EDICT OF GOVERNMENT

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UGANDA STANDARD

Specification

for

ENGINE OIL

First Edition: December 2000

UGANDA NATIONAL BUREAU OF STANDARDS

PRICE GROUP: C

Descriptors: Oil, engine fuel systems.

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The following table will assist the user to update the standard

AMENDMENTS

<table>
<thead>
<tr>
<th>Clause</th>
<th>Amendment No.</th>
<th>Date of Issue</th>
<th>Text affected</th>
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In order to keep abreast of technological development Uganda Standards are subject to periodic review.

NOTE:

1. Compliance with this Standard does not, of itself confer immunity from legal obligations.
2. A Uganda standard does not purport to include all necessary provisions of a contract. Users are responsible for its correct application.

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0. FOREWORD

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Tourism, Trade and Industry established by the Act of Parliament of 1983, of the Laws of Uganda. UNBS is

(i.) a member of International Organisation for Standardisation (ISO) and
(ii.) the National Codex Contact Point (CCP) for the WHO/FAO Codex Alimentarius Commission on Food Standards, and
(iii.) the National Enquiry Point on TBT.SPS Agreements of the World Trade Organisation (WTO).

The work of preparing Uganda standards is carried out through Technical Committees. A Technical Committee is established to deliberate on standards in a given field or area and consists of representatives of consumers, traders, academicians, manufacturers, Government and other stake-holders. Draft Uganda standards adopted by the Technical Committee are widely circulated to stake-holders and the general public for comments which are reviewed before recommending them to the National Standards Council for declaration as national standards.

This Uganda Standard was elaborated by the Sub committee on Petroleum products under the guidance the Uganda National Bureau of Standards (UNBS) Technical Committee on the Chemicals and Environment. It specifies the performance requirements of both automotive diesel and petrol engine oils based on the API (American petroleum Institute) classification.

TECHNICAL COMMITTEE REPRESENTATION

- Government Chemist
- National Environment Management Authority
- Revoline Lubricants
- Kobil (U) Ltd
- Jovenna (U) Ltd
- Castrol (U) Ltd
- Agip
- Uganda Revenue Authority
- Petrol (U) Ltd
- Uganda Consumer Protection Association
- Shell (U) Ltd
- Galana Oil
- Caltex Oil
- Fontana Auto Parts
UGANDA STANDARD SPECIFICATION FOR ENGINE LUBRICATING OIL (FOR API SERVICES SF AND CD)

1. SCOPE

This Uganda standard covers crankcase lubricating oils, for automotive type internal combustion engines, meeting or exceeding the, API service classification
i. "SF" for gasoline engines
ii. "CD" for diesel engines.

The standard does not cover the chemical requirements for oils as these vary with the type of additive used in the formulation of a particular oil for a particular category.

NOTES –

i. Requirements that must be specified by the purchaser and those that must be agreed upon are listed appendix A.

2 NORMATIVE REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this part of US 249. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this part of US 249 are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from the Uganda National Bureau of Standards.

i. API Publication 1509, 11E: July 1988 – Engine Service Classification System and guide to crank case oil selection
ii. ASTM D287: 1990 – Test for API Gravity for Crude Petroleum products by hydrometer method
iii. ASTM D 445:1990 – Test for dynamic viscosity for petroleum products
iv. ASTM D 874: 1990 – Test for sulphated ash from lubricating oils and additives
v. ASTM D 2896:1990 – Determination of TBN
vii. ASTM D 4628:1990 – Analysis of Ba, ca, Mg, and Zn in unused lubricating oils by Atomic Absorption Spectrophotometry.

3 DEFINITIONS

For the purpose of this Standard the following definitions apply.

3.1 Acceptable: In relation to the certification mark and to consignment inspections carried out by and acceptable to the National Bureau of Standards.

3.2 Additive: An oil-soluble chemical compound added to base oil to improve its performance characteristics.
4. REQUIREMENTS

4.1 General requirements

4.1.1 The engine lubricating oil shall consist of approved petroleum products, or of approved synthetically prepared products, or of a combination of these two types of products, compounded, in all cases, with such functional additives (detergents, dispersants, oxidation inhibitors, corrosion inhibitors, etc.) as are necessary to enable it to meet the other requirements of the standard. It shall be free from suspended matter, sediment, water, and other impurities and,

4.1.2 When so required by the purchaser, the ash content or the phosphorus content or both shall not exceed the value agreed upon between supplier and purchaser.

4.2 Performance classification

Automotive engine oils are classified in two general groups by API. Those designated with a) an S prefix are intended for use in automotive gasoline application such as passenger cars, light trucks and vans

b) C prefix are intended for use in diesel powered vehicle.

These groups are further divided into categories with intended service application as indicated below

4.2.1 SF - 1980 – 1989 US petrol engine warranty maintenance service for petrol engines in passenger cars and some trucks. Oils developed for this service provide increased oxidation stability and improved anti-wear performance relative to oils which meet the maximum requirements for API Service Category SE. These oils also provide protection against engine deposits, rust, sludge, wear and corrosion. Oils meeting API Service Category SF may be used wherever API Service Categories SE, SD, or SC are recommended.

4.2.2 SG – Service typical of gasoline engines in passenger cars, vans and light duty trucks, beginning with the 1989 models operating under manufacturers’ recommended maintenance procedures. Oils developed for API Service Classification SG provided control of sludge and varnish, oil oxidation and engine wear relative to engine oils developed for previous categories. These oils also provide protection against rust and corrosion. Oils meeting API Service category SG may be used when API categories SF, SE, and earlier categories are recommended.

These oils meet the performance requirements measured in the following gasoline and diesel engine tests:

♦ The II D and VE gasoline engine tests have been correlated with a short-strip service particularly in regard to rusting tendencies, sludging and valve train-wear, respectively.

♦ The IIIE gasoline engine test which has been correlated with high temperature service particularly in regard to oil thickening and valve train wear.

♦ The L-38 gasoline engine test requirement, which is considered to provide an additional measure of protection from copper-lead bearing weight-loss and piston varnish under temperature operating conditions.

♦ The 1H2 diesel engine test requirement, which is considered to provide an additional measure of protection from high temperature piston deposits.
4.2.3 SH for 1994 Gasoline Engine Warranty Maintenance Service
Service typical of gasoline engines in current and earlier passenger car, van and light truck operation under vehicle manufacturers’ recommended maintenance procedures. Oils in this category were first available in 1994, and they exceed the minimum performance requirements of API service category SG in the areas of deposit control, oil oxidation, wear, rust and corrosion. Engine oils meeting API service category SH have been tested in accordance with the Chemical Manufacturers Association (CMA) Code of practice and may be used where API Service Category SG and earlier categories have been recommended.

4.2.4 SJ for 1996 Gasoline Engine Warranty Maintenance Service
Service typical of Gasoline engines in current and earlier passenger car, van, and light truck operation under vehicle manufacturers’ recommended maintenance procedures. Oils of this category exceed the minimum performance requirements of API service category SH with a slightly different simulated distillation and evaporation loss, plus meeting the requirements of bench tests for wet filterability, gelation index, high temperature foaming, and high temperature deposits. API service Category SJ also introduced a limit on phosphorus content of 0.01 mass %. API Service category SJ may be used where API SH, SG, and earlier categories have been recommended.

4.2.5 CD - Severe duty diesel engine service
1955 – 1987 Service typical of certain naturally aspirated, turbo-charged or supercharged diesel engines in high-speed, high-output duty requiring highly effective control of wear and deposits. These oils provide protection against bearing corrosion and high-temperature deposits in supercharged diesel engines when using fuels of a wide quality range.

4.2.6 CE - Oil meeting the performance requirements described in category CD by the 1G2 and L-38 tests, plus the Macks Trucks, Inc. T-6 tests (1984) and the Cummins engine Co. PTC-400 (1983) to address oil consumption, deposits, wear and oil thickening. Provides turbocharged, direct injection diesel performance.

4.2.7 CF for Severe-Duty Diesel Engine Service (Two and Four Stroke-Cycle)
Service typical of certain high-speed, turbocharged and supercharged, two and four-stroke-cycle diesel engines since 1990. API Service category CF oils exceed the requirements of the API service category CE, and provide improved control of oil consumption and engine deposits. Oils meeting API Service Category CF may be used when API Service Categories CE and CD are recommended for diesel engines.

4.2.8 CG for Severe-Duty Two and Four Stroke-Cycle Diesel Engine Service
API Service category describes oils for use in high speed, two and four-stroke-cycle diesel engines used in both heavy-duty, on-highway (0.05% weight sulphur fuel) and off-highway (less than 0.5% weight sulphur fuel) applications. These oils provide effective control over high temperature piston deposits, wear, corrosion, foaming, oxidation stability and soot accumulation. These oils may also be used in engines requiring API Service category CF, CE and CD.

4.3 Other physical and chemical tests
All engine oils shall satisfy the requirements specified in the table 2 below
Table 2: Characteristics and chemical tests for Petrol and Diesel engine oil.

<table>
<thead>
<tr>
<th>Type of oil</th>
<th>Characteristic</th>
<th>Requirement</th>
<th>Method of test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol engine</td>
<td>Viscosity index, min</td>
<td>90</td>
<td>ASTM D 445</td>
</tr>
<tr>
<td>Diesel engine oil</td>
<td>Viscosity index, min</td>
<td>90</td>
<td>ASTM D 445</td>
</tr>
<tr>
<td></td>
<td>Sulphated ash% max</td>
<td>3</td>
<td>ASTM D 874</td>
</tr>
<tr>
<td></td>
<td>Total Base Number (TBN) mg KOH/g min</td>
<td>7</td>
<td>ASTM D 445</td>
</tr>
</tbody>
</table>

4.4 API engine performance tests

4.4.1 Oils labelled or used as passenger or motor oils must have a performance not lower than that defined by API - SF.
4.4.2 Oils labelled or used as automotive diesel engine oils shall have a performance not lower than that defined by API - CD.
4.4.2 All importers and/or distributors shall be required to notify Uganda National Bureau of Standards on the brands marketed and performance parameters.
4.4.3 IR Spectra:
4.4.3.1 Oils shall have an IR spectra which matches with the IR spectra previously taken from reference samples forwarded to the Uganda National Bureau of Standards.
4.4.3.2 The Uganda National Bureau of Standards shall be notified of any changes in the formulation and an API warranty certificate shall be produced as evidence before a new spectra can be taken for reference purposes.
4.4.4 Product identification data
Oils shall satisfy the requirements specified in the product identification data forwarded previously to the Uganda National Bureau of Standards for reference samples on the following parameters indicated in the table below

Table 2: Test methods for the physical and chemical requirements for engine oils

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Viscosity Cst at 100 °C</td>
<td>ASTM D 445</td>
</tr>
<tr>
<td>2. Viscosity Cst at 40 °C</td>
<td>ASTM D 445</td>
</tr>
<tr>
<td>3. Viscosity index</td>
<td>ASTM D 445</td>
</tr>
<tr>
<td>4. API Gravity</td>
<td>ASTM D 287</td>
</tr>
<tr>
<td>5. Sulphated ash m/m %</td>
<td>ASTM D 874</td>
</tr>
<tr>
<td>6. TBN</td>
<td>ASTM D 2896</td>
</tr>
<tr>
<td>7. Zinc m/m %</td>
<td>ASTM D 4628</td>
</tr>
<tr>
<td>8. Calcium m/m%</td>
<td>ASTM D 4628</td>
</tr>
<tr>
<td>9. Magnesium m/m%</td>
<td>ASTM D 4628</td>
</tr>
</tbody>
</table>
5. PACKING AND MARKING

5.1 Packing
The condition of the drums or smaller containers and the bulk tankers into which the oil is filled shall be such as to have no detrimental effect on the quality of the oil during normal transportation and storage. Only containers of the same size filled with oil of the same batch identification shall be packed together in a carton.

5.2 Marking
5.2.1 The following information shall appear in legible and indelible marking on each container and each carton (if used).

a) the manufacturer's identification and/or Distributor’s name
b) API service classification;
c) SAE viscosity grade;
d) batch identification;
e) quantity.

5.2.2. Small containers packed in cartons, the batch identification may be marked on each carton only.

5.2.3. Oil packed in bulk tankers, the batch identification shall be marked on the consignment documents:

5.2.4. Engine oil recommended for use in both petrol and diesel engines, shall meet the minimum requirements for both categories or types of oils stipulated in this standard.
ANNEX A

(Informative)

A.1. The grade required must be specified in tender invitation, order or contract
A.2. The limit for the ash content or phosphorus content or both these properties must when relevant, be agreed upon between supplier and purchaser

ANNEX B

(Informative)

Other Classification of Engine Oils

The following classification do not meet the requirements of this standard.

B.1 SA – Utility petrol and diesel engine service

Service typical of engines operated under such mild conditions that the protection afforded by compounded oils is not required. This classification has no performance requirements. These oils should not be used in any engine unless specifically recommended by the equipment manufacturer. This oil contains no additives, except that it may contain foam depressants

B.2 SB – Minimum duty petrol engine service

Service typical of engines operated under such mild conditions that only minimum protection afforded by compounded oils is desired. Oils designed for this service have been used since the 1930’s and provide only anti-scuff capability, resistance to oil oxidation, and bearing corrosion. They should not be used in any engine unless specifically recommended by the equipment manufacturer.

B.3 SC - 1964 Petrol engine warranty service

Service typical of petrol engines in 1964 - 1967 models of passenger cars and trucks operating under engine manufacturers’ warranties in effect during those model years. Oils designed for this service provide control of high-and low-temperature deposits, wear, rust and corrosion in petrol engines.

B.4 SD - 1968 Petrol engine warranty maintenance service

Service typical of petrol engines in 1968 - 1970 models of passenger cars and some trucks operating under engine manufacturers’ warranties in effect during those model years. May also apply to certain 1971 or later models (or both), as specified (or recommended) in the
owners’ manuals. Oils designed for this service provide more protection against high-and low-temperature engine deposits, wear, rust, and corrosion in petrol engines than oils which are satisfactory for API Engine Service Classification SC, and may be used when this classification is recommended.

B.5 SE - 1972 Petrol engine warranty maintenance service

Service typical of petrol engines in passenger cars and some trucks beginning with 1972 and certain 1971 models operating under engine manufacturers’ warranties. Oils designed for this service provide more protection against oil oxidation, high-temperature engine deposits, rust, and corrosion in petrol engines than oils which are satisfactory for API Petrol Engine Warranty Maintenance Classification SD or SC, and may be used when either of these classifications is recommended.

B.6 CA - Light duty diesel engine service

Service typical of diesel engines operated in mild to moderate duty with high quality fuels. Has occasionally included petrol engines in mild service. Oils designed for this service were widely used in the late 1940's and 1950's. These oils provide protection against bearing corrosion and high-temperature deposits in normally aspirated diesel engines when using fuels of such quality that they impose no unusual requirements for wear and deposit protection.

B.7 CB - Moderate duty diesel engine service

Service typical of diesel engines operated in mild to moderate duty, but with lower quality fuels, which necessitate more protection against wear and deposits. Has occasionally included petrol engines in mild service. Oils designed for this service were introduced in 1949. Such oils provide necessary protection against bearing corrosion and high-temperature deposits in normally aspirated diesel engines with higher sulphur fuels.

B.8 CC - Moderate duty diesel and petrol engine service

Service typical of certain naturally aspirated, turbocharged or supercharged diesel engines operated in moderate to severe duty, and has included certain heavy duty petrol engines. Oils designed for this service were introduced in 1961 and used in many trucks and in industrial and construction equipment and farm tractors. These oils provide protection against high-temperature deposits in lightly supercharged diesel engines and also against rust, corrosion, and low-temperature deposits in petrol engines.

ANNEX C
Bibliography

MS 44 – 1984: Engine Lubrication Oil
KS03-1099: Kenya Standards specification for Engine Oil