	ASTM D2596
Extreme pressure of the welding spot by the four-ball test,	kgf	250	ASTM D2596
Mass wear diameter, by the four-ball test,	mm	0.4	ASTM D2266
Wear Protection, four-ball test Max.40kg, 1200 rpm, 1h, 75°C,	mm	_	ASTM D2266
Penetration, 60X, 0.1mm	mm	280	ASTM D217
NLGI 3			
Color (ASTM)		Brown	Visual
Kinematic Viscosity at 40°C	mm2/s	160	ASTM D445
Drop point	c	190	ASTM D566
Welding load, by four-ball test	kgf	_	ASTM D2596
Extreme pressure of the welding spot by the four-ball test,	kgf	250	ASTM D2596
Mass wear diameter, by the four-ball test,	mm	0.4	ASTM D2266
Wear Protection, four-ball test Max.40kg, 1200 rpm, 1h, 75°C,	mm	_	ASTM D2266
Penetration, 60X, 0.1mm	mm	235	ASTM D217

Note: Source: Exxon Mobil Corporation (2009)

An addendum to the Executive Decree No. 536/15, in order to add to the tables presented, will further facilitate the evaluation of the quality of lubricants in Angola.

Conclusions

In ways to enrich the chapter II of the Executive Decree No. 536/15 of August 28, which regulates the specifications of lubricating oils sold in the Republic of Angola, the work illustrates aproposal for *segmentation of the classes and standards for measuring the main properties of the product for sale with specifications*, based on international references. This proposed segmentation of classes and standards with specifications is illustrated in the form of tables, where we can see thecharacteristics, units, limit values, and test methods that we think quality inspectors and certifiers can easily use when testing for product quality certification.

Since lubricating oils for four-stroke diesel engines must meet theAPI CH-4 or ACEA B3/E3 standard in accordance with Executive Decree No. 536/15, the study also concluded that it is necessary to update the inclusion of the ACEA E4 standard to replace ACEA B3/E3 for four-stroke diesel engines, because in the review of the latest publication of the ACEA sequence of standards does not include the E3 class, as it has been obsolete since October 2004.

Based on the results of the study carried out, it is recommended to the Ministry of Mineral Resources and Petroleum, representing the Government of the Republic of Angola, that increase the subsidies (tables, where are presented,Characteristics, Units, Limit Value and Test Methods) to the Executive Decree No. 536/15.

References

Association des Constructeurs Européens d'Automobiles. (2016). *Acea European Oil Sequences.* Bruxelas: ACEA.

Decreto Exectivo n.º 563/15 de 28 de Agosoto. (2015). Regulamento sobre as especificações dos lubrificantes comercializados na República de Angola. núm. 123, pp 3150 – 3152. Angola: Diário da República I Série, núm 122, pp 3150 - 3153.

Durovic, M. (2019, 12 21). International Consumer Law: What Is It All About? *Journal of Consumer Policy*(43), pp. 125-143. doi:10.1007/s10603-019-09438-9

Exxon Mobil Corporation. (2009). *Graxa - Seus Componentes e Características.* Brasil: Móbil Grease.

Gândara, G. M. (2000). Óleos lubrificantes minerais: uma análise das potencialidades da reutilização. *Dissertação de Mestrado*, 28. Santa Bárbara d‟ Oeste, Brasil: Faculdade de Engenharia Mecânica e de Produção da Universidade Metodista de Piracicaba.

Gestroil. (2017). *Classificação API.* Lisboa: Gestroil Auto Parts.

Infneum. (2015). *API Engine Oil Classifications. Service fill oils for gasoline, light-duty diesel and heavy-duty diesel engines.* Estados Unidos da América: Infineum International Limited.

JXTG Nippon Oil e Energy Corporation. (2011). *High-Grade Automotive Gear Oil (GL-4).* Product Bulletin, JXTG Nippon Oil e Energy Corporation, Tokyo.

JXTG Nippon Oil e Energy Corporation. (2011). *High-Grade Automotive Gear Oil (GL-5).* Product Bulletin, JXTG Nippon Oil e Energy Corporation, Tokyo.

Lei n.º 28/11 de 1 de Setembro. (2011). Regulamento sobre as actividades de refinação de petróleo bruto, armazenamento, transporte e comercialização de produtos petrolíferos. 4114 – 4129. Angola: Diário da Republica I Série, núm. 168.

Lubritejo. (2008). *Tabelas informativas ACEA e API.* Santarém: Lubritejo.

Morais, P. G., & Kurtz, J. D. (2021). Desarrollode un sistema de gestión y control de la calidad de los aceites lubricantes para automóviles aplicable al contexto angoleño. *Project, Designand Management, 3*, pp. 99-116.

Sousa, N. J. (2016). Direito da energia e recursos energéticos do mar. (J. S. Monteiro, Ed.) *Revista da Faculdade de Direito da Universidade Lusófona do Porto, 6*(6), 79-97.

United Nations. (1985). *Consumer protection.* ONU, General Assembly. USA: United Nations. doi:Resolution 39/248 of 9 April 1985 (A/RES/70/186)

United Nations. (2016). Standards for the safety and quality of consumer goods and services. *UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT* (pp. 14-15). New York and Geneva: UNCTD. Retrieved 08 24, 2022, from https://unctad.org/system/files/official-document/ditccplpmisc2016d1_en.pdf

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