Personal Protective Equipment 120: Hearing Protection

Noise can reach hazardous levels in the workplace. If over an 8-hour shift, the noise levels reach or exceed 85 decibels, the employer is required to put a hearing conservation program in place, which includes the use of hearing protection and regularly scheduled hearing tests for the employees.

At first glance, the 85 decibel noise level may appear to be an 85 decibel average over an 8-hour shift. However, 85 decibels cannot be an average because an average allows for some values to be less than 85 decibels. This is not the case since the noise level must be at 85 decibels or more for the entire 8-hour shift.

What if an employee is exposed to more than 85 decibels of noise during an 8-hour shift? Can an average noise level be calculated if the noise level changes throughout the 8-hour shift? This type of average is called a weighted average or weighted mean because the noise levels are weighted by the length of time the noise level lasted. This weighting (unequal relevance) of the noise levels must be taken into account when the weighted mean or average is calculated.

Rule for Figuring a Weighted Average

1. Multiply each of the values that are to be averaged by their assigned weight and add these products.
2. Add the weights to determine the total weight.
3. Divide the sum in Step 1 by the total weight in Step 2.

EXAMPLE:

The noise levels in the workplace reached the following values over an employee's 10-hour shift. Calculate the average noise level taking into account the amount of time the employee was exposed to each noise level.

85 decibels for 3 hours
90 decibels for 2 hours
100 decibels for 1 hour
92 decibels for 4 hours

SOLUTION:

1. The values to be averaged are the noise levels. The weights are the numbers of hours during which the noise level lasted.

   Value x Weight
   85 decibels x 3 = 255
   90 decibels x 2 = 180
   100 decibels x 1 = 100
   92 decibels x 4 = 368
   903 decibels

2. The total weight is the total number of hours. 3 + 2 + 1 + 4 = 10 hours

3. $\frac{\text{903 decibels}}{\text{10 hours}}$ = 90.3 decibels/hour

   Over the 10-hour shift, the average noise level was 90.3 decibels/hour.

Even though the weighted average (mean) was used here to calculate the average noise level, it can be used to calculate the average number of welds per hour during a shift or the average number of parts shipped per day over a week's time.

EXERCISES:

1. During an 8-hour shift, an employee completed the following number of welds in the given time.
   15 welds per hour over 2 hours
   12 welds per hour over 3 hours
   10 welds per hour over 2 hours
   0 welds in 1 hour

   Determine the average number of welds per hour for this employee.

2. One department within the company manufactured the following number of parts during the indicated days. What was the department's average production per day?

   500 parts per day Monday and Tuesday
   480 parts per day Wednesday and Thursday
   530 parts Friday

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