THE COST OF POWER AS A FIXED CHARGE.*

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Note.—This paper was received just before going to press, and to put it in the available space, it has been found necessary to omit some, and change the wording of other parts.—[Editor.]

The cost of power as a fixed charge in manufacturing is a subject which has gone so long without expert treatment by the average manufacturer that he has come to look upon his coal bill as an item of expense with which little or nothing can be done, except pay it.

I take it for granted that most of you are generating your own power, in your own premises. That some of you are purchasing power from hydroelectric sources. And that all of you are interested in the question—"Can I produce my own power at a lesser cost than it can be purchased for from the outside?"

Every manufacturer is in intimate touch with the business side of his concern, but as for power—beyond his coal bill and what he pays his engineer the average manufacturer does not know and, in my opinion, does not make a proper effort to know the exact cost.

Since nearly every manufacturing plant which produces its own power is equipped with a steam plant, let us take as an illustration a moderate sized, ordinary steam plant and assume that it operates on a basis of ten hours per day for 300 days in the year, and the average actual power required throughout each day of ten hours is 200 horse-power, coal being $3.50 per ton.

The coal bill for one year in such a plant will be not less than $4,200. You will pay your engineer $1,000. Fireman $720, and after the incidentals have been added—for oil, packing, waste, etc.—the total will amount to $6,200. Then, adding for interest and depreciation will easily bring this amount up to at least $7,000, or, say, $33 per horse-power for the average of 200 horse-power. There is not, perhaps, one manufacturing plant in fifty making its own power for so low a cost as $35.

What does this $7,000 per year as a fixed charge for power stand for? $7,000 represents the net profits on perhaps from $75,000 to $100,000 of finished product. It represents a fixed charge against your business, equivalent to $140,000 of 5 per cent. bonds, and it is needless to say that you would give much serious thought to the question of the issuance of such an amount of bonds, and that you would analyze all the vital elements in your business before you decided to incur such a burden upon your earnings. In the face of this you pay $7,000 a year for power, without having given anything like a corresponding consideration to the question as to whether or not $7,000 per year for an average of 200 horse-power is the right price.

Look only at the coal bill of $4,200. Perhaps most of you do not know that of these $4,200 burned under your boilers, $3,800 are lost—absolutely non-productive; that out of every dollar's worth of coal burned, over 90 per cent. goes up the chimney and out of the exhaust, without doing work of any kind. This is what is happening every day in the average plant.

It is obvious that to get the cost of your power down to a point where the outlay in that department is consistent with the economies demanded in the science of modern manufacturing you must either secure a reduction in the price of coal or you must generate your power on less coal. The first alternative is at present out of the question, but to materially reduce the amount of coal required to produce your present horse-power is an easy matter if you will give this department the expert treatment which it deserves.

What Is a Horse-Power?

We hear on every hand, "so much per annum per horse-power." "Cost per horse-power hour." What is a horse-power hour? If all the power in this little piece of coal (shows specimen) could be utilized, if all its latent energy could be converted into actual work, it would lift 1,980,000 lbs. one foot high in one hour, or nearly 1,000 tons of dead weight off the ground for one hour. It weighs but 2¾ ounces, and yet could lift a weight twelve million times greater than itself. In other words, it contains the net equivalent of one horse-power hour.

Now let us digress for a moment and make this point clear. I have taken two pounds to represent the best average economy of the fire. The Simplex Reciprocating Steam Engine, the Compound Condensing Steam Engine, the Steam Turbine, the Gas Engine, and the Oil Engine. Each has its place; each has its just claims, and no one type will ever supplant any of the others.

When you undertake to convert this amount of latent energy into the actual driving of machinery, I will not say that you must burn, but that you do burn a piece this size (5 lbs). We cannot convert all of this latent energy into actual work, because nature demands a premium on what she gives us, and a big premium. On the other hand, however, she does not ask us to pay any such price as this (5 lbs.) for one horse-power hour.

We know that a horse-power hour of actual work can be produced for 2 lbs., it therefore becomes apparent that in the average plant there is being burned unnecessarily and without return the difference between 2 and 5 lbs.. or 60 per cent. more coal than is required by present day methods. If, therefore, six per cent. of this $4,200 coal bill can be saved, or say $2,500 per year, you may then consider you have retired an obligation of $41,500. Would you not consider a department worthy of expert treatment which unnecessarily places upon your business the equivalent of a $41,500 obligation at six per cent?

If you will treat your power as a department, and if you will give to that department the attention it deserves, you will easily confirm the claim that modern practice and actual results will place this great economy within your reach.

This subject of power cost must be approached as a fixed charge in your manufacturing with a serious mind. You must ascertain what your load factor is, and know what actual horse-power it takes to drive your plant, and when you know this you have got the key which will open the door to an important department in your business—a department which you have hitherto neglected.

To ascertain the load factor a diagram covering the daily run must be made by an expert. This diagram must show the horse-power output from your engines at every hour during the day's run, and, preferably for a number of days in succession, so that the load factor may be arrived at—the average actual horse-power you require.

Power Account.

A power account should be opened, and into that account charge that part of your capital invested in engines, boilers, pumps, dynamos, power house, chimneys, foundations, piping, shafting, belting, and every part of your equipment which either generates or transmits power, together with all its accessories. This item will show you how much of your capital has been invested in your power department, and then you will know upon what amount to charge for depreciation. Charge against this account your fuel, engineers' and firemens' salaries, oil, water, repairs, upkeep, and all the incidentals which in the average manufacturing plant are lost in other accounts. Some may say "Yes, but all these items come out at the end of the year in some other account. So what is the difference?" The difference is simply this: that in order to manage your power department in a way that will insure your getting power at the right price, you must know all about that department, just as you know and insist upon knowing all about the other departments in your business.

With the load factor known, and with all these items charged into this account, it then becomes merely a matter of dividing the total number of dollars footed up by the average horse-power taken from your power diagram—for one year—and the quotient will be your cost per annum per horse-power.

It may not be for me to set down an arbitrary amount per annum per horse-power as representing the price at which you would be justified in generating your own power

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