

U. S. Department of Labor

Mine Safety and Health Administration
 4800 Forbes Avenue
 Pittsburgh, Pennsylvania 15213
 Pittsburgh Health Technology Center
 Physical and Toxic Agents Division



Wardlester

May 6, 1983

Mr. Joe Lagowski
 Vice President, Engineering
 Fairchild Incorporated
 P. O. Box 1184
 Beckley, WV 25801

Dear Mr. Lagowski,

I am writing this letter to you to provide information with regard to the acoustic field evaluation that was conducted at Copper Valley Mining Company, No. 6 mine, located near Elderton, Pennsylvania. This evaluation, which was conducted during the time period from February 23, 1983 through March 9, 1983, dealt with a Wilcox Mark 20 auger miner system and a set of modified, sand filled cutting heads. These cutting heads were leased to the Physical Agents group for the purpose of the evaluation.

The testing procedure was as follows. First, a baseline set of acoustic measurements were made at various locations around the Mark 20 system. During the baseline measurements, standard cutting heads were in use. Also, it should be noted that the Mark 20 system did not have any noise controls installed. Acoustic measurements were made with calibrated sound level meters, tape recorders, and noise dosimeters while the machine was in actual production. Next, the standard cutting heads were changed out for the set of modified sand filled cutting heads. The same acoustic measurements were repeated at a later time. The following table summarizes the overall noise levels obtained.

TABLE 1 - Noise Levels Associated with the Two Types of Cutting Heads

<u>Position, Condition</u>	<u>Ave. Noise Levels, dba</u>	
	<u>Standard Heads</u>	<u>Modified Heads</u>
Operator, cutting coal	103.3	98.6
Right Jacksetter, cutting coal	104.0	98.8
Bridge Conveyor Operator, w/coal	96.0	96.0

TABLE 2 - Noise Dosimeter Measurements

<u>Position</u>	<u>Noise Exposure, %</u>	
	<u>Standard Heads</u>	<u>Modified Heads</u>
Operator	308	182
Jacksetter	466	295

As can be seen, there was a significant noise reduction due to the cutting heads. To further illustrate this reduction, enclosed with this letter are charts showing the frequency distribution of the noise.

As a result of this field investigation, an interesting situation arose. Mine company personnel discussed three problem areas that occurred when the modified, sand fill cutting heads were in use. These were:

1. A ridge of coal remaining on the roof and floor.
2. Increase in the amount of dust.
3. Increase in the amount of spillage from the cutting heads.

Attached is a copy of the letter sent to us by Copper Valley. As a result of this, the Bureau of Mines and Wyle Labs were contacted. They investigated these problems further and concluded the following:

1. The ridge of coal appears to be the result of operator inexperience in using the modified cutting heads. With a change on the size of the headcasting in the two types of heads, an operator may have the tendency to try to "over drive" the modified heads.
2. The water spray on the Mark 20 system did not utilize the spray nozzles on the cutting heads. Any increase in dust due to the modified heads was not sufficiently suppressed by their current spray system.
3. The excess spillage left by the cutting heads was due to a set of steel plates welded on the conveying side of the helix to balance the cutting heads. If balancing is needed, it should be placed on the non-conveying side of the helix.

Attached is the Bureau of Mines letter concerning these conclusions. With regard to item 2 concerning the dust problem, we feel that this situation may be due to the fact the dust from the modified cutting heads is not sufficiently suppressed by the current water spray system. The current spray system does not utilize the spray nozzles on the cutting heads.

In conclusion, the field evaluation was very meaningful. The modified, sand filled cutting heads did reduce the noise level significantly. The current noise problem now involves the untreated conveyor system on both the miner and bridge conveyors. This can be dealt with.

At this time I would like to express my sincere appreciation for the cooperation and assistance given us by Fairchild.

Sincerely,



Leonard C. Marraccini
Chief, Physical Agents Branch

- cc: M. Jacobson, Arlington
D. Altizer, Arlington
R. Beckman, Denver
R. Peluso
L. Marraccini
J. Seiler
J. Snyder
G. Durkt
P&TAD Files

FIGURE 1. - Operator Position, cut and load

x-x-x Untreated System
o-o-o Modified Cutting Heads

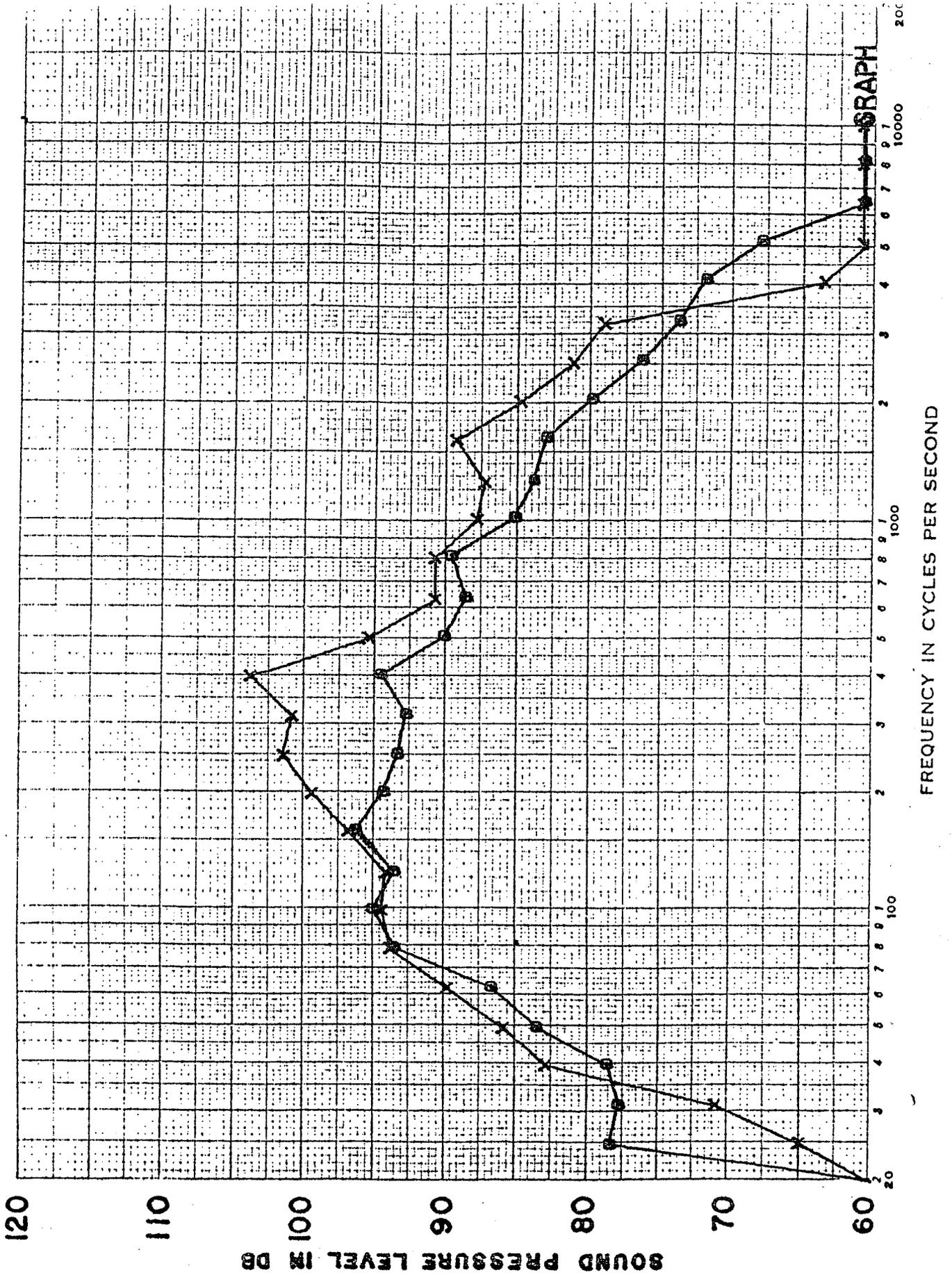
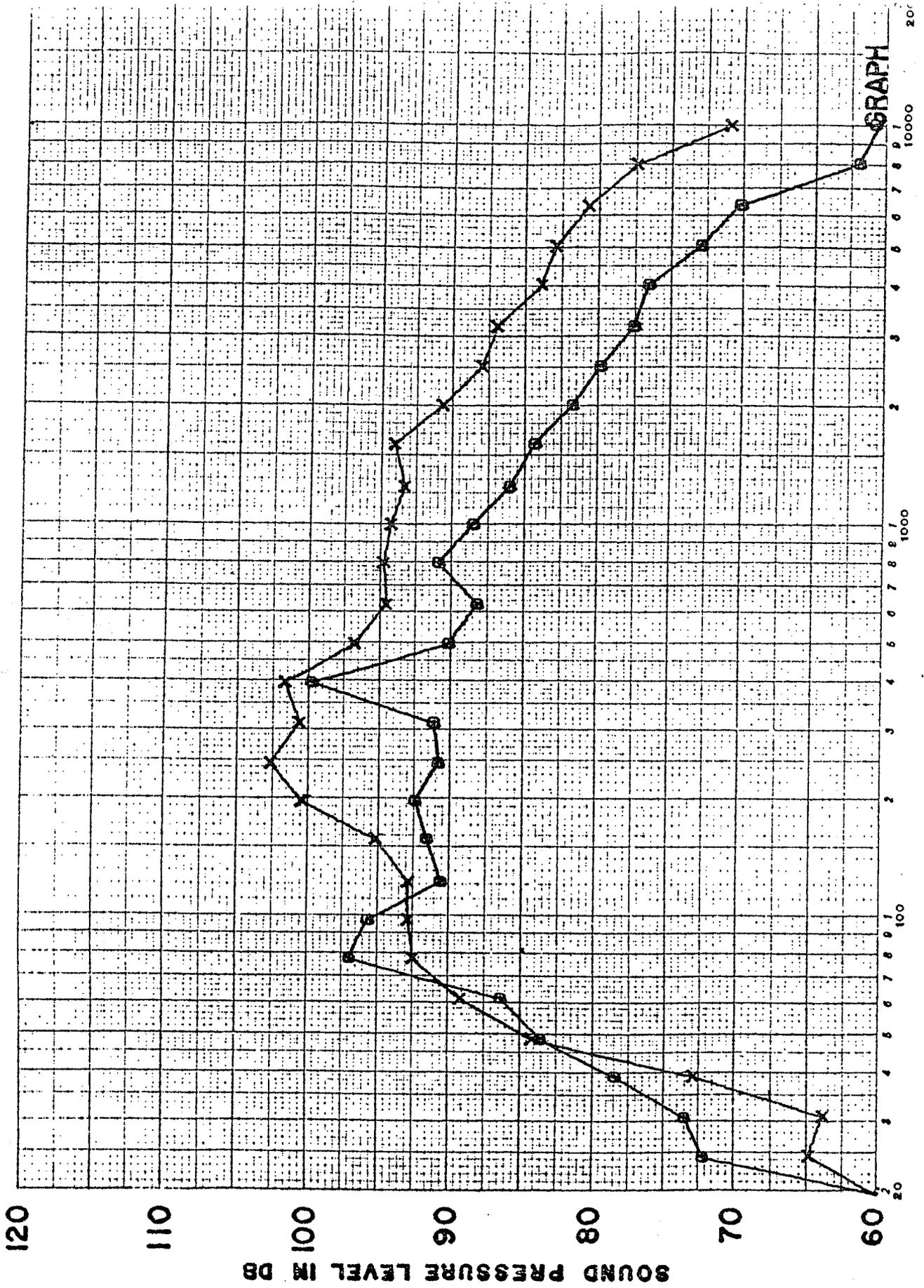


FIGURE 2. - Jacksetter Position, cut and load

x---x Untreated System
o---o Modified Cutting Heads



FREQUENCY IN CYCLES PER SECOND

GRAPH

COPPER VALLEY COAL COMPANY, INC.

R. D. #2, HOMER CITY, PENNSYLVANIA 15748

Telephone: (412) 479-9951

March 18, 1983

Leonard Marraccini
MSHA PNTAD
4800 Forbes Avenue
Pittsburgh, PA
15213

Dear Mr. Marraccini:

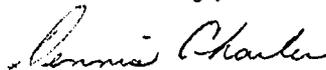
This letter is in regards to the use of the sand filled augers tested at Copper Valley #6 on March 8 and March 9, 1983.

The following production problems were encountered during the use of the sand filled augers.

1. A ridge of coal was left on the roof and on the bottom at the face, after a completed cycle of mining. The dimensions of these ridges were approx. 7" wide x 3" thick the entire length of the cut. The problem these ridges created was that on the next mining cycle the augers could only advance 60 % of there length, so that the ridges left by the previous cycle could be removed.
2. A noticable increase in the amount of coal dust created by the augers was observed.
3. There was an increase in the amount of spillage left by the augers. The normal amount of spillage ranges from 3 to 4 inches in depth. The sand filled augers created spillage ranging from 8 to 10 inches.

If you have any questions concerning this letter please contact me at the above address or phone number.

Sincerely,



Dennis Charles
Safety Director

c.c. Michael Steele
File



United States Department of the Interior

BUREAU OF MINES

PITTSBURGH RESEARCH CENTER
COCHRANS MILL ROAD
POST OFFICE BOX 18070
PITTSBURGH, PENNSYLVANIA 15236

April 26, 1983

Mr. Leonard C. Marraccini
Chief, Field and Applications Branch
Physical Agents Division
Pittsburgh Health Technology Center
Mine Safety & Health Administration
4800 Forbes Avenue
Pittsburgh, PA 15213

Dear Mr. Marraccini:

In response to your request, personnel from Wyle Laboratories and IS&TS investigated several problems that had occurred with reduced-noise auger miner cutting heads.* During this investigation conducted on April 6-7, 1983, three different places were visited: (1) Rochester and Pittsburgh Coal Company, Emilie No. 1 Mine--a set of reduced-noise augers was operating successfully at this mine; (2) Copper Valley Coal Company--this mine had experienced problems with the reduced-noise augers; and (3) Fairchild, Inc., Indiana, PA--the reduced-noise augers were removed from the Copper Valley Mine and stored at this warehouse. The following summarizes the problems experienced by Copper Valley and the reasons for these problems as determined by Wyle and IS&TS.

Problems reported by Copper Valley personnel

1. Poor clean-up ability--coal was thrown sideways by the reduced-noise augers rather than pulled rearward as required for effective clean-up.
2. A ridge of coal approximately 3 inches high and 8 inches deep was left at both the roof and the floor of the coal seam after each pass of the reduced-noise augers was completed. This interfered with the normal operating procedure of the auger miner (a Fairchild Model Mark 20).

*Designed under USBM Contract No. H0188065, Wyle Laboratories, and fabricated by Fairchild, Inc.

Letter to Mr. L. C. Marraccini, 04/26/83, Subject: Reduced-noise auger miner cutting head problems investigated by Wyle Laboratories and Bureau of Mines personnel

Reasons for problems at Copper Valley

1. After observing the reduced-noise augers at the Fairchild warehouse, the reason for the clean-up problem was obvious. In an attempt to balance the augers during fabrication, metal plates had been welded to the conveying sides of the auger helixes. The 2-inch high "steps" between the plates and the helix surfaces acted as "shovels" that threw the coal sideways rather than rearward. These plates had been mounted in four places--two on each auger. Effective clean-up ability will undoubtedly be restored if these plates are removed. In the future, if auger balancing is desired,** counterweights should be added to the non-conveying rather than the conveying sides of the helixes.

2. The reason for the "ridge of coal" problem was not as obvious, but it probably resulted from Copper Valley's inexperience with the "new" Fairchild auger designs. The head castings of the "old" augers now being used by Copper Valley are of the same diameter as the helixes; cutting bits are also located on both helixes of these "old" augers. When Fairchild redesigned the "old" augers to place all cutting bits on one helix (leaving one "bitless" helix), they also reduced the diameter of the head castings by about 2 inches.*** The reduced-noise augers designed by Wyle contained both the smaller head castings and the identical bit lacing patterns of the "new" Fairchild augers.

Figures 1 through 4 show how the "ridge of coal" problem could have occurred. Because of the smaller head castings of the "new" augers, the profile of the finished coal face assumed a more concave shape than with the "old" augers (Figures 1 and 2). The machine operator at Copper Valley would not have expected this, so he sumped the Wyle augers until the outby bits were fully "buried" into the face, as was standard practice with the "old" augers (Figure 3). This placed the outby bits slightly inby the point at which the face became concave. When the operator raised the lead auger and lowered the trailing auger to begin his sweep toward the rib (Figure 4), a ridge of coal was left behind the outby bits.

It is important to note that the noise control treatments were not responsible for the "ridge of coal" problem. The same problem would probably have occurred if Copper Valley had switched to the "new," unquieted Fairchild augers with the smaller head castings. The problem could probably have been

**Wyle maintains that the augers need not be balanced for effective machine operation; the "out-of-balance" force experienced by the cutting mechanism is negligible compared to the very large forces experienced during the cutting process.

***Wyle and the Bureau were unable to determine Fairchild's reasons for using smaller head castings.

Letter to Mr. L. C. Marraccini, 04/26/83, Subject: Reduced-noise auger miner cutting head problems investigated by Wyle Laboratories and Bureau of Mines personnel

eliminated if the machine operator had not sumped as far into the face on each pass (2 to 4 inches shallower than with the "old" augers). Since the reduced-noise augers were used for less than three full operating shifts, the operator may not have become "used to" the new face profile and the shallower sump depth required.

It is also important to note that the "ridge of coal" was not a serious problem in the two other mines where the reduced-noise augers were used. In the April 6, 1983 visit to Rochester and Pittsburgh Coal Company, Emilie No. 1 Mine, operating personnel expressed complete satisfaction with the reduced-noise augers on their Fairchild Mark 22 Miner. (Fairchild had fabricated both the Copper Valley augers and the Rochester and Pittsburgh augers.) The reduced-noise augers fabricated by Wyle under USBM Contract No. H0188065 had also performed without this problem at Mears Coal Company, Dixon Run No. 3 Mine, for a period of approximately 8 months on a Fairchild Mark 20 Miner. The key factor in these successful applications may have been the fact that the "newer," unquieted Fairchild augers had been used before the switch to the reduced-noise augers. The machine operators were probably "used to" the concave face profile obtained with the smaller head castings, and would make shallower sumps to compensate for this.

Conclusions reached by Wyle and IS&TS

1. The clean-up problem can be eliminated by removing the plates on the conveying sides of the auger helixes.
2. The "ridge of coal" problem was the result of machine operator unfamiliarity with the face conditions resulting from the use of augers with smaller head castings, and the resulting need for shallower sumps.
3. In future retrofit applications of the reduced-noise augers, the design of the "present" augers should be noted. If the "present" augers are the "new" Fairchild augers (bits on one helix, smaller head castings), problems should be minimal; if the "present" augers are the "old" augers (bits on both helixes), the machine operator should be alerted to the "ridge of coal" problem and instructed to make shallower sumps. Alternatively, Fairchild could be asked to place the "old" style (larger) head castings on all reduced-noise augers built in the future.

Please call me at (412) 675-6831 if you have any questions.

Sincerely yours,

William W. Aljoe

William W. Aljoe
Mining Engineer, IS&TS

Enclosure

Figure 1 - Flat face profile resulting from "old" augers

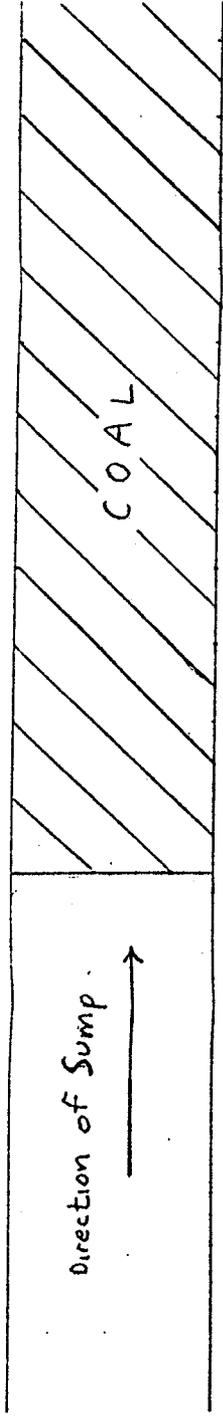


Figure 2 - Concave face profile resulting from "new" augers (smaller head castings)

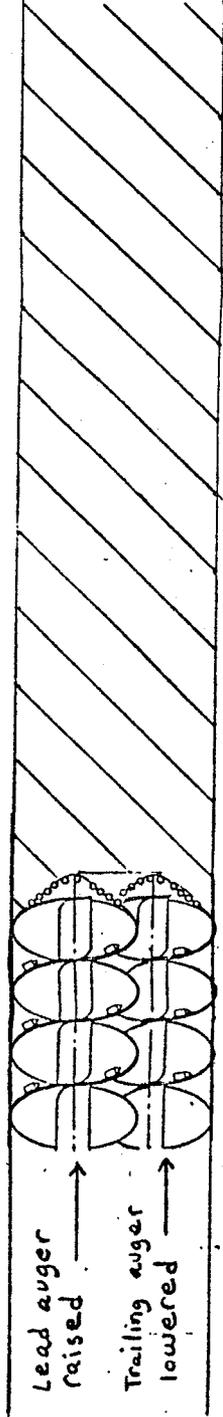


Figure 3 - Augers sumped until outby bit is buried in coal

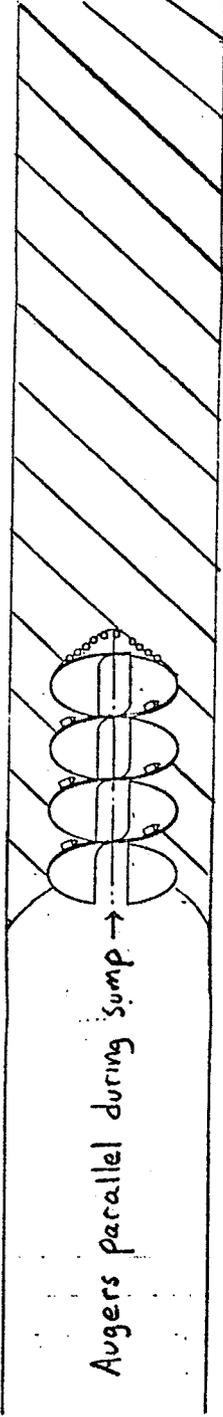


Figure 4 - "Ridge of coal" left during sweep toward rib

