Story behind the story...

No one expected anything unusual when two Western Electric engineers presented a paper* on power-plant modernization at ASME's spring meeting. You could have predicted its nature—an analysis of the problem, a description of the new plant, a report of savings effected. And the paper did all that in an exceedingly workmanlike fashion. But so do many articles on modernization. What made this different?

Just one thing, we believe. The authors didn't stop when they'd figured out the answers. They knew they'd have to enlist active support of management. So they put real thought and imagination into "translating" their findings from Btu's and kwhr to management's own terms of costs, savings and profits. To top it off, they hit their key points hard with easy-reading charts and diagrams.

The result? Management listened understandingly, went along with the proposals. And we have a relatively rare case study in the art of "selling" engineering ideas to management.

We've freely adapted this paper, on these two pages and the two that follow. You'll find here the broad outline of the modernization problem and its solution. More important, we think, you'll find key examples of the way facts were interpreted in management terms. Use them to stimulate your own thinking when you have a modernization plan to put over with management.

Now for background: Hawthorne Works of Western Electric Co (Cicero, Ill.) is a major link in the manufacturing chain supplying the Bell Telephone System. Engineers there were fully aware of dollar savings a modernized power plant could produce. Yet they recognized that light manufacturing, characteristic of most Western Electric operations, grew up with a history of high ratios of manpower to heat-produced energy. This *ratio once ran so high that energy cost had little effect* on product cost.

But an undeniable change had taken place over the years. Use of more power per worker was making energy cost a vastly greater part of the total. And so Hawthorne's old power plant was exacting an ever greater toll in needless fuel and labor costs. The answer seemed obvious—call management's attention to the situation and take steps to correct it.

The engineers began by compiling data on past and probable future labor-energy ratios and the effect of energy cost on production. Next they isolated and traced the past experience of the two major influences on energy costs—fuel and labor.

They were then ready to work out new plant cycles that would cut these costs and do it in a way that offered quick recovery of capital expenditures.

Up to this point, they followed the thinking and methods typical of engineers. Then they took the extra step of translation to management terms which is emphasized in the remainder of this article.

*Rehabilitation of an Industrial Power Plant, by C E Morrow, Power & Service Facilities Engineer, and R P Born, Mechanical Engineer, Western Electric Co, Chicago, Ill. Paper No. 53-S-14, Spring Meeting, ASME, Columbus, Ohio.

These basic facts

More power per worker shows up as a decided trend in industry today. Light manufacturing is no exception. At Western Electric, the term "power" means manufacturing energy. It represents the heat equivalent of net plant output, including electricity, process steam, compressed air, building heating. But for graphical representation a single yardstick was desirable. Electric energy was chosen because more accurate data was available than for steam or other forms of energy.

Chart below dramatically pictures how electric energy and more efficient manufacturing methods have changed the ratio of manpower to energy. In 1929, with plant personnel up three times over 1910, plant operations took 14 times as much electrical energy. In 1951, employment was down to 55% of 1929, but electricity usage was up 11%.

Other data collected in the study indicate similar relationships for steam and other forms of energy. Energy cost is now major factor in product cost—chart, studies below:

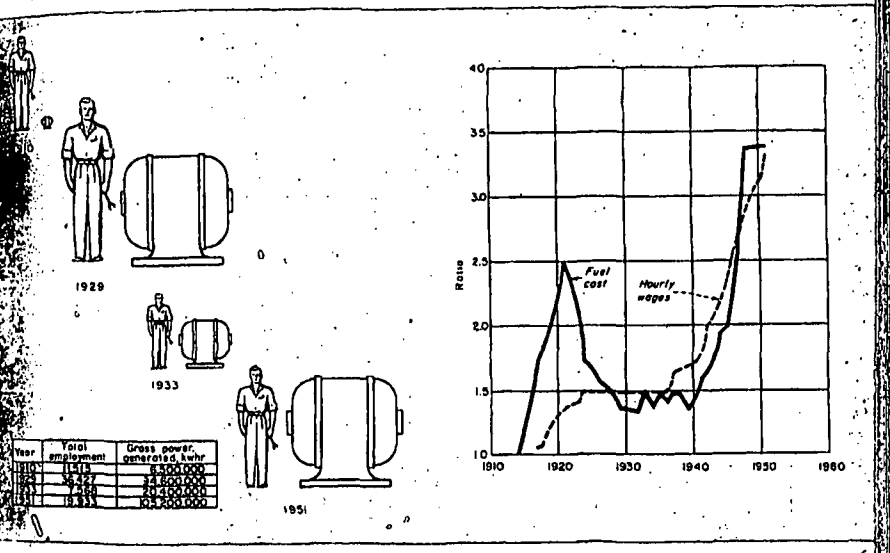
Fuel and labor are major elements in energy cost. Since 1914, both wages and coal costs tripled. You'd expect energy cost to increase in about this proportion unless energy-generation improvements compensated for increases.

That's what happened at Western Electric. In 1928 they completed a power rehabilitation program based on a study made in 1926. This report, with its complete 1926 operating data, served as an ideal reference point for the 1949 survey.

Generation in 1926 was 52 million kwhr, compared with 94 million in 1949. But boiler output to produce this demand, plus other manufacturing energy, was about the same. This shows improvement in cycle efficiency over the period. But same amount of fuel was needed in 1949 as in 1926, so gains took place outside of the steam-generating equipment.

In 1949 coal costs ran 91% higher than in 1926 and labor was 186% higher. Variable cost per million Btu of manufacturing energy was up 64% by 1949.

Pictured this way



Produced these conclusions

Studies of growth in energy requirements indicated that, if trends established over a 25-yr period held true, normal production levels would produce maximum demands averaging 26,000 kw for the next ten years. Load factor would run over 50%. By 1960, maximum demands as high as 28,000 kw could be expected. While these figures received full attention, modernization plans were based on a conservative 23,000-kw maximum demand and 45% load factor.

Studies of process-steam needs revealed generally similar trends. Relationships were developed to permit making long-range estimates of steam demands.

These figures made it imperative to find ways to reduce costs. This investigation got under way in the latter part of 1949. In April, 1950, it was accelerated because insurance carriers said that the old boilers in the separate 26th Street plant had to be replaced in two years.

So total annual energy costs went under the microscope. Only unit cost considered was that per million Btu of manufacturing energy. Two alternatives were apparent: (1) Purchase all or part of electric energy from the utility. (2) Continue power generation but with a cycle improved to reduce fuel cost and with equipment needing minimum personnel.

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