Table 2-1. DILUTION AIR VOLUMES FOR VAPORS

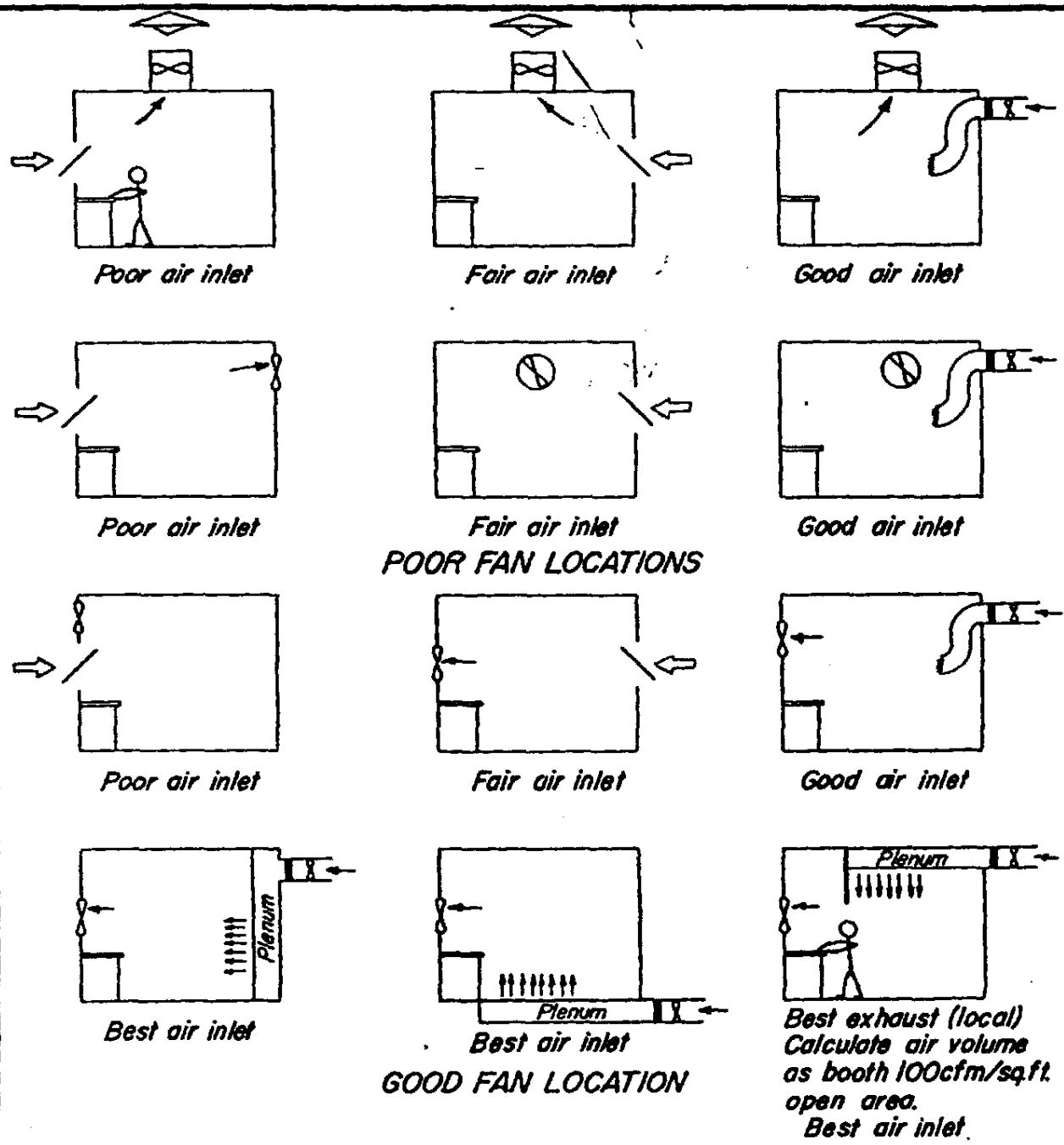
The following values are tabulated using the TLV values shown in parentheses, parts per million. TLV values are subject to revision if further research or experience indicates the need. If the TLV value has changed, the dilution air requirements should be calculated from the following formulae.

$$\text{Cu ft air per pint evaporated} = \frac{403 \times \text{sp. gr. liquid} \times 1{,}000{,}000 \times K}{\text{molecular weight liquid} \times \text{TLV}}$$

$$\text{Cu ft air per lb evaporated} = \frac{387 \times 1{,}000{,}000 \times K}{\text{molecular weight liquid} \times \text{TLV}}$$

Liquid	Cu ft of air (STP) required for dilution to TLV*	
	Per Pint Evaporation	Per Pound Evaporation
Acetone (1000)	5,500	6,650
n-Amyl acetate (100)	27,200	29,600
Isoamyl alcohol (100)	37,200	43,900
Benzol (25)	Not Recommended	
n-Butanol (butyl alcohol) (100)	44,000	52,200
n-Butyl acetate (150)	20,400	22,200
Butyl cellosolve (50)	61,600	65,600
Carbon disulfide (20)	Not Recommended	
Carbon tetrachloride (10)	Not Recommended	
Cellosolve (2-Ethoxyethanol) (200)**	20,800	21,500
Cellosolve acetate (2-ethoxyethyl-acetate)(100)	29,700	29,300
Chloroform (25)	Not Recommended	
1-2 Dichloroethane (50)** (ethylene dichloride)	Not Recommended	
1-2 Dichloroethylene (200)	26,900	20,000
Dioxane (100)	47,300	43,900
Ethyl acetate (400)	10,300	11,000
Ethyl alcohol (1000)	6,900	8,400
Ethyl ether (400)	9,630	13,100
Gasoline	Requires special consideration	
Methyl acetate (200)	25,000	26,100
Methyl alcohol (200)	49,100	60,500
Methyl butyl ketone (100)	33,500	38,700
Methyl cellosolve (25)	Not Recommended	
Methyl cellosolve acetate (25)	Not Recommended	
Methyl ethyl ketone (200)	22,500	26,900
Methyl isobutyl ketone (100)	32,300	38,700
Methyl propyl ketone (200)	19,000	22,400
Naptha (coal tar) (100)	30,000-38,000	40,000-50,000
Naptha (petroleum) (500)	Requires special consideration	
Nitrobenzene (1)	Not Recommended	
n-Propyl acetate (200)	17,500	18,900
Isopropyl alcohol (400)	13,200	16,100
Isopropyl ether (500)**	5,700	7,570
Stoddard solvent (200)	15,000-17,500	20,000-25,000
1,1,2,2-Tetrachloroethane (5)	Not Recommended	
Tetrachloroethylene (100)	39,600	23,400
Toluol (Toluene) (100)	9,500	10,500
Trichloroethylene (100)	45,000	29,400
Xylol (xylene) (100)	33,000	36,400

* The tabulated dilution air quantities must be multiplied by the selected K value.
** See Threshold Limit Values for 1973 in Appendix.
See Appendix for additional TLV and for LEL values.



Note:
Inlet air requires tempering during winter months.
See Section 7

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

PRINCIPLES OF DILUTION VENTILATION

DATE 1-66 | Fig. 2-1

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The principles to be applied to a dilution ventilation system are as follows:

1. Select from factual data the amount of air required for satisfactory dilution of the contaminant. The values tabulated on Table 2-1 assume perfect distribution and dilution of the air and solvent vapors. These values must be multiplied by the proper K value.
2. Locate the exhaust openings near the sources of contaminant, if possible, in order to obtain the benefit of "spot ventilation."
3. In order for dilution methods to be effective, the exhaust outlet and air supply must be so located that all the air employed in the ventilation passes through the zone of contamination.
4. Replace exhausted air by a make-up air system. Make-up air should be heated during cold weather. Dilution ventilation systems usually handle large quantities of air by means of propeller fans. Make-up air usually must be provided if the ventilation is to be adequate and the system to operate satisfactorily.
5. The general air movements in the room should keep the source between the operator and the exhaust opening.
6. A combined supply and exhaust system is preferred with a slight excess of exhaust if there are adjoining occupied spaces and a slight excess of supply if there are no such spaces.
7. Avoid re-entrance of the exhausted air by discharging the exhaust high above the roof line or by assuring that no window, outside air intakes or other such openings are located near the exhaust discharge.

Dilution Ventilation for Fire and Explosion

Another function of dilution ventilation is to reduce the concentration of vapors within an enclosure to below the lower explosive limit. It should be stressed that this concept is never applied in cases where workers are exposed to the vapor. In such instances, dilution rates for health hazard control are always applied. The reason for this will be apparent when comparing TLV's and lower explosive limits (LEL's).

The TLV of xylol is 100 ppm. The LEL of xylol is 1% or 10,000 ppm. An atmosphere of xylol safeguarded against fire and explosion will usually be kept at 25% of the LEL or 2500 ppm. Exposure to such an atmosphere may cause severe illness or death. However, in baking and drying ovens, in enclosed air drying spaces, within ventilation ductwork, etc., dilution ventilation for fire and explosion is used to reduce the vapor concentration to below the LEL.

The formulas listed on page 2-2 may be modified to yield air quantities to dilute to below the LEL. By substituting LEL for TLV:

$$\text{Cu ft per pint evaporated} = \frac{(403)\ (\text{sp. gr. liquid})\ (100)\ (C)}{(\text{Mol. wt liquid})\ (\text{LEL})\ (B)} \quad \text{(For Standard Air)}$$

Note: 1. Since LEL is expressed in %(parts per 100) rather than ppm (parts per million as for the TLV), the factor of 1,000,000 becomes 100.

2. C is a safety factor which depends on the percentage of the LEL necessary for safe conditions. In most ovens and drying enclosures it has been found desirable to maintain vapor concentrations at not more than 25% of the LEL at all times in all parts of the oven. In properly ventilated continuous ovens, a C factor of 4 is used. In batch ovens, with good air distribution, the existence of peak drying rates requires a C factor of 10 or 12 to maintain safe concentrations at all times. In non-recirculating or improperly ventilated batch or continuous ovens, larger C factors may be necessary.

3. B is a constant which takes into account the fact that the lower explosive limit of a solvent vapor-air mixture decreases at elevated temperatures. B = 1 for temperatures up to 250 F; B = 0.7 for temperatures above 250 F.

Example I

A batch of enamel dipped shelves is baked in a recirculating oven at 350 F for one hour. The volatiles in the enamel applied to the shelves consist of two pints of xylol. What oven ventilation rate, in cfm, is required to dilute the xylol vapor concentration within the oven to a safe limit at all times?

For xylol, the LEL = 1%; Sp. gr. = 0.88; Mol. Wt. = 106; C = 10; B = 0.7. From the above formula:

$$\text{cu ft per pint evaporated} = \frac{(403)(0.88)(100)(10)}{(106)(1)(0.7)}$$

For two pints of xylol evaporated in one hour:

$$\text{cfm}_{(STP)} = \frac{(2)(403)(0.88)(100)(10)}{(106)(1)(60)(0.7)} = 158$$

Since the above formula is at standard conditions, the air flow rate must be converted from 70 F to 350 F (operating conditions).

$$\text{acfm}_{350\ F} = (\text{cfm}_{STP})\ \text{(Ratio of Absolute Temperatures)}$$

$$= (\text{cfm}_{STP})\ \frac{(460\ F + 350\ F)}{(460\ F + 70\ F)}$$

$$\text{acfm}_{350\ F} = (158)\ \frac{(810)}{(530)} = 242$$

Example II

In many circumstances, solvent evaporation rate is non-uniform due to the process temperature or the manner of solvent use.

A 6 ft diameter muller is used for mixing resin sand on a 10 minute cycle. Each batch consists of 400 pounds of sand, 19 pounds of resin and 8 pounds of ethyl alcohol. What ventilation rate is required?

For ethyl alcohol: LEL = 3.28%; mol wt = 46.07; C = 4; B = 1

$$\text{cu ft per pound evaporated} = \frac{(387)\ (100)\ (C)}{\text{Mol wt x LEL x B}} = \frac{(387)\ (100)\ (4)}{(46.07)\ (3.28)\ (1)} = 1022$$

For 8 pounds of ethyl alcohol evaporated in 2 minutes:

$$\text{cfm}_{(STP)} = \frac{8}{2} \times 1022 = 4088$$

To convert to operating conditions, 200 F

$$\text{acfm}_{(200\ F)} = 4088\ \frac{(460\ F + 200\ F)}{(460\ F + 70\ F)} = 5100$$

Another source of data is the National Board of Fire Underwriters' Pamphlet #86, "Standard for Class A Ovens and Furnaces". This contains a more complete list of solvents and their properties. In addition it lists and describes a number of safeguards and interlocks which must always be considered in connection with fire dilution ventilation. See also Reference 81.

Mixtures

In many cases the parent liquid for which dilution ventilation rates are being designed will consist of a mixture of solvents. The common procedure used in such instances is as follows.

Health Dilution Ventilation

When two or more hazardous substances are present, their combined effect, rather than that of either individually, should be given primary consideration. In the absence of information to the contrary, the effects of the different hazards should be considered as additive. That is, if the sum of the following fractions,

$$\frac{C}{TLV_1} + \frac{C}{TLV_2} + \cdots + \frac{C}{TLV_n}$$

exceeds unity, then the threshold limit of the mixture should be considered as being exceeded. C indicates the observed atmospheric concentration and TLV the corresponding threshold limit.

Exceptions to the above rule may be made when there is good reason to believe that the chief effects of the different harmful substances are not in fact additive but independent, as when purely local effects on different

organs of the body are produced by the various components of the mixture. In such cases, the threshold limit ordinarily is exceeded only when at least one member of the series $\left(\frac{C_1}{TLV_1} \text{ or } \frac{C_2}{TLV_2}, \text{ etc.}\right)$ itself has a value exceeding unity.

Where two or more hazardous substances are present, the dilution ventilation should be therefore calculated in the absence of information to the contrary on the basis that the effect of the different hazards is additive. The air quantity required to dilute each component of the mixture to the required safe concentration is calculated and the sum of the air quantities is used as the required dilution ventilation for the mixture.

Where two or more hazardous substances are present and it is known that the effects of the different substances are not additive but act independently on the different organs of the body, the required dilution ventilation for each component of the mixture should be calculated and the highest cfm thus obtained used as the dilution ventilation rate.

Example III

A paint stripping operation is being performed; methylene chloride (dichlormethane) and methyl alcohol (methanol) are being released. Both of these have narcotic properties and the effects are considered additive. Air samples disclose concentrations of 300 ppm methylene chloride and 100 ppm methyl alcohol. Using the equation given, the sum of the fractions $\left(\frac{300}{500} + \frac{100}{200} = 1.1\right)$ is greater than unity and the TLV of the mixture is exceeded. The volume of air at standard temperature and pressure required for dilution of this mixture to the TLV would be as follows.

Assume that 2 pints of each is being released each hour. Select a "K" value of 4 for methylene chloride and a "K" value of 6 for methyl alcohol.

$$\text{Dilution rate for methylene chloride} = \frac{403 \times 1.336 \times 1{,}000{,}000 \times 4 \times 2}{84.94 \times 500 \times 60} = 1700 \text{ cfm (STP)}$$

$$\text{Dilution rate for methyl alcohol} = \frac{403 \times 0.792 \times 1{,}000{,}000 \times 6 \times 2}{32.04 \times 200 \times 60} = 9950 \text{ cfm (STP)}$$

Dilution rate for the mixture = 1700 + 9950 = 11,650 cfm

Fire Dilution Ventilation

There is a formula for determining the lower explosive limit of mixtures of gases which is usually correct but which frequently shows a marked discrepancy between calculated and observed values, particularly for mixtures of solvent vapors. This formula is useful when its applicability to a particular mixture of solvent vapors can be demonstrated but it cannot be applied indiscriminately.

In such instances, it is common practice to regard the entire mixture as consisting of the components requiring the highest amount of dilution air per unit liquid volume and to calculate the required air quantity on that basis. (This component would be the one with the highest value for $\frac{\text{sp. gr}}{(MW)(LEL)}$).

Curve Fitting

In addition to characterizing a population, the methods of statistics are often used in making predictions. This involves the consideration of relationships between two or more variables. Such a study usually begins with the plotting of the points on a rectangular coordinate system, giving a visual image of the relationship between the variables. In the case where the values of y are fairly well approximated by a linear function of x, linear correlation is said to exist. A measure of the closeness of this correlation is given by the linear correlation coefficient

$$r = \frac{\sum_{i=1}^{n} (x_i - \bar{x}) \cdot (y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2 \cdot \sum_{i=1}^{n} (y_i - \bar{y})^2}}.$$

If this value is close to 0, there is little linear relationship between the variables; while if it is near $+1$ or -1, the linear relationship may be greater. However, the extent of such a relationship depends strongly on the sample size. Also, there may be a high degree of correlation that is not of the linear type and thus not indicated by the linear correlation coefficient.

When a relationship is seen to exist between two variables, it is often desirable to approximate the function in order to predict the value of one variable from the other. This is often accomplished simply by joining the data points by a curve that appears to best approximate the relationship, as shown in Figure 3-9.

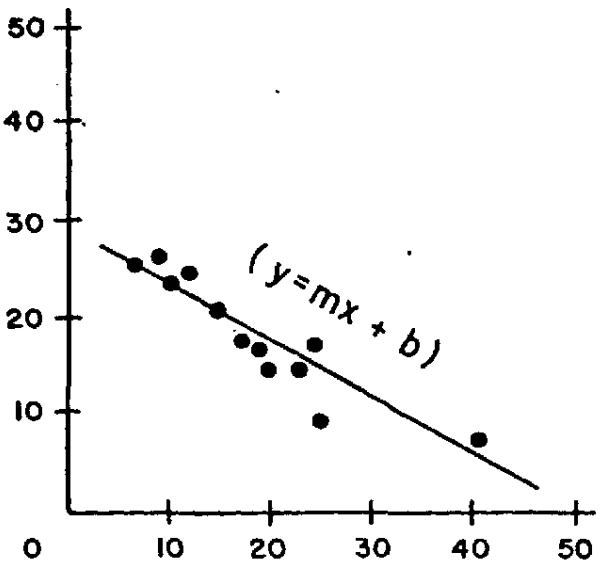

Figure 3-9

An equation of this curve can then be found by substituting points on the curve into the general equation of the curve and solving the resulting equations simultaneously. A more precise method of determining the equation is given by the method of least squares, a procedure which minimizes the error committed in fitting a curve of a definite type to a set of data. A detailed description of this method can be found in most of the references cited at the end of this chapter.

Dimensional Analysis

Expressions of concentrations of atmospheric contaminants in industrial hygiene are usually corrected to 25°C and 760 mm Hg pressure, but the actual conditions are frequently not sufficiently removed from this standard to require temperature and pressure corrections. When calculating concentrations, recall that one gram-mole is the amount of material in grams equal to the molecular weight of the material. Also, at standard temperature and pressure (0°C and 760 mm Hg), one gram-mole of any compound in the gaseous state occupies 22.4 liters.

Terms Peculiar to Industrial Hygiene

The concentration of gases and vapors is usually expressed as parts per million parts of air, ppm, on a volumetric basis.

$$\text{ppm} = \frac{\text{parts}}{10^6 \text{ parts (air)}} = \frac{\text{micro-liter}}{\text{liter (air)}} = \frac{\text{cubic meters}}{10^6 \text{ cubic meters (air)}} = \frac{\text{cubic feet}}{10^6 \text{ cubic feet (air)}}$$

This is similar to the concept of percent,

$$\% = \frac{\text{parts}}{100 \text{ parts}}.$$

The concentration of fumes, mists, dusts, and of gases and vapors on occasion, is expressed as milligrams of material per cubic meter of air, mg/M^3.

Examples

(1) Given the concentration of a contaminant in ppm, convert to mg/M^3.

$$\text{Since 1 ppm} = \frac{1 \text{ liter}}{10^6 \text{ liters}},$$

$$\text{Concentration} = \left(\frac{1 \text{ liter}}{10^6 \text{ liters}}\right) \times \left(\frac{1 \text{ gram-mole}}{22.4 \text{ liters}}\right) \times \left(\frac{\text{MW Grams}}{\text{gram-mole}}\right) \times \left(\frac{10^3 \text{ liters}}{M^3}\right) = \frac{\text{grams}}{10^3 M^3} = \frac{\text{mg}}{M^3}.$$

At 25°C and 760 mm Hg, one gram-mole of a perfect gas or vapor occupies 24.45 liters. Therefore, under these conditions,

$$\frac{\text{mg}}{M^3} = \text{ppm} \times \frac{\text{Molecular Weight}}{24.45}.$$

(2) Derive an equation for the preparation of

a known concentration of a volatile liquid given the following:

V_T = Chamber volume in liters
MW = Molecular weight of a substance
T = Absolute temperature
P = Pressure in mm Hg
ρ = Density in grams per milliliter
v = Volume of material to be used in milliliters
C = Concentration in ppm

$$C\ (ppm) = \frac{(v\ ml)\ \rho\ \frac{gm}{ml}\ \frac{22.4\ liters}{gm\text{-}mole}\ \frac{gm\text{-}mole}{MW\ gms}\ \frac{T}{273}\ \frac{760}{P}}{V_T\ Liters} \times \frac{10^6\ parts}{10^6\ parts}$$

$$= \frac{(v)\ (\rho)\ \frac{22.4}{MW}\ \frac{T}{273}\ \frac{760}{P}}{V_T} \times 10^6.$$

Recommended Reading

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1. Our standard operating procedure of locking [illegible] ventilating of the polymerizers will be continued and closely policed.

2. The present warning system in the event of a fire in the plant is believed to provide adequate warning to the man working inside a polymerizer; however, this will be reviewed by Mr. Brooks and his staff and if it is inadequate, a suitable alarm device will be located at the polymerizer.

3. A control switch will be located in the ventilating line, which supplies exhaust ventilation to the polymerizer, and this switch will activate an alarm in the event the ventilation system becomes inoperable.

4. An automatic alarm device will be located outside of the polymerizer being cleaned, of the same type that we now use generally in our PVC Plants. This consists of an automatic alarm sounding every three to four minutes and requires acknowledgment by the polymerizer cleaner. A failure to acknowledge indicates the cleaner's inability to do so and a general plant alarm immediately sounds.

W. E. McCormick

dd

cc: J. Wade Miller Jr.

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COMPANY CONFIDENTIAL

Report of Visit to the Welland Plant
September 24, 1968

A visit was made to the Welland Plant on September 24, 1968 for the purpose of reviewing manufacturing operations with respect to industrial health hazards. As a result of this visitation, the following recommendations and results are presented:

Recommendations:

Require the wearing of ear protective devices on those personnel entering the grinding room of the dryer building.

Results and Discussion:

1. Poly Entry

Since mid-1967, standbys have not been present during polycleaning, but rather the warning system, which is in use in all BFG-U.S. polyvinyl grinding plants has been in effect. This system has been well accepted by cleaning personnel, and the provincial authorities are agreed that it is satisfactory.

2. Noise Measurements

Noise measurements were taken at the most obviously noisy locations in the Plant and the following results obtained:

Location	Overall	Noise Level (decibels) at Indicated Frequency							
		0-75	75-150	150-300	300-600	600-1200	1200-2400	2400-4800	4800 Up
Dryer Building									
Baggers station, just outside of grinding room. Door of room open 1".	88	84	81	79	81	77	74	72	68
Inside of grinder room, one grinder running.	105	84	98	94	100	100	95	90	88
Poly Building									
Operating area, 1st floor.	89	77	76	80	82	82	82	78	67
" " 2nd floor.	92	81	81	83	84	84	85	82	73
" " 3rd floor.	90	80	79	80	81	84	82	78	69

Noise levels in excess of an average of 85db in the frequency bands of 300-600, 600-1200 and 1200-2400 may produce occupational hearing loss. The only location where a noise hazard exists is inside of the grinding room of the dryer building. Personnel do not spend a great amount of time inside of this room, but when they enter, they should be equipped with ear protective devices to reduce their noise exposure to acceptable levels.

3. Miscellaneous

In general, the environmental conditions in this Plant were found to be good. A strong program is in effect by the Plant's Management to control health and safety hazards.

W.E. McCormick

mj
10/9/68

LOUISVILLE SITUATION--Mr. Vittone reviewed the plans for the Occupational Safety and Health Administration Hearings on possible hazards of vinyl chloride manufacturing and use to be held in Washington February 15, 1974. He stated that in addition to BFG, presentations will be made by the Manufacturing Chemists Association, Dr. Selikoff of Mount Sinai School of Medicine, Professor Meltoni of Italy, Dow Chemical, and possibly the Organization Resources Council.

The various points to be covered by Mr. Vittone in his testimony were discussed. Mr. Vittone will be accompanied by Dr. Johnson, Dr. Strassburg, and Messrs. Bell, Buehler and Fast.

Mr. Vittone stated that Dr. Johnson is scheduled to be in Louisville on February 13 to discuss what action is to be taken concerning employees who show continued liver irregularities on the second medical test.

Agenda
MEETING OF BOARD OF DIRECTORS
June 17, 1974

		Page
1.	Call to order	
2.	Report on Vinyl Chloride Environmental Health Situation	
3.	Minutes of Meeting of Board of Directors - May 20, 1974	1 - 8
4.	Operations Report	9 - 15
5.	Appropriation Requests	16 - 19
6.	Chemische Industrie AKU-Goodrich B. V. - Increase in Capital	20 - 21
7.	Mutual Assistance Pact - Uniroyal	
8.	Financing of Sabre Gas Purchase Project	22 - 24
9.	U.S. Salaried Pension Plan - Amendment	25 - 26
10.	Employee Stock Purchase and Savings Plan - Committee	27
11.	Savings-Stock Bonus Plan - Committee	28
12.	Financial, Facilities, Investment, and Other Statements	29 - 32
13.	General Discussion	
14.	July Meeting - July 15, 1974, 2:00 p.m., New York, New York	

The first thing I would like to say about the medical aspects of the angiosarcoma problem is that we do not have an epidemic of angiosarcoma in the world. There have been ninteen cases reported to date, thirteen of these in the United States. I am certain of the dates of the thirteen in the U.S. and let me run through them briefly for you. There was one in 1961, one in 1964, three in 1968, two in 1969, two in 1970, two in 1971, three in 1972, two in 1973 and three in 1974. While this is certainly a significant number of cases, I think that spread over a ten year period they do not indicate an epidemic, but to me they indicate rather that we have for these many years that PVC has been dealing with a rather low level carcinogen in man.

All of the deaths in B.F.Goodrich occured at the Louisville Plant; there was one in 1964, one in 1968, one in 1971, two in 1973, and we have discovered two living cases now in 1974. The question is asked whether or not we will have more cases in the future and I think the answer to this is that we very probably will. It would seem unreasonable looking at the distribution of cases in the past that we should find these two in 1974 and than suddenly find no more.

The present cases, of course, reflect very high exposures in the early years and as time goes on I think that we will see the results of the decreasing exposures levels over the years and will, therefore, see a decrease of the number of tumors but I do think that we can expect some more.

The two living cases from the Louisville Plant are responding well to their therapy. Both have shown objective evidence of decrease in the sizes of their tumors. One of them has been able to return to work, as a guard on the construction gate far away from the VCl operation. I am sure this has been a big boost to his morale and to the morale of the other employees in the plant as well. The other man has not as yet been able to return to work and it is not completely clear whether this is due only to his illness or to the fact that he has choosen to stay constantly drunk since he has been under treatment.

There are two serious medical problems facing B.F.Goodrich and the Vinyl Chloride industry in general. The first is that we have no adequate test for angiosarcoma or for any condition that which may preceed it. The current tests which we are doing were set up by Dr. Creech and myself last September before we even knew about the angiosarcoma problem, and although we expanded the program some to included the tumor detection, the fundamental screening tests are the same that we designed last Fall. The tests which the government is proposing are, with only very minor changes, a direct copy of the B.F.Goodrich program. The unhappy fact is that there is no way to assure someone that they do not have an angiosarcoma of the liver except for a surgical exploration of the abdomen and, even then, a small tumor deep in the liver can easily be missed. The fact is that the tests which are proposed by the government at this time are proposed not because they are effective but because there is a feeling that we must do something and this is the best that we know, even though it is admittedly very inadequate.

The second problem that we face is the management of the employee who shows some abnormalities in his liver function tests. To date using our own best judgment on a case by case bases we have removed from exposure or re-assigned seventy employees. Twelve of these have improved and have been able to return

to their regular jobs. Fifty-eight are still away from their regular jobs. Of these fifty-eight, twenty-four were able to have some restriction put on the job which eliminated their exposure and yet remain 100% effective in their work. Of the remaining thirty-four, fourteen have been re-assigned, to regular full time jobs and are completely effective but twenty employees are either absent because of illness or have been assigned to what are at least in part "make work" type jobs. If we are allowed to continue to use our best judgment in these cases, we will continue to have a difficult problem which will no doubt result in some lost in the efficiency in the over all operation but I think it will be a problem that we can somehow handle one way or another.

If, on the other hand, the proposed Federal OSHA standard is adopted we will have a far more serious problem. This proposed standard states that any employee who has shown any abnormalities in liver functions on a repeat test must be remove from exposure, and can not be returned unless it can be demonstrated that his abnormal test results were caused by something other than liver disease. If this standard is adopted we will have a considerable number of cases who show abnormal test results which later return to normal and the reason why they were abnormal and why they returned to normal will never be clear, but the standard will not allow us to return these people to work in any area where they can have a possible VC exposure.

Should this standard be adopted I think that we will have a situation which will be almost totally unmanageable. I think with provision along with many other in the proposed standard have to be modified if PVC is going to continue to be a viable industry.

M. N. Johnson, M.D. - Director
Environmental Health Department

GENERAL DISCUSSION. There was a general discussion of the affairs of the Company, including reports to the Board on recent developments since its last meeting in (1) the vinyl chloride monomer situation and (2) the relations with Montedison.

At this time the meeting proceeded in Executive Session to receive a report of the meeting of the Committee on Directors held earlier in the afternoon.

Mr. Thomas called the meeting to order and presided.

REPORT ON VINYL CHLORIDE ENVIRONMENTAL HEALTH SITUATION.

The Board was informed concerning the developments in the vinyl chloride matter, Mr. Vittone reviewing the temporary and proposed final standards of OSHA, the features of them, their effective dates, and the procedures required to comply with them. He also explained the results and economic impact of the proposed standards if they were not modified, stating that the Company, as well as other members in the industry and various associations, would appear at hearings on them to be held later in the month. The Board then was informed concerning the current situation in the plants of the Company with respect to average exposure, the research and development program now underway to attain lower standards of exposure, and the capital costs involved.

Dr. Johnson reviewed the medical aspects of the situation, analyzing its magnitude and emphasizing two important medical problems: first, the lack of an adequate test for angiosarcoma or for any condition which may precede it and, second, the handling of employees who show abnormality in liver function tests; he explained that we now are treating each employee on a case by case basis through removal from exposure to vinyl chloride, reassignment to other duties, or, after an employee has improved, returning him to his regular work, but that if a proposed OSHA standard were adopted, this procedure would be restricted.

MEETING OF BOARD OF DIRECTORS
February 19, 1975

A regular meeting of the Board of Directors of The B. F. Goodrich Company was held at the office of the Company, 277 Park Avenue, New York, New York, at 2:00 p.m. on Wednesday, February 19, 1975, in accordance with notice sent to each Director on January 31, 1975.

There were present O. Pendleton Thomas, Chairman, Gerard Alexander, Gordon Edwards, Fred G. Fusee, Boone Gross, R. Stanley Laing, David L. Luke III, Thomas B. Nantz, John D. Ong, James N. Purse, and John L. Weinberg, being all of the Directors and constituting a quorum. There also were present by invitation T. W. Blazey and R. A. Heuerman and, during a part of the meeting, Roger W. Strassburg. V. W. Benson, Assistant Secretary, recorded the minutes of the meeting.

Mr. Thomas called the meeting to order and presided.

MINUTES OF MEETING OF BOARD OF DIRECTORS. Copies of the minutes of the meeting of the Board of Directors held on January 20, 1975, had been given to each Director for review and, on motion duly made and seconded and by unanimous vote, these minutes were approved.

ENVIRONMENTAL AFFAIRS PRESENTATION. Dr. Roger W. Strassburg, Director of Environmental Affairs, presented a report on the Company's activities relating to environmental safety and health. He stated that the cost of environmental controls is already substantial and in the future we are going to face increasing capital investments and operating expenses for this purpose. The Council on Environmental Quality forecasts that industry will spend five per cent of its capital budget in response to environmental regulations. These expenditures will siphon off growth capital that otherwise would go into new production facilities. As our level of investment rises we have no choice but to apply all the data-gathering, planning and budgeting techniques we use elsewhere.

To enable us to make appropriate decisions, he said the Company has taken the following steps to increase our knowledge of environmental needs:

First, we have established a centralized environmental laboratory to provide direction for all of our environmental analyses. The laboratory tests existing methods and develops new procedures for monitoring pollutants, thus enabling our plants to gather more reliable information. Our laboratory has received clinical accreditation by the Department of Health, Education and Welfare.

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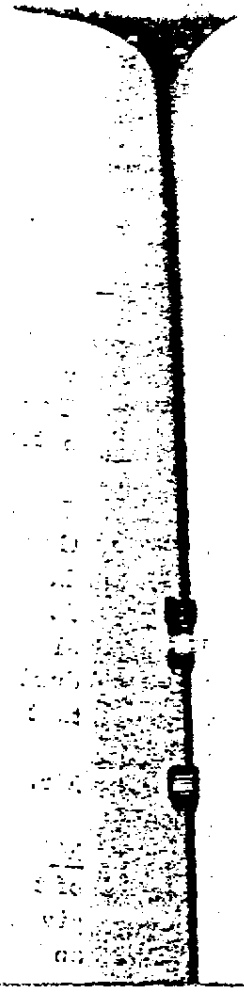
I HEREBY CERTIFY THAT THIS SHEET IS PAGE NO. 73, Vol. 24, OF THE RECORDS O
THE B. F. GOODRICH COMPANY

R. A. Heuerman
SECRETARY



Secondly, we are developing environmental profiles for each of our production facilities using an environmental review team made up of safety, industrial medicine, industrial hygiene and environmental engineering specialists. The team reviews safety, health and environmental conditions at these facilities and helps to develop specific plans for improvement. The team also reviews the Company's compliance with appropriate governmental regulations. A program similar to this is now receiving a trial run in foreign operations.

Thirdly, we have set up an information monitoring system to stay abreast of environmental health research. We have a full time information specialist who is responsible for the acquisition and distribution of environmental affairs information. Internal information from technical reports concerning toxicity gathered by those in our environmental program will be computerized. During 1975 we will have computer-terminal access to the data files of Chemical Abstracts and the National Library of Medicine. In the area of environmental health we are preparing to design a computer-based health record system to maintain health records and chemical exposures of all employees in U. S. plants.

Dr. Strassburg then reviewed the potential problems in 1975.