AIR POLLUT..N SURVEY

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Summary Report

Period: April 1, 1953, to January 1, 1954

For purposes of this study, a mobile laboratory was completely equipped and made available so that on the spot analyses of the composition of the air could be made. The mobile laboratory has many advantages over the former method of collecting samples and bringing them back to the laboratory for subsequent examination. It permits sampling at almost any point within the area, taking larger samples, and making repeated checks, if necessary, of the particular components which are desired. Automatic equipment on the truck permits more rapid determinations which are not subject to the operator error commonly found in the hand operated instruments. All results to date have justified the development of the mobile laboratory, and it is obvious that there are many material advantages to be obtained from its use.

Methods

The methods used in the analysis of the air during our studies are accepted and proven methods which have been used for many years in stream and air pollution. Though many of these methods leave a great deal to be desired, they are the best available at the moment. In atmospheres as complex as the one in Baton Rouge, it is necessary to establish methods that are free of interferences or to set up procedures that can be so modified as to minimize the interfering effects. As a result of

our experience, we have modified certain procedures and evolved new ones which give us more reliable data.

For purposes of this report, we shall outline briefly for you our methods and our comments as to the authenticity, accuracy, and reliability of these methods.

Surveying Methods and Meteorological Observations

The meteorological data collected during the course of our survey seems sufficient for the purpose at hand. The equipment utilized was satisfactory for general purposes, and the data obtained indicates the conditions at ground level. If at some future date, correlative or substantiating data are required, they can be obtained from the Harding Field Weather Bureau records.

Due to the industrial operations north of the city in the immediate plant areas, wind directions and wind velocities are not always reliable. There seems to be a continual and rather pronounced turbulence in the air at ground level. When overhead winds are in one direction (as observed from the stacks) it is not uncommon to find strong cross currents at right angles or almost opposite directions at ground level. The understructure, or ground level, winds may also change as much as two to three points of the compass within the matter of two to three hours. Therefore, for purposes of this study, wind directions are reported as the wind direction observed from the stacks which are some four to five hundred feet above ground level.

Dust Studies

Standard methods of dust count are used throughout our studies. It is generally accepted that the dust counts and identifications are an index to the general condition of the atmosphere at the moment that the sampling is done. Whereas the count is generally accepted as measuring the overburden in the air, the identification of these particles is less common. The microscopical approach utilized throughout our study has proved very satisfactory, and for the Baton Rouge area seems to give fairly reliable indication of the dust sources. While the measurements are not strictly quantitative, they give excellent comparative results as to the relative amounts of the various types of dust particles present in the air. We feel that the dust count, taken together with the dust identification, is quite valuable in our studies.

Dust Fall

We have made several attempts to obtain dust fall measurements in and around the area. To date, none of these methods is particularly satisfactory. We recognize the importance of the dust fall measurement and are making every effort to devise a plan which will prove satisfactory. Over the period of our observations, however, the weather conditions, particularly with regard to heavy rainfall, were such that most of our samples were considered to be unreliable and are not shown in our present report. A great deal of difficulty was experienced with bugs, vegetable

materials, algae, molds, etc., which are common to high temperature, high humidity areas. New methods covering shorter intervals of time and new methods of collection are now being studied, and we hope that before the end of the year we will have a satisfactory method of making dust fall counts and observations.

Chemical Observations

The determination of ammonia using Nessler's reagent has proved relatively satisfactory. It is necessary, however, to obtain blanks at each point, and for this reason studies are now in effect to develop a colorimetric method which will be freer from interference than those found in the Nessler reagent. We feel, however, that both the sensitivity and the accuracy of the older method, which is classic and well-established for trace analysis of water and streams, is quite adequate for our purpose.

The methods for the determination of chloride and sulfate are based on turbidimetric practices. Though these methods lack somewhat in sensitivity, they are quite reliable for appreciable concentrations, and at the moment are the most satisfactory ones available. No alternative methods having greater sensitivity or accuracy have been developed up to the present time.

The chlorine determination using the orthotolidine procedure gives excellent sensitivity and excellent results. We are quite satisfied with this determination.

A new colorimetric procedure has been developed. It is based on induced color development of bleached basic fuchsin by sulfur dioxide. The method is more sensitive and much freer from interferences than the iodine method. For this reason, it will be adopted for future determinations.

Corrosion

The corrosion studies cover the period of July 21, 1953, to November 22, 1953. The corrosion test boards were made up with the metal samples of chromium plated soft steel, galvanized iron, copper, aluminum, and soft steel. Two paint samples, one either black or blue and the other either red or cream, were placed on each board. The paint samples were sprayed on soft steel metal backgrounds using a standard automobile lacquer. Three samples of rubber were also included on the test panel and were mounted in such fashion as to produce a sharp strain (fold) at one point, with decreasing strain as the fold was allowed to taper out to a flat surface. The test strips were four by four sheets of the sample of material to be tested with the exception of the rubber. All metal and paint strips were supported about one and one-half inches from the board surface and were mounted on porcelain insulators. The test strips were set at 45° angles to the ground and faced south. Both the tops and the lower sides of the strips were exposed to the atmosphere. The test boards were mounted approximately three feet from the ground on wooden supports.

Interpretations of results were obtained by weighing the test strips carefully before exposure then weighing the strips after the corrosion products had been removed or stripped from them. The corrosion layers were removed by stripping solutions as follows:

Aluminum, 5% hydrochloric acid.

Steel, 20% sulfuric acid containing stannous chloride and gelatin.

Galvanized iron (zinc), saturated ammonium acetate.

Copper, 5% sulfuric acid.

Chrome, 20% sulfuric acid.

Reference: Ulick R. Evans, "Metallic Corrosion Passivity and Protection," Edward Arnold and Company, 1948.

Corrosion Results

Location	Corrosion (Mg/in^2/month)				
	Chrome	Galv. Iron	Copper	Aluminum	Steel
South Gate	37.9	1.3	2.1	0.6	45.3
East Field	29.2	0.5	0.9	0.05	39.1
Northwest Corner	54.9	3.7	2.3	1.0	71.6
North of Cafeteria	79.7	1.1	13.0	1.3	95.3
Chem Products	29.5	0.9	1.0	0.2	42.5
Maryland *	-	-	-	-	-
Anchorage	24.4	1.2	1.6	0.3	45.5
Control (Aubin Lane)	14.6	1.4	1.5	0.07	19.6

*Samples found destroyed October 14, 1953.

The general survey of corrosion conditions would indicate that the Baton Rouge atmosphere is quite corrosive, probably due in part to the high humidities and high temperatures normally found in the area. The greatest amount of corrosion was found at the position north of the cafeteria, then the northwest corner, and the south gate, in that order. There seemed to be a very definite falling off of the corrosion effects at locations away from the plant area.

All paint samples showed a dulling and graying of the paint surface. The cream paint turned slightly yellowish in color. The greatest effect on the paint samples was at the northwest corner where considerable pitting and discoloration of the samples took place.

The rubber samples were placed on boards on October 29th and checked on November 22nd. This is comparatively a short period. In every case, however, the sample of ~~GRI~~ GRS rubber showed material cracking and breaking in its surface at the point where strain was greatest. The ~~GRS~~ GR-I sample and the natural rubber sample seemed to be unchanged in this period.

Summary of Results

The general summary of our results to date indicates the following:

1. We do not have sufficient data yet to treat all materials statistically though it is possible to draw certain conclusions and make certain direct correlations under existing conditions.

2. The Baton Rouge atmosphere does have in it certain materials which are conducive to corrosion. Traces of chlorine, chloride, ammonia, sulfur dioxide, and alkali have been found on a number of occasions. Rather wide ranges of hydrogen ion concentration have been found.

3. The quantity of material over the area investigated is not sufficiently great to be hazardous to health. All of the concentrations of contaminants have been well below the limits established by the various public health agencies.

4. The dust count and dust identification results are particularly important inasmuch as they give us a fair estimate of the general overburden of the particulate matter in the atmosphere and in addition they furnish at least partial identification of the sources from which this material is emanating.

5. The results of our investigation to date will apparently give us fairly accurate information as to what is happening in the locations where the samples were taken. Since contamination in this area is likely to occur from sources other than Esso, we are apparently getting a measure of what is happening to Esso as a result of other industrial activity in North Baton Rouge. We are not, however, gaining much information as to what the plant operations carried out by the Esso Standard Oil Company are contributing to the atmospheric pollution of the area. Most of the effluents from the Esso stacks is in the nature of fumes rather than solid

particulate matter, and the fall out and diffusion of this material will take place at some distance from the Standard Oil plant.

Recommendations

The results to date indicate clearly that where the data which we have obtained so far seem to be significant, correlation is only possible for a portion of the period involved. We feel that the survey should be continued for an additional period of time so that sufficient data can be accumulated that it may be treated statistically and valid conclusions drawn from such treatment.

It is highly possible that more frequent sampling should be done. More runs should be made during those periods where inversion has occurred and conditions of smog exist.

It might be well to consider both the number and locations at which samples are taken. The situation north of the cafeteria seems to be particularly intriguing and sampling should be continued at this location and at the northwest corner of the plant.

In connection with the sample technique, it is our belief that sampling should be done in at least one other way. Specifically, a series of samples should be taken down wind at varying distances from apparent sources of pollution so as to locate the point at which contamination begins to affect the area outside of the plant. It may be that this does not fall within the purview of the investigation that is presently being conducted. We should

like to point out, however, that our present results would indicate what is happening in the specific area involved. It does not give us a measure of contamination which might arise out over the residential area in close proximity to the plants.

It is our present plan to obtain an electrostatic precipitator for the collection of dust and particulate matter from the atmosphere. We believe that this will be a valuable addition to the dust fall, dust count, and dust identification program.

The determination of hydrocarbons in the atmosphere seems to be beyond the scope of our present investigations. The equipment necessary for such determination is so large, so heavy, and so expensive that it represents a major project to undertake such investigation. It might be well, however, to include certain other specific tests in our investigations such as tetraethyl lead and benzene hexachloride.

WCA

Dust Fall Report

June 8, 1954

This report covers the period

March 2, 1954, to April 30, 1954

These samples were run according to conventional methods in which dust was collected through six inch funnels into gallon bottles. Collected rain water and dust were then taken to the laboratory and aliquot samples removed, filtered and the amount of insoluble material (dust) determined gravimetrically. The average of duplicate analyses was used to determine the dust fall values.

Results

Location	Dust Fall* (tons/sq. mile/mo.)
Maryland	33.
Anchorage	3.8
N. East Corner	2.0
N. of Cafeteria	6.7
N. West Corner	1.7
S. East Corner	3.0
South Gate	5.8
Aubin Lane (A. R. Choppin)[1]	1.1

* Insoluble dusts

1 Control

Corrosion Data

Period: January 22, 1954, to April 30, 1954.

Location	Corrosion ($mg/in^2/month$)				
	Steel	Galv. Iron	Copper	Alum.	Chrome
South Gate	53.6	1.6	1.7	1.2	19.0
East Field	40.7	1.1	0.9	1.7	35.9
N.W. Corner	62.9	1.8	1.9	3.0	68.2
N. of Cafeteria	40.1	1.2	1.0	1.8	41.1
Chem. Products	36.8	1.3	2.0	1.9	37.1
Maryland	40.2	1.2	1.2	2.4	26.6
Anchorage	31.1	1.0	0.9	2.0	14.9
Aubin Lane (control)	11.9	0.8	1.9	1.8	10.2