Productivity Methodologies, Tools, and Techniques

Work sampling

Contributed by Managing Director Kok Seong Lee, QMC Resources Center Sdn. Bhd., Malayisa, resource speaker for the APO training course on the Development of Productivity Practitioners: Basic Program.

Work sampling is a widely used basic industrial engineering technique designed to determine the rate of occurrence of a certain activity through random or fixed-interval observations. It can be applied in manufacturing, service, and office operations to a group of workers and/or machines. Analysis of the data collected will show how well the workers and machines are utilized and help to identify areas for improvement.

Work sampling is used to:

- Determine the time spent by each worker or machine on productive or nonproductive activities such as delays or interruptions during working hours; and
- Establish a standard time for each manual task or operation. The standard time can be used for manpower planning, work distribution, production planning, and costing, among others.

When carrying out a work sampling study, a sufficient number of observations must be made to ensure that the results accurately reflect the work performed. The following statistical formula is used to help determine how many observations should be made (see formula — below, right):

$$N = \frac{4\ p\ (100-p)}{A^2}$$

where p is the estimated percentage of time spent on the activity, A is the limit of error expressed as a percentage, and N is the number of observations to be made. For A in most situations, a 95% confidence limit with a ±3–5% limit of error is required. Observations should be recorded over a period of days or weeks so as to reduce work variations during the period of study.

General steps for conducting work sampling are:

- Define the purpose.
- Define the activities.
- Conduct a pilot study.
- Determine the number of observations.
- Establish a time period for the study.
- Determine random observation times.

- Conduct observations.
- Perform analysis and evaluation.
- Take corrective actions and follow up.

Case study

Work sampling was used to determine the productivity of a fruit juice production line of a beverage manufacturing company. The activities of 24 workers and technicians were observed for five continuous workdays over two shifts. The results, based on 2,200 observations, showed that on average, the workers spent only 50.2% of their working time on productive activities. They spent a large proportion of their time on unproductive activities such as waiting for materials or performing tasks that were not related to their work. The average overall equipment effectiveness (OEE) of the production line was only 32%.

The study revealed that the low worker utilization rate and OEE were mainly due to the long setup time for the production line and stoppages such as machine downtime and other delays due to poor planning. After a detailed analysis of all the contributing factors, an action program including rearrangement of the work sequence, elimination of all unnecessary activities, and standardization of work procedures was drawn up and implemented. As a result, the OEE of the production line was increased by 24% to 56% and the total crew size was reduced from 24 to 15 workers for the two shifts.

Back to list

To top of page