

NIOSH Develops New Software to Analyze and Reduce Hazardous Noise Exposure

Objective

To help mine safety and health professionals manage and reduce hazardous noise exposure with a software tool that simplifies the record-keeping and analysis process.

Background

Hearing loss resulting from overexposure to noise continues to be a problem throughout the U.S. mining industry. Studies indicate that 70%–90% of all miners have a noise-induced hearing loss severe enough to be classified as a hearing disability by the time they reach retirement age. To address this problem, the National Institute for Occupational Safety and Health (NIOSH) developed the Determination of Sound Exposures (DOSES) software program. DOSES is designed specifically for use by mine management and safety personnel to simplify the record-keeping and analysis associated with time-motion studies, making it easier to identify and solve noise exposure problems.

Approach

DOSES relies on time-motion study data that profile a worker’s daily activities. In this case, that information is the task and location breakdown of a worker’s regular working routine. In addition, as task and location data are noted, associated sound levels are collected using a dosimeter or sound level meter. The data are then entered into the program

(Figure 1) as complete observations made of the following parameters:

- Start time
- Stop time
- Task name
- Task location
- Sound level

With the time-motion and sound level data entered into the program, analysis is moved from the clipboard to the computer where extensive analysis of the worker’s noise exposure over time can be conducted.

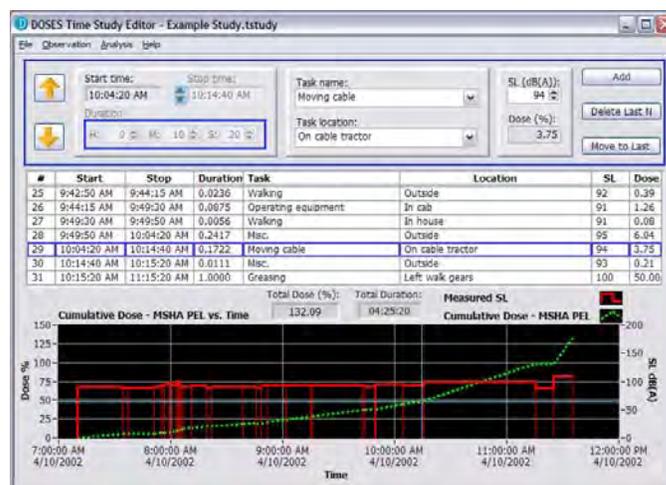


Figure 1.—The DOSES Time Study Editor with areas for entering new or editing existing observations, a table displaying the observations, and a graphical plot of cumulative dose and sound level versus time.

Results

DOSES assesses noise exposure by analyzing the time-motion study data of a worker's daily schedule broken down by task and location. This analysis is shown visually on the main screen in tabular form and as a plot of the cumulative dose and observed sound level over time as each observation from the time study is entered. As each entry is completed, the percent noise exposure is calculated using one of three formulas chosen by the user (Table 1).

Table 1.—Formulas used to calculate percent dose

Designation	Percent dose formula
NIOSH REL	$= 0 \text{ for } Leq < 80$ $= \left(\frac{\text{Duration}}{2^{((Leq-85)/3)}} \right) \times 100$
MSHA PEL	$= 0 \text{ for } Leq < 90$ $= \left(\frac{\text{Duration}}{2^{((Leq-90)/5)}} \right) \times 100$
MSHA AL	$= 0 \text{ for } Leq < 80$ $= \left(\frac{\text{Duration}}{2^{((Leq-90)/5)}} \right) \times 100$
REL	Recommended exposure limit.
PEL	Permissible exposure level.
AL	Action level.
Duration	Exposure time, in hours.
Leq	Equivalent sound level.

Once the study is completely entered, a more in-depth analysis is performed where cumulative exposures by task and location are calculated and displayed in tables (Figure 2) and bar graphs (Figure 3). If a dosimeter was used during the time study, the dosimeter log file can be imported into the program for comparison to the observation-based results.

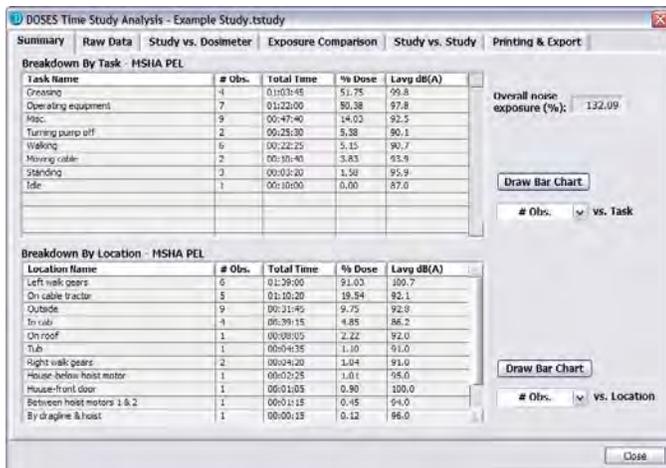


Figure 2.—The first tab in the Analysis dialog showing the breakdown by task and location tables.

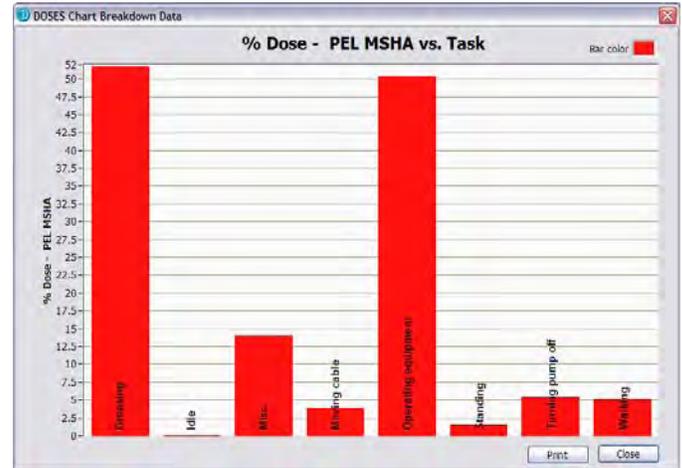


Figure 3.—Bar chart of percent dose versus task.

Customizable reports from the data can be generated and printed or saved in HTML format. With these analysis capabilities, high noise exposure aspects of the job can be easily identified by task or location, allowing the safety officer to mitigate them with engineering or administrative noise controls. The raw time study observation data can also be exported in comma-separated ASCII format for easy use by other programs.

For More Information

The DOSES software program can be downloaded from the NIOSH Mining Web site at: <http://www.cdc.gov/niosh/mining/products/>

For more information about the DOSES program, contact Gregory P. Cole (412-386-6744, GPCole@cdc.gov), Ellsworth R. Spencer (412-386-6831, ESpencer@cdc.gov), or the Pittsburgh Health Communications Coordinator (pithealth@cdc.gov), NIOSH Pittsburgh Research Laboratory, P.O. Box 18070, Pittsburgh, PA 15236-0070.

To receive NIOSH documents or for more information about occupational safety and health topics, contact: **1-800-CDC-INFO** (1-800-232-4636), **1-888-232-6348** (TTY), e-mail: cdcinfo@cdc.gov, or visit the NIOSH Web site at <http://www.cdc.gov/niosh>

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