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AIR DUST MONITORING AT ATLAS STEELS FOUNDRY, WELLAND, ONTARIO, DECEMBER 19, 1963

By

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MINERAL SCIENCES DIVISION

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SUMMARY OF RESULTS

Air dust samples were collected before, during and after the addition of uranium to steel. The uranium was added to the ladle during tapping.

Results indicate the concentration of uranium dust in the air to be well below the maximum permissible level.

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INTRODUCTION

On December 19, 1963, Atlas Steels conducted a further test on the production of uranium-bearing alloy steels at its Welland, Ontario plant. The writer attended as an observer to air dust monitoring operations, which were conducted by Mr. M.J. Kent, Supervisor in charge of the programme with Atlas Steels, and his technical assistant Mr. J. Matich. Mr. R.K. Buhr, metallurgist with the Physical Metallurgy Division, Mines Branch, attended to observe the metallurgical aspects.

The heat D-1423 - SAE 8615 was made in a basic electric furnace. The theoretical tapping weight was 71,300 lbs. Following a delay period with the melt in the ladle, a 70 lb uranium addition was made to the heat. The metal was poured into 11 moulds, No. 2, No. 5, and No. 8 were 26 inches in diameter, the others were 22 inches in diameter. No. 11 contained the residual and was approximately 1/3 full following the pouring.

AIR DUST SAMPLING PROCEDURE

The air dust samples were collected in a sequence similar to that followed by the writer during previous melts. Nos. 1, 3 and 4 were collected on the pulpit, before, during and after tapping. Nos. 2, 5 and 6 were collected on the pouring platform before, during and after pouring. The pulpit samples were collected with a Staplex sampler unit recently obtained by the Atlas Steels Company, which was operated by Mr. Kent. The pouring platform samples were collected with a similar unit from the Mines Branch, which was operated by Mr. Matich.

OBSERVATIONS AND RESULTS

During the pouring operations a considerable amount of fuming occurred, which disseminated rapidly leaving the area occupied by the personnel reasonably clear. Other pouring and melting operations in the building were also contributing to this situation, particularly in the area of the pulpit. When a large door was opened to remove ingots from the building the areas affected were quickly cleared. Under such conditions it is necessary to check the gauge on the sampler unit periodically, and to record the volume throughput. Airborne dust particles accumulating on the filter during the No. 6 sample collection, reduced the air volume throughput from 45 to 15 cu ft/min.

After a period of 4 days, the filter samples were checked for beta activity, at the Mines Branch laboratory by the writer. They were then sent to the Extraction Metallurgy Division for chemical uranium determinations. The results of these tests (Table 1) show the uranium concentration to be low.

CONCLUSION

Air dust monitoring at the Atlas Steels foundry at Welland, Ontario, has been conducted by the Physics and Radiotracer Subdivision since the initial uranium in steel melt was made on May 17, 1961. Dr. G.G. Eichholz, who was at that time Head of the Subdivision, and the writer, attended a series of six 500 lb heats during May 17, 18 and 19. The writer continued with this investigation during four additional heats that varied in size from 13 to 50 tons.

Information obtained by analysis on air dust samples and observations recorded in previous reports (1, 2, 3, 4) of this series, show that company personnel have carefully cooperated in this programme and have conducted it in such a manner that those operating in the test areas are not exposed to a health hazard from airborne uranium particles.

As a result of these findings, Dr. J.D. Keys, Head of the Physics and Radiotracer Subdivision, suggested that the writer attend the Dec. 19th melt only as an observer, since the company have acquired the necessary equipment and are familiar with the sampling procedure they are now in a position to carry out the dust monitoring without further

assistance from the Mines Branch. In response to a request from Mr. Kent, a report describing a method for determining the uranium content in the filters was forwarded on Jan. 9, 1964.

Film badges were not worn during this heat. They had been worn during each of the previous tests, but at no time was there a measurable indication of exposure to radiation. This had been expected since uranium is a weak gamma-ray emitter. The writer suggested to Mr. Kent, that, in the event that materials which do emit gamma-rays having high energies were handled, it would be advisable to get in touch with the Radiation Protection Division, Department of National Health and Welfare, Ottawa.

The writer wishes to express his appreciation to Mr. Kent and Mr. Matich of Atlas Steels for their friendly cooperation.

REFERENCES

1. C. McMahon and G.G. Eichholz, "Air Monitoring During First Uranium-Steel Production at Atlas Steels Ltd., May 17-19, 1961", Mines Branch Investigation Report IR 61-63, June 12, 1961.

2. C. McMahon, "Uranium Dust Monitoring at Atlas Steels Limited, Welland, Ontario, June 16, 1961", Mines Branch Investigation Report IR 61-78, July 7, 1961.

3. C. McMahon, "Uranium Air Dust Monitoring at Atlas Steels Limited, Welland, Ontario, August 9th, 1963", Mines Branch Investigation Report IR 63-98, September 29, 1963.

4. C. McMahon, "Uranium Air Dust Monitoring at Atlas Steels Limited, Welland, Ontario, November 6, 1963", Mines Branch Investigation Report IR 63-121, November 22, 1963.

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TABLE 1

Analysis on Air Dust Samples Collected on December 19, 1963

Sample No.	Location	Sampling Time	Approx. Volume Sampled (cu ft)	Net Beta Count Rate after 4 days (c/min)	Total Uranium (chemical) (μ g)	U Concentration in Air Calculated (μg/cu ft)
1	Sampler unit No. 1 on tripod base on pulpit prior to tapping.	1:27am - 2:27 am	1320	5.5	8.48	0 x 0.006
2	Sampler unit No. 2 on tripod base on pouring platform prior to tapping.	1:49am - 2:19 am	1470	2.1	8.48	0 x 0.006
3	Sampler unit No. 1, held by hand, on the pulpit during tapping.	3:50am - 3:54 am	90	10.6	16.96	0 x 0.188
4	Sampler unit No. 1 on tripod base on pulpit after ladle was removed.	3:56am - 4:36 am	920	4.2	8.48	0 x 0.009
5	Sampler unit No. 2, held by hand, on the pouring platform during pouring.	4:07am - 4:35 am	840	12.4	93.28	0 x 0.111
6	Sampler unit No. 2 on tripod base on the pouring platform after pouring.	4:37am - 5:00 am	690	4.6	16.96	0 x 0.024

Notes: (a) Beta background = 21.4 c/min $\pm$ 1.4.
(b) Chemical analyses were done by the fluorimetric method in the Extraction Metallurgy Division.
(c) Maximum permissible uranium concentration in air = 5.6 μg/cu ft.