COMBUSTION & INDUSTRY PANEL

Introduction and Agenda | Ir. J.J.P. Kuenen

TNO innovation for life

GUIDEBOOK UPDATES

- In Summer 2019, a new version of the EMEP/EEA Guidebook will be published (2019 version)
  - This TFEIP can formally adopt updated chapters and other improvements

- Main goal for this Expert Panel:
  - Discuss the changes proposed to 5 chapters
  - Decide on approval
  - Agree on a list of errors/inconsistencies that will be fixed

GUIDEBOOK UPDATES

Chapter	Proposed changes
1A1 Energy industries	Updated HM emission factors for Tier 1 & 2 in refineries (CONCAWE)
1B2c Venting and flaring	Updated HM emission factors and NOX/CO in Tier 2 for flaring (CONCAWE)
2A5a Quarrying and mining	Introduction of Tier 2 methodology updated supported by Germany
2D3i/2G Other product use	Introduction of new Tier 2 methods for lubricant use (supported by Germany) and aircraft deicing (input from Switzerland)
1A4 Small combustion	Update EF tables for biomass combustion so that only EFs for total PM (incl. condensables) are in there; filterable only EFs in separate table for reference

1A1A/1B2C – PROPOSED CHANGES

- Changes for HMs have been introduced by CONCAWE at the Expert Panel meeting in Krakow in 2017
- In addition to the changes CONCAWE proposed NOX and CO for flaring to be updated to the US EPA emission factors

1A1A/1B2C - PROPOSED EF CHANGES

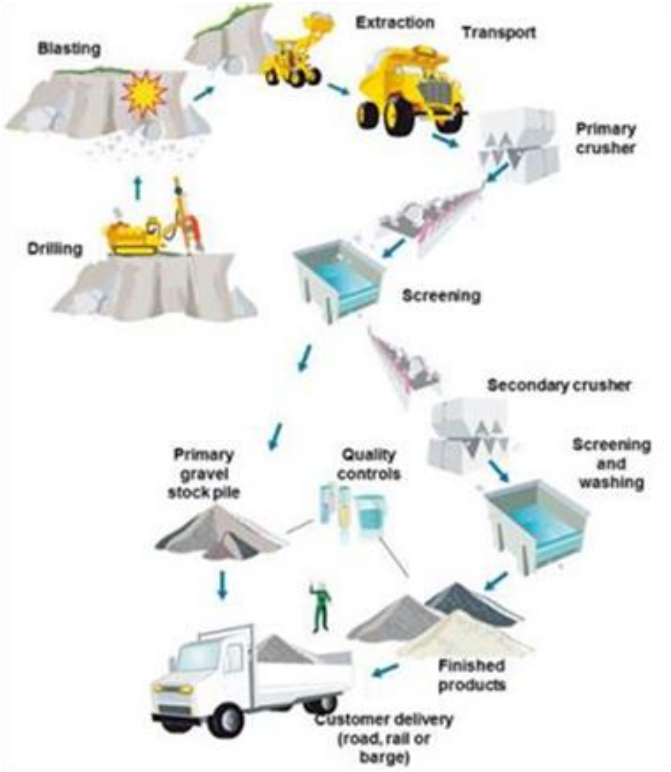
EMEP chapter	Table number	Pollutant	Present Value	Units	Proposed Value	Lower limit	Upper limit	Reference / Comment
1.A.1 Energy industries	4-2	Pb	1.79	mg/GJ	1.61	1.2	2.1	Concawe Report 9/16 [1]
	4-2	Cd	0.712	mg/GJ	2.19	0.6	3.8	Concawe Report 9/16
	4-2	Hg	0.086	mg/GJ	0.372	0.2	0.5	Concawe Report 9/16
	4-2	As	0.343	mg/GJ	0.352	0.3	0.4	Concawe Report 9/16
	4-2	Cr	2.74	mg/GJ	6.69	0.3	13.1	Concawe Report 9/16
	4-2	Cu	2.22	mg/GJ	3.29	2.4	4.2	Concawe Report 9/16
	4-2	Ni	3.60	mg/GJ	7.37	1.6	13.1	Concawe Report 9/16
	4-2	Se	0.42	mg/GJ	1.56	1.1	2.0	Concawe Report 9/16
	4-2	Zn	25.5	mg/GJ	17.0	12.0	22.0	Concawe Report 9/16
	4-4	Ni	1030	mg/GJ	773	647	900	Concawe Report 9/16
1.B.2.c Venting and flaring	3-4	NOx	32.2	g/GJ	29.2	10	90	US EPA AP-42 Section 13.5, Industrial flares, dated 4/15
	3-4	CO	177	g/GJ	133	45	400	US EPA AP-42 Section 13.5, Industrial flares, dated 4/15
	3-4	Pb	2	mg/GJ	1.61	1.2	2.1	Concawe Report 9/16
	3-4	Cd	0.7	mg/GJ	2.19	0.6	3.8	Concawe Report 9/16
	3-4	Hg	0.09	mg/GJ	0.372	0.2	0.5	Concawe Report 9/16
	3-4	As	0.3	mg/GJ	0.352	0.3	0.4	Concawe Report 9/16
	3-4	Cr	3	mg/GJ	6.69	0.3	13.1	Concawe Report 9/16
	3-4	Cu	2	mg/GJ	3.29	2.4	4.2	Concawe Report 9/16
	3-4	Ni	4	mg/GJ	7.37	1.6	13.1	Concawe Report 9/16
	3-4	Se	-	mg/GJ	1.56	1.1	2.0	Concawe Report 9/16
	3-4	Zn	26	mg/GJ	17.0	12.0	22.0	Concawe Report 9/16

2A5A - QUARRYING AND MINING

- In some countries, this source category 2A5a may be a key source of PM emissions, however until now only a Tier 1 methodology was available
- Tier 2 methodology introduced based on US EPA methodology and adapted for European circumstances. The method distinguishes the following sources:
  1. Drilling and blasting
  2. Material processing: crushing, screening and transfer points
  3. Internal transport
  4. Material handling operations: loading and unloading
  5. Wind erosion from stockpiles
- Spreadsheet model provided along with the updated chapters which may be used by countries to calculate their emissions for this source category

QUARRYING AND MINING

Crushed rock



Sand and gravel quarries

SPREADSHEET MODEL

Parameters per category

Deposit nature category	Size category	
Crushed rock	Large	Category 1
	Medium	Category 2
	Small	Category 3
Sand and Gravel	Large	Category 4
	Medium	Category 5
	Small	Category 6
Recycled aggregates	Large	Category 7
	Medium	Category 8
	Small	Category 9

Drilling and blasting	Material processing	Internal transport	Material handling operations	Stockpiles erosion	Total
EF_{cat-1} (g/t) $Emissions_{cat-1}$ (t)	+ EF_{cat-1} (g/t) $Emissions_{cat-1}$ (t)	+ (R) EF_{cat-1} (g/t) $Emissions_{cat-1}$ (t)	+ (R) EF_{cat-1} (g/t) $Emissions_{cat-1}$ (t)	+ (R) EF_{cat-1} (g/t) $Emissions_{cat-1}$ (t)	= $EF_{TOTAL\ cat-1}$ (g/t) $Emissions_{TOTAL\ cat-1}$ (t)
EF_{cat-2} (g/t) $Emissions_{cat-2}$ (t)	+ EF_{cat-2} (g/t) $Emissions_{cat-2}$ (t)	+ (R) EF_{cat-2} (g/t) $Emissions_{cat-2}$ (t)	+ (R) EF_{cat-2} (g/t) $Emissions_{cat-2}$ (t)	+ (R) EF_{cat-2} (g/t) $Emissions_{cat-2}$ (t)	= $EF_{TOTAL\ cat-2}$ (g/t) $Emissions_{TOTAL\ cat-2}$ (t)
EF_{cat-3} (g/t) $Emissions_{cat-3}$ (t)	+ EF_{cat-3} (g/t) $Emissions_{cat-3}$ (t)	+ (R) EF_{cat-3} (g/t) $Emissions_{cat-3}$ (t)	+ (R) EF_{cat-3} (g/t) $Emissions_{cat-3}$ (t)	+ (R) EF_{cat-3} (g/t) $Emissions_{cat-3}$ (t)	= $EF_{TOTAL\ cat-3}$ (g/t) $Emissions_{TOTAL\ cat-3}$ (t)
	EF_{cat-4} (g/t) $Emissions_{cat-4}$ (t)	+ (R) EF_{cat-4} (g/t) $Emissions_{cat-4}$ (t)	+ (R) EF_{cat-4} (g/t) $Emissions_{cat-4}$ (t)	+ (R) EF_{cat-4} (g/t) $Emissions_{cat-4}$ (t)	= $EF_{TOTAL\ cat-4}$ (g/t) $Emissions_{TOTAL\ cat-4}$ (t)
	EF_{cat-5} (g/t) $Emissions_{cat-5}$ (t)	+ (R) EF_{cat-5} (g/t) $Emissions_{cat-5}$ (t)	+ (R) EF_{cat-5} (g/t) $Emissions_{cat-5}$ (t)	+ (R) EF_{cat-5} (g/t) $Emissions_{cat-5}$ (t)	= $EF_{TOTAL\ cat-5}$ (g/t) $Emissions_{TOTAL\ cat-5}$ (t)
	EF_{cat-6} (g/t) $Emissions_{cat-6}$ (t)	+ (R) EF_{cat-6} (g/t) $Emissions_{cat-6}$ (t)	+ (R) EF_{cat-6} (g/t) $Emissions_{cat-6}$ (t)	+ (R) EF_{cat-6} (g/t) $Emissions_{cat-6}$ (t)	= $EF_{TOTAL\ cat-6}$ (g/t) $Emissions_{TOTAL\ cat-6}$ (t)
	EF_{cat-7} (g/t) $Emissions_{cat-7}$ (t)	+	+ (R) EF_{cat-7} (g/t) $Emissions_{cat-7}$ (t)	+ (R) EF_{cat-7} (g/t) $Emissions_{cat-7}$ (t)	= $EF_{TOTAL\ cat-7}$ (g/t) $Emissions_{TOTAL\ cat-7}$ (t)
	EF_{cat-8} (g/t) $Emissions_{cat-8}$ (t)	+	+ (R) EF_{cat-8} (g/t) $Emissions_{cat-8}$ (t)	+ (R) EF_{cat-8} (g/t) $Emissions_{cat-8}$ (t)	= $EF_{TOTAL\ cat-8}$ (g/t) $Emissions_{TOTAL\ cat-8}$ (t)
	EF_{cat-9} (g/t) $Emissions_{cat-9}$ (t)	+	+ (R) EF_{cat-9} (g/t) $Emissions_{cat-9}$ (t)	+ (R) EF_{cat-9} (g/t) $Emissions_{cat-9}$ (t)	= $EF_{TOTAL\ cat-9}$ (g/t) $Emissions_{TOTAL\ cat-9}$ (t)

$$EF_{TOTAL} = \sum_{i=1}^{9} \left(EF_{TOTAL\ cat-i} \frac{Production_{cat-i}}{Production_{Total}} \right)$$

$$Emissions_{TOTAL} = \sum_{i=1}^{9} Emissions_{TOTAL\ cat-i}$$

(R) = Regionalised EF

INPUT DATA REQUIRED

- Tier 2 method requires quite a lot of input data (equivalent to a Tier 3 approach)
- However, the method also provides default values for (most of) the parameters based on the situation in France where this method has already been applied
- These obviously need to be reviewed and/or changed for other countries, but in case data are not available these may be used to get a first rough estimate of the emissions, and therewith an idea of the importance of the sector for PM emissions

2D3I/2G OTHER PRODUCT USE

- New emission factors introduced for
  - Lubricant use
  - Aicraft deicing

LUBRICANT USE

- New Tier 2 emission factors

Pollutant	Value	Unit	95% confidence interval	
			Lower	Upper
NMVOC (Engine oil)	1	% of product	0	2
NMVOC (Automotive gear oil)	1	% of product	0	2
NMVOC (Industrial gear oil)	1,5	% of product	1	2
NMVOC (Compressor oil)	1,5	% of product	1	2
NMVOC (Turbine oil)	0,5	% of product	0	1
NMVOC (Hydraulic oil)	1,5	% of products	1	2
NMVOC (Electro insulating oil)	0	% of products	0	0
NMVOC (Machine oil)	2,5	% of products	0	5
NMVOC (Process oils)	0	% of products	0	0
NMVOC (Other oil not for lubricating purposes)	25	% of products	0	50
NMVOC (Metalworking fluids)	5	% of products	0	10
NMVOC (Greases)	0	% of products	0	0
NMVOC (Base oil)	10	% of products	5	15
NMVOC (Extracts from lubricant production)	0	% of products	0	0

References needed!

AIRCRAFT DEICING

- New Tier 2 emission factor for NMVOC from aircraft deicing, based on Swiss study
- Main reason was a large discrepancy between the GB2016 EF (246 kg/t product) and US Federal Aviation Administration (FAA) factor (11 kg/t VOC)

- Experts agreed that one is too high, and the other seems too low
- Independent factor derived based on data from airports of Geneva, Zurich and Bern

AIRCRAFT DEICING

- Geneva material flow model designed to model C-flows into WWTP/surface waters is used to assess losses from aircraft deicing fluids
- Taking into account losses when applying the fluids, but also upon taxiing and take-off

Pollutant	Value	Unit	95% confidence interval		Reference
			Lower	Upper	
NMVOC	53	kg/ton deicing fluid used	27	106	KBP (2018)

1A4 SMALL COMBUSTION

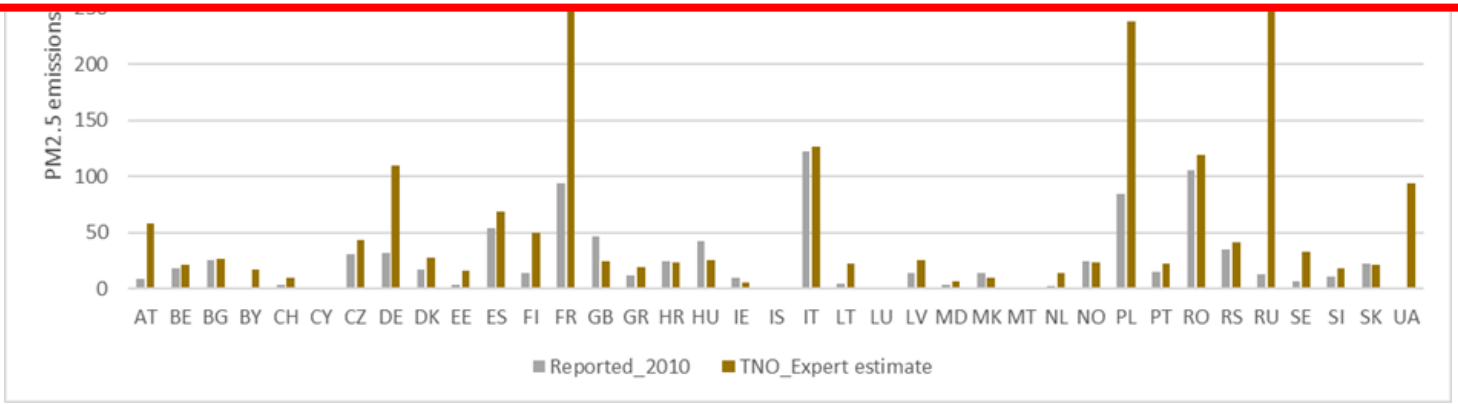
- The changes proposed for small combustion reflect the note "Improving Emissions of Condensable Particulate Matter in the Context of the LRTAP Convention", which was presented/discussed during the EMEP Steering Body meeting (Sep 2018)
- This note builds on the TFEIP decision to harmonize PM emission reporting in a sector specific way (Krakow meeting, 2017)

https://www.unece.org/fileadmin/DAM/env/documents/2018/Air/EMEP/TFEIP-TFMM_proposal_condensables_for_EMEP_Steering_Body_v6.pdf

CONDENSABLES

- Key issue is the inconsistency in reporting PM from small combustion activities from different countries in the current situation

Comparability 'Comparability' means that estimates of emissions reported by Parties in their inventories should be comparable. For that purpose, Parties should use the accepted methodologies as elaborated in the Reporting Guidelines and the NFR formats for making estimations and reporting their inventories



TAKING A STEP BACK…

- With or without condensables is not the only factor determining PM emissions, and we can be sure there are still differences in PM reporting between different countries, thinking about
  - Quality of fuels (what type of wood, using wet or dry wood)
  - Is the stove/boiler used in the correct way (avoiding unnecessary emissions)?

- Recognizing the very large uncertainties associated with all these issues, we as emission community should strive towards consistent & comparable reporting where we can, as required by our own guidance
  - This implies that a harmonization of PM reporting in small combustion is needed

WHAT CAN WE DO?

- As Expert Panel, we can discuss how we want to report, but in the end it is up to the Parties
- But our discussions should try to ensure as much as possible consistency, and we should try to harmonize our approaches where we can

- But what we can do is make sure the guidance (the EMEP/EEA Guidebook) is prepared in such a way that it clearly recommends what countries should do as consistently/comparable as possible

HOW TO HARMONIZE?

- Two options
  - Harmonize on reporting PM including condensables
    - Pro: no change required for countries that already include condensables, better for our users (modellers)
    - Con: for those countries using filterable only at the moment, emissions may increase considerably, and method revision is needed (EFs for previous years may need to be revised)
  - Harmonize on reporting PM based on filterable only
    - Pro: no change required for countries using filterable only
    - Con: for those countries including condensables, emissions may decrease considerably, and method revision is needed; modellers need to apply “fudge factor”

GUIDEBOOK UPDATE

- Situation how it was:
  - The Tier 2 EFs for biomass include both emission factors with and without condensables, with additional text
- Update proposal
  - Tier 1 & Tier 2 (only for biomass at the moment) have been updated in such a way that the PM emission factors all include condensables
  - Filterable only EFs have been included in separate table “for reference”
  - The main goal is to further strengthen the guidance for countries with as main goal to have countries reported on the basis of total PM where possible (in accordance with the EMEP “informal document”)


THANK YOU FOR YOUR ATTENTION
Take a look:
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