

AIR POLLUTION

HISTORICALLY AIR POLLUTION HAS CAUSED DEATH AND ILLNESS.

DEATH FROM AIR POLLUTION IS STILL RARE, BUT INCREASED MORBIDITY (SICKNESS) IS OF GREAT CONCERN.

MOST EFFORT UNTIL RECENTLY FOCUSED ON SIX CRITERIA (INDICATOR) POLLUTANTS

CO	Carbon Monoxide	- reduces O_2 in blood, ^{Stress} Heart
NO ₂	Nitrogen Dioxide	- Respiratory irritant
O ₃	Ozone	- " ", Stress lungs & heart
SO ₂	Sulfur Dioxide	- Respiratory irritant
PM ₁₀	Particulates less than 10µm (pass through 10µm filter)	- Respiratory irritant, ^{100% Zoon} Visibility, ^{vector} for toxic
Pb	Lead	- blood poison, neurological effects

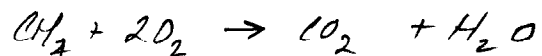
RECENTLY FOCUS HAS EXPANDED TO INCLUDE AIR TOXICS.

SOURCES OF AIR POLLUTION

- (I) EMISSIONS FROM COMBUSTION
- (II) " " EVAPORATION
- (III) " " FROM ABRASION

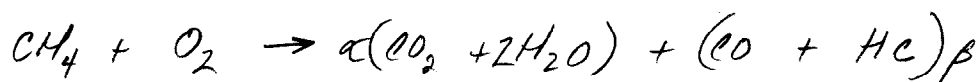
COMBUSTION

- AUTOMOBILE; ELECTRICITY GENERATION; AGRICULTURE; HOME & OFFICE HEATING; CEMENT MANUFACTURE; AIR, SEA, RAIL TRANSPORT
FOOD PREPARATION

MODEL REACTION

RELATIVELY BENIGN PRODUCTS

MOST COMBUSTION IS OXYGEN STARVED, EVEN WITH EXCESS O_2 SO THAT (NO ATTEMPT TO PRESERVE BALANCE)

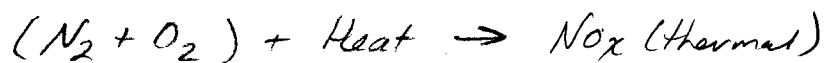


$$\alpha \gg \beta$$

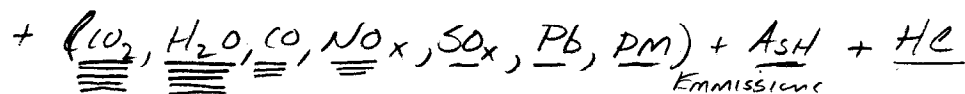
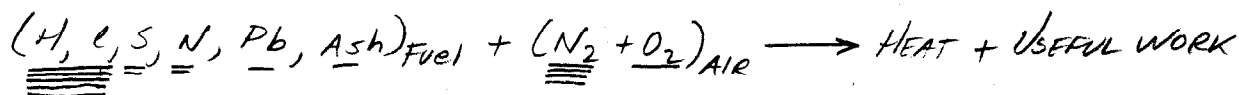
α, β "conversion coefficients"

$$\alpha + \beta = 1$$

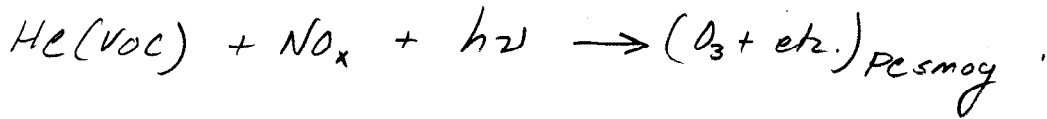
MOST COMBUSTION IS ALSO "AIR BREATHING" SO THE N_2 IN AIR BECOMES INVOLVED.



MOST FUELS ARE NOT PURE HYDROCARBON, BUT HAVE N, S, Pb & OTHER MATERIALS.



NOW THE EMISSIONS REACT WITH EACH OTHER IN THE PRESENCE OF LIGHT TO PRODUCE OTHER POLLUTANTS



www.epa.gov/airnow/

EVAPORATION

GASOLINE, PAINTS, SOLVENTS, TRANSPIRATION INTRODUCE HC(VOC) INTO AIR.

TRANSPIRATION (NATURAL) SOURCE IS ACTUALLY SIGNIFICANT

ABRASION

PARTICLES, SOIL(DUST), SILICA(DUST) ARE INTRODUCED BY EROSION/ABRASION PROCESSES. LIKE SMALL PARTICLES IN WATER, SMALL PARTICLES IN AIR CAN REMAIN SUSPENDED FOR LONG TIME PERIODS

STANDARDS

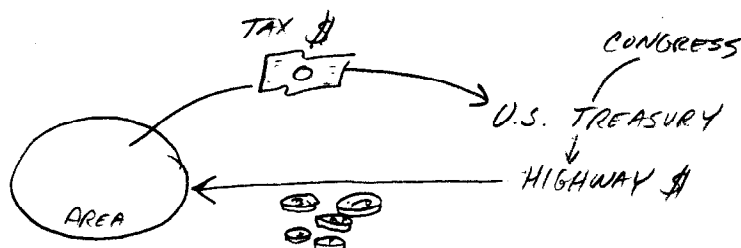
AMBIENT (BACKGROUND)
EMISSION

CLEAN AIR ACT ESTABLISHES NAAQS.

IF AN AREA IS NOT IN ATTAINMENT (CANNOT MEET) THEN MUST DEVELOP AND SUBMIT A SIP (STATE IMPLEMENTATION PLAN).

IF CANNOT MEET STANDARDS BY CERTAIN DATE
EPA CAN IMPOSE ECONOMIC SANCTIONS (TYP. CUT OF
HIGHWAY FUNDS).

CONCEPT OF
ECONOMIC SANCTIONS



GENERALLY AREAS IN US RECEIVE \$0.5 - \$0.7 / \$1.0
RETURN. HOWEVER IF YOU PAY \$1.00 IN TAX
AND RECEIVE NO SERVICE YOU GET ANGRY FAST -
IDEA IS TO FORCE CHANGE

NON ATTAINMENT MEANS VIOLATE ONE OR MORE
STANDARDS 2 DAYS PER YEAR.

MEASURES IN NON ATTAINMENT AREAS

(1) NO NEW NET EMISSIONS

(OFFSETS - NEW SOURCE OK, IF CAN REDUCE
EXISTING SOURCES CONTRIBUTIONS.

EMISSIONS MARKET

(2) NEW SOURCES MUST EMPLOY LAER TECHNOLOGY
REGARDLESS OF COST.

OC
M
S
+
e

ATTAINMENT AREAS

CLASSIFIED BY AMOUNT OF DEGRADATION ALLOWED (PSD)

CLASS I: NO INCREASE IN POLLUTION ALLOWED.

CLASS II: MODERATE INCREASE ALLOWED.

CLASS III: "AIRSHED SACRIFICE AREAS" - LARGE INCREASES ALLOWED

IN ALL PSD AREAS MUST USE BACT ON NEW SOURCES. ECONOMIC CONSIDERATIONS ALLOWED.

CAA 1990 AMENDMENTS

"SO₂ ALLOWANCE" - DEGRADATION PERMITS (RESOURCE ALLOCATION, CONSERVATION RESERVE (NEGAWATTS))

NON ATTAINMENT AREAS (ACCELERATION)

- CLASSIFIED BY DEGREE OF NON ATTAINMENT

MARGINAL: NEW SOURCE REQUIRES COST + 10% OFFSET

MODERATE

SERIOUS

SEVERE

EXTREME: NEW SOURCE REQUIRES COST + 50% OFFSET

- ADDED 189 POLLUTANTS TO AIR TOXIC LIST

(ASBESTOS, BENZENE, BERYLLIUM, COKE, ARSENIC, MERCURY, RADIO NUCLIDES, VINYL CHLORIDE)

POLLUTANT STANDARDS INDEX (PSI)

NO LONGER CALLED PSI - RENAMED TO
AQI

AQI IS CALCULATED SAME WAY AS PSI, SOME
ADDITIONAL SUBINDICES (PM_{2.5}) HAVE BEEN ADDED

CO - MAIN CAUSE IS POOR COMBUSTION

- MAIN EFFECT IS TO COMPETE WITH OXYGEN
FOR HEMOGLOBIN.

$$\% \text{COHB} = \beta(1 - e^{-\gamma t}) [\text{CO}]$$

$$\gamma = 0.402 \text{ hr}^{-1}$$

$$\beta = 0.15\% \text{ ppm CO}$$

$$[\text{CO}] = \text{ppm CO}$$

CAUSES SEVERE HEART STRESS.

10% SAT - HEADACHE

30% SAT - CONFUSION

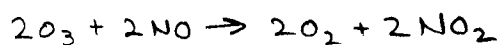
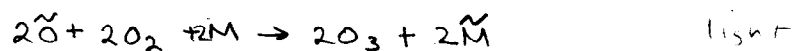
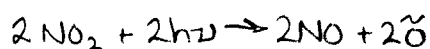
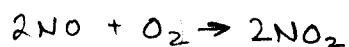
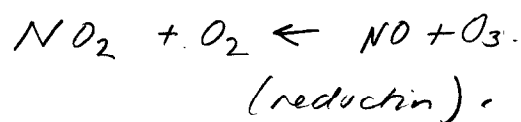
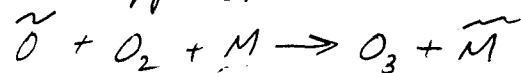
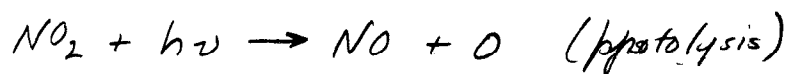
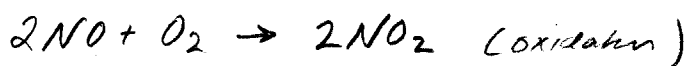
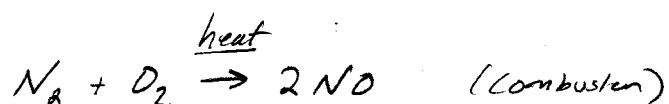
60% SAT - LOSS OF CONSCIOUSNESS & DEATH.

COMMON IN INDOOR AIR - EASILY PURGED WITH FRESH
AIR

NO_x NO, NO_2

Irritant, bronchitis, pneumonia

Forms Nitric Acid and can damage plants.

VOC - react with NO_x to produce photo smog.

dark



FACT SHEET

REVISIONS TO THE AIR QUALITY INDEX

TODAY'S ACTION

- The Environmental Protection Agency (EPA) is revising its Air Quality Index to enhance the public's understanding of air pollution across the nation. Previously known as the Pollutant Standards Index, this uniform air quality index is used by state and local agencies for reporting on daily air quality to the public. The Index provides general information to the public about air quality and associated health effects .
- EPA is revising the Index to update health messages for carbon monoxide, sulfur dioxide and nitrogen dioxide. It will also reflect updated health information considered in the Agency's recent reviews of the air quality standards for ground-level ozone (smog) and particulate matter. The revised Index will ensure consistency between current science on the health effects of all of these air pollutants and the reporting of this air quality and health information to the public.
- EPA developed the revised Index in close partnership with health and public affairs experts in state and local agencies.

WHAT ARE THE BENEFITS OF THE REVISIONS?

- Today's action enhances the public's understanding of the nation's air quality by providing clear and consistent information regarding the health effects of several common air pollutants.
- The revised Index provides more accurate and specific information on health risks associated with exposure to air pollution. This, in turn, will help individuals make informed decisions regarding actions to avoid or reduce their exposure to these pollutants.
- The revised Index can also serve as a basis for programs that encourage the public to take action to reduce air pollution on days when levels are projected to be of concern to local communities.
- A new national Internet website, AIRNOW, which includes "real time" air quality data and forecasts of summertime smog levels in many states, uses the Index categories, colors and descriptors to communicate information about air quality.

BACKGROUND

- Under the Clean Air Act, EPA is required to establish a nationally uniform air quality index for the reporting of air quality. In 1976, EPA established this index, then called

the Pollutant Standards Index, for use by state and local communities across the country.

- The Index provides information on pollutant concentrations for ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. The Index is "normalized" across pollutants so that an Index value of 100 represents the level of health protection associated with the health-based standard for each pollutant and an Index value of 500 represents the significant harm level.
- This Index has been adopted internationally and is used around the world to provide the public with information on air pollutants.
- On July 18, 1997, EPA revised the ozone and particulate matter standards, in light of a comprehensive review of new scientific evidence. EPA replaced the 1-hour ozone standard with an 8-hour ozone standard, and supplemented the particulate matter standard with 24-hour and annual standards for fine particulate matter.
- The revised Index was developed through extensive coordination with public information, health, and air quality experts from state and local agencies, as well as input from the general public through EPA-sponsored focus groups. For example, EPA sponsored eight focus groups in major U.S. cities to help evaluate how to most effectively communicate air quality and health effects information. Numerous state and local agencies and associations also participated through workshops to provide comment on the Index revisions.

WHAT ARE THE SPECIFIC REVISIONS TO THE INDEX?

- EPA is changing the name of the Pollutant Standards Index to the Air Quality Index.
- The revised Index adds an additional air quality category just above the level of the standard. Previously, Index values from 101 - 200 were characterized "unhealthful." The revised Index establishes a category from 101 -150 characterized as "unhealthy for sensitive groups," and a category of 151 - 200 as "unhealthy."
- When air quality is "unhealthy for sensitive groups", EPA has added a corresponding requirement to report a pollutant-specific statement indicating what specific groups in the population are most at risk. For example, when the Index is above 100 for ozone the AQI report will contain the statement "Children and people with asthma are the groups most at risk."
- To the extent that state and local agencies use colors to communicate Index values, specific colors are required. For instance, any agency that chooses to use colors to communicate such values must represent the Index values of 151 - 200 as "red". Examples of the use of color in Index reporting include the color bars that appear in many newspapers, and the color contours of the Ozone Map.
- The revised Index includes modifications to the ozone sub-index and a new sub-index for fine particulate matter. These changes to the Index are based on health effects information from the review of the ozone and particulate matter standards, as well as

information and feedback provided by state and local agencies and the public. The modifications also reflect the addition of the new air quality category "unhealthy for sensitive groups."

- The revised Index includes changes to the sub-indices for ozone, inhalable particulate matter (PM₁₀), carbon monoxide and sulfur dioxide to reflect the addition of the new air quality category of "unhealthy for sensitive groups."
- This action requires all Metropolitan Statistical Areas with populations greater than 350,000 to report the Index. Previously, urbanized areas with populations greater than 200,000 were required to report.

WHO WILL BE AFFECTED BY THESE REVISIONS?

- The revised Index benefits the general public by providing clear and consistent information regarding air quality and associated health risks.
- The revised Index will not impose new burdens on state and local agencies.

FOR MORE INFORMATION

- Interested parties can download the final decision on the Index from EPA's World Wide Web site on the Internet under "recent actions" at the following address: <http://www.epa.gov/ttn/oarpg>. For further information about the proposal, contact Susan Stone (919 541-1146) or Terence Fitz-Simons (919 541-0889) of EPA's Office of Air Quality Planning and Standards.
- To read ozone forecasts and to see maps showing real-time ozone animations, go to the AIRNOW web site at <http://epa.gov/airnow>. Each day's animation is available by early afternoon. Next-day forecasts generally are available after 4:15 p.m.

Air Quality Index

Category Index Values, Descriptors, and Colors.

Index Values	Descriptor	Color
0 - 50	Good	Green
51 - 100	Moderate	Yellow
101 - 150	Unhealthy for Sensitive Groups	Orange

151 - 200	Unhealthy	Red
201 - 300	Very Unhealthy	Purple
301 - 500	Hazardous	Maroon

[EPA](#) | [OAR](#) | [OAQPS Home Page](#) | [AIRNOW home](#) | [Map Archives](#)

<http://www.epa.gov/airnow/factsht.html>

[Search](#) | [Comments?](#)

November 29, 2000