Carbon Footprint in Chemical Industry – Organic Chemical Products

PEP Review 2025-05

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Glossary

¢/kWh	Cents per kilowatt hour
¢/lb	Cents per pound
¢/Mgal	Cents per thousand gallons
¢/Mlb	Cents per thousand pounds
¢/t-h	Cents per ton hour
°C	Degree Celsius
ADN	Adiponitrile
bhp	Brake horsepower
Btu	British thermal units
CDM	Clean Development Mechanism
CFCs	Chlorofluorocarbons
CO_2e/GJ	Carbon dioxide equivalent per gigajoule
CO_2e/MWh	Carbon dioxide equivalent per megawatt-hour
DEG	Diethylene glycol
EIA	Energy Information Administration
EPDM	Ethylene propylene diene monomer
EU-ETS	European Union European Trading Scheme
EVA	Ethylene vinyl acetate
EVAs	Ethylene-vinyl acetate copolymers
ft	Feet
ft dia	Feet diameter
g	Gram
gal	Gallon
GHG	Greenhouse gas
GJ/ton	Gigajoules per ton
GWP	Global warming potential
h	Hour
HFCS	High-fructose corn syrup
HMDA	Hexamethylenediamine
HPA	Hydroxypropionic acid
HPPO	Hydrogen peroxide to propylene oxide
IPCC	Intergovernmental Panel on Climate Change
kg	Kilogram
kg/cm^2	Kilograms per square centimeter
kg/h	Kilograms per hour
lb	Pounds
lb/h	Pounds per hour
lb/y	Pounds per year
MDI	Methylene diphenyl diisocyanate
mgal	Thousand gallons
mlb	Thousand pounds
MMBtu/h	Million British thermal units per hour
MMt	Million metric tons
MMt/y	Million metric tons per year
Mol wt	Molecular weight
MWh	Megawatt-hour
MWh/ton	Megawatt-hour per ton
PEP	Process Economics Program
PET	Polyethylene terephthalate
PFCs	Perfluorinated compounds
PTA	Purified terephthalic acid
psig	Pounds per square inch gauge
sq ft	square feet
SS	Stainless steel
t	Metric tons

t/y	Metric tons per year
TFC	Total fixed capital
USGC	United States Gulf Coast
VCM	Vinyl chloride monomer
wt%	weight percent

Abstract

There has been a growing urgency to curb greenhouse gas (GHG) emissions. While viable solutions to reduce GHG emissions are being explored, the chemical industry has been a primary focus of many international environmental organizations. Numerous opportunities exist for emissions reductions in the chemical industry. It is necessary to quantify the carbon emissions for chemical processes to understand potential reductions. However, carbon emissions estimates for many chemical processes have not been established.

To help determine potential emissions reductions, the Process Economics Program has prepared an estimate of the carbon footprint of major organic chemical products. This review presents carbon dioxide emissions factors for 364 processes. Estimates have been broken down into Scope 1 (direct emissions) and Scope 2 (indirect emissions). Direct emissions occur at the plant site, while indirect emissions arise due to remotely located electrical generators. GHG emissions factors calculations are presented on a US Gulf Coast basis.

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