# WALK-THROUGH SURVEY REPORT:

# HVLV CONTROL TECHNOLOGY FOR MACHINING AND SANDING AT:

Kenworth Truck Company
Seattle, Washington


REPORT WRITTEN BY:

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REPORT DATE:

September 1983

REPORT NO. 145.15a



NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Physical Sciences and Engineering
Engineering Control Technology Branch
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| PLANT SURVEYED: | Kenworth Truck Company<br>8801 E. Marginal Way South<br>Seattle, Washington 98108 |
| SIC CODE: | 3711 (Truck Tractor Manufacturer)<br>3713 (Truck Cab Manufacturer) |
| SURVEY DATE: | June 8, 1983 |
| SURVEY CONDUCTED BY: | Bruce A. Hollett, C.I.H., P.E. |
| EMPLOYER REPRESENTATIVES CONTACTED: | Mr. Robert Kemp, Facilities Manager<br>(206) 767-8493<br><br>Ms. Rosalind Evans, RN, Safety Manager<br>(206) 767-8407 |
| EMPLOYEE REPRESENTATIVES CONTACTED: | Not Available, Union on strike |

# I. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) is the primary Federal agency engaged in occupational safety and health research. Located in the Department of Health and Human Services (formerly DHEW), it was established by the Occupational Safety and Health Act of 1970. This legislation mandated NIOSH to conduct a number of research and education programs separate from the standard setting and enforcement functions carried out by the Occupational Safety and Health Administration (OSHA) in the Department of Labor. An important area of NIOSH research deals with methods for controlling occupational exposure to potential chemical and physical hazards. The Engineering Control Technology Branch (ECTB) of the Division of Physical Sciences and Engineering has been given the lead within NIOSH to study the engineering aspects of health hazard prevention and control.

Since 1976, ECTB has conducted a number of assessments of health hazard control technology on the basis of industry, common industrial process, or specific control techniques. Examples of these completed studies include the foundry industry; various chemical manufacturing or processing operations; spray painting; and the recirculation of exhaust air. The objective of each of these studies has been to document and evaluate effective control techniques for potential health hazards in the industry or process of interest, and to create a more general awareness of the need for or availability of an effective system of hazard control measures.

These studies involve a number of steps or phases. When the perceived need for research requires further definition, a pilot study is undertaken to assess the need for bench research and/or validation of existing capabilities. If it is determined that field studies are needed, a series of walk-through surveys is conducted to select plants or processes with effective and potentially transferable control concepts or techniques. Next, in-depth surveys are conducted to determine both the control parameters and the effectiveness of these controls. The reports from these in-depth surveys are then used as a basis for preparing technical reports and journal articles on effective hazard control measures. Ultimately, the information from these research activities builds the data base of publicly available information on hazard control techniques for use by health professionals who are responsible for preventing occupational illness and injury.

The objective of this pilot study is to determine the state-of-the-art of High Velocity Low Volume (HVLV) technology and to what extent it has been successfully applied in various industries. It will provide an assessment of the need for research and/or validation of existing capabilities and their potential for transfer to other industries. The purpose of this visit was to explore the potential for use of this technology in the truck body manufacturing.

## II. PLANT AND PROCESS DESCRIPTION

Plant Description:

Kenworth Truck Company was originally established by two men. It was purchased by PAC CAR, a diversified transportation conglomerate, in 1940. Kenworth now has divisions in 4 other countries: Mexico, Australia, England, and Canada.

Kenworth produces truck tractors, at full production they could turn out 30 Class 8 truck tractors per day. Normal production would be about 16 or 17 per day, however, under the strike conditions presently existing the output is much less. Under normal production conditions, the plant employs about 1000 workers, 800 of whom are production workers. Normal shift is 6:50 a.m. to 3:20 p.m. The company has a corporate physician, a full-time nurse, and a RN safety director.

Process Description:

Kenworth accomplishes complete assembly of the truck tractor chassis and body at this facility. The areas where HVLV systems have been provided are:

-Cab buildup - an edge router is used to trim the window frames in a glassfiber body. The router shroud was designed by the plant tool shop.

-Paint - a number of drops were originally provided for sanders used in this activity, however they were not used, therefore, only one drop was relocated to in front of a paint booth when the department was relocated.

-Grinding - approximately a dozen collection systems are installed on the fixed grinders and lathes.

-Plastics - these activities are housed in a separate building. The glassfiber cabs are manufactured by using chopped fiber applications and layups over molds. The cab is then sanded and trimmed using hand tools. The large truck cabs were mounted on adjustable height mobile platforms, this made it possible to position the work to take advantage of the lateral exhaust and to reduce the stooping. It is still necessary to sand vertical surfaces, some of which are elevated. The production line runs along two sides of a center isle the length of the building. There are 26 HVLV vacuum drops hung from above the work area at intervals along both sides of the isle so that they are convenient to every work station. The HVLV control system was currently in use on only one tool, the trim saw. Separate local exhaust systems were provided for each activity area.

Potential Hazards:

The areas of interest during this visit related to the application of HVLV to glassfiber and resin dust control. The glassfiber hazard is a primary irritant.

# III. CONTROLS

## PRINCIPLES OF CONTROL

Occupational exposures can be controlled by the application of a number of well-known principles, including engineering measures, work practices, personal protection, and monitoring. These principles may be applied at or near the hazard source, to the general workplace environment, or at the point of occupational exposure to individuals. Controls applied at the source of the hazard, including engineering measures (material substitution, process/equipment modification, isolation or automation, local ventilation) and work practices, are generally the preferred and most effective means of control both in terms of occupational and environmental concerns. Controls which may be applied to hazards that have escaped into the workplace environment include dilution ventilation, dust suppression, and housekeeping. Control measures may also be applied near individual workers, including the use of remote control rooms, isolation booths, supplied-air cabs, work practices, and personal protective equipment.

In general, a system comprised of the above control measures is required to provide worker protection under normal operating conditions as well as under conditions of process upset, failure and/or maintenance. Process and workplace monitoring devices, personal exposure monitoring, and medical monitoring are important mechanisms for providing feedback concerning effectiveness of the controls in use. Ongoing monitoring and maintenance of controls to ensure proper use and operating conditions, and the education and commitment of both workers and management to occupational health are also important ingredients of a complete, effective, and durable control system.

These principles of control apply to all situations, but their optimum application varies from case-to-case. The application of these principles in the Truck Cab Manufacturing process is discussed below.

### Engineering Controls:

The HVLV systems were installed to reduce employees exposures to dust. In the case of the most extensive system, in the plastic shop, there were apparent cost advantages over the previously installed lateral exhaust system. The only tools still being used with the HVLV system are the two trimming devices in the cab buildup and plastic shop. The design of the hoods on these tools are unique, they were provided by the in-house tool shop. The router hood acts as a guide to limit the depth of cut. The trimming saw hood is an integral part of the tool design.

The Cab assembly and paint shop system was powered by a 10 Hp Spencer Vacuum which draws 350 CFM @ 5" of mercury.

The Plastic Shop has a number of ventilation controls. At one end, a separate ventilated enclosure is provided for the gelcoat activity and the chopped fibers are applied in ventilated booths. The remainder of the shop has local exhaust from a series of approximately 7 foot high banks of filtered lateral exhaust plenums, similar to those found in large paint spray booths, along opposing outer walls. The sanding is accomplished in front of these exhausts. The air from the banks of filters along the east wall is recirculated.

The plastic shop HVLV system consists of a 75 Hp Spencer Vacuum which draws 1830 CFM @ 8" of Mercury. There are 26 ceiling drops located throughout the shop connected to the tools by a 20' long 2 1/2" flex hose. The design analysis showed a distinct cost savings over the high volume exhaust system. The large exhaust system costs including filter replacement, maintenance labor, heating, and electric were around $16,000 per year. The HVLV system had an initial cost of $31,800 (excluding the tools) and an annual maintenance cost of $5,500. This provided a cost amortization in 3 years which is more than enough to justify the expenditure.

Practices:

The plastic shop workers found the effort required to use the heavier tools combined with the encumberance of the extra exhaust hose less desirable than alternative protective measures. They chose to use supplied air hoods or respirators. The body of the heavier HVLV sander was reported to be too large to fit their hands comfortably and slower at the job requiring additional time and effort to complete their work.

Workers suggested that if HVLV tools were required to be used it would be an advantage to have a belt or harness - similar to the air hood's - that would help keep the weight of the exhaust hose off of the tool. They were more enthusiastic about the possibility of using an even lighter tool which one worker had used previously for many years. It was a "DA" pneumatic sander reportedly sold in auto body supply shops in Tacoma. (It is noted that another worker at the Alameda Naval Air Station also recommended the DA sander.)

Monitoring:

The industrial hygienist reported that the plastic shop workers personal exposure measurements were lower when they used the HVLV. However, they were below the legal limit of 10 $mg/m^3$ for nuisance dust even without the use of the HVLV sanders. Therefore, it was hard to justify requiring them to use the HVLV, especially when they preferred to use the supplied air hoods.

The company requires preemployment physical examinations. They also provide appropriate periodic monitoring including blood pressure, hearing, urine, blood, and spyrometry testing as indicated by the type of work environment. Workers in the plastic and paint shops all receive full annual examinations.

Personal Protection:

Workers were provided with protective coveralls, head gear, and booties. These were worn taped at openings to reduce dust penetration. Workers had their choice of either supplied air respirators or hoods. Several commented they preferred the hoods because the fresh air kept them cleaner.

Other Unique Practices:

In a discussion with the facility engineer and the superintendent of the tool and die shop, it was learned that a number of people had visited thier facility to see the hoods designed for the edge trimming operations.

Other Observations:

In the discussion with the facility engineer and the industrial hygienist, it was indicated that the plastic shop ventilation system was given recognition by OSHA as exemplary. NIOSH was offered a return visit to see the plant in full production, hopefully the next week. They also felt that it would be possible to demonstrate HVLV system operations for a couple of days for NIOSH observation purposes if we so desired.

Conclusions and Recommendations:

This facility provided a number of interesting HVLV observations. The success of in-house shrouds designed for special applications, a well documented cost analysis justifying the large plastic shop sytem, the typical pattern of worker dissatisfaction and eventual disuse of a large well-equipped system, and an apparent willingness to cooperate in a demonstration of the large HVLV system in the plastic shop. The discussions with the plastic shop workers during a break period in their rest area was also enlightening with respect to work practices and may lead to further worthwhile contacts with the DA tool manufacturer.

Should the HVLV project be continued with field surveys, this facility would be a likely candidate if the proposed demonstration period could be arranged.