concawe
ENVIRONMENTAL SCIENCE FOR THE EUROPEAN REFINING INDUSTRY

Handbook

Specific Consumer Exposure Determinants (SCEDs) & Supporting Explanation

December 2017

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ENVIRONMENTAL SCIENCE FOR THE EUROPEAN REFINING INDUSTRY

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Prepared by the Exposure Assessment Special Task Force (STF-29)

of the Concawe Health Management Group

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Brussels
December 2017

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Contents

Concawe_SCED_13_1_a_v2.1: Fuels, Liquid, Automotive refuelling (gasoline)

Products/activities covered by the SCED:
Filling motor vehicle outdoors with a full tank of fuel every week
Applicability of the SCED (depending on substances properties):
Determinant values refer to gasoline as the fuel

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	*Fuels, Liquid: Automotive refuelling (gasoline)*
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_1_a_v2.1
Code of other related SCED	Concawe_SCED_13_2_a_v2.1 Concawe_SCED_13_3_a_v2.1
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Liquids
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	52
Rationale	Once/week; consistent with the 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1).
Dermal Specific Parameters	
Exposure via dermal route	Yes
Rationale	
Skin Contact Area	Palm of one hand
Rationale	Only one hand holds the fuel nozzle when refuelling
Dermal transfer factor	0.002
Rationale	Estimated conservative value for gasoline. This value is greater (more conservative) than the 75th percentile of 0.00005 for hand contamination during pouring from a pesticide container
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No

Exposure Descriptor or Determinant	Value
Amount of Product used per application (g/event)	37500
Rationale	Based on 50 L fuel dispensed and density of 750 g/L. Value is consistent with reported refuelling amounts: 90th percentile of 53 L and average of 30 L
Exposure Time per event (hr)	0.05
Rationale	Consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1 min.
Inhalation transfer factor	0.002
Rationale	Measured evaporative losses of 4 – 10.4 g VOC emitted per gallon of gasoline during vehicle refuelling converts to an inhalation transfer factor of 0.001 – 0.004 for automobiles without vapour capture systems. EU laws mandate vapour capture and applying the recovery system default value of 98% efficiency to this data gives an estimated emission of 0.0001-0.0003 weight fraction
Place of use	Outdoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_1_a_v2.1: Supporting Explanation

Self-service customers can be exposed to gasoline through inhalation from vapour evaporation or vapour displacement (from the fuel tank) or dermal contact from spillage when they are refuelling their cars or similar vehicles. Specific changes to the TRA defaults to better represent the scenario in reality while maintaining a conservative exposure prediction included the increase of the product ingredient and use amount from ECETOC TRA defaults and assumptions of weekly fuelling a full tank in a location designed to be conservative for an outdoor scenario. Use of a vapour recovery system at the pump can be expected to further reduce the exposure concentration. The inhalation prediction from TRA v3 based on the parameter values above (728 mg/m^3) is greater than the airborne concentration measurements of 113 mg/m3 as a typical value and 531 mg/m^3 as a reasonable worst case value [4], indicating the conservativeness of the auto-refuelling scenario as a whole.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility		Typically 69000 Pa at 34 °C (source product and SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for fuel – liquids [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.14	Once/week; consistent with the 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1) in a recent survey [2]. These data suggest lower values than the TRA default of 1 (daily refuelling) [1]
Dermal Specific Parameters		
Skin Contact Area (cm^2)	210	Palm of one hand as only one hand holds the fuel nozzle. Based on a recent survey, 90% of respondents indicated that on no occasion or only sometimes did they have skin contact during refuelling [2]. These observations suggest a lower value than the TRA default of 857.5 cm^2 [1]. Consumer simulations (visualisation techniques) of the use suggest actual contact area likely to be less than 50 cm^2 [11].
Dermal Transfer Factor**	0.002	Estimated conservative value for gasoline. This value is greater (more conservative) than the 75th percentile of 0.00005 for hand contamination during pouring from a pesticide container [3]. Estimated values supported by consumer simulations of the use [11] where a factor of <0.00001 was calculated for diesel fuel (that might be expected to be associated with higher dermal exposures as a consequence of its lower volatility).
Inhalation Specific Parameters		
Amount of Product used per application (g)	37500	Based on 50 L and density of 750 g/L. Value is consistent with reported refuelling amounts: 90th percentile of 53 L and average of 30 L [2] and 6-60 L [4] and 3.6-85.1 L [5]. This value is increased from the TRA default of 5000 g [1].

Exposure Descriptor or Determinant	Value	Rationale
Exposure Time (hr)	0.05	Set it to be greater than the 97th percentile value for refuelling time [5]. Generally consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1 min [4] and self-recall survey estimates based upon 2 min ranges indicating refuelling time 7 min (90th percentiles) and 4 min (average) [2]. These observations indicate a value lower than the TRA default of 4 hr [1].
Is product used outdoors only?	Yes	Service station
Room Volume (m^3)	100	100 m^3 used as a conservative default volume for an outdoors scenario [1, 6].
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	2.5	TRA [1] and RIVM [6] default for outdoor scenario.
Inhalation transfer factor (fraction of total amount handled lost to air)	0.002	Evaporative losses during refuelling are expected to be <0.002: measured emissions of 4 – 10.4g VOC emitted per gallon of gasoline during vehicle refuelling converts to an inhalation factor of 0.001 – 0.004 for automobiles without vapour recovery systems [7] and applying the recovery system default value of 98% efficiency [8] to this data gives an estimated emission of 0.0001-0.0003 weight fraction; loss from refuelling without vapour recovery system was <0.002 at 25°C [9]; refuelling loss of about 0.0027 was indicated [10].

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

1. ECETOC (2014) ECETOC Targeted Risk Assessment (TRA) Tool, version3.1. Brussels: European Centre for Ecotoxicology and Toxicology of Chemicals (available at: http://www.ecetoc.org/tra)

2. CONCAWE (2014) Use of motor fuels and lubricants: habits and practices of consumers in Europe. Report No. 4/14. Brussels: CONCAWE

3. HSE (2008) Pesticide containers: guidance on operator exposure considerations. London: Health and Safety Executive (http://www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/P/packaging-guidance.pdf)

4. Hakkola, M.A. and Saarinen, L.H. (2000) Customer exposure to gasoline vapors during refueling at service stations. *Applied Occupational and Environmental Hygiene 15, 677-680*

5. Vainiotalo, S. et al (1999) Customer exposure to MTBE, TAME, C6 Alkyl methyl ethers, and benzene during gasoline refueling. *Environ Health Perspect 107, 2, 133-140*

6. Bremmer, H. et al (2006) Limiting conditions and reliability, ventilation, room size, body surface area. General fact sheet. Updated version for ConsExpo 4. RIVM report 320104002. Bilthoven: National Institute for Public Health and the Environment

7. Quigley, C.J. (2007) Refueling and evaporative emissions of volatile organic compounds from gasoline powered motor vehicles. Dissertation. The University of Texas at Austin. Civil Engineering. Ann Arbor, MI: ProQuest

8. EPA (2003) Frequently Asked Questions on Mobile6. Document EPA420-B-03-013, page 36. Washington DC: US Environmental Protection Agency - available from www.epa.gov/otaq/models/mobile6/420b03013.pdf

9. Wongwises, S. et al (1997) Displacement losses from the refuelling operation of passenger cars. *Thammasat* Int. J. Dc. Tech *2, 1, 22-29*

10. Tanaka, H. et al (2008) Effects of ethanol or ETBE blending in gasoline on evaporative emissions. *Transaction of society of automotive engineers of Japan 39, 2, 135*

11. Galea K. et al (2013) Determination of the potential for dermal exposure from transfer of lubricants and fuels by consumers. IOM report TM/13/03. Edinburgh: Institute of Occupational Medicine. (available at http://www.iom-world.org/media/106928/iom_tm1303.pdf)

Concawe_SCED_13_2_a_v2.1: Fuels, Liquefied gas, Automotive refuelling

Products/activities covered by the SCED:
Filling motor vehicle outdoors with a full tank of fuel every week
Applicability of the SCED (depending on substances properties):
Determinant values refer to Liquefied Petroleum Gas (LPG) as the fuel; an assessment for liquids should be carried out.

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	*Fuels, Liquefied gas, Automotive refuelling*
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_2_a_v2.1
Code of other related SCED	Concawe_SCED_13_1_a_v2.1 Concawe_SCED_13_3_a_v2.1
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Gas
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	52
Rationale	Once/week; consistent with the 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1).
Dermal Specific Parameters	
Exposure via dermal route	No
Rationale	Substance is a gas. If dermal contact occurs then it will result in cold burns.
Skin Contact Area	N/a
Rationale	
Dermal transfer factor	N/a
Rationale	
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No

Exposure Descriptor or Determinant	Value
Amount of Product used per application (g/event)	43000
Rationale	Based LPG vehicle tank filled with 80 L LPG and LPG density of 533 g/L
Exposure Time per event (hr)	0.05
Rationale	Consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1 min.
Inhalation transfer factor	0.0005
Rationale	LPG refuelling is via a contained self-sealing nozzle due to flammability considerations. Hence, leakage on nozzle insertion and withdrawal is very low.
Place of use	Outdoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_2_a_v2.1: Supporting Explanation

Self-service customers can be exposed to LPG through inhalation from vapour evaporation when they are refuelling their cars or similar vehicles. Dermal exposure is not likely to be significant given restrictive dispensing conditions due to flammability considerations. Specific changes to the TRA defaults to better represent the scenario in reality while maintaining a conservative exposure prediction included the increase of the product ingredient and use amount from ECETOC TRA defaults, and assumptions of weekly fuelling of a full tank in an indoor location designed to be conservative for an outdoor scenario.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility		Typically >133000 Pa at 20 ˚C (source product SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for fuel [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.14	Once/week; consistent with the 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1) in a recent survey [2]. These data suggest lower values than the TRA default of 1 (daily refuelling) [1]
Dermal Specific Parameters		
Skin Contact Area (cm^2)	N/a	Substance is a gas. If dermal contact occurs then it will result in cold burns.
Dermal Transfer Factor**	N/a	
Inhalation Specific Parameters		
Amount of Product used per application (g)	43000	Based on 100 L LPG vehicle tank filled with 80 L LPG to allow 20% expansion. LPG density of 533 g/L (tank size ranges from 46 L to 95 L, generally <100 L [3]). This is an increase over the TRA default of 5000 g [1]
Exposure Time (hr)	0.05	Set it to be greater than the 97th percentile value for refuelling time [5]. Generally consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1min [4] and self-recall survey estimates based upon 2 min ranges indicating refuelling time 7 min (90th percentiles) and 4 min (average) [2]. These observations indicate a value lower than the TRA default of 4 hr [1].
Is product used outdoors only?	Yes	Service station
Room Volume (m^3)	100	100 m^3 used as a conservative default volume for an outdoors scenario [1, 6].
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	2.5	TRA [1] and RIVM [6] default for outdoor scenario.

Exposure Descriptor or Determinant	Value	Rationale
Inhalation transfer factor (fraction of total amount handled lost to air)	0.0005	LPG refuelling is via a contained self-sealing nozzle due to flammability considerations. Hence, leakage on nozzle insertion and withdrawal is very low. The factor utilized is intended to be conservative, and is greater than that estimated from US Federal Transit Administration [7] emission limits of 0.15 g/gallon of LPG dispensed (<0.0001).

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

1. ECETOC (2014) ECETOC Targeted Risk Assessment (TRA) Tool, version3.1. Brussels: European Centre for Ecotoxicology and Toxicology of Chemicals (available at: http://www.ecetoc.org/tra)

2. CONCAWE (2014) Use of motor fuels and lubricants: habits and practices of consumers in Europe. Report No. 4/14. Brussels: CONCAWE

3. LPG tank size for vehicle in Europe. Available at: http://www.tinleytech.co.uk/sizes.html

4. Vainiotalo, S. et al (1999) Customer exposure to MTBE, TAME, C6 Alkyl methyl ethers, and benzene during gasoline refueling. *Environ Health Perspect 107, 2, 133-140*

5. Hakkola, M.A. and Saarinen, L.H. (2000) Customer exposure to gasoline vapors during refueling at service stations. *Applied Occupational and Environmental Hygiene 15, 677-680*

6. Bremmer, H. et al (2006) Limiting conditions and reliability, ventilation, room size, body surface area. General fact sheet. Updated version for ConsExpo 4. RIVM report 320104002. Bilthoven: National Institute for Public Health and the Environment

7. Jenks C.W. (1998) Technology assessment of refueling-connection devices for CNG, LNG, and Propane: Transportation Research Board, National Research Council. Washington DC: Transit Cooperative Research Program

Concawe_SCED_13_3_a_v2.1: Fuels, Liquid, Automotive refuelling (diesel)

Products/activities covered by the SCED:
Filling motor vehicle outdoors with a full tank of fuel every week
Applicability of the SCED (depending on substances properties):
Determinant values refer to gasoil (diesel) as the fuel

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	*Fuels, Liquid: Automotive refuelling (diesel)*
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_3_a_v2.1
Code of other related SCED	Concawe_SCED_13_1_a_v2.1 Concawe_SCED_13_2_a_v2.1
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Liquids
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	52
Rationale	Once/week; consistent with the 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1).
Dermal Specific Parameters	
Exposure via dermal route	Yes
Rationale	
Skin Contact Area	Palm of one hand
Rationale	Only one hand holds the fuel nozzle when re-fuelling
Dermal transfer factor	0.005
Rationale	This value is greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin when refuelling cars with diesel.
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No

Exposure Descriptor or Determinant	Value
Amount of Product used per application (g/event)	44000
Rationale	Based on 50 L fuel dispensed and density of 880 g/L. Value is consistent with reported refuelling amounts: 90th percentile of 53 L and average of 30 L.
Exposure Time per event (hr)	0.05
Rationale	Consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1 min.
Inhalation transfer factor	0.002
Rationale	Refuelling via contained nozzle. Leakage on nozzle insertion and withdrawal is expected to be very low. As diesel fuel has a higher boiling point and let much lower vapour pressure than gasoline, emissions are expected to be much less significant than those for gasoline.
Place of use	Outdoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_3_a_v2.1: Supporting Explanation

Self-service customers can be exposed to gas oils primarily through dermal contact from spillage when they are refuelling their cars or similar vehicles, although inhalation from vapour evaporation or vapour displacement (from the fuel tank) can also occur. Specific changes to the TRA defaults to better represent the scenario in reality while maintaining a conservative exposure prediction included the increase of the product ingredient and use amount from ECETOC TRA defaults and assumptions of weekly fuelling a full tank in a location designed to be conservative for an outdoor scenario.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility		Typically 300 Pa at 20 °C (source product SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for fuel – liquids [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.14	Once/week; consistent with the 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1) in a recent survey [2]. These data suggest lower values than the TRA default of 1 (daily refuelling) [1]
Dermal Specific Parameters		
Skin Contact Area (cm^2)	210	Palm of one hand as only one hand holds the fuel nozzle. Based on a recent survey, 90% of respondents indicated that on no occasion or only sometimes did they have skin contact during refuelling [2]. These observations suggest a lower value than the TRA default of 857.5 cm^2 [1]. Consumer simulations (visualisation techniques) of the use suggest actual contact area likely to be less than 50 cm^2 [11].
Dermal Transfer Factor**	0.005	This value is greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin [11] and the 75th percentile of 0.00005 for hand contamination during pouring from a pesticide container [3].
Inhalation Specific Parameters		
Amount of Product used per application (g)	44000	Based on 50 L and density of 880 g/L. Value is consistent with reported refuelling amounts: 90th percentile of 53 L and average of 30 L [2] and 6-60 L [4] and 3.6-85.1 L [5]. This value is increased from the TRA default of 5000 g [1].
Exposure Time (hr)	0.05	Set it to be greater than the 97th percentile value for refuelling time [5]. Generally consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1 min [4] and self-recall survey estimates based upon 2 min ranges indicating refuelling time 7 min (90th percentiles) and 4 min (average) [2]. These observations indicate a value lower than the TRA default of 4 hr [1].
Is product used outdoors only?	Yes	Service station

Exposure Descriptor or Determinant	Value	Rationale
Room Volume (m^3)	100	100 m^3 used as a conservative default volume for an outdoors scenario [1, 6].
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	2.5	TRA [1] and RIVM [6] default for outdoor scenario.
Inhalation transfer factor (fraction of total amount handled lost to air)	0.002	Refuelling via contained nozzle. Leakage on nozzle insertion and withdrawal is expected to be very low. Estimates based upon read across from gasoline indicate that evaporative losses during refuelling would be expected to be less than 0.002. Measured emissions of 4 to 10.4 g VOC emitted per gallon of gasoline during vehicle refuelling converts to an inhalation factor of 0.001-0.004 for automobiles without vapour recovery systems [7] such as with diesel vehicles. Furthermore, as diesel fuel has a higher boiling point and much lower vapour pressure than gasoline, emissions are expected to be much less significant than those for gasoline.

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

1. ECETOC (2014) ECETOC Targeted Risk Assessment (TRA) Tool, version3.1. Brussels: European Centre for Ecotoxicology and Toxicology of Chemicals (available at: http://www.ecetoc.org/tra)

2. CONCAWE (2014) Use of motor fuels and lubricants: habits and practices of consumers in Europe. Report No. 4/14. Brussels: CONCAWE

3. HSE (2008) Pesticide containers: guidance on operator exposure considerations. London: Health and Safety Executive (http://www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/P/packaging-guidance.pdf)

4. Hakkola, M.A. and Saarinen, L.H. (2000) Customer exposure to gasoline vapors during refueling at service stations. *Applied Occupational and Environmental Hygiene 15, 677-680*

5. Vainiotalo, S. et al (1999) Customer exposure to MTBE, TAME, C6 Alkyl methyl ethers, and benzene during gasoline refueling. *Environ Health Perspect 107, 2, 133-140*

6. Bremmer, H. et al (2006) Limiting conditions and reliability, ventilation, room size, body surface area. General fact sheet. Updated version for ConsExpo 4. RIVM report 320104002. Bilthoven: National Institute for Public Health and the Environment

7. Quigley, C.J. (2007) Refueling and evaporative emissions of volatile organic compounds from gasoline powered motor vehicles. Dissertation. The University of Texas at Austin. Civil Engineering. Ann Arbor, MI: ProQuest

8. EPA (2003) Frequently Asked Questions on Mobile6. Document EPA420-B-03-013, page 36. Washington DC: US Environmental Protection Agency - available from www.epa.gov/otaq/models/mobile6/420b03013.pdf

9. Wongwises, S. et al (1997) Displacement losses from the refuelling operation of passenger cars. *Thammasat* Int. J. Dc. Tech *2, 1, 22-29*

10. Tanaka, H. et al (2008) Effects of ethanol or ETBE blending in gasoline on evaporative emissions. *Transaction of society of automotive engineers of Japan 39, 2, 135*

11. Galea K. et al (2013) Determination of the potential for dermal exposure from transfer of lubricants and fuels by consumers. IOM report TM/13/03. Edinburgh: Institute of Occupational Medicine. (available at http://www.iom-world.org/media/106928/iom_tm1303.pdf)

Concawe_SCED_13_4_a_v2.1: Fuels, Liquids, Garden equipment refuelling

Products/activities covered by the SCED:
Filling lawn mower outdoors / indoors (garage) with a full tank of fuel once per week during spring and summer (6 months)
Applicability of the SCED (depending on substance's properties):
SCED data refers to gasoline

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	Lubricants, Liquids, Garden equipment refuelling
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_4_a_v2.1
Code of other related SCED	
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Liquids
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	26
Rationale	Once/two weeks: refuelling of garden machinery activity occurs mostly during spring and summer; reported frequency for (vehicle) refuelling activity throughout the year was once/week that corresponds to once/two weeks per year for garden equipment.
Dermal Specific Parameters	
Exposure via dermal route	Yes
Rationale	
Skin Contact Area	Inside of one hand/palm
Rationale	Only one hand holds the fuel nozzle when refuelling. Total area exposed less than for one hand.
Dermal transfer factor	0.001
Rationale	Estimated value for gasoline. This value is greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin when refuelling cars.

Exposure Descriptor or Determinant	Value
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No
Amount of Product used per application (g/event)	750
Rationale	Based on tank size of 1 L and substance density of 750 g/L
Exposure Time per event (hr)	0.033
Rationale	Estimated 2 min: time taken to refuel a smaller size tank should be significantly less than for the auto-refuelling exposure time of 3 min.
Inhalation transfer factor	0.03
Rationale	Estimated loss of <0.03 product used via spillage or evaporation.
Place of use	Outdoor / Indoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_4_a_v2.1: Supporting Explanation

Customers can be exposed to gasoline through inhalation from vapour evaporation/ displacement or dermal contact from spillage when they are refuelling their garden equipment (e.g. lawnmower). Specific changes to the TRA defaults to better represent the scenario in reality while maintaining a conservative exposure prediction include the increase of the product ingredient from ECETOC TRA defaults and assumptions of bi-weekly refuelling a full tank in a location designed to be conservative for an indoor scenario. Changes to the assumptions concerning dermal exposure reflect data from comparable vehicle scenarios.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility	69 KPa	At ambient (source product SDS)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for lubricants, greases, and release products – liquids [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.07	Once/two weeks, based on a recent survey data [2]. In the survey, refuelling activity of garden machinery occurred mostly during spring and summer and the reported frequency for (vehicle) refuelling activity throughout the year was once/ week, that corresponds to once/ two weeks per year for garden equipment. The survey results suggest a lower value than the TRA default of 1 [1].
Dermal Specific Parameters		
Skin Contact Area (cm^2)	210	Estimated quarter of each hand based on UV visualisation data [8], a decrease from the TRA default: 857.5 cm^2 [1].
Dermal Transfer Factor**	0.001	Estimated value for gasoline. This value is greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin when refuelling cars with diesel [8] and the 75^{th} percentile of 0.00005 for hand contamination during pouring from a pesticide container [3].The skin transfer factor should not be confused with the nature of any subsequent dermal absorption of the substance [9], which can be expected to be very low [10].
Inhalation Specific Parameters		
Amount of Product used per application (g)	750	Based on 1 L and density of 750 g/L (tank size of lawnmower is about 0.9 L [4]). Due to the smaller size of lawn and garden equipment fuel tanks, the amount is lower than the generic fuel TRA default of 5000 g [1].

Exposure Time (hr)	0.05	Estimated 2 min as it should take less time to refuel a smaller size tank than auto-refuelling. In the auto-refuelling, the exposure time (3 min) was set to be greater than the 97th percentile value for refuelling time [5], which is generally consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1 min [6] and self-recall survey estimates based upon 2 min ranges indicating refuelling time 7 min (90th percentiles) and 4 min (average) [2]. Typical refuelling practices suggest values lower than the TRA default of 4 hr [1].
Is product used outdoors only?	No	Garage. As a conservative approach, indoor use was assumed as default TRA input for use in garage. In a higher tier model, garage-specific room volume and ventilation rate may be used [7].
Room Volume (m^3)	34	Garage volume [7]. This activity is likely to take place outdoors or, if indoors, in a garage. Sufficient space for equipment and fuel container handling are also needed. The volume is increased as compared to the TRA default of 20 m^3 [1].
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	1.5	A default ventilation rate for a garage based on RIVM general factsheet [7]. The ventilation rate is increased as compared to the TRA default of 0.6 1/h [1].
Inhalation transfer factor (fraction of total amount handled lost to air)	0.03	Assumed to be less controlled than scooter refuelling (which is estimated as 0.02 for refuelling spillage and 0.002 for vapour displacement emission [6])

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

1. ECETOC (2014) ECETOC Targeted Risk Assessment (TRA) Tool, version3.1. Brussels: European Centre for Ecotoxicology and Toxicology of Chemicals (available at: http://www.ecetoc.org/tra)

2. CONCAWE (2014) Use of motor fuels and lubricants: habits and practices of consumers in Europe. Report No. 4/14. Brussels: CONCAWE

3. HSE (2008) Pesticide containers: guidance on operator exposure considerations. London: Health and Safety Executive

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Concawe_SCED_13_5_a_v2.1: Fuels, Liquid, Home space heater

Products/activities covered by the SCED:
Filling space heater indoors with fuel every day during heating season
Applicability of the SCED (depending on substances properties):
Determinant values refer to kerosene as the fuel

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	*Fuels, Liquid: Home space heater*
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_5_a_v2.1
Code of other related SCED	
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Liquids
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	180
Rationale	Daily use during heating season (6 months)
Dermal Specific Parameters	
Exposure via dermal route	Yes
Rationale	
Skin Contact Area	Palm of one hand
Rationale	Palm of only one hand expected to hold the fuel container when refuelling
Dermal transfer factor	0.001
Rationale	Estimated value. This value is greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin when refuelling cars.
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No
Amount of Product used per application (g/event)	3320

Exposure Descriptor or Determinant	Value
Rationale	Based on 4L and a density of 830 g/L (tank size of a home space heater is about 5L and the heater with a full tank of the fuel can last for 12-15hr.
Exposure Time per event (hr)	0.033
Rationale	Estimated 2 min as it should take significantly less time to refuel a smaller size tank than auto-refuelling (3 min)
Inhalation transfer factor	0.02
Rationale	It is reasonable to anticipate that only a low amount (c. 5 mL) is likely to be routinely spilled during pouring in a residence and this equates to a comparative evaporative loss of <0.02 based on equivalent gasoline values for scooters (for scooter refuelling, the emission loss is calculated to be ~0.001 for refuelling spillage and 0.002 for vapour displacement emission based on the scooter tank volume of 5 L).
Place of use	Indoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_5_a_v2.1: Supporting Explanation

Consumers can be exposed to kerosene and other home heating fuels through inhalation from vapour evaporation; vapour displacement from the fuel tank of the heating appliance; or dermal contact from spillage when they are refuelling their home space heaters. The basis for the SCED values (when compared to the TRA defaults) that better represent the scenario in reality are listed below.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility		Typically <133 Pa at 20 °C (source products SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for fuel – liquids [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	1.00	TRA default for fuel [1]. Daily use during heating season (6 months).
Dermal Specific Parameters		
Skin Contact Area (cm^2)	210	Palm of one hand as only one hand holds the refuelling container. This is lower than the TRA default of 857.5cm^2 [1].
Dermal Transfer Factor**	0.001	Estimated value. This value is greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin when refuelling cars [12] and the 75th percentile of 0.00005 for hand contamination during pouring from a pesticide container [2].
Inhalation Specific Parameters		
Amount of Product used per application (g)	3320	Based on 4 litres and a density of 830 g/L (tank size of a home space heater is about 5L and the heater with a full tank of the fuel can last for 12-15hr [3]). This is lower than the TRA default of 5000 g [1].
Exposure Time (hr)	0.03	Estimated 2 min as it should take less time to refuel a smaller size tank than auto-refuelling. In the auto-refuelling, the exposure time (3 min) was set to be greater than the 97th percentile value for refuelling time [4], which is generally consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1min [5] and self-recall survey estimates based upon 2 min ranges indicating refuelling time 7 min (90th percentiles) and 4 min (average) [6]. Typical pouring practices suggest values lower than the TRA default of 4hr [1].
Is product used outdoors only?	Yes	
Room Volume (m^3)	20	TRA default for an indoor room [1]
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	0.6	TRA default [1] for an indoor room without ventilation.

Exposure Descriptor or Determinant	Value	Rationale
Inhalation transfer factor (fraction of total amount handled lost to air)	0.02	Expect low amount (5 mL max or 0.001) spilled during pouring in a residence, evaporative loss expected to be <0.02 based on equivalent gasoline values for scooters. For scooter refuelling, 10x the gasoline value was used as a conservative estimate due to less contained transfer. The emission loss is calculated to be ~0.001 for refuelling spillage and 0.002 for vapour displacement emission based on the scooter tank volume of 5L when using fuel pump [7]. For auto refuelling, evaporative losses during refuelling are expected to be <0.002: measured emissions of 4 – 10.4g VOC emitted per gallon of gasoline during vehicle refuelling converts to an inhalation factor of 0.001 – 0.004 for automobiles without vapour recovery systems [8] and applying the recovery system default value of 98% efficiency [9] to this data gives an estimated emission of 0.0001-0.0003 weight fraction; loss from refuelling without vapour recovery system was <0.002 at 25 ˚C [10]; refuelling loss of about 0.0027 was indicated in another reference [11].

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

1. ECETOC (2014) ECETOC Targeted Risk Assessment (TRA) Tool, version3.1. Brussels: European Centre for Ecotoxicology and Toxicology of Chemicals (available at: http://www.ecetoc.org/tra)

2. HSE (2008) Pesticide containers: guidance on operator exposure considerations. London: Health and Safety Executive (http://www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/P/packaging-guidance.pdf)

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5. Hakkola, M.A. and Saarinen, L.H. (2000) Customer exposure to gasoline vapors during refueling at service stations. *Applied Occupational and Environmental Hygiene 15, 677-680*

6. CONCAWE (2014) Use of motor fuels and lubricants: habits and practices of consumers in Europe. Report No. 4/14. Brussels: CONCAWE

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11. Tanaka, H. et al (2008) Effects of ethanol or ETBE blending in gasoline on evaporative emissions. *Transaction of society of automotive engineers of Japan 39, 2, 135*

12. Galea K. et al (2013) Determination of the potential for dermal exposure from transfer of lubricants and fuels by consumers. IOM report TM/13/03. Edinburgh: Institute of Occupational Medicine. (available at http://www.iom-world.org/media/106928/iom_tm1303.pdf)

Concawe_SCED_13_6_a_v2.1: Fuels, Liquefied gas, Home space heater

Products/activities covered by the SCED:
Changing compressed gas cylinder to indoor space heater every week
Applicability of the SCED (depending on substances properties):
Determinant values refer to Liquefied Petroleum Gas (LPG) as the fuel; an assessment for liquids should be carried out.

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	*Fuels, Liquefied gas, Home space heater*
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_6_a_v2.1
Code of other related SCED	
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Gas
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	52
Rationale	Once/week
Dermal Specific Parameters	
Exposure via dermal route	No
Rationale	Substance is a gas. If dermal contact occurs then it will result in cold burns.
Skin Contact Area	N/a
Rationale	
Dermal transfer factor	N/a
Rationale	
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No
Amount of Product used per application (g/event)	15000
Rationale	Based on a typical 15 kg domestic gas cylinder
Exposure Time per event (hr)	0.017
Rationale	Estimated 1 min due to small volume being transferred. Changed from ECETOC TRA default value.

Exposure Descriptor or Determinant	Value
Inhalation transfer factor	0.0005
Rationale	Only low evaporative losses likely but percentage increased as compared to lubricant refuelling to be
Place of use	Indoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_6_a_v2.1: Supporting Explanation

Consumers can be exposed to LPG through inhalation from vapour evaporation/displacement when they are replacing the tank of a home space heater. Specific changes to the TRA defaults to better represent the scenario in reality while maintaining a conservative exposure prediction included the increase of the product ingredient from ECETOC TRA defaults and assumptions about dis/connecting the cylinder for a home space heater.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility (Pa)	>133000	at 20 °C (source product's SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for fuel – liquids [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.14	Once/week; 15 kg LPG cylinder unlikely to be changed more than weekly in a domestic setting (based on typical substance burn time of c.140 hr [5])
Dermal Specific Parameters		
Skin Contact Area (cm^2)	N/a	Substance is a gas. If dermal contact occurs then it will result in cold burns.
Dermal Transfer Factor**	N/a	
Inhalation Specific Parameters		
Amount of Product used per application (g)	15000	Based on typical domestic 15 kg cylinder. Larger cylinders are not routinely provided due to manual handling considerations (bulk, weight) [4]. This is greater than the TRA default of 5000 g [1].
Exposure Time (hr)	0.017	Estimated 1 minute as it takes much less time to swap out a gas cylinder than for liquids refuelling. In the liquids SCED, the exposure time (2 min) was set to be less than the 97th percentile value for a vehicle refuelling time [2], i.e. typical handling practices are much lower than the TRA default of 4hr [1].
Is product used outdoors only?	No	
Room Volume (m^3)	20	The TRA default is 20 m^3 [1].
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	0.6	TRA default [1] for an indoor room without ventilation.

Exposure Descriptor or Determinant	Value	Rationale
Inhalation transfer factor (fraction of total amount handled lost to air)	0.0005	LPG cylinder connection via sealed pipework due to flammability considerations. Loss of substance anticipated to be very small. Read across from the auto refuelling with LPG. For vehicles, LPG re-fuelling is via a contained self-sealing nozzle due to flammability considerations. Hence, leakage on nozzle insertion and withdrawal is very low. The factor utilizes is intended to be conservative, and is greater than that estimated from US Federal Transit Administration [3] emission limits of 0.15 g/ gallon of LPG dispensed (<0.0001).
Oral Specific Parameters		
	N/a	Oral contact cannot conceivably arise

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

1. ECETOC (2014) ECETOC Targeted Risk Assessment (TRA) Tool, version3.1. Brussels: European Centre for Ecotoxicology and Toxicology of Chemicals (available at: http://www.ecetoc.org/tra)

2. Vainiotalo, S. et al (1999) Customer exposure to MTBE, TAME, C6 Alkyl methyl ethers, and benzene during gasoline refueling. *Environ Health Perspect 107, 2, 133-140*

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Update Dec 2016; changed annual use frequency reporting format

Concawe_SCED_13_7_a_v2.1: Fuels, Liquids, Recreational vehicles (quad bikes or similar)

Products/activities covered by the SCED:
Filling tank of recreational vehicle with fuel every week outdoors
Applicability of the SCED (depending on substances properties):
Determinant values refer to gasoline as the fuel

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	*Fuels, Liquids, Recreational vehicles (quad bikes or similar)*
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_7_a_v2.1
Code of other related SCED	
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Liquid
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	52
Rationale	Once/week
Dermal Specific Parameters	
Exposure via dermal route	Yes
Rationale	
Skin Contact Area	Palm of one hand
Rationale	Only one hand holds the fuel nozzle when refuelling
Dermal transfer factor	0.01
Rationale	Estimated value. This value is much greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin when refuelling a car with diesel fuel.
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No
Amount of Product used per application (g/event)	7500
Rationale	Based on a typical 10 L fill volume

Exposure Descriptor or Determinant	Value
Exposure Time per event (hr)	0.017
Rationale	Estimated 1 min due to small volume being transferred. Changed from ECETOC TRA default value.
Inhalation transfer factor	0.01
Rationale	Assumed to be equivalent to the value applied for general gasoline transfers.
Place of use	Outdoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm^3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_7_a_v2.1: Supporting Explanation

Users of recreational vehicles (such as quad bikes or ATVs) can be exposed to gasoline through inhalation from vapour evaporation/displacement or dermal contact from spillage when they are refuelling their quad bikes or similar vehicles. Specific changes to the TRA defaults to better represent the scenario in reality while maintaining a conservative exposure prediction included the increase of the product ingredient from ECETOC TRA defaults and assumptions of weekly fuelling a full tank in a location designed to be conservative for an outdoor scenario.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility (Pa)	>69000	at 20 ºC (source product's SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for fuel – liquids [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.14	Once/week, estimated as similar to consumer auto vehicle refuel with gasoline. For auto refuelling, a 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1) was reported [2]. These data suggest lower values than the TRA default of 1 (daily refuelling) [1].
Dermal Specific Parameters		
Skin Contact Area (cm^2)	210	Palm of one hand as only one hand holds fuel container or nozzle. TRA default is 857.5 cm^2 [1].
Dermal Transfer Factor**	0.01	This value is greater (more conservative) than the factor of 0.002 that is applied when refuelling a car with gasoline at the pump but reflects that refuelling is invariably from a petrol can and hence is less controlled. This should be contrasted with the 75th percentile of 0.00005 for hand contamination during pouring from a pesticide container [4].The skin transfer factor should not be confused with the nature of any subsequent dermal absorption of the substance [9], which can be expected to be very low [10].
Inhalation Specific Parameters		
Amount of Product used per application (g)	7500	Based on 10 L fill volume and density of 750 g/L (ATV tank size is typically ~15 L [3]). The use amount has been increased from the TRA default of 5000 g [1].

Exposure Descriptor or Determinant	Value	Rationale
Exposure Time (hr)	0.03	Estimated as 2 min as it should take less time to refuel a smaller size tank than for car auto-refuelling. In the auto-refuelling, the exposure time (3 min) was set to be greater than the 97th percentile value for refuelling time [4], which is generally consistent with reported refuelling time ranging from 0.3-3.5 min, with an average of 1min [5] and self-recall survey estimates based upon 2 mins ranges indicating refuelling time 7 min (90th percentiles) and 4 min (average) [2]. These observations indicate values substantially lower than the TRA default of 4hr [1].
Is product used outdoors only?	Yes	
Room Volume (m^3)	100	100 m3 used as a conservative default volume for an outdoors scenario [1, 6].
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	2.5	TRA [1] and RIVM [6] default for outdoor scenario.
Inhalation transfer factor (fraction of total amount handled lost to air)	0.01	Assumed to be equivalent to the value applied for general gasoline transfers where the emission loss is calculated to be ~0.001 for refuelling spillage and 0.002 for vapour displacement [7].
Oral Specific Parameters		
	N/a	Direct oral contact will only arise from intentional ingestion of the product. Significant indirect contact is unlikely due to volatility of substance.

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

1. ECETOC (2014) ECETOC Targeted Risk Assessment (TRA) Tool, version3.1. Brussels: European Centre for Ecotoxicology and Toxicology of Chemicals (available at: http://www.ecetoc.org/tra)

2. CONCAWE (2014) Use of motor fuels and lubricants: habits and practices of consumers in Europe. Report No. 4/14. Brussels: CONCAWE

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Concawe_SCED_13_8_a_v2.1: Fuels, Liquid, Lamp oil

Products/activities covered by the SCED:
Filling oil lamp indoors with fuel every week
Applicability of the SCED (depending on substances properties):
Determinant values refer to foots oil as the fuel

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	*Fuels, Liquid, Lamp oil*
PC/AC descriptor	PC13
SCED code	Concawe_SCED_13_8_a_v2.1
Code of other related SCED	
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Liquids
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	52
Rationale	Once/week;
Dermal Specific Parameters	
Exposure via dermal route	Yes
Rationale	
Skin Contact Area	Palm of one hand.
Rationale	Only inside of one hand expected to hold fuel container when refuelling.
Dermal transfer factor	0.005
Rationale	Estimated conservative value based on a comparison with values available for handling lubricants where <0.001% of product is transferred to the skin.
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No
Amount of Product used per application (g/event)	255
Rationale	Based on an upper end lamp reservoir volume of 0.3 L and density of 850 g/L.
Exposure Time per event (hr)	0.017
Rationale	Estimated 1 min due to small volume being transferred. Changed from ECETOC TRA default value.

Exposure Descriptor or Determinant	Value
Inhalation transfer factor	0.05
Rationale	Only low evaporative losses likely but percentage increased as compared to lubricant refuelling.
Place of use	Indoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible.
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_13_8_a_v2.1: Supporting Explanation

Consumers can potentially be exposed to lamp oils through inhalation from vapour evaporation/displacement or dermal contact from spillage when they are refuelling their lamp. Specific changes to the TRA defaults to better represent the scenario in reality while maintaining a conservative exposure prediction included the increase of the product ingredient from ECETOC TRA defaults and assumptions of refuelling a lamp every week.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility (Pa)	5	Typically 5 Pa at 20 °C (source product's SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for fuel – liquids [2].
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.14	Once/week; consistent with the 90th percentile of 5 times per month (0.17) and average of 3.1 times per month (0.1) in a recent survey [6]. These data suggest lower values than the TRA default of 1 (daily refuelling) [2].
Dermal Specific Parameters		
Skin Contact Area (cm^2)	210	Palm of one hand as only one hand holds the refuelling container. It is less than TRA default (two hands): 857.5 cm^2 [2].
Dermal Transfer Factor**	0.005	This value is greater (more conservative) than the <0.001% of material handled that has been measured as being transferred onto the skin when filling a car engine with lubricants [5]. It should be noted that this compares with the value estimated (0.003) for a dermal scenario while changing the oil in a car in US EPA E-FAST (based on the film thickness of 0.0119 cm and surface area of 2 hands (480 cm^2), i.e. the amount contact with skin is estimated to be 5 g) [4]. Estimated based on low volatility and potential contact with incidental drips from pouring activity. These estimates have been shown to be conservative in consumer simulations of the use [5].
Inhalation Specific Parameters		
Amount of Product used per application (g)	255	Based on 0.3 L and density of 850 g/L [1, 3]. Fuel capacity ranges from 2.5 to 12 oz (≈ 0.08 to 0.39 L) based on product manufacturers [3]. The lamp with larger fuel capacity will last longer and needs to be refuelled less frequently than the one with small fuel capacity. For example, the 2.5 oz lamp can be used for 8 hr and the 12 oz lamp can be used up to 20 hr). These observations indicate a lower use.
Exposure Time (hr)	0.017	Estimated 1 min due to small volume being transferred. TRA default time is 4 hr [2].
Is product used outdoors only?	No	
Room Volume (m^3)	20	The TRA default is 20 m^3 [2].

Exposure Descriptor or Determinant	Value	Rationale
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	0.6	TRA default [2] for an indoor room without ventilation.
Inhalation transfer factor (fraction of total amount handled lost to air)	0.005	Based on its MSDS, the vapour pressure is very low and the expected loss of volatile material will be negligible from an open container. Also, the fuel transfer will not be expected to result in aerosol exposure. An inhalation factor consistent with that for diesel refuelling is therefore applied.
Oral Specific Parameters		
	N/a	Direct oral contact will only arise from intentional ingestion of the product. Significant indirect contact is unlikely.

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

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3. Oil lamp fuel capacity: http://www.delite.dk/essorensen/oil_lamps.html

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Concawe_SCED_24_1_a_v2.1: Lubricants, Liquids, Filling vehicle engine

Products/activities covered by the SCED:
Filling passenger vehicle engine outdoors / indoors (garage) with lubricant
Applicability of the SCED (depending on substances properties):
SCED data refers to the lubricating base oils (refined or synthetic)

Exposure Descriptor or Determinant	Value
SCED characteristics	
Name of the SCEDs	Lubricants, Liquids, Filling vehicle engine
PC/AC descriptor	PC24
SCED code	Concawe_SCED_24_1_a_v2.1
Code of other related SCED	
Author	Concawe
Source of SCED	http://www.concawe.org
Physical form of the product	Liquids
User characteristics	
Adult/child assumed	Covers adult use
Common parameters	
Concentration of substance in mixture (g/g)	1
Explanations	
Frequency of use over a day (event/day)	1
Rationale	Unchanged from ECETOC TRA default value
Frequency of use over a year (times/year)	4
Rationale	4 times/year; consistent with the average top up frequency for a car of once/5.7 months and the 90th percentile of once/month.
Dermal Specific Parameters	
Exposure via dermal route	Yes
Rationale	
Skin Contact Area	Inside of 2 hands
Rationale	Based on EPA estimates and the observed findings in simulation studies
Dermal transfer factor	0.001
Rationale	Based on measured data from controlled simulations indicating <0.001% of product is transferred to the skin.
Inhalation Specific Parameters	
Exposure via inhalation route	Yes
Rationale	
Spray application?	No
Amount of Product used per application (g/event)	870
Rationale	Changing 1 L, density of 868 g/L
Exposure Time per event (hr)	0.17
Rationale	About 10 min, 75th percentile value

Exposure Descriptor or Determinant	Value
Inhalation transfer factor	0.01
Rationale	Estimated loss of <0.01 product used via spillage or evaporation. Based on cited data in safety data sheets, the evaporation rate is very low at 25 °C.
Place of use	Outdoor / Indoor
Oral Specific Parameters	
Exposure via oral route	Oral exposure assumed to be negligible
Rationale	The SCED already addresses inhalation and dermal exposure routes assuming 100% systemic absorption. Oral exposure (e.g. from hand-to-mouth behaviour) is only likely to arise from incidental consumer actions. The potential contribution of oral exposure to systemic dose is therefore expected to be minimal when seen in the context of the other exposure routes.
Volume swallowed (cm3)	N/a
Rationale	
Oral transfer Factor	N/a
Rationale	

Concawe_SCED_24_1_a_v2.1: Supporting Explanation

Consumers can be exposed to lubricant base oils through inhalation from vapour (evaporation or displacement) or dermal contact from spillage when they are maintaining their vehicle engine. Direct oral contact will only arise from intentional ingestion. The Concawe SCEDs reflect the true nature of consumer exposures and both contain specific changes to the TRA defaults to better represent the scenario in reality e.g. the increase of the product ingredient from ECETOC TRA defaults; the change in location from indoors to an outdoor scenario.

Exposure Descriptor or Determinant	Value	Rationale
Product Characteristics		
Volatility		Typically <7 Pa at 20 °C (source products SDSs)
Product Ingredient Fraction (by weight)	1	Increased above ECETOC TRA default (0.5) for lubricants, greases, and release products – liquids [1]
Frequency of Use (events/day), value <1 indicates infrequent (less than daily) use *	0.011	4 times/year [2]; consistent with the 90th percentile of the top up frequency of once/month (=0.03) and the average top up frequency of once/5.7 months (=0.006) [3]. It is less than TRA default use frequency for lubricant: daily [1].
Dermal Specific Parameters		
Skin Contact Area (cm^2)	480	Surface area of face of 2 hands (equivalent to palm of 2 hands or both face and dorsal surfaces of one hand). Consistent with 468 cm^2 = 7.8 cm^2/kg, adjusted to 60 kg [2]. It is less than TRA default (two hands): 857.5 cm^2 [1] and significantly greater than the value of c. 50 cm^2 identified from simulated studies [6].
Dermal Transfer Factor**	0.001	Based on measured data from controlled simulations indicating <0.001% of product is transferred to the skin [6] and consistent with the value estimated (0.003) for a dermal scenario while changing the oil in a car in US EPA E-FAST (based on the film thickness of 0.0119 cm and surface area of 2 hands (480 cm^2), i.e. the amount contact with skin is estimated to be 5 g) [2]. Estimated based on low volatility and direct contact with contaminated surfaces and incidental drips from pouring activity. The skin transfer factor should not be confused with the nature of any subsequent dermal absorption of the substance [8], which can be expected to be very low [7].
Inhalation Specific Parameters		
Amount of Product used per application (g)	870	Estimated changing one litre, density of 868 g/L. Top up amount 1.25 L (90th percentiles) and 0.7 L (average) [3]. It is less than TRA default: 5000 g [1].
Exposure Time (hr)	0.17	About 10 min, 75th percentile value [4]. It is less than TRA default: 4 hr [1]. These estimates have been

Exposure Descriptor or Determinant	Value	Rationale
		shown to be conservative in consumer simulations of the use [6].
Is product used outdoors only?	No	Garage. As a conservative approach, indoor use was assumed as default TRA input for use in garage. In a higher tier model, garage-specific room volume and ventilation rate may be used [7].
Room Volume (m^3)	34	A default room size for a garage in RIVM general factsheet [5]. It is greater than TRA default: 20 m^3 [1].
Ventilation specified or likely due to properties (e.g. odour, etc.)- if so what type – (open window, fan)	1.5	A default ventilation rate for a garage based on RIVM general factsheet [5]. The volume is increased as compared to the TRA default of 20 m^3 [1].
Inhalation factor (fraction of total amount handled lost to air)	0.01	Estimated loss of <0.01 product used via spillage or evaporation. This is a more conservative estimate than the auto-refuelling with gas oils value (0.002) due to less contained transfer. Also, based on its MSDS, the evaporation rate approximates zero at 25 ^oC.

* A frequency of <1 is used for chronic exposure assessments. Exposure for the day of use would still be based upon a value of 1 or greater (if the default suggests multiple uses occur in a single day).

****** Dermal transfer factor (DTF) represents the % of total amount handled that is transferred to the skin. If this factor is being applied in a tool with an algorithm that uses skin surface area and the thickness of the layer to calculate dermal loading, such as ECETOC TRA v3, the DTF would need to be adjusted so that the final dermal loading remains the same as when the DTF is applied to the total amount.

References:

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