# Coal Mine Fires

**Jack W. Dini**
1537 Desoto Way
Livermore, CA 94550
E-mail: jdini@comcast.net


**Local warning sign at Centralia fire.** (User created public domain image – Wikipedia, 2006).

"Scrapping all the cars, SUVs, minivans, and pickup trucks in America could reduce greenhouse gas emissions by about 2%. Extinguishing the fires that burn unchecked at coal deposits around the world could reduce emissions by 2 to 3% without the economic devastation."[1]

Are you doing your best to try and minimize your carbon dioxide imprint? If so, that's commendable. However, it's not going to make a hoot of a difference in the big picture. For example, here are two facts about the impossibility, or futility, of controlling emissions:

• Uncontrolled fires in China's abandoned coal mines release as much carbon dioxide as the entire country of Japan does from useful fuel consumption.[2]

• The Third World is growing. China has 30,000 coal mines and is opening a new power station every five days until 2012. India is right behind in present and future energy consumption. Its annual demand for coal has been steadily increasing over the past decade, and is now nearly 50% greater than it was a decade ago.[3]

Whatever the West does to "save the planet" is mere gesture unless the rest of the world agrees to give up its right to grow as we've grown. The Al Gore machine seeks to limit each person to one ton of carbon per year. The proposal is to create a system of carbon allowances that will be the rationing cards of the future.[2]

This is a commendable goal for folks in developed countries, but what is left unstated is that the remaining two-thirds of the world's population (more than four billion people) are doing their best to emulate our present lifestyle and aren't about to stop.

Let's look at coal mine fires which are underground smoldering of coal mines. Mine fires can burn for very long periods of time (months or years), until the seam in which they smolder is exhausted. They propagate in a creeping fashion along mine shafts and cracks. Because they are underground, they are extremely difficult and costly to reach and put out.

Michael Woods reports, "Underground coal fires are relentlessly incinerating millions of tons of coal around the world. The blazes spew out huge amounts of air pollutants, force residents to flee their homes, send toxic runoff flowing into waterways and leave the land above as scarred as a battlefield."[4]

Around the world, thousands of inextinguishable mine fires are burning, especially in China and India. "A global environmental catastrophe," is how Geologist Glenn Stracher, of East Georgia College in Swainsboro, describes these fires. Stracher co-organized an international symposium on the topic at the annual meeting of the American Association for the Advancement of Science in 2003. The AAAS estimates that mine coal fires, started mainly by human activity, contribute significantly to carbon dioxide emissions - as much as 3% of the world output deriving from such fires in China alone.[5]

One of the worst underground fires in the United States, the Centralia, Pennsylvania mine fire, has been burning since May 1962. The fire was started when the local city council set trash ablaze in an abandoned strip mine that had been used as an illegal dump. The fire burned along a coal seam into tunnels located beneath Centralia, sending smoke and toxic fumes into the air. Kevin Krajick reported in 2005, "A hellish landscape is about all that remains of the once-thriving town of Centralia, Pennsylvania. Forty-three years ago, a vast honeycomb of coal mines at the edge of the town caught fire. An underground inferno has been spreading ever since, burning at depths of up to 300 feet, baking surface layers, venting poisonous gases and opening holes large enough to swallow people or cars. The conflagration may burn for another 250 years, along an eight mile stretch encompassing 3,700 acres, before it runs out of the coal that fuels it."[6]

The fire was brought to national and international attention in 1981 after a 12 year old boy fell into an open steaming hole. By that time Centralia had been irreversibly damaged by the fire. In 1980 poisonous gases had begun to infiltrate a local elementary school and several homes in Centralia and whole sections of streets and yards were near collapse from the tremendous heat of the fire. In 1983 a group of concerned citizens eventually won relocation for those who wanted to leave. Most of the 1,000 residents of Centralia chose that route. David DeKok describes the trials and tribulations of Centralia residents in his book, *Unseen Danger*.[7]

Pennsylvania has over 250,000 acres of abandoned mine lands and has 1/3 of the nation's mine problems. There are over 45 mine fires burning across Pennsylvania. There are five underground fires in Allegheny County, five in Percy County, one in Westmoreland, and others in more isolated areas.[8]

Pennsylvania isn't alone. The U.S. harbors hundreds of blazes from Alaska to Alabama. Near Glenwood Springs, Colorado an old coal mine has burned for the past 100 years. In the summer of 2002, the blaze ignited a forest fire that consumed 12,000 acres and 43 buildings. Putting it out cost $6.5 million. And the mine still burns.[6] The underground coal seam that ignited the fire has been burning for about

**Section of PA Route 61 closed due to mine fire.** (User created public domain image – Wikipedia, 2006).

100 years. It was also responsible for the infamous 1994 Storm King Mountain fire that killed 14 firefighters.[5]

## China and India

The fires in the United States pale in comparison to those in China, which has an estimated 56 coal conflagrations.[9] One, in northern China consumes up to 200 million tons of coal each year. For comparison, coal consumption in the United States during 2000 was just about one billion tons.[10]

A team from the Netherlands studying the environmental effects of these fires concluded, that they release up to 360 million metric tons of carbon dioxide each year, equal to two to three percent of global carbon dioxide releases.[5]

Soot from the fires in China, India and other Asian countries are a source of the "Asian Brown Haze." It is a two-mile thick cloud of soot, acid droplets and other material that sometimes stretches across South Asia from Afghanistan to Sri Lanka.[4]

Kevin Krajick reports, "India, where large scale mining began more than a century ago, accounts for the world's greatest concentration of coal mine fires. Rising surface temperatures and toxic byproducts in groundwater and soil have turned the densely populated Raniganj, Singareni and Jharia coal fields into vast wastelands."[6] The Jharia is an exclusive storehouse of prime coke coal in the country, consisting of 23 large underground and nine large open cast mines. The mining activities in these coal fields started in 1894 and had really intensified in 1925. The history of the coal mine fire in Jharia can be traced back to 1916 when the first fire was detected. At present, more than 70 mine fires are reported from this region.[11]

## Fighting the fires

Michael Woods notes, "Mine fires are frustratingly difficult and costly to extinguish. Weapons range from backfilling mine shafts to cutting off the oxygen supply with a new foam-like grout that's squirted into mine shafts like shaving cream and then expands to sniff out the fire. Most are simply left alone to burn until they eventually exhaust their fuel supply."[4]

Regarding the fighting of the Centralia fire, Krajick notes, "Over some 20 years, firefighters tried eight times to put it out. First they dug trenches, but the fire outpaced them. Then they attempted 'flushing' - a process that involves augering holes into or ahead of a fire, and pouring down wet sand, gravel, slurries of cement and fly ash to cut off oxygen. Next, state and federal geologists drilled hundreds of exploratory boreholes to define the fire, and then dug a huge trench across its supposed path. But the fire had already spread beyond the trench. Flooding the area with water was rejected; it is nearly impossible to inundate a large underground area, especially one as complex and well drained as Centralia. A final solution, to dig a pit three-quarters of a mile long and as deep as a 45-story building would have cost $660 million, more than the value of the property in town. It too, was rejected."[6]

Remote sensing technology has made it possible to detect coal fires and study their effects. Thermal and optical images along with field-based measurements are used to determine the location, size, depth, propagation direction, burning intensity, temperature and coal consumption of a fire. This information has been useful for fighting fires in northern China.[12]

In the case of the Jharia coalfields in India, measures include bulldozing, leveling and covering with soil to prevent the entry of oxygen and to stabilize the land for vegetation. Fire fighting in this area requires relocation of a large population, which poses to be a bigger problem than the actual fire fighting operations.[11]

## Summary

While the United States is cutting its own emissions, some nations, especially China and India, are belching out more and more dirty air. As a result, overseas pollution could partly cancel out improvements in U.S. air quality that have cost billions of dollars.[13] According to the International Energy Agency (IEA), by 2030, coal-based power generation is projected to more than triple while providing roughly one-third of global electricity generation.[14] Do you think this will mean fewer underground, uncontrolled fires? I think not. *P&SF*

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*Continued on page 37.*

## New Chairs elected to PMA's 20 local districts

The 20 local districts of the Precision Metalforming Association (PMA) (Cleveland, OH) are pleased to announce their 2007-2008 Chairs. These leaders and their respective volunteer boards provide dedicated service in each of PMA's districts by promoting the metalforming industry through local meetings on topics related to manufacturing. PMA district activities include training and education, networking, apprenticeship programs, plant tours, supplier exhibitions and social events. PMA is the full-service trade association representing the $91-billion metalforming industry of North America.

PMA's districts have elected the following chairs for the 2007-2008 meeting season:

- Canada: Chris Nantau, Pressline Equipment Ltd.
- Carolinas: Keith Herbs, Lane Punch Corp.
- Chicago: Dennis Spitz, Stainless Sales Corp.
- Cleveland: Liz Comstock, Anchor Mfg. Group, Inc.
- East Michigan: Pat Westergaard, Westco Metalcraft, Inc.
- Eastern Pennsylvania: Jim Eichelberger, Hamilton Precision Metals, Inc.
- Greater Missouri: Peter Fischer Sr., Beehler Corp.
- Indiana: Pat Bosler, MS Fluid Technologies
- Lone Star: Michael Tofte, ITD Precision
- New England: David Vaz, Truex, Inc.
- New York/New Jersey: Mark Weissenrieder & Elisabeth Bennis, Weiss-Aug Co.
- Northern California: Fermin Rodriguez, Airtronics Metal Products, Inc.
- Northwest Ohio: Dave Kubacki, Nebraska Industries Corp.
- Ohio Valley: Jim McGregor, Morgal Machine Tool Co., Inc.
- Southern California: Dale Congelliere, Crenshaw Die & Mfg. Corp.
- Southern New England: Peter Doolittle, Hobson & Motzer, Inc.
- Tennessee: Al Hentsch, Flexible Metal Products, Inc.
- Twin Cities: Stuart Peterson, Paradise Press Equipment
- West Michigan: Don Dawson, Pridgeon and Clay
- Wisconsin: Michael Steger, Waukesha Tool & Stamping, Inc.

For more information about the activities of the districts, visit www.pma.org/districts. *P&SF*

## Answers to I.Q. Quiz #435

1. A magnetic field

2. The current in one half of the cycle strips off the metal plated during the first half (60 times per second).

3. Among other things:
   - In high speed plating of strip, where the anode-to-cathode spacing must be maintained but cannot because the control of high current to a soluble anode in certain baths is difficult.
   - Where the conforming shape of an anode must be maintained.
   - In precious metal plating, where anode costs may be prohibitive.

4. Maintaining the plating solution. In addition to supplying metal from soluble anodes, side reactions can oxidize Cr(III) to Cr(VI) in maintaining chromium baths, affect solution pH, etc.

5. High conductivity: chloride, bromide, nitrate, sulfate (in dilute acid), potassium
   Poor conductivity: phosphate, acetate, sulfate (in concentrated acid), ammonium

## Fact or Fiction?

*Continued from page 35.*


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14. "Asia-Pacific Partnership on Clean Development and Climate: Coal Mining Task Force Summary of Action Plan and Projects," October 31, 2006; http://www.state.gov/g/oes/rls/fs/2006/75376.htm; accessed August 31, 2007.


***Editor's Note:*** *We would like to mention that Mr. Dini is having so much fun providing these columns that he is churning them out at a rate faster than we can publish them on a monthly basis. Indeed, he has created a blog at http://myblogscience.blogspot.com. If you wish to see more of Mr. Dini's provocative works that might not have appeared in* Plating & Surface Finishing, *check it out.*