Foundry Coke Supply Beyond 2000

~ presented by ~

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THE COKE CRISIS

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AMERICAN COKE AND COAL CHEMICALS INSTITUTE

For 54 years, the American Coke and Coal Chemicals Institute (ACCCI) has been a united voice for the metallurgical coke and coal industry and continues to contribute to industry standards and federal legislation and regulations. Today, ACCCI represents all U.S. merchant coke producers and eight of the nine U.S. integrated coke producers.

BACKGROUND

The merchant producer fulfills an increasingly important role in the production of metallurgical coke in the United States. Chart number one represents the distribution of coke production by integrated and merchant producers, with the merchant segment showing the most stability. The merchant segment is responsible for 100% of the foundry coke produced for the U.S. market. For purposes of this presentation, the term integrated describes any coke producer affiliated with or owned by a steel manufacturer; merchant producers are those whose coke is sold on the open market. Today there are currently 26 plants in the U.S. operating 70 batteries, and producing a total of 23 million tons of coke per year. Ten plants producing approximately 3.4 millions tons/year, are merchant producers. The focus of this paper is coke for the foundry industry which during boom times consumes approximately 1.4 million tons per year. This need is currently being satisfied by six coke plants with a capacity of 1.75 million tons per year. The purpose of this paper is to examine the elements which will influence this supply in the 21st century.

CLEAN AIR ACT AMENDMENTS OF 1990.

Possibly the single major source of speculation concerning future supply of foundry coke is the ability of producers to meet the requirements of the Clean Air Act Amendments of 1990 (CAAA '90). During the legislative process which lead to the 1990 act, the American Coke and Coal Chemicals Institute (ACCCI) in cooperation with the American Iron and Steel Institute (AISI) representing the integrated producers, were successful in fashioning provisions which traded early compliance with strict emission standards for extension of residual risk standards until the year 2020. The United States Environmental Protection Agency (US/EPA), upon passage of (CAAA'90) initiated a regulatory negotiation process to craft the implementing regulations. The participants in this negotiation represented these stakeholders.

- The United States Environmental Protection Agency.
- The American Coke and Coal Chemicals Institute representing the Merchant Coke Producer.
- The American Iron and Steel Institute representing the integrated coke producers.

- The National Resources Defense Council (NRDC) representing a caucus of environmental organizations.
- The United Steel Workers of America (USWA) who represents the majority of workers in the coke industry.
- The State and Local Regulators represented by STAPPA/ALAPCO (1)
- Other interested parties, such as the Group Against Smog and Pollution. (GASP) of Pittsburgh, Pa.

The negotiations established the numerical standards, work practices, required equipment modifications and inspection methods. The regulatory negotiation process was completed in October of 1993 with all parties agreeing to the regulations. The regulations are difficult, but attainable, resulting in significant initial emission reduction. Further reductions were required in 1995 and 1998 that depend on the compliance track selection. (See Table #1) The key element here for the merchant producers was attainability. The 1998 mile post has just been passed for the extension tract coke plants, and 85 % of the capacity which selected this compliance track in 1993 is in production today and is fully compliant. The stricter 1998 requirements are the last before a minor adjustment in 2010, until the year 2020.

(1) STATE AND TERRITORIAL AIR POLLUTION PROGRAM ADMINISTRATORS ASSOCIATION OF LOCAL AIR POLLUTION CONTROL OFFICIALS.

The environmental situation after 2020 is not clear yet. The residual risk standards which will apply then are health based rather then technology based. This means each individual plant because of its geography, prevailing wind patterns and population density will calculate the potential risk of cancer to those effected by a plant's emission. The science which underlies this calculation is currently under review. The ACCCI in cooperation with the AISI is working with the US/EPA to clarify how this calculation will be made.

MERCHANT DEMOGRAPHICS

The generally accepted guideline is that a battery of coke ovens has a 20 to a 30-year life span. This premise does not hold up when the merchant segment is analyzed. The average age of U.S. merchant batteries is 40 years. (See Chart # 2) The reason for this is partially the merchant mentality. An integrated producer views a coke plant as a disposal asset, producing a raw material. In the end for an integrated steel producer, coke is a make or buy decision. The merchant producer knows that his battery is his livelihood, and therefore, will take extraordinary steps to maintain his facility. For example, the oldest merchant battery operating today was built in 1902, and still has a future due to continuing facility renovation and oven rebuilds.

The CAAA '90 has also resulted in delaying the deterioration cycle of coke ovens. The mechanisms which result in leakage are the same which cause failure of ovens, so when leakage is systematically eliminated the result is longer battery life.

CAPITAL RENEWAL

The merchant coke producers have spent hundreds of millions of dollars to comply with the CAAA'90. Merchant producers typically being independent operations, go to the capital market for the required dollars. It is significant that these moneys have been invested by the stockholders and financial institutions who can see a future for this industry.

COKE SUBSTITUTES

The usefulness of coke substitutes has been evaluated by the Iron Casting Research Institute (I.C.R.I) Their findings are:

- ANTHRACITE COAL

Most anthracite is too small for the larger cupolas and all of it is too weak to adequately support the charge burden. It also contains nearly twice as much ash as foundry coke which reduces its net caloric value significantly. For every extra pound of ash, there must be about another pound of limestone charged to flux it. Large volume of slag can suck up a lot of BTUs. The I.C.R.I. has heard of no one successfully using anthracite coal above 20% of the total fuel charge. It may have some merit as an extender, if the price is right, but not usually at a 1 to 1 ratio.

- EXTENDERS

Included in this grouping are all the other things that have been tried; rubber tires, (shredded, chopped or whole) sawn RR ties, scrap electrodes, aluminum reduction pot linings, sawdust briquets, etc. All of them burn, and some have properties worth investigation, but availability and price have always been questionable, excepting the sawdust, of course.

- BRIQUETTED COKE

There have been a number of attempts, here and abroad, at making a briquet from coke breeze, ground coke, ground coal and /or other high carbon sources, but all have floundered on low strength. These compacts have always lacked the hot crushing strength necessary to support a cupola burden. While it is possible to operate a conventional cupola with only a few charges on the coke bed, fuel economy goes out the window along with the melting rate.

OTHER COKES

- **FORMED COKE**

Formed coke processes are well known and are technically viable. However, due to the raw material required and the inherent energy consumptions versus oven technology, this process has an inherent cost disadvantage versus oven produced coke.

- **IMPORTED FOUNDRY COKE**

This element is somewhat of a wild card. Rarely has foundry coke been imported to the U.S. Recently foundry coke from mainland China has arrived. It is the first import of any significance in approximately 20 years. This coke's chemistry is not equivalent to domestic production and its structure and resulting carbon pick up is suspect. The existing unused merchant capacity has been absorbed by the furnace market, which is a net importer. Furnace coke purchase arrangements have been both contractual and spot in nature, with contractual arrangements becoming more prevalent. The risk of reliance on long supply lines of distribution and the whims of foreign policy makers, currency fluxuations could result in import coke reductions with little or no notice. An item such as the Global Warming Treaty could do this. If the

United States ratifies this treaty, on the basis that developing countries such as China would comply with this treaty the same as developed nations. This would result in the environmentally uncontrolled beehive ovens in China which are the source of essentially all the exported foundry coke, would be forced out of business. The eventual effect of imported foundry coke may be a change to how merchant capacity is distributed.

Foundry coke consumers without long range domestic supply could experience short term supply disruptions until the domestic market adjusts. Existing merchant producers could produce 2.7 millions tons of foundry coke if all merchant capacity was swung to this product. With consumption at approximately 1.4 million tons/year in 1996, which is a boom year in the foundry industry, it is unlikely that this will be needed.