

POSSIBILITIES OF THE RELIEF OF FUEL CONSUMPTION IN CANADIAN INDUSTRY BY THE INCREASED USE OF HYDRO-ELECTRIC ENERGY*

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THE growing necessity for some comprehensive plan looking towards the more complete and efficient utilization of our resources has been apparent for many years to those whose duties make them familiar with the tremendous wastage of materials which results from the lack of co-ordination in the use of the various raw materials with which our country is so richly endowed. The public, generally speaking, has little real idea as to what constitutes the real essential of conservation of natural resources. Simple reduction in demand; the restriction of the use of such materials, thereby restricting the output of essential industries is obviously not true conservation. The goal to be aimed at is development, present and future, and in order to secure this end we must make use of such materials as are necessary for the maintenance of our trade and commerce and the growth and development of our national life. Economic utilization of such resources, considering both present and future, would limit the use of irreplaceable materials even though they might be more cheaply and readily obtained under given conditions, and promote the use of other materials whose use conserves to a greater extent the assets of the community. The elements of cheapness and availability of raw materials are large factors in determining the success or failure of any industrial enterprise and as such must be given due weight. We have been, however, and we are still, too much inclined to accept these factors as excuses for taking the material nearest at hand which is suitable for our purpose and letting the future take care of itself. A little thought and investigation devoted to the development of possible substitutes will frequently disclose methods by which an industry may utilize materials or processes the use of which does not deplete the resources of the country. The ideal conservation would provide for the maintenance of the industries of the world by the use of basic materials supplied from natural growth so that the stock of raw material which constitutes the capital of the world would not be reduced but would be handed down unimpaired from generation to generation. Such an ideal conservation is obviously beyond reach in our present stage of development but, although we are still using up our capital at an alarming rate, the increasing realization of the need of care and the increasing efficiency of utilization which science is placing in our hands makes the future look more hopeful than might be considered warranted by a consideration of the special and temporary restrictive measures which have been applied to industry as a whole during the past few months. From these experiences it is apparent that the most essential elements in our industrial life at present are transportation and fuel, and to a large extent transportation means fuel since the equipment required for transportation can neither be produced nor operated in the absence of an adequate supply of fuel. It therefore follows that any modification of our past practice which will maintain our industries and at the same time reduce the consumption of fuels will be an application of true conservation principles in more than one way as, first, it will reduce the

consumption of a material which once used cannot be replaced, and secondly, it will reduce the demand for transportation for such material as will thereby leave for the use of some other industry a larger supply of raw material for which for its purposes there is no substitute.

The use of raw coal as a basis for the generation of power through the medium of steam is fundamentally uneconomic, as too large an amount of valuable by-product is sacrificed for very little return and the efficiency of the conversion is much too low. When it is considered that under average conditions the amount of coal required to generate a horse-power hour is of the order of five or six pounds, representing an efficiency from coal to power of only 3 or 4 per cent., which, generally speaking, must be again divided by two before the energy is applied to the work, it can be readily realized that our present methods of operation leave much room for improvement. In defence of the steam plant it may be claimed that such figures represent only the practice of the smaller plants and that in the large manufacturing centres power is supplied from steam plants which operate much more efficiently. It is a very good plant which can average a kilowatt hour on $1\frac{1}{2}$ lbs. of coal, including all auxiliaries, so that even under the best conditions we get an efficiency of only about 15 per cent. It is, of course, necessary to remember that such low efficiencies are not due to imperfections in the equipment but rather to the limitations imposed by thermal laws and until a method of conversion radically different from the present has been discovered, such losses cannot be eliminated.

These figures, unsatisfactory as they are, tell only half of the story. In using raw coal we are throwing away in a wasteful manner material which contains many valuable by-products which add but slightly to its value as a fuel but which when extracted have a value greater than the value of the coal itself. Many of these materials are essential elements in our industrial life for which at present there are no substitutes.

Notwithstanding this very unsatisfactory showing, the necessities of the case require that coal should be used for fuel in the absence of better means of providing readily available energy. It would seem, however, more or less elementary that the use of coal for such purposes should be restricted to cases where no substitute is available in order that when science places in our hands improved means of converting fuel into power, we shall not be in the unfortunate position of having squandered our patrimony and left ourselves without the means to take advantage of the improved processes when available.

Climatic conditions in this country, owing to the northern location, impose upon us a heavy burden every winter. Heat must be maintained in our houses and shops. At this stage of progress the only generally available means of heating is by fuel—coal, oil or gas—of which the former is by far the most important. We cannot avoid the use of coal for heating our factories, but we can see to it that as soon as practicable raw coal is not used for this purpose, and that what fuel is used is for heating purposes only wherever adequate substitutes for coal-generated power are available. Too many of our industrial establishments are operated entirely by coal simply because the controlling head likes the idea of "independence" and declines to consider the purchase of public service supply because he would then be "dependent on the power company." In places where hydro-electric service is available the power required by such establishments should be purchased and generally is purchasable at rates and under conditions more favorable than the costs of operation by coal and with much less investment

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