**FOSSIL FUEL COMBUSTION – RESIDENTIAL – DISTILLATE OIL**

## *a. Source Category Description*

Residential distillate oil combustion is oil that is burned in residential housing.

The general approach to calculating emissions for this SCC is to take State-level distillate oil consumption from the EIA and allocate it out to the county level using the methods described below. County-level oil consumption is multiplied by the emission factors to calculate emissions.

For this source category, the following SCC was assigned:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SCC** | **Descriptor 1** | **Descriptor 3** | **Descriptor 6** | **Descriptor 8** |
| 2104004000 | Stationary Source Fuel Combustion | Residential | Distillate Oil | Total Boilers and  IC Engines |

## *b. Activity Data*

The state-level volume of distillate oil consumed by residential combustion in the U.S. was used to estimate emissions. Distillate oil consumption by energy use sector is presented in State Energy Data 2009 Consumption tables published by the Energy Information Administration (EIA).1 Year 2009 consumption data were used as a surrogate for 2011 emissions because year 2009 data were the latest data available when this inventory was prepared.

State-level distillate oil consumption was allocated to each county using the US Census Bureau’s 2000 Census Detailed Housing Information.2 These data include the number of housing units using a specific type of fuel for residential heating. State distillate oil consumption was allocated to each county using the ratio of the number of houses burning distillate oil in each county to the total number of houses burning distillate oil in the State.

## *c. Control Factors*

No control measures are assumed for this category.

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## *d. Emission Factors*

Criteria pollutant emission factors for distillate oil are from AP-42 (see Table 1). 3 For all counties in the United States, the distillate oil consumed by residential combustion is assumed to be No. 2 fuel oil with a heating value of 140,000 Btu per gallon and a sulfur content of 0.30%.4 Dioxin/furan and HAP emission factors are from “Documentation of Emissions Estimation methods for Year 2000 and 2001 Mobile Source and Nonpoint Source Dioxin Inventories”5 and “Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants,”6 respectively. Sulfur content was 0.30% and was obtained from data compiled in preparing the 1999 residential coal combustion emissions estimates.7 The ammonia emission factor is from EPA’s *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Report*.8

## *e. Sample Calculations*

Emissions are calculated for each county using emission factors and activity as:

E*x,p* = FC*x* × EF*x,p*

where:

E*x,p* = annual emissions for fuel type x and pollutant p

FC*x* = annual fuel consumption for fuel type x

EF*x,p* = emission factor for fuel type x and pollutant p

And FC*x* = AState x (Hcounty / HState)

where:

AState = State activity data from EIA

HCounty = number of houses in the county using distillate oil as the primary heating fuel

HState = number of houses in the state using distillate oil as the primary heating fuel

**Example:**

Using Allegheny County, PA as an example:

The State of Pennsylvania had a reported use of 13,645 thousand barrels of distillate oil in the residential sector in 2009. Allegheny County, PA had 8,123 houses out of the state total of 1,217,155 that use distillate oil as the primary heating fuel. This equates to a share of 0.67% of the distillate oil used for residential heating in the state. From Table 5, the emission factor for CO is 5 lb/thousand gallons. Because the emission factor is in lbs/thousand gallons, a conversion factor of 42 gallons per barrel is applied.

AAlegheny = 13,645 thousand barrels × 8,123 houses / 1,217,155 houses)

× 42 gal / barrel

= 3,824.5 thousand gallons

EmisAlegheny, CO = = 3,824.5 thousand gallons × 5 lb CO/ thousand gallons

= 19,122.7 lbs CO or 9.6 tons CO

## *f. References*

1. U.S. Department of Energy, Energy Information Administration (EIA). [State Energy Data 2009 Consumption](https://www.epa.gov/air-emissions-inventories). Washington, DC 2012, accessed June 2019.

2. U.S. Census Bureau. "[Table H40. House Heating Fuel Type](https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t)", Census 2000: Summary File 3, accessed June 2019.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency. Emission Factor and Inventory Group. [Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion](https://www.epa.gov/air-emissions-inventories). Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002, accessed June 2019.

5. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. “Documentation of Emissions Estimation methods for Year 2000 and 2001 Mobile Source and Nonpoint Source Dioxin Inventories.” Prepared by E.H. Pechan & Associates, Inc., Durham, NC. May 2003.

6. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. “Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants.” Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

7. U.S. Environmental Protection Agency. Emission Factor and Inventory Group. [Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion](https://www.epa.gov/air-emissions-inventories). Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. accessed June 2019.

8. U.S. Environmental Protection Agency. Emission Factor and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Report. Prepared by E.H. Pechan and Associates, Inc. Research Triangle Park, NC. September 2003.

**Table 1. National Emission Factors for Residential Distillate Oil Combustion**

|  |  |  |  |
| --- | --- | --- | --- |
| **Pollutant Code** | **Code Description** | **Emissions Factor (LB/E3GAL)** | **Reference** |
| 120127 | ANTHRACENE | 1.222E-06 | 6 |
| 129000 | PYRENE | 4.214E-06 | 6 |
| 1746016 | 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN | 4.659E-10 | 5 |
| 191242 | BENZO[G,H,I,]PERYLENE | 2.248E-06 | 6 |
| 193395 | INDENO[1,2,3-C,D]PYRENE | 2.107E-06 | 6 |
| 206440 | FLUORANTHENE | 4.916E-06 | 6 |
| 208968 | ACENAPHTHYLENE | 2.528E-07 | 6 |
| 218019 | CHRYSENE | 2.388E-06 | 6 |
| 3268879 | OCTACHLORODIBENZO-P-DIOXIN | 5.491E-10 | 5 |
| 39001020 | OCTACHLORODIBENZOFURAN | 2.496E-10 | 5 |
| 50000 | FORMALDEHYDE | 3.371E-02 | 6 |
| 51207319 | 2,3,7,8-TETRACHLORODIBENZOFURAN | 4.410E-10 | 5 |
| 53703 | DIBENZO[A,H]ANTHRACENE | 1.686E-06 | 6 |
| 56553 | BENZ[A]ANTHRACENE | 4.074E-06 | 6 |
| 71432 | BENZENE | 2.107E-04 | 6 |
| 7439921 | LEAD | 1.264E-03 | 6 |
| 7439965 | MANGANESE | 8.428E-04 | 6 |
| 7439976 | MERCURY | 4.214E-04 | 6 |
| 7440020 | NICKEL | 4.214E-04 | 6 |
| 7440382 | ARSENIC | 5.619E-04 | 6 |
| 7440417 | BERYLLIUM | 4.214E-04 | 6 |
| 7440439 | CADMIUM | 4.214E-04 | 6 |
| 16065831 | Chromium III | 0.000345556 |  |
| 18540299 | Chromium (VI) | 0.0000758538 |  |
| 75070 | ACETALDEHYDE | 4.916E-03 | 6 |
| 7782492 | SELENIUM | 2.107E-03 | 6 |
| 83329 | ACENAPHTHENE | 2.107E-05 | 6 |
| 85018 | PHENANTHRENE | 1.054E-05 | 6 |
| 86737 | FLUORENE | 4.495E-06 | 6 |
| 91203 | NAPHTHALENE | 1.138E-03 | 6 |
| CO | CARBON MONOXIDE | 5.000E+00 | 3 |
| NH3 | AMMONIA | 1.000E+00 | 8 |
| NOX | NITROGEN OXIDES | 1.800E+01 | 3 |
| PM10-FIL | PRIMARY PM10, FILTERABLE PORTION ONLY | 1.080E+00 | 3 |
| PM10-PRI | PRIMARY PM10 (INCLUDES FILTERABLES + CONDENSIBLES) | 2.380E+00 | 3 |
| PM25-FIL | PRIMARY PM2.5, FILTERABLE PORTION ONLY | 8.300E-01 | 3 |
| PM25-PRI | PRIMARY PM2.5 (INCLUDES FILTERABLES + CONDENSIBLES) | 2.130E+00 | 3 |
| PM-CON | PRIMARY PM CONDENSIBLE PORTION ONLY (< 1 MICRON) | 1.300E+00 | 3 |
| SO2 | SULFUR DIOXIDE | 4.260E+01 | 3 |
| VOC | VOLATILE ORGANIC COMPOUNDS | 7.000E-01 | 3 |