WALK-THROUGH SURVEY REPORT:

HVLV CONTROL TECHNOLOGY FOR WELDING GUN AT:

Kaiser Aluminum and Chemical Corporation
Drainage Products Operations
Sacramento, California 95838

REPORT WRITTEN BY:

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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Physical Sciences and Engineering
Engineering Control Technology Branch
4676 Columbia Parkway
Cincinnati, Ohio 45226

PLANT SURVEYED:	Kaiser Aluminum and Chemical Corporation Drainage Products Operations 4585 Pell Drive Sacramento, California 95836 (916) 927-7548
SIC CODE:	3317 Steel Pipe and Tubes (Welded conduit)
SURVEY DATE:	June 14, 1983
SURVEY CONDUCTED BY:	Bruce A. Hollett, C.I.H., P.E.
EMPLOYER REPRESENTATIVES CONTACTED:	Mr. H.R. Wood, Plant Manager (916) 927-7548 Mr. Harry Church, Foreman
EMPLOYEE REPRESENTATIVES CONTACTED:	Mr. Robin Phillip, Welder

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 welding applications.

II. PLANT AND PROCESS DESCRIPTION

Plant Description:

This plant has been established at this location for 18 years. They normally employ about 15 people. They manufacture corrugated aluminum or galvanized steel storm drainage pipe for highway construction. The pipe is produced from 6 to 180 inches in diameter in gauges from 8 to 16. The portion of their activity of interest is the welding shop. The welding process was installed two years ago. The welding is primarily corrugated aluminum or galvanized steel storm drainage pipe fittings. They have employed as many as 4 welders at peak production periods. The present reduced level of activity employs one welder.

Process Description:

The plant receives coiled stock metal, which is processed through dyes to form the corrugated pipe which is joined by a lock seam. Welding is required for special order fittings. The mig-welding units use argon for the shielding gas. Production activities for welders are about 50/50 setup and welding time.

Hazards:

Welding fumes in general are a concern due to the fine respirable nature of these particulates and their potential for deposition in the lungs. Welding fumes from the galvanized steel pipe would present an additional acute toxic hazard from zinc oxide fume exposure. Zinc oxide fumes produce the metal fume fever syndrome. Aluminum oxide does not have any acute toxicity. Acute toxicity is related to the specific composition of the materials associated with the welding process. Other potentially toxic metals fumes include lead, chromates, and cadmium.

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 welding process is discussed below.

Engineering Controls:

The initial attempt at welding fume control was a general exhaust through the roof. This method did not prove adequate to remove fumes from the workers breathing zone. They have used pedestal fans, air-supplied helmets, and a commercially available welding gun exhaust without the desired degree of success. The present HVLV system is a refined gun exhaust system using a custom designed shroud.

The system is powered by a 10 Hp blower rated at 300 CFM. The exhaust is filtered through a bag system. The cost of the HVLV system hardware exclusive of the engineering and shroud design was under $8,000 in 1981. This system was designed to support four welders. The four vacuum drops are located on the wall at each of four work stations. Kaiser has installed other similar systems for smaller welding shops.

Work Practices:

The welder who demonstrated the system has been with this facility for three years. He has experienced all of the various control methods. In his opinion, the HVLV system was by far the best. He did not find the added shroud and exhaust hose to be a problem in his work. Those who were bothered by them had used a binder to wrap the welding hoses in a bundle with the exhaust hose. He noted that with the new shroud there was no problem maintaining the argon shielding gas.

Monitoring:

The Corporate Industrial Hygiene office in Oakland participated in the development and testing of the HVLV system. The hygienist who participated in this system evaluation was no longer with Kaiser. The industrial hygienist who presently has responsibility for this plant was contacted by phone. He had no personal experience in this facility. His review of the records showed the initial performance evaluation findings were satisfactory, however, later evaluation results were not so good. He could not determine the reason for this inconsistency and noted that there was little opportunity for additional measurements since the plant is on a very limited production schedule at this time.

Personal Protection:

A welding helmet, safety glasses, jacket, safety shoes, and gloves were in use.

Other Observations:

A brief video recording was taken during a demonstration of the HVLV welding system. It was evident to the observer that a majority of the visible fume emissions at the source were removed by the gun. Stray emissions from welding spatter were still present, however, not in the immediate proximity of the welders breathing zone.

Conclusions and Recommendations:

This facility was not observed in routine operation and the records of its exposure control performance are reportedly variable. If it were decided to pursue a study of HVLV welding system controls at some future date, it would be worthwhile to explore further the potential of this system or one patterned after it.