T. B. BONNEY

PITTSBURGH OFFICE

MR. J. C. VERGHO

ALCOA OPERATIONS

December 30, 1964

TBC

PLAINTIFF'S EXHIBIT AL-1368

Confidential

Re: INDUSTRIAL HYGIENE SURVEY - INGOT PLANT

The results of the general industrial hygiene survey conducted in Alcoa's Ingot Plant on October 15 are given below. This report consists of an evaluation of conditions existing at the time without regard to proposed changes (some of which may already have been accomplished) that are expected to improve the overall environmental conditions. I have also appended a list of operations or locations that should receive attention when your program of regular surveillance has been established.

GENERAL

In general there were no serious hazards apparent in the Ingot Plant. An overall look indicated that there was some room for improvement in the housekeeping. General ventilation appeared to be poor especially for this time of year when air movement should be at a maximum. There was considerable haze throughout the building and occasional areas where upper respiratory irritation was present. In the furnace area, 9 of 21 roof monitors were inoperative. None were operating in the rotary barrel area. With all fans operating, improvement can be expected.

FURNACE FLUXING

At the time of the survey furnace fluxing, whether it be with chlorine in the holding hearth or aluminum chloride in the melting hearth, did not appear to present any problems. During the observation of these operations the furnace ventilation appeared adequate to remove the contamination. Air samples were collected at the pouring station between Furnaces 15 and 16 while one of the furnaces was being fluxed. Detector tubes failed to detect the presence of any hydrogen chloride and only a slight stain (trace quantity) was noted on the chlorine tube. Even though the length of stain was not significant, I feel that it was due to some interfering material, not chlorine. There were no fumes in the area and no traces of respiratory irritation, indicating a safe working environment. It is anticipated that this is the normal condition, but malfunction of the chlorine system or insufficient ventilation of the furnaces could change the picture. Therefore, surveillance is indicated.

SKIMMING FURNACES

A holding hearth skimming operation was observed during the survey.

The fumes from the skim are high in acid chlorides generated during chlorine fluxing. Although the skimmer can frequently work around these fumes, there are times when he cannot and occasionally he may be subjected briefly to high concentrations of irritants (A concentration of 30 ppm HCl was measured near the furnace). It should be kept in mind that the threshold limit value for an irritant is the same for short exposures as for long ones. The action of these fumes is mainly irritation of the upper respiratory tract. The most important results of the acute discomfort are the possible creation of a safety problem as the worker, sometimes hastily, attempts to avoid the irritants; and to puts Alcoa in a poor defensive position if any injury is alleged. In view of this, the use of any practical means to control the fumes from the skim container is warranted. The same comments apply to the skimming of melting hearths since the basic problem and the irritant components are identical.

FURNACE CLEANING

Furnace cleaning will involve essentially the same problem as furnace skimming, namely irritation. The presence of fluoride in the furnace cleaner is not expected to change the picture since the furnace cleaning operations are relatively infrequent.

SKIM HOUSES

At the time of inspection the skim houses represented a major contribution to the overall contamination in the ingot plant. Observation was made of a skim cooling operation in the skim house in the No. 57 Bay. Heavy fuming escaped the skim house into the general area. Irritation of the upper respiratory tract will be the usual problem; however, the presence of toxic metals (e.g. Cd & Be) in the skim will present additional problems. A concentration of 3 ppm HCl was measured late in the cycle, but it was apparent that earlier, the concentrations were much heavier. Examination of the exhaust fan on this house showed it to be inoperative. Ventilation at several other skim houses was seen to be ineffective. It would be well to determine if the fans are operating in the region of their design capacity. If they are and the ventilation is still inadequate, it is quite likely that the design of the systems can be greatly improved without having to move additional volumes of air.

On the other hand, if the use of these skim houses is to be discontinued, the problem will be solved and a large contributor to the ingot plant contamination and corrosion will be eliminated.

SKIM RECLAMATION

This is an area in which the primary interest is in nuisance dust and respiratory irritants, primarily acid chlorides. The small amount of fluoride used is not anticipated to be a problem. At

the time of inspection there was a relatively low order of activity and environmental conditions were good. Therefore, the observed conditions are not necessarily typical. It is known that at times upper respiratory irritation is high in this area. A number of inspections would be necessary for a proper evaluation. In fairness to yourselves, the presently inoperative monitors in this area should be put back into operation for such an evaluation. Certainly, these fans when operating are capable of providing much more general ventilation control than existed at the time of the survey.

It is impossible to evaluate the hoods over the rotary barrels without having optimum general ventilation. It is not likely, and is probably not intended, that the hoods collect 100 percent of the generated fume. However, when this spot ventilation is used with good general ventilation provided by roof monitors, you should end up with sufficient control to provide a healthy working environment. Whether you do or whether you don't will have to be determined with the entire ventilation system operating as intended.

The skim coolers as well as the barrels can contribute to the overall contamination in the reclamation area. In order that the control equipment built into the units performs adequately, periodic maintenance and policing is necessary. At the time of the survey one of the hood doors was open, resulting in inadequate dust control.

LEACHING STAINLESS SCREENS

At the time of the survey the caustic cleaning area in Building 811 was clear. There was no sign of irritating caustic mist arising from the tank even without the use of exhaust ventilation. This was understandable since the amount of bubbling in the tank was minimal. Higher temperatures, higher caustic concentrations or greater quantities of aluminum in the solution could increase the amount of caustic mist generated and require the use of exhaust ventilation. Therefore, surveillance is indicated.

ALLOYING WITH TOXIC METALS

This should be an infrequent problem. In the past the element of major interest at Alcoa has been cadmium. Upon alloying, cadmium is added to molten metal at a temperature close to the boiling point of cadmium ($\sim$ 1410°F). As the result a considerable amount of cadmium is vaporized. If the furnace does not have sufficient exhaust, the brown fumes of cadmium oxide will escape from the furnace. This operation should be observed and, if there is an appreciable escape of cadmium into the work area, air samples should be collected. Skim from cadmium alloys will also be a source of exposure. It should be dumped without rotary barrel processing.

Beryllium should not pose such a problem for two reasons: The infrequent use of Be alloys at Alcoa and the low vapor pressure of the metal. There should be sufficient ventilation in the

furnaces to keep the working area safe. However, whenever beryllium is used in a plant it must be considered as a potentially troublesome material, and its use controlled accordingly. The greatest chance of exposure to Be is from handling skim that has been generated from alloys containing beryllium. Skimming, rotary barrel reclaiming and loading beryllium-containing skim are the operations to watch.

BAFFLE SHOP

Only the area and materials were observed during the survey since no one was working in the area at the time. Concern in this area was the tank of methyl alcohol used to clean molds. Such large quantities could result in appreciable exposures to this very volatile alcohol, especially during the warmer months. The health aspects of this cleaning operation should be evaluated by observing the operation, noting the vapor concentration and determining the usual duration of exposures. A field detector tube can be used to measure the alcohol vapor concentration. The fire hazard might provide a more serious problem. For this reason, Mr. Morton may wish to be advised if he is not already aware of the cleaning operation.

FURNACE REPAIR

No dismantling of furnaces was observed during the survey. However, this operation is one to which the plant industrial hygienist should pay special attention. Jobs that raise furnace dust (e.g. those employing jack hammers) are of particular interest. It should be kept in mind that irritating components may be deposited on the brick from the fluxes; therefore dust exposures should be kept minimal. Also, furnaces that are regularly used to produce alloys containing toxic metals will present special problems. Engineering controls or personal protection will probably be needed when work is being done on these furnaces.

The sawing of refractory materials is also of interest. Silica brick is cut, wet, at the job site. The wet method does not usually cause any problems but this observation should be periodically checked to insure safe operating conditions. If there are any doubts as to the silica dust exposures, air samples should be collected.

During the survey the refractory sawing areas were checked. The disc saw in the North end of Building 811 was observed to be well ventilated. On the other hand, the ventilation on the band saw was found to be ineffective. Although air is exhausted at the cutting area, this control is completely overpowered by a strong air stream (generated by the rotating top wheel) that comes out of the top wheel housing and travels down the blade. Any method that can divert this air stream or lessen its velocity will improve the overall capture of the exhaust system and may result in its operating efficiently without the need to exhaust more air.

Modification of the table or the hood (e.g. making multiple perforations in the table around the blade that enters the hood) may also be productive.

Saws used to cut asbestos and Marinite should have effective exhaust systems on them unless the sawing operations are infrequent, in which case personal protection is a suitable substitute. If there is any doubt as to whether or not an exhaust system is adequate, air samples should be collected.

CRANE CABS

Periodic surveillance of the crane cab environments should be made. This involves sampling for hydrogen chloride and carbon monoxide by the use of appropriate sampling tubes and making pertinent observations as to the physiological effects of the environment.

LOADING SKIM

This operation should be observed occasionally to determine if the workers are adequately protected. The observer should keep in mind that all of the skim contains irritants and in some portions of it may contain toxic metals (e.g. Be and cd).

HEAT

It would be well for your industrial hygiene committee to be aware of those areas that are especially hot. The purpose of mentioning this is merely to alert you to the growing interest in heat stress in the industrial environment. In the future you may find it necessary or desirable to collect some temperature data.

SURVEILLANCE PROGRAM

As mentioned earlier a list of suggested sampling stations is included with the report of this survey. The list should include all the areas and operations discussed above. For identification purposes you may wish to assign numbers to the sampling stations, and you may wish to make separate stations for a single operation that is performed at several locations. We will leave this to your judgement. Whichever way seems best for your modus operandi will be quite suitable with us.

We would suggest that the Ingot Plant (and eventually the entire Tennessee Operations) be periodically surveyed on a monthly basis. For the most part the surveys will consist of simple inspections, squeeze bulb detector tube air analyses, and smoke tube ventilation checks. Collection of air samples using classical (and more time-consuming) techniques will be minimal. If an operation is not carried out during any particular survey, we would suggest that the evaluation be deferred until the time of the next scheduled survey. Only if the surveyor is apprehensive about the operation

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would there be need for an early recheck.

Regardless of the method used to evaluate the stations during a scheduled surveillance tour, a record of the evaluation must be made. In order to make this as simple as possible, we have devised a form for this purpose, a copy of which is enclosed. You may find this, or a variation of it, suitable for your needs. A word of explanation about the form may be in order. The first two entries are self-evident, but because the headings of the last three columns are quite general we have shown typical entries as we anticipate them. For example, entries under Evaluation Method might be: "inspection, smoke tube, air sample, etc." For Evaluation Results we might have: "very dusty, effective ventilation, 10 ppm SO_2, eye irritation, no solvent odor, etc." Under Remarks one might find entries such as: "good housekeeping, fan inoperative, doors and windows open, high rate of production, etc."

Your immediate needs for the equipment necessary to conduct a monthly survey of the Tennessee Operations are minimal. They are:

1) MSA Universal Testing Kit, Model 1, Cat. No. 08-83500, $75.00. Detector tubes for the kit can be ordered as needed either from MSA or the other suppliers mentioned in Table 5.1 of the Alcoa Industrial Hygiene Handbook. (For the Ingot Plant surveillance you will need tubes for carbon monoxide, hydrogen chloride and chlorine). MSA's address is Mine Safety Appliances, Pittsburgh, Pennsylvania 15208.

2) Ventilation Smoke Tubes, Cat. No. 08-5645, $7.50/pkg. of twelve. These are for determining direction and velocity of air currents and are very useful for determining the effectiveness of ventilation systems.

I know that your laboratory has other sampling equipment available. That plus the above items should put you in good position to take care of your sampling needs.

You might keep in mind the "Mighty Mite" (see the enclosed brochure). As you can see, such a device is quite handy if you receive a request to do an immediate sampling job that cannot be done with a detector tube. MSA is expected to come out with a similar unit in a month or so and it should be more rugged and versatile than the Mite. Unless you can see immediate need for one of these devices you might wish to wait until you get well into your program at which time your complete needs will become obvious. On my next visit to Alcoa I'd be glad to talk about sampling equipment, let you know what is available and let you determine if it has application for the Tennessee Operations.

As you know, I plan to return to Alcoa in the near future to conclude the survey of the fabricating facilities. By the time of my next visit you will have had the opportunity to digest the contents of this report. At that time I will be pleased to clarify any points that may have been left hazy and, if you

wish, will offer such assistance as I can to set up your program on a sound and practical basis.

T.B.BONNEY

TBB:DB
Encls.

cc: Miles O.Colwell,L.V.Cralley, file

OPERATION OR LOCATION	CONTAMINANTS	EVALUATION METHODS	REMARKS
12. Caustic Tank	NaOH mist	Irritation, Ventilation Smoke Tubes	
13. Furnace Repair (Jackhammer work)	Nuisance, Irritant or Toxic Dust	Visual, Air Samples if Indicated	
14. Sawing Refractory Brick (Wet)	Silica Dust	Visual, Air Samples if Indicated	
15. Sawing Asbestos or Marinite	Asbestos Dust	Visual, Ventilation, Smoke Tubes, Air Sample if Indicated	
16. Cleaning Molds	CH_3OH	Detector Tubes	
17. Miscellaneous Shops	General	Visual	
18. Crane Cabs	HCl, CO	Visual, Irritation, Detector Tubes	

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ALCOA WORKS -- INDUSTRIAL HYGIENE SAMPLING STATIONS

	OPERATION OR LOCATION	CONTAMINANTS	EVALUATION METHODS	REMARKS
1.	Furnace Room, General	General (Fumes, Dusts and Gases)	Visual, Degree of Irritation	Check number of inoperative fans
2.	Preparing $AlCl_3$ Flux Packages	HCl	Irritations, Detector Tubes	
3.	Furnace Fluxing, Cl_2	HCl, Cl_2	Visual, Irritation, Detector Tubes	
4.	Furnace Fluxing, $AlCl_3$	HCl	Visual, Irritation, Detector Tubes	
5.	Cadmium Alloying	CdO	Visual, Air Samples if Indicated	
6.	Fluxing Toxic Alloys, e.g., cont'g. Be, Cd, etc.	Toxic Metals	Visual, Air Samples if Indicated	
7.	Furnace Cleaning (Refrak-Kleen)	HCl, HF	Visual, Irritation	
8.	Furnace Skimming	HCl, Occasionally Toxic Metals	Visual, Irritation, Detector Tubes, Air Samples, if Indicated	
9.	Skim Sheds	HCl	Visual Irritation, Detector Tubes	
10.	Skim Reclamation, Rotary Barrel Area	General (Fumes, Dusts, HCl)	Visual, Irritation, Detector Tubes	Check number of inoperative fans
11.	Skim Reclamation, Skim Coolers	Dust and Fume	Visual	

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WORKS

INDUSTRIAL HYGIENE SURVEY

DATE 10/15/64

...tion or Location	Contaminant	Evaluation Method	Evaluation Results	Remarks	off	on
[illegible]	Gonl	Obs. + subj	considerable haze - occasional irritation		~~IIIIII~~	~~IIII~~
[illegible]	HCl	tube	3 ppm	hvy fuming, fan inoperative in refective ventilation at other hangers	will soon be out	
Fluxing @ 15+16 [illegible] - Pouring Sta	HCl, Cl_2	tubes	HCl - N.D. Cl_2 - tr. < 1 ppm	no apparent contaminants		
[illegible] Reclamation	[illegible] HCl			Fans inoperative		
[illegible] Coolers	[illegible] HCl			hood door open ventilation inefective		
[illegible]	Housekeeping					
Caustic Etch	Caustic	[illegible] - smoke tube	no irritation no ventilation	5% caustic - little bubbling		
[illegible] Repair	duct					
[illegible] Holding Hearth	HCl	tube	30 ppm			
[illegible]	Methyl Alcohol	obs	—	Station		
[illegible]	pneumoconiosis - producing dusts	smoke tube		Band saw vent n.g. disc OK	Sta	Cl_2 Brick saw [illegible] in field
[illegible]				very little [illegible] on saw		future
[illegible]	cd					
Exposures ?						

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