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COPERT 4 v8.1

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Summary

This report presents the methodological and software revisions of COPERT 4 version 8.1, compared to version 8.0.

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Contents

1 Methodology

1.1 CH4 EF for Euro 4, Euro 5, Euro 6 Diesel PC and LDV

CH4 hot and cold emission factors for Euro 4, Euro 5 and Euro 6 diesel light duty vehicles and passenger cars are set equal to 0.0011 gr/km (bulk emission factor).

1.2 N2O EF for Euro 5, Euro 6 LPG PC

N2O hot and cold emission factors parameters for Euro 5 and Euro 6 LPG passenger cars are set equal to Euro 5 and Euro 6 gasoline ones.

Note that N2O emission factors are calculated based on the Sulphur Content of the fuel. Accordingly for LPG vehicles the value of LPG Sulphur Content of 'Country > Fuel Info > Fuel Specifications' table is used.

1.3 Maximum Cumulative Mileage value for N2O and NH3

A maximum value of cumulative mileage ('Activity Data > Input Fleet Data') is set to 250.000 km for the calculation of N2O and NH3 emission factors. If the user provides greater values in the 'Input Fleet Data' form, the 250.000 value will be used.

2 Software

2.1 Registration form

The user has to register the COPERT 4 software in order to unlock all features. A registration code can be obtained from the website of Emisia (http://www.emisia.com/copert/license.html). Then the user can register his software with the 'Help > Register' form (Figure 1, Figure 2).

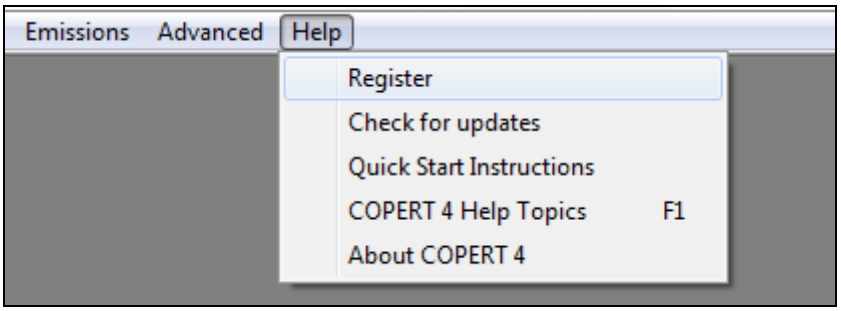

Figure 1: Registration form

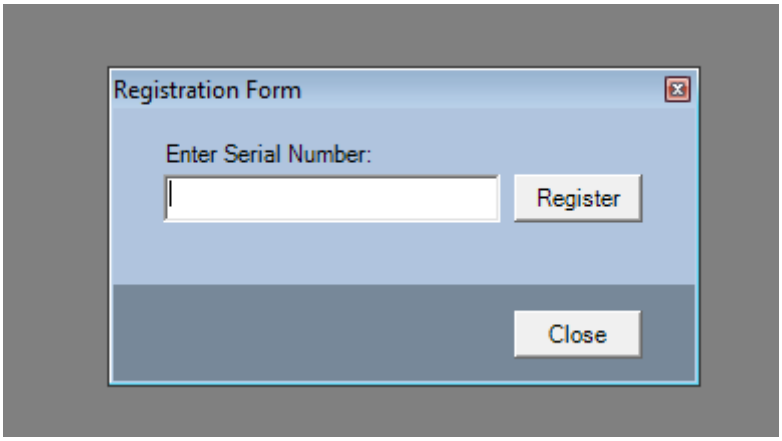

Figure 2: Registration form

2.2 "Check for updates" button

The user can now check automatically if there is a new version of COPERT 4 available on the website of Emisia (http://www.emisia.com/copert/Download.html) with the 'Help > Check for updates' button (Figure 3, Figure 4).

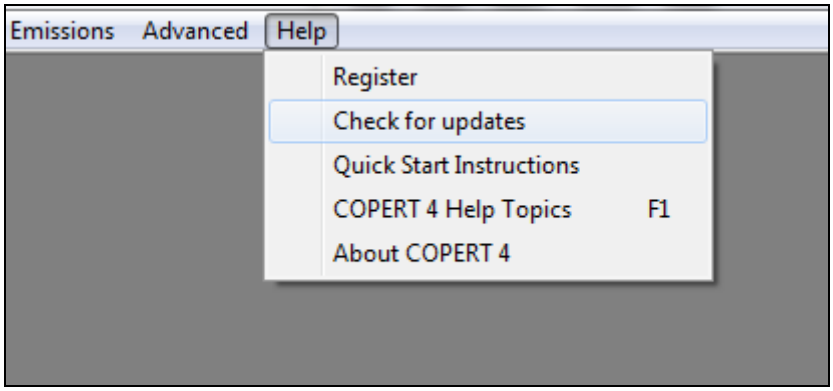

Figure 3: "Check for updates" button

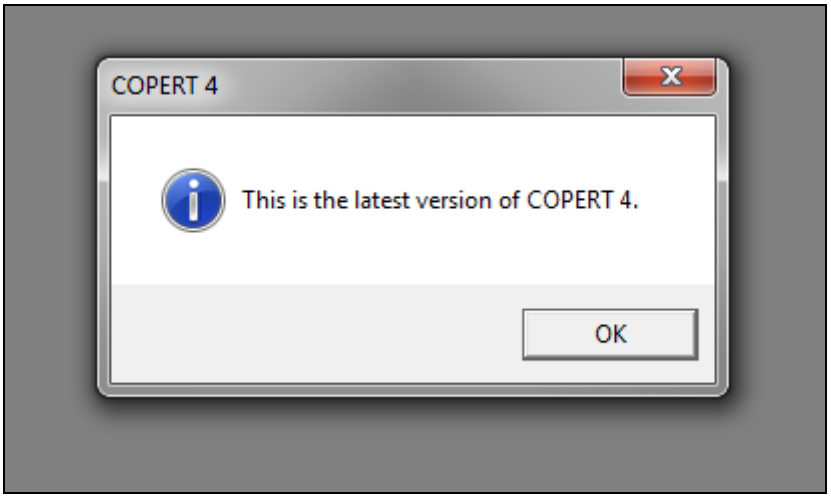

Figure 4: "Check for updates" message

3 Bugs Fixed

3.1 Corrected CH4, N2O and NH3 emissions calculation

For CH4, N2O and NH3 emissions, the algorithm of Annex I is followed. Due to a bug this was applied to all vehicle types, although this algorithm should be applied only to passenger cars and light duty vehicles. This is now corrected.

3.2 Corrected export process of NFR format

There was a software bug during the export of the NFR format file in the 'File > Import/Export > Export NFR (Excel File)' form, if the user had set at the computer's regional settings the digit grouping symbol as space " ". This is now corrected.

4 Annex I

Calculation algorithm for CH4, N2O and NH3 hot/cold emissions

The calculation of N_2O, NH_3 and CH_4 emissions is based on cold urban, and hot urban, rural and highway emissions. The following paragraphs present the calculation algorithm that is used in order to calculate these emissions. In particular for methane, the estimation is of importance because NMVOC emissions are calculated as the difference between VOC and CH_4.

First one needs to check whether the mileage fraction driven at thermally non-stabilised engine condition (β-parameter) exceeds the mileage share attributed to urban conditions (S_{URBAN}). For each vehicle category j, and pollutant i (i = CH_4, N_2O, NH_3) the calculation algorithm takes the form:

If $\beta_{i,j} > S_{URBAN;\,j}$

$$E_{COLD\ URBAN;\,i,\,j} = \beta_{i,j} \times N_j \times M_j \times e_{COLD\ URBAN;\,i,\,j}$$

$$E_{COLD\ RURAL;\,i,\,j} = 0$$

$$E_{HOT\ URBAN;\,i,\,j} = 0$$

$$E_{HOT\ RURAL;\,i,\,j} = [S_{RURAL;\,j} - (\beta_{i,j} - S_{URBAN;\,j})] \times N_j \times M_j \times e_{HOT\ RURAL;\,i,\,j}$$

$$E_{HOT\ HIGHWAY;\,i,\,j} = S_{HIGHWAY;\,j} \times N_j \times M_j \times e_{HOT\ HIGHWAY;\,i,\,j}$$

Else if $\beta_{i,j} <= S_{URBAN;\,j}$

$$E_{COLD\ URBAN;\,i,\,j} = \beta_{i,j} \times N_j \times M_j \times e_{COLD\ URBAN;\,i,\,j}$$

$$E_{COLD\ RURAL;\,i,\,j} = 0$$

$$E_{HOT\ URBAN;\,i,\,j} = (S_{URBAN;\,j} - \beta_{i,\,j}) \times N_j \times M_j \times e_{HOT\ URBAN;\,i,\,j}$$

$$E_{HOT\ RURAL;\,i,\,j} = S_{RURAL;\,j} \times N_j \times M_j \times e_{HOT\ RURAL;\,i,\,j}$$

$$E_{HOT\ HIGHWAY;\,i,\,j} = S_{HIGHWAY;\,j} \times N_j \times M_j \times e_{HOT\ HIGHWAY;\,i,\,j}$$

where:

$\beta_{i,j}$: fraction of mileage driven with cold engines or catalyst operated below the light-off temperature,

$S_{URBAN;\,j}$: the mileage share attributed to urban conditions for vehicle class j,

$S_{RURAL;\,j}$: the mileage share attributed to rural conditions for vehicle class j,

$S_{HIGHWAY;\ j}$: the mileage share attributed to highway conditions for vehicle class j,

N_j : number of vehicles [veh.] of class j in circulation,

M_j : total mileage per vehicle [km/veh.] in vehicle class j,

$E_{COLD\ URBAN;\ i,\ j}$: cold start emissions of the pollutant i (for the reference year), poduced by vehicle class j under urban conditions,

$E_{COLD\ RURAL;\ i,\ j}$: cold start emissions of the pollutant i (for the reference year), produced by vehicle class j under rural conditions,

$E_{HOT\ URBAN;\ i,\ j}$: hot emissions of the pollutant i (for the reference year), produced by vehicle class j under urban conditions,

$E_{HOT\ RURAL;\ i,\ j}$: hot emissions of the pollutant i (for the reference year), produced by vehicle class j under rural conditions,

$E_{HOT\ HIGHWAY;\ i,\ j}$: hot emissions of the pollutant i (for the reference year), produced by vehicle class j under highway conditions,

$e_{COLD\ URBAN;\ i,\ j}$: cold start emission factor of the pollutant i (for the reference year) for vehicle class j under urban conditions,

$e_{HOT\ URBAN;\ i,\ j}$: hot emission factor of the pollutant i (for the reference year) for vehicle class j under urban conditions,

$e_{HOT\ RURAL;\ i,\ j}$: hot emission factor of the pollutant i (for the reference year) for vehicle class j under rural conditions,

$e_{HOT\ HIGHWAY;\ i,\ j}$: hot emission factor of the pollutant i (for the reference year) for vehicle class j under highway conditions.