DESERT BREEZE

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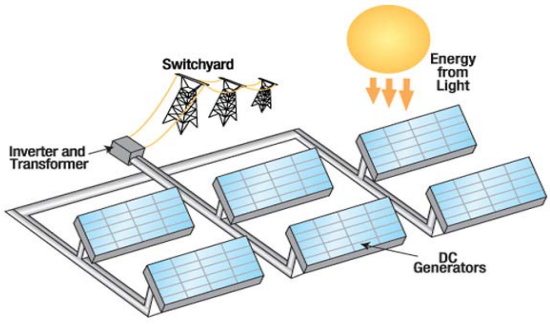
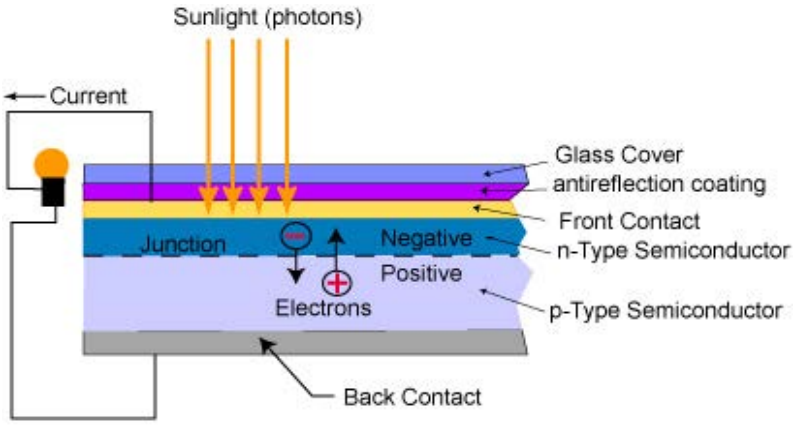
SOLAR POWER PLANTS

Part 2 of a 3 part series



Last issue we talked about thermal solar power plants utilizing mirrors to concentrate the suns power to a single point to produce power. Closer to home, all the solar power generating facilities in Eastern Kern County, currently, utilize photovoltaic (PV) cells. Covering acres of land, PV cells utilize specially treated silicon (or similar semiconductor material) to convert light energy directly to electricity.



The technology is identical to the solar cells appearing on roof tops throughout Kern County, and utilized on PV cells attached to the International Space Station (ISS) circling 249-miles above the earth.

The PV cells on the ISS PV generate more power than PV cells on the ground because more of the Sun's power reaches the cells in outer space. The earth is protected by an ozone layer that absorbs approximately 98% of the Sun's medium frequency ultraviolet light (UVB) before it reaches the ground. Medium frequency ultraviolet light is utilized by PV cells to generate electricity; therefore, more power is generated in space when the UVB is not blocked. Further discussion about ultraviolet light and stratospheric ozone will be reserved for another date.

PV solar farms in Eastern Kern connect thousands of PV cells over thousands of acres to generate power. A single solar farm (solar power plant) in Eastern Kern can generate up to 650-megawatts (MW) of electricity. 1-MW can power an average of 164-homes; that's over 107,000-homes! However, the 650-MW solar power plant will cover almost 5,698-acres, and utilize approximately 1.7-million solar panels.

The large area (footprint) a solar power plant occupies is often its disadvantage. Next time (our final article on solar power), we'll discuss another type of solar power plant, advantages and disadvantages of solar power.

-Glen Stephens

Grant Incentive for Lower Emission Vehicle Purchase!

The Eastern Kern Air Pollution Control District (District) receives an annual "air quality impact" fee collected by the DMV pursuant to AB 2766. A substantial portion of these funds are allocated to the District's DMV Grant Program. The DMV Program offers funding for many types of motor vehicle related emission reduction projects located within Eastern Kern County.

Eligible projects include road paving, lower-emission vehicle purchase, EV charging stations, CNG refilling stations, and public education. Historically, funds were awarded through a lengthy application submission/review period that included a public town hall style project selection meeting conducted by a Grant Committee of ten.

In an effort to streamline the funding process, the District revised the 2016 DMV Grant Program into the following three funding tiers: Tier I, Incentive for Purchase of Low-Emitting Vehicle, Tier II, Incentive for Infrastructure and Public Education, and Tier III, Road Improvement. The Grant Committee was also released from service. Although this greatly improved the program's overall performance during the 2016 funding process, District staff realized the vehicle purchase component needed further revision.

Beginning with the 2017 funding cycle (October 1, 2016), the Tier I, Incentive for Purchase of Low-Emitting Vehicle component will become first-come, first-serve until all funds have been allocated. Eligible projects will be awarded monthly.

Tier I funds will be distributed through award vouchers in the following amounts and categories:

$2,000 for purchase of an Ultra-Low Emission Vehicle (ULEV);

$3,000 for purchase of a Partial Zero Emission Vehicle (PZEV);

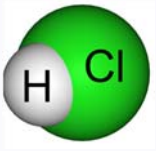
$5,000 for purchase of a Zero Emission Vehicle (ZEV).

Tier II and Tier III projects will continue to be awarded annually and in a process similar to that of the 2016 funding cycle because they require more planning and offer larger incentives.

The 2017 DMV Grant Program guidelines and project applications will become available October 1, 2016, on the District's website: www.kernair.org under the Grants/DMV Grants tab. Hard copies will also be available at the District's Administrative office located at 2700 M St., Ste 302, Bakersfield, CA 93301. This program is open to the public and everyone is welcome to apply.

-Jeremiah Cravens

Hydrochloric Acid



Hydrochloric acid (HCl) is a clear, colorless liquid that is highly corrosive. Hydrochloric acid is naturally found in gastric acid, which is a digestive fluid formed in the stomach to assist in the breakdown of foods and digestion of proteins. Hydrogen Chloride is the gaseous form of hydrochloric acid which is also given the chemical formula HCl.

HCl is used in the manufacture of a variety of industrial chemicals, fertilizers and dyes. It is used in the textiles industry, to separate cotton from wool and fluff, and in the electronics industry, to etch semiconductor crystals.

The most significant releases of HCl occur when coal is burned such as coal-fired power stations, cement plants, as well as when waste is incinerated. This occurs because coal and waste foods contain sodium chloride, which reacts with hydrogen and form Hydrochloric acid.

HCl gas is highly corrosive and will damage metal and limestone structures and buildings. If high levels of HCl gas dissolve in a body of water, aquatic organisms will be harmed and even killed. This can happen only if much larger than normal amounts of HCl are released to the environment. HCl gas has a very high solubility; therefore, releases of HCl into the atmosphere are quickly washed out by rain and moisture in the air.

HCl can enter the body either by inhalation of air containing HCl, accidental ingestion of liquid HCl, or by dermal (skin) contact with HCl. Dermal contact mainly occurs in the occupational setting. Inhalation of air containing low levels of hydrogen chloride over short periods of time can cause throat irritation. Ingestion of HCl can cause severe burns to the lips, mouth, throat, esophagus and stomach.

The International Agency for Research on Cancer has not designated HCl in terms of its carcinogenicity. However, exposure to hydrogen chloride at normal background levels is unlikely to have any adverse effect on human health. Releases of HCl are regulated through agencies such as local air pollution control districts, California Air Resources Board and the Environmental Protection Agency (EPA). These agencies have taken action to reduce emissions of HCl. For example, the EPA has created National Emission Standards for Hazardous Air Pollutants to limit HCl emissions in the kiln system of cement plants, which requires operators to utilize HCl control technologies. Eastern Kern Air Pollution Control works with these and many other sources to ensure that they are compliant and do not pose any significant health risk to the surrounding communities.

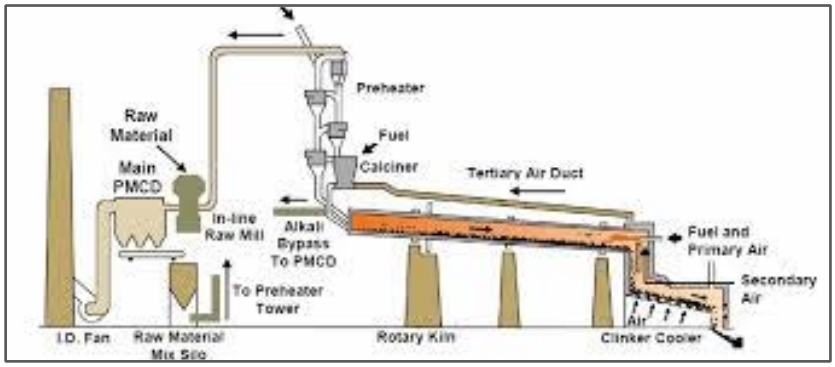
-Cherita Young

Portland Cement Manufacturing Process

Pyro Processing: Part 2 of a 3 part series on the cement manufacturing process.

The suspension preheater tower is the basis of all modern cement pyro-process, kiln burning systems. This is part 2 of a series of articles that explain the cement manufacturing process. Part 1 discussed the mining and particle size reduction processes as well as blending of the "raw" constituents. We now have the correct chemical composition of the mix, the proper fineness and homogeneity.

The product of the pyro-process phase is called "clinker". These are small nodules of "lava looking" dark greyish material typically less than 1.5 inch in size (distribution to include fine particles). Ideally the clinker shouldn't have an excess of fine particles (under burning) or huge nodules (over burning). Clinker is primarily a mixture of four chemicals (tricalcium aluminate, tetracalcium aluminoferrite, dicalcium silicate, and tricalcium silicate). The clinker and other additives are later ground in the milling process to produce portland cement (part 3 of this article).



The purpose of the pre-heater tower is to capture and use the heat that otherwise would be lost (akin to older technologies). Raw-mix, or kiln feed, in dry powder form is injected into the pyro-process at the top of the pre-heater tower. The upward gas velocity is sufficient for the powder to be picked up and lifted "in suspension." Huge induction draft fans supply this "lift". This process is repeated a number of times - typically five to six - by stacking "riser" ducts and a series of cyclones (or vessels) on top of one another in a tower (typical for the 3 cement plants in the Eastern Kern APCD area – see figure above). The kiln feed descends down through this system of cyclones. Typically the temperatures at the top (kiln feed entry area) are about 500 ° F (Fahrenheit) and temperatures increase as the material descends toward the kiln. The action of the cyclone is, essentially, centrifugal. By repeated heat exchange, most of the heat from the kiln exhaust gas can be captured. Calcination (the loss of carbon dioxide from the limestone) occurs in the pre-calciner vessel where the pre-calciner burner is housed. The heat that escapes the preheater is used to heat the raw mill as well. Reactions in the tower trigger chemically bonded water and carbon dioxide to be released through the stack. Approximately one-third of the weight of the kiln feed is given off through the stack in the form of water vapor and carbon dioxide (CO_2). Cement plant generated CO_2 accounts for about 5% of all man made CO_2 releases.

This feed (material) after having been transformed chemically makes its way through the tower enters the rotary kiln. At this point the material has been heated to about 1750 °F.

The rotary kiln consists of a tube made from steel plate, and lined with refractory brick. The tube slopes slightly (1–4 degrees) and slowly rotates on its axis. Material from the preheater tower is fed in at the upper end, and the rotation of the kiln causes it gradually to move downhill to the other (discharge) end of the kiln. At this end, fuel, in the form of gas, oil, or pulverized solid fuel (coal and/or coke), is blown in through the burner pipe, producing a large concentric flame in the lower part of the kiln tube. As material moves under the flame, it reaches its peak temperature (about 2750 °F), before dropping out of the kiln tube into the cooler. Air is drawn first through the cooler and then through the kiln for combustion of the fuel. In the cooler, the air is heated by the cooling clinker, so that it may be 750 to 1500°F before it enters the kiln, thus causing intense and rapid combustion of the fuel. The clinker is cooled rapidly in order to block any further chemical reactions. If it is not cooled at this rapid rate, reverse chemical reactions could take place.

Clinker is then transported via various conveyance systems to a storage facility (silo, clinker barn, or outdoor storage/yard facility) depending on plant facilities.

Cement plant laboratories check each step in the manufacture of portland cement by frequent chemical and physical tests. The labs also analyze and test the finished product to ensure that it complies with all industry specifications.

Of particular concern to air districts regarding the pyro-process are the high temperatures that occur in the kiln, upwards to 2750 °F. Combustion of fuel in air generate oxides of nitrogen (NOx) emissions. NOx and volatile organic compounds (VOC) can generate ground level ozone (different than stratospheric ozone). Cement plants are under strict scrutiny to reduce emissions, and they undergo huge expenses to monitor and control NOx, VOC and toxic emissions.

The next article will discuss the finished grinding process and preparation for the delivery of the finished product, portland cement.

-John Hayes

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Board of Directors usually meet once every two months starting in January at various locations.

Air Pollution Control Officer

Glen E. Stephens, P.E.

Hearing Board Members

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Chris Ellis

Vacant

For news updates and other information, please visit the Eastern Kern APCD website at www.kernair.org

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