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URANIUM DUST MONITORING AT ATLAS STEELS LIMITED, WELLAND, ONT., JUNE 16, 1961

by

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MINERAL SCIENCES DIVISION

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SUMMARY OF RESULTS

Air samples were collected to determine the uranium concentrations in air during the production of a 35 ton heat of Vibresist stainless steel containing about 0.09% uranium. The results obtained indicated that the ventilation was adequate and the airborne level of uranium concentrations remained well below the maximum permissible level.

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INTRODUCTION

A melt of uranium-bearing steel was made by Atlas Steels Limited in their plant at Welland, Ont., on June 16, 1961. The writer attended for the purpose of obtaining dust samples in the electric furnace shop, where the operations were conducted. Mr. R.D. McDonald, a metallurgist with the Physical Metallurgy Division, Mines Branch, was also in attendance covering the metallurgical aspects, which he will describe in a separate report.

During previous tests conducted by the company in their plant on May 17-19, eight heats of 500 lb each were made in an induction furnace. Different amounts of uranium were added to seven of these heats. Results of the monitoring tests, conducted during that series, may be found in Mines Branch Investigation Report IR 61-63.

For the June 16 heat (No. D-7447), a large electric furnace was used and the heat, which was produced by the basic double slag process, consisted of 35 tons of Vibresist steel. The uranium content aimed for was 0.09% uranium, based on 70% recovery. Tapping temperature was 2850°F. Ladle temperature was 2810°F. The uranium was added as ferro-uranium in 20 lb packages, wrapped in aluminum foil, in rapid succession after tapping. The metal was poured from the ladle through a nozzle of 1 3/4 in. diameter into 20 in. diameter fluted ingot moulds.

The furnace tapping was originally scheduled to be at approximately 10 am on June 16, but, because of furnace difficulties requiring a lengthy maintenance delay, tapping operations did not start until 6:25 pm.

DUST SAMPLING PROCEDURE

Two Staplex dust-sampling units were used in collecting the samples. The mains frequency in the area is 25 cycles; as the sampling units are normally operated on 60 cycles, a possible reduction in the calibrated air volume, while not noticeable by the gauge readings, may have occurred.

Five dust samples were taken in the following positions:

A - On the pulpit. 3 samples were taken, before, during and after tapping.

B - On the pouring platform. 2 samples were taken during the pouring operations.

To collect the samples on the pulpit, the sampler unit was placed on a stand facing the tapping area, above the ladle, for the two background control samples, No. 1 - prior to tapping, and No. 3 - taken immediately after tapping. To obtain the No. 2 sample, the unit was held by hand in the location where the melter stood, while making the ladle additions and during the tapping.

TABLE 1

Analysis of Air Dust Samples taken at the Atlas Steels Foundry, June 16, 1961

Sample No.	Location	Sampling Time	Approx. Volume sampled (cu ft)	Net Count Rate		Net Count Rate		Total Uranium (chemical)	U Concentration in Air (µg/ cu ft)
				after 3 days	after 4 days	after 7 days	after 10 days		
		June 16, 1961		(c/min)		(c/min)		(µg)	
1	On pulpit prior to tapping.	6:03 pm - 6:21 pm	782	Bgd.	1.62	Bgd.			
2	Held by hand during tapping and additions.	6:24 pm - 6:29 pm	250	0.96	1.91	1.74			0.11 (calc)
3	On pulpit after tapping.	6:32 pm - 7:02 pm	1455	1.82	1.08	1.61		21	0.014
4	On pouring platform. Ingots No. 1-7.	6:37 pm - 6:43 pm	288	3.20	2.12	1.55	3.61	29	0.10
5	On pouring platform. Ingots No. 8-16.	6:44 pm - 6:56 pm	624	Bgd.	1.62		Bgd.		

Notes: Counter background 11.8 to 14.2 c/min.

Chemical analyses were done by fluorimeter by J.B. Zimmerman, Extraction Metallurgy Division.

The net counts in all cases were comparable with the fluctuations in background counts. This accounts for the variations in count rate for Sample No. 4 and the counts are useful only as an indication of the presence of some uranium.

For Samples No. 4 and 5, taken on the pouring platform, the sampler unit was held by hand approximately 8 to 10 ft from each ingot being poured.

The ventilation throughout the building appeared to be most efficient in carrying off the fumes in each area of operations, suitable atmospheric conditions, with moderate westerly winds, being a contributing factor.

Each of the samples was checked at the Mines Branch for beta activity on the third and fourth day following collection. No. 1 to 4 were re-run on the seventh day, and No. 4 and 5 on the tenth day. The results obtained in these tests are presented in Table 1, together with chemical uranium determinations on samples No. 3 and 4.

CONCLUSIONS

Results from the beta counter tests and chemical determinations show the uranium concentrations in the air to have been well below the maximum permissible level of 5.6 μg U/cu ft. Because of the delay arising from the furnace difficulties and the necessity of making train connections, time was not available to collect a background control sample on the pouring platform following the completion of the pouring operations. From the result of tests shown on Sample No. 3, taken after the tapping was completed,

and the ladle removed, it is evident that the ventilation was adequate to remove fumes and dust from each operational area.

Appreciation is expressed to Mr. E.G. Schempp, research and development metallurgist with Atlas Steels Limited, and to Mr. R.D. McDonald of the Mines Branch for their assistance in collecting the samples.

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