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AMERICAN BRAKE SHOE COMPANY

AMERICAN BRAKE BLOK DIVISION

WINCHESTER, VIRGINIA

EVALUATION OF ENVIRONMENTAL HEALTH

IN

MANUFACTURE OF BRAKE LININGS

SUBMITTED BY

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INDUSTRIAL HYGIENIST

AUGUST 7, 1959

INDEX

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IN

MANUFACTURE OF BRAKE LININGS

On June 25 and 26, 1959, an environmental health study was conducted to evaluate the hazards associated with the manufacture of brake linings. An investigation was made of airborne lead, airborne asbestos, methyl ethyl ketone and noise exposures. The following general conclusions summarize the exposure in the order of importance.

GENERAL CONCLUSIONS

1. Airborne lead during dry compounding existed in sufficient quantities to be considered a health hazard. The concentration was far above the recognized safe limit of 0.2 milligrams per cubic meter.

2. A borderline health hazard from airborne asbestos exists in the dry compounding area. Improved capture velocities on the dust control equipment will reduce the exposure.

3. The exposure to methyl ethyl ketone is not significant except at the applicator machine in the PC Department.

4. The Ventilation Study indicates improvement is required in control velocities in such areas as Strip Finishing, Compounding and Brake Blok.

5. The Hearing Conservation Study indicates a moderate exposure exists in the Strip Finishing and Brake Blok areas.

The interest of management in the health of the workers is clearly demonstrated by the provision and maintenance of an excellent dust control program.

S. T. Wagner
S. T. Wagner
Industrial Hygienist

STW/oq

GENERAL INFORMATION

Weather Conditions:

This latter part of June was extremely warm. The temperature during the first day was a little above 90°F. Later in the evening local showers raised the humidity to an uncomfortable level. On the second day the same warm conditions existed with very little natural draft. As a result, every available window and door was open to increase natural drafts. The weather at the time of the survey produced conditions to adequately evaluate the dust control equipment with the exception of make-up air.

Production Activity:

On the first shift, production was normal with all departments in operation. On the second shift, a make-up force was in operation.

Acknowledgements:

We would like to thank Mr. C. B. Mallory, Works Manager, for the courtesy and interest that was shown to us in this survey. In particular, we would like to thank Mr. W. H. Baker, Personnel Manager, for his assistance and co-operation in organizing the activities with the various department heads. The supervisory personnel also provided valuable assistance in co-ordinating the various operations required for an environmental study.

AIRBORNE LEAD

Air sampling was conducted in the Strip Finishing, Compounding, Rolling, Brakeblok and Book Press Departments. This phase of the study was conducted to evaluate the exposure of the workers to airborne lead during drilling, grinding, dusting, champering, cut-off, rolling, pre-forming and compounding. The results of this investigation are summarized as follows:

CONCLUSIONS

Compounding:

1. A serious health hazard exists during lead weighing on the dry line in compounding. The airborne lead concentration was 4.33 milligrams per cubic meter; this exceeded the threshold limit of 0.2 milligrams.

2. A borderline health hazard may exist at mixer No.1 when the batch material is discharged to the cart. An increase in the inward draft on the hood is indicated.

3. Airborne lead concentrations during dumping from blender to hammermill No.1 indicates a borderline health hazard may exist.

4. The exposure to airborne lead during lead handling on line No.2 and weighing is not considered a health hazard. Batch weighing and blender loading did not produce excessive airborne lead on the Dry Line.

Rolling:

5. Minimal concentrations of airborne lead existed at the rolling machines except backing machine No.6. At the rolling position the airborne lead level was 0.16 milligrams per cubic meter.

Strip Finishing:

6. Airborne lead did not exceed 0.1 milligrams per cubic meter at the operations in Coil or Industrial Strip Finishing Department.

7. Close surveillance on the exhaust systems is required where the higher lead contamination existed (0.1 milligrams). This consists of Automatic Champer No.2, back grinder No.3 and the exhaust of the Torit Collector for the automatic strip grinder.

Brakeblok:

8. Airborne lead in the finishing and preforming operations did not exist in sufficient concentrations to be considered a health hazard.

General:

9. The exhaust of Torit Dust Collector in the ball joint area was connected to ducts that conveyed the lead particles out of the plant.

10. In the final analysis, an excellent dust control program is in operation except in specific areas where improvement is required.

CONTROLS FOR ATMOSPHERIC CONTAMINATION

1. An exhausted hood covering two-thirds of the periphery of the storage container will maintain airborne lead at a safe limit in dry compounding. A minimum inward draft of 100 feet per minute across the top of the container is required.

2. A bottom door or baffle on No.1 mixer discharge in dry compounding will increase the inward draft or a 3-sided enclosure may be considered.

3. Side baffles on the exhausted transfer from blender to hammer mill will increase the inward draft. Provision of the baffle would not interfere with material flow.

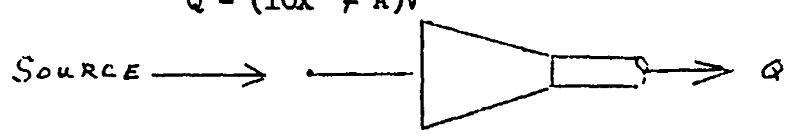
4. Hopper charging on No.6 backing machine in the Rolling Department requires a partial cover to reduce the airborne lead contamination. Moreover, consideration should be given to enclose the feed chute.

DISCUSSION

Provision of an engineered dust control system maintains airborne lead below the threshold limit except the dry line in the Compounding Department. Of course, there are areas where the threshold limit is approached and these are evaluated as borderline health hazards. However, on an overall basis, airborne lead is within reasonable limits and the health hazard is under control.

In the Compound Department dry line, lead for the batch is removed from the fiber drum container without the benefit of local exhaust. Moreover, the handling technique was poor and accounted for the high airborne lead contamination. Local exhaust at the storage drum is required to maintain the exposure at a minimum. This can be accomplished by providing an exhaust for at least two-thirds of the periphery of the fiber drum. Moreover, sufficient capacity is required to maintain an inward draft of at least 100 feet per minute at the source of contamination. The capacity required for the hood can be computed as follows:

$$Q = (10x^2 + A)V$$



Q = Required exhaust volume, cfm.

X = Distance from hood face to farthest point of contaminant release, feet.

A = Hood face area, square feet.

V = Capture velocity, fpm at distance x.

Application of this equation will provide the minimum capacity required to remove the airborne lead from the operator's breathing zone. However, the operator should be required to remove the material from the container without spillage or careless handling.

The blender, hammermill, mixer and discharging cycle in Dry Compounding did not produce exceedingly high airborne lead contamination. However, it is felt that improved inward draft can be achieved by addition of baffles. This is a semi-automatic transfer cycle and properly placed baffles should not interfere with the operating cycle.

In the Rolling Department, airborne lead approached the hygienic standard and a borderline health hazard may exist. It is felt that the primary source of airborne lead is associated with the hopper feed as raw material is introduced. A partial cover for the hopper and enclosure for the feed chute would reduce the airborne lead.

Airborne lead in Strip Finishing was not above the safe limit. However, in comparison, 0.1 milligrams may be considered relatively high with the exposure in other areas. Close surveillance on the Torit collector exhaust, automatic champer No.2 and back grinder No.3 is required because additional airborne lead may result in unsafe concentrations. Primarily, this is a problem of ventilation and will be covered in a separate section.

Hygienic Standard:

The threshold limit for airborne lead has been established as 0.2 milligrams per cubic meter.

Application of controls for atmospheric contamination will control the exposure associated with the use of lead.

DATA

Results of: Airborne Lead

Method of Collecting: Willson pump with filter paper cones and collected at a rate of 20 liters per minute.

Method of Analysis: Dithizone method and read on the Beckman Spectrophotometer.

Strip Finishing (Coil Side)

Sample No.	Time	Location	Results*	MAC*
1.	10:50AM 10 Min.	Breathing zone of operator hand drill No.1.	0.01	0.2
2.	11:01AM 10 Min.	Breathing zone of operator hand drill No.3.	0.02	0.2
3.	12:33PM 5 Min.	Breathing zone of operator multiple drill operator.	0.04	0.2
4.	12:50PM 5 Min.	Breathing zone of operator duster and printer No.2.	0.08	0.2
5.	12:27PM 5 Min.	Breathing zone of operator duster and printer No.1.	0.04	0.2
6.	1:02PM 5 Min.	Breathing zone of operator champer machine No.1.	0.07	0.2
7.	1:10PM 5 Min.	Breathing zone of operator automatic champer No.2.	0.10	0.2
8.	1:19PM 5 Min.	Breathing zone of operator strip grinder No.2.	0.08	0.2
9.	1:25PM 5 Min.	Breathing zone operator back grinder No.3.	0.10	0.2
10.	1:51PM 5 Min.	At exhaust of Torit Dust Collector automatic strip grinder.	0.10	0.2
11.	1:57PM 5 Min.	Breathing zone operator at automatic strip grinder.	0.09	0.2
12.	2:05PM 5 Min.	Breathing zone of operator at No.2 coil grinding.	0.04	0.2

Sample No.	Time	Location	Results*	MAC*
13.	2:11PM 5 Min.	Breathing zone of operator coil cut-off saw.	0.06	0.2
Strip Finishing (Industrial Side)				
14.	11:12AM 10 Min.	Breathing zone operator every cutting.	Trace	0.2
15.	11:23AM 10 Min.	Breathing zone strip grinder.	0.04	0.2
16.	12:27PM 5 Min.	Breathing zone internal grinding.	0.03	0.2
Compounding Room:				
17.	2:55PM 4 Min.	Breathing zone drawing material from storage line No.2.	0.09	0.2
18.	2:59PM 5 Min.	Breathing zone loading mixer line No.2.	0.09	0.2
19.	4:25PM 6 Min.	Breathing zone weighing material on dry line.	4.33	0.2
20.	4:32PM 5 Min.	General room dumping material from blender to hammer mill No.1 dry line.	0.16	0.2
21.	4:45PM 5 Min.	General room at transfer from hammer mill to mixer dry line.	0.09	0.2
22.	5:02PM 5 Min.	Breathing zone at mixer No.1 transfer to cart.	0.18	0.2
Rolling:				
23.	7:17PM 5 Min.	Breathing zone of operator SKA machine No.2.	0.02	0.2
24.	7:23PM 5 Min.	Breathing zone of operator SKA machine No.4.	0.06	0.2
25.	7:53PM 5 Min.	Breathing zone at rolling position backing machine No.6.	0.16	0.2

Brakeblok (Preforming):

Sample No.	Time	Location	Results*	MAC*
26.	8:04PM 5 Min.	Breathing zone at preform machine No.4.	0.09	0.2
27.	8:11PM 5 Min.	Breathing zone at preform machine No.3.	0.03	0.2
Brakeblok (Finishing):				
28.	9:45AM 5 Min.	Breathing zone at trimming machine No.BR-7.	0.03	0.2
29.	9:50AM 5 Min.	Breathing zone at automatic burr and champer machine.	0.06	0.2
30.	9:56AM 5 Min.	General room at radius grinder No.3.	0.09	0.2
31.	10:05AM 5 Min.	Breathing zone at automatic drilling machine No.3.	0.05	0.2
32.	10:11AM 5 Min.	Breathing zone at strip grinder No.3.	0.04	0.2
Book Press:				
33.	8:22PM 5 Min.	Breathing zone at No.7 preforming press.	0.03	0.2
34.	8:28PM 5 Min.	Breathing zone at No.3 preforming press.	0.04	0.2
35.	8:35PM 5 Min.	Breathing zone at champer preforming.	0.05	0.2

*Results and Maximum Allowable Concentrations (MAC) are expressed in milligrams per cubic meter.

AIRBORNE ASBESTOS

An investigation was conducted in the Compounding Department to evaluate the exposure to airborne asbestos. Air sampling was conducted in the Wet and Dry Compounding lines. The results are summarized as follows:

CONCLUSIONS

1. A borderline health hazard exists at the weigh and dumping stations in the wet line. Airborne abestos was slightly above and below the recognized safe limit of 5 million particles per cubic foot of air.

2. During weighing and blender charging on the Dry Line, airborne asbestos exceeded the recognized safe limit of 5 million particles.

3. The primary cause of airborne dust can be attributed to lack of sufficient inward drafts at the source of contamination. The velocities ranged from 0 to 100 feet per minute.

CONTROLS FOR AIRBORNE ASBESTOS

1. An inward draft of 100 feet per minute from the furthest point from the lateral exhaust at the weigh station in wet compounding will maintain the airborne dust at a minimum. The inward draft at the source of contamination was zero.

2. The inward draft during dumping into the digestor has insufficient capture velocity to remove the dust generated by the surge of material. A minimum inward draft of 200 feet per minute is required at the wet line.

3. A minimum inward draft of 100 feet per minute at the source of contamination is required at the weigh scale in dry compound. Baffles with increased capacity may provide the control velocity.

4. The lateral exhaust hoods on the blender are not evenly balanced. Balancing of the system is required to maintain a control velocity of 100 feet per minute at the source of contamination.

DISCUSSION

Adequate dust control equipment is provided but the inward draft does not have sufficient capture velocities. The velocities ranged from zero to 100 feet per minute on the various lateral exhaust installations. This is primarily caused by insufficient capacity and an unbalanced exhaust system. Since the design incorporates lateral exhaust, the control velocities should comply with the American Standards Association Code for Ventilation and Operation of Open Surface Tanks. This design criteria takes into consideration the tank width and length so that adequate control velocity is maintained at the center of the tank or the source of airborne dust.

In the wet compounding area the velocity at the weigh station was zero. The lateral hood had insufficient capacity to provide a control velocity of 100 feet per minute at the furthest point from the hood. This is also reflected in the results of air sampling as shown by Sample No.1. Dumping into the digester produced airborne dust that exceeded the threshold limit. A velocity of 25 feet per minute is maintained but it is ineffective when the surge from the hopper displaces the air from the digestor. A minimum inward draft of 100 feet per minute is required.

In Dry Compounding, a similar condition exists at the weigh scale. A lateral exhaust is provided but a inward draft of only 50 feet per minute exists. Much of the dust generation is outside of the capture effect of the control velocity. The blender is also provided with lateral exhaust but the system is unbalanced. The inward draft on the left side is zero (this is opposite the hood) and increase to 100 feet per minute near the hood. Apparently, the system was designed to operate with a cover so that the capture velocity was reduced when the area was increased. A minimum inward draft of 100 feet per minute is required from the furthest point of the hood to remove airborne asbestos from the breathing zone of the worker.

Hygienic Standard:

The safe limit for airborne asbestos has been established as 5 million particles per cubic foot of air.

An evaluation of the capacities of the asbestos exhaust equipment will provide adequate inward draft to maintain the airborne dust at a minimum.

DATA

Results of: Airborne Asbestos

Method of Collecting: Willson pump with midget impingers and collected at a rate of 5 liters per minute in distilled water.

Method of Analysis: The samples were counted microscopically by the light field technique on a Spencer Bright-Line Haemacytometer Counting Cell.

Sample No.	Time	Location	Results*	MAC*
1.	3:08PM 10 Min.	Breathing zone operator dumping material at weigh station - Wet Compounding.	4.8	5.0
2.	3:08PM 10 Min.	Breathing zone while dumping material into digestor - Wet Compounding.	6.0	5.0
3.	3:42PM 10 Min.	General room at digestor No.1 in Wet Compounding.	13.1	5.0
4.	3:42PM 10 Min.	General room at digestor No.2 in Wet Compounding.	3.7	5.0
5.	3:58PM 5 Min.	Breathing zone opening and charging weigh scale in Dry Compounding.	8.5	5.0
6.	3:58PM 5 Min.	Breathing zone charging blender in Dry Compounding.	6.8	5.0

*Results and Maximim Allowable Concentration (MAC) are expressed in million particles per cubic foot of air.

METHYL ETHYL KETONE VAPOR IN AIR

Air sampling for methyl ethyl ketone vapor in air was conducted in the PC and Blok Cement Compounding areas. The results of this investigation are summarized as follows:

CONCLUSIONS

PC Department:

1. The short part cleaning cycle did not produce significant concentrations of methyl ethyl ketone vapor in air.

2. The operator at the applicator machine is exposed to a borderline health hazard. The vapor in air was 254 parts per million; this is slightly above the accepted safe limit of 250 parts per million

Blok Cement Compounding:

3. Simulated operations did not indicate a health hazard exists during the use of methyl ethyl ketone in the cement compounding area.

4. Handling and storage techniques indicate that excessive vapor concentrations will not exist under normal operating conditions.

CONTROL FOR METHYL ETHYL KETONE IN AIR

1. A local exhaust with a minimum inward draft of 100 feet per minute at the point of operation on the applicator will reduce the methyl ethyl ketone vapor.

DISCUSSION

Storage and Handling:

Methyl ethyl ketone in the PC Department and Blok Cement Compounding area should not present any serious health hazard under normal operating conditions.

PC Department:

The methyl ethyl ketone for cleaning is stored in a safety can and cleaning is conducted with minimum exposure to the worker. The parts are stored in the solvent and wiped clean after the cement is removed.

A borderline health hazard exists at the applicator machine. Vapor concentrations were slightly above the recognized safe limit of 250 parts per million. For this reason, it is felt that local exhaust should be provided at the point of application. This local exhaust will remove the vapor from the breathing zone of the operator.

Blok Cement Compounding Area:

A simulated operation was investigated and the results indicate that a health hazard is not present. Storage and handling of the solvent appear to control the exposure. However, periodic follow-up should be made by supervision to maintain safe operating techniques.

Hygienic Standard:

The safe limit for methyl ethyl ketone has been established as 250 parts per million.

The safe operating techniques control the health hazard that normally would be associated with this type of operation.

DATA

Results of: Methyl Ethyl Ketone Vapor in Air.

Method of Collecting: Bottle samples that were had aspirated were used for collecint purposes.

Method of Analysis: Idometric Method.

Sample No.	Location	Results*	MAC*
PC Department:			
1.	BZ before cleaning with MEK in PC department.	Negative	250
2.	BZ of worker during cleaning of parts with MEK in PC Department.	Negative	250
3.	BZ of operator at head drying area after cleaning in PC Department.	Negative	250
4.	GR in PC Department.	Negative	250
5.	GR at conveyor in PC Department.	32	250
6.	BZ of operator at applicator machine.	254	250
7.	GR at production conveyor area.	Negative	250
Blok Cement Compounding Area:			
8.	GR in blok cement compounding area.	Negative	250
9.	BZ of operator drawing MEK in blok cement compounding area.	Negative	250
10.	BZ of operator after drawing MEK into bucket in blok cement compounding area.	Negative	250
11.	GR in cement compounding area.	Negative	250
12.	GR at pump station for MEK in cement compounding area.	Negative	250

*Results and Maximum Allowable Concentration (MAC) are expressed in parts per million.

HEARING CONSERVATION SURVEY

A noise study was conducted to evaluate the exposure to the workers in the Finishing and Brake Blok Department. The conclusions are summarized as follows:

CONCLUSIONS

1. The noise exposures in the Finishing and Brake Blok Departments range from a marginal to a moderate noise classification.

2. Internal grinding in Strip Finishing (Industrial Side) can be classified as moderate.

NOISE CONTROL PRACTICES

1. Ear protection can be supplied for those operators who are in a moderate noise classification.

2. It is suggested that audiometric testing be adopted for those individuals who are required to wear ear protection.

DISCUSSION

The Hearing Conservation Survey indicates that the workers are not exposed to severe noise classifications in the Finishing and Brake Blok Department. At the present time, the more feasible approach to control would be in the way of ear protection. This protection can be made available for those workers who are in a moderate or near moderate exposure.

The undertaking of an ear protection program requires some method of evaluating the co-operation of the workers. Audiometric testing is generally accepted as an established procedure in this matter. In this way, periodic tests can be made to determine if the worker is wearing the ear protection or if the proper fit exists.

NOISE CLASSIFICATIONS

For descriptive purposes, it is possible to categorize noise exposures in terms of the approximate effect on a group of workers. As a result of the data analysis of a large number of surveys, we have grouped noise exposures in the following four classifications.

CLASSIFICATION A - Severe Exposures - Whenever the noise levels in any octave band above (but not including) the 150 to 300 cycle per second band are in excess of 105 decibels, we may expect that the majority of personnel exposed to such noise for a working period of from 10 to 20 years will have sufficient hearing loss to cause slight difficulty in understanding normal speech.

CLASSIFICATION B - Moderate Exposures - Whenever the noise levels in any octave band above (but not including) the 150 to 300 cycle per second band are between 95 and 105 decibels, we may expect that a significant percentage of workers exposed to such noise for a working period of from 10 to 20 years will have sufficient hearing loss to cause slight difficulty in understanding normal speech.

CLASSIFICATION C - Marginal Exposures - Whenever the noise levels in any octave bands (but not including) the 150 to 300 cycle per second band are between 85 and 94 decibels, we may expect that the rare noise sensitive worker exposed to such noise for a 10 to 20 year period will have sufficient hearing loss to cause slight difficulty in understanding normal speech.

CLASSIFICATION D - No Exposure - Noise levels below 85 decibels are not hazardous. Even after a lifetime in such an environment, it is unlikely that hearing loss will be incurred.

While the classifications will be of value as a guide in evaluating exposures, it should be remembered that the decibel groupings are based upon relatively constant exposure over an 8 hour day.

DATA

Results of: Hearing Conservation Survey

Method of Analysis: A General Radio Sound Survey Meter - Type No.155A, Serial No.745 was used. The approximate frequency analysis in three bands was computed using the method of J.R. Cox, Liberty Mutual Insurance Company, as reported in the General Radio Handbook of Noise Measurement.

Position No.	Location	Decibels* Low Band (20-150 cps)	Decibels* Middle Band (150-600cps)	Decibels* High Band (600-8000cps)
Strip Finishing (Coil Side)				
1.	Hand Drill No.1	84	83	83
2.	Hand Drill No.3	87	77	85
3.	Multiple Drilling	82	85	80
4.	Duster & Printer No.1	91	86	91
5.	Champer Machine No.1	83	89	92
6.	Automatic champer machine No.2.	92	84	90
7.	Strip Grinder No.2.	87	85	93
Strip Finishing (Industrial Side)				
8.	Saw Cutting	92	87	92
9.	Internal Grinding	92	92	98
Brake Blok Finishing				
10.	Brake Blok Trimming BR7	85	85	94
11.	Automatic Burr and Champer	85	86	92

*Decibels re 0.0002 microbar

VENTILATION STUDY

The inward draft on various machines in the Strip Finishing, Compounding, Rolling and Brake Blok Departments was measured. This investigation was conducted to determine if adequate velocities were maintained at the point of operation.

CONCLUSIONS

1. Adequate inward draft is maintained on the surveyed machines in the Strip Finishing Department. Velocities ranged from 100 to 200 feet per minute.

2. Improvement in the control velocities for specific operations in the Compounding Department is in order.

3. Sufficient capture velocities are provided for those machines in the Rolling Department with exhaust hoods.

4. The exhaust system on the preforming machines in Brake Blok is unbalanced. The inward draft at the point of operation ranged from 0 to 200 feet per minute.

5. The inward draft at the point of operation averaged 150 feet per minute in Brake Blok Finishing except the automatic burr and champer machine.

APPLICATION OF LOCAL EXHAUST VENTILATION

1. The inward draft on the plain duct ends in the Finishing Department can be improved by the addition of the flanged end.

2. Addition of baffles for the transfer points from blender to mixdrs in dry compounding will reduce the open area and increase the inward draft.

3. The exhaust system on the Brake Blok preforming machines is unbalanced. A minimum inward draft of 150 feet per minute across the die will prevent airborne contamination.

4. Flanged end ducts bolted to the preforming machines in Brake Blok will increase the inward draft and prevent workers from changing the duct position.

5. An enclosure for the automatic burr and champer machine in Brake Blok finishing will prevent the high velocity particles of brake lining from becoming airborne. This will also improve the inward draft at the point of operation.

DISCUSSION

An excellent dust control system has been installed. However, there are certain applications of design criteria that will further improve the capturing velocities on the hoods. A flanged duct end on the plain duct ends will improve the inward draft. The coefficient of entry for a plain duct end is 0.72 and can be increased to 0.82 with the addition of a flange. Moreover, the loss in per cent of velocity head will be reduced from 93 for an open end to 49 for a flanged end. Application of this principle over the entire system will provide optimum operating efficiency.

Strip Finishing:

The exhaust on the machines in strip finishing are all equipped with plain duct end openings. Provision of flanged duct ends and properly positioned at the point of operation will maintain airborne lead at a absolute minimum. With the current practice, the operator positions the duct as he sees fit and this does not provide adequate control in some instances.

Compounding:

Adequate inward draft is maintained on the transfer points from the blender to the mixers. However, a baffle will improve the inward draft on the transfer hoods by decreasing the area in relation to the basic equation $Q = AV$ where Q is the capacity in feet per minute, A is the area in square feet and V is the velocity in feet per minute. With constant capacity and a decrease in hood area, the v-locity will increase.

Brake Blok:

The plain end duct openings on the preforming machines are not properly positioned. The operators set the ducts at their own standard and as a result, adequate inward draft is not maintained at the point of operation. This system requires balancing and application of flanges with proper location. The flanges can be used to bolt the ducts to the machine and this will eliminate lack of proper ventilation.

Brake Blok finishing also has plain ducts and the capture velocity can also be improved by the addition of flanges. Ventilation is provided for the automatic burr and champer but the dust particles have high velocity and cannot be captured by the plain and ducts. Therefore, an enclosure at the point of operation will isolate the particles and allow the ducts to remove the contaminants.

DATA

Results of: Ventilation Study

Method of Analysis: An Alnor Velometer manufactured by the Illinois Testing Laboratories was used. This instrument expressed the air velocity in feet per minute.

Position No.	Location	Velocity*
Strip Finishing (Coil Side)		
1.	Hand drill No.1 at point of operation.	150
2.	Hand drill No.2 at point of operation.	200
3.	Hand drill No.3 at point of operation.	200
4.	Point of operation at No.2 Duster and Printer.	150
5.	Point of operation at automatic champer No.2.	200
6.	Point of operation on strip grinder No.2.	200
7.	Point of operation back grinder No.3.	200
8.	Source of contamination at automatic strip grinder.	100
9.	Point of operation a coil grinding machine No.2.	200
Compounding Department:		
10.	Point of operation at wet mixer No.1.	50
11.	Point of operation at wet mixer No.2.	50
12.	Weigh station on wet compounding at source.	0
13.	Dumping into digester wet compounding.	25

Position No.	Location	Velocity*
14.	Left side of blender in dry compounding.	0
15.	Right side of blender near hood in dry compounding.	100
16.	Opening and charging weigh scale at top of scale on dry compound line 2.	50
17.	Hood at transfer to hammer mill in dry compounding.	180
18.	Hood at transfer to mixer in dry compounding.	50
19.	Transfer from small to large mixer.	100
20.	Transfer from mixer to cart dry compounding.	100
Rolling Department:		
21.	Backing machine No.6 at roll up position.	150
22.	Backing machine No.6 at table position.	200
23.	Rolling machine SKA73	No Ventilation
24.	Rolling machine SKA23	No Ventilation
25.	Rolling machine SKA24	No Ventilation
Brake Blok Department:		
26.	Brake blok preforming machine No.1 at die.	0
27.	Brake blok preforming machine No.2 at die.	200
28.	Brake blok preforming machine No.3 at die.	150
29.	Brake blok preforming machine No.4 at die.	150
30.	Brake blok preforming machine No.5 at die.	50
31.	Brake blok preforming machine No.6 at die.	50
32.	Automatic Burr and Champer in finishing.	0

Position No.	Location	Velocity*
33.	Automatic drilling machine No.4 in finishing.	125
34.	Automatic drilling machine No.4 in finishing.	150
35.	Hand drill machine No.1 at point of operation in finishing.	200
36.	Point of operation at strip grinder No.3 in finishing.	150

*Velocity is reported as inward draft in feet per minute.