

Industrial Hygienists and is published by the American Medical Association in AMA Archives of Industrial Hygiene and Occupational Medicine. Introductory paragraphs define the values as follows:

"Values are given in the following tabulation for the maximum average atmospheric concentration of contaminants to which workers may be exposed for an eight-hour working day without injury to health.

These values are based on the best available information from industrial experience, from experimental studies, and, when possible, from a combination of the two. They are not fixed values but are reviewed annually by the Committee on Threshold Limits for changes, revisions, or additions as further information becomes available. Threshold Limits should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations. They represent conditions only

They represent conditions only within which it is felt that workers may be repeatedly exposed, day after day, without their health being adversely affected. It is felt, at the present time, that workers should not be exposed to a working environment containing any of these substances in excess of the value indicated.

These values are not intended for use, or for modification for use, in the evaluation or control of community air pollution or air pollution nuisances."

A few of the materials encountered in the petroleum industry and their Threshold Limits are listed below:

Gases and Vapors	
Substance	Parts per million
Benzene (benzol).....	10
Carbon dioxide.....	5000
Carbon monoxide.....	100
Carbon tetrachloride.....	25
Casimene.....	500
Hydrogen sulfide.....	20
Naphtha (petroleum).....	500
Octane.....	500
Sulfur dioxide.....	10
Toxic dusts, fumes, and mists	
Substance	Milligrams per cubic meter
Iron oxide fume.....	10
Lead.....	0.15
Sulfuric acid.....	1
Mineral dusts	
Substance	Milligrams of particles per cubic foot
Asbestos.....	5
Dust (silica, as free silica).....	50
Silica.....	5
high (above 80% free SiO ₂).....	5
medium 5 to 80% free SiO ₂	20
low (below 15% free SiO ₂).....	50

Nineteen states observe Threshold Limit Values in their laws or regulations, and more are sure to follow. Industrial hygienists, as part of their duties, advise management of the existence of these requirements in order that precautionary measures may be taken to avoid excessive exposure of personnel.

Industrial hygienists undertake measurement of air contaminants for compliance with states' codes. Even a common material like gasoline has a maximum safe level which is 500 parts per million.

The following are just a few of the hazardous materials that are encountered in petroleum refinery operations:

Materials encountered in petroleum refinery operations		
Respiratory irritants	Toxic materials	Skin irritants
Acrolein	Aniline, liquid	Acids—all kinds
Acetaldehyde	Aniline, dyes	Ammonia
Aluminum chloride	Benzol (Benzene)	Benzol (Benzene)
Ammonia	Cadmium	Caustics
Asbestos	Carbon monoxide	Chromium salts
Diterary butyl para cresol	Chlorinated hydrocarbons	Coal-tar compounds
Dusts, physiologically inert, general	Chromic compounds	Cobalt, metal and compounds
Dusts, attapulgus clay	Cobalt, metal	Dyes
Dusts, bauxite	Hydrogen sulfide	Inhibitors
Dusts, caustic	Inhibitors	Nickel salts
Formaldehyde	Lead, metal & fumes	Oil, general
Fluorides	Lead, oxide, litharge	Oil, high boiling aromatic
Formic acid	Lead, tetraethyl	Oil, insoluble cutting
Inhibitors	Lead, scrap	Phenol
Lime	Manganese	Pitch
Nitrogen oxides	Mercury	Solvents
Osone	Methanol	Ultra violet radiation
Pine oil	Radioactive materials, general	Wax, untreated
Silica	Tobacco (Toluene)	
Sinole	Xylo (Xylene)	
Sulfur dioxide	Zinc	
Welding fumes		

Product Labeling

One very important function of the industrial hygienist in the petroleum industry concerns precautionary labeling of products. This is receiving more emphasis as state after state passes labeling regulations. One of the most recent is the State of New York, where on February 26, 1954, the Council on Public Health passed labeling regulations which became effective August 26, 1954, as Chapter IX-A of the New York State Sanitary Code. These labeling regulations have the force and effect of law and require precautionary labeling on any product that entails a hazard in a reasonably anticipated use.

A hazard is defined as "the risk of injury or illness which may be encountered during or as a result of any reasonably anticipated type of handling or use of a substance, or during its specified use, if any, by reason of toxicity of the substance through ingestion, inhalation or absorption through the skin, or due to its corrosiveness or irritating properties, or because of its flammability or explosiveness."

Somewhat similar labeling regulations already exist in California, Illinois, New Jersey, Oregon, and the Territory of Hawaii and are in the making in many other states, so more can be expected. Most state regulations are guided by recommendations of the Manufacturing Chemists' Association, Inc., and with some exceptions, conformity in one state results in conformity in other states.

It is recognized that, as a rule, labeling of many products is advisable and results in safer handling of the ma-

terial by customers. However, this requires extensive work, knowledge of product, and toxicological information to determine what products must be labeled and how they should be labeled.

Prior to 1932, only a handful of persons were engaged in industrial hygiene procedures. By the end of the next decade, there were industrial hy-

giene divisions in nearly every industrial state, and in many insurance companies. Industries themselves, however, have made the greatest expansion in industrial hygiene units over the past 22-year period. Today, in most large industries, industrial hygiene is being conducted under the guidance of increasingly well-trained, professional personnel.

No longer is industrial hygiene seen by industry as an "aimless effort of intellectuals collecting bottles filled with nothing so that they can prepare long and useless discourses that few read or understand or would know what action to take". Instead, the safeguarding of health is assuming a new significance. It not only saves time, money, and problems for management, but it actually improves employee morale and efficiency by eliminating apprehension in occupational environments.

Instead of telling what mistakes have been made and how to correct them with costly changes, industrial hygienists now are called in at the blueprint stage where their ideas can be incorporated into factories, machines and other installations to accomplish the most good easily and inexpensively.

Industrial hygiene at its best in the petroleum industry requires the cooperation and skills of industrial physicians, industrial nurses, toxicologists, chemists, safety men, and industrial hygienists working together as a team. American industry, particularly the oil industry, is aware of the benefits of more and better production derived from environmental control and health-promotional activities. It needs only to be guided in the application. * * *

PLAINTIFF'S EXHIBIT

MBL-105

Memorandum from T. E. ALLEN, M. D.
NEW YORK, N. Y.

Date 13 August 1973

To

Dr. H.H. Golz
API

Dr. Allen has asked me to
send the attached to you for
your information.

Joan DiGangi
Dr. Allen's Secretary

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Memo to File

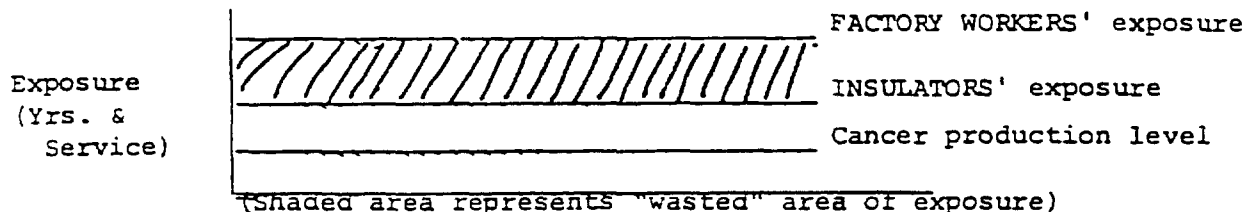
As noted in a memorandum dated 11 July 1973, a meeting was arranged, following an invitation from Dr. Irving Selikoff, to meet with him at the Mt. Sinai Medical Center. Attending the meeting were:

Dr. Harry Hermann - Associate of Dr. Selikoff - NY
Dr. W. Nicholson - Associate of Dr. Selikoff - NY
Dr. N. Roberts - Assoc. Medical Director, Exxon Corp.-NY
Dr. M. Goldman - Ass't. Medical Director, Exxon Corp.-NY
Dr. H.A. Sinclair- Assoc. Medical Director, Mobil-NY
Dr. T.E. Allen - Medical Director, Mobil-NY

The purpose of the meeting was to present findings that Dr. Selikoff had made following examination of a group of represented Mobil employees (Paulsboro Refinery) on the request of the union at Paulsboro. In addition, Dr. Selikoff hoped that, on discussion of these findings, the group might be able to advise him whether such findings might be considered typical and usual of an average refinery population.

The meeting lasted approximately two and one half hours and consisted principally of a presentation of asbestosis as an occupational illness, with major points of same being illustrated by x-rays, statistics, and data gathered on the Mobil population examined. No list of examinees was given, and, at no time, was any data or x-ray identified by a specific name.

Initially, Dr. Selikoff gave a brief discussion of the disease, asbestosis. In this coverage, he covered the highlights of work being done here and in U.K. He mentioned historical work done in shipyards in USA and U.K. He made it clear that, during the discussions, he would be talking in terms of "insulators, brick workers, etc. in user companies," rather than in terms of "factory workers" (where asbestos products, piping, etc. are made such as Johns Manville, etc.). In spite of this, he pointed out that if exposure to asbestos fibers in insulators was enough to produce malignancy, the great exposure normally experienced in factory employees was "excess exposure" as far as cancer was concerned. Graphically shown, this would be as follows:



Dr. Selikoff pointed out that the typical x-ray findings in a case of asbestosis were:

- 1) General thickened pleura (the pleura is the thin, transparent covering of the lungs)
- 2) Pleural plaques (a concentration of thickening of the pleura in certain specific areas)
- 3) Reticular fibrosis (intensified marking throughout lung tissue, particularly in lower lung fields producing a

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- 4) A shaggy appearance to the heart outline.
- 5) Blunting or even complete obliteration of the area where the diaphragm touches the rib area.

It was emphasized that the above findings were typical of but not pathognomonic (specifically distinctive or diagnostic) of asbestosis. These findings, along with an extensive work or exposure history, can be considered diagnostic. One does not necessarily need to have positive pulmonary function tests to clinch the diagnosis. The development of asbestosis need not produce death in any person sufficiently exposed, but, there is developed in cases of asbestosis susceptibility to lung cancer, and even to mesothelioma, a specific type of malignancy.

In regard to Mobil's employee group at Paulsboro, Dr. Selikoff stated he was requested by the "union" there to examine a group of represented employees. This group of employees was presented by the union to Dr. Selikoff who did not have a voice in the choice and he had no previous knowledge of the examinees' medical, work or social history. He stated emphatically that, as a result, the study was a biased one, but he could not state whether it was biased in favor of a sick, average or well group. The only point on which there was certainty was that all examinees had had at least 20 years of work in the refinery. On several occasions, the size of the examined group was stated to be 137, this is not quite accurate because only 118 were examined. The remaining 19 were those employees who, at an earlier date, had been seen only for a chest x-ray and chest examination and, on whom, the union requested the company x-rays be forwarded to Dr. Selikoff at his Paterson, N.J. office.

Dr. Selikoff handed out six sheets showing in graph form some of the findings resulting from his examination of the 118 employees. (It should be noted that the examinations were done by a team of 9 people from Mt. Sinai Medical Center who, with the aid of mobile x-ray unit, completed these examinations during one week-end.) After the charts were handed out, discussion was so continuous that it was not possible to examine these charts thoroughly. Constant references were made to the charts, however, during the discussion.

On the days following the conference, when the undersigned was able to thoroughly review these charts, it was evident that there were many errors in calculation, as well as some ambiguity in reporting the population studied and the results found in same. A call was made to Dr. Selikoff's office and some corrections were offered via the phone, and others were made by sending revised charts to replace those in question.

Attached are copies of the revised tables issued to us at the meeting. Table VI was not given at the meeting. It was included in a later mailing to the undersigned. General comments on the tables, which are self-explanatory, include the following.

It will be immediately obvious from Table I that the medical review was not restricted to "active" employees as was first thought. We are told by Dr. Selikoff's office that the breakdown of the 137 examinees is as

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follows:

annuitants	13
"active" employees	105 (full medical review)
"active" employees	19 (partial medical review)

The 19 employees listed above were employees (no annuitants) who were seen at an earlier date by Dr. Selikoff and on whom only a chest examination and a chest x-ray were done. This was the group of employees on whom the union requested their company x-rays to be sent to Dr. Selikoff.

We are not aware in which group, i.e. service, the 13 annuitants fall. We can assume they may be in the 30-39 and 40-49 because it is in this group that ages in excess of normal retirement age are listed. It is possible that some might be in the first service category, 20-29 yrs., if they retired at an age younger than 65 years.

The remaining tables are self-explanatory but indicate, among other things, that

- 1) none of the cases in this series showing classic signs of asbestosis are "serious" cases. There is no doubt that, in x-ray films shown to us (some taken in the mobile unit - some previously in the group of 19) there are some x-ray signs indicative of asbestosis. Unfortunately, we were not given the names of the patients represented in the x-rays shown as samples. Dr. Selikoff feels, from his long experience, that x-rays alone (if not correlated with pulmonary function tests, etc.) tend to "unread" the time picture of asbestosis.
- 2) Clinical findings such as bronchitis and positive x-ray findings and pulmonary function tests are higher in "smokers" than "non-smokers" and higher in "ex smokers" than in the group which has no smoking history.
- 3) A high percentage of this group are "no history of smoking" (28%) and "ex smokers" (39%) making a total group of "non smokers" - 67%.
- 4) The study is unique in one aspect. With the expected exposure of this group of employees to firebrick, there is no indication of silicosis. Firebrick is about 85% quartz in composition.

We are not prepared, at this time, to dispute or confirm Table VI. It is interesting to note that cancer of the lung in this group studied is recorded as 0.8%. The national average of cancer of the lung (males) is 3%.

Probably the most revealing and appropriate chart is Table VII. This shows that of all the categories of workers represented in the study, that of the insulators, masons and bricklayers (13), 81% show positive signs of both

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higher than the findings in all other occupations represented. Again, it was stated by Dr. Selikoff that although asbestosis is unquestionably established as a diagnosis, these do not represent presently "serious" cases.

Attached with the statistical tables is a copy of the recording form used in the analysis of x-rays of patients whose occupation might make them liable to pneumoconioses (chronic fibrous reaction in the lungs to the inhalation of any type of dust) such as asbestos, iron dust, cloth fibers, and silica. It should be noticed that this form and its legend is the official classification established by the I.L.O., and generally accepted as a classification by most pulmonary and occupational health specialists.

Dr. Selikoff feels that, in an ideal program of preventive health, workers with 20 years or more exposure in jobs involving insulating materials, fire-brick and masonry cement, chest x-rays should be done every three months. He also thinks many other preventive procedures to protect their respiratory systems should be instituted. Thus, he advocates the administration of flu vaccine each year for such a group. Above all, he urges all workers to stop smoking.

Dr. Selikoff was most professional in his conduct during this session. At no time did he mention the company's name and only, as identification of location of the worker studied, was the name Paulsboro used. Furthermore, he feels that the union is unaware of "99% of the great work done by the company medical department." "They only see and talk about the bad things when they happen." He cited a common union complaint that "our men naturally are sick breathing in that contaminated air at the refinery every working day." He quickly referred again to Table V showing that chronic bronchitis, if the union complaint had merit, would be appearing in all represented employees, when actually his statistics show it occurs primarily and predominately in the "smokers."

He urged consideration of a joint management - union study of the asbestos workers (those who have been exposed during their work life) in at least five refineries, among which should be included the "best" (as far as modern, but not recent construction) and the "worse." Thus assumes more than one company would be so involved. The whole research project should be jointly sponsored - developed and each side totally aware of the progress from planning through completion stages.

Such a study can be done by any one of many agencies. There is no doubt that it could be done by the federal government - through the agency of NIOSH. If done by them, he feels it would be a fair, well done and complete study. However, NIOSH could and would probably look at such a project only once and not on a continuing basis, and this type of study needs at least a 20-30 year follow-up since this can be the "incubation" period of asbestosis.

The study could be done completely by any outside agency, such as an academic group or a private research group. Needless to say, choice of the group would have to be mutually agreeable.

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The ideal project, in Dr. Selikoff's opinion, is one planned with, guided and supervised by capable outside experts, but with all the examinations, x-rays, lab. work done by the company inplant medical department. He feels this is the only source of ongoing interested medical supervision available to the men. He does feel that, in Paulsboro's case, it may well take a gigantic effort to get the union and management to mutually trust each other in such an undertaking. He does not feel that it is impossible, and he feels every effort should be made to accomplish this goal. Again, he pointed out that, in the general male population of the USA, there is a 3-4% death rate due to lung cancer. Admittedly, there are multiple etiological factors in development of lung cancer. However, if and when lung cancer occurs in a company worker exposed to such materials as asbestos, the first and most obvious conclusion is that this is due to a carcinogenic material in the work environment. This is difficult to combat, and admittedly, can be unfair to managements. Research and careful clinical follow-up can establish data that could remove the haziness as to responsibility in all such cases.

In summation, Dr. Selikoff presented findings to the group in a most professional and non spectacular fashion. He admitted repeatedly the group studied is an ideal one in many respects. A more ideal study, jointly sponsored by management and union, should be undertaken. Mobil is not the only petroleum company with this problem (cases in Texaco were cited). Dr. Selikoff did not pretend to be an expert on refinery health since he has never had an opportunity to visit a refinery.

No commitment was made to him as to follow up to his presentation or suggestions.

After the close of the meeting, Dr. Selikoff was asked if he would explain his relationship to either OCAW or independent unions in the petroleum industry. He answered that he has no contract with OCAW or any union. OCAW and independent unions have and do request the Mt. Sinai Medical School - Department of Environmental Medicine to do projects for them as indicated in this study of some Paulsboro employees. He emphasized his commitment is not unilateral, and both the school and he, as an individual, are free at any time to consider research or consultant capacities with any agency, management, union or government.

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Table I

Age distribution of 137 refinery workers,
by years since first exposure

Years since first exposure	Length of exposure (years)	Number	Age range	Average age
20-29	20-29	65	41-65	50.0
30-39	30-39	55	48-70	53.4
	15	1	81	81
40-49	40-49	12	59-66	63.1
	36-39	4	64-70	68.2

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Table II

Work Activities of 137 Production and Maintenance Employees

Type of Work	Active	Retirees
"Clean Work" (Docks, Case-Can, Auto Shop)	10	1
"Dusty" Production Work (Bead Plant, Filter Dept.)	5	
Fume Exposure (All other production units)	28	7
Mixed Fumes and Dust	6	
"Clean" Maintenance (Carpenters, Machinists, Electricians, etc.)	21	2
High Asbestos Exposure (Insulators, Masons, and Bricklayers)	13	3
Other Maintenance (Pipefitters, Welders, and Boilermakers)	41	
Totals	124	13

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X-ray changes

Length of exposure (years)	Number of Persons	Parenchymal		Pleural (only)	Total pleural changes	Total changes Parenchymal and/or pleural		No changes
		1	2					
20-29	65	18 28%	2 3%	10 15%	15 23%	30 46%		35 54%
30-39	55*	20 36%	2 4%	3 5%	3 5%	25 45%		31 56%
>40	16	9 57%	1 6%	0	3 19%	10 62%		6 38%
Total	136*	47 34%	5 4%	13 10%	21 15%	65 48%		72 52%

* A X-ray of one individual was unsatisfactory and could not be read

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Table II

Pulmonary function abnormalities
in relation to X-ray changes
and smoking

	<u>Restriction</u>				<u>Obstruction</u>		
	Smokers	Ex-smokers	Non-smokers	Total	Smokers	Ex-smokers	Non-smokers
Parenchymal and/or pleural changes	7 11%	6 9%	3 5%	16 25%	11 17%	9 14%	0
Number of persons 65							20 31%
No changes	2 3%	2 3%	2 3%	6 9%	8 11%	5 7%	3 4%
Number of persons 71							16 22%

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Table IV

Smoking Habits

Length of exposure (years)	Number of Workers	Smoking Habits		
		Smokers	Ex-smokers	Non-smokers
20-29	65	22 34%	23 35%	20 31%
30-39	56	19 34%	21 37%	16 29%
40+	16	4 25%	10 52%	2 13%
Total	137	45 33%	54 39%	38 28%

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Table V

Prevalence of Chronic Bronchitis

Length of exposure (years)	Number of Persons	Smokers	Ex-Smokers	Non-Smokers	Total
20-29	65	9	4	3	16 25%
30-39	56	11	3	1	15 27%
40+	16	1	1	0	2 12.5%
Total	137	21	8	4	33 24%

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*This chart is
included in
the report*

Table VI

History of previous cancer
in 118 refinery workers

Cancer	Number of cases	
Skin	2	1.6%
Bladder	2	1.6%
Colon	1	0.8%
Abdominal	1	0.8%
Lung	1	0.8%
Total	7	6%

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X-ray Results of Refinery Production and Maintenance Employees

Type of Work	Negative			Positive				Pleural	% Positive
	0/0	0/1	1/0	1/1	1/2	2/1	2/2		
Clean Work" (Docks, ase-Can, Auto Shop	5	4	1	1					18
ust (Dead Plant, ilter Dept.)	1	3						1	20
umes (All other roduction units)	9	9	8	5	1	1		1	47
ixed Fumes and ust	1	3				1		1	33
Clean" maintenance Carpenters, Machin- st, Electricians, tc.)	6	5	3	7			1	1	52
ther maintenance Pipefitters, Welders, nd Boilermakers)	11	11	4	6	5			4	46
nsulators, Masons, nd Bricklayers	2	1		8	2		1	2	81 ✓
								overall	48

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Research Group)

ent:

C International Classification of Radiographs of Pneumoconioses

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