

23,620

ser 622(11)(21)
C212MS

Dept. Energy, Mines & Resources
Mines Branch
AUG 1 1969
LIBRARY
OTTAWA, CANADA.

MINES BRANCH,
DEPARTMENT OF MINES,
OTTAWA, CANADA.

NEW FUEL RESEARCH LABORATORIES

By

B. F. Haanel

Memorandum Series
No. 34
July 1928.

This document was produced
by scanning the original publication.

Ce document est le produit d'une
numérisation par balayage
de la publication originale.

MINES BRANCH
DEPARTMENT OF MINES, OTTAWA, CANADA.

Memorandum Series

July 1928

No. 34

New Fuel Research Laboratories

By

B. F. Haanel.*

The Department of Mines has erected in Ottawa a new Fuel Research Laboratory building, which is being equipped with modern large and small-scale apparatus for conducting extensive research on Canadian fuels - solid, liquid and gaseous.

The original building and equipment permitted of only large scale tests with a view to determining the comparative values of solid fuels for the generation of steam and the production of a power and industrial gas. A small but well-equipped chemical laboratory was provided, in which were made complete analyses of solid, liquid and gaseous fuels, as well as determinations of the calorific powers of these fuels and an examination of their physical characteristics and properties. The work of the laboratories increased so rapidly that extensions to that building were made only a short time after its erection, and today these facilities have proven inadequate. It is hoped that the building now erected will serve the purpose of the Division of Fuels and Fuel Testing for some time.

*Chief Division of Fuels & Fuel Testing.

The new Fuel Research Laboratories were designed and the equipment selected with a view to carrying out investigations which would be in the interests of the development of the coal resources of the Dominion. The allocation of floor space will be as follows:-

BASEMENT

Front Part:

- a - Laboratory for small technical scale coal carbonization, oil shale retorting and oil refining investigations.
- b - Electric switch boards and gas meters.
- c - Photomicrograph and photometer laboratory.
- d - Receiving room and stores for chemical apparatus and chemicals.

Rear Part:

- e - Gas engines.
- f - Machine shop.
- g - Coal grinding and sample preparation equipment.
- h - Coal briquetting installation.
- i - Coal washing equipment.
- j - Stores.

A two-ton by-product coke oven will be located outside at the rear of the building. The condensing and scrubbing train for the oven will be located in the building on the ground floor. The minimum head room in that part of the building occupied by the briquetting and coal washing equipment is 40 feet, the maximum 60 feet.

FIRST FLOOR

Front Part:

- a - Offices for executives and engineers.
- b - Carbonization laboratory for research and plant control.
- c - General gas analyses laboratory.

Rear Part: (Technical-scale laboratory)

- d - Domestic furnaces for efficiency tests.
- e - Powdered fuel boiler installation.
- f - Gas producers.
- g - Gas meters, scrubbers and condensers.
- h - Space for low-temperature, carbonization retorts, coil liquefaction, etc.
- i - Technical-scale oil refining apparatus.

SECOND FLOOR (Chemical Laboratories) Front Part

Solid Fuel Analysis:

- a - Offices for engineering chemists.
- b - General laboratory (proximate analyses, etc.)
- c - Calorimeter room.
- d - Electric furnace room (ultimate analyses, etc.)

Liquid and Gaseous Fuels:

- a - Offices for engineering and research chemists.
- f - General oil laboratory.
- g - Oil research laboratory.
- h - Gas research laboratory.

The permanent equipment, in addition to chemical laboratories and small scale research apparatus, will include:-

- (1) - Commercial by-product recovery coke plant.
- (2) - Experimental domestic heating plant.
- (3) - Commercial-scale powdered fuel steam generating plant.
- (4) - Commercial-scale briquetting plant.
- (5) - Large-scale coal washing plant.

Commercial By-Product Recovery Coke Plant:- The by-product recovery coke plant will have a capacity of two tons, and is of a type which is now being used commercially in the state of Illinois and elsewhere in the United States. This coke oven will be complete with gas condensing, scrubbing and recovery train, and will enable the coking properties of coals to be determined in great detail. The coking of coals in this oven will furnish information regarding the physical properties of the cokes produced and allow the exact quantities of coke, tar oils, gas ammonium sulphate, light oils, etc., to be determined with accuracy. Before coals are coked in this oven small representative samples will be carbonized in the Koppers small-scale carbonization apparatus, in which the conditions in a commercial type oven are approximated. The Koppers laboratory oven permits quantities of gas, tar oils, and other by-products, and also the yield of coke, to be determined, but the quality and physical properties of the coke which it is possible to make from any coal can be determined only in a large scale oven. In the coking tests conducted in 1908, these properties were determined by coking coals in a perforated iron box which was placed in a coke oven with the regular charge. This method has been resorted

to by the Division of Fuels and Fuel Testing in all large scale coking tests, but has not proved altogether satisfactory.

Experimental Domestic Heating Plant:- The laboratory space allotted to the testing of domestic heaters will permit the erection of various types of domestic heaters now on the market, and also the testing out of alterations that it may be desirable to make to any type of heater, in order to burn a special class of coal more efficiently. The heating tests conducted during the past three or four years were confined to certain Canadian coals, coke, and imported coals. In the future these investigations will be extended to include fuel oil, retort gas and producer gas, as well as coals in their natural state.

Commercial Powdered Fuel Steam Generating Plant:- The burning of solid fuels in the pulverized form has assumed such great importance in recent years that it was decided to install complete equipment of this type, so that the comparative values of Canadian fuels for steam raising, when burned in the pulverized form might be determined. Provision will be made for changes in burners, etc., to suit particular fuels. The burning of a solid fuel in the pulverized condition makes possible the utilization of low-grade coals which cannot be satisfactorily burned by hand-firing or on any mechanical stoker. It also permits considerable economies to be realized in operating costs when high grade and more expensive fuels are burned.

Commercial Scale Briquetting Plant:- The commercial scale briquetting plant will be equipped with two types of presses — roll and plunger — and all necessary equipment, such as crushers, fluxers, macerators, etc. This plant will permit various briquetting processes to be tried out on a commercial scale, as well as on a technical scale, to determine the value of various types of binders and methods of treatment, heat and otherwise. Reliable information regarding the amenability of Canadian coals to any of the existing briquetting processes is very meagre, and the information which will be obtained in this manner will serve to guide those who are looking towards briquetting as a means of utilizing coals.

Large Scale Coal Washing Plant:- Commercial scale dry and wet coal washing units will be installed. These will be utilized for determining the economy of submitting coals high in ash and sulphur to such treatment, and the degree to which they can be beneficiated.

Low Temperature Carbonization Retorts:- The advantages claimed for processes for carbonizing coals at low temperature are being brought so forcibly to the attention of the public, that one of the important functions of a fuel research laboratory will be to secure reliable information concerning the value of low temperature carbonization when applied to any particular Canadian coal. The permanent equipment of the plant will consist of only one or two technical scale retorts constructed on two of the main systems, e.g., internally and externally heated. It is proposed as the occasion arises, to erect technical scale low temperature carbonization retorts of different types, with a capacity of from 500 to 1,000 pounds of fuel per day, and with which it will be

possible to demonstrate the soundness of the principles involved in design and construction. The most promising of the low temperature carbonization processes will be tested in this manner. The gas condensing, scrubbing, and recovery train, which will form a permanent part of the equipment of the laboratory, will serve these temporary experimental retorts, as well as the by-product recovery coke oven above mentioned.

Oil Cracking and Refining Plant:- Technical scale pressure cracking stills will be erected, and with this equipment, processes for treating oils will be investigated. The oils to be investigated will include those recovered in the carbonization of coals, from oil shales, and from bituminous sands, and those obtained by synthetic liquid fuel or coal liquefaction processes. The results obtained will afford information regarding the value of the processes investigated for converting any of the above fuels into motor oils, lubricating oils, waxes, fuel oils, etc.

Liquefaction of Coal and the Production of Motor Spirits

according to Synthetic Fuel Processes:- The main testing laboratory has been designed with sufficient floor space to permit of the erection of a coal liquefaction plant of modern capacity, and apparatus for testing certain of the more promising synthetic liquid fuel processes, and it is hoped that such a plant will be installed in the near future.

Oil Shale Retorts:- The more promising of the processes for distilling oil shales will be tried out on a technical scale, using temporary retorts constructed according to different designs. In this manner, oil shales obtained from the provinces of Nova Scotia, New Brunswick and elsewhere in Canada will be tested.

Chemical Laboratories:- The main laboratories will contain the usual standard apparatus found in any well equipped laboratories. Most of this equipment is already in use in the present fuel research station, but certain of the laboratory scale apparatus for conducting research relating to high and low temperature carbonization, synthetic fuel processes, and the cracking and refining of oils, will be changed from time to time as required.

Ottawa, July 16, 1928.