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The Dirt on Clean Coal

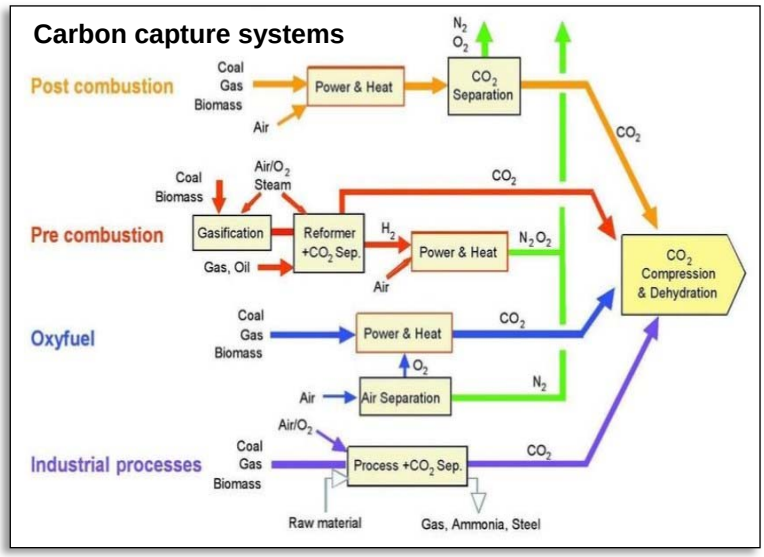
By Richard J. Izzo, PG

Around 300 million years ago, during the aptly-named "Carboniferous" Era, plants on the edges of countless sedimentary basins were buried by tectonic activity (and the resulting rise in sea level), and thus, coal (the staple of energy production for over a century) was born. Of course, a lot of things had to happen over the 300 million years to turn the buried plant matter into coal. Over time, heat and pressure caused the cellulose in the plants to change to peat and then eventually to the four "grades" of coal including lignite or brown coal, subbituminous, bituminous, and finally, anthracite. Although all grades may be used as fuel, bituminous is by far the most common in the U.S. and produces the highest BTUs. Bituminous is also used as "coking" coal to produce steel.

Coal has been used to generate electricity in the U.S. since 1882 when it was the chief source of fuel for the Edison Plant in New York City. By the mid-20th century, coal was the leading fuel for electric power production across the country. Although its use is on the decline (around 20% in the past 20 years) in favor of cleaner cost-effective fuels such as natural gas, coal is still widely used in the U.S. According to the U.S. Energy Information Administration (EIA), as recently as 2017, coal accounted for around 30% of all fuel used for generating electricity.

Coal continues to have the distinction of being the "dirtiest" of all fossil fuels. Its production of greenhouse gases ranks first among fossil fuels. In addition, the burning of coal releases a number of airborne toxins including mercury, lead, sulfur dioxide, nitrogen oxides, particulates, and various heavy metals. In addition, many of these same toxins remain in the estimated 100-million tons of coal ash generated annually. Much of this winds up in ponds, lakes, and landfills, potentially contributing to surface water and groundwater contamination. Coal mining itself produces contaminated wastewater, and although government restrictions were previously in place to regulate mining waste disposal, many of these restrictions have been lifted over the past year by the current administration.

So now that we've spent all this time talking about regular old "dirty" coal, let's talk about "clean" coal. How is clean coal produced? Surely clean coal is much better for the environment than dirty coal, right? Proponents of coal have been tossing this term around for the past few years and have created some confusion among the general public that clean coal is a real type of coal. Unfortunately, it's not. Banish from your mind, if you will, the image of hundreds of aproned minions furiously scrubbing away at chunks of the grimy black stuff to produce a shiny pristine fuel. No. Clean coal, albeit a slick marketing ploy, is not a type of coal, but rather it is a collection of technologies/processes designed to reduce coal emissions. Some of these have been around for decades including wet scrubbers to remove sulfur dioxide, electrostatic precipitators to remove particulates, and coal washing (yes they do wash it, sort of) in which the coal is ground up and mixed with liquid to allow impurities (metals, etc.) to precipitate out.



The most recent process employed for the reduction of greenhouse gas emissions is known as Carbon Capture and Storage (CCS). This technology may be employed for all fossil fuels, not just coal, and involves the capture of carbon dioxide (CO2) during or before combustion. During combustion, the CO2 may be captured from the exhaust by absorbing it into a solvent which is later heated to release the gas for storage. Other methods for separating CO2 during combustion include high pressure membrane filtration, adsorption/desorption processes and cryogenic separation. Pre-combustion removal is done through gasification which combines coal with steam and oxygen to produce "syngas" - a mixture of carbon monoxide and hydrogen. After the CO2 is captured, it is injected into the ground in oil or gas fields for reuse in enhanced fuel recovery.

As you may have guessed by now, the biggest obstacle for use of these technologies is cost. It is estimated that the cost for a coal-burning power plant using CCS technology is roughly 75% higher than for those with no carbon capture. With natural gas prices continuing to remain attractively low, the cost/benefit of this approach on a large-scale basis appears irreconcilable. In addition, neither CCS, nor any of the other "clean" coal technologies described above solve the problem of coal ash or mining waste disposal. With this in mind, and with anthropogenic greenhouse gas production's proven impact on climate change, it would seem that the best way forward is to continue to phase out the use of coal and other carbon-emitting fossil fuels in favor of more sustainable alternative energy sources such as solar and wind. Doing so would provide a "brighter" future and clear skies for all of us.

Richard J. Izzo, PG, is Vice President at CA RICH Consultants, Inc. Mr. Izzo designs, implements, and manages environmental testing and remediation programs involving soil, groundwater, and soil vapor impacts. He has successfully guided clients through numerous regulatory compliance programs and has helped clients satisfy or close out orders on consent, petroleum and chemical spill cases, and other regulatory agency -issued agreements. Mr. Izzo has been called upon as an expert witness in several matters involving the transfer of environmentally-impacted real property, and remediation of chemical and petroleum releases. In addition, he heads up CA RICH's water resource exploration, development, and management capabilities including watershed hydrologic budgets, groundwater investigations, aquifer mapping, safe yield determination, and water allocation permitting. Mr. Izzo holds credentials as a NY State Licensed Professional Geologist and a Hazardous Waste Emergency Response Supervisor.