report no. 6/10

CONCAWE compilation of selected physical-chemical properties of petroleum substances and sulfur

CONCAWE compilation of selected physical-chemical properties of petroleum substances and sulfur

Prepared by:

Ph. Baille
D. Chales de Beaulieu
J.C. Carrillo
K. Cowie
S. Forbes
H. Kleise
A. Merck
H. Pollack
B. Simpson

Brussels
November 2010

ABSTRACT

For the purpose of REACH registration, CONCAWE has collected physical-chemical data from its member companies on petroleum substances and sulfur produced at their sites. Substances were identified using CAS Registry Numbers and / or EINECS / EC numbers. Some 1400 measured data points for physical-chemical properties, mainly for boiling range, melting point/pour point, density, vapour pressure, flash point, self-ignition temperature and kinematic viscosity, have been grouped into substance categories. All data points have been validated and the laboratory test reports archived by CONCAWE.

KEYWORDS

CONCAWE, physical-chemical data, boiling range, melting point, pour point, density, vapour pressure, flash point, self-ignition temperature, kinematic viscosity.

INTERNET

This report is available as an Adobe pdf file on the CONCAWE website (www.concawe.org).

CONTENTS

Page

SUMMARY

This report summarizes the results of the collection of physical-chemical data on petroleum substances by CONCAWE from its European member companies since 2008, prior to the first deadline for REACH registrations (1 December 2010). Physical-chemical data have been collected to:

- serve as a source of physical-chemical information on petroleum substances and sulfur

- provide a literature source with sufficient reliability to serve as a key study or supporting study for reference in IUCLID5 registration dossiers.

1. INTRODUCTION

The purpose of this report is to present physical-chemical data on petroleum substances and sulfur that are produced at refinery sites in the European Community (EC). The data were collected and validated by a team of physical chemistry experts from CONCAWE member companies.

The petroleum substances listed in EINECS [3] were subdivided into distinct groups according to their refinery processing history and similarities in their physical-chemical, toxicity and eco-toxicity properties. This was done to aid in the collection of information for petroleum substances to meet the requirements of the regulation on existing substances [1] and also to assist in the assessment of classification and labelling requirements of petroleum substances under the Dangerous Substances Directive [2]. These chemical groups have been described in CONCAWE Product Dossiers [6,7,8,9,10,11,12,13,14,15], and were later adapted to the requirements of REACH registration and now include 18 categories plus 3 stand-alone substances. In this updated form, they are also used in the current report for the collection of physical-chemical information.

Each section in this report contains information for a petroleum substance category which consists of an indication of the number of companies that provided information, the ranges of values for each of the physical-chemical endpoints for each substance in the category, and an overall summary of the information for the category. The section also contains a listing of the methods most commonly used by CONCAWE member companies to determine the physical and chemical properties for substances within the category, together with any relevant remarks.

The report includes a general section on methodology that briefly summarises the methods most commonly used by CONCAWE members in the determination of physical-chemical endpoints for petroleum substances and sulfur.

The anonymized raw data, collected from individual companies for each petroleum substance in each category are included in Appendices 1 to 21 to this report. All original test reports received from CONCAWE member companies are archived in CONCAWE.

2. COLLECTION AND EVALUATION OF INFORMATION

The categories of petroleum substances for which data have been collected and summarised are:

- Low Boiling Point Naphthas (Gasolines)
- Kerosines
- MK1 Diesel Fuel
- Straight-Run Gas Oils
- Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels
- Cracked Gas Oils
- Other Gas Oils
- Heavy Fuel Oil Components
- Unrefined/Acid Treated Oils
- Highly Refined Base Oils
- Other Lubricant Base Oils
- Foots Oils
- Residual Aromatic Extracts
- Untreated Distillate Aromatic Extracts
- Treated Distillate Aromatic Extracts
- Paraffinic and Hydrocarbon Waxes
- Slack Waxes
- Petrolatums
- Bitumen
- Oxidized Asphalt
- Sulfur

No physical-chemical data have been collected for Petroleum Coke. These substances are exempted from the obligation to register under REACH, see

regulation amending REACH Annexes IV and V [4] and the associated guidance published by ECHA [5].

Physical-chemical data for Petroleum Gases were not compiled by the group of experts from CONCAWE member companies, but by other experts, in a broader industry effort on gases that included the Petrochemical Industry.

2.1. COLLECTION OF INFORMATION

CONCAWE member companies were asked to provide physical-chemical data for all the petroleum substances that they would be registering under REACH. Companies were provided with a model laboratory test report to assist in the compilation of data.

Only data that was supported by a valid laboratory report, and validated by the designated category focal point in the respective CONCAWE expert group has been included in this handbook.

2.2. EVALUATION / ASSESSMENT OF INFORMATION

The following information was summarised for each substance within each category:

- the number of companies responding for each physical-chemical endpoint for each petroleum substance
- the values or ranges of values submitted by the companies on an endpoint and substance basis

In establishing the ranges of endpoint data that should be used to describe each petroleum substance category, the expert group considered the information that had been submitted by the member companies. The expert group also took into account information used to define the petroleum substances in the EINECS inventory for each substance category. Typically, petroleum substances are defined in EINECS by e.g. refinery process, boiling range or carbon number range (EINECS).

Some values that were provided for boiling ranges and for viscosity ranges for some of the petroleum substances were outside of the ranges included in the CAS registry definitions. In these cases the data were excluded from the evaluation together with any other physical-chemical data on the same sample, as this suggests that the CAS number may have been incorrectly assigned to the sample.

2.2.1. VALIDITY OF DATA

The criteria described by Klimisch et al (1997) were used to evaluate the reliability of experimental data submitted to CONCAWE.

According to Klimisch et al, studies/data considered to be reliable without restriction (category 1) would include those from the literature or reports which were carried out or generated according to generally valid and/or internationally accepted testing guidelines or in which the test parameters documented are based on a specific (national) testing guideline (preferably performed according to GLP) or in which all parameters described are closely related / comparable to a guideline method.

It follows that any data determined using national and internationally agreed methods would be considered reliable without restriction (Klimisch category 1).

Indirect references (e.g. in IUCLID5 REACH registration dossiers) to such data, through reference to the present Handbook, would be considered reliable with restrictions (Klimisch category 2).

3. METHODS OF ANALYSIS

Brief comments are given below on the reported methods which are most commonly used in the industry for the determination of individual endpoint values for petroleum substances.

Alternative or equivalent methods exist for the majority of these methods and may be used to generate equally reliable data. In each of the subsequent sub-sections in this report, the commonly used / reported methods are listed without comment unless it was considered necessary to do so.

3.1. INITIAL / FINAL BOILING POINT, AND CARBON NUMBER RANGE

The boiling range is determined by a physical distillation of the sample.

The test method generally used for the determination of the initial and final boiling point (IBP) is EN ISO 3405, which is equivalent to IP 123 and ASTM D86. However, the lowest IBP that can be measured using ASTM D86 is +5°C. Some CAS RN descriptions (e.g. some of the gasoline naphthas) include IBPs as low as -20°C and this temperature can be determined using method ASTM 3710 (true boiling point method / simulated distillation). Data measured under IP 406 or ASTM D 2887 are not comparable with any of the methods referred to above unless converted using the calculation included in the method to convert to IP123 / D86 equivalent data. Generally, higher boiling materials are analysed using a high temperature simulated distillation method such as EN 15199. These data can be thought of as equivalent to true boiling point as defined by ASTM methods D2892 / D5236. Physical distillation under vacuum (ASTM D1160) is not generally used now.

Results are presented in °C.

The approximate carbon number range can be inferred from data obtained by the a.m. simulated distillation test methods, calibrated against known boiling points of n-alkanes. No data for carbon number ranges are provided in this report.

3.2. DENSITY

The density routinely measured in the petroleum industry is absolute density (mass of product for a given volume at a given temperature) at a standard temperature of (usually) 15°C. The REACH requirement is for relative density (weight of sample compared to water at a given temperature). The values of absolute and relative density are different but the differences are minor. ‘Petroleum Measurement Tables’ published by API (as API Standard 2540 and supported by ASTM D1250 and IP200) can be used to convert absolute to relative densities and densities measured at different temperatures.

Density can be determined either by a hydrometer (as per EN ISO 3675 or ASTM D1298) or a vibrating ‘U’ tube method (EN ISO 12185 or ASTM D4052).

A commonly used test method for the determination of relative density is EN 12185. Equivalent methods are IP365, ASTM D4052.

Results are quoted in g/cm^3.

3.3. VAPOUR PRESSURE

Vapour pressure of liquids is measured as dry vapour pressure equivalent (DVPE) using methods ASTM D5191 or EN13016-1 or Reid vapour pressure (RVP) using methods ISO 3007 or ASTM D323. Differences between methods for DVPE are minor and all should give similar results for dry samples.

Results are quoted in kPa @ 37.8°C (100°F).

3.4. SELF IGNITION TEMPERATURE

The self ignition temperature is determined as described in DIN 51794.

Results are quoted in °C.

3.5. VISCOSITY

Kinematic viscosity is usually measured by a capillary viscometer.

The test method is described in method ISO 3104 (comparable to the ASTM D 445). Stabinger viscosity determined by ASTM D7042 may be used if the result is provided as kinematic viscosity.

Results are quoted in mm^2/s, equivalent to cSt (centistokes), at a given temperature (usually 40°C or 100°C depending on the petroleum substance category).

3.6. FLAMMABILITY

The Abel Closed Cup method of flash point determination (EN ISO 13736) has a range of -30 to 70°C and is generally used for Kerosine and lighter materials.

The Pensky-Martin's Closed Cup method of flash point determination (EN ISO 2719 ASTM D93) has a range of 40°C and higher and is generally used for gas oils and heavier materials.

Scope of the Pensky-Martin's method states:

- Procedure A is used for the determination of the flash point of … other petroleum products not covered by Procedure B.
- Procedure B is used for the determination of the flash point of residual fuels ….

Results are presented as °C.

4. LOW BOILING POINT NAPHTHAS (GASOLINES)

4.1. SUBMITTED INFORMATION

There are 123 substances in the Low Boiling Point Naphthas (Gasoline) category, and 15 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 33 of the substances in this category of Low Boiling Point Naphthas (Gasolines), together with the number of companies that provided the information for each of these, is presented in **Appendix 1**.

4.2. EVALUATION OF AVAILABLE INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for each substance in the category were identified and are summarised in **Table 1**. The overall ranges for the category are shown in **Table 2**. For those endpoints for which no data were provided, the cells are blank (-).

Table 1 Summary of submitted data for the substances in the Low Boiling Point Naphthas (Gasoline) category

CAS registry number	Boiling range (°C)	Flash point (°C)	Relative Density at 15°C	Absolute Density (g/cm^3) at 15°C	Vapour Pressure (KPa) at 37.8°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 40°C
64741-41-9	103 - 178.1	-	-	-	13	-	-
64741-42-0	30 - 184	-	0.707	0.645 – 0.760	9 - 86	250	0.48
64741-46-4	-1 - 176	-	-	0.675 – 0.723	12 – 78	-	0.28
64741-54-4	80 - 202	-	-	-	-	-	-
64741-55-5	30 - 179	-	-	0.727	77	-	-
64741-63-5	88 - 188	-	-	0.682 – 0.815	21 - 26	-	-
64741-69-1	33 - 160	-	-	0.718	-	-	-
64741-70-4	30 - 104	-	0.645	0.622 – 0.675	78 - 160	-	-
64741-72-6	41.5 - 220	-	-	0.735	28	-	-
64741-83-9	-	-	0.720	-	84	-	-
64741-84-0	41 - 107	-	-	0.657 – 0.736	28	-	-
64741-87-3	65 - 200	-	0.765	-	17- 127	-	-
64742-48-9	90.3 - 180	-	0.730 - 0.747	0.726 – 0.752	13 - 53	-	-
64742-49-0	30 - 82	-	0.659	-	82	-	-
64742-73-0	-	-	-	0.652	96	-	-
64742-82-1	-	47	-	-	19	-	-
64742-89-8	32 - 138	-	-	0.635 – 0.697	47 - 97	-	0.8 (-20°C)
68475-79-6	-	-	-	0.628 – 0.656	114	-	-
68476-50-6	-	-	-	0.636 – 0.639	-	-	-
68476-55-1	> 30	-	-	0.634-0.687	-	-	-
68527-27-5	-	-	-	0.687	-	-	-
68606-11-1	37 - 163	< 0	-	0.676 – 0.715	58	-	-
68783-12-0	38 - 185	-	0.725	-	84	-	-

CAS registry number	Boiling range (°C)	Flash point (°C)	Relative Density at 15°C	Absolute Density (g/cm^3) at 15°C	Vapour Pressure (KPa) at 37.8°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 40°C
68919-37-9	37 - 190	-	-	0.825	35 - 39	-	-
68955-35-1	48 - 239	-	0.816	0.808 - 0.870	4 - 31	-	-
85116-59-2	-	-	-	0.686	16	-	-
86290-81-5	30 - 210	-	0.741 - 0.777	0.737 - 0.762	46 - 87	275 - 445	0.8 (-20°C)
92045-37-9	65 - 240	-	-	0.764	6 - 16	-	-
92045-59-5	35 - 205	-	-	0.736- 0.743	51 - 115	-	-
92045-60-8	-	-	-	0.620- 0.622	150 163 (40°C)	-	-
93571-75-6	≥130	-	0.870	-	-	-	-
93572-29-3	45-212	-	-	0.815	41	-	-
101316-76-1	37 - 138	-	-	0.700	-	-	-

Table 2 Overall ranges submitted and established for the category of Low Boiling Point Naphthas (Gasolines)

Property	Unit	Ranges of values for the category
Boiling range	°C	-1 - 240
Flash point	°C	< 0 - 47
Density at 15°C, relative **absolute**	- g/cm³	0.64 - 0.82 0.62 - 0.87
Vapour pressure at 37,8°C **at 40°C**	Kpa	4.1 - 160 163
Self ignition temperature	°C	275 - 445
Viscosity at 40°C **at -20°C**	cSt	0.28 – 0.48 0.8

4.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for the Low Boiling Point Naphthas (Gasolines) are:

Endpoint	Method	Comment
Initial boiling point	EN ISO 3405	Equivalent to IP 123, and ASTM D86
	ASTM 3710	for substances with IBP as low as -20 °C
Final boiling point	EN ISO 3405	Equivalent to IP 123, and ASTM D86
Relative Density	EN 12185	Equivalent to IP365 and ASTM D4052
Viscosity	EN ISO 3104, IP 71	Equivalent to ASTM D 445, and Stabinger (ASTM D7042)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	ASTM E659	
Flammability	EN ISO 13736	

5. KEROSINES

5.1. SUBMITTED INFORMATION

There are 23 substances in the Kerosines category and 16 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 6 of the substances in this category of Kerosines, together with the number of companies that provided the information for each of these, is presented in **Appendix 2**.

5.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for each substance in the category were identified and are summarised in **Table 3**. The overall ranges for the category are shown in **Table 4**. For those endpoints for which no data were provided, the cells are blank (-).

Table 3 Summary of submitted data for the substances in the Kerosines category

CAS registry number	Boiling range (°C)	Flash point (°C)	Freezing point	Relative Density at 15°C	Absolute Density (g/cm^3)at 15°C	Vapour Pressure (KPa) at 37.8°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 40°C
8008-20-6	146 - 280	29 - 64	-59 - -54	0.800 - 0.803	0.767 - 0.829	<1 - 3.6 8.6 (50°)	250	1.0 - 1.3 2.8 - 4.0 (-20°C)
64742-31-0	-	43	-	-	0.790	3.7 11.7(50°)	-	1.4 (20°C)
64742-47-8	181 - 278	66 - 67	-	-	0.810 - 0.828	-	-	1.5 - 2.0
64742-81-0	155 - 299	35 - 70	-61	0.802	0.770 - 0.854	<1	220 - 225	1.1 - 2.4 3.3 - 4.3 (-20°C)
64742-88-7	151	35	-	-	0.781	1.4	-	-
91770-15-9	150 - 280	> 38 - 50	-56	0.798 - 0.800	0.809 - 0.840	-	-	3.7 - 4.0 (-20°C)

Table 4 Overall ranges submitted and established for the category of Kerosines

Property	Unit	Ranges of values for the category
Boiling range	°C	146 - 299
Flash point	°C	29 - 70
Freezing point	°C	-61 - -54
Density at 15°C, relative **absolute**	- g/cm^3	0.80 0.77 - 0.85
Vapour pressure at 37.8°C **at 50°C**	KPa	<1.0 - 3.7 8.6 - 11.7
Self ignition temperature	°C	220 – 250
Viscosity at 40°C **at - 20°C**	cSt	1.0 - 2.4 2.8 - 4.3

5.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Kerosines are:

Endpoint	Method	Comment
Initial boiling point	EN ISO 3405	Equivalent to IP 123, and ASTM D86
Final boiling point	EN ISO 3405	Equivalent to IP 123, and ASTM D86
Freezing point	ASTM D2385	Equivalent to IP16
Relative Density	EN ISO 3675	Equivalent methods are ASTM D1298 Hydrometer
	EN ISO 12185	ASTM D4052 U-Tube
Vapour pressure	EN 13016-1	Equivalent methods are IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Flammability	EN ISO 13736	
Viscosity	ISO 3104	Equivalent methods are ASTM D 445 Normally measured at 40°C, but viscosity at -20°C is needed to fulfil legal and application-driven requirements for Kerosine

6. MK1 DIESEL FUEL

6.1. SUBMITTED INFORMATION

Three companies provided information on MK1 Diesel Fuel.

Information provided on physical-chemical endpoints of MK1 Diesel Fuel is presented in **Appendix 3**.

6.2. EVALUATION OF SUBMITTED INFORMATION

The ranges of endpoint values for MK1 Diesel Fuel are summarised in **Table 5**.

Table 5 Overall ranges submitted and established for MK1 Diesel Fuel

CAS registry number 64742-47-8	Boiling range (°C)	Flash point (°C)	Absolute Density (g/cm^3) at 15°C	Vapour Pressure (KPa) at 37.8°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 40°C
Endpoint range	180 - 295	60 - 67	0.807 - 0.817	0.7 - <5	240 - 290	1.9 - 2.1

6.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for MK1 Diesel Fuel are:

Endpoint	Method	Comment
Boiling range	EN ISO 3405	Equivalent to IP 123, and ASTM D86
Density (absolute and relative)	EN ISO 3675	Equivalent method is ASTM D 1298
Density, absolute	EN ISO 12185	Equivalent method is ASTM D4052
Vapour pressure	EN 13016-1	Equivalent method is IP394 Different method with comparable result is ASTM D 5191
Self Ignition	DIN 51794	

Flash point	EN ISO 2719	Equivalent methods are ASTM D 3828 or ASTM D 93
Viscosity	ISO 3104	Equivalent methods are ASTM D 445, Stabinger ASTM D 7045

7. STRAIGHT-RUN GAS OILS

7.1. SUBMITTED INFORMATION

There are 9 substances in the category of Straight-Run Gas Oils and 13 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 4 of the substances in this category of Straight-Run Gas Oils, together with the number of companies that provided the information for each of these, is presented in **Appendix 4**.

7.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for each substance in the category were identified and are summarised in **Table 6**. The overall ranges for the category are shown in **Table 7**. For those endpoints for which no data were provided, the cells are blank (-).

Table 6 Summary of submitted data for the substances in the Straight-Run Gas Oils category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 40°C
64741-43-1	193 - 361	83	6	0.860 - 0.890	240	4.1 - 8.0
64741-44-2	199 - 338	89	-	0.798 - 0.843	-	3.1
68814-87-9	149 - 399	67 - 103	-	0.819 - 0.885	310 - 320	2.1 – 27
68915-96-8	-	66 - >100	-21	0.890 - 0.906	-	11.0 11.0 - 16.0 (50°C)

Table 7 Overall ranges submitted and established for the category of Straight-Run Gas Oils

Property	Unit	Range of values for category
Boiling range	°C	149 - 399
Flash point	°C	66 - 103
Pour point	°C	-21 - +6
Density absolute at 15°C	g/cm³	0.80 - 0.91
Self ignition temperature	°C	240 - 320
Viscosity at 40°C **at 50°C**	cSt	2.1 - 27 11 - 16

7.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Straight-Run Gas Oils are:

Endpoint	Method	Comment
Initial boiling point	ASTM D86	Equivalent to IP 123, and EN ISO 3405
Final boiling point	ASTM D 86	Equivalent to IP 123, and EN ISO 3405
Flash point	ASTM D93	Equivalent to EN ISO 2719 Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Viscosity	ISO 3104	Equivalent to ASTM D 445, Stabinger D 7042

8. VACUUM GAS OILS, HYDROCRACKED GAS OILS & DISTILLATE FUELS

8.1. SUBMITTED INFORMATION

There are 17 substances in the category of Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels and 17 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 7 of the substances in this category of Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels, together with the number of companies that provided the information for each of these, is presented in **Appendix 5**.

8.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for each substance in the category were identified and are summarised in **Table 8**. The overall ranges for the category are shown in **Table 9**. For those endpoints for which no data were provided, the cells are blank (-).

Table 8 Summary of submitted data for the substances in the Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point (°C)	Absolute Density (g/cm^3) at 15°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 40°C
64741-49-7	258 - 394	120 - 140	-	0.882	-	3.2 - 4.0
64741-58-8	177 - 462	83 - 175	-16	0.884 - 0.911	-	7.4 - 117 11.0 - 14.5 (50°C) 7.9 - 20 (100°C)
64741-77-1	168 - 323	65	-	0.81 - 0.835	-	2.3
68334-30-5	154 - 381	58 - 81	-40 - -10	0.819 - 0.856	225 - 230	1.8 - 4
68476-30-2	-	58	-	0.835	-	3.8
68476-31-3	-	-	-	0.897	-	-
68476-34-6	174 - 384	60 - 75	-25 - -15	0.809 - 0.875	-	1.5 - 4.5

Table 9 Overall ranges submitted and established for the category of Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels

Property	Unit	Ranges of values for category
Boiling range	°C	154 - 462
Flash point	°C	58 - 175
Pour point	°C	-40 - -10
Density absolute at 15°C	g/cm³	0.81 - 0.91
Self ignition temperature	°C	225 - 230
Viscosity at 40°C **50°C** **100°C**	cSt	1.5 - 117 11 - 14.5 7.9 - 20

8.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels are:

Endpoint	Method	Comment
Initial boiling point	ASTM D86	Equivalent to IP 123, and EN ISO 3405
Final boiling point	ASTM D 86	Equivalent to IP 123, and EN ISO 3405
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Viscosity	ISO 3104	Equivalent to ASTM D 445

9. CRACKED GAS OILS

9.1. SUBMITTED INFORMATION

There are 10 substances in the category Cracked Gas Oils and 17 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 5 of the substances in this category of Cracked Gas Oils, together with the number of companies that provided the information for each of these, is presented in **Appendix 6**.

9.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for each substance in the category were identified and are summarised in **Table 10**. The overall ranges for the category of Cracked Gas Oils are shown in **Table 11**. For those endpoints for which no data were provided, the cells are blank (-).

Table 10 Summary of submitted data for the substances in the Cracked Gas Oils category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Viscosity (mm^2/sec) at 40°C
64741-59-9	150 - 411	60 - 130	< -20	0.840 - 0.975	1.1 - 4.5
64741-60-2	299 - 385	86 - 154	-	0.950 - 0.993	6.0 (at 20°C)
64741-82-8	158 - 383	56 - 62	-	0.816 - 0.884	1.2 - 2.3
68333-25-5	201	94	-	0.920	8.1 (at 20°C)
92045-29-9	159 - 343	60 - 138	-	0.838	-

Table 11 Overall ranges submitted and established for the category of Cracked Gas Oils

Property	Unit	Ranges of values for the category
Boiling range	°C	150 - 411
Flash point	°C	56 - 154
Pour point	°C	< -20
Density absolute at 15°C	g/m^3	0.816 - 0.993
Viscosity at 40°C **at 20°C**	cSt	1.1 - 4.5 6.0 - 8.1

9.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Cracked Gas Oils are:

Endpoint	Method	Comment
Initial boiling point	ASTM D86	Equivalent to IP 123, and EN ISO 3405
Final boiling point	ASTM D 86	Equivalent to IP 123, and EN ISO 3405
Flash point	ASTM D93	Equivalent to EN ISO 2719 Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Viscosity	ISO 3104	Equivalent to ASTM D 445, Stabinger ASTM D 7042

10. OTHER GAS OILS

10.1. SUBMITTED INFORMATION

There are 27 substances in the category Other Gas Oils and 17 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 4 of the substances in this category of Other Gas Oils, together with the number of companies that provided the information for each of these, is presented in **Appendix 7**.

10.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for each substance in the category were identified and are summarised in **Table 12**. The overall ranges for the category are shown in **Table 13**. For those endpoints for which no data were provided, the cells are blank (-).

Table 12 Summary of submitted data for the substances in the Other Gas Oils category

CAS registry number	Boiling range (°C)	Pour Point (°C)	Flash point (°C)	Absolute Density (g/cm^3) at 15°C	Viscosity (mm^2/sec) at 40°C
64742-46-7	194 - 397	-	74 - 110	0.846 - 0.854	4.5 7.1 (20°C)
64742-79-6	274 - 372	-	122	0.815 - 0.848	8.1
64742-80-9	211 - 399	6	55 - 136	0.810 - 0.901	2.0 - 6.2 4.0 - 7.0 (50°C)
90622-53-0	175 - 193	-	-	-	-

Table 13 Overall ranges submitted and established for the category of Other Gas Oils

Property	Unit	Ranges of values for category
Boiling range	°C	175 – 399
Pour point	°C	6
Flash point	°C	55 - 136
Density absolute at 15°C	g/cm^3	0.810 - 0.901
Viscosity at 40°C **at 20°C** **at 50°C**	cSt	2.0 - 8.1 7.1 4.0 - 7.0

10.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Other Gas Oils are:

Endpoint	Method	Comment
Initial boiling point	ASTM D86	Equivalent to IP 123, and EN ISO 3405
Final boiling point	ASTM D 86	Equivalent to IP 123, and EN ISO 3405
Flash point	ASTM D93	Equivalent to EN ISO 2719 Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675 EN ISO 12185	Equivalent to ASTM D1298 (Hydrometer) ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Viscosity	ISO 3104	Equivalent to ASTM D 445, Stabinger ASTM D 7042

11. HEAVY FUEL OIL COMPONENTS

11.1. SUBMITTED INFORMATION

There are 36 substances in the category of Heavy Fuel Oil Components and 21 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 19 of the substances in this category of Heavy Fuel Oil Components, together with the number of companies that provided the information for each of these, is presented in **Appendix 8**.

11.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for each substance in the category were identified and are summarised in **Table 14**. The overall ranges for the category of Heavy Fuel Oil Components are shown in **Table 15**. For those endpoints for which no data were provided, the cells are blank (-).

Table 14 Summary of submitted data for the substances in the Heavy Fuel Oil Components category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Vapour Pressure (KPa)	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 100°C
64741-45-3	> 750	100 - >140	33	0.934 - 1.110	0,090 (120°C) 0,097 (150°C)	350 - 382	250 (100°C) 144 - 6611 (50°C) 115 (80°C)
64741-57-7	-	165 - 171	-	0.877 - 0.933	0.100	250	35 (40°C) 15 - 38 (50°C)
64741-61-3	-	124	-	-	-	-	8.1
64741-62-4	-	-	-	1.092	-	-	6.8
64741-75-9	-	200	-	0.838 - 0.859	-	-	5.4 - 5.8
64741-80-6	-	101	-9 - <15	0.924 - 1.022	-	-	6.6 - 100 9.6 - 457 (50°C)
64741-81-7	-	64	-	0.868 - 0.952	0.024 (120°C) 0.063 (150°C)	378	21 - 57 (50°C)
64742-59-2	244 - 570	100-175	-	0.890 - 0.905	-	-	6.5 - 7.0 14.5 (50°C)
64742-86-5	278 - 601	80 - 310	-	0.835 - 0.907	-	-	6.7 18.0 (50°C)
68333-22-2	>750	-	-	-	-	380 - 390	-
68476-33-5	160 - >750	70 - 168	31	0.841 - 1.076 1.010 - 1.025 (60°C)	0.727 - 0.791 (120°C) 0.800 - 0.861 (150°C)	392 - 537	4.5 - 396 80 - 900 (50°C)
68553-00-4	-	86	-	0.980	-	-	174 (50°C)
68607-30-7	260 - 550	100	-	0.920 - 0.936	-	-	210 - 350 (50°C)
68783-08-4	290 - 410	100	-	0.870 - 0.880	-	-	9.0 - 10.0 (40°C)
68955-27-1	262	150	12	0.981 - 1.028	-	350	111 270 (40°C)
70592-77-7	232 - 521	-	-	0.907 - 0.920	-	-	4.0
70592-78-8	340 - 625	206 - 298	-	0.919 - 0.935	-	330 - 380	3.6 - 12.0
92045-14-2	-	70 - 167	7	0.961 - 1.092	-	-	115 (40°C)
92061-97-7	272 - 641	82	0	1.068 - 1.072	-	405	18.0 - 22.3 360 (50°C)

Table 15 Overall ranges submitted and established for the category of Heavy Fuel Oil Components

Property	Unit	Ranges of values for the category
Boiling range	°C	160 - >750
Flash point	°C	64 - 310
Pour point	°C	-9 - +31
Density absolute at 15°C **absolute at 60°C**	g/cm³	0.84 - 1.11 1.01 - 1.03
Vapour pressure at 120°C **150°C**	KPa	0.02 - 0.79 0.06 - 0.86
Self ignition temperature	°C	250 – 537
Viscosity at 100°C **40°C** **50°C** **80°C**	cSt	3.6 - 396 9 -270 9.6 - 6611 115

11.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Heavy Fuel Oil Components are:

Endpoint	Method	Comment
Initial boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A; procedure B for residual fuels)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Flammability	EN ISO 13736	
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

12. UNREFINED / ACID TREATED OILS

12.1. SUBMITTED INFORMATION

There are 12 substances in the category of Unrefined/Acid Treated Oils and 5 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 2 of the substances in this category of Unrefined/Acid Treated Oils, together with the number of companies that provided the information for each of these, is presented in **Appendix 9**.

12.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for two of the substances in the category were identified and are summarised in **Table 16**. The overall ranges for the category of Unrefined/Acid Treated Oils are shown in **Table 17**. For those endpoints for which no data were provided, the cells are blank (-).

Table 16 Summary of submitted data for the substances in the Unrefined/Acid Treated Oils category

CAS registry number	Boiling range (°C)	Flash point (°C)	Absolute Density (g/cm^3) at 15°C	Viscosity (mm^2/sec) at 100°C
64741-50-0	> 210 - 453	-	-	2.5 - 3.1
64741-51-1	310 - 636	202 - 206	0.936 - 0.960	4.1 - 50.0

Table 17 Overall ranges submitted and established for the category of Unrefined/Acid Treated Oils

Property	Unit	Ranges of values for the category
Boiling range	°C	> 210 - 636
Flash point	°C	202 - 206
Density absolute at 15°C	g/cm^3	0.94 - 0.96
Viscosity at 100 °C	cSt	2.5 - 50.0

12.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Unrefined/Acid Treated Oils are:

Endpoint	Method	Comment
Initial boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719 Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Flammability	EN ISO 13736	
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

13. HIGHLY REFINED BASE OILS

13.1. SUBMITTED INFORMATION

There are 2 substances in the category of Highly Refined Base Oils and 2 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of one of the substances in this category of Highly Refined Base Oils, together with the number of companies that provided the information, is presented in **Appendix 10**.

13.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for one of the substances in the category (CAS RN 8042-47-5) were identified and are summarised in **Table 18**.

Table 18 Ranges submitted and established for the category of Highly Refined Base Oils (substance CAS RN 8042-47-5)

Property	Unit	Ranges of values for category
Boiling range	°C	224 - 575
Flash point	°C	112 - 260
Pour point	°C	-39 - -24
Density absolute at 15°C	g/cm³	0.81 - 0.89
Vapour pressure at 20°C	KPa	< 0.01
Viscosity at 40 °C **at 100°C**	cSt	3.1 - 3.4 9.2

13.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Highly Refined Base Oils are:

Endpoint	Method	Comment
Initial boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Flammability	EN ISO 13736	
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

14. OTHER LUBRICANT BASE OILS

14.1. SUBMITTED INFORMATION

There are 81 substances in the category of Other Lubricant Base Oils and 8 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 15 of the substances in this category of Other Lubricant Base Oils, together with the number of companies that provided the information for each of these, is presented in **Appendix 11**.

14.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substances in the category were identified and are summarised in **Table 19**. The overall ranges for the category of Other Lubricant Base Oils are shown in **Table 20**. For those endpoints for which no data were provided, the cells are blank (-).

Table 19 Summary of submitted data for the substances in the Other Lubricant Base Oils category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 40°C
64741-76-0	-	98	0	0.820	-	-
64741-88-4	-	200	-	-	-	53 – 121 3.9 - 13.2 (100°C)
64741-89-5	207 – 329	-	-	0.813	-	2.0 - 11.7 3.0 (100°C)
64741-95-3	448 - 716	274 - 344	-	0.891 - 0.936	-	446 – 889 33 - 41 (100°C)
64741-96-4	342 - 532	218 - 226	-	0.970	-	-
64742-01-4	-	-	-	-	-	518 36 (100°C)
64742-52-5	287 - 547	181 - 221	-	0.885 - 0.920	-	-
64742-53-6	243 - 413	144 - 149	-	0.872 - 0.889	-	-
64742-54-7	-	-	-	-	330 - 355	-
64742-55-8	>158 - 327	125	-	0.817 - 0.851	325 - 335	4.0 - 14.0
64742-56-9	262 - 327	180	-	0.852	-	12.5
64742-57-0	-	-	-	0.915	-	-
64742-62-7	411 - 750	-	0	-	394	354 24.2 (100°C)
64742-65-0	>193 - 627	194	-	0.862 - 0.961	334	20.3 - 120 4.1 - 12.8 (100°C)
74869-22-0	-	206 - 250	-17 - 0	0.866 - 0.891	-	61 - 107 5.0 - 14.0 (100°C)

Table 20 Overall ranges submitted and established for the category of Other Lubricant Base Oils

Property	Unit	Ranges of values for category
Boiling range	°C	>158 - 750
Flash point	°C	98 - 344
Pour point	°C	-17 - 0
Density absolute at 15°C	g/cm³	0.81 - 0.97
Self ignition temperature	°C	325 – 394
Viscosity at 40 °C **at 100°C**	cSt	2.0 - 889 3 - 41

14.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Other Lubricant Base Oils are:

Endpoint	Method	Comment
Initial boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Self Ignition	DIN 51794	
Flammability	EN ISO 13736	
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

15. FOOTS OILS

15.1. SUBMITTED INFORMATION

There are 6 substances in the category of Foots Oils and 3 CONCAWE member companies submitted information for this category.

Validated information provided on physical-chemical endpoints of one of the substances in this category of Foots Oils, together with the number of companies that provided the information for each of these, is presented in **Appendix 12**.

15.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substance CAS RN 64742-67-2) in the category were identified and are summarised in **Table 21**.

Table 21 Overall ranges submitted and established for the category of Foots Oils (substance 64742-67-2)

Property	Unit	Ranges of values for category
Flash point	°C	>180 - 199
Pour point	°C	10 - 49
Density Absolute at 15°C	g/cm³	0.811 - 0.852
Viscosity at 40°C **at 100°**	cSt	38 2.7 - 15

15.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Foots Oils are:

Endpoint	Method	Comment
Boiling range	EN 15199	Simulated distillation by GC
	ASTM D 1160	Vacuum distillation
Relative Density	EN ISO 3675 or ASTM D1298	Hydrometer
	EN ISO 12185 or ASTM D4052	U-Tube
Flash point	EN ISO 2719, ASTM D93	Pensky-Martin's closed-cup method (procedure A)
Vapour pressure	EN 13016-1	
	IP 394	
	ASTM D 5191	
Viscosity	ISO 3104/ASTM D 445	Usually measured at 100 °C

16. RESIDUAL AROMATIC EXTRACTS

16.1. SUBMITTED INFORMATION

There are 2 substances in the category of Residual Aromatic Extracts (RAEs) and 6 CONCAWE member companies submitted information for this category.

Validated information provided on physical-chemical endpoints of both of the substances in this category of RAEs, together with the number of companies that provided the information for each of these, is presented in **Appendix 13**.

16.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substances in the category were identified and are summarised in **Table 22**. The overall ranges of submitted data for the category of RAEs are shown in **Table 23**. For those endpoints for which no data were provided, the cells are blank (-).

Table 22 Summary of submitted data for the substances in the RAEs category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Vapour Pressure (KPa) at 20°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 100°C
64742-10-5	380	298	-	0.960 - 1.020	-	-	92 - 100 2000 - 7000 (40°C)
91995-70-9	400 - 700	305 - 335	3 - 9	0.972 - 1.002	< 0.1	> 300 - 397	55 - 189 2900 (40°C)

Table 23 Overall ranges submitted and established for the category of RAEs

Property	Unit	Ranges of values for category
Boiling range	°C	380 - 700
Flash point	°C	298 - 335
Pour point	°C	3 - 9
Density absolute at 15°C	g/cm³	0.96 - 1.02
Vapour pressure at 20°C	KPa	< 0.1
Self ignition temperature	°C	> 300 - 397
Viscosity at 40 °C **at 100°C**	cSt	2000 - 7000 55 - 189

16.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for RAEs are:

Endpoint	Method	Comment
Initial boiling point	EN 15199-1	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199-1	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)

Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

17. UNTREATED DISTILLATE AROMATIC EXTRACTS

17.1. SUBMITTED INFORMATION

There are 6 substances in the category of Untreated Distillate Aromatic Extracts (DAEs) and 10 CONCAWE member companies submitted information for this category.

Validated information provided on physical-chemical endpoints of one of the substances in this category of DAEs, together with the number of companies that provided the information for each of these, is presented in **Appendix 14**.

17.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substance CAS RN 64742-04-7 in the category were identified and are summarised in **Table 24**.

Table 24 Overall ranges submitted and established for the category of DAEs (substance 64742-04-7)

Property	Unit	Ranges of values for category
Boiling range	°C	250 - 640
Flash point	°C	240 - 289
Pour point	°C	0 - 50
Density absolute at 15°C **at 70°C**	g/cm³	0.93 - 1.05 0.96 - 1.01
Vapour pressure at 20°C	KPa	< 0.1
Self ignition temperature	°C	>280 - 410
Viscosity at 40 °C **at 50°C** **at 70°C** **at 100°C**	cSt	50 - 21087 16 - 24 8.3 - 11 3.8 – 124

17.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for DAEs are:

Endpoint	Method	Comment
Initial boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

18. TREATED DISTILLATE AROMATIC EXTRACTS

18.1. SUBMITTED INFORMATION

There are 18 substances in the category of Treated Distillate Aromatic Extracts (TDAEs) and 4 CONCAWE member companies submitted information for this substance.

Information provided on physical-chemical endpoints of one of the substances in this category of TDAEs, together with the number of companies that provided the information for each of these, is presented in **Appendix 15**.

18.2. EVALUATION OF SUBMITTED INFORMATION

The ranges of values for each of the endpoints of TDAEs (substance CAS RN 68783-04-0) are shown in **Table 25**.

Table 25 Overall ranges submitted and established for the category of TDAEs (substance 68783-04-0)

Property	Unit	Ranges of values for category
Boiling range	°C	350 - 550
Flash point	°C	254 - 303
Pour point	°C	0
Density absolute at 15°C **at 80°C**	g/cm³	0.94 - 1.05 1.02 - 1.03
Vapour pressure at 20°C	KPa	< 0.1
Self ignition temperature	°C	> 280
Viscosity at 40 °C **at 100°C**	cSt	400 20 - 147

18.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for TDAEs are:

Endpoint	Method	Comment
Initial boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Vapour pressure	EN 13016-1	Equivalent to IP394 and ASTM D 5191
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

19. PARAFFINIC AND HYDROCARBON WAXES

19.1. SUBMITTED INFORMATION

There are 22 substances in the category of Paraffinic and Hydrocarbon Waxes and 4 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 4 of the substances in this category of Paraffinic and Hydrocarbon Waxes, together with the number of companies that provided the information for each of these, is presented in **Appendix 16**.

19.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substances in the category were identified and are summarised in **Table 26**. The overall ranges for the category of Paraffinic and Hydrocarbon Waxes are shown in **Table 27**. For those endpoints for which no data were provided, the cells are blank (-).

Table 26 Summary of submitted data for the substances in the Paraffinic and Hydrocarbon Waxes category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Self Ignition temperature (°C)	Viscosity (mm^2/sec) at 100°C
8002-74-2	358 - 489	-	58.2	0.804	380 - 400	3.0
63231-60-7	-	-	-	0.834 - 0.847	-	-
64742-42-3	-	317	85.1	-	-	-
64742-51-4	341 - 655	-	-	0.804 - 0.820	-	-

Table 27 Overall ranges submitted and established for the category of Paraffinic and Hydrocarbon Waxes

Property	Unit	Ranges of values for category
Boiling range	°C	341 - 655
Flash point	°C	317
Pour point	°C	58.2 - 85.1
Density absolute at 15°C	g/cm^3	0.80 - 0.85
Self ignition temperature	°C	380 - 400
Viscosity at 100 °C	cSt	3.03

19.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Paraffinic and Hydrocarbon Waxes are:

Endpoint	Method	Comment
Initial boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Final boiling point	EN 15199	Simulated distillation by GC
	D 1160	Vacuum distillation
Flash point	ASTM D93	Equivalent to EN ISO 2719
		Pensky-Martin's closed-cup method (procedure A)
Relative Density	EN ISO 3675	Equivalent to ASTM D1298 (Hydrometer)
	EN ISO 12185	ASTM D4052 (U-Tube)
Viscosity	ISO 3104	Equivalent to ASTM D 445 Usually measured at 100°C

20. SLACK WAXES

20.1. SUBMITTED INFORMATION

There are 10 substances in the category of Slack Waxes and 6 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 2 of the substances in this category of Slack Waxes, together with the number of companies that provided the information for each of these, is presented in **Appendix 17**.

20.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substances in the category were identified and are summarised in **Table 28**. The overall ranges for the category of Slack Waxes are shown in **Table 29**. For those endpoints for which no data were provided, the cells are blank (-).

Table 28 Summary of submitted data for the substances in the Slack Waxes category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Viscosity (mm^2/sec) at 100°C
64742-61-6	315 - 537	>190 - 288	48 - 60	0.77 - 0.96 0.77 - 0.85 (70°C)	2.3 - 30 3.5 - 6.5 (70°C)
92062-09-4	320 - >700	>190	48 - 60	0.80 0.77 - 0.85 (70°C)	2.5 3.5 - 6.5 (70°C)

Table 29 Overall ranges submitted and established for the category of Slack Waxes

Property	Unit	Ranges of values for category
Boiling range	°C	315 - >700
Flash point	°C	>190 - 288
Melting point	°C	48 - 60
Density absolute at 15°C **at 70°C**	g/cm^3	0.77 - 0.96 0.77 - 0.85
Viscosity at 100°C **at 70°C**	mm^2/sec	2.3 - 30 3.5 - 6.5

20.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Slack Waxes are:

Endpoint	Method	Comment
Boiling range	EN ISO 15199	Simulated distillation by GC
	ASTM D 1160	Vacuum distillation
Relative Density	EN ISO 3675 or ASTM D1298	Hydrometer
	EN ISO 12185 or ASTM D4052	U-Tube
Flash point	EN ISO 2719, ASTM D93	Pensky-Martin's closed-cup method (procedure A)
Viscosity	ISO 3104/ASTM D 445	Usually measured at 100 °C

21. PETROLATUMS

21.1. SUBMITTED INFORMATION

There are 7 substances in the category of Petrolatums and 7 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 2 of the substances in this category of Petrolatums, together with the number of companies that provided the information for each of these, is presented in **Appendix 18**.

21.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substances in the category were identified and are summarised in **Table 30**. The overall ranges for the category of Petrolatums are shown in **Table 31**. For those endpoints for which no data were provided, the cells are blank (-).

Table 30 Summary of submitted data for the substances in the Petrolatums category

CAS registry number	Boiling range (°C)	Flash point (°C)	Pour point	Absolute Density (g/cm^3) at 15°C	Viscosity (mm^2/sec) at 100°C
8009-03-8	368 – >700	>180 - >286	51 - 71	0.865 - 0.886 0.815 (80°C)	7.2 - 17.9
92045-77-7	360 – 732	-	-	-	-

Table 31 Overall ranges submitted and established for the category of Petrolatums

Property	Unit	Ranges of values for category
Boiling range	°C	360 – 732
Flash point	°C	>180 - >286
Melting point	°C	51 – 71
Density absolute at 15°C at 80°C	g/cm^3	0.865 - 0.886 0.815
Viscosity at 100°C	cSt	7.2 - 17.9

21.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Petrolatums are:

Endpoint	Method	Comment
Boiling range	EN 15199	Simulated distillation by GC
	ASTM D 1160	Vacuum distillation
Relative Density	EN ISO 3675 or ASTM D1298	Hydrometer
	EN ISO 12185 or ASTM D4052	U-Tube
Flash point	EN ISO 2719, ASTM D93	Pensky-Martin's closed-cup method (procedure A)
Viscosity	ISO 3104/ASTM D 445	Usually measured at 100 °C

22. BITUMEN

22.1. SUBMITTED INFORMATION

There are 8 substances in the category of Bitumen, and 11 CONCAWE member companies submitted information for this category.

Information provided on physical-chemical endpoints of 4 of the substances in this category of Bitumen, together with the number of companies that provided the information for each of these, is presented in **Appendix 19**.

22.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for the substances in the category were identified and are summarised in **Table 32**. The overall ranges for the category of Bitumen are shown in **Table 33**. For those endpoints for which no data were provided, the cells are blank (-).

Table 32 Summary of submitted data for the substances in the Bitumen category

CAS registry number	Boiling range (°C)	Flash point (°C)	Softening point	Abs. Density (g/cm^3) at 15°C	Abs. Density (g/cm^3) at 25°C	Self Ignition temp. (°C)	Viscosity (mm^2/sec)
8052-42-4	343 - 738	>230 – 328	45 - 68	0.959 - 1.030	1.021 - 1.062	490	1382 - 8200 *) (at 60°C) 1981 - 2552 (at 100°C) 243 - 3210 (at 135°C)
64741-56-6	475 - 699	180 – 336	44	0.925 - 1.044	1.070	410 - 440	275 - 1274 (at 100°C)
92062-05-0	-	-	128	0.973	-	430	-
100684-39-7	-	-	24 - 33	-	-	-	-

*) viscosity data at 60°C are in Pa.s

Table 33 Overall ranges submitted and established for the category of Bitumen

Property	Unit	Ranges of values submitted by member companies
Boiling range	°C	343 - 738
Flash point	°C	180 - 336
Softening point	°C	24 - 128
Density absolute 15°C **25°C**	g/cm^3	0.93 - 1.04 1.02 - 1.07
Self ignition temperature	°C	410 - 490
Viscosity	cSt	1382 - 8200 Pa.s (60°C) 243 - 3210 (135°C) 275 - 2552 (100°C)

22.3. METHODS OF ANALYSIS

Relevant physical-chemical endpoints and commonly used methods of analysis for Bitumen are:

Endpoint	Method	Comment
Boiling range	EN 15199	Simulated distillation by GC
	ASTM D 1160	Vacuum distillation Equivalent: D 2887, IP 480
Absolute Density	ENISO 12185 / D4052	Equivalent: D3289, D70, DIN 51757 V.4, EN 15326, EN ISO 3838
Flash point	EN ISO 2719, ASTM D93	Pensky-Martin's closed-cup method (procedure B)
	For normal hard bitumen: Cleveland Open Cup = EN ISO 2592	Equivalent: ASTM D 92; SR 5489-08
Viscosity	D 2170, EN 12595	Equivalent to IP 319
Pour Point, Softening Point	EN 1427	
Self Ignition	ASTM E 659	

23. OXIDIZED ASPHALT

23.1. SUBMITTED INFORMATION

Information provided on physical-chemical endpoints of Oxidized Asphalt is presented in **Appendix 20**.

23.2. EVALUATION OF SUBMITTED INFORMATION

Based on the information that was submitted to CONCAWE, the ranges of endpoint values for Oxidized Asphalt were identified and are summarised in **Table 34**.

Table 34 Overall ranges submitted and established for Oxidized Asphalt (CAS RN 64742-93-4)

Property	Unit	Ranges of values submitted by member companies
Initial boiling point	°C	308 - ≥383
Flash point	°C	244 - 334
Softening Point	°C	38 - 107
Density absolute at 15°C **at 25°C**	g/cc	1.00 - 1.07 1.02 - 1.05
Viscosity at 135°C **at 160°C**	cSt	1301 967 - 3708

23.3. METHODS OF ANALYSIS

Methods of analysis and relevant endpoints for Oxidized Asphalt are:

Endpoint	Method	Comment
Boiling range	ASTM D 7169	Equivalent to IP 507 and EN 15199-2
	EN 15199	Simulated distillation by GC
	ASTM D 1160	Vacuum distillation
Absolute Density	EN ISO 15326	Equivalent to IP 549
	EN ISO 3838	Equivalent to IP 189

Flash point	EN ISO 2719, ASTM D93	Pensky-Martin's closed-cup method (procedure B)
	For normal hard bitumen: EN ISO 2592	Equivalent to Cleveland Open Cup or ASTM D 92
	SR 5489-08	
Viscosity	EN 12595	Equivalent to IP 319

24. SULFUR

24.1. SUBMITTED INFORMATION

Information on physical-chemical endpoints of sulfur was provided by two companies.

24.2. EVALUATION OF SUBMITTED INFORMATION

Information on sulfur is shown in **Table 35**.

Table 35 Overall ranges submitted and established for sulfur

CAS registry number	Absolute Density (g/cm^3) at 15°C	Melting point (°C)	Granulometry (% m/m)
7704-34-9	1.07 - 1.17	113	<1 - <2

24.3. METHODS OF ANALYSIS

Test methods used for sulfur were

Density UOP294-93

Granulometry UOP333-07

25. REFERENCES

1. EU (1993) Council Regulation (EEC) No. 793/93 of 23 March 1993 on the evaluation and control of the risks of existing substances. Official Journal of the European Communities No. L84, 05.04.1993

2. EU (1993) Commission Directive 93/21/EEC of 27 April 1993 adapting to technical progress for the 18th time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances. Official Journal of the European Communities No. L110, 04.05.1993

3. EU (1990) EINECS (European Inventory of Existing Commercial chemical Substances) - Volumes I and II. Annex to Official Journal of the European Communities No. C146A, 15.06.1990

4. EU (2008) Commission Regulation (EC) No. 987/2008 of 8 October 2008 amending Regulation (EC) No. 1907/2006 of the European Parliament and of the Council on Registration, Evaluation, Authorisation and restriction of Chemicals (REACH) as regards Annexes IV and V. Official Journal of the European Communities No. L268, 09.10.2008

5. ECHA (2010) Guidance for Annex V - exemptions from the obligation to register. Version 1, March 2010. Helsinki: European Chemicals Agency

6. CONCAWE (1992) Aromatic extracts. Product Dossier No. 92/101. Brussels: CONCAWE

7. CONCAWE (1992) Liquefied petroleum gas. Product Dossier No. 92/102. Brussels: CONCAWE

8. CONCAWE (1992) Gasolines. Product Dossier No. 92/103. Brussels: CONCAWE

9. CONCAWE (1992) Bitumens and bitumen derivatives. Product Dossier No. 92/104. Brussels: CONCAWE

10. CONCAWE (1993) Petroleum coke. Product Dossier No. 93/105. Brussels: CONCAWE

11. CONCAWE (1995) Kerosines/jet fuels. Product Dossier No. 94/106. Brussels: CONCAWE

12. CONCAWE (1996) Gas oils (diesel fuels/heating oils). Product Dossier No. 95/107. Brussels: CONCAWE

13. CONCAWE (1997) Lubricating oil basestocks. Product Dossier No. 97/108. Brussels: CONCAWE

14. CONCAWE (1998) Heavy fuel oils. Product Dossier No. 98/109. Brussels: CONCAWE

15. CONCAWE (1999) Petroleum waxes and related products. Product Dossier No. 99/110. Brussels: CONCAWE

16. Klimisch, H.-J. et al (1997) A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. *Regulatory Toxicology & Pharmacology 25, 1-5*

26. GLOSSARY

API	American Petroleum Institute
ASTM	American Society for Tasting and Materials
CAS RN	CAS Registry Number, Registry Number of the Chemical Abstract Society
DAE	Untreated Distillate Aromatic Extracts
DIN	Deutsches Institut für Normung e.V.
DVPE	Dry Vapour Pressure Equivalent
EC number	Numeric substance identifier of the European Commission
ECHA	European Chemicals Agency, Helsinki
EINECS number	Numeric substance identifier of the European Inventory of Existing Commercial chemical Substances
GLP	Good Laboratory Practice
HFOs	Heavy Fuel Oil Components
HRBOs	Highly Refined Base Oils
IBP, FBP	Initial / Final Boiling Point
ISO	International Organization for Standardization
IUCLID 5	International Uniform Chemical Information Database: software to capture substance properties
LBOs	Other Lubricant Base Oils
MK1 Diesel Fuel	Environmentally Classified Swedish Diesel Fuel
RAE	Residual Aromatic Extracts
REACH	Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
RVP	Reid Vapour Pressure
TDAE	Treated Distillate Aromatic Extracts
VGOs	Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels

ARRANGEMENT OF INFORMATION IN THE APPENDICES

Each of the tables in these Appendices contains information on the substances in a separate petroleum substance category.

The information in the tables is summarised per CAS registry number.

All data were provided to CONCAWE by its member companies and were supported with accompanying test reports. These data are considered sufficiently robust to allow a Klimisch rating of 1. A summary row of data is also included for each CAS registry number. The last row in every table shows the overall ranges for all the substances in each category.

Each Appendix also includes a summary of the number or Member Companies reporting results, presented by CAS registry number.

APPENDIX 1 LOW BOILING POINT NAPHTHAS (GASOLINES)

Number of companies providing information on substances in the category of Low Boiling Point Naphthas (Gasolines)

CAS Registry Number	N° of companies	Boiling range	Flash point	Rel. density	Abs. density	Abs. density -1°C	Vapour pressure	Self ignition temperature	Viscosity
64741-41-9	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
64741-42-0	**6**	**6**	**-**	**1**	**6**	**-**	**5**	**-**	**1**
64741-46-4	**3**	**3**	**-**	**-**	**3**	**-**	**2**	**-**	**1**
64741-54-4	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
64741-55-5	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
64741-63-5	**3**	**2**	**-**	**-**	**3**	**-**	**1**	**-**	**-**
64741-69-1	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
64741-70-4	**9**	**2**	**-**	**1**	**6**	**-**	**8**	**-**	**-**
64741-72-6	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
64741-83-9	**1**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
64741-84-0	**2**	**1**	**-**	**-**	**2**	**-**	**1**	**-**	**-**
64741-87-3	**2**	**1**	**-**	**1**	**-**	**-**	**2**	**-**	**-**
64742-48-9	**4**	**2**	**-**	**2**	**3**	**-**	**2**	**-**	**-**
64742-49-0	**1**	**1**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
64742-73-0	**1**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
64742-82-1	**2**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	**-**
64742-89-8	**4**	**3**	**-**	**-**	**3**	**1**	**4**	**-**	**1**
68475-79-6	**2**	**-**	**-**	**-**	**2**	**-**	**1**	**-**	**-**
68476-50-6	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
68476-55-1	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
68527-27-5	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

CAS Registry Number	N° of companies	Boiling range	Flash point	Rel. density	Abs. density	Abs. density -1°C	Vapour pressure	Self ignition temperature	Viscosity
68606-11-1	**2**	**2**	**1**	**-**	**2**	**-**	**1**	**-**	**-**
68783-12-0	**1**	**1**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
68919-37-9	**2**	**1**	**-**	**-**	**1**	**-**	**2**	**-**	**-**
68955-35-1	**5**	**3**	**-**	**1**	**3**	**-**	**5**	**-**	**-**
85116-59-2	**1**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
86290-81-5	**9**	**7**	**-**	**2**	**5**	**-**	**5**	**3**	**1**
92045-37-9	**2**	**1**	**-**	**-**	**1**	**-**	**2**	**-**	**-**
92045-59-5	**3**	**3**	**-**	**-**	**2**	**-**	**3**	**-**	**-**
92045-60-8	**2**	**-**	**-**	**-**	**2**	**-**	**1**	**-**	**-**
93571-75-6	**1**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**
93572-29-3	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
101316-76-1	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

Physical-chemical endpoint data on substances in the category of Low Boiling Point Naphthas (Gasolines)

Naphthas		Boiling range	Flash point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity, 40°
		(°C)	(°C)		(g/cm³)	(kPa)	(°C)	(mm²/s)
64741-41-9						12.6		
64741-41-9		103 - 178						
64741-41-9	Summary	103 - 178				12.6		
64741-42-0		35 - 70			0.645	86.3		
64741-42-0		30 - 175		0.707	0.719	38.6		0.48
64741-42-0		37 - 184			0.718 - 0.735	30.0 - 73.0		
64741-42-0		49 - 157			0.698	38.5		
64741-42-0		37 - 170			0.725 - 0.746			
64741-42-0		89 - 170			0.760	9.0		
64741-42-0	Summary	30 - ≤ 184		0.707	0.645 - 0.760	9.0 - 86.3		0.48
64741-46-4		38 - 126			0.675	77.9		0.28
64741-46-4		-1 - 176			0.723			
64741-46-4		30 - 97			0.686	11.6		
64741-46-4	Summary	-1 - 176			0.675 - 0.723	11.6 - 77.9		0.28
64741-54-4	Summary	80 - 202						
64741-55-5	Summary	30 - 179			0.727	76.6		
64741-63-5					0.682			
64741-63-5		≤ 184 - ≤ 188			0.804 - 0.815	21.0 - 26.0		
64741-63-5		88 - 183			0.807			

Naphthas		Boiling range	Flash point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity, 40°
64741-63-5	Summary	88 - ≤ 188			0.682 - 0.815	21.0 - 26.0		
64741-69-1	Summary	33 - 160			0.718			
64741-70-4					0.640	160		
64741-70-4						114		
64741-70-4		30 - 82			0.668	89.0		
64741-70-4					0.656 - 0.657	102		
64741-70-4		36 - 104			0.658	84.0		
64741-70-4				0.645		99.1		
64741-70-4					0.622			
64741-70-4					0.675	78.1		
64741-70-4						105		
64741-70-4	Summary	30 - ≤ 104		0.645	0.622 - 0.675	78.1 - 160		
64741-72-6	Summary	42 - 220			0.735	28.3		
64741-83-9	Summary			0.720		84.4		
64741-84-0					0.657	28.3		
64741-84-0		41 - ≥ 107			0.661 - 0.736			
64741-84-0	Summary	41 - ≥ 107			0.657 - 0.736	28.3		
64741-87-3						127		
64741-87-3		65 - 200		0.765		16.6		
64741-87-3	Summary	65 - 200		0.765		16.6 - 127		
64742-48-9		90 - 180		0.747	0.741	13.2		
64742-48-9				0.730		53.1		

Naphthas		Boiling range	Flash point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity, 40°
64742-48-9		102 - 164			0.752			
64742-48-9					0.726			
64742-48-9	Summary	90 - 180		0.730 - 0.747	0.726 - 0.752	13.2 - 53.1		
64742-49-0	Summary	30 - 82		0.659		82.1		
64742-73-0	Summary				0.652	96.4		
64742-82-1						19.3		
64742-82-1			47					
64742-82-1	Summary		47			19.3		
64742-89-8					0.663	90.7		
64742-89-8		51 - 81			0.684	46.7		0.8 (at -20°C)
64742-89-8		32 - 138			0.671 (at -1°C)	97.0		
64742-89-8		32 - 109			0.635 - 0.697	75.0		
64742-89-8	Summary	32 - 138			0.635 - 0.697 0.671 (at -1°C)	46.7 - 97.0		0.8 (at -20°C)
68475-79-6					0.656	114		
68475-79-6					0.628			
68475-79-6	Summary				0.628 - 0.656	114		
68476-50-6	Summary				0.636 - 0.639			
68476-55-1	Summary	> 30			0.634			
68527-27-5	Summary				0.687			
68606-11-1		40 - 155	< 0		0.715			
68606-11-1		37 - 163			0.676	58.0		

Naphthas		Boiling range	Flash point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity, 40°
68606-11-1	Summary	37 - 163	< 0		0.676 - 0.715	58.0		
68783-12-0	Summary	38 - 185		0.725		83.5		
68919-37-9						34.5		
68919-37-9		37 - 190			0.825	38.9		
68919-37-9	Summary	37 - 190			0.825	34.5 - 38.9		
68955-35-1		≤ 239			0.870	4.1		
68955-35-1						25.2		
68955-35-1		50 - 221		0.816		30.5		
68955-35-1		48 - 190			0.808	27.9		
68955-35-1					0.870	5.0		
68955-35-1	Summary	48 - ≤ 239		0.816	0.808 - 0.870	4.1 - 30.5		
85116-59-2	Summary				0.686	16.2		
86290-81-5		32 - 190		0.741 - 0.743	0.737	60.0 - 80.0		0.8 (at -20°C)
86290-81-5		≤ 184 - ≤ 188						
86290-81-5		≤ 184 - ≤ 195			0.738 - 0.751	53.0 - 87.0		
86290-81-5		33 - 209		0.777	0.740 - 0.753	46.0 - 85.7		
86290-81-5							340	
86290-81-5		52 - 183			0.748 - 0.753	57.7		
86290-81-5		≤ 200 - ≤ 210			0.747 - 0.762	63.5 - 66.7		
86290-81-5		30 - 210						
86290-81-5							275 - 445	
86290-81-5	Summary	30 - 210		0.741 - 0.777	0.737 - 0.762	46.0 - 87.0	275 - 445	0.8 (at -20°C)

Naphthas		Boiling range	Flash point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity, 40°
92045-37-9		65 - 240			0.764	16.4		
92045-37-9						5.5 - 11.1		
92045-37-9	Summary	65 - 240			0.764	5.5 - 16.4		
92045-59-5						115		
92045-59-5		35 - 195			0.736	61.5		
92045-59-5		≥ 36 - ≤ 205			0.743	51.3		
92045-59-5	Summary	35 - ≤ 205			0.736 - 0.743	51.3 - 115		
92045-60-8					0.622	163 (at 40°C)		
92045-60-8					0.620	150		
92045-60-8	Summary				0.620 - 0.622	150 163 (at 40°C)		
93571-75-6	Summary	≥ 130			0.870			
93572-29-3	Summary	45 - 212			0.815	40.9		
101316-76-1	Summary	37 - 138			0.700			
Category Summary		**-1 - 240**	**< 0 - 47**	**0.645 - 0.816**	**0.620 - 0.870 0.671 (at -1°C)**	**4.1 - 160 163 (at 40°C)**	**275 - 445**	**0.28 - 0.48 0.8 (at -20°C)**

APPENDIX 2 KEROSINES

Number of companies providing information on substances in the category of Kerosines

CAS Registry Number	N° of companies	Freezing point	Boiling range	Flash point	Rel. Density	Abs. Density	Vapour pressure	Self ignition temperature	Viscosity
8008-20-6	**13**	**2**	**8**	**8**	**1**	**8**	**3**	**2**	**4**
64742-31-0	**2**	**-**	**-**	**1**	**-**	**1**	**1**	**-**	**1**
64742-47-8	**2**	**-**	**2**	**2**	**-**	**2**	**-**	**-**	**2**
64742-81-0	**11**	**1**	**5**	**8**	**1**	**4**	**1**	**2**	**5**
64742-88-7	**1**	**-**	**1**	**1**	**-**	**1**	**1**	**-**	**-**
91770-15-9	**3**	**1**	**2**	**2**	**1**	**2**	**-**	**-**	**2**

Physical-chemical endpoint data on substances in the category of Kerosines

Kerosines		Boiling range	Flash point	Freezing point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Vapour pressure 50°C	Self ignition temp.	Viscosity 40°	Viscosity -20°C
		(°C)	(°C)	(°C)		(g/cm³)	(kPa)	(kPa)	(°C)	(mm²/s)	(mm²/s)
8008-20-6										1.0	
8008-20-6		150 - 280	> 38 - 45		0.800 - 0.803					1.3	4.0
8008-20-6						0.805 - 0.808					
8008-20-6		166 - 250				0.791					
8008-20-6		147 - 253	40 - 45	-54		0.790 - 0.800	1.7			1.0	4.0
8008-20-6		153 - 250	39 - 64			0.767 - 0.811 0,762 - 0.808 (at 20°C)					
8008-20-6									250		
8008-20-6							3.6	8.6			
8008-20-6		146 - 229	52			0.792					
8008-20-6		157	41			0.787	< 1.0				
8008-20-6		150 - 253	41	-59		0.805					2.8
8008-20-6		156 - 265	49								
8008-20-6			29			0.820 - 0.829					
8008-20-6	Summary	146 - 280	29 - 64	-59 - -54	0.800 - 0.803	0.767 - 0.829 0.762 - 0.808 (at 20°C)	< 1.0 - 3.6	8.6	250	1.0 - 1.3	2.8 - 4.0
64742-31-0							3.7	11.7			

Kerosines		Boiling range	Flash point	Freezing point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Vapour pressure 50°C	Self ignition temp.	Viscosity 40°	Viscosity -20°C
64742-31-0			43			0.790				1.4 (at 20°C)	
64742-31-0	Summary		43			0.790	3.7	11.7		1.4 (at 20°C)	
64742-47-8		184 - 278	66			0.822 - 0.828				1.5	
64742-47-8		≥ 181	67			0.810				2.0	
64742-47-8	Summary	≥ 181 - 278	66 - 67			0.810 - 0.828				1.5 - 2.0	
64742-81-0		0				0.770 - 0.854				1.1 - 2.4	
64742-81-0			40								
64742-81-0			44	-61		0.792					3.3
64742-81-0		187 - 245	48		0.802						4.3
64742-81-0		155 - 279	36 - 47			0.787 - 0.795				1.5 - 1.7	
64742-81-0			56 - 70								
64742-81-0									225		
64742-81-0		169 - 210	53			0.787					
64742-81-0							< 1.0				
64742-81-0		159 - 262	49								4.3
64742-81-0			35						220		
64742-81-0	Summary	155 - 299	35 - 70	-61	0.802	0.770 - 0.854	< 1.0		220 - 225	1.1 - 2.4	3.3 - 4.3
64742-88-7	Summary	151	35			0.781	1.4				
91770-15-9						0.840					
91770-15-9		150 - 280	> 38 - 47		0.798 - 0.800						3.8 - 4.0

Kerosines		Boiling range	Flash point	Freezing point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Vapour pressure 50°C	Self ignition temp.	Viscosity 40°	Viscosity -20°C
91770-15-9		163 - 255	50	-56		0.809					3.7
91770-15-9	Summary	150 - 280	> 38 - 50	-56	0.798 - 0.800	0.809 - 0.840					3.7 - 4.0
Category Summary		**146 - ≤ 299**	**29 - 70**	**-61 - -54**	**0.798 - 0.803**	**0.767 - 0.854 '0.762 - 0.808 (at 20°C)**	**< 1.0 - 3.7**	**8.6 - 11.7**	**220 - 250**	**1.0 - 2.4 1.4 (at 20°C)**	**2.8 - 4.3**

APPENDIX 3 MK1 DIESEL FUEL

Physical-chemical endpoint data on MK1 Diesel Fuel

MK1 Diesel Fuel	**Boiling range**	**Flash point**	**Density, abs., 15°C**	**Vapour pressure 37,8°C**	**Self ignition temp.**	**Viscosity 40°**
	(°C)	**(°C)**	**(g/cm³)**	**(kPa)**	**(°C)**	**(mm²/s)**
64742-47-8				0.7	240	1.9 - 2.1
64742-47-8	180 - 295	60	0.807 - 0.817	< 5.0	290	2.0
64742-47-8	181 - 280	67	0.810			2.0
Substance Summary	**180 - 295**	**60 - 67**	**0.807 - 0.817**	**0.7 - < 5.0**	**240 - 290**	**1.9 - 2.1**

APPENDIX 4 STRAIGHT-RUN GAS OILS

Number of companies providing information on substances in the category of Straight-Run Gas Oils

CAS Registry Number	N° of companies	Boiling range	Pour point	Flash point	Rel. density	Abs. density	Vapour pressure	Self ignition temperature	Viscosity
64741-43-1	**5**	**2**	**1**	**1**	**-**	**4**	**-**	**1**	**2**
64741-44-2	**2**	**1**	**-**	**1**	**-**	**2**	**-**	**-**	**1**
68814-87-9	**8**	**4**	**-**	**3**	**-**	**6**	**-**	**-**	**4**
68915-96-8	**4**	**-**	**1**	**2**	**-**	**3**	**-**	**-**	**2**

Physical-chemical endpoint data on substances in the category of Straight-Run Gas Oils

Straight-Run Gas Oils		Boiling range	Flash point	Pour point	Density. abs., 15°C	Self ignition temp.	Viscosity 40°
		(°C)	(°C)	(°C)	(g/cm³)	(°C)	(mm²/s)
64741-43-1		193 - 361	83		0.890		4.1
64741-43-1				6	0.856		8.0
64741-43-1					0.863 - 0.868		
64741-43-1						240	
64741-43-1		244 - 345			0.856		
64741-43-1	Summary	193 - 361	83	6	0.856 - 0.890	240	4.1 - 8.0
64741-44-2					0.798		
64741-44-2		199 - 338	89		0.843		3.1
64741-44-2	Summary	199 - 338	89		0.798 - 0.843		3.1
68814-87-9		164 - 363	67		0.870		2.1
68814-87-9							7.8 - 27
68814-87-9		≥ 149			0.819 - 0.885		
68814-87-9		232 - 399	103		0.867		7.8
68814-87-9		172 - 365			0.841		2.9
68814-87-9			67 - 88				
68814-87-9					0.832 - 0.876		
68814-87-9	Summary	≥149 - 399	67 - 103		0.819 - 0.885		2.1 - 27
68915-96-8					0.903 - 0.906		11.2 - 15.9 (at 50°C)
68915-96-8			66 - 78				

Straight-Run Gas Oils		Boiling range	Flash point	Pour point	Density. abs., 15°C	Self ignition temp.	Viscosity 40°
68915-96-8			> 100	-21	0.890		11.0
68915-96-8					0.896	310 - 320	
68915-96-8	Summary		66 - > 100	-21	0.890 - 0.906		11.0
Category Summary		**≥149 - 399**	**66 - 103**	**-21 - 6**	**0.798 - 0.906**	**240 - 320**	**2.1 - 27 11.2 - 15.9 (at 50°C)**

APPENDIX 5 VACUUM GAS OILS, HYDROCRACKED GAS OILS & DISTILLATE FUELS

Number of companies providing information on substances in the category of Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels (VGOs)

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute Density	Self ignition temperature	Viscosity
64741-49-7	**2**	**2**	**2**	**-**	**1**	**-**	**2**
64741-58-8	**5**	**1**	**2**	**1**	**2**	**-**	**2**
64741-77-1	**2**	**2**	**1**	**-**	**2**	**-**	**1**
68334-30-5	**13**	**5**	**8**	**2**	**8**	**2**	**6**
68476-30-2	**1**	**-**	**1**	**-**	**1**	**-**	**1**
68476-31-3	**1**	**-**	**-**	**-**	**1**	**-**	**-**
68476-34-6	**4**	**1**	**2**	**1**	**4**	**-**	**3**

Physical-chemical endpoint data on substances in the category of Vacuum Gas Oils, Hydrocracked Gas Oils & Distillate Fuels (VGOs)

VGOs		Boiling range	Flash point	Pour point	Density. abs., 15°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C
		(°C)	(°C)	(°C)	(g/cm³)	(°C)	(mm²/s)	(mm²/s)
64741-49-7		258 - 394	120		0.882		3.2	
64741-49-7		265 - 336	124 - 140				4.0	
64741-49-7	Summary	258 - 394	120 - 140		0.882		3.2 - 4.0	
64741-58-8							23.0 - 117	7.9 - 20.0
64741-58-8							7.4 - 8.0	
64741-58-8		177 - 462	92 - 175		0.884 - 0.887		11.1 - 14.5 (at 50°C)	
64741-58-8			83	-16				
64741-58-8					0.905 - 0.911			
64741-58-8	Summary	177 - 462	83 - 175	-16	0.884 - 0.911		7.4 - 117 11.1 - 14.5 (at 50°C)	7.9 - 20.0
64741-77-1		168 - 323	65		0.835		2.3	
64741-77-1					0.810			
64741-77-1	Summary	168 - 323	65		0.810 - 0.835		2.3	
68334-30-5			58		0.827		2.0	
68334-30-5		≤ 359 - ≤ 364	61 - 70					
68334-30-5					0.820			
68334-30-5		157 - 159			0.820 - 0.822			
68334-30-5			69 - 73		0.833 - 0.844		2.5	

VGOs		Boiling range	Flash point	Pour point	Density. abs., 15°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C
68334-30-5		168 - 372		-40 - -10	0.819 - 0.840		1.8 - 3.2	
68334-30-5			59 - 81					
68334-30-5					0.834			
68334-30-5						230		
68334-30-5			62	-20				
68334-30-5			70 - 78		0.832 - 0.842		2.1 - 3.0	
68334-30-5		155 - 381					2.0 - 4.0	
68334-30-5		≥ 154			0.825 - 0.856	225	3.7	
68334-30-5	Summary	≥ 154 - 381	54 - 81	-40 - -10	0.819 - 0.856	225 - 230	1.8 - 4.0	
68476-30-2	Summary		58		0.835		3.8	
68476-31-3	Summary				0.897			
68476-34-6					0.875			
68476-34-6					0.809		1.5	
68476-34-6		174 - 384	60		0.860		3.9	
68476-34-6			70 - 75	-25 - -15			1.7 - 4.5	
68476-34-6	Summary	174 - 384	60 - 75	-25 - -15			1.5 - 4.5	
Category Summary		**≥ 154 - 462**	**58 - 175**	**-40 - -10**	**0.809 - 0.911**	**225 - 230**	**1.5 - 117 11.1 - 14.5 (at 50°C)**	**7.9 - 20.0**

APPENDIX 6 CRACKED GAS OILS

Number of companies providing information on substances in the category of Cracked Gas Oils

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute density	Viscosity
64741-59-9	**12**	**7**	**7**	**1**	**9**	**6**
64741-60-2	**3**	**1**	**2**	**-**	**2**	**1**
64741-82-8	**7**	**5**	**3**	**-**	**5**	**4**
68333-25-5	**1**	**1**	**1**	**-**	**1**	**1**
92045-29-9	**2**	**1**	**2**	**-**	**1**	**-**

Physical-chemical endpoint data on substances in the category of Cracked Gas Oils

Cracked Gas Oils		Boiling range	Flash point	Pour point	Density. abs., 15°C	Viscosity 40°
		(°C)	(°C)	(°C)	(g/cm³)	(mm²/s)
64741-59-9					0.916 - 0.975	
64741-59-9			70		0.936	2.1
64741-59-9		150 - 360	> 70		0.930 - 0.950	3.0 - 4.0
64741-59-9						1.1
64741-59-9		180 - 337	60		0.940	2.1
64741-59-9					0.840	
64741-59-9					0.851 - 0.907	
64741-59-9		223 - 340	100	< -20	0.939	
64741-59-9		163 - 411	90		0.946	2.4
64741-59-9		190 - 314	74		0.952	
64741-59-9		220 - 390	120 - 130			3.5 - 4.5
64741-59-9						2.6 - 3.0 (at 50°C)
64741-59-9	Summary	150 - 411	60 - 130	< -20	0.840 - 0.975	1.1 - 4.5 2.6 - 3.0 (at 50°C)
64741-60-2					0.993	
64741-60-2		299 - 385	154			
64741-60-2			86		0.950	6.0 (at 20°C)
64741-60-2	Summary	299 - 385	86 - 154		0.950 - 0.993	6.0 (at 20°C)
64741-82-8		158 - 383			0.879 - 0.884	1.2
64741-82-8		167 - 363	62		0.839 - 0.866	

Cracked Gas Oils		Boiling range	Flash point	Pour point	Density. abs., 15°C	Viscosity 40°
64741-82-8		166 - 347			0.862	2.3
64741-82-8						2.3
64741-82-8		163 - 292	56		0.816	
64741-82-8		198 - 388	75			
64741-82-8					0.858	1.8 - 2.2 (at 50°C)
64741-82-8	Summary	158 - 388	56 - 75		0.816 - 0.884	1.2 - 2.3 1.8 - 2.2 (at 50°C)
68333-25-5	Summary	≥ 201	94		0.920	8.1 (at 20°C)
92045-29-9			138			
92045-29-9		159 - 343	60		0.838	
92045-29-9	Summary	159 - 343	60 - 138		0.838	
Category Summary		**150 - 411**	**56 - 154**	**< -20**	**0.816 - 0.993**	**1.1 - 4.5** **6.0 - 8.1 (at 20°C)** **1.8 - 3.0 (at 50°C)**

APPENDIX 7 OTHER GAS OILS

Number of companies providing information on substances in the category of Other Gas Oils

CAS Registry Number	N° of companies	Boiling range	Pour point	Flash point	Absolute density	Viscosity
64742-46-7	**4**	**2**	**-**	**4**	**2**	**1**
64742-79-6	**2**	**1**	**-**	**1**	**2**	**1**
64742-80-9	**12**	**6**	**1**	**5**	**10**	**5**
90622-53-0	**1**	**1**		**-**	**-**	**-**

Physical-chemical endpoint data on substances in the category of Other Gas Oils

Other Gas Oils		Boiling range	Flash point	Pour point	Density. abs., 15°C	Viscosity 40°
		(°C)	(°C)	(°C)	(g/cm³)	(mm²/s)
64742-46-7			74 - 95			
64742-46-7			90 - 110			
64742-46-7		200 - 397	86		0.854	4.5 7.1 (at 20°C)
64742-46-7		194 - 350	80		0.846	
64742-46-7	Summary	194 - 397	74 - 110		0.846 - 0.854	4.5 7.1 (at 20°C)
64742-79-6					0.815	
64742-79-6		274 - 372	122		0.848	8.1
64742-79-6	Summary	274 - 372	122		0.815 - 0.848	8.1
64742-80-9		399	67		0.826 - 0.895	2.1 - 6.2
64742-80-9		379			0.821	2.3
64742-80-9			136			
64742-80-9					0.846 - 0.878	
64742-80-9		211 - 369	89		0.837	3.2
64742-80-9		372 - 377			0.820 - 0.860	
64742-80-9		318		6	0.828 - 0.901	
64742-80-9					0.810 - 0.816	
64742-80-9					0.820	
64742-80-9		233 - 364	97		0.851	5.2

Other Gas Oils		Boiling range	Flash point	Pour point	Density. abs., 15°C	Viscosity 40°
64742-80-9			55 - 65			2.0 - 4.0 4.0 - 7.0 (at 50°C)
64742-80-9					0.830	
64742-80-9	Summary	211 - 399	67 - 136	6	0.810 - 0.901	2.0 - 4.0 4.0 - 7.0 (at 50°C)
90622-53-0	Summary	175 - 193				
Category Summary		**175 - 399**	**55 - 136**	**6**	**0.810 - 0.901**	**2.0 - 8.1 7.1 (at 20°C) 4.0 - 7.0 (at 50°C)**

APPENDIX 8 HEAVY FUEL OIL COMPONENTS

Number of companies providing information on substances in the category of Heavy Fuel Oil Components (HFOs)

CAS Registry Number	N° of companies	Boiling range	Pour point	Flash point	Relative density	Absolute density	Vapour pressure	Self ignition temperature	Viscosity
64741-45-3	8	1	-	2	-	4	1	2	4
64741-57-7	3	0	1	1	-	2	1	1	2
64741-61-3	1	-	-	1	-	-	-	-	1
64741-62-4	2	-	-	-	-	1	-	-	1
64741-75-9	2	-	-	1	-	2	-	-	2
64741-80-6	4	-	1	1	-	2	-	-	3
64741-81-7	4	-	-	1	-	2	1	1	1
64742-59-2	2	2	-	2	1	1	-	-	1
64742-86-5	3	1	-	2	-	2	-	-	2
68333-22-2	1	1	-	-	-	-	-	1	-
68476-33-5	12	4	1	5	-	7	2	3	9
68553-00-4	1	-	-	1	-	1	-	-	1
68607-30-7	1	1	-	1	-	1	-	-	1
68783-08-4	1	1	-	1	-	1	-	-	1
68955-27-1	3	1	1	1	-	2	-	1	2
70592-77-7	2	2	-	-	-	2	-	-	1
70592-78-8	6	3	-	2	-	3	-	1	2
92045-14-2	2	-	1	2	-	2	-	-	1
92061-97-7	3	1	1	1	-	2	-	1	2

Physical-chemical endpoint data on substances in the category of Heavy Fuel Oil Components (HFOs)

HFOs		Boiling range	Flash point	Pour point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C	Viscosity 50°C
		(°C)	(°C)	(°C)		(g/cm³)	(kPa)	(°C)	(mm²/s)	(mm²/s)	(mm²/s)
64741-45-3							0.090 (at 120°C) 0.097 (at 150°C)	382			
64741-45-3			100			0.936 - 0.965					210 - 538
64741-45-3						0.984 - 1.001					1626 - 6611
64741-45-3		> 750									
64741-45-3										250	
64741-45-3								350 - 360			
64741-45-3			> 100 - > 140	33		0.934 - 0.953					164 115 (at 80°C)
64741-45-3						1.110					
64741-45-3	Summary	> 750	100 - > 140	33		0.934 - 1.110	0.090 (at 120°C) 0.097 (at 150°C)	350 - 382		250	164 - 6611 115 (at 80°C)
64741-57-7						0.877 - 0.933					15.0 - 38
64741-57-7			165 - 171			0.901 - 0.913	0.1		35		22.6
64741-57-7								250			
64741-57-7	Summary		165 - 171			0.877 - 0.933	0.1	250	35		15.0 - 38

HFOs		Boiling range	Flash point	Pour point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C	Viscosity 50°C
64741-61-3	Summary		124							8.1	
64741-62-4										6.8	
64741-62-4						1.092					
64741-62-4	Summary					1,092				6.8	
64741-75-9						0.838				5.4	
64741-75-9				< 45							
64741-75-9			200			0.859				5.8	
64741-75-9	Summary		200	< 45		0.838 - 0.859				5.4 - 5.8	
64741-80-6										6.6	
64741-80-6										100	
64741-80-6						1.022				73	
64741-80-6			101	-9 - < 15		0.996					9.6 - 457
64741-80-6	Summary		101	-9 - < 15		0.996 - 1.022				6.6 - 100	9.6 - 457
64741-81-7			64								
64741-81-7						0.868 - 0.952					21.0 - 57
64741-81-7						0.911					
64741-81-7							0.024 (at 120°C) 0.063 (at 150°C)	378			
64741-81-7	Summary		64			0.868 - 0.952	0.024 (at 120°C) 0.063 (at	378			21.0 - 57

HFOs		Boiling range	Flash point	Pour point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C	Viscosity 50°C
							150°C)				
64742-59-2		260 - 570	100			0.890 - 0.905				6.5 - 7.0	
64742-59-2		244 - 532	175		0.887						14.5
64742-59-2	Summary	244 - 570	100 - 175		0.887	0.890 - 0.905				6.5 - 7.0	14.5
64742-86-5						0.835 - 0.885					18.0
64742-86-5			80 - 310								
64742-86-5		278 - 601	200			0.907				6.7	
64742-86-5	Summary	278 - 601	80 - 310			0.835 - 0.907				6.7	18.0
68333-22-2	Summary	> 750						380 - 390			
68476-33-5		> 161									
68476-33-5							0.727 (at 120°C) 0.800 (at 150°C)	392			
68476-33-5						0.859				5.1	
68476-33-5		160 - 550	90 - 110			0.960 - 0.990					560 - 900
68476-33-5						0.943 - 0.951					80 - 180
68476-33-5			88 - 109			0.988 - 0.995	0.791 (at 120°C) 0.861 (at 150°C)	537		28 - 35	

HFOs		Boiling range	Flash point	Pour point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C	Viscosity 50°C
68476-33-5		213 - 632	70 - 168	31		0.953 - 1.076 0.962 (at 20°C)				5.3 - 47	
68476-33-5										4.5 - 4.7	
68476-33-5						0.841					
68476-33-5			> 100			0.989				31	376
68476-33-5			120 - 135			1.010 - 1.025 (at 60°C)				18.0 - 23.0	
68476-33-5		> 750						408 - 420		396	
68476-33-5	Summary	160 - > 750	70 - 168	31		0.841 - 1.076 0.962 (at 20°C) 1.010 - 1.025 (at 60°C)	0.727 - 0.791 (at 120°C) 0.800 - 0.861 (at 150°C)	392 - 537		4.5 - 396	80 - 900
68553-00-4	Summary		86			0.980					174
68607-30-7	Summary	260 - 550	100			0.920 - 0.936					210 - 350
68783-08-4	Summary	290 - 410	100			0.870 - 0.880			9.0 - 10.0		
68955-27-1						1.028				111	
68955-27-1								350			
68955-27-1		≥ 262	150	12		0.981			270		
68955-27-1	Summary	≥ 262	150	12		0.981 - 1.028		350	270	111	
70592-77-7		> 250				0.920					
70592-77-7				< 45							

HFOs		Boiling range	Flash point	Pour point	Density. rel., 15°C	Density. abs., 15°C	Vapour pressure 37.8°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C	Viscosity 50°C
70592-77-7		232 - 521				0.907				4.0	
70592-77-7	Summary	232 - 521		< 45		0.907 - 0.920				4.0	
70592-78-8						0.935					
70592-78-8		340 - 557	222			0.919					
70592-78-8			206 - 298							3.6	
70592-78-8		615 - 625									
70592-78-8		359 - 595				0.932				12.0	
70592-78-8								330 - 430			
70592-78-8	Summary	340 - 625	206 - 298			0.919 - 0.935		330 - 430		3.6 - 12.0	
92045-14-2			70			0.961					
92045-14-2			167	7		1.092			115		
92045-14-2	Summary		70 - 167	7		0.961 - 1.092			115		
92061-97-7		272 - 641				1.072				22.0	
92061-97-7			82	0		1.068				18.0	360
92061-97-7								405			
92061-97-7	Summary	272 - 641	82	0		1.068 - 1.072		405		18.0 - 22.0	360
Category Summary		**160 - > 750**	**64 - 310**	**-9 - < 45**	**0.887**	**0.835 - 1.110 0.962 (at 20°C) 1.010 - 1.025 (at 60°C)**	**0.1 0.024 - 0.791 (at 120°C) 0.063 - 0.861 (at 150°C)**	**250 - 537**	**9.0 - 270**	**3.6 - 396**	**9.6 - 6611 115 (at 80°C)**

APPENDIX 9 UNREFINED / ACID TREATED OILS

Number of companies providing information on substances in the category of Unrefined/Acid Treated Oils

CAS Registry Number	N° of companies	Boiling range	Flash point	Absolute density	Viscosity
64741-50-0	**3**	**2**	**-**	**-**	**2**
64741-51-1	**4**	**2**	**1**	**2**	**2**

Physical-chemical endpoint data on substances in the category of Unrefined/Acid Treated Oils

Unrefined/Acid Treated Oils		**Boiling range**	**Flash point**	**Density. abs., 15°C**	**Viscosity 100°C**
		(°C)	**(°C)**	**(g/cm³)**	**(mm²/s)**
64741-50-0					2.5
64741-50-0		281 - 453			3.1
64741-50-0		> 210			
64741-50-0	Summary	> 210 - 453			2.5 - 3.1
64741-51-1				0.936	
64741-51-1		301 - 636	202 - 206		4.1 - 22.2
64741-51-1				0.960	50
64741-51-1		< 615			
64741-51-1	Summary	301 - 636	202 - 206	0.936 - 0.960	4.1 - 50
Category Summary		**> 210 - 636**	**202 - 206**	**0.936 - 0.960**	**2.5 - 50**

APPENDIX 10 HIGHLY REFINED BASE OILS

Number of companies providing information on substance in the category of Highly Refined Base Oils (HRBOs)

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute density	Vapour pressure	Viscosity
8042-47-5	**3**	**2**	**3**	**1**	**3**	**1**	**3**

Physical-chemical endpoint data on substance in the category of Highly Refined Base Oils (HRBOs)

HRBOs	Boiling range	Flash point	Pour point	Density, abs., 15°C	Vapour pressure 20°C	Viscosity 40°	Viscosity 100°C
	(°C)	(°C)	(°C)	(g/cm³)	(kPa)	(mm²/s)	(mm²/s)
8042-47-5		260		0.867	< 0.01		9.2
8042-47-5	224 - 575	112 - 218	-39 - -24	0.809 - 0.893		3.1 - 3.4	
Category Summary	**224 - 575**	**112 - 260**	**-39 - -24**	**0.809 - 0.893**	**< 0.01**	**3.1 - 3.4**	**9.2**

APPENDIX 11 OTHER LUBRICANT BASE OILS

Number of companies providing information on substances in the category of Other Lubricant Base Oils (LBOs)

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Abs. density	Self ignition temperature	Viscosity
64741-76-0	**2**	**-**	**1**	**1**	**1**	**-**	**-**
64741-88-4	**1**	**-**	**1**	**-**	**-**	**-**	**1**
64741-89-5	**2**	**2**	**-**	**-**	**1**	**-**	**2**
64741-95-3	**3**	**1**	**2**	**-**	**3**	**-**	**3**
64741-96-4	**1**	**1**	**1**	**-**	**-**	**-**	**-**
64742-01-4	**1**	**-**	**-**	**-**	**-**	**-**	**1**
64742-52-5	**1**	**1**	**1**	**-**	**1**	**-**	**-**
64742-53-6	**1**	**1**	**1**	**-**	**1**	**-**	**-**
64742-54-7	**1**	**-**	**-**	**-**	**-**	**1**	**-**
64742-55-8	**3**	**2**	**1**	**-**	**2**	**1**	**2**
64742-56-9	**1**	**1**	**1**	**-**	**1**	**-**	**1**
64742-57-0	**1**	**-**	**-**	**-**	**1**	**-**	**-**
64742-62-7	**3**	**1**	**-**	**1**	**-**	**1**	**1**
64742-65-0	**4**	**2**	**1**	**-**	**3**	**1**	**2**
74869-22-0	**2**	**-**	**1**	**2**	**1**	**-**	**1**

Physical-chemical endpoint data on substances in the category of Other Lubricant Base Oils (LBOs)

LBOs		Boiling range	Flash point	Pour point	Density. abs., 15°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C
		(°C)	(°C)	(°C)	(g/cm³)	(°C)	(mm²/s)	(mm²/s)
64741-76-0				0				
64741-76-0			98		0.820			
64741-76-0	Summary		98	0	0.820			
64741-88-4	Summary		200				53 - 121	3.9 - 13.2
64741-89-5		207 - 329			0.813		2.0	
64741-89-5		265 - 329					4.1 - 11.7	3.0
64741-89-5	Summary	207 - 329			0.813		2.0 - 11.7	3.0
64741-95-3					0.891 - 0.926		446 - 889	
64741-95-3		448 - 716	344		0.936		847	41
64741-95-3			274		0.934			33
64741-95-3	Summary	448 - 716	274 - 344		0.891 - 0.936		446 - 889	33 - 41
64741-96-4	Summary	342 - 532	218 - 226		0.970			
64742-01-4	Summary						518	36
64742-52-5	Summary	287 - 547	181 - 221		0.885 - 0.920			
64742-53-6	Summary	243 - 413	144 - 149		0.872 - 0.889			
64742-54-7	Summary					330 - 355		
64742-55-8		> 158			0.849 - 0.851		13.0 - 14.0	
64742-55-8		262 - 327	125		0.817		4.0	
64742-55-8						325 - 335		
64742-55-8	Summary	> 158 - 327	125		0.817 - 0.851	325 - 335	4.0 - 14.0	

LBOs		Boiling range	Flash point	Pour point	Density. abs., 15°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C
64742-56-9	Summary	262 - 327	180		0.852		12.5	
64742-57-0	Summary				0.915			
64742-62-7		411 - 750					354	24.2
64742-62-7				0				
64742-62-7						394		
64742-62-7	Summary	411 - 750		0		394	354	24.2
64742-65-0		> 193			0.885 - 0.892		92 - 98	
64742-65-0					0.961			
64742-65-0		308 - 627	194		0.862 - 0.881		20.3 - 120	4.1 - 12.8
64742-65-0						334		
64742-65-0	Summary	> 193 - 627	194		0.862 - 0.961	334	20.3 - 120	4.1 - 12.8
74869-22-0			206 - 250	-17 - -12	0.866 - 0.891		61 - 107	5.0 - 14.0
74869-22-0				0				
74869-22-0	Summary		206 - 250	-17 - 0	0.866 - 0.891		61 - 107	5.0 - 14.0
Category Summary		**> 158 - 750**	**98 - 344**	**-17 - 0**	**0.813 - 0.970**	**325 - 394**	**2.0 - 889**	**3.0 - 41**

APPENDIX 12 FOOTS OILS

Number of companies providing information on substance in the category of Foots Oils

CAS Registry Number	N° of companies	Flash point	Pour point	Relative density	Absolute density	Viscosity
64742-67-2	**3**	**2**	**3**	**-**	**2**	**2**

Physical-chemical endpoint data on substance in the category of Foots Oils

Foots Oils	**Flash point**	**Pour point**	**Density. abs., 15°C**	**Viscosity 100°C**
	(°C)	**(°C)**	**(g/cm³)**	**(mm²/s)**
64742-67-2	> 180	28 - 46	0.828 - 0.852	3.0 - 15.0 38 (at 40°C)
64742-67-2	199	49	0.811	2.7
64742-67-2		10		
Category Summary	**> 180 - 199**	**10 - 49**	**0.811 - 0.852**	**2.7 - 15.0** **38 (at 40°C)**

APPENDIX 13 RESIDUAL AROMATIC EXTRACTS

Number of companies providing information on substances in the category of Residual Aromatic Extracts (RAEs)

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute density	Vapour pressure	Self ignition temperature	Viscosity
64742-10-5	**3**	**1**	**1**	**-**	**2**	**-**	**-**	**2**
91995-70-9	**3**	**2**	**3**	**1**	**2**	**1**	**2**	**2**

Physical-chemical endpoint data on substances in the category of RAEs

RAEs		Boiling range	Flash point	Pour point	Density. abs., 15°C	Vapour pressure 20°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C
		(°C)	(°C)	(°C)	(g/cm³)	(kPa)	(°C)	(mm²/s)	(mm²/s)
64742-10-5		380			0.960 - 1.020			2000 - 7000	
64742-10-5					0.998 - 1.001				92 - 100
64742-10-5			298						
64742-10-5	Summary	380	298		0.960 - 1.020			2000 - 7000	92 - 100
91995-70-9			335	9	0.986 - 1.002				182 - 189
91995-70-9		400 - 610	305	3	0.972	< 0.1	> 300	2900	55
91995-70-9		700	330				397		
91995-70-9	Summary	400 - 700	305 - 335	3 - 9	0.972 - 1.002	< 0.1	> 300 - 397	2900	55 - 189
Category Summary		**380 - 700**	**298 - 335**	**3 - 9**	**0.960 - 1.020**	**< 0.1**	**> 300 - 397**	**2000 - 7000**	**55 - 189**

APPENDIX 14 UNTREATED DISTILLATE AROMATIC EXTRACTS

Number of companies providing information on substance in the category of Untreated Distillate Aromatic Extracts (DAEs)

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute density	Density abs. 70°C	Vapour pressure	Self ignition temperature	Viscosity
64742-04-7	**10**	**4**	**6**	**3**	**7**	**2**	**1**	**2**	**8**

Physical-chemical endpoint data on substance in the category of DAEs

DAEs	Boiling range	Flash point	Pour point	Density. abs., 15°C	Vapour pressure 20°C	Self ignition temp.	Viscosity 40°	Viscosity 100°C
	(°C)	(°C)	(°C)	(g/cm³)	(kPa)	(°C)	(mm²/s)	(mm²/s)
64742-04-7				0.956 (at 70°C)			16.1 - 24.1(at 50°C) 8.3 - 11.0 (at 70°C)	4.0 - 4.7
64742-04-7	250 - 640			0.950 - 1.030			50 - 1500	
64742-04-7		266	24	1.006				28
64742-04-7				1.046 1.011 (at 70°C) 0.957 (at 80°C)			21087	124
64742-04-7	306 - 580	276		0.978 - 1.018			3756	51
64742-04-7		240		0.950			53	
64742-04-7			50					
64742-04-7	389 - 576	289		0.93 - 0.969				3.8 - 54
64742-04-7	350 - 550	265	0	0.990	< 0.1	> 280	910	24.0
64742-04-7		279				410		
Category Summary	**250 - 640**	**240 - 289**	**0 - 50**	**0.93 - 1.046 0.956 - 1.011 (at 70°C) 0.957 (at 80°C)**	**< 0.1**	**> 280 - 410**	**50 - 21087 16.1 - 24.1(at 50°C) 8.3 - 11.0 (at 70°C)**	**3.8 - 124**

APPENDIX 15 TREATED DISTILLATE AROMATIC EXTRACTS

Number of companies providing information on substance in the category of Treated Distillate Aromatic Extracts (TDAEs)

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute density	Vapour pressure	Self ignition temperature	Viscosity
68783-04-0	**4**	**1**	**3**	**1**	**4**	**1**	**1**	**3**

Physical-chemical endpoint data on substance in the category of TDAEs

TDAEs	Boiling range	Flash point	Pour point	Density. abs., 15°C	Density. abs., 80°C	Vapour pressure 20°C	Self ignition temp.	Viscosity 100°C
	(°C)	(°C)	(°C)	(g/cm³)	(g/cm³)	(kPa)	(°C)	(mm²/s)
68783-04-0		303		1.048	1.018 - 1.025			114 - 147
68783-04-0				0.941				
68783-04-0		254		0.965 (at 20°C)				37
68783-04-0	350 - 550	265	0	0.950 - 1.050		< 0.1	> 280	20.0 400 (at 40°C)
Category Summary	**350 - 550**	**254 - 303**	**0**	**0.941 - 1.050**	**1.018 - 1.025**	**< 0.1**	**> 280**	**20.0 - 147 400 (at 40°C)**

APPENDIX 16 PARAFFINIC AND HYDROCARBON WAXES

Number of companies providing information on substances in the category of Paraffinic and Hydrocarbon Waxes

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute density	Self ignition temperature	Viscosity
8002-74-2	**3**	**1**	**-**	**1**	**1**	**1**	**1**
63231-60-7	**1**	**-**	**-**	**-**	**1**	**-**	**-**
64742-42-3	**1**	**-**	**1**	**1**	**-**	**-**	**-**
64742-51-4	**1**	**1**	**-**	**-**	**1**	**-**	**-**

Physical-chemical endpoint data on substances in the category of Paraffinic and Hydrocarbon Waxes

Paraffinic and Hydrocarbon Waxes		**Boiling range**	**Flash point**	**Pour point**	**Density. abs., 15°C**	**Self ignition temp.**	**Viscosity 100°C**
		(°C)	**(°C)**	**(°C)**	**(g/cm³)**	**(°C)**	**(mm²/s)**
8002-74-2		358 - 489			0.804		3.0
8002-74-2				58			
8002-74-2						380 - 400	
8002-74-2	Summary	358 - 489		58	0.804	380 - 400	3.0
63231-60-7	Summary				0.834 - 0.847		
64742-42-3	Summary		317	85			
64742-51-4	Summary	341 - 655			0.804 - 0.820		
Category Summary		**341 - 655**	**317**	**58 - 85**	**0.804 - 0.847**	**380 - 400**	**3.0**

APPENDIX 17 SLACK WAXES

Number of companies providing information on substances in the category of Slack Waxes

CAS Registry Number	N° of companies	Boiling range	Flash point	Pour point	Absolute density	Viscosity
64742-61-6	**6**	**3**	**5**	**2**	**5**	**4**
92062-09-4	**3**	**1**	**1**	**2**	**1**	**2**

Physical-chemical endpoint data on substances in the category of Slack Waxes

Slack Waxes		Boiling range	Flash point	Pour point	Density. abs., 15°C	Density. abs.,70°C	Viscosity 100°C	Viscosity 70°C
		(°C)	(°C)	(°C)	(g/cm³)	(g/cm³)	(mm²/s)	(mm²/s)
64742-61-6		> 350	220 - 246		0.770 - 0.960		3.0 - 30	
64742-61-6		315 - 432			0.796		2.3	
64742-61-6			200 - 288		0.816 - 0.868		3.2	
64742-61-6			222	53	0.826 (at 20°C)			
64742-61-6		380 - 537	210		0.911		5.8	
64742-61-6			> 190	48 - 60		0.770 - 0.850		3.5 - 6.5
64742-61-6	Summary	315 - 537	> 190 - 288	48 - 60	0.770 - 0.960 0.826 (at 20°C)	0.770 - 0.850	2.3 - 30	3.5 - 6.5
92062-09-4		320 - > 700			0.799		2.5	
92062-09-4				57				
92062-09-4			> 190	48 - 60		0.770 - 0.850		3.5 - 6.5
92062-09-4	Summary	320 - > 700	> 190	48 - 60	0.799	0.770 - 0.850	2.5	3.5 - 6.5
Category Summary		**315 - > 700**	**> 190 - 288**	**48 - 60**	**0.770 - 0.960 0.826 (at 20°C)**	**0.770 - 0.850**	**2.3 - 30**	**3.5 - 6.5**

APPENDIX 18 PETROLATUMS

Number of companies providing information on substances in the category of Petrolatums

CAS Registry Number	N° of companies	Boiling range	Pour point	Flash point	Melting point	Absolute density	Viscosity
8009-03-8	**5**	**4**	**1**	**3**	**1**	**4**	**3**
92045-77-7	**1**	**1**	**-**	**-**	**-**	**-**	**-**

Physical-chemical endpoint data on substances in the category of Petrolatums

Petrolatums		Boiling range	Flash point	Pour point	Density. abs., 15°C	Density. abs., 80°C	Viscosity 100°C
		(°C)	(°C)	(°C)	(g/cm³)	(g/cm³)	(mm²/s)
8009-03-8		412 - 576			0.865		
8009-03-8		514 - > 700				0.815	17.9
8009-03-8		368 - 575	> 180	51 - 71	0.868 - 0.886		7.2 - 13.8
8009-03-8		412 - 663	260 - > 286		0.864 (at 20°C)		16.3
8009-03-8			259 - 277		0.872		
8009-03-8	Summary	368 - > 700	> 180 - > 286	51 - 71	0.865 - 0.886 0.864 (at 20°C)	0.815	7.2 - 17.9
92045-77-7	Summary	360 - 732					
Category Summary		**360 - 732**	**> 180 - > 286**	**51 - 71**	**0.865 - 0.886**	**0.815**	**7.2 - 17.9**

APPENDIX 19 BITUMEN

Number of companies providing information on substances in the category of Bitumen

CAS Registry Number	N° of companies	Boiling range	Flash point	Softening point	Absolute density	Self ignition temperature	Viscosity
8052-42-4	**7**	**1**	**3**	**2**	**4**	**1**	**4**
64741-56-6	**5**	**3**	**3**	**1**	**4**	**1**	**3**
92062-05-0	**2**	**-**	**-**	**1**	**1**	**1**	**-**
100684-39-7	**1**	**-**	**-**	**1**	**-**	**-**	**-**

Physical-chemical endpoint data on substances in the category of Bitumen

Bitumen		Boiling range	Flash point	Pour point	Density. abs., 15°C	Density. abs., 25°C	Self ignition temp.	Viscosity 100°C	Viscosity 60°C	Viscosity 135°C
		(°C)	(°C)	(°C)	(g/cm³)	(g/cm³)	(°C)	(mm²/s)	(mm²/s)	(mm²/s)
8052-42-4			298	45						
8052-42-4					1.031					
8052-42-4			> 230 - 320		1.015 - 1.025	1.035				280 - 450
8052-42-4			> 320 - 328	68		1.021 - 1.062			8200	243 - 3210
8052-42-4					0.959 - 1.009					
8052-42-4		343 – 738							1382	
8052-42-4							490	1981 - 2552		
8052-42-4	Summary	343 – 738	> 230 - 328	45 - 68	0.959 - 1.031	1.021 - 1.062	490	1981 - 2552	1382 - 8200	243 - 3210
64741-56-6		484 – 597			0.925					
64741-56-6		475 – 699	186 - 336		0.969			275		
64741-56-6		572						1274		
64741-56-6			260 - 284	44	0.998 - 1.025					
64741-56-6			180		1.044	1.070	410 - 440	396		
64741-56-6	Summary	475 – 699	180 - 336	44	0.925 - 1.044	1,070	410 - 440	275 - 1274		
92062-05-0				128						
92062-05-0					0.973		430			
92062-05-0	Summary			128	0.973		430			
100684-39-7	Summary			24 - 33						
Category Summary		**343 – 738**	**180 - 336**	**24 - 128**	**0.925 - 1.044**	**1.021 - 1.070**	**410 - 490**	**275 - 2552**	**1382 - 8200**	**243 - 3210**

Physical-chemical endpoint data on Oxidized Asphalt

Oxidized Asphalt	Boiling range	Flash point	Softening point	Density. abs., 15°C	Density. abs., 25°C	Viscosity 135°C	Viscosity 160°C
	(°C)	(°C)	(°C)	(g/cm³)	(g/cm³)	(mm²/s)	(mm²/s)
No. of companies that submitted data	**1**	**6**	**3**	**2**	**1**	**1**	**1**
64742-93-4		268	105				
64742-93-4		> 320		1.065			
64742-93-4		276					
64742-93-4		310 - 334					
64742-93-4	≥ 308 - ≥ 383	244 - 316	61 - 107	1.029 - 1.053	1.022 - 1.046	1301	967 - 3708
64742-93-4		250 - 286	38 - 95	0.998 - 1.029	1.017		
Substance Summary	**≥ 308 - ≥ 383**	**244 - 334**	**38 - 107**	**0.998 - 1.065**	**1.017 - 1.046**	**1301**	**967 - 3708**

CONCAWE
Boulevard du Souverain 165
B-1160 Brussels
Belgium

Tel: +32-2-566 91 60
Fax: +32-2-566 91 81
e-mail: info@concawe.org
website: http://www.concawe.org