

Qualifying Explanatory Statement

Carbon¹ Neutrality Declaration



Carbon neutrality of Castrol Professional engine oils including the Edge, Magnatec and GTX product ranges achieved by Castrol Limited in accordance with PAS 2060 at 31st March 2020 with commitment to maintain to 31st March 2021 for the period commencing 1st April 2020, DNV GL certified.

Signed: *Carolyn A. Bongard*

Date: 15 February 2021

This Qualifying Explanatory Statement (QES) contains all the required information on the carbon neutrality of Castrol Professional engine oils including the Edge, Magnatec and GTX product ranges, defined as 'the subject'. All the information provided within this report has been reviewed by a third party and is believed to be correct. Should any information be provided which affects the validity of the statements within this document, a revised version of the document will be subsequently issued. This report will be made available to the public upon request.

| | |
|---------------------|--|
| Business: | Castrol |
| Issue Date: | 15/12/2020 |
| Issuing Authority: | BP Castrol |
| Assurance Provider: | DNV GL |
| Application Number: | 7 |
| Commitment Period: | 1 st Apr 20 – 31 st Mar 21 |

Contents

¹ Here, Carbon is used as shorthand for aggregated greenhouse gas (GHG) emissions, reported as carbon dioxide equivalents (CO₂e). Hereafter in this report, the full term or CO₂e is employed. A full list of GHG emissions included in the inventory is provided in Annex C of this report.

| | | |
|-----|--|----|
| 1. | Terms and Definitions | 3 |
| 2. | Introduction | 4 |
| 2.1 | Foreword | 4 |
| 2.2 | General information | 4 |
| 2.3 | Boundaries of the Subject | 5 |
| 2.4 | PAS 2060 Carbon Neutrality Options | 5 |
| 3. | Quantification of the Carbon Footprint | 6 |
| 3.1 | Standard Chosen and Emissions Sources | 6 |
| 3.2 | Carbon Footprint | 6 |
| 4. | Data Methods | 10 |
| 4.1 | Data Sources | 10 |
| 4.2 | Data Quality and Uncertainties | 10 |
| 4.3 | Key uncertainties, assumptions, estimations and allocations | 12 |
| 5. | Carbon Management Plan | 14 |
| 5.1 | Commitment | 14 |
| 5.2 | Management Plan | 14 |
| 6. | Offset Program | 15 |
| | <u>Annex A: Qualifying Explanatory Statement (QES) Checklist</u> | 16 |
| | <u>Annex B: Carbon Neutrality Assurance Statement</u> | 22 |
| | <u>Annex C: Included GHG Emissions</u> | 24 |

1. Terms and Definitions

| | |
|--|---|
| 100-year Global Warming Potential | Figures by the IPCC to account for the global warming potential of GHG emissions |
| Carbon | Carbon is used as shorthand for aggregated greenhouse gas (GHG) emissions, reported as carbon dioxide equivalents (CO ₂ e). Throughout the report, the full term (CO ₂ e) is employed. A full list of GHG emissions included in the inventory is provided in Annex C of this report |
| Ecoinvent v3.1 | Database of emission factors from the not-for-profit association, Ecoinvent, used for Lifecycle Analysis |
| GHG | Greenhouse Gas refers to carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), sulphur hexafluoride (SF ₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). A full list of GHG emissions included in the inventory is provided in Annex C of this report |
| GHGP | Greenhouse Gas Protocol sets the standards to measure and report GHG emissions |
| GHGP Product Standard | Greenhouse Gas Protocol Product Life Cycle Accounting and Reporting Standard. Refers to a sub-section found in the GHG Protocol |
| IPCC Fifth Assessment Report | The Intergovernmental Panel on Climate Change (IPCC) provides an international statement on the scientific understanding of climate change |
| I3P-3 (for third party) | The conformity assessment type as outlined in PAS2060, in this case: Independent 3P certification conformity assessment |
| PAS 2060 | Publicly available Specification for the Demonstration of Carbon Neutrality. PAS 2060:14 (referenced in this document) refers to the latest 2014 version of the document |
| QES | The explicit declaration or claim of carbon neutrality in the form of a prescribed, publicly available statement is required, this can be issued as part of the qualifying explanatory statement |

2. Introduction

2.1 Foreword

This QES demonstrates that Castrol Limited has achieved carbon neutrality for Castrol Professional engine oils including the Edge, Magnatec and GTX product ranges sold globally. This QES is in accordance with the Publicly Available Specification for the Demonstration of Carbon Neutrality (PAS 2060) and is committed to being carbon neutral in accordance with PAS 2060:2014. Annex A provides a checklist of information required and the respective location within the QES.

2.2 General information

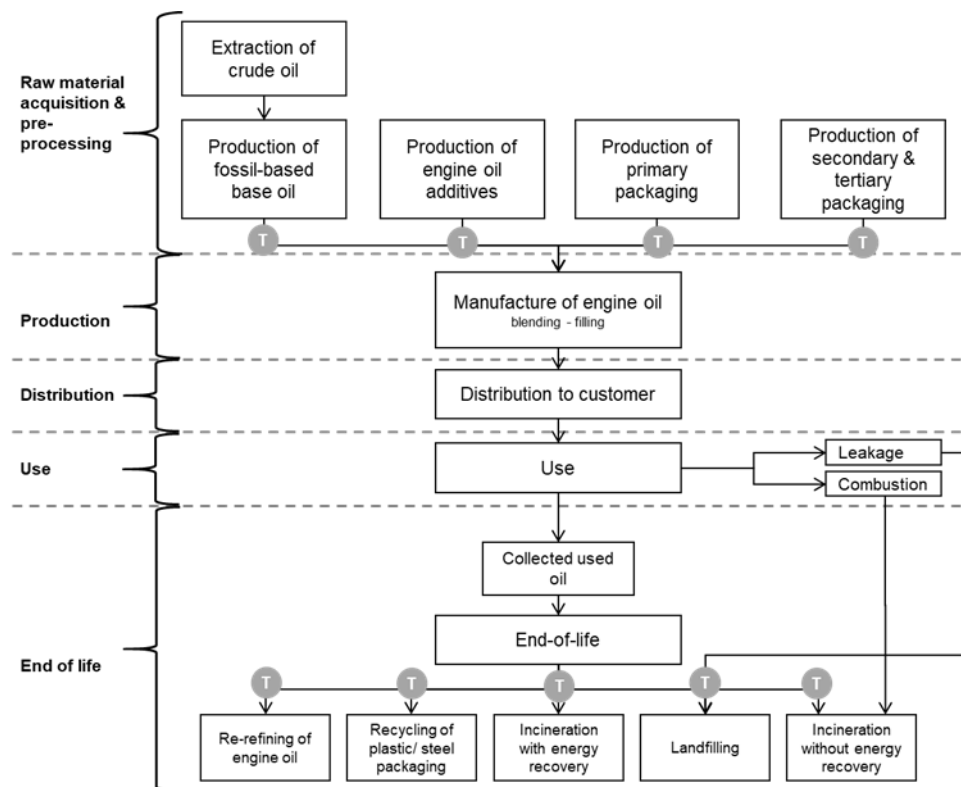
| PAS 2060 Information Requirement | Information as it relates to Castrol Ltd |
|--|--|
| Individual responsible for the evaluation and provision of data necessary for the substantiation of the declaration including that of preparing, substantiating, communicating and maintaining the declaration | Carolyn Bongard, Sustainability Accounting Manager |
| Entity making PAS 2060 declaration | Castrol Ltd |
| Subject of the PAS 2060 declaration | Castrol Professional engine oils, comprising the final engine oil product, including: <ul style="list-style-type: none"> • Castrol EDGE Professional; • Castrol MAGNATEC Professional; and • Castrol GTX Professional. 1L of each product is used as the functional unit of analysis. |
| Rationale for selection of the subject | This Professional range of lubricant products is specifically formulated to meet the advanced technical needs of global car manufacturers and incorporates unique micro-filtration technology. Car manufacturers are increasingly concerned with sustainability. |
| Conformity assessment type | I3P-3 Independent third-party certification – unified |
| Baseline date Date of first determined footprint | 1 st Apr 14 |
| Achievement period Offset of baseline/previous commitment period | 1 st Apr 19 – 31 st Mar 20 |
| Commitment period Period of upcoming carbon neutrality | 1 st Apr 20 – 31 st Mar 21 |

2.3 Boundaries of the Subject

The commitment to carbon neutrality covers all activities that are material for the functionality of Castrol Professional which is an engine oil lubricant for the automotive industry. It is therefore a B2B and B2C sold product with clear end-of-life processes that make it practical to conduct 'cradle-to-grave' lifecycle analysis in accordance with the requirements of the Greenhouse Gas Protocol Product Life Cycle Accounting and Reporting Standard (GHGP Product Standard)². The system boundary considered in assessing the carbon footprint of these products is described in Figure 2.1.

Figure 2.1: Boundaries of the subject

T = transport



2.4 PAS 2060 Carbon Neutrality Options

Castrol Ltd. will demonstrate carbon neutrality as set out in PAS 2060:2014 using an independent 3rd party certification in accordance with 10.3.2. For the application period following the baseline date and all subsequent periods with an unchanged subject, declaration I3P-3 modified as per A.2 shall be used.

² <http://www.ghgprotocol.org/standards/product-standard>

3. Quantification of the Carbon Footprint

3.1 Standard Chosen and Emissions Sources

The GHGP Product Standard was used to quantify the GHG emissions associated with the subject. This method was chosen as it provides an internationally recognised approach to the calculation of product CO₂e footprints and meets the requirements of PAS 2060 for the substantiation of GHG emissions (PAS 2060:2014 5.2.2 to 5.2.4). The product CO₂e footprints have been reviewed and assured by an independent third party (see Annex B of this report for the assurance statement).

GHG emissions that are accounted for in the study are based on the 100 year Global Warming Potential figures published in Table 2.14 of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014) and include those required by the GHGP Product Standard, which specifies emissions to and removals from the atmosphere of: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). A full list of GHG emissions included in the inventory is provided in Annex C of this report.

All Scope 1, 2 and 3 emissions relevant to the product are included in the carbon footprint and are summarised in Table 3.1 below. Where GHG emissions have been estimated, these have been determined based on a conservative approach that precludes underestimation. Sources of biogenic carbon in the Castrol Professional product system are limited to the production of wood packaging materials, which are identified as negligible. Therefore, the carbon footprint results from this study do not provide separate reporting of biogenic carbon emissions.

3.2 Carbon Footprint

The Life Cycle Analysis (LCA) conducted for the subject calculated the per litre GHG emissions of Castrol Professional products sold globally. The average per product group can be found in Table 3.1.

Table 3.1: Emission profiles of the subject

| Inventory results: kg CO ₂ -eq per unit of analysis | |
|--|------------------------------------|
| Product group description | GHG Emissions per litre of product |
| All Professional products | |
| Edge | |
| GTX | |
| Magnatec | |

The sales volume for the achievement period of [REDACTED] litres equates to an absolute footprint of 240,830 tCO₂e. The forecasted sales for the commitment period of [REDACTED] litres equates to an absolute footprint of 189,853 tCO₂e. Both calculations were done at the product group level.

Whilst the baseline period for this portfolio of products dates back to 2014, the base inventory was originally split between several geographies. This was amalgamated into one global inventory for 2016 (Inventory 3). The revised initial baseline value for the Castrol Professional global product range is [REDACTED] per litre of product. The carbon footprint for this inventory is calculated to be [REDACTED] kg CO₂-eq per litre of product, which represents an 8% reduction.

The sales of the Professional products have been declining over the past 2 achievement periods as the brand continues to get phased out. Sales may have been also slightly impacted by the decline in the economic growth rate, as shown for key markets in Table 3.2. This trajectory will likely continue beyond the commitment period, irrespective of the impacts from COVID-19.

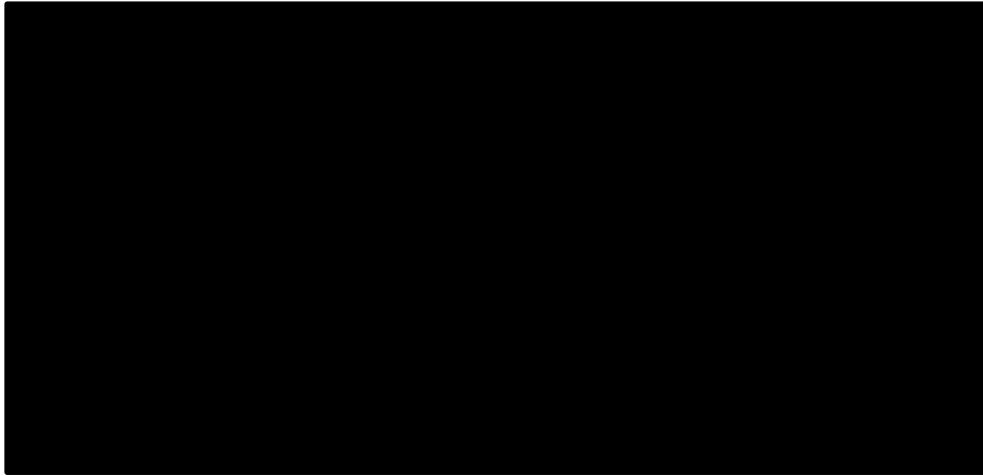


Table 3.3: Description of GHG emissions

| Boundary setting | |
|---|---|
| Life cycle stage definition | |
| Material acquisition and pre-processing | <p>Raw material extraction and processing to produce base components for use in the engine oil production process for all Professional brand products worldwide.</p> <p>The following processes are included in the boundary of this life cycle stage:</p> <ul style="list-style-type: none"> • Production of base oils, comprising extraction of crude oil; transportation of crude oil to refining; and refining of crude oil to produce base oil and co-products => allocated to base oils on a mass basis; • Production of additives, comprising production of chemicals and processing to make engine oil additives and viscosity modifiers and associated transport; and • Production of packaging materials (plastics, steel, wood), comprising extraction and transportation of raw materials; processing to packaging base materials; and fabrication of packaging products. <p>The following processes are not included in the boundary of this life cycle stage.</p> <ul style="list-style-type: none"> • Capital goods and infrastructure (i.e. manufacture and maintenance of buildings and machinery), which are considered to be negligible in relation to one litre of engine oil. |
| Production | <p>Blending of base components (base oil and additives) to produce engine oils and filling into product packaging (plastic bottles and steel drums) for all Professional brand products worldwide.</p> <p>The following processes are included in the boundary of this life cycle stage:</p> <ul style="list-style-type: none"> • Incoming transport of engine oil ingredients and packaging to Castrol sites; • Blending operations for production of Professional brand engine oils at Castrol sites worldwide; • Filling to plastic bottle, steel drum and bulk packaging of Professional brand engine oils; and • Management of wastes and emissions from Castrol sites producing Professional brand engine oils worldwide. <p>The following processes are not included in the boundary of this life cycle stage.</p> <ul style="list-style-type: none"> • Capital goods and infrastructure (i.e. manufacture and maintenance of buildings and machinery), which are considered to be negligible in relation to one litre of engine oil. • Personnel activities (e.g. commuting to and from work). |

| | |
|---------------------------------|---|
| <p>Distribution and storage</p> | <p>Distribution of packed Professional brand products from Castrol blending sites to customers (e.g. dealerships) comprising:</p> <ul style="list-style-type: none"> • Transportation by third party fleet to distribution hub in the market country; and • Transportation by in-country third party carrier from distribution hub to customer (e.g. car dealerships). <p>The following processes are not included in the boundary of this life cycle stage.</p> <ul style="list-style-type: none"> • Capital goods and infrastructure (i.e. manufacture and maintenance of buildings and machinery), which are considered to be negligible in relation to one litre of engine oil. • Storage at distribution warehouse, as the Castrol Professional engine oil products are stored at ambient temperature and do not require any additional treatment for storage. The impact from storage, comprising energy for lighting, is considered to be negligible per litre of product. • Personnel activities (i.e. commuting to and from work). |
| <p>Use</p> | <p>Engine oils are used to facilitate the efficient running of vehicles. They are not typically consumed by the engine, although there is inevitably some engine oil loss through leakage or combustion with the fuel. During use, engine oils become contaminated with impurities. This reduces performance and therefore requires, at regular intervals, the oil to be drained and replaced with new clean oil.</p> <p>Use of engine oils includes the following:</p> <ul style="list-style-type: none"> • Filling of vehicles with Castrol Professional engine oils; • Leakage of engine oil from vehicles during use; • Combustion of engine oil with vehicle fuel during use; and • Draining of used engine oil from vehicles. <p>The following processes are not included in the boundary of this life cycle stage.</p> <ul style="list-style-type: none"> • Capital goods and infrastructure (i.e. manufacture and maintenance of buildings and machinery), which are considered to be negligible in relation to one litre of engine oil. • Vehicle fuel use to drive to and from filling/draining sites. • Draining of used engine oil from vehicles as this is a manual operation. • Personnel activities (e.g. commuting to and from work). |

| | |
|-------------|---|
| End-of-life | <p>At end of life, used engine oils can be re-refined, incinerated for energy recovery, incinerated without energy recovery or landfilled, the packaging must also be treated. It is assumed that no improper disposal (e.g. dumping to land) occurs due to the customers for Professional being OEMs/dealerships. The following processes are included in the boundary of this life cycle stage:</p> <ul style="list-style-type: none"> • Transportation of used oil to a waste management facility; • Used oil incineration with and without energy recovery, landfill or re-refining; • Treatment of waste packaging to recycling, incineration with energy recovery, incineration without energy recovery or landfill. <p>In line with the recycled content method (Chapter 9 of the GHG Product Protocol), the following processes are not included in the boundary of this life cycle stage:</p> <ul style="list-style-type: none"> • Processes that transform waste to a useful material in another process (e.g. re-refining of used oil and recycling of plastic). |
|-------------|---|

4. Data Methods

4.1 Data Sources

Data used for the study include a mix of primary and secondary sourced data. Where possible, primary data were sourced. Secondary data were sourced only where primary data were not available or where the relative impact on the carbon footprint result was nominal.

Primary data were sourced for all Castrol activities, comprising product specifications and formulations; operational data at blend sites; production output from blend sites; sales data in market countries; packaging material inputs; incoming material transport distances; and distribution modes of transport. Primary data were also sought from a number of Castrol's suppliers for base oil, additives and primary packaging as part of previous GHG inventories. However, primary data were not received in relation to all data requests. Where data were lacking, secondary data were used to fill gaps based on documented assumptions.

Distribution routes and distances were estimated based on the location of the blending site where a product is manufactured and the location of Castrol warehouse facilities in the market country.

Secondary data were sourced to support use and disposal scenarios and for all other activities associated with the life cycle of engine oil, comprising: GHG emission factors, which were sourced from reputable published databases; secondary and ancillary packaging materials; and average country specific waste management rates for used oil and packaging materials.

4.2 Data Quality and Uncertainties

All data points (primary and secondary) were assessed for data quality to appraise representativeness in relation to – technology, geography, time period, completeness and reliability – and assigned a score on a scale of 1 to 4 (1 being poor; 4 being good). A single data quality score was calculated as the simple average of all five representativeness categories (equal weighting for each category). The quality of the overall dataset was appraised as a percentage of the total carbon footprint result which relies on data that is appraised as 'poor' (weighted average score <2.5) as follows:

| % total footprint result from 'poor' data | Data quality category |
|---|-----------------------|
| <10% | Very good |
| 10% to <30% | Good |
| 30% to <50% | Satisfactory |
| >50% | Poor |

Separate data quality assessments were undertaken for activity data and emission factor data. Overall data quality has improved in comparison to the first inventory.

| Data Quality Appraisal - Activity Data | |
|--|-----------|
| All Professional products - global | Very good |
| Edge - global | Very good |
| GTX - global | Very good |
| Magnatec - global | Very good |

The following provides an overview of the Emission Factor Data Quality Appraisal:

| Data Quality Appraisal - Emission Factor Data | |
|---|--------------|
| All Professional products - global | Good |
| Edge - global | Good |
| GTX - global | Satisfactory |
| Magnatec - global | Good |

The following identifies specific areas of uncertainty in the product carbon footprint results:

Raw material inputs – for raw material inputs for which primary data were not received, secondary data were used. The nature of key raw material inputs (base oil and additives) is such that there is potentially a high degree of variability between suppliers and consequently the GHG impact can vary accordingly. Given the contribution to total GHG emissions from the production of raw materials, the assumptions made relating to raw material impacts have the potential to have a significant effect on the overall result.

End-of-life management – waste management rates are assumed based on national/ regional averages. Waste management rates can vary significantly between different countries in the same region or between different areas in the same country. However, GHG emissions resulting from the waste management methods of materials relevant to the Castrol Professional products are relatively low.

Improvements to data quality

The data collected for this inventory has improved in terms of completeness and robustness, based on learnings from the process to complete previous inventories.

4.3 Key uncertainties, assumptions, estimations and allocations

| Source of uncertainty | Qualitative description |
|----------------------------------|---|
| Scenario uncertainty | |
| Blending locations | <p>Data to link the production of a formulation at a specific blend site and its subsequent sale to an end market are not available. Therefore, some assumptions were required to map the formulation through the life cycle. Castrol sales data provides volumes sold to each end market, broken down by product code. Product codes can then be mapped to formulation codes and blend sites. Where formulations are blended at more than one blend site, a blend site was selected based on geographic proximity to the end market. The assumption for blending site location largely affects blending and distribution processes. Given the availability of data and the relatively small contribution to the total footprint from blending and distribution, this is considered a reasonable approach.</p> |
| Use profile | <p>Engine oils are used in vehicle engines to enhance engine efficiency and are not typically consumed by the engine. Vehicles are filled with engine oil using an automated pump fuelled by electricity. During use, the engine oil becomes contaminated with impurities. This reduces its performance and requires the oil in the vehicle to be changed.</p> <p>Engine oils are not intended to be consumed by the vehicle engine. However, there is inevitable leakage of the product, as well as unintended combustion with fuel in the engine. Information relating to the quantity of engine oil that leaks or is burned with fuel is limited. Therefore, in order to remain conservative, it is assumed that 100% of engine oil that is lost (through leakage or combustion) is combusted (i.e. incinerated without energy recovery).</p> <p>Data relating to the proportion of engine oil that leaks or is combusted with fuel is taken from Kline (2010), 'Global Used Oil 2009: Market Analysis and Opportunities' and Kline (2016) 'Global Used Oil and Re-refined Lubricants: Market Analysis and Opportunities'. This relates to a global average for passenger car motor oil.</p> |
| End-of-life profile | <p>Following the drainage of old oil from the vehicle, it is assumed that 100% of used oil is collected by a reputable waste contractor for management. At end-of-life, used oil can be recycled (requiring a re-refining process to remove impurities and produce a re-refined engine oil product); incinerated with recovery of energy; incinerated without recovery of energy; or landfilled. The proportion of used oil following each waste management route is estimated, based on country-specific or region-specific average rates</p> |
| Parameter uncertainty | |
| Global warming potential factors | <p>The model contains complete referencing of all GWP factors. The sources are:</p> |

| | |
|---|--|
| | <p>2020 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting for UK grid electricity, liquid and gaseous fuels and freight transport;</p> <p>Ecoinvent 3.4;</p> <p>Confidential supplier data; and</p> <ul style="list-style-type: none"> • 2019 International Energy Agency (IEA) grid factors. |
| Model uncertainty | |
| Model sources not included in scenario or parameter uncertainty | Not applicable. Material issues relating to uncertainty are covered under parameter and scenario uncertainty. |

| Allocation | |
|---|---|
| Methods used to avoid or perform allocation | <p>Production of base oils</p> <p>Impacts from crude oil refining have been allocated to base oil and co-products on a mass basis. As per Chapter 9 of the GHG Product Protocol, allocation has been based on the underlying relationship between the quantity of the co-products and quantity of emissions generated. Refining of crude oil results in several co-products, none of which can be assumed to be the primary reason for refining. It is therefore considered reasonable to allocate emissions on a mass basis, assigning impacts relative to the quantity (by mass) of each co-product output.</p> <p>Incineration with energy recovery (use of used oil as fuel)</p> <p>System expansion has been applied for impacts from incineration at end-of-life with energy recovery as per the direction made in Chapter 9 of the GHG Product Protocol. This accounts for the use of used oil as a fuel for the generation of heat and electricity and is reflected in the applied emission factor (0 kg CO₂-eq per kg of used oil). This is equivalent to the recycled content approach where 100% of the emissions are allocated to the generation of electricity and useful heat.</p> <p>Incineration without energy recovery</p> <p>In this case, the waste is not incinerated for a useful purpose and the associated emissions are allocated to the Castrol system (e.g. incineration of used oil without energy recovery).</p> <p>Recycling/re-refining at end-of-life</p> <p>The recycled content approach is employed for the recycling of materials at end-of-life. This method applies to the allocation of impacts from the processing of waste materials in order that they can be used in another process (i.e. recycling/reuse). This method allocates 100% of impacts incurred from recycling processes (e.g. cleaning, sorting, chipping) to the system that uses the recycled material. This method has been applied to all materials that are recycled at end of life.</p> <p>In this inventory, recycling relates to the end-of-life stage and refers to used oil and packaging materials. It is reflected in the relevant emission factors for recycling at end of life (all 0 kg CO₂e per kg of waste):</p> |

| | |
|---|---|
| | <p>Used oil recycling (i.e. re-refining) – 0% of re-refining process allocated to Castrol system and 100% allocated to system that uses re-refined oil; and Packaging materials – 0% of recycling processes allocated to Castrol; 100% allocated to system that uses recycled materials.</p> <p>Site operational data</p> <p>Castrol’s blend sites typically produce more than one type of product. However, the process for blending and filling is comparable regardless of product (confirmed by Castrol). Therefore, total site operational data have been allocated to Professional products on a mass basis.</p> |
| Displaced emissions and removals using the closed loop approximation method | Not applicable |

5. Carbon Management Plan

5.1 Commitment

The entity is committed to achieve carbon neutrality of the subject for the period of April 2020 to March 2021 in accordance with PAS 2060:2014. This commitment can be broken down as follows:

- Offset actual volumes for achievement period of April 2019 to March 2020;
- Offset upfront 100% of forecasted sales volumes for the commitment period as permitted by PAS 2060:2014 (*Section 6* provides further detail of the offset program);
- Commit to implement a carbon footprint management plan in order to achieve carbon reductions of the subject during the commitment period through improved measurements and additional initiatives. As part of this carbon management plan, the entity will reassess the emission profile at the end of the commitment period.
- Commit to an offset program for the remaining GHG emissions in line with PAS 2060:2014 (*Section 6* reports available information at the time of this commitment).

5.2 Management Plan

The main factors contributing to the reductions are changes to engine oil formulations that have shifted towards the use of lower impact raw materials, and changes to waste oil management practices within market countries resulting in a global reduction in volumes of oil incinerated without energy recovery. There were no specific targets associated with the carbon management plan.

Going forward from January 2021 (in the last quarter of this commitment period), the Professional branded products will be consolidated with a growing number of other existing and new Castrol carbon neutral products into one aligned process. The carbon management plan will include actions and targets that align with Castrol's Global Sustainability Strategy, as well as a commitment to periodically review the actions and track progress and performance. This plan will include reduction activities in the following areas:

Raw Materials - exploring options to incorporate lower carbon raw materials in select regions and products; working with suppliers to understand their supplier-specific product LCA's and support their plans for lower carbon raw materials.

Production Energy - transitioning to renewable energy across our owned assets and moving away from fuel oil where this exists as a significant source of energy. In 2020, the Neuhof plant (which manufactures Professional products) initiated this transition moving to renewably sourced electricity.

End of Life - conducting market research to understand how our products compare to the industry assumptions on collection rates and explore options to drive a behavioral shift in key markets

Packaging – exploring options to reduce the carbon impact of our packaging per unit as well looking to reduce overall plastic consumption across our portfolio

6. Offset Program

The table below shows the sales volume and the associated tonnes of CO₂e for the 6th and 7th application / achievement periods as well as the forecasted sales and associated CO₂e tonnes for this application’s commitment period.

Table 6.1 Credit Reconciliation

| | Period | Sales (liters) | Tonnes CO ₂ e | Retired Credits for Commitment Period | +ve = buffer |
|---------------------|----------------|----------------|--------------------------|---------------------------------------|--------------|
| Apr 2019 - Mar 2020 | 6 (Commitment) | | 326,299 | 350,000 | |
| Apr 2019 - Mar 2020 | 7 (Achieved) | | 240,830 | | 109,170 |
| Apr 2020 - Mar 2021 | 7 (Commitment) | | 189,853 | | |
| | | | | 97,233 | |
| Total | | | 430,683 | 447,233 | 16,550 |

The credits required to be retired in total for Professional over these 2 application periods is calculated to be 430,683. The 6th application included evidence of retired credits for the 6th Commitment Period equalling 350,000, thus requiring an additional 80,683 of credits to be retired based on forecasted sales. However, to ensure there was a buffer during the transition of accountabilities within the Castrol team, 97,233 of credits were retired in 3Q 2020 with a further reconciliation to take place at the end of the commitment period.

Further details can be found in Table 6.2

These credits were procured in advance, forming BP Target Neutral’s Project Portfolio, and were purchased from sources which guarantee that:

- The offsets purchased represent genuine, additional GHG emissions reductions; and
- The projects involved in delivering offsets meet the criteria of additionality, permanence, leakage and double counting.

The purchase of offsets via these schemes also guarantees that they have been verified by an independent third party, only issued after the emission reductions had taken place, and were retired within 12 months from the date of the declaration of the achievement. These credits are supported by publicly available project documentation, references for which are provided in Table 6.2 and are stored and retired in an independent and credible registry.

The exact quantity of offsets required for the entity is not yet fully known as they are based on predicted sales volumes. Additional credits will be purchased and retired as required. The exact projects from which BP Target Neutral will source the additional offsets, if required, are not confirmed. However, the entity is committed to source its offsets from ICROA approved standards, guaranteed to fulfil PAS 2060 requirements.

Table 6.2: Carbon offsets to account for sales volumes in the commitment period

<https://ihsmarket.com/products/environmental-registry.html>;

<https://cdm.unfccc.int/Registry/index.html>

| Project name | Account name | Standard and Registry Type | Date of retirement | Actual carbon offset (credits/tCO ₂ e) |
|---|--------------------------|-------------------------------------|--------------------|---|
| Biogas CDM Project of Bagepalli Coolie Sangha | GB960900914919 | UN registry for CDM projects | October 2020 | 2,116 |
| Grouped Hydropower Plants in Chongqing | BP International Limited | VCS / Markit Env Registry | October 2020 | 13,837 |
| Lower Zambezi REDD+ Project | BP International Limited | VCS / Markit Env Registry | October 2020 | 33,335 |
| Sichuan Rural Poor-Household Biogas Development Programme | GB960900914919 | UN registry for CDM projects | October 2020 | 8,154 |
| BIRU Indonesia Biogas | BP International Limited | Gold Standard / Markit Env Registry | October 2020 | 16 |
| ORB Energy Solar India | BP International Limited | VCS / Markit Env Registry | October 2020 | 8 |
| Campus Wide Clean Energy & Energy Efficiency | BP International Limited | VCS / Markit Env Registry | October 2020 | 10,006 |
| Distribution of ONIL stoves - Mexico | BP International Limited | VCS / Markit Env Registry | October 2020 | 12,699 |
| KAMIRANGA Ceramic Brazil | BP International Limited | VCS / Markit Env Registry | October 2020 | 9 |
| WIND power CGN Zhaoyuan | BP International Limited | VCS / Markit Env Registry | October 2020 | 17,053 |
| | | | | |
| | | TOTAL: | | 97,233 |

Annex A

Qualifying Explanatory Statement (QES) Checklist

Table A.1 Checklist for QES supporting declaration of commitment to carbon neutrality

The following table has been extracted from PAS 2060:2014. It provides a checklist of information that should be included in the commitment to carbon neutrality, as well as identification of where this information is located.

| # | Item Description | Status | Section in this QES |
|----|---|--------|--------------------------------------|
| 1 | Identify the individual responsible for the evaluation and provision of data necessary for the substantiation of the declaration including that of preparing, substantiating, communicating and maintaining the declaration. | ✓ | Section 2.2 |
| 2 | Identify the entity responsible for making the declaration. | ✓ | Section 2.2 |
| 3 | Identify the subject of the declaration. | ✓ | Section 2.2 |
| 4 | Explain the rationale for the selection of the subject. <i>(The selection of the subject should ideally be based on a broader understanding of the entire carbon footprint of the entity so that the carbon footprint of the selected subject can be seen in context; entities need to be able to demonstrate that they are not intentionally excluding their most significant GHG emissions (or alternatively can explain why they have done so).)</i> | ✓ | Section 2.2 |
| 5 | Define the boundaries of the subject. | ✓ | Section 2.2; 2.3 Figure 2.1 |
| 6 | Identify all characteristics (<i>purposes, objectives or functionality</i>) inherent to that subject. | ✓ | Section 2.2 |
| 7 | Identify and take into consideration all activities material to the fulfilment, achievement or delivery of the purposes, objectives or functionality of the subject. | ✓ | Section 2.2; 2.3 |
| 8 | Select which of the 3 options within PAS 2060 you intend to follow. | ✓ | Section 2.4 |
| 9 | Identify the date by which the entity plans to achieve the status of 'carbon neutrality' of the subject and specify the period for which the entity intends to maintain that status. | ✓ | Section 2.2 |
| 10 | Select an appropriate standard and methodology for defining the subject, the GHG emissions associated with that subject and the calculation of the carbon footprint for the defined subject. | ✓ | Section 3.1 |
| 11 | Provide justification for the selection of the methodology chosen. <i>(The methodology employed shall minimise uncertainty and yield accurate, consistent and reproducible results.)</i> | ✓ | Section 3.1 |
| 12 | Confirm that the selected methodology was applied in accordance with its provisions and the principles set out in PAS 2060. | ✓ | Section 3.1 |
| 13 | Describe the actual types of GHG emissions, classification of emissions (<i>Scope 1, 2 or 3</i>) and size of carbon footprint of the subject exclusive of any purchases of carbon offsets: | ✓ | Section 3.1 and 3.2 Table 3.1 |
| | <i>a) All greenhouse gases shall be included and converted to tCO₂e.</i> | ✓ | Table 3.1 |
| | <i>b) 100% Scope 1 (direct) emissions relevant to the subject shall be included when determining the carbon footprint.</i> | ✓ | Table 3.1; Section 3.1 |
| | <i>c) 100% Scope 2 (indirect) emissions relevant to the subject shall be included with determining the carbon footprint.</i> | ✓ | Table 3.1; Section 3.1 |
| | <i>d) Where estimates of GHG emissions are used in the quantification of the subject carbon footprint (particularly when associated with Scope 3 emissions) these shall be determined in a manner that precludes underestimation.</i> | ✓ | Table 3.1; Table 3.3; Section 3.1 |

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| | e) <i>Scope 1, 2 or 3 emission sources estimated to be more than 1% of the total carbon footprint shall be taken into consideration unless evidence can be provided to demonstrate that such quantification would not be technically feasible or cost effective. (Emissions sources estimated to constitute less than 1% may be excluded on that basis alone.)</i> | ✓ | Section 3, Table 3.1; Table 3.3 |
| | f) <i>The quantified carbon footprint shall cover at least 95% of the emissions from the subject.</i> | ✓ | Section 3, Table 3.1; Table 3.3 |
| | g) <i>Where a single source contributes more than 50% of the total emissions, the 95% threshold applies to the remaining sources of emissions.</i> | ✓ | Section 3, Table 3.1; Table 3.3 |
| | h) <i>Any exclusion and the reason for that exclusion shall be documented.</i> | ✓ | Table 3.3 |
| 14 | Where the subject is an organisation/ company or part thereof, ensure that: | | |
| | a) <i>Boundaries are a true and fair representation of the organisation's GHG emissions (i.e. shall include GHG emissions relating to core operations including subsidiaries owned and operated by the organisation). It will be important to ensure claims are credible – so if an entity chooses a very narrow subject and excludes its carbon intensive activities or it if outsources its carbon intensive activities, then this needs to be documented.</i> | N/A | |
| | b) <i>Either the equity share or control approach has been used to define which GHG emissions are included. Under the equity share approach, the entity accounts for GHG emissions from the subject according to its share of equity in the subject. Under the control approach, the entity shall account for 100% of the GHG emissions over which it has financial and/or operational control.</i> | N/A | |
| 15 | Identify if the subject is part of an organisation or a specific site or location and treat as a discrete operation with its own purpose, objectives and functionality. | N/A | |
| 16 | Where the subject is a product of service, include all Scope 3 emissions <i>(as the life cycle of the product/ service needs to be taken into consideration).</i> | ✓ | Section 4.3; Table 3.3 Section 3.1 |
| 17 | Describe the actual methods used to quantify GHG emissions <i>(e.g. use of primary or secondary data)</i> , the measurement unit(s) applied, the period of application and the size of the resulting carbon footprint. <i>(The carbon footprint shall be based as far as possible on primary activity data.)</i> Where quantification is based on calculations <i>(e.g. GHG activity data multiplied by greenhouse gas emission factors or the use of mass balance/ life cycle models)</i> then GHG emissions shall be calculated using emissions factors from national <i>(Government)</i> publications. Where such factors are not available, international or industry guidelines shall be used. In all cases the sources of such data shall be identified. | ✓ | Section 4.1, Section 4.2, Section 6 |
| 18 | Provide details of, and explanation for, the exclusion of any Scope 3 emissions. | ✓ | Table 3.3 |
| 19 | Document all assumptions and calculations made in quantifying GHG emissions and in the selection or development of greenhouse gas emissions factors. <i>(Emission factors used shall be appropriate to the activity concerned and current at the time of quantification.)</i> | ✓ | Section 4.3 |
| 20 | Document your assessments of uncertainty and variability associated with defining boundaries and quantifying GHG | ✓ | Section 4.2 |

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| | emissions including the positive tolerances adopted in association with emissions estimates. <i>(The statement could take the form of a qualitative description regarding the uncertainty of the results, or a quantitative assessment of uncertainty if available (e.g. carbon footprint based on 95% of likely greenhouse gas emissions; primary sources are subject to variation over time; footprint is best estimate based on reasonable costs of evaluation)).</i> | | |
| 21 | Document Carbon Footprint Management Plan: | | |
| | <i>a) Make a statement of commitment to carbon neutrality for the defined subject.</i> | ✓ | Section 5.1 |
| | <i>b) Set timescales for achieving carbon neutrality for the defined subject.</i> | ✓ | Section 5.1 |
| | <i>c) Specify targets for GHG reduction for the defined subject appropriate to the timescale for achieving carbon neutrality including the baseline date, the first qualification date and the first application period.</i> | ✓ | Section 5.2 |
| | <i>d) Document the planned means of achieving and maintaining GHG emissions reductions including assumptions made and any justification of the techniques and measures to be employed to reduce GHG emissions.</i> | ✓ | Section 5.2 |
| | <i>e) Specify the offset strategy including an estimate of the quantity of GHG emissions to be offset, the nature of the offsets and the likely number and type of credits.</i> | ✓ | Section 6, Section 6.1 |
| 22 | Implement a process for undertaking periodic assessments of performance against the Plan and for implementing corrective action to ensure targets are achieved. The frequency of assessing performance against the Plan should be commensurate with the timescale for achieving carbon neutrality. | | Section 5.2 |
| 23 | Where the subject is a non-recurring event, such as weddings or a concert, identify ways of reducing GHG emissions to the maximum extent commensurate with enabling the event to meet its intended objectives before the event takes place and include 'post event review' to determine whether or not the expected minimisation in emissions has been achieved. | N/A | |
| 24 | Any reductions in the GHG emissions from the defined subject delivered in the three years prior to the baseline date and not otherwise considered in any GHG emissions quantification have been made in accordance with this PAS. | N/A | |
| 25 | Record the number of times that the declaration of commitment has been renewed without declaration of achievement. | N/A | |
| 26 | Specify the type of conformity assessment: | | |
| | <i>a) independent third-party certification</i> | ✓ | Section 1 |
| | <i>b) other party validation</i> | N/A | |
| | <i>c) self-validation</i> | N/A | |
| 27 | Include statements of validation where declarations of commitment to carbon neutrality are validated by a third-party certifier or second party organisations. | ✓ | Annex B |
| 28 | Date the QES and have signed by the senior representative of the entity concerned (e.g. CEO of a corporation; Divisional Director, where the subject is a division of a larger entity; the Chairman of a town council or the head of the household for a family group). | ✓ | Page 1 |

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| 29 | Make the QES publicly available and provide a reference to any freely accessible information upon which substantiation depends (e.g. via websites). | ✓ | A redacted version of the QES will be made publicly available |
| 30 | Update the QES to reflect changes and actions that could affect the validity of the declaration of commitment to carbon neutrality. | ✓ | A commitment has been made by the business to do this |

Table A.2 Checklist for QES supporting declaration of achievement of carbon neutrality

The following table has been extracted from PAS 2060:2014. It provides a checklist of information that should be included in the commitment to carbon neutrality, as well as identification of where this information is located.

| # | Item Description | Status | Section in this QES |
|---|---|--------|---------------------|
| 1 | Define standard and methodology to use to determine its GHG emissions reduction. | ✓ | Section 3.1 |
| 2 | Confirm that the methodology used was applied in accordance with its provisions and the principles set out in PAS 2060 were met. | ✓ | Section 3.1 |
| 3 | Provide justification for the selection of the methodologies chosen to quantify reductions in the carbon footprint, including all assumptions and calculations made and any assessments of uncertainty. <i>(The methodology employed to quantify reductions shall be the same as that used to quantify the original carbon footprint. Should an alternative methodology be available that would reduce uncertainty and yield more accurate, consistent and reproducible results, then this may be used provided the original carbon footprint is re-qualified to the same methodology, for comparison purposes. Recalculated carbon footprints shall use the most recently available emission factors, ensuring that for purposes of comparison with the original calculation, any change in the factors used is considered.)</i> | ✓ | Section 3.1 |
| 4 | Describe the means by which reductions have been achieved and any applicable assumptions or justifications. | ✓ | Section 5.2 |
| 5 | Ensure that there has been no change to the definition of the subject. <i>(The entity shall ensure that the definition of the subject remains unchanged through each stage of the methodology. If material change to the subject occurs, the sequence shall be re-started based on a newly defined subject.)</i> | ✓ | Section 2.3 |
| 6 | Describe the actual reductions achieved in absolute and intensity terms and as a percentage of the original carbon footprint. <i>(Quantified GHG emissions reductions shall be expressed in absolute terms and shall relate to the application period selected and/or shall be expressed in emission intensity terms (e.g. per specified unit of product or instance of service).)</i> | ✓ | Section 3.2 |
| 7 | State the baseline/ qualification date. | ✓ | Section 2.2 |
| 8 | Record the percentage economic growth rate for the given application period used as a threshold for recognising reductions in intensity terms. | ✓ | Section 3.2 |
| 9 | Provide an explanation for circumstances where a GHG reduction in intensity terms is accompanied by an increase in absolute terms for the determined subject. | ✓ | Section 3.2 |

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| 10 | Select and document the standard and methodology used to achieve carbon offset. | ✓ | Section 6 |
| 11 | Confirm that: | | |
| | a) Offsets purchased or allowance credits surrendered represent genuine, additional GHG emission reductions elsewhere | ✓ | Section 6 |
| | b) Projects involved in delivering offsets meet the criteria of <i>additionality, permanence, leakage and double counting</i> . (See WRI Greenhouse Gas Protocol for definitions of <i>additionality, permanence, leakage and double counting</i> .) | ✓ | Section 6 |
| | c) Carbon offsets are verified by an independent third-party verifier | ✓ | Section 6 |
| | d) Credits from carbon offset projects are only issued after the emission reduction has taken place | ✓ | Section 6 |
| | e) Credits from carbon offset projects are retired within 12 months from the date of the declaration of achievement | ✓ | Section 6 |
| | f) Credits from carbon offset projects are supported by publicly available project documentation on a registry which shall provide information about the offset project, quantification methodology and validation and verification procedures | ✓ | Section 6; Table 6.2 |
| | g) Credits from carbon offset projects are stored and retired in an independent and credible registry | ✓ | Section 6; Table 6.2 |
| 12 | Document the quantity of GHG emissions offset and the type and nature of offsets purchased including the number and type of credits used and the time period over which credits were generated including: | ✓ | Section 6; Table 6.1 & Table 6.2 |
| | a) Which GHG emissions have been offset | ✓ | Section 6; Table 6.1 & 6.2 |
| | b) The actual amount of carbon offset | ✓ | Section 6; Table 6.1 & 6.2 |
| | c) The type of offset and projects involved | ✓ | Section 6; Table 6.2 |
| | d) The number and type of carbon offset credits used and the time period over which the credits have been generated | ✓ | Section 6; Table 6.2 |
| | e) Information regarding the retirement/ cancellation of carbon offset credits to prevent their use by others including a link to the registry where the offset has been retired. | ✓ | Section 6 |
| 13 | Specify the type of conformity assessment: | | |
| | a) independent third-party certification | ✓ | Section 1 |
| | b) other party validation | N/A | |
| | c) self-validation | N/A | |
| 14 | Include statements of validation where declarations of achievement of carbon neutrality are validated by a third-party certifier or second party organisations. | ✓ | Annex B |
| 15 | Date the QES and have it signed by the senior representative of the entity concerned (e.g. CEO of a corporation; Divisional Director, where the subject is a division of a larger entity; the Chairman of a town council or the head of the household for a family group). | ✓ | Section 1 |
| 16 | Make the QES publicly available and provide a reference to any freely accessible information upon which substantiation depends (e.g. via websites). | ✓ | Section 1; A redacted version of the QES will be made publicly available. |

Independent Limited Assurance Report to the Management of Castrol (U.K.) Limited

Castrol (U.K.) Ltd ("Castrol") commissioned DNV GL Business Assurance Services UK Limited ("DNV GL", "us" or "we") to conduct a limited assurance engagement over the declaration of carbon neutrality in the **Qualifying Explanatory Statement** (the "Report") for the **Castrol Professional engine oils** made by **Castrol** for the achievement period ending 31 March 2020.



Our Conclusion: Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that causes us to believe that the Report is not fairly stated and has not been prepared, in all material respects, in accordance with the Criteria. This conclusion relates only to the Report, and is to be read in the context of this Independent Limited Assurance Report, in particular the inherent limitations explained below.

Scope of work

The scope and boundary of our work is restricted to assessing that Castrol's preparation of the declaration of carbon neutrality presented in the Report, is in accordance with the Publicly Available Specification for the PAS 2060:2014 Demonstration of Carbon Neutrality (the "Criteria").

The products included within the **Castrol Professional engine oils** are: Castrol EDGE Professional; Castrol MAGNATEC Professional; and Castrol GTX Professional.

We have not performed any work, and do not express any conclusion, on any other information that may be published outside of the Report and/or on Castrol's websites for the current reporting period or for previous periods. Our work also excluded assessing the reliability of the inputs of the carbon footprint model.

Basis of our conclusion

We are required to plan and perform our work in order to consider the risk of material misstatement of the Report; our work included, but was not restricted to:

- Conducting interviews with Castrol's management to obtain an understanding of the key processes, systems and controls in place to generate and produce the content of the Report;
- Conducting interviews with the third party in charge of maintaining and updating the carbon footprint model, used in the production of the Report;
- Assessing whether the standards and methodologies used in the carbon footprint model met the Criteria;
- Performing limited substantive testing of the carbon footprint model to check that its data and underlying assumptions had been appropriately measured, recorded and reported; and
- Reviewing that the evidence, calculations and the context provided in the Report is prepared in line with the Criteria.

Our competence, independence and quality control

DNV GL's policies and procedures are designed to ensure that DNV GL, its personnel and others where applicable, are subject to independence requirements (including personnel of other entities of DNV GL) and maintain independence where necessary by relevant ethical requirements. This engagement was carried out by an independent team of sustainability assurance professionals. DNV GL holds other contracts with Castrol, none of which conflict with the scope of this work. Our multi-disciplinary team consisted of professionals with a combination of environmental and sustainability assurance experience.

Inherent limitations

All assurance engagements are subject to inherent limitations as selective testing (sampling) may not detect errors, fraud or other irregularities. Non-financial data may be subject to greater inherent uncertainty than financial data, given the nature and methods used for calculating, estimating and determining such data. The selection of different, but acceptable, measurement techniques may result in different quantifications between different entities. Our assurance relies on the premise that the data and information provided to us by Castrol have been provided in good faith. DNV GL expressly disclaims any liability or co-responsibility for any decision a person or an entity may make based on this Independent Limited Assurance Report.

Standard and level of assurance

We performed a **limited** assurance engagement in accordance with the International Standard on Assurance Engagements (ISAE) 3000 revised – ‘Assurance Engagements other than Audits and Reviews of Historical Financial Information’ (revised), issued by the International Auditing and Assurance Standards Board. This standard requires that we comply with ethical requirements and plan and perform the assurance engagement to obtain limited assurance.

DNV GL applies its own management standards and compliance policies for quality control, in accordance with ISO/IEC 17021:2015 - Conformity Assessment Requirements for bodies providing audit and certification of management systems, and accordingly maintains a comprehensive system of quality control including *documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.*

The procedures performed in a limited assurance engagement vary in nature and timing from, and are less in extent than for, a reasonable assurance engagement; and the level of assurance obtained is substantially lower than the assurance that would have been obtained had a reasonable assurance engagement been performed. We planned and performed our work to obtain the evidence we considered sufficient to provide a basis for our opinion, so that the risk of this conclusion being in error is reduced but not reduced to very low.

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DNV GL Business Assurance Services UK Limited

London, UK
12 February 2021



Responsibilities of Castrol's Management and DNV GL

The Management of Castrol have sole responsibility for:

- Preparing and presenting the Report in accordance with the Criteria;
- Designing, implementing and maintaining effective internal controls over the information and data, resulting in the preparation of the Report that is free from material misstatements;
- Measuring and reporting the Report's data based on the established Criteria; and
- Contents and statements contained within the Report.

Our responsibility is to plan and perform our work to obtain limited assurance about whether the Report has been prepared in accordance with the Criteria and to report to Castrol in the form of an Independent Limited Assurance Conclusion, based on the work performed and the evidence obtained. We have not been responsible for the preparation of the Report.

DNV GL Business Assurance

DNV GL Business Assurance Services UK Limited is part of DNV GL – Business Assurance, a global provider of certification, verification, assessment and training services, helping customers to build sustainable business performance.

www.dnvgl.co.uk/BetterAssurance

Annex C Included GHG Emissions

Table C.1 Global warming potential (GWP) values relative to CO₂

The following table includes the 100-year time horizon global warming potentials (GWP) relative to CO₂, which have been used for the carbon footprint assessment of the subject. This table is adapted from the IPCC Fifth Assessment Report, 2014 (AR5). For more information, please see the IPCC website (www.ipcc.ch).

| Industrial designation or common name | Chemical formula | GWP values for 100-year time horizon Fifth Assessment Report (AR5) | |
|---|---|---|-------------------------------|
| Carbon dioxide | CO ₂ | 1 | kg CO ₂ -eq per kg |
| Methane | CH ₄ | 28 | kg CO ₂ -eq per kg |
| Nitrous oxide | N ₂ O | 165 | kg CO ₂ -eq per kg |
| Substances controlled by the Montreal Protocol | | | |
| CFC-11 | CCl ₃ F | 4,660 | kg CO ₂ -eq per kg |
| CFC-12 | CCl ₂ F ₂ | 10,200 | kg CO ₂ -eq per kg |
| CFC-13 | CClF ₃ | 13,900 | kg CO ₂ -eq per kg |
| CFC-113 | CCl ₂ FCClF ₂ | 5,820 | kg CO ₂ -eq per kg |
| CFC-114 | CClF ₂ CClF ₂ | 8,590 | kg CO ₂ -eq per kg |
| CFC-115 | CClF ₂ CF ₃ | 7,670 | kg CO ₂ -eq per kg |
| Halon-1301 | CBrF ₃ | 6,290 | kg CO ₂ -eq per kg |
| Halon-1211 | CBrClF ₂ | 1,750 | kg CO ₂ -eq per kg |
| Halon-2402 | CBrF ₂ CBrF ₂ | 1,470 | kg CO ₂ -eq per kg |
| Carbon tetrachloride | CCl ₄ | 1,730 | kg CO ₂ -eq per kg |
| Methyl bromide | CH ₃ Br | 2 | kg CO ₂ -eq per kg |
| Methyl chloroform | CH ₃ CCl ₃ | 160 | kg CO ₂ -eq per kg |
| HCFC-21 | CHCl ₂ F | 148 | kg CO ₂ -eq per kg |
| HCFC-22 | CHClF ₂ | 1,760 | kg CO ₂ -eq per kg |
| HCFC-123 | CHCl ₂ CF ₃ | 79 | kg CO ₂ -eq per kg |
| HCFC-124 | CHClFCF ₃ | 527 | kg CO ₂ -eq per kg |
| HCFC-141b | CH ₂ CCl ₂ F | 782 | kg CO ₂ -eq per kg |
| HCFC-142b | CH ₂ CClF ₂ | 1,980 | kg CO ₂ -eq per kg |
| HCFC-225ca | CHCl ₂ CF ₂ CF ₃ | 127 | kg CO ₂ -eq per kg |
| HCFC-225cb | CHClFCF ₂ CClF ₂ | 525 | kg CO ₂ -eq per kg |
| Hydrofluorocarbons (HFCs) | | | |
| HFC-23 | CHF ₃ | 12,400 | kg CO ₂ -eq per kg |
| HFC-32 | CH ₂ F ₂ | 677 | kg CO ₂ -eq per kg |
| HFC-41 | CH ₃ F ₂ | 116 | kg CO ₂ -eq per kg |
| HFC-125 | CHF ₂ CF ₃ | 3,170 | kg CO ₂ -eq per kg |
| HFC-134 | CHF ₂ CHF ₂ | 1,120 | kg CO ₂ -eq per kg |
| HFC-134a | CH ₂ FCF ₃ | 1,300 | kg CO ₂ -eq per kg |
| HFC-143 | CH ₂ FCHF ₂ | 328 | kg CO ₂ -eq per kg |
| HFC-143a | CH ₃ CF ₃ | 4,800 | kg CO ₂ -eq per kg |
| HFC-152 | CH ₂ FCH ₂ F | 16 | kg CO ₂ -eq per kg |
| HFC-152a | CH ₃ CHF ₂ | 138 | kg CO ₂ -eq per kg |
| HFC-161 | CH ₃ CH ₂ F | 4 | kg CO ₂ -eq per kg |
| HFC-227ea | CF ₃ CHFCF ₃ | 3,350 | kg CO ₂ -eq per kg |
| HFC-236cb | CH ₂ FCF ₂ CF ₃ | 1,210 | kg CO ₂ -eq per kg |
| HFC-236ea | CHF ₂ CHFCF ₃ | 1,330 | kg CO ₂ -eq per kg |
| HFC-236fa | CF ₃ CH ₂ CF ₃ | 8,060 | kg CO ₂ -eq per kg |
| HFC-245ca | CH ₂ FCF ₂ CHF ₂ | 716 | kg CO ₂ -eq per kg |
| HFC-245fa | CHF ₂ CH ₂ CF ₃ | 858 | kg CO ₂ -eq per kg |
| HFC-365mfc | CH ₃ CF ₂ CH ₂ CF ₃ | 804 | kg CO ₂ -eq per kg |
| HFC-43-10mee | CF ₃ CHFCF ₂ CF ₃ | 1,650 | kg CO ₂ -eq per kg |
| Perfluorinated compounds | | | |
| Sulphur hexafluoride | SF ₆ | 23,500 | kg CO ₂ -eq per kg |
| Nitrogen trifluoride | NF ₃ | 16,100 | kg CO ₂ -eq per kg |

| | | | |
|--|--|--------|-------------------------------|
| PFC-14 | CF ₄ | 6,630 | kg CO ₂ -eq per kg |
| PFC-116 | C ₂ F ₆ | 11,100 | kg CO ₂ -eq per kg |
| PFC-218 | C ₃ F ₈ | 8,900 | kg CO ₂ -eq per kg |
| PFC-318 | c-C ₄ F ₈ | 9,540 | kg CO ₂ -eq per kg |
| PFC-31-10 | C ₄ F ₁₀ | 9,200 | kg CO ₂ -eq per kg |
| PFC-41-12 | C ₅ F ₁₂ | 8,550 | kg CO ₂ -eq per kg |
| PFC-51-14 | C ₆ F ₁₄ | 7,910 | kg CO ₂ -eq per kg |
| PCF-91-18 | C ₁₀ F ₁₈ | 7,190 | kg CO ₂ -eq per kg |
| Trifluoromethyl sulphur pentafluoride | SF ₅ CF ₃ | 17,400 | kg CO ₂ -eq per kg |
| Perfluorocyclopropane | c-C ₃ F ₆ | 9,200 | kg CO ₂ -eq per kg |
| Fluorinated ethers | | | |
| HFE-125 | CHF ₂ OCF ₃ | 12,400 | kg CO ₂ -eq per kg |
| HFE-134 | CHF ₂ OCHF ₂ | 5,560 | kg CO ₂ -eq per kg |
| HFE-143a | CH ₃ OCF ₃ | 523 | kg CO ₂ -eq per kg |
| HCFE-235da2 | CHF ₂ OCF ₂ CF ₃ | 491 | kg CO ₂ -eq per kg |
| HFE-245cb2 | CH ₃ OCF ₂ CF ₃ | 645 | kg CO ₂ -eq per kg |
| HFE-245fa2 | CHF ₂ OCH ₂ CF ₃ | 812 | kg CO ₂ -eq per kg |
| HFE-347mcc3 | CH ₃ OCF ₂ CF ₂ CF ₃ | 530 | kg CO ₂ -eq per kg |
| HFE-347pcf2 | CHF ₂ CF ₂ OCH ₂ CF ₃ | 889 | kg CO ₂ -eq per kg |
| HFE-356pcc3 | CH ₃ OCF ₂ CF ₂ CHF ₂ | 413 | kg CO ₂ -eq per kg |
| HFE-449sl (HFE-7100) | C ₄ F ₉ OCH ₃ | 421 | kg CO ₂ -eq per kg |
| HFE-569sf2 (HFE-7200) | C ₄ F ₉ OC ₂ H ₅ | 57 | kg CO ₂ -eq per kg |
| HFE-43-10pccc124 (H-Galden 1040x) | CHF ₂ OCF ₂ OC ₂ F ₄ OCHF ₂ | 2,820 | kg CO ₂ -eq per kg |
| HFE-234ca12 (HG-10) | CHF ₂ OCF ₂ OCHF ₂ | 5,350 | kg CO ₂ -eq per kg |
| HFE-338pcc13 (HG-01) | CHF ₂ OCF ₂ CF ₂ OCHF ₂ | 2,910 | kg CO ₂ -eq per kg |
| HFE-227ea | CF ₃ CHFOCF ₃ | 6,450 | kg CO ₂ -eq per kg |
| HFE-236ea2 | CHF ₂ OCHF ₂ CF ₃ | 1,790 | kg CO ₂ -eq per kg |
| HFE-236fa | CF ₃ CH ₂ OCF ₃ | 979 | kg CO ₂ -eq per kg |
| HFE-245fa1 | CHF ₂ CH ₂ OCF ₃ | 828 | kg CO ₂ -eq per kg |
| HFE-263fb2 | CF ₃ CH ₂ OCH ₃ | 1 | kg CO ₂ -eq per kg |
| HFE-329mcc2 | CHF ₂ CF ₂ OCF ₂ CF ₃ | 3,070 | kg CO ₂ -eq per kg |
| HFE-338mcf2 | CF ₃ CH ₂ OCF ₂ CF ₃ | 929 | kg CO ₂ -eq per kg |
| HFE-347mcf2 | CHF ₂ CH ₂ OCF ₂ CF ₃ | 854 | kg CO ₂ -eq per kg |
| HFE-356mec3 | CH ₃ OCF ₂ CHFCF ₃ | 387 | kg CO ₂ -eq per kg |
| HFE-356pcf2 | CHF ₂ CH ₂ OCF ₂ CHF ₂ | 719 | kg CO ₂ -eq per kg |
| HFE-356pcf3 | CHF ₂ OCH ₂ CF ₂ CHF ₂ | 446 | kg CO ₂ -eq per kg |
| HFE-365mcf3 | CF ₃ CF ₂ CH ₂ OCH ₃ | <1 | kg CO ₂ -eq per kg |
| HFE-374pc2 | CHF ₂ CF ₂ OCH ₂ CH ₃ | 627 | kg CO ₂ -eq per kg |
| Perfluoropolyethers | | | |
| PFPME | CF ₃ OCF(CF ₃)CF ₂ OCF ₂ OCF ₃ | 9,710 | kg CO ₂ -eq per kg |
| Hydrocarbons and other compounds – direct effects | | | |
| Chloroform | CHCl ₃ | 16 | kg CO ₂ -eq per kg |
| Methylene chloride | CH ₂ Cl ₂ | 9 | kg CO ₂ -eq per kg |
| Methyl chloride | CH ₃ Cl | 12 | kg CO ₂ -eq per kg |
| Halon-1201 | CHBrF ₂ | 376 | kg CO ₂ -eq per kg |