used entirely at all times and at other times the exhaust steam was not sufficient to meet the demand. In the first case, steam was exhausted to the atmosphere, while in the second case steam was directly taken from the boilers. Steam at the main 450-lb. header had a B.t.u. value of 1350, the bled steam 1260 B.t.u. and the exhaust steam 1190 B.t.u.

For costing purposes, the steam flow to the turbine throttle, the bled steam, the total 25-lb. steam passing to process, and the 25-lb. steam taken from the main 450-lb. header, were metered.

The total cost of steam generation including fuel, labor, fixed charges, maintenance, water, chemical and sundry expenses was determined. This cost was prorated to electric power and process steam on a heat basis.

The difference between the total 25-lb. steam going to the main distribution lines and the 25-lb. steam taken direct from the 450-lb. main steam header gave the total amount of turbine exhaust steam used for process.

An arbitrary figure of 10% of the steam generated was charged to steam generating costs since this was used to operate accessories.

To find the net steam to be used for calculations, the total steam as metered from both boilers, less 10%, was taken. The pounds of steam were then converted to a B.t.u. basis for determining the proration of heat units to electricity and process steam, and the following calculations were made:

1. Total net B.t.u. available for process and electricity = steam metered at boilers − 10% × 1350
2. B.t.u. charged to electric power = steam metered to turbine throttle × 1350 − (total 25-lb. steam metered to process − 25-lb. steam metered from main header) × 1190 − metered bled steam × 1260
3. Per cent of net heat units charged to electric power = Item 2 ÷ Item 1
4. Per cent of net heat units charged to process steam = Item 1 − Item 2 ÷ Item 1
5. Total cost of steam generation
6. Total cost of electric power = Item 5 × Item 3 + labor, maintenance, fixed charges, sundry supply, etc., charged direct to electric power
7. Total cost of process steam = Item 4 × Item 5.

Since only a very small part of the process steam was used at 80-lb. pressure, all process steam was charged at a common rate on a pound basis. All process steam was metered before passing to the various departments.

The first year operating cost summary showed a saving slightly better than the estimated saving. For the last three months of this period, the plant operated at a reduced production schedule, so that if normal operation had been maintained for the entire year, the actual saving would have been 25% higher than the original estimate. An analysis of steam and electric costs showed the saving in another way. The cost of process steam in 1927 and 1928 averaged $0.35 per 1000 pounds and electric power $0.013 per kilowatt-hour. The average cost for the first year operation of the new plant showed a process steam cost of $0.30 and electric power cost of $0.006 per kilowatt-hour. The actual saving the first year was $31,200.00 and if normal operation had been possible the saving would have been approximately $40,000.00.

The entire installation met all expectations and the unit has operated successfully after some preliminary adjustments were made.