IX. REFERENCES


12. Report of visit to South African Coal, Oil and Gas Corporation, Ltd (SASOL), Sasolburg, South Africa. Rockville, MD, Enviro Control, Inc, Dec 5-8, 1977 (submitted to NIOSH under contract No. 210-76-0171)


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27. Sexton RJ: The hazards to health in the hydrogenation of coal--IV. The control program and the clinical effects. Arch Environ Health 1:208-231, 1960


65. American Conference of Governmental Industrial Hygienists (ACGIH). Documentation of the Threshold Limit Values for Substances in Workroom Air. Cincinnati, OH, ACGIH, 1974


81. Attari A: Fate of Trace Constituents of Coal During Gasification. NIES PB-223-J01. Chicago, IL, Institute of Gas Technology, 1973


100. Western Coal Gasification Company (WESCO): WESCO application for permit and certification of registration. General Form for Sources Located Within the State of New Mexico. Farmington, NM, WESCO, 1973

101. Hoogendoorn JC: Gas from coal with Lurgi gasification at Sasol. Presented at the American Institute of Mining Engineers, June 1974. Dallas, TX, AIME, 1974


103. South African Coal, Oil and Gas Corporation, Ltd: General Data on the Gas Production, Rectisol, Phenosolvam, and Effluent Streams of Sasol. Sasolburg, South Africa, Sasol, 1975


113. Institute of Gas Technology: A Survey of R&D Projects Directed Toward the Conversion of Coal to Gaseous and Liquid Fuels. Chicago, IL, IGT, 1972, pp IP7-IP20, IP27, IG7-IG18


121. Maddox RN: Gas and Liquid Sweetening, ed. II. John M Campbell Publisher, Norman, OK, 1974, pp 98-115


<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ACID GAS</td>
<td>A gas which, when dissolved in an ionizing liquid such as water, produces hydrogen ions. Carbon dioxide, hydrogen sulfide, sulfur dioxide, and various nitrogen oxides are the typical acid gases produced in coal gasification.</td>
</tr>
<tr>
<td>ANTHRACITE</td>
<td>&quot;Hard&quot; coal containing 85 to 98 percent fixed carbon and small percentages of volatile material and ash.</td>
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<tr>
<td>ASH</td>
<td>Theoretically, the inorganic salts contained in coal; practically, the noncombustible residue from the combustion of dried coal.</td>
</tr>
<tr>
<td>ASPHYXIANT</td>
<td>A substance capable of producing a condition due to lack of oxygen in respired air, resulting in impending or actual cessation of life.</td>
</tr>
<tr>
<td>BINDERS</td>
<td>Carbon products, tars, etc., used to impart cohesion to the body to be formed; a coal-extract binder may be used to prepare formed-coke pellets from non-coking coals.</td>
</tr>
<tr>
<td>BITUMINOUS COAL</td>
<td>A broad class of coals containing 46 to 86 percent fixed carbon and 20 to 40 percent volatile matter.</td>
</tr>
<tr>
<td>BLOW DOWN</td>
<td>Periodic or continuous removal of water containing suspended solids and dissolved matter from a boiler or cooling tower to prevent accumulation of solids.</td>
</tr>
<tr>
<td>BTU</td>
<td>British thermal unit, the quantity of energy required to raise the temperature of one pound of water one degree Fahrenheit.</td>
</tr>
<tr>
<td>CAKING</td>
<td>The softening and agglomeration of coal as a result of the application of heat.</td>
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</tbody>
</table>
CARBON-STEAM REACTION (WATER-GAS REACTION)  
The reaction in which steam is passed over incandescent carbon to form a low-BTU gas consisting of hydrogen, carbon monoxide and carbon dioxide.

CARBONIZATION  
Destructive heating of carbonaceous substances with the production of a solid porous residue, or coke, and the evolution of a number of volatile products.

CAVITATION  
The formation and collapse of vapor cavities in a flowing liquid where the local pressure on the liquid is reduced to the liquid vapor pressure at that temperature. Collapse of these cavities produces objectionable noises and erosion on the adjacent surfaces.

CHAR  
The solid residue remaining after the removal of moisture and volatile matter from coal.

CLAUS PROCESS  
An industrial method of obtaining elemental sulfur through the partial oxidation of gaseous hydrogen sulfide in air followed by catalytic conversion to molten sulfur.

COAL  
A natural solid material consisting of amorphous elemental carbon with various amounts of organic and inorganic compounds.

COAL GAS  
The gas that comes from retorts, mufflers, or coke ovens during the distillation of coal. Large quantities of coal gas are produced when coal is used to make coke, coal tar, benzene, toluene, ammonia, and other products.

COAL GASIFICATION  
The reaction of coal at high temperatures in an atmosphere (reducing) deficient in oxygen to produce a combustible gas.

COKE  
Porous residue consisting of carbon and mineral ash formed when bituminous coal is heated in a limited air supply or in the absence of air. Coke may also be formed by thermal decomposition of petroleum residues.
COKE OVEN GAS  The gas secured from coke ovens during the production of coke. (The properties of this gas are identical to those of coal gas, and the two products are interchangeable. Coke is particularly useful in making iron and steel and as an industrial fuel.)

CRUDE GAS  The impure gas produced in a gasifier.

DEVOLATILIZATION  The removal of a portion of the volatile matter from medium- and high-volatile coals.

DOG  Any of various usually simple mechanical devices for holding, gripping, or fastening.

ECONOMIZER  Heat exchanging mechanism for recovering heat from flue gases.

ELUTRIATION  The preferential removal of the small constituents of a mixture of solid particles by a stream of high-velocity gas.

ENTRAIN  To draw in and transport (as solid particles or gas) by the flow of a fluid.

FINES  In general, the smallest particle of coal or mineral in any classification, process, or sample of material; especially those that are elutriated from the main body of material in the process.

FIXED BED  A bed in which the individual particles or granules of a solid are motionless and supported by contact with each other (in contrast with moving bed).

FLASH DISTILLATION  A continuous equilibrium vaporization in which all the vapor formed remains in contact with the residual liquid during the vaporization process. It is usually accomplished by the sudden reduction of pressure in a hot liquid.
PLUME GAS (STACK GAS)

Synonymous terms for the gases resulting from combustion of a fuel.

PLY ASH

A fine ash from the pulverized coal burned in power station boilers, or entrained ash carried over from a gasifier.

GAS LIQUOR (SOUR WATER)

The aqueous acidic streams condensed from the coal conversion and processing areas by scrubbing and cooling of the crude gas stream.

GASIFIER

A vessel in which gasification occurs, usually utilizing fluidized-bed, fixed-bed, or entrained-bed units.

GASWORKS

Plants built during the 19th and early 20th centuries to produce gas. Coal was generally burned in reducing atmosphere with steam to form a low-BTU gas. The hot gas was passed through a brick checkerwork at atmospheric pressure to heat the brick. When the brick was hot, the gas was switched to a second checkerwork and oil was sprayed into the first. The gas produced from the thermally cracked oil was added to the coal gas to form a medium (500-BTU) gas.

HIGH-BTU GAS

Fuel gas having an energy content of 950-1035 BTU/scf.

HIGHER HEATING VALUE (HHV) (GROSS HEAT VALUE)

The heat liberated during a combustion process in which the product water vapor is condensed to a liquid and the heat of condensation is recovered.

LEACHING

The process of extracting a soluble component from a mixture by percolating a solvent, usually water, through the mixture, resulting in the solution and eventual separation of the soluble components.

LIGNITE

Brownish-black coal containing 65 to 72 percent carbon on a mineral-matter-free basis, with a rank between peat and sub-bituminous coal.

LOW-BTU GAS

A gas having a heating value of up to 125-175 BTU per standard cubic foot.
LOCKHOPPER
A mechanical device that permits the introduction of a solid into an environment at different pressure.

LOWER HEATING VALUE
(NATURAL HEAT VALUE)
The heat liberated by a combustion process assuming that none of the water vapor resulting from the process is condensed, so that its latent heat is not available.

MEDIUM-BTU GAS
A gas having a heating value of 225-500 BTU per standard cubic foot.

METHANATION
The catalytic combination of carbon monoxide and hydrogen to produce methane and water.

MOVING BED
A body of solids in which the particles or granules of a solid remain in mutual contact, but in which the entire bed moves in piston-like fashion with respect to the containing walls (in contrast with fixed bed).

NATURAL GAS
Naturally occurring gas extracted from sedimentary structures, consisting mainly of methane and having a higher heating value of approximately 1,050 BTU per standard cubic foot.

NONCAKING GAS
A coal that does not form a cake under normal conditions.

ON-STREAM OPERATING TIME
The time during which the entire plant is actually working at preset conditions, as opposed to the time in which it is shut down for repairs, starting up, etc.

PILOT PLANT
A small-scale industrial process unit operated to test the application of a chemical or other manufacturing process under conditions that will yield information useful in design and operation of full-scale manufacturing equipment.

POKEHOLE
An opening in the cover of a process vessel through which steel rods are inserted, for the purpose of determining the fire bed depth and the ash bed depth in a gasifier.
<table>
<thead>
<tr>
<th><strong>PROCESS STREAM</strong></th>
<th>Any material stream within the coal conversion processing area.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRODUCT STREAM</strong></td>
<td>Streams within the coal conversion plant that contain the material which the plant was built to produce.</td>
</tr>
<tr>
<td><strong>QUENCHING</strong></td>
<td>Cooling by immersion in oil, water bath, or water spray.</td>
</tr>
<tr>
<td><strong>RANK</strong></td>
<td>Those differences in the coals due to geological processes designated as metamorphic, whereby the carbonaceous materials change from peat through lignite and bituminous coal to anthracite or even to graphite; the degree of coal metamorphism.</td>
</tr>
<tr>
<td><strong>RAW GAS</strong></td>
<td>Impure gas produced in a gasifier.</td>
</tr>
<tr>
<td><strong>REAL TIME</strong></td>
<td>The actual time during which an event takes place with the reporting on or recording of the event simultaneously with its occurrence.</td>
</tr>
<tr>
<td><strong>SLUDGE</strong></td>
<td>A soft mud, slush, or mire, eg, the solid product of a filtration process before drying.</td>
</tr>
<tr>
<td><strong>SOUR GAS</strong></td>
<td>A gas containing acidic substances such as hydrogen sulfide or carbon dioxide.</td>
</tr>
<tr>
<td><strong>SOUR WATER</strong></td>
<td>See gas liquor.</td>
</tr>
<tr>
<td><strong>SPARED EQUIPMENT</strong></td>
<td>Standby, parallel equipment that is available for immediate use by switching power or process from on-stream equipment.</td>
</tr>
<tr>
<td><strong>STUFFING BOX</strong></td>
<td>A device that prevents leakage from an opening in an enclosed container through which a shaft is inserted.</td>
</tr>
<tr>
<td><strong>SUB-BITUMINOUS COAL</strong></td>
<td>Coal of intermediate rank (between lignite and bituminous); weathering and nonagglomerating coal having calorific values in the range of 8,300 to 11,000 BTU, calculated on a moist, mineral/matter-free basis.</td>
</tr>
<tr>
<td><strong>SWEET GAS</strong></td>
<td>Gas from which acidic constituents such as H2S have been removed.</td>
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</tbody>
</table>
SYNTHETIC NATURAL GAS (SNG) Substitute natural gas; a manufactured gaseous fuel generally produced from naphtha or coal that contains 95% to 98% methane and has an energy content of 980 to 1,035 BTU/scf (about the same as that of natural gas).

SYNTHESIS GAS A mixture of hydrogen and carbon monoxide which can be reacted to yield hydrocarbons.

TAIL GAS A gas issuing from a gas-treatment unit which may be recycled to the process or exhausted.

TAR A brown or black viscous combustible liquor formed by the destructive distillation of coal. It condenses out of the raw gas stream as part of the gas liquor, has a specific gravity of approximately 1.1, and contains most of the fines which are carried over from the gasifier in the gas stream.

TAR OIL The more volatile portion of the tar, with a specific gravity of approximately 0.9, a boiling range of approximately 185 to 300 °C (365 to 660 °F) depending on the coal feed and operation conditions. In addition, tar oil floats on the gas liquor.

TOXICANT A substance that kills or injures an organism through chemical or physical action, or by altering the organism's environment.

TRACE ELEMENTS The term "trace elements" is applied to elements that are present in the earth's crust in concentrations of 0.1% (1000 ppm) or less. Trace element concentrations are usually somewhat enriched in coal ash. Environmentally hazardous trace elements present in coal include: antimony, arsenic, beryllium, cadmium, mercury, lead, selenium, and zinc.

VENTING Release of gases or vapors under pressure to the atmosphere.