CANADA MINES BRANCH

REPORT NO. 90

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REPRINT OF PRESIDENTIAL ADDRESS DELIVERED AT THE FOURTH ANNUAL MEETING OF THE AMERICAN PEAT SOCIETY, HELD AT OTTAWA, JULY 25, 1910.

THE EXPLOITATION OF OUR PEAT BOGS FOR THE PRODUCTION OF FUEL FOR DOMESTIC AND INDUSTRIAL PURPOSES.

BY

Eugene Haanel, Ph.D.

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THE EXPLOITATION OF OUR PEAT BOGS FOR THE PRODUCTION OF FUEL FOR DOMESTIC AND INDUSTRIAL PURPOSES.[1]

BY

Eugene Haanel, Ph.D.,

Director of Mines, Ottawa.

In a country such as ours, where, independently of the continually increasing amount of fuel required for industrial purposes, we are, during the long winters, dependent upon artificial heat in our homes, the item of cheap fuel becomes one of the most important factors in the prosperity of the nation. Our coal deposits are situated in the far east and west, and the long hauls to bring this fuel to the central Provinces render the price of our own coal prohibitive, and leave us dependent on outside sources for the necessary supply of fuel in these Provinces. The rapid industrial development of Canada, and increase of our population, therefore, render the intelligent exploitation of our abundant and excellent peat deposits, for fuel purposes, of supreme importance.

We can at present form no estimate of the enormous extent of our peat bogs. The 37,000 square miles already known form probably but a small fraction of the amount of this valuable fuel asset in existence in Canada.

The necessity of utilizing the peat deposits scattered throughout the more settled portions of the Provinces, has, within recent times, been appreciated, and efforts have been made by some of our enterprising citizens to establish a peat industry. Much money, thought, and energy have been spent on this problem. Many plants have been erected; but unfortunately, so far, without reaching commercial results. Only in rare instances is progress made in improvement of processes of manufacture by those who are unfamiliar with what has already been achieved, and the causes which have led to failure. This may have been one of the reasons why the efforts so far made in utilizing our peat deposits have not been attended with success. With a view to preventing

[1] Reprint of presidential address delivered at the Fourth Annual Meeting of the American Peat Society: held at Ottawa, July 25, 1910.

further failure from this cause, in the manufacture of peat fuel, an investigation was made by our Department three years ago, and a report issued on the manufacture of peat for fuel and other purposes in the peat-using countries of Europe. This investigation has demonstrated:—

(1) That for the economic production of fuel from peat, machinery driven by power must be substituted as far as possible for manual labour.

(2) That processes, so far invented, for removing the water content of the peat by pressure and artificial heat, have not led to commercial results, and after trial have been abandoned.

At any rate the existence of plants in any country furnishing regularly and at reasonable prices artificially dried and briquetted peat, are not known at our office. The recent reports received by us regarding two very promising processes employing artificial heat in the production of peat-fuel, are very disappointing: namely, the process of the Electropeat Syndicate, with the head office at Newcastle-on-Tyne, England; and the somewhat famous Ekenburg process.

The Electropeat Syndicate erected an extensive plant at Kilberg, in the county of Kildare, Ireland, for the production of peat fuel as a substitute for coal, which they expected to sell at six shillings per ton. No money was spared in trying to make the experiments a success, and very expensive machinery was put down. Experts were brought from Germany to look after the work, under the superintendence of Captain Verey, R.E. Large shipping companies, on the strength of samples submitted, and representations made to them, promised some very large contracts for fuel; but the Company, at the end of over one year's experimentation, found that their process was a failure. The peat made by them looked like coal and burned well, but was hygroscopic, and after a short time crumbled to powder. All efforts to overcome this defect failed, and, in June last, the project was permanently abandoned.

The Ekenburg process of the wet carbonization of peat is exceedingly ingenious, and has aroused great expectations, but is still in the experimental stage—after the expenditure of 200,000 kronor in Sweden, to place it upon a commercial basis.

The endeavour to accomplish *economically,* by artificial means, and in a *short time,* what has been accomplished by nature in exceedingly long periods of time, namely the change of peat into a substance similar to coal, has so far, apparently, not been attended with success. I would not like to say that it cannot be done, since it is unsafe to make any statements regarding the possibilities of future achievement; but at present the outlook in this direction is certainly not encouraging. In view of these facts, the only proper course for us in Canada to follow, if we desire to establish a peat industry, and render ourselves, at least to some extent, independent of outside sources for our fuel, is to introduce such processes and such machinery as have proved successful, and are now in actual commercial operation in Europe. We may safely leave experimentation and the development of new ideas to the future, when our peat industry is on a secure basis, and peat-fuel in abundance on the market. We will then have gained in the manufacture of peat-fuel along lines which are at

present commercial, the necessary experience to warrant the hope that proposals for modifications and improvements of present processes will be based upon a thorough and practical understanding of the nature of peat and the principles upon which future economy may reasonably be expected. This is a safe proceeding for our country, and above criticism. It will give us the required fuel and prevent waste of capital in experimentation. Departure from this principle has led to failure, and created a pronounced distrust in everything connected with peat and the utilization of our peat bogs.

To re-establish the confidence of the people of Canada in the value of peat as a domestic and industrial fuel, and to stimulate renewed activity in the development of our peat resources, the Government has acquired 300 acres of peat bog, with an average depth of 9 feet, for the purpose of manufacturing peat-fuel on a commercial scale, and by a method which has proved successful in European practice. At this plant interested parties will have an opportunity of ascertaining for themselves the working of the bog as well as the suitability of the peat-fuel produced. The capacity of our plant is a production of 30 tons per day. For a large commercial plant, mechanical excavators should replace the manual labour employed at our plant, if the bog to be exploited is suitable for this class of labour-saving machinery. The plant at Alfred is to serve as a model of a successful process, and not for the production of peat-fuel on an extensive scale. We expect, however, to manufacture during this season about 2,000 tons of peat-fuel, part of which is to be used in our peat-gas producer at Ottawa.

There is nothing artistic about the appearance of the fuel produced at our bog. It has not the regular geometric form of briquettes, nor their smooth exterior, but it serves the purpose for which fuel is intended, as well as briquettes, and has the advantage of being low in cost of manufacture.

Allowing 140 days for a season's operations, the cost per ton of air-dried machine peat, including interest on capital invested, amortization, oil, and repairs, is as follows:—

Cost of fuel on the field	$1 40
Cost of fuel stored in shed	1 65
Cost of fuel loaded on car	1 65
Cost of fuel in stack	1 70

By the employment of mechanical excavators and the manufacture of peat on a large scale, the cost of production per ton should be considerably less than the figures here given.

The objection to the air-drying process, practised at our plant, is that it is not a continuous process, that it can be worked only during the summer months, and that the amount of fuel which can be produced during one season is dependent upon weather conditions.

These statements are quite true, and yet Sweden, Finland, Denmark, Germany, Holland, Austria, and Russia, depend for a large part of their fuel supply on the simple process of pulping the peat, forming it into bricks upon the field, and harvesting it as air-dried fuel. The weather conditions in Canada are as favourable, if not more so, for the production of air-dried machine peat, as in

the countries mentioned. To prevent shortage of peat-fuel on account of unfavourable weather conditions during a season's work, a year's supply of peat-fuel should always be kept in storage.

Russia is the largest producer of peat-fuel in the world. In 1902, the production was 4,000,000 tons of peat-fuel, and the annual increase of production has since then amounted to nearly 200,000 tons. Many private plants exist in Russia in connexion with cotton mills for the production, for their own use, of 200,000 tons of peat-fuel annually. 1,300 plants making machine peat are now in operation in Russia.

I admit that the hardness of anthracite, permitting long hauls without much waste—the small volume it occupies requiring a minimum of space for storage—and the small amount of volatile matter it contains ensuring a nearly smokeless flame, are such valuable properties of this fuel, that so long as it can be obtained, it will be used by those who can afford to pay for it. Peat-fuel is, however, admirably adapted for use in grates during the late fall and early spring, when our heating furnaces are not in operation. This fuel will compete in price and cleanliness with soft coal for the purpose stated in our most luxurious homes. For the inhabitants of our rural districts, villages, and certain parts of our cities, whose homes are not supplied with hot air, hot water, and steam systems of heating, but require the use of stoves, peat-fuel will prove a cheap and excellent fuel, far superior to wood, and far more convenient to handle.

Although peat can be used in any of the common stoves now in use in Canada, a stove of excellent design, specially constructed for peat-fuel, has been brought out in Sweden by the Aktiebolaget Ankarsrums bruk. These stoves—a model of which may be seen at our Peat Plant at Alfred—are tasteful in appearance, and very convenient in operation.

The economy which may be effected by the use of peat is readily understood, when it is stated that in Ontario and Quebec the average price of anthracite with a high percentage of ash is $7.50, and in Manitoba, $10 per ton, whereas air-dried machine peat, containing only about 5 per cent of ash, can be manufactured at a cost of considerably under $3 for an amount having the same calorific value as a ton of the anthracite we import. This could be sold, at places conveniently situated as regards transportation facilities and not too far from the place of manufacture, for a little more than one-half the price paid for anthracite in Ontario and Quebec, and for a little more than one-third of the price paid for anthracite in Winnipeg.

Some few years ago the labour troubles in the United States taught us a lesson which should be heeded, and which should enable us to conceive what a real fuel famine would mean for Canada. Anthracite coal in Ottawa at that time was sold at $12 per ton. What if it could not be got at any price, and if we had to pay the transportation costs of fuel from either Nova Scotia or the far west? Who can even imagine the suffering it would entail upon our population? It is very easy to say that such a state of affairs is not likely to occur, but who will guarantee that it might not?

The central Provinces of Canada have accumulated no stores of fuel, ready

to be drawn upon in cases of emergency. We import what we need from year to year, and any shortage of supply from whatever cause affects seriously our industries and the comfort of our people.

We can not afford, in the light of past experience, to waste capital on the experimentation for the discovery of processes, which shall be continuous in operation and furnish a fuel from peat similar to coal, nor can we wait until some one at some time in the future will invent such process and demonstrate its commercial possibilities. Neither should prospective manufacturers listen to the marvellous representations made by promotors of schemes and processes, which promise great profit from production at excessively low costs of a peat-fuel superior to anything yet put upon the market, but wisely adopt processes which are already an assured commercial success in the peat-using countries of Europe.

The peat bog at Alfred was acquired by the Government for the purpose of demonstrating to prospective manufacturers of peat-fuel one of these processes, and to prevent failure from choosing bogs unsuitable for their purpose, the Mines Branch has recently undertaken a systematic investigation of the more easily accessible peat bogs. In carrying out this investigation, our peat expert has been instructed to determine and map their extent, ascertain their depth, and also the quantity, character, and calorific value of the peat contained in them. So far, twelve bogs have been investigated, mapped, and reported upon. In case of need, the staff performing this work can be increased to meet the requisitions made upon the Department.

The successful inauguration of a peat-fuel industry in Canada may be looked forward to with confidence if, content to accept European practice, we establish peat plants at strategic points on the workable bogs scattered throughout the farming regions of those Provinces which require to import coal, and operate them in the interests of the neighbouring communities. This will prevent long hauls, for which air-dried machine peat is not fitted.

Regarding the transportation of peat-fuel, our railway companies, realizing the importance of an adequate fuel supply for the central Provinces, and its intimate connexion with the prosperity and further development of these Provinces, should come to our aid by granting special rates for the transportation of this class of fuel. This is the course followed by Germany in those districts which depend to a large extent upon peat for their fuel.

Air-dried peat is not alone an excellent fuel for domestic use, but for the production of power it proves an ideal fuel in the peat-gas producer, which is, to-day, as reliable and efficient in its operation as the coal-gas producer. I do not hesitate to say that it is an ideal fuel, because the peat from most bogs is free from a clinkering ash, and yields on combustion a fine white residue which readily allows of the thorough cleaning of the fire, and the property of not fusing or caking in the producer assures regular operation. Moreover, since gas leaves the producer with a high degree of sensible heat, which must be cooled to the temperature of the atmosphere before being used in the gas engine—it is exceedingly important that as much of this sensible heat as possible be utilized in the producer itself, in order to increase its thermal efficiency. This is accomplished in coal-gas producers by the introduction of water vapour, which passes through

the incandescent fuel with the air supplied for combustion. This water vapour is decomposed, yielding hydrogen and oxygen. The latter combines with the carbon of the fuel, forming carbon monoxide. This chemical reaction absorbs a large amount of heat and lowers the sensible heat of the gas, but the heat absorbed in liberating the hydrogen is to a large extent restored and utilized when the gas enriched by hydrogen is burned in the gas engine or other apparatus. With peat containing from 25 to 30 and more per cent of moisture, the moisture content is sufficient to accomplish all that is required without the introduction of water in the producer from an outside source.

To demonstrate the value of peat for the production of power for industrial purposes, a modern German peat-gas power plant has been erected by the Department in Ottawa. Its capacity is 60 horse-power, and consists of a double fire zone Körting peat-gas producer, with the necessary gas cleaning apparatus, and a Körting four-cycle single-acting gas engine direct-connected to a Westinghouse 50 kw. direct current generator.

While no definite figure can at present be given of the consumption of peat per brake horse-power hour, since the investigation begun some time ago is not yet completed; our preliminary trials, however, bear out the results obtained in Swedish and German plants, where the amount of peat consumed per brake horse-power hour ranges from a little over two pounds to about three pounds, depending on the calorific value of the peat employed. Since the peat of the different bogs so far examined has a high calorific value, we expect that our figure for the consumption of peat per brake horse-power hour will be in the neighbourhood of two pounds.

The erection of gas producers designed for the recovery of by-products is not recommended except in localities where such by-products would command a ready and profitable market. In Canada it is far more economical to aim at the complete gasification of all the heat elements in the fuel.

Peat-gas producers for power purposes should, whenever possible, be erected on the bog, and the energy generated in the form of electricity transmitted to neighbouring towns and villages for power and lighting purposes as in the case of water-power. This is the policy adopted in European countries.

Whatever other valuable products may be obtained, such as moss litter, peat mull, alcohol, packing paper, millboards, ammonia, and nitrates, the great and important need for us in Canada is the production from the peat deposits of a constant reliable supply of fuel for domestic and industrial purposes.

When this has been attained and peat-fuel is put on the market in abundance, and sold at a reasonable price, we shall not alone have rendered ourselves to a great extent independent of outside sources for this necessity, thus enabling us to retain in our own country a large part of the capital now spent annually for the purchase of fuel from abroad, but a new era of industrial development will dawn upon our nation, and we shall here see repeated what has been accomplished in Europe—the establishment of large industrial corcerns on the waste areas of our country underlaid by peat, and the wide stretches of these solitudes will become resonant with the welcome sounds of industrial activity.

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