Volatile Organic Compounds - VOCs

Last Updated: 25 August 2017

< Carbon monoxide - CO

Acid equivalent - Aeq >

Associated topic: greenhouse effect, photochemical pollution

Emissions monitoring period: since 1988

Data source: CITEPA / SECTEN format - April 2017

Source of the pollutant

A volatile organic compound (VOC) is a compound containing at least one atom of carbon together with atoms of hydrogen, oxygen, nitrogen, sulphur, halogens, phosphorous and silicon. Due to their physico-chemical properties, these compounds may be present in the atmosphere in the form of vapour. Hydrocarbons are included in the VOC group and often mistakenly equated with it. This is probably because VOCs are often expressed as total methane- or propane-equivalent hydrocarbons. Methane (CH$_4$), which is a specific VOC and a GHG naturally present in air, is often considered apart from the other VOCs, which are referred to as NMVOCs (non-methane volatile organic compounds).

VOCs are released by:

- combustion,
- the evaporation of solvents in paints, inks, glues, stain removers, cosmetics, etc.
- the evaporation of organic compounds from petrol for example,
- biological reactions.

There are a great many sources of VOC emissions. They are released by certain industrial processes involving the use of solvents (production of base and refined chemicals and parachemicals, metal cleaning, application of paints, printing, glues and adhesives, rubber, cleaning products, perfumes and cosmetics, etc.), and others not involving solvents (petroleum refining, production of alcoholic beverages, bread, etc.). Fuel combustion in the industrial and tertiary sectors contributes slightly to emissions but in very much smaller proportions than emissions of SO$_2$ and NO$_x$.

However, small wood-fired boilers are a major source of VOC emissions, as are forests.

Effect of the pollutant

VOCs have a great many effects on health. They can cause various problems when inhaled (aromatic substances and olefins for example) or through contact with the skin (e.g. aldehydes). They can also cause cardiac, digestive, kidney and nervous disorders. Finally, some VOCs, such as benzene, are carcinogenic, teratogenic or mutagenic. Concentrations in the environment
are low.

In the environment, solar radiation causes VOCs to react with nitrogen oxides, forming tropospheric ozone (photochemical pollution). This type of ozone, which is in the air we breathe, is harmful to health (breathing problems, irritation of the eyes, etc.). VOCs are also indirect greenhouse gases.

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**Classification of the sub-sectors with the highest emission levels* in 2015**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Sub-sectors</th>
<th>Share of sub-sector in total national emissions in mainland France</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential sector including:</td>
<td>45% including:</td>
</tr>
<tr>
<td></td>
<td>Combustion of heating appliances (boilers, inserts, closed and open fireplaces, stoves, etc.)</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>Domestic use of solvents</td>
<td>21%</td>
</tr>
<tr>
<td></td>
<td>Non road mobile machineries - Household and gardening</td>
<td>0.5%</td>
</tr>
<tr>
<td></td>
<td>Open burning of household garden wastes and other (vehicle burning, etc.)</td>
<td>0.5%</td>
</tr>
<tr>
<td>2</td>
<td>Construction</td>
<td>10%</td>
</tr>
<tr>
<td>3</td>
<td>Other manufacturing industries</td>
<td>8.4%</td>
</tr>
<tr>
<td>4</td>
<td>Food processing, beverages industry</td>
<td>5.8%</td>
</tr>
</tbody>
</table>

* one sector (out of six: energy transformation, manufacturing industry, residential/tertiary, agriculture/forestry, road transport and other transport) is broken down into sub-sectors.

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**Emissions and trends**

- Minimum observed: 623 kt in 2015
- Maximum observed: 2,445 kt in 1988
- Emissions in 2015: 623 kt
- Trends 2015/1990: -74.0%
- Trends 2015/maximum: -74.5%
- Trends 2015/minimum: 0%

Measurement unit: kt (kilotonne)

Source: CITEPA / SECTEN format – April 2017
Emissions atmosphériques par secteur en France métropolitaine en kt

(\*) Following UNECE/NEC definitions: emissions classified "except total" are not included, i.e. emissions from international maritime, emissions from domestic and international air transport cruise (≥ 1000 m), emissions from agriculture and forestry biogenic sources and emissions from non-anthropogenic sources.

(e) preliminary estimate

Analysis
Whichever the sector (residential/tertiary or manufacturing industry), the main source of NMVOC emissions is... (to read more, consult the SECTEN report online via your login and password)

Data source: CITEPA / SECTEN format - April 2017