HOW MONITORING DATA CAN BE USED TO REDUCE ILL HEALTH

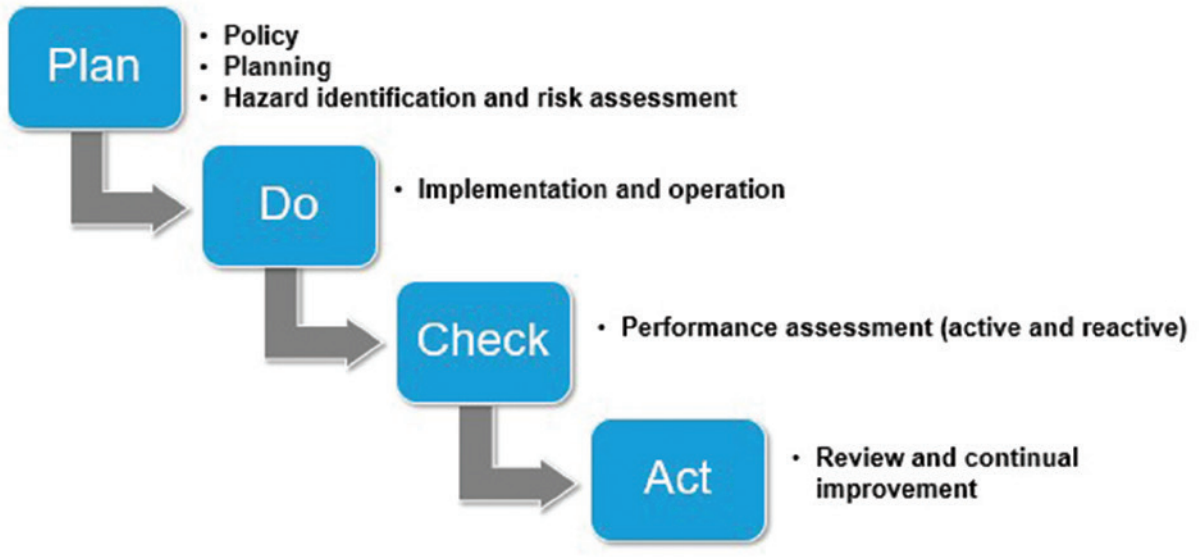
The "health" element of health and safety has been, for the most part, the silent partner of health and safety. Yet in the UK in 2017/18*, it was estimated that there were 13,000 deaths linked to past exposures to hazardous substances at work, compared to the 144 people who died as a result of a physical accident. In addition, it is estimated that there were 1.4 million work related ill health cases, with the cost to industry well into the billions.

These statistics demonstrate that work-related ill health is a serious issue in the UK, and worryingly these statistics show no sign of slowing down. Ill health issues such as cancers and chronic lung diseases account for most fatalities in the UK and musculoskeletal disorders and stress-related illnesses are the biggest financial burden on the UK economy.

Health risks are challenging to manage because health is NOT like safety; not only the hazards themselves but also the way industry understands and manages risk. To achieve real, lasting change, this needs to be addressed.

Part of the risk assessment process involves an element of risk quantification; determining the level of exposure is often a major step in identifying if employees are at risk of contracting ill health. Data obtained by employee exposure can also be used to identify possible sources of ill health, identify patterns of exposure, emphasise the need for adequate controls or to assess whether the controls implemented bring the risk down to an acceptable level.

The Plan, Do, Check, Act (PDCA) or Demming Cycle, is an approach to health and safety management recommended by the HSE; it achieves a balance between systems and behavioural aspects of management. Many management systems including ISO 45001 rely on the use of the Demming Cycle as seen in the diagram above. Operator assessment and monitoring falls under "Check" which includes the requirement to ensure that controls are adequate.



Key to the success of any monitoring survey is the observation of the working being carried out, the accurate collection of data and the competency of the people involved. This process can be split into pre-survey, monitoring survey and then an analysis and interpretation of the results.

The pre-survey should be undertaken well before the monitoring – this is when you are considering your strategy or if ill health is believed to be attributable to the inhalation of hazardous substances, excessive noise or vibration exposure. The pre-survey is usually carried out on site, with people who are familiar with the work and the processes employed, so that the correct strategy can be formed.

The monitoring survey is usually the easiest part of the process, providing that the findings from the pre-survey are followed. Observations from the survey are important to fully understand what tasks the operative has carried out, whether the tasks are fully representative of their normal shift work, the number of breaks they have, whether there is any job rotation in place etc. Following the sampling, if applicable the data should be analysed by a lab and the results compared to the relevant exposure limit or standard.

Three common survey types carried out to assess ill health in the workplace are:

Air monitoring

Air monitoring is usually carried out via active sampling, with the operative wearing a pump calibrated to a specific flow rate and connected to specific sampling media. For most dusts, this is calibrated to 2 litres per minute but for contaminants such as solvents the flow rate can be as low as 100ml per minute.

The sampling method is standardised and the methodology must be followed to reduce sampling error. The HSE publish a variety of Methods for Determination of Hazardous Substances (MDHS) for various contaminants if one is not available, approved international sampling methodologies are used.

Passive sampling can also be carried out for some gases/vapours. Diffusion monitors are simple and easy to use and don't require the use of sampling pumps, tubing, batteries or air flow calibration. They are lightweight and can be simply clipped on to the collar of the worker for personal sampling (TWA or STEL) or can be used for area monitoring providing there is sufficient airflow. Some disadvantages are that they cannot sample low vapour pressure organics such as glutaraldehyde and reactive compounds such as phenols and aldehydes. Diffusion badges using charcoal suffer from the same moisture and recovery issues associated with active sampling tubes. Additionally, with some diffusive samplers (depending on design) inaccuracies can occur at wind speeds >2.5 m/s.

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Sampling can be carried out over the whole shift, a task, for 15 minutes or other predetermined periods. The samples are then sent away for analysis by a UKAS accredited lab. Exposure is calculated using the concentration of the contaminant, the amount of air pulled through by the sample pump and the operator shift/task time.

Direct reading instruments

There have been significant advances in this area of monitoring over the last 10 to 20 years. Previously they were often large bulky instruments unsuitable for personal monitoring, but with advances in technology they can now be worn as personal sampling devices for an ever-increasing number of gases and vapours. Direct reading instruments allow real time measurements and many allow analysis of instantaneous (seconds), short term 15-minute STEL and 8 hour TWA concentrations of the particular contaminant. However, these are often expensive to purchase and there are limitations to the substances monitored, the potential for interferences and cross sensitivity. The ability to interpret the data is also required.

Results of air monitoring carried out can be fed into any COSHH/ risk assessments.

Noise Monitoring

An assessment of sound within a workplace is usually carried out by measuring background noise (static measurements) and an assessment of personal exposure (via personal dosimetry). The general rule of thumb is that noise could be an issue if voices have to be raised to have a normal conversation with someone approximately 1 metre away. Background levels are assessed using a type 2 sound level meter (SLM) designed to measure sound pressure levels. The A weighting of decibels is the most common measurement and has a similar frequency response to the human ear, the pressure is measured and the results expressed as dB(A).

As workplace noise is rarely constant, the time taken to collect background noise measurements vary, from a few seconds for a constant noise source to a couple of minutes or even longer if a process is cyclic.

Carrying out static measurements alongside personal dosimetry covers movement of staff and variation in noise levels. Exposure will generally fluctuate due to the production rate or speed of equipment, product being manufactured, cyclical nature of machines, rotating equipment, process flow, etc.

The noise dosimeter is a type of SLM designed to measure a worker's noise exposure over a period of time (usually for all or most of their shift). The dosimeter (also referred to as a noise dose meter or personal sound exposure meter) contains a microphone, usually fixed to the top mid-section of the employee's shoulder or shirt collar. It continuously measures the A-weighted sound levels and this information is used to determine actual operator exposure.

Whilst the information obtained from the noise dosimeter is useful, it should never be used exclusively to form a noise survey – the reading can be distorted by a hidden/covered microphone, plus the dosimeter may be tampered with. Regular supervision and monitoring can reduce this likelihood.

Measuring for Hand Arm Vibration

These assessments are aimed at highlighting the risk to individuals of developing hand arm vibration syndrome (and other related vibration conditions), and are usually made by either:

- Measuring the vibration levels emitted by a tool when in use
- Measuring the daily/weekly exposure of a person who may be using vibrating tools.

The strategy used depends upon the types of equipment used and the task being carried out. However, all vibration measurements should be equated to an A(8) value (the average (A) exposure over an eight-hour (8) day) and takes into account the magnitude of the vibration and how long you are exposed to it. The rate of vibration of a tool or piece of machinery is measured in metres (m) per second (s) – its movement per second. Measurement results can be highly variable, and dependent on many factors such as; the operator's technique, the condition of the work equipment, the material being processed and the measurement method. The competence and experience of the person who makes the measurements is important so that they can recognise and take account of these uncertainties in producing representative vibration data.

The HSE has a points matrix which assesses vibration and estimates daily exposure, this matrix can be found on the HSE website.

Summary

Work-related ill health is a problem for every section of society, with conditions ranging from cancer and other long-latency diseases, noise induced hearing due to vibration exposure, stress and musculoskeletal disorders. Greater awareness of the harm, costs and preventability of work-related ill health should drive collective action to improve health outcomes.

The HSE and other bodies (including IOSH and BOHS) are encouraging a focus on early prevention rather than trying to intervene when a person is suffering from more serious ill health. Moving the emphasis to prevention requires the implementation of control measures and in many cases will require monitoring data to demonstrate controls are effective with the overall desire to reduce deaths and ill health linked to workplace activities.

*Health & Safety (HSE) statistics 2017/2018

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