Walk-through Survey Report

Aluminum Company of America - Alcoa
Badin, North Carolina

PURPOSE: Recent studies by Milham and Tabershaw/Cooper have indicated increased cancer mortality among aluminum workers thought to be related to increased exposures to particulate polycyclic organic matter (PPOM). In order to fully define the specific cancer risk, a retrospective case control study is being done by NIOSH on reduction workers exposed to PPOM. The purpose of this survey was to evaluate potential plants for selection for an in-depth industrial hygiene survey.

DATE OF SURVEY: July 13, 1978

DATE OF REPORT: September 20, 1978

PERSON PREPARING REPORT: Jane Brown

CONTACTS AT PLANT: Ralph McAlister - Works Manager
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UNION - John Cauble - Electrician, Union Representative
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DESCRIPTION OF THE PLANT: The original Badin plant was built in 1916. There are several facilities at this site including the reduction facility and carbon plant, casting operations, and fabricating facility. The entire reduction facility was rebuilt in 1962, including the carbon plant.

The potlines operate on a continuous basis, three shifts per day, seven days per week. There are two potlines, with 124 pots per line. The reduction pots use prebaked anodes which are prepared in the carbon plant. The pots are completely hooded to reduce emissions. A dry scrubber system is used to reduce atmospheric emissions.

The carbon plant consists of a green carbon mix and preparation areas and two baking furnaces, both of which are similar. The carbon plant operates two shifts per day, five days per week. Both carbon anodes and cathode blocks are prepared at this site. As different materials are used for anodes and cathodes, different mixing facilities are used for each.

DESCRIPTION OF MEDICAL

The plant employs the part-time services of three physicians four hours per week. One licensed registered nurse is employed on a full time basis and is at the plant during the day shift. Four full time first aid people are also employed, so that each shift is covered. The plant has it own ambulance. The nearest hospital is 10 to 15 minutes away.

Pre-employment physicals are required and provided by the plant. Employees over 46 years of age are also provided with annual physicals. Employees between age 36 and 45 are given a physical every 2 years. Employees under age 36 are given physicals every 5 years. Both physicals include the following: SMA 12, EKG, pulmonary function tests, audiograms, chest x-rays. A lumbar spinal x-ray is also done in the pre-employment ohysical. Pulmonary function testing is done annually on workers exposed to asbestos. There is current asbestos exposure. Accident and illness, hospitalization, dental, and optometric insurance is provided through Metropolitan. Medical records are retained for twenty years on all employees, including terminated personnel.

DESCRIPTION OF PROCESS

Carbon Plant - Carbon anodes are prepared using petroleum (coke) with a coal tar pitch binder. Raw materials come in by rail. The coke is unloaded into a conveyor belt which moves the material to the mixing area. The coal tar pitch is heated to temperature in the rail car, and then pumped to heated storage tanks. The petroleum coke is ground in ball mills to the desired mesh and then coveyed to mixers, where it is combined with liquid coal tar pitch. This mixture is then pressed into blocks and moved to the baking furnaces. There are four anode producers in the green carbon area.

The anodes are placed in pits, ten anodes per pit. Five anodes are placed on the bottom. Five more are added as a top layer. The pit is then filled with fluid coke. The baking cycle is thirty days, although each pit is actually fired only 48 hours. Baking is done by ring furnaces. Cranemen in open cabs operate pulling and packing equipment with the aid of a man on the floor who helps guide the equipment. When the baking cycle is complete,

the coke is scooped out and the anodes are pulled. Excess coke on the anodes is blown off by the man on the floor using the plant air system. The finished anodes are then taken to the rodding room.

In each furance room there are two cranemen, two packer-pullers, one furnace operator, and two point-up men who make sure the furnaces are packed tightly to insure a good seal and reduce heat loss.

In the rodding room, metal rods are attached to the baked anodes. Scrap metal is melted down in an electromelt furnace. The steel stubs attached to the rod are placed in a cavity in the anode. The molten metal is then poured around the end of the rod, sealing the two. Rods are reused. Spent anodes ("butts") are stripped from the rod in this room, and ground for reuse. About ten people are involved in the rodding operations, 4 anode assembly men, one furnace operator (electromelt), one pouring molten metal, three grab truck operators, and one man on the stripping operation.

Cathodes are produced using anthracite coal and coal tar pitch as a binder. Three operators are involved in the cathode block production, one at the mixer and two on ground level. One of these two men directs the paste to the forming equipment and the other operates a fork lift truck. Cathode blocks are made at this plant for in-house use as well as for sale to other producers.

Potrooms - Aluminum is produced by electrolytically reducing alumina (Al_2O_3) in a bath of cryolite to form aluminum and oxygen. The oxygen which is liberated combines with the carbon in the anode to be released as carbon dioxide. The molten aluminum settles to the bottom of the pot, and is periodically syphoned off in a process called "tapping". To facilitate this reduction reaction, electric current is passed through the prebaked anode to the cathode in the bottom of the reduction cells, or "pot". This reaction generates high temperatures in the cell. The cooler bath material around the top of the pot hardens to form a crust which must be broken to facilitate tapping or carbon changing. This crust helps to seal the pot, allowing for more effective ventilation.

Tapping is done at this plant using a vacuum syphon system. A tapper helper breaks the crust for insertion of the syphon; the tapper operates the syphon. Anodes are changed by schedule, according to a predetermined need. The crust is broken to make a hole for the old anodes to be pulled, and then broken again to allow the larger new anodes to be inserted.

Crane cabs at this plant are not enclosed, and can be operated from the floor or from above. Disposable respirators are provided for all potroom employees, and are changed at the discretion of the worker. Safety glasses and shoes are required, as are long sleeves. Metatarsal guards are required in some areas, and are provided.

DISCUSSION AND RECOMMENDATIONS

This plant might have been suitable for study in an industrial hygiene survey, however, the drastic changes that have taken place here make it less desirable for use. As the plant was completely rebuilt in 1962, it is felt that conditions here now would be completely dissimilar from those twenty years ago. Any data collected now would be difficult to correlate to past exposures. Consequently, it is suggested that a plant with fewer changes in its history be utilized.