

for plant. In the cases of factories located where such service only is obtainable, sufficient engine plant should be installed to make possible the abstraction of the maximum amount of energy from the steam before it is used for heating, the idea being to operate steam plant only to the extent of the heat requirements utilizing the steam equipment as the reducing valve and increasing or decreasing the purchased power to such extent as may be required to offset the variation in the by-product power recovered from steam required for heating or process work.

As the average manufacturing establishment in most parts of Canada require more steam for heat than for power during the winter months and almost no steam during the summer months, and as the demand for electric energy for lighting purposes is much greater during the winter, such an arrangement works to the advantage of both company and consumer, as the combination makes possible the almost ideal utilization of the energy in the fuel during the winter and the capacity on the power system thus released becomes available to take care of the increased load which must be carried electrically. The diversity thus introduced into the power demand makes possible the fixing of a power rate which is attractive to the consumer and at the same time remunerative to the power company.

In some plants, considerable ingenuity is displayed in so combining equipment for utilizing steam, electricity and compressed air or refrigeration with outside service so that no fuel whatever is burned, except for supplying heat, and every possible unit of energy is abstracted from the steam before it is utilized as heat. Variation in the demand for air and electricity is compensated for by use of machinery driven by two sources of power involving very interesting cross-conversion of energy.

The experience of those who have plants operating under these conditions is quite satisfactory as they have secured the convenience of freedom from unnecessary heat and dirt during the summer, the advantage of a standby plant as protection against shut-down—extremely low cost of power during the winter and a satisfactory power service available at all times when required.

The fact that such economies are usually realized in plants of considerable size is due principally to the fact that the large plants are directed by executives of broad views who realize that elimination of waste is desirable even though in a given case it may not result in a net saving of money.

Instances have arisen this year in which factories which operate by steam power in winter and purchase hydro-electric power during the summer months have anticipated the date for the commencement of this purchased service with the consent of the power company, and are reducing their coal consumption as weather permits to the minimum absolutely necessary for heat and are paying to the power company for service to make up the deficiency in power recovery the net amount they would have paid for additional coal. The power company, having power available, is satisfied to accept this amount for temporary service from month to month without further obligation on the part of either party. Such co-operation shows evidence of broadmindedness on the part of all concerned and leads us to hope that further progress in co-operation would develop many other instances in which very real savings could be made to the advantage of the country as a whole.

An indication of the extent to which an enlightened policy under favorable conditions can carry the substitution of hydro-electric service for steam in an industrial

community is given by a comparison of the figures representing the consumption of electrical energy in the more important industrial centres in America. For the year 1916, the figures in kilowatt hours per head of population were as follow: New York, 225; Philadelphia, 250; Boston, 350; Cleveland, 400; Minneapolis, 450; Pittsburg, 500; Buffalo, 585; Toronto, 700; Montreal, 783. The figures for 1917 are not yet available but it is probable that the figures for both Toronto and Montreal would show an increase of about 10 per cent. Montreal would thus be about 800 while the whole province of Quebec was about 700.

The total power utilized in the Montreal district is about 200,000 h.p., of which about 165,000 is supplied from hydro-electric sources and the balance by steam. If the city pumping plant and the plant of the Tramways Co. are excluded the total steam capacity now in regular operation in this territory would be about 10,000 to 12,000 h.p. or about 5 or 6 per cent. of the total power utilized. Even this small part of the demand would be reduced materially were it not for the fact that most of these plants are of a kind which produce large quantities of combustible waste which must be disposed of by burning or are plants in which there is relatively large demand for high temperature steam for process work and a relatively small demand for power.

When it is considered that the amount of coal required to replace the electrical energy supplied by these hydro-electric plants would be of the order of 1,750,000 tons per year it is clear that while there still remains much to do, a very considerable amount has been done.

It should be borne in mind that this is no isolated instance. What has been done here is being done to a greater or less extent in many other centres, as is clear from the large and increasing load carried by the hydro-electric system in Ontario. Toronto's use of current is almost equal to that of Montreal and both of them are quite remarkable for very complete utilization of purchased power. Co-operation between the consumer and the company with fair rates and conditions for service rendered and a reasonable willingness on the part of the consumer to adapt himself and his plant to new conditions, even when such adaptation may perhaps entail the sacrifice of a little of his apparent independence, will assist our power companies in improving the already high character of the services they are now rendering by reducing to a minimum the utilization of irreplaceable materials and extending and broadening the use of power supplied from inexhaustible natural sources.

The development and utilization of our water power reserves is a measure of our economic advance in the scale of civilization, and the formulating of a broad and liberal policy which will ensure the keeping of such development in advance of the requirements of our industries is something which should engage the attention of our government and our industrial leaders.

It is surely not too much to hope that in a country so richly endowed with natural power sites, distributed almost ideally from an economic standpoint the time will come when practically all of the power required for our industrial life will be supplied from such sources, and we will be free from the reproach that because it is easy and obvious we cheerfully squander our patrimony while we neglect to develop the natural heritage with which a wise Providence has blessed us.

A Seattle syndicate, believed to represent the Pacific Coast Steel Corporation, has bought a manganese mine near Kaslo, B.C., for \$160,000. Concentrators are being installed.