



CHART A

TABLE I

DATA ON CHANGE FROM TWO TO THREE SHIFTS
MILL No. 2

	No. Men Employed on Two Shifts	No. Men Employed on Three Shifts	Increase in No. of Men
Acid Plant	8	15	7
Digester House	18	27	9
Boiler House	24	37	13
Engineers	7	10	3
Wood Room	78	114	36
Wood Yard	19	23	4
Log Pond	20	30	10
Blowpits	10	15	5
West Screen Room	8	9	1
East Screen Room	10	12	2
Machine Room	113	135	22
Bleachery	2	3	1
Filter House	2	3	1
Press Repairs	2	3	1
Cell House	15	19	4
TOTALS (Tour Workers only)	336	455	119
Day Workers	200	200	—
GRAND TOTALS	536	655	119

% Increase (Considering Tour Workers Only) 35.4%
% Increase (Tour and Day Workers)22.2%

percentage of increase in the tour workers only was 35.4 per cent and, considering all workers in the plant, was 22.2 per cent. In this mill, as in the previous one referred to, the actual amount of money paid

per day of eight hours was the same as was previously paid for twelve hours. In this latter mill, while the labor cost per ton increased at first about 22 per cent, this was soon offset by the increased production. Our experience indicates very clearly that the large production increase comes because of the fact that our men are wider awake and more "on the job" and, consequently, have much better control of the processes.

We actually increased the production of this mill from 42,000 tons to 111,000 tons per year, in seven years' time, without adding to the equipment a single digester for cooking the pulp; in other words, the production was increased 2.9 times. I am not claiming that this increase in production was due entirely to the change from two to three shifts, but I do know that we would not have been able to reach anywhere near this figure if we had continued to operate on the two-shift basis. Furthermore our quality changed during this period from the poorest pulp manufactured to the very best. Our keenest competition had always been from Europe, largely because of the fact that European quality was very much better than our own.

Our men, however, were not constantly tired out, but mentally alert, because of the reasonable hours that they worked, so that we were able to eliminate European competition entirely and our pulp invariably obtained the preference because it was cleaner,

stronger and better in color. In Europe, at that time, the mills were all on a two-shift basis.

Right at this point, it might be well to mention the fact that we doubled the number of our employees while the production was being trebled, but this increase was largely because of the fact that in the development of the new processes, which made for greater economy in the use of materials, we needed a larger working force. The net result, however, was a reduction in the actual cost of manufacturing the pulp (in spite of the increase in the cost of raw materials) of from \$5.00 to \$6.00 per ton, with the equivalent of an additional reduction due to the value of our by-products of approximately \$2.00 per ton.

Table II gives the actual figures from a small plant which changed from the two-shift to the three-shift basis, but because of the fact that the plant itself was modern and up to date, an actual saving in the number of men could be effected, so that the total increase in the number of men was only 22.1 per cent., considering tour workers only; and the actual increase in cost 13.1 per cent. The rates of pay per day, as shown, and the drop in wages which took place here were due largely to the fact that this mill had postponed changing from two to three shifts so long that they were obliged to raise the hourly rates of their men so that they were half way between the normal paid by the industry, on a three-shift basis, and their old original rates paid on the two-shift basis. After the change was made these rates became practically normal for that section of the country where the three-shift wages were in effect.

The per cent increase in the number of men, when day workers are also included, was only 12.1 per cent. In this case, as in the previous one, the tonnage of the mill increased. It rose in a few months from an average of 70 tons per day, on the two-shift basis, to an average of 100 tons per day on a three-shift basis.

To a considerable extent this increase in production came from mechanical improvements made in the processes, but from actual observation of what took place, I know that great impetus was given to the betterment of the quantity and quality of output by the change to shorter hours.

The man who managed this plant during the time that this change took place wrote me, when he sent me these figures, as follows:

"You, of course, are familiar with the difference in spirit that permeated our organization after we changed to three

TABLE II
DATA ON CHANGE FROM TWO TO THREE SHIFTS
MILL No. 3

Two Shift			Three Shift			
No. Men	Total Cost per Day	Ave. Pay	DEPT.	No. Men	Total Cost per Day	Ave. Pay
6	\$23.68	\$3.95	Acid Plant	5	\$20.34	\$4.07
6	27.36	4.56	Digester House	9	37.44	4.16
22	87.89	4.00	Screens	29	97.66	3.37
12	57.72	4.81	Bleachery	12	56.58	4.72
40	165.60	4.14	Machines	51	197.76	3.88
18	70.40	3.91	Boiler House	21	79.50	3.79
Total Tour						
104	432.65	4.15	Workers	127	489.28	3.85
80			Day Workers	80		
184			Total Men	207		

% Increase in No. of Men 22.1, considering tour workers only
% Increase in Cost 13.1, considering tour workers only

% Increase in No. of Men when day workers are included12.5

shifts. The men were wide-awake, energetic and on their toes, and interested in their work, while on the old basis they lacked enthusiasm and had a tendency to neglect things and sleep on the job. Much of the increased production, in my judgment, came from the change to the three-shift basis."

Interpretation of Experiences

This interpretation has, to some extent, been given in explanation of the actual illustrations. Three generalizations, however, can be made from these experiences, which I will summarize as follows.

1. That there is a limit to the physical endurance of men and that there is a time beyond which nothing further is gained by prolonging the hours. Our experience has been that, so far as the paper industry is concerned, eight hours constitutes a proper day's work, that even in the case of our day workers more work was actually accomplished in eight hours than in nine or ten-hour day.

2. It is equally true that men are not mentally alert when physically fatigued. Mental alertness is absolutely essential to good quality of product and our experience has been that invariably when the obstacles to uniform quality are removed the obstructions to increased output are also removed.

3. As maximum quantity and quality cannot be obtained when the workmen are tired out, so is it impossible to operate economically unless the hours are short enough to permit a proper amount of relaxation