

January 19, 1994

Mr. Hugh Hanes
Vice President Governmental Affairs
Brush Wellman Inc.
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Subject: Brief Study of Operations at the Lorain Plant of the
Brush Beryllium Co. Relative to Unique Health and Safety
Issues.

Dear Hugh:

As per your request, a brief review of the operations at the Lorain Plant of The Brush Beryllium Co. was made relative to factors which were unique to this plant as compared to other beryllium industrial operations. This question is of interest because the data from this plant may indicate that beryllium is a carcinogen.

I have no personal experience on the beryllium operations at Lorain; the fire which terminated beryllium operations occurred in 1948. I joined the company in mid 1949. I did work in the shell of the burned-out plant for about six months on a Zirconium-Hafnium separation contract for the AEC and the Navy. The following suggestions are made on the basis of what I was told by numerous personnel in the early days, the literature and the knowledge of the beryllium industry I gathered over the years. Mr. Jack Valiquette was contacted by phone and several discussions were held on this subject as you requested. Jack also carried out some survey work.

The technical aspects of the processing carried out at Lorain are covered briefly, but well, by the paper authored by C.B. Sawyer and B.R. Kjellgren entitled "Newer Developments in Beryllium" and published in Industrial and Engineering Chemistry, Vol 30, page 301, May, 1938. A copy of this paper is enclosed. The operations of The Beryllium Corporation of America have been described by H. Kawecky in "The Metal Beryllium", Chapter IV B, p.63-70 (White and Burke editors, ASM, 1955).

The factors which appear to be unique in the beryllium operations at Lorain are:

1. Lorain was the only commercial extraction/reduction operation which used the sulfate process to open the ore, beryl, without health and safety precautions. This was due to a lack of knowledge relative to health problems from beryllium during most of its operational period. The Beryllium Corporation used a fluoride process. By the time Luckey operated the sulfate process, ventilation and exposure controls were in use.

See NOB
Sulfate
make way
ventilation

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The conditions in the Lorain plant were described as a continual smoke/fog of chemical fumes by personnel. This can be confirmed by surviving retirees. These fumes were most likely composed of sulfuric acid mists, fluoride vapors and the interaction of these chemicals with ammonia fumes.

2. Beryllium sulfate was fired to beryllium oxide in a gas-fired rotary kiln. This was possibly the only time that this type of firing was carried. Beryllium Corp. and its successor, KBI, normally fired the hydroxide to produce both alloy feed and ceramic-grade oxide.

The operation of the rotary kiln firing the sulfate, along with the sulfation of beryl in similar equipment, provided a substantial source of sulfuric acid fumes. The oxide was a major product of the plant supplying the fluorescent light industry. Alloy production increased during the years of World War II to also become a major product.

If the use of the rotary kiln to produce the oxide is deemed significant, the equipment used at Luckey should be researched. I think that the oxide was a very minor product at Luckey, but I may be wrong.

3. The beryllium-copper alloys manufactured at Lorain used nickel as the grain stabilizing agent. The Beryllium Corporation used cobalt for this purpose in the alloys they manufactured. After Lorain burned and the Korean War broke out, military specs were written calling for cobalt. Accordingly, when Brush got back into alloy production, it was necessary to use cobalt. This was the situation until recently when the price of cobalt forced the re-introduction of nickel.

The lack of protection in the Lorain operation would have provided ample opportunity for nickel and nickel oxide fumes to be air-borne to an extent not present in any other commercial operation. It is of interest to note that the Lorain fire was caused by the failure of an experimental pour of a beryllium-nickel alloy through a small shot tower.

Respectfully submitted,

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*Hms and
Ni was used in
Lorain.*

Per NOB

E. ventilation measurements in

~80,000 ft³/min

*300
21 = 2,500 in*

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