

sound level meter. The effect of using different engine, propeller and muffler configurations to reduce workshift noise exposures is evaluated using a Metrosonics Model db-3100 noise dosimeter. During normal herbicide application activities, the airboat engine and propeller, not the application equipment, is the primary source of noise. Sound pressure levels increase with increasing engine and propeller RPM. Measurements indicate that the wood propeller offers an engineering control advantage over the carbon fiber propeller by shifting its energy to a portion of the noise spectrum to which the ear is less sensitive. The research found the use of aircraft engines to offer an engineering control advantage over automotive engines because they provide maximal thrust at minimal engine RPM. The dosimetry tests reveal the daily noise exposures of aquatic herbicide applicators to vary between 94 and 106 dBA. Herbicide application and open plane activities contribute most of the daily noise dose. The use of earmuffs and earplugs is effective protection only when used in combination. It is therefore recommended that airboat operators and passengers wear both types of protection at all times.

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STUDY OF ACTIVE NOISE CONTROL IN AIR-CONDITIONING DUCTS. E. Omana, Universidad Central de Venezuela, Caracas, Venezuela; D. Dager, G. H. UCV, Caracas, Venezuela.

ABSTRACT For many years physicists have known that when acoustic waves are randomly mixed, the noise level can be increased or diminished. In 1934 the German Lueg realized that air velocity is less than the speed of electricity, so that when a sound wave is moving from A to B there is enough time inside an electric circuit to process signals and activate a response that will attenuate the noise at B. Lueg's original idea was to shoot the sound wave in B against the sound wave coming from A. Nowadays noise is a huge problem for office workers, and one of its causes is the movement of air through air-conditioning ducts. This type of noise is characterized by frequencies of under 2,000 cps, a level at which passive control is not efficient. We have managed to create an active noise control system that generates an inverse wave. The system is made up of an electrodynamic microphone, a wave inverter, an amplifier and a loudspeaker. Results: Noise levels were determined around two air-conditioning outlets before and after the installation of the active control system. In both outlets the noise level decreased in frequencies between 31.5 and 2,000 cps and increased in frequencies between 4,000 and 8,000 cps. In one of the outlets the total level of sound diminished from 63.8 to 59.8 dB(A) and in the other from 62.1 to 55.9 dB(A). Analysis of air velocity revealed that the microphone and loudspeaker installations did not perturb air movement. Conclusion: Noise generated by air-conditioning system in offices can be diminished applying active noise and workers inside them could have better work conditions.

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RADIATION LEAKAGE FROM MICROWAVE OVENS USED IN AN ACADEMIC INSTITUTION. F. Akbar-Khanzadeh, M. Jahangir-Blouchian, M. A. Valigosky, Medical College of Ohio, Toledo, OH; S. M. Mirbod, Gifu University School of Medicine, Gifu, Japan.
An academic institution with numerous

microwave ovens in routine use never systematically inspected their operating condition nor checked for radiation leakage. Because employees were concerned about the possible risks associated with radiation exposure from ovens used in their workplace, a research survey was initiated to collect information on the ovens' characteristics and condition of operation. A microwave survey meter (Model HI-1801, Holaday Industries Inc.) was used to check the appliances for radiation leakage. Of the 112 appliances located in the institution, 77 were in common rooms, 30 in research laboratories, 3 in the cafeteria kitchen and 2 in clinics. Characteristics of the appliances included physical condition (excellent 14%, good 40%, average 37% and poor 9%), years of service (>10 years 29%, 6-10 years 35% and < 6 years 34%), total volume (average 58 L and range 20-152 L), compliance with 21 CFR Subchapter J (94%), operating power (120-2400 W), output power (500-1400 W), output frequency (2450 MHz 100%), functional interlock (98%), and interlock shut-off (temporary 14%, permanent 86%). At less than 5 cm, 76% of ovens showed no detectable radiation leakage, 21% showed leakage from 0.02-0.75 mW/cm², and 3% showed leakage from 0.75-2.5 mW/cm². Mean leakage for ovens in poor condition was 0.5 mW/cm² and for ovens in average or good condition was 0.1 mW/cm². None of the ovens in excellent condition showed leakage. The mean leakage for ovens used for >10 years was 0.2 mW/cm² and for others was 0.1 mW/cm². In conclusion, radiation leakage in 97% of ovens was less than 0.75 mW/cm², the amount of radiation leakage decreased as the years of service for the ovens decreased, and radiation leakage decreased if the ovens were kept in better physical condition.

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FACTORS RELATING TO OPERATOR EXPOSURE FROM PLASTIC WELDERS. J. Wright, Department of Employment, Training and Industrial Relations, Brisbane, Queensland, Australia.

In plastics manufacturing, radiofrequency electromagnetic energy at 15 to 50 MHz are used to make strong seams in dielectric material. Operators work close to the frequently unshielded die and field strengths to which operators are exposed can be extremely high. The audits were initiated after a WH&S pilot study in 1998-99 found high exposure levels and low levels of exposure awareness were common in the industry. Seven hygienists around Queensland conducted the measurements. Each audit consisted of field strength measurements taken with one of three Holaday Hi series broadband isotropic field strength meters. Measurement was conducted in 55 workplaces (129 operators). Field strength measurements were taken at the level of the eyes, chest, gonads, hands and ankles. The duty cycle was measured over six minutes and the temporal average calculated. Light measurements were taken at each operator position and health-related information was collected. The data were analysed. Exposure for electric, magnetic or both fields exceeded the Australian Exposure Limits for 10-400 MHz (E field 61 V/m, H field 0.16 A/m) in 78% of workplaces. Magnetic field exposure was significantly associated with welder type. In the previous year 26% of operators had received burns. Of the operators who had received recent burns 40% reported tingling in fingers when welding. The average magnetic field strength at the hands was 2.15 A/m where the operator had reported finger tingling when welding and 1.33 A/m where not. Exposure to the eyes averaged

0.501 A/m when illuminance exceeded 400 lux but 2.493 A/m when it did not. Distance, grounding, shielding, retro-redesign or a combination were used to reduce excessive field strengths. Exposure of dielectric welder operators was found to be excessive, particularly for the magnetic field and seems to be significantly associated with the induction of burns and nerve damage in the hands and/or wrists.

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ACTIVITIES OF THE NIOSH HAZARD EVALUATIONS AND TECHNICAL ASSISTANCE (HETA) PROGRAM. B. Reh, R. Hartle, NIOSH, Cincinnati, OH.

This poster summarizes the activities of the Hazard Evaluations and Technical Assistance (HETA) Program of the National Institute for Occupational Safety and Health (NIOSH). The HETA Program responds to requests from employers, employees, employee representatives, other Federal agencies, and State and local agencies. Through a staff of industrial hygienists, engineers, occupational physicians, epidemiologists, other health professionals, and support personnel, the HETA Program conducts health hazard evaluations (HHEs) to determine if chemical, physical, biological, or other agents are hazardous to workers. Control procedures, improved work practices, and medical programs may be recommended to reduce hazardous exposures and prevent adverse health effects. The results of individual evaluations may trigger wider studies of similar exposures in other settings, or may stimulate recommendations for implementation or modification of health standards. More than 10,000 evaluations have been completed since the inception of the HETA Program in 1972. Recently, the HETA Branch has begun to prepare internal annual reports, publish HHE summary documents, and develop an internal evaluation program. The annual reports present information about requests received and projects closed, personnel, and non-HHE activities. Over the past five years, HETAB has received an average of 350 HHE requests per year and closed an average of 340 HHEs per year. Of the requests received, approximately two-fifths have involved one or more site visits, two-fifths were closed with an informative letter, and one-fifth were legally invalid. The most common health effects reported on the requests were respiratory and neurologic, but not all requests reported symptoms. Of the projects involving site visits, 30 to 40 a year were closed within six months. Many HHEs have involved similar exposures or health effects and the HETA Program has started to publish summary documents for some of these, including tuberculosis, lead exposures, isocyanate exposures, firefighting, and wastewater treatment.

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NIOSH EXPOSURE ASSESSMENT OF CELLULOSE INSULATION APPLICATORS. R. McCleery, J. McCullough, R. Hall, J. Fernback, NIOSH, Cincinnati, OH.

Introduction: The National Institute for Occupational Safety and Health (NIOSH) was pre-

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ABSTRACTS