HETA 91-0021-2144
OCTOBER 1991
THOMSON CONSUMER ELECTRONICS
MARION, INDIANA

NIOSH INVESTIGATOR:
Randy L. Tubbs, Ph.D.

I. SUMMARY

In October 1990, management at Thomson Consumer Electronics (TCE) asked the National Institute for Occupational Safety and Health (NIOSH) to assist the company in determining the spectral characteristics of worker noise exposures for the purpose of the reduction of these levels by the company's plant engineering department. This facility is engaged in the manufacture and assembly of television picture tubes. Approximately 250 workers are employed at this location.

Two separate visits were made to the facility on November 13-16, 1990, and February 26-27, 1991, to collect noise data needed to complete this Health Hazard Evaluation (HHE). During both of the site visits, area noise sampling and worker noise dosimeter measurements were made in several locations of the facility. Octave band measurements at consecutive center frequencies of 31.5 Hertz (Hz) to 16 kilohertz (kHz) along with A-weighted and C-weighted scales were made with a sound level meter integrating the sound energy over a 1-minute period with a 3 dB exchange rate. The noise dosimeter data was collected to determine worker's noise exposures during their work shift.

The results of the noise measurements revealed several areas at TCE where the workers are exposed to noise levels in excess of 85 decibels on an A-weighted scale [dB(A)]. These areas include the Q-Set/Mask Department, Slurry/Matrix Rooms #1, #2, #5, #6, and #9, Frit Dispense Department, Frit Seal Department, Thump and Flush Department, and the Paint Room next to CIP. There were no instances, however, where the dB(A) values exceeded 90 dB(A) on either area noise samples or on the 8-hour average dosimeter measurements.

Because several of the area noise measurements and the worker's personal noise dosimetry values were in excess of the NIOSH Recommended Exposure Limit of 85 dB(A), NIOSH investigators conclude that a potential health hazard exists for the employees at TCE. However, because no employee audiometric records were evaluated in this evaluation, it cannot be determined if these noise levels have had a deleterious effect on the workers' hearing. Regardless of the hearing abilities of the employees, the engineering department of TCE should use the spectral noise data to devise noise reduction controls in the affected departments. Specific suggestions as to the kind of controls that may be effective for this facility are given in Section VII of this report. Also included in this section are recommen-dations for the implementation of a comprehensive hearing conservation program that should be activated until the noise exposures can be permanently reduced to levels below 85 dB(A).

KEYWORDS: SIC 3651 (Household Audio and Video Equipment), noise exposure, noise control engineering, hearing conservation programs.

II. INTRODUCTION

Thomson Consumer Electronics (TCE) is the parent company of RCA, a television manufacturing company. The Marion, Indiana, plant manufactures and assembles television picture tubes of various dimensions in a facility with over 900,000 square feet of floor space. The manufacturing process consists of producing the screen portion of the picture tube, coating the screen, or mask, with a phosphorous slurry mix, and connecting the screen to the back glass funnel of the picture tube. After the electronics are added, the completed tubes are sealed and air is removed, creating a vacuum in the picture tube. Following a testing program for the completed tubes, they are packed and shipped to other TCE facilities, or sold to other video equipment manufacturers. During the survey period of the Health Hazard Evaluation (HHE), the Marion plant employed over 250 workers. The plant did not offer a hearing conservation program to the employees. Therefore, employees were not given annual audiometric examinations, nor were they using hearing protection devices (HPDs) in any systematic fashion.

In October 1990, the National Institute for Occupational Safety and Health (NIOSH) was contacted by TCE to request that a HHE be conducted at the Marion, Indiana, plant. Specifically, the management of TCE requested that a complete spectral noise survey be performed at the plant in order to supply information to the company's engineering department for the implementation of engineering controls in areas of the plant where employees were being exposed to high levels of noise and noise reduction was needed. Personal noise dosimetry was planned in conjunction with the area sampling to determine where the employees had the highest exposures. One specific area of concern by the company was the Q-Set/Mask Department. A lehr oven had recently been put into production in the department and the noise levels were noticeably increased. Preliminary price quotations from acoustical material suppliers who toured the lehr oven area and submitted possible engineering controls ranged up to $150,000. However, no noise spectra had been collected in the area.

Noise surveys were conducted at TCE in November 1990 and February 1991. During the survey periods, both personal noise dosimetry and area noise sampling was completed throughout the Marion plant, specifically targeting areas that had been identified by management as potential high noise exposure areas. Shortly after completion of each of the surveys, the spectral data were provided to the company so that TCE engineers and consultants could begin noise reduction projects in the departments with the greatest noise problems. This final report represents the compilation of all survey results and NIOSH investigators' recommendations to further reduce noise exposures to workers at this facility.

III. METHODS

Area noise samples were made with a Larson-Davis Laboratories Model 800B Precision Integrating Sound Level Meter. Octave band measurements at consecutive center frequencies of 31.5 Hertz (Hz) to 16 kilohertz (kHz) along with A-weighted and C-weighted scales were made at several locations in the paper mill. All measurements were made with the sound level meter integrating the sound energy over a 1-minute period with a 3 dB exchange rate. Values are reported as

1-minute equivalent levels (L_{eq}) at each measurement band or scale. The area measurements were made in six different departments at the Marion plant. All areas had been identified by the company as potential noise areas.

The noise dosimeters used in the survey were Metrosonics Model dB301/26 Metrologgers, a small noise level recording device which is worn on the waist of the employee with a 1/4 inch microphone attached to the worker's shirt collar, or the shoulder area if the shirt has no collar. This dosimeter is designed to measure noise in decibels, A-weighted levels (dB[A]) four times per second. The noise measurements are integrated according to the Occupational Safety and Health Administration (OSHA) noise regulation (see Evaluation Criteria section of this report) for an entire minute and stored separately in the Metrologger for later analysis and final storage. Each dosimeter was calibrated according to the manufacturer's instructions before being placed on the worker. After the recording period was completed, the dosimeter was removed from the worker and placed in the standby mode of operation. The data was later transferred to a Metrosonics Model dt-390 Metroreader/Data Collector following the day's noise sampling. Prior to turning off the dosimeter, it was again calibrated to assure that the device had not changed during the sampling period. The dosimeter information was finally transferred to a personal computer with supporting Metrosonics Metrosoft computer software for permanent data storage and later analysis.

IV. EVALUATION CRITERIA

Occupational deafness was first documented among metalworkers in the sixteenth century.[1] Since then, it has been shown that workers have experienced excessive hearing loss in many occupations associated with noise. Noise-induced loss of hearing is an irreversible, sensorineural condition that progresses with exposure. Although hearing ability declines with age (presbycusis) in all populations, exposure to noise produces hearing loss greater than that resulting from the natural aging process. This noise-induced loss is caused by damage to nerve cells of the inner ear (cochlea) and, unlike some conductive hearing disorders, cannot be treated medically.[2]

While loss of hearing may result from a single exposure to a very brief impulse noise or explosion, such traumatic losses are rare. In most cases, noise-induced hearing loss is insidious. Typically, it begins to develop at 4000 or 6000 Hz (the hearing range is 20 Hz to 20000 Hz) and spreads to lower and higher frequencies. Often, material impairment has occurred before the condition is clearly recognized. Such impairment is usually severe enough to permanently affect a person's ability to hear and understand speech under everyday conditions. Although the primary frequencies of human speech range from 200 Hz to 2000 Hz, research has shown that the consonant sounds, which enable people to distinguish words such as "fish" from "fist," have still higher frequency components.[3]

The OSHA existing standard for occupational exposure to noise (29 CFR 1910.95)[4] specifies a maximum permissible exposure limit (PEL) of 90 dB(A)-slow response for a duration of 8 hours per day. The regulation, in calculating the PEL, uses a 5 dB time/intensity trading relationship. This means that in order for a person to be exposed to noise levels of 95 dB(A), the amount of time allowed at this exposure level must be cut in half in order to be within OSHA's PEL. Conversely, a person exposed to 85 dB(A) is allowed twice as much time at this level

(16 hours) and is within his daily PEL. Both NIOSH, in its Criteria for a Recommended Standard,[5] and the American Conference of Governmental Industrial Hygienists (ACGIH), in their Threshold Limit Values (TLVs),[6] propose an exposure limit of 85 dB(A) for 8 hours, 5 dB less than the OSHA standard. Both of these latter two criteria also use a 5 dB time/intensity trading relationship in calculating exposure limits.

Time-weighted average (TWA) noise limits as a function of exposure duration are shown as follows:

Duration of Exposure (hrs/day)	Sound Level (dB(A)) NIOSH/ACGIH	OSHA
16	80	85
8	85	90
4	90	95
2	95	100
1	100	105
1/2	105	110
1/4	110	115 *
1/8	115 *	- **

* No exposure to continuous or intermittent noise in excess of 115 dB(A).

** Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

The OSHA regulation has an additional action level (AL) of 85 dB(A) which stipulates that an employer shall administer a continuing, effective hearing conservation program when the TWA value exceeds the AL. The program must include monitoring, employee notification, observation, an audiometric testing program, hearing protectors, training programs, and recordkeeping requirements. All of these stipulations are included in 29 CFR 1910.95, paragraphs (c) through (o).

The OSHA noise standard also states that when workers are exposed to noise levels in excess of the OSHA PEL of 90 dB(A), feasible engineering or administrative controls shall be implemented to reduce the workers' exposure levels. Also, a continuing, effective hearing conservation program shall be implemented.

V. RESULTS AND DISCUSSION

Octave-band noise data were collected at 18 locations in six different departments at TCE. The Larson-Davis Precision Sound Level Meter will display several pieces of information about the measurement period for the integration period. The information includes the integrated level (L_{eq}), plus the lowest and highest root-means-squared (rms) sound signal measured during the integration period. These highest and lowest values are presented as the "upper limit" and "lower limit" on Figures 1-18. The L_{eq} values are given as the heavy, solid line in the figures.

The Q-Set/Mask Department was one area of concern to TCE. A metal stabilizing lehr oven located in the northeast corner of the department had been identified as a major noise source in the department. The area noise samples collected in this area ranged from 81 to 88 dB(A). The octave-band data are shown in Figures 1-8. The welding stations, located along the north wall of the department, were found to have similar octave-band spectra and A-weighted levels and were ranked as the louder operations in the department. The three lowest noise levels were measured at the Hayes, press, and frame blackening operations. These operations are located along the southern wall of the department. Finally, the rotary spring clip operation (Figure 8) was measured as the noisiest operation in the department. Inspection of the spectrum shows a slight rise in sound energy from 2 kHz to 16 kHz. This is the result of the small metal pieces being vibrated into position on a metallic, circular track in the assembly of the spring clip. Even though this workstation is situated away from the oven, its own assembly process accounts for the majority of the noise levels.

The slurry/matrix rooms are also noisy areas because the rooms have to be closed in order to keep contaminants from the plant entering the area and ruining the television screens as they are coated with a phosphorous slurry. The production in this room is controlled by a mechanized assembly line that moves the screens to different locations to complete the coating process. The machinery and alerting signals, which warn that the line is about to move, contribute to the noise in the area. Because the rooms are closed to the rest of the plant, the noise is unable to escape to other areas of the plant and continues to reverberate throughout the slurry/matrix rooms. The spectra measured in the Slurry #9 Room are shown in Figures 9-11. The Blue Station and the Red Station are located in the center of the slurry room, surrounded by the machinery which moves the product through the coating process. The inspection area is located in a corner of the room. The A-weighted levels show that the areas in the center of the room have higher noise exposures than the location at the edge. All three octave-band spectra are relatively flat, with minimal spread between the upper and lower limits of sound energy.

The next area sampled was the Frit Dispensing Department (Figures 12-13). In this department, the back portion of the television picture tube, or funnel, is coated in the neck portion of the funnel. A paste material (frit) is then applied to the edge of the large opening of the funnel in preparation for sealing the front part of the screen to the picture tube. Two contributing noise sources in this area are located at the neck coating and funnel painting machinery. A funnel holder on the neck coater machine rotates whenever the work table falls to its start position in order to accept an unpainted funnel. When the holder rotates, it also falls onto a metal stop, producing a large "clunk" with instantaneous noise peaks up to 115 dB. A similar situation was observed at the funnel painting machine where a funnel transporter uses a suction cup arrangement to move the funnels to a painting port or onto the conveyor system. When the suction cup mover releases a funnel, it falls to its bottom position, creating a "clunk" sound from metal striking metal. These metal-to-metal contacts produced area noise measurements of 86 dB(A). The relatively large extremes seen in the 250 Hz to 1 kHz octave bands seen at the frit dispensing machine are the result of a public address speaker located near the ceiling, adjacent to this work station. Repeated, loud pages through this speaker were a major source of noise at this location.

In the Frit Seal Department, area noise measurements were made on the lehr oven loading platform (Figure 14). The assembly process in this department consisted of removing picture tubes from one conveyor system and placing them onto a metal carrier which held the tubes as they went through the lehr. The carrier, when filled with picture tubes, was released into position to enter the oven. The metal carrier created a lot of noise as it bounced along the metal rollers. Also, when the carriers were released, escaping compressed air was heard throughout the area. The escaping air is seen as large high frequency variations between the upper limit and lower limit values given in the figure.

The Thump and Flush Department checks each picture tube before the picture tube is sealed and a vacuum is created inside of it. The check consists of mechanically pounding the front panel of a picture tube with a rubber mallet. This process creates a lot of noise. The inspectors (Figure 15) are located at the end opposite the thumping process, but are still exposed to levels of 88 dB(A).

A new section of the Marion TCE Plant, The Very Large Screen (VLS) Department, had recently opened at the time of the HHE. The department has processes similar to the other section of the facility, but it contains more robotics for moving the tube parts from assembly points. The area noise measurements made in the panel wash and slurry/matrix rooms and at the frame blackening machine were all lower than the measurements made in the rest of the plant. It was noted in the slurry/matrix room that a warning buzzer, located on top of a control panel in the front, center part of the room, was especially loud compared to the ambient noise in that room. The effect of this buzzer can be seen in the octave band measurements as a large difference between the upper and lower limits at 1, 2, and 4 kHz (Figure 17). A limited a -octave band analysis (Figure 19) was made in the vicinity of the buzzer in order to determine the spectral characteristics of the warning device. This analysis revealed that the buzzer has most of its sound energy between 1.25 and 2.0 kHz.

During the survey period, selected workers in the areas chosen for area noise sampling were also requested to wear personal noise dosimeters for the length of their work shift. Dosimeter measurements show how the short-term noise levels in an area affect worker's noise exposures for their entire shift. Additional noise dosimeter samples were also taken in other areas at TCE which had been identified as possible noise impact areas. A summary of all of the dosimeter readings is given in Table 1. None of the 47 full-shift samples exceeded the OSHA 90 dB(A) PEL for noise. However, the median 8-hour TWA was 85 dB(A) or greater in 8 of the 15 areas surveyed. The median percentage of time that the employees were in 85 dB(A) or greater noise confirms that TCE workers are exposed to a lot of noise that exceeds 85 dB(A).

Examples of the dosimeter printouts are presented in Figures 20-34. One worker's dosimeter record from each of the surveyed departments is given to show how most of the surveyed workers are exposed to relatively steady-state noise. The changes in the exposure patterns seem to be the result of break periods when the workers can leave the area. While the workers are in the department, however, the noise is of a constant nature, evidenced by the relatively straight lines seen in the dosimeter records. The two exceptions to this finding are the power house workers and the cathode bar washer. These jobs are characterized as having a variable noise exposure, which is not surprising because of the mobile nature of these jobs. These employees move around in performing their work tasks, rather than being stationary in a general area while the work pieces are conveyed to them. All of the dosimeter records are based on 6 to 7½ hour sample periods, with the exception of the paint room measurement. This 4 hour sample was the result of a dosimeter failure in the morning portion of the work shift. Once the failure had been noted, a new dosimeter was placed on the worker for the afternoon part of the work shift.

VI. CONCLUSIONS

Several of the area noise measurements and the TWA values measured on the dosimeters were found to be in excess of 85 dB(A), the NIOSH REL for noise. In no instance was the OSHA PEL of 90 dB(A), TWA ever surpassed. Because of the limited nature of the dosimeter survey, it cannot be determined at this time which process areas of TCE should be included in a hearing conservation program according to the regulations promulgated by OSHA. It is highly probable, however, that some of the production areas at the Marion Plant should be included in a comprehensive hearing conservation program, based on the consistency of the noise results measured in this HHE.

Many of the surveyed areas had noise levels near 85 dB(A). These production areas could benefit from engineering and/or administrative controls implemented in these areas. The controls need not be elaborate, because only a few decibel reduction will lower the noise to a nonhazardous level for most of the employees working in these areas. Also, moderate increases in the amount of time that a worker remains outside of the worker area, such as in the slurry/matrix rooms will decrease the daily TWA to a level less than 85 dB(A).

Other simple noise controls that may reduce the TWA noise levels to values less than 85 dB(A) include moving or total removal of the public address system loud speakers on the work floor, eliminating metal-on-metal contacts in machinery, and lowering the audio frequency of the warning buzzers in the slurry/matrix rooms. All of these changes will reduce the A-weighted noise levels found in these locations and will thus lower the workers' noise exposures. Of course, better barriers and enclosures around noisy machinery will also lower worker noise exposures.

Until these engineering and administrative controls are put into place and documentation of the amount of noise reduction resulting from the change is collected, TCE should institute a hearing conservation program to document the workers' noise exposures throughout the plant and to have records of workers' hearing ability. Because of the closeness of the noise exposures at the Marion Plant to the AL [85 dB(A)] regulated by OSHA, it is possible that TCE could be subject to regulatory action. The OSHA Regulatory Analysis included with the 1983 final rule of the hearing conservation amendment[7] estimated an average cost of $41 per worker included in the mandated amendment.

The audiometric data resulting from the program can also be used as an early warning indicator as to the effectiveness of the noise controls put into place through audiometric database analysis techniques.[8,9,10,11] The benefits to be gained from audiometric testing of employees at TCE can outweigh the costs involved in such a program. It was noted during the second visit to the Marion Plant that several engineers and nurses at TCE were involved in a Council for Accreditation in Occupational Hearing Conservation (CAOHC) 3-day course for certification as Occupational Hearing Conservationists. Thus, the personnel to run an in-house testing program have already been trained. The company needs only to procure the necessary audiometer and testing booth before hearing testing can proceed.

VII. RECOMMENDATIONS

The finding of noise levels near 85 dB(A) for both the short-term area measurements and the worker's full-shift dosimetry measurements leads to the following recommendations.

1. Because all of the measured noise levels were found to be less than 90 dB(A), TCE should be conservative in their approach to noise engineering at the Marion Plant. Before the expensive, elaborate controls are purchased, the engineers at the company should try simpler, less expensive controls. For example, a temporary barrier can be erected and the noise reduction measured as a result of the barrier before a total enclosure is purchased and installed. If the barrier concept reduces the noise levels to an acceptable level, then a permanent barrier can be installed for a fraction of the cost of the enclosure. Most of the controls needed at this facility generally need only reduce noise levels by 3-6 dB(A) to impact the total noise exposure to the workers. Regardless of the types of controls installed at the Marion Plant, advice should be sought of acoustical consultants who base their decision on noise data rather than the kind of product that they sell.

2. There were areas identified in the noise survey that are affected by metal hitting metal in the production process. Examples of these areas are the rotary springs clip station #29 in the Q-Set/Mask Department, the neck coating and funnel painting machines in the Frit Dispensing Department, and the tube holders which convey the tubes through the lehr oven in the Frit Seal Department. If metal-to-metal contacts can be eliminated, the noise from these operations can be reduced. Because the HHE

was not inclusive of the entire Marion Plant, these type of noise sources should be sought in the other areas of the facility that were not surveyed in this evaluation.

3. The alerting signals in the slurry/matrix rooms are a major source of noise in these locations. The a-octave band analysis of the signal in the VLS Slurry/Matrix Room revealed that the sound energy was centered between 1.25 and 2.0 kHz. Sound frequencies in this range are actually over-emphasized on an A-weighted scale by approximately 1 dB because of their potential for damage to human hearing. If the frequencies emitted by the alerting signal were lowered to 250 to 500 Hz, the A-weighted values measured in these slurry/matrix rooms would be reduced. An area of investigation by the TCE engineers should be whether or not an alternate type of warning signal can be installed in the slurry/matrix rooms. If a visual signal could be used, then this noise source can be removed entirely.

4. The Thump & Flush Department is one of the highest noise areas in the facility. The source of this noise is the pounding of hollow picture tubes with the rubber mallets. Because the pounding operation is located in a specific area, it should be possible to isolate the noise source from the inspectors at the opposite end of the department. A barrier separating the thumping operation from the rest of the room may lower the noise exposures of the inspectors.

5. The high-pitched sound associated with the release of compressed air in the Frit Seal Department should be reduced. There are commercially available mufflers for compressed air systems that should be evaluated by the TCE engineers to reduce this noise source and any similar noise sources found at the plant.

6. The public address system used for paging personnel throughout the Marion Plant is a major source of noise. It was observed by the NIOSH investigators that the paging system was used almost constantly throughout the workday. The clarity of the sound signal coming from the speakers was often less than desirable, leaving workers wondering if they had been paged or not. Of course, if the worker did not answer the first page, then additional pages were broadcast throughout the entire facility. There were several examples of "worker engineering" seen during the survey periods where the speakers had been stuffed with rags, covered with cardboard and duct tape, or directed away from employee's workstations. Alterations to the TCE paging system, up to a complete removal of the speaker system, would reduce worker noise exposures in many of the departments surveyed during this evaluation.

7. A conveyor belt in the VLS Mask Fabrication Department was heard to have an audible squeak while it was in motion. This, and all other squeaky operations, should be corrected as soon as they are observed by employees.

8. Until engineering or administrative noise controls are put into place and documented as to their effectiveness, this company should begin audiometric testing of employees in noisy departments. This testing should be done on an annual basis to identify employees who have changes in hearing over their work history at TCE. This will allow for intervention to slow down the progression of the hearing loss before it becomes a more severe handicap to the employee. These annual audiometric tests can also be used to evaluate the effectiveness of the hearing conservation program. The new audiometric database analysis techniques referenced earlier in this report will accomplish this kind of feedback on how the company's noise program is working.

9. The use of hearing protection devices (HPDs) should be made mandatory in all of the areas of the plant where noise levels exceed 85 dB(A). Workers should be given the opportunity to choose from among the available, effective types of HPDs. Area supervisors must consistently enforce the use of HPDs for all employees, including workers assigned to the area, workers assigned to other areas who are visiting the area, and management officials and visitors while they are in the noise areas. The areas should be identified with warning signs posted at the entrances to the affected area.

VIII. REFERENCES

1. Alberti [1591 (1970)], cited by Bunch, C.C. Traumatic deafness. In E.P. Fowler, Jr. (Editor), Medicine of the ear, chapter X. Reprinted Translations of the Beltone Institute for Hearing Research, No. 23.

2. Ward WD [1986]. Anatomy & physiology of the ear: normal and damaged hearing. Chapter 5. In: Berger EH, Ward WD, Morrill JC, Royster LH, eds. Noise & hearing conservation manual. 4th ed. Akron, OH: American Industrial Hygiene Association, pp. 177-195.

3. Ward WD, Fleer RE, Glorig A [1961]. Characteristics of hearing loss produced by gunfire and by steady noise. Journal of Auditory Research, 1:325-356.

4. Code of Federal Regulations [1989]. OSHA. 29 CFR 1910.95. Washington, DC: U.S. Government Printing Office, Federal Register.

5. NIOSH [1972]. Criteria for a recommended standard: occupational exposure to noise. Cincinnati, OH: U.S. Department of Health, Education, and Welfare, Health Services and Mental Health Administration, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 73-11001.

6. ACGIH [1990]. 1990-1991 threshold limit values for chemical substances and physical agents and biological exposure indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists.

7. 48 Federal Register 9738 [1983]. Occupational Safety and Health Administration: occupational noise exposure; hearing conservation amendment; final rule. (Codified at 29 CFR 1910.)

8. Melnick W [1984]. Evaluation of industrial hearing conservation programs: A review and analysis. American Industrial Hygiene Association Journal, 45:459-467.

9. Royster LH, Royster JD [1988]. Getting started in audiometric data base analysis. Seminars in Hearing, 9:325-337.

10. Royster JD, Royster LH [1986]. Audiometric Data Base Analysis. Chapter 9. In: Berger EH, Ward WD, Morrill JC, Royster LH, eds. Noise & hearing conservation manual. 4th ed. Akron, OH: American Industrial Hygiene Association, pp. 293-317.

11. Royster JD, Royster LH [1990]. Hearing conservation programs: practical guidelines for success. Boca Raton, FL: Lewis Publishers, Inc.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By: Randy L. Tubbs, Ph.D.
Senior Research Scientist Officer
Hazard Evaluation and Technical Assistance Branch

Evaluation Assistance: Gregory A. Burr, C.I.H.
Industrial Hygienist
Industrial Hygiene Section

Originating Office: Hazard Evaluation and Technical Assistance Branch
Division of Surveillance, Hazard Evaluations, and Field Studies

Report Typed By: Patricia Lovell
Clerk Typist
Industrial Hygiene Section

X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report may be freely reproduced and are not copyrighted. Single copies of this report will be available for a period of 90 days from the date of this report from the NIOSH Publications Office, 4676 Columbia Parkway, Cincinnati, Ohio 45226. To expedite your request, include a self-addressed mailing label along with your written request. After this time, copies may be purchased from the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding the NTIS stock number may be obtained from the NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Industrial Hygienist, Thomson Consumer Electronics
2. Safety Representative, International Brotherhood of Electrical Workers Local 1160, Thomson Consumer Electronics
3. NIOSH Cincinnati Office
4. Indiana Department of Labor\OSHA

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE 1

Results of Noise Dosimeter Survey

Thomson Consumer Electronics
Marion, Indiana
HETA 91-021
November 14-15, 1990 & February 26-27, 1991

Department	Number of Samples	Median Sample Period [hh:mm]	Median TWA (RANGE) [dB(A)]	Median 1-min Maximum Period (RANGE) [dB(A)]	Median Percentage of Time ≥ 85 dB(A) (RANGE)
Q-Set/Mask	9	07:02	86.6 (83.8-88.6)	97 (94-102)	71.4 (24.8-76.9)
Frit Dispensing	2	06:58	85.6 (85.6-85.6)	94 (94-94)	71.1 (61.2-81.0)
Frit Seal	2	06:38	85.8 (84.0-87.5)	94 (91-97)	65.2 (49.5-81.0)
Thump & Flush	2	06:31	87.6 (87.3-87.8)	96 (94-97)	74.2 (70.3-78.2)
CIP	4	07:22	82.6 (81.4-85.3)	92 (92-98)	26.0 (13.6-44.2)
Power House	2	06:29	80.6 (79.6-81.6)	96 (95-98)	18.0 (16.1-19.8)
Paint Room	1	03:52	87.9	95	91.5
Cathode Bar Wash	1	07:26	82.7	96	28.5
Slurry #1/Matrix #2	4	06:54	85.9 (84.9-88.4)	97 (95-98)	67.2 (60.8-72.4)

TABLE 1 (continued)

Results of Noise Dosimeter Survey

Thomson Consumer Electronics
Marion, Indiana
HETA 91-021
November 14-15, 1990 & February 26-27, 1991

Department	Number of Samples	Median Sample Period [hh:mm]	Median TWA (RANGE) [dB(A)]	Median 1-min Maximum Period (RANGE) [dB(A)]	Median Percentage of Time ≥ 85 dB(A) (RANGE)
Slurry #5/Matrix #6	4	06:38	87.0 (84.9-88.4)	94 (93-95)	77.2 (59.7-91.0)
Matrix #7/Matrix #8	8	06:12	83.7 (82.0-85.2)	93 (90-96)	42.0 (29.3-68.7)
Slurry #9	3	06:03	85.2 (84.4-87.4)	96 (92-98)	54.0 (49.9-77.7)
VLS - Slurry/Matrix	3	07:15	82.3 (80.9-83.8)	92 (91-95)	21.7 (16.2-37.7)
VLS - Mask Fabrication	1	07:09	81.6	92	13.5
VLS - Panel Wash	1	06:58	82.7	96	15.8

TWA values are given for an 8-hour work shift. The 1-minute Maximum Period is the largest 1 minute integration period seen in the time/intensity history record. The percentage of time ≥ 85 dB(A) is the percentage of time the time/intensity history was at 85 dB(A) or greater.