The Natural Gas Situation

IN THE COUNTIES OF

Kent, Essex and Lambton

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Essential Difficulties in Dealing with the Production and Distribution of Natural Gas

There are certain peculiarities about natural gas which make the economical production and use of it difficult. In the first place the fact that it is invisible and is instantly annihilated once it is allowed to escape into the open air renders the waste of gas less impressive and revolting than would be the case with other valuable products. Before the regulations prohibiting waste were enforced in the Kent gas field in 1907, it was nothing out of the way for a gas well to blow off two to three million cubic feet per day. This is equivalent in heating power and, consequently, value to about 100 tons of coal, or over 400 barrels of petroleum; anyone permitting the absolute destruction of such amounts daily of coal or oil would be regarded as a menace to the community, but in the case of gas it was tolerated and the operators of the wells wasting gas even fancied they had a grievance when compelled to close the wells, and found many sympathizers. Moreover, the fact that it is not physically possible to separate, or fence off as it were, the holdings of different operators—allowing each one on his own property to plan a careful and economical development—is really the source of all the trouble. A competitor with the right to drill for gas on adjoining territory can draw off the gas under-lying the leases of any operator who might be disposed to conserve the gas for the future indispensable needs of the community. It accordingly becomes a scramble to draw off the gas first and sell it for any price rather than let a rival have it. This causes unnecessary expense in drilling superfluous wells to "offset," as it is called, the competitor's wells, in laying scores of miles of double pipe lines which are enormously expensive, all of which the consumer must ultimately pay for. There is no other product of nature of which this is the case and it is the governing factor in operations. The experience, therefore, drawn from older industries, which is finally crystallized into legislation, is of no value because the thing is essentially different, and any regulations designed to ensure an intelligent and economical production and use of natural gas which do not take cognizance of this fact must necessarily fail in their purpose.

Estimate of Probable Amount of Gas in Reserve in the Known Gas Field

Up to the end of 1917 about 80,000 million cu. ft. of gas had been produced from the Kent field. During this time the pressure dropped from about 590 lbs. to 320, a decrease of 270 lbs. Assuming the pressure may go down to 100 lbs. before the field is abandoned, there remains a drop of 220 lbs. to be drawn on, and this represents a proportional amount of gas which is available and should produce $80{,}000 \times \frac{320}{270}$, or 65,000 million cu. ft. If the pressure may go down to 50 lbs. there remains a drop of 270, representing in a similar way about 80,000 cu. ft. It is, however, almost an absolute certainty that more gas will be obtained than is indicated by the calculations just made. This is only reasonable to expect from the shape of the field, which is roughly that of a ham, the knuckle of the ham pointing northwards and the broad base extending into Lake Erie. In making the cal-

culations given in Report of the Bureau of Mines, Vol. XIX, p. 150, a probable mean porosity of the rock of 10 per cent. was assumed and a yield of 38,000 million cu. ft. arrived at on that basis, whereas it can be seen the production will ultimately be about four times this amount, thus requiring a porosity of 40 per cent., which I believe is quite unknown in any field. The only way the excess production over the calculated amount can be accounted for is by the movement of gas from under the lake. This of course would have the same original pressure as that under the land area, viz., 590 lbs., and as the pressure drops, due to the flow of gas from the wells, the gas now in strata under the lake will gradually find its way to the wells drilled on land. The extent to which this would increase the calculated production cannot be determined in any way, but an increase of 20 per cent. might reasonably be looked for from this source, making thus a reserve of 78,000 to 96,000 million feet. As 24,000 cu. ft. of this gas are equal to one ton of coal, this is equivalent to 3,200,000 or 4,000,000 tons, something well worth making an intelligent effort to conserve. The amount that has been produced to the end of 1917 is equal in heating value to 3,300,000 tons of coal.

Amount of Fuel Necessary for Domestic Use and Comparison with Coal and Artificial Gas in Cost

What is a reasonable amount of fuel for the inhabitants of the districts in Kent, Essex and Lambton served by natural gas to use? It is easily capable of calculation. Assume the population thus served to be 80,000. The figures given in Municipal Bulletin No. 10 for 1916 for Windsor, Walkerville, Sandwich, Wallaceburg, Chatham, Blenheim, Ridgetown, Tilbury, Dresden, Leamington, Kingsville, Sarnia and Petrolia total 76,300, allowing the balance to be made up by small places not mentioned and farm houses along the lines. From the figures given in Vol. XIX of the Bureau of Mines Reports, 10,000 people use 700,000 daily average throughout the year for domestic purposes. Eighty thousand would use 5,600,000 daily, or 2,044,000,000 per year. Now the total importation of anthracite coal into Ontario for the fiscal year 1915-16 was 1,827,000 tons, and this anthracite coal is a measure of the amount of fuel used for domestic purposes in the province outside of the consumption of wood, natural gas and artificial gas. This means that the average consumption is probably not much over a ton per individual, or say 100,000 tons for the 80,000 people concerned. This is equivalent to 2,400,000,000 cu. ft. of gas, a figure which agrees fairly closely with the one obtained by direct observation given above.

One circumstance which has hindered any efforts to prevent waste of gas, not only by direct escape into the air and consequent destruction, but also by the employment of wasteful appliances or using an unnecessary amount, is the fact that the price paid for the gas is totally out of keeping with the cost of the standard fuel—coal—at the present time.

From the figures given above, 24,000 ft. of gas being equal to one ton of coal, the following relation between prices can be seen, viz.:—

Natural gas at	10c.	per 1,000 ft.	equals coal at.....	$2 40	per ton.
"	15c.	"	"	.....	3 60	"
"	20c.	"	"	.....	4 80	"
"	25c.	"	"	.....	6 00	"
"	30c.	"	"	.....	7 20	"
"	35c.	"	"	.....	8 40	"
"	40c.	"	"	.....	9 60	"
"	50c.	"	"	.....	12 00	"

Even the domestic consumer who pays the highest rate, 25c. per thousand, is getting the equivalent of coal at $6.00 per ton, with the additional advantage of the elimination of all work in connection with its use. The industrial concern and the large user were only paying 11 to 15 cents per thousand, or the equivalent of coal at $2.64 to $3.60 per ton, surely an absurd price in these times, and one that will never compel rigid economy. There does not seem to be any reason, compatible with the idea of enforcing the utmost economy, why large users should have any advantage over small consumers beyond possibly a small discount. In this respect the interests of both the gas companies, who are anxious to sell their product before a rival can get it, and the large users are identical, but it is inimical to intelligent conservation. If any use at all is allowed for industrial purposes, the same rate should be paid, and there seems to be no reason why this should be less than 40c. per thousand, or the equivalent of coal at $9.60 per ton, with no expense for labor attached. Those who can purchase anthracite coal at this price are fortunate indeed. Compared with prices paid for artificial gas the difference is striking. The cheapest artificial gas sold anywhere in Ontario is in Toronto, where the price is 80c. per thousand for a gas having a heating efficiency of 570 as compared with over 1,000 efficiency for the Kent gas, or to buy on the same basis as the Toronto householder the consumer in Kent should pay $1.10 per thousand, and *vice versa* the Toronto user in order to be on as favorable a footing as the dweller in Kent county paying 40c. per thousand should be able to get his gas at 23 cents instead of 80.

Long Life of the Gas Field with Higher Rates Advantageous to the Domestic Consumers—not the Gas Companies

The benefit to be derived from the increase in rates is the enforcement of the utmost economy in the use of gas. With 20,000 or so meters in commission, representing as many users, no regulations unless backed by an army of inspectors could enforce economy. This of course is both undesirable and impracticable. The benefit that would accrue to the public by an increase of the rates is a prolongation of the life of the field due to the extra care that would result in the use of gas. This benefit would not go to the gas companies, as can easily be seen by a simple calculation. Assume for a moment that the smallest amount calculated above as gas in reserve, viz., 65,000 million cu. ft., is correct. For the last few years the industrial consumption has been 70 per cent. of the total and the domestic 30 per cent., and the rate of consumption is now 15,000 million per year, or four years' supply. Apart altogether from the inevitable breakdown of the system, which would increase in seriousness every spell of cold weather and result in the loss of a great deal of gas as against the system of careful nursing of the wells possible under domestic consumption only, we can compare the results of the two systems as far as the gas companies are concerned. In the first place, imagine the present system continued and even admit, what is probably impossible, that all of the gas can be marketed under those conditions; then we have as follows:—

30%	of 65,000 or	19,500	Mill at 25c. =	$3,997,500
70%	"	45,500	" 13c. =	5,915,000
Total.....				$9,912,500

As this 65,000 million feet is equal to 2,700,000 tons of coal, this means that it would be sold at the average rate of $3.67 per ton. No economy can be enforced under these conditions.

If this amount were collected in four years it would mean a yearly amount of $2,478,100, the present value of which at 5 per cent. would be $8,787,200. On the 40c. rate suggested with a consumption of a little over 2,000 million cu. ft. per year and a minimum life of thirty-three years for the field, the total final revenue obtained from the 65,000 million feet would be $26,000,000, which would give a yearly collection of $787,800 for the thirty-three years. The present value of this is $12,606,800. There is thus an apparent gain of about $3,800,000, but all the expenses of leaseholds, upkeep, repairs, office staff, etc., for thirty-three years as against four years must be taken into consideration. This would amount to more than enough to make up the difference. The price would probably have to be increased as the supply declined greatly. In addition to these expenses the present pipe lines could be removed at the end of four years and sold for a substantial amount, but would have to be renewed wholly or in part before the end of the thirty-three years, thus increasing the disadvantage against the gas companies. If the interest be put at 6 per cent. as in the latest provincial loan, the present values under the two systems would differ by about $2,600,000.

Interest of Domestic Consumers Greatest in Importance

It is evident that the domestic consumers resident in cities, towns and in the country now supplied by this gas have the greatest aggregate interest of any of the parties concerned in the question, and that a long life for the gas field is of the greatest importance to them. Moreover, the matter was easily capable of calculation years ago; for instance, Vol. XIX of the Bureau of Mines Reports published in 1910 contained a calculation of the amount of gas that would be obtained from this field, which was close enough to shape an intelligent line of development. The production then was already high enough, viz., over 4,500 million cu. ft. per year. In the Report (Vol. XXII) published in 1913, on p. 45 and 46 information is given from which it could be calculated that the total production would be over 138,000 million, and yet the production went on increasing till by 1916 it trebled the amount yielded in 1910 and more than trebled it in 1917. The total production was published every year for the last five years. The way the output increased can be seen from the following table:—

Waste (estimated)	2,000	million cu. ft.
1907 production	297.0	"
1908 "	848.0	"
1909 "	1,996.0	"
1910 "	4,589.0	"
1911 "	5,649.0	"
1912 "	7,752.5	"
1913 "	7,975.8	"
1914 "	10,121.6	"
1915 "	10,819.1	"
1916 "	13,752.5	"
1917 estimated	15,000.0	"

In spite of this information being easily available to anyone interested in the matter, Utility Committees formed in that part of the country were trying to coax industries to come in and use up the gas at a rapid rate under the delusion that this was showing enterprise. One industry that required 5,000,000 feet per day was induced to establish itself there on account of the gas supply. This amount of gas is sufficient for the average daily consumption throughout the year of 70,000

people. Industries that have built plants designed for the use of gas in the face of information easily obtainable have only themselves to blame and do not appear to be entitled to much consideration.

Of the production from the Kent field given above, during the last few years a certain portion of this was sent eastwards to Brantford, Hamilton, and other cities and towns. In 1916 this amounted to 22 per cent. of the total yield. If we assume half of this was used for industrial purposes and would be cut off in the future, leaving about 10 per cent. of the Kent production used for domestic purposes in that part of the province, this would shorten the life of the field to that extent, but as already indicated, the amount of gas in reserve assumed in calculating the life of the field will almost certainly be increased by 20 per cent. or more, this will not affect any of the conclusions arrived at.