THE USE OF COKE OVENS GAS AS AN OPEN HEARTH FUEL.

By Arthur P. Scott. (1.)

Characteristic of more or less recent metallurgical literature has been an increasing interest in the disposition of By-product Coke Ovens Gas, more especially with reference to its possibilities as a fuel in the Open Hearth Furnace, and in this connection four articles, which seem to be of especial importance, will be briefly abstracted by way of introduction to a short discussion of the subject. The first of these, "On the Present Day Status of Basic Open Hearth Practice," which is to be found in Numbers 1 and 2 of Stahl und Eisen for 1910, was read by Dr. Otto Petersen before the Verein Deutscher Eisenhüttenleute on December 5th, 1909, in Düsseldorf. In describing the Hubertushütte Open Hearth Plant in Kattowitz, O.S., Dr. Petersen says in effect: "The Steel Works consists of two twenty ton and one twenty-five ton Basic Open Hearth Furnaces, the capacity of whose regenerators amounts to about 1.4 cubic meters per ton in the gas chambers, and 1.6 cubic meters in the air chambers. The Gas Producer Plant consists partly of old Siemens Producers and partly of modern water-sealed Producers. This Open Hearth Plant has been using Coke Ovens Gas as a fuel since June, 1907. The quantity of Ovens Gas used was small at first, but was gradually increased until, taking the coal consumption at Hubertushütte for 1906 as normal under Producer Practice at 31.8%, in September, 1909, with an ingot production of 6,200 tons, the coal consumption amounted to only 14.9%, so that 53.15% of the total coal requirements was replaced by Ovens Gas. The above fuel consumption includes besides the Open Hearth Furnaces, provision for such allied requirements as test and hardening forges, ladle warming and a six ton Acid Open Hearth in the Steel Foundry with its Annealing and Core Ovens.

Ovens Gas is in regular use at Hubertushütte and the full complement of producers is only requisitioned to make good an occasional shortage. The life of the Open Hearth ends and roof has been reduced by about 8-10%, (being now 550-600 heats), while the life of the checkers has been increased 40-60%, (now 1,050 heats), for which reason, along with the saving in coal, unloading wages, producer labor and maintenance, this feature in Open Hearth Practice appears to be of considerable economic importance.

In the discussion following Dr. Petensen's address Herr Ing. E. von Maltitz, of Barmen, said in part: "I some years ago had to run three of the Open Hearth Furnaces on Coke Ovens Gas exclusively at the works of the Dominion Iron and Steel Co., at Sydney, C.B., Canada. It was not possible to preheat the Ovens Gas in the regenerators without considerable loss of CO and a corresponding increase of CO_2. We were compelled, therefore, to use the gas without regeneration and we followed the method employed in the Pittsburg district for Natural Gas, that is, the gas was led into the furnace through 6-in. pipes inserted close to the hearth on both sides of the ports. The heat obtained from this gas was so small that we were compelled to supplement it with tar from the Coke Oven Plant. As a result of the use of tar the life of the roof was reduced to ninety heats. We were obliged, after three years of fruitless effort, to give up the use of Coke Ovens Gas with tar. For this reason it would interest me very much if Director Amende, of Hubertushütte, gave a few details concerning his methods, whereby not only is the time of heat cut down, but also the life of the roof, considering the fuel employed is so unusually high."

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Director Amende in replying gave no information as to the method of introduction of the gas, merely adding the following facts: That the Coke Oven Plant at Hubertushütte consists of ninety Otto Hoffman Ovens, 10 meters long, 1.5 meters high and .55 meters wide. This plant handles three hundred and twenty tons of coal in twenty-four hours and the Ovens Gas has the following consumption:—

CO_2	6.5
C_2H_4	2.0
O.	1.2
CH_4	16.4
H	38.7
N	24.8
CO	10.4

The coal employed is of poor quality and 50-60% or even 70% of the gas is used for heating the Ovens themselves. In general the excess gas amounts to 45%, in all about 50,000 to 70,000 cubic meters in twenty-four hours. There has been no deleterious effect upon the Open Hearth product, which consists of shapes and bars, also sheets and band iron of the finest grade. In every respect the use of Coke Ovens Gas has proven satisfactory and he would gladly use more of it if he had it to use.

The second article in question is a paper (2) read before the Fifth International Congress for Mining, Metallurgy, Applied Mechanics and Practical Geology, at Düsseldorf in June, 1910, by Chief Engineer Terpitz, who describes the use of Ovens Gas as an Open Hearth fuel at Hubertushütte, but adds nothing to the data given by Dr. Petersen and Director Amende. He calls attention, however, to the large additional surpluses of tunnel head gas that have become available by reason of the development of the Gas Engine, and emphasizes the increasing importance of studying the peculiar adaptabilities of Blast Furnace Gas and Coke Ovens Gas, respectively, that each may be employed to the best economic advantage.

He describes certain attempts to utilize Blast Furnace Gas as an Open Hearth fuel and though results to date have not been definitely encouraging, he believes that in a few years Blast Furnace Gas will be successfully used in that capacity, although it will probably have to be regenerated by passing it through hot coke or coal. He adds, however, that in view of the ease with which low grade dust coal may be used under boilers and of the fact that Blast Furnace Gas is distinctly more suitable for gas engine consumption than is Ovens Gas, the logical outlet for the latter is through the Open Hearth Furnace, for use in which, as has been fully demonstrated at Hubertushütte, it is preeminently well adapted.

The third article, which is a communication made to the alumni of the Liége Engineering School on May 1st, 1910, by Charles Wigny, Chief Engineer of the Cockerill Company, and is published in the Revue Universelle des Mines for August, 1910, describes the use of Ovens Gas in a four ton Open Hearth Furnace in the Cockerill Foundry. This article has already been reviewed from the German in the Iron Age of February 2nd, 1911, Page 318, but has lost so much in the double translation that it will be well worth the reader's while to refer to the original. A few of the main facts are here recapitulated. The furnace in question manufactures soft steel for the foundry, making with producer gas three and one half heats in twenty-four hours from a charge of 30% pig iron, 35% steel scrap and 35% steel turnings, with a yield of 95%. It is of special design, the hearth, gas producers and regenerative chambers for the air constituting one solid block of masonry. The gas

(2) Reviewed in the Iron Age, July 14th, 1910, Page 103.