THE PAST, PRESENT AND FUTURE OF VENTILATION AND DUST CONTROL IN SOUTH AFRICAN GOLD MINES

PRESIDENTIAL ADDRESS, 1968

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INTRODUCTION

The gold mining industry originated from the mining operations on the Witwatersrand which started in 1886. Mining started with very simple methods of excavation on the surface along the outcrops of the gold-bearing reef, but developed rapidly as it became necessary to apply more and more advanced mining skills to mine the ore-bodies at increasing depth. Progress and development in ventilation techniques and dust suppression measures perforce had to proceed in order to keep pace with the complexity of the mining methods.

From 1886 to the close of the century a number of small mines were in operation; the mines were shallow and no ventilation of any sort was applied. Dust conditions were as bad as could be expected under the circumstances. At the turn of the century, as the ore-bodies were followed and mining at increasing depths began to require the sinking of shafts, so the necessity for ventilation became an essential requirement.

For purposes of following the different stages of progress in ventilation, I have found it advantageous to consider progressive periods of approximately 20 years in length (or multiples of 20 years), starting from the beginning of the century.

PERIOD 1900–1920 (Initial Period)

During this period shaft-sinking began to be utilized to reach the ore-bodies. Ore was extracted over stoping widths of up to several hundred feet, and the majority of shafts did not exceed 3,000 to 4,000 ft in depth. Mines were ventilated mainly by natural draught, but fans for mechanical ventilation began to be introduced towards the latter part of this period.

Up to the beginning of this period the seriousness of the dust hazard was not considered, and mines were worked dry except in so far as the ground was naturally wet. Shifts of ten hours or more were in common use. Casual blasting was carried out at any time during the shifts, and the cut and round in each end was blasted separately during the same shift. There was no blasting interval and continuous working in development ends was permitted. The high prevalence of silicosis, then referred to as miners' phthisis, gradually impressed on the authorities and parties concerned the danger of dust and the increasingly deleterious state of conditions underground, and from about 1903 onwards precautionary measures began to be instituted.

Within a few years these measures were fairly well established. Wet drilling was being used, the water-blast was brought into action, and water supplies were available to wet broken rock which was being moved or handled. Blasting was confined to the end of the shift, and the concept of the " blasting interval " introduced. At developing faces the cut and round were blasted at the same time.

The Miners' Phthisis Prevention Committee reported in 1916 that "*. . . abundance of clean water judiciously used, is generally the most satisfactory medium at present known for dealing with dust.*"

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The importance of ventilation to supply adequate fresh air to the persons working underground was appreciated as workings became deeper.

The first fans to provide mechanical ventilation were installed in 1909; by 1916 it was reported that nearly half of the mines on the Witwatersrand were mechanically ventilated by fans. There were 42 fans in number, with a total nominal capacity of 4,500,000 cfm. The first standards set required at least 30 cfm of air per person, this figure having been very carefully calculated and shown to be the minimum required to ensure adequate dilution and displacement in the workings of the products of explosion, respiration and combustion. An investigation in 1916 showed that, in fact, an average over all mines of 46 cfm was being supplied per person, the total number of persons underground being 133,000 employed in approximately 50 different mines. It is interesting to compare this with the average of 175 cfm per person supplied in our mines at the present time.

The first determination of dust in the air in Witwatersrand mines was made in 1903 by weighing dust caught on cotton wool. Systematic dust sampling with the sugar-tube commenced in 1913.

The Kotze Konimeter for the determination of dust particles by number was first introduced in 1916, and the circular form came into mine use in 1919. The original counting was carried out under light-field illumination and there was no treatment for selective removal of extraneous matter.

In 1914 a Dust Sampling Department was established by the Transvaal Chamber of Mines, with the duty of periodically examining the dust concentrations in the air of working places, and to help in improving the dust conditions in mines. In 1916 a trained dust inspector was appointed on each mine to assist in the control of dust. The sugar-tube was the official instrument used by the Chamber and the mine officials for the dust sampling in the mines.

The first dust measurements in 1903, when dust suppression was in its infancy, indicated exposure of workers to concentrations as high as 400 mg per cu m after blasting, and from 15 to over 100 mg per cu m in workings, drives and raises. The dust surveys in 1913 after precautionary measures were in active application showed an average dust content of 5·4 mg per cu m.

Following on recommendations by the Miners' Phthisis Prevention Committee in their reports of 1916 and 1919, the Mining Regulations were strictly applied and the end of this period can be regarded as the time when the systematic application of ventilation and dust control measures became an accomplished fact. The great difference in dust conditions resulting from these measures has made it necessary to distinguish the effects of the dust hazard on persons who worked under pre-control conditions from those on persons who commenced work after 1920, the so-called " new Rand miners."

PERIOD 1920–1960 (The Steady Development Period)

Abbreviated Summary

This period was one of gradual and progressive development, without any large or drastic changes, either in the basic mining techniques or the associated ventilation and dust suppression applications. In 1933 the country went off the gold standard and this gave impetus for increased mining activity resulting in the development of the West Wits line of mines and the extension of gold mining to the Orange Free State, but the changes were of intensity and scale rather than of method.

The period was characterized by the gradual increase in depth of mining, resulting in the latter half, of the emergence of the heat problem as a serious factor in several mines. Another characteristic was the growth in mechanization, with its attendant aggravating effect on the dust problem.

The standard method of " ascentional " ventilation became firmly established. The main supply of ventilating was transmitted to the bottom of the mine and then made to course upwards through the stopes. Strike walls and brattices were used to induce the air to flow along the working faces. Average face velocities up to 115 fpm were achieved. Ventilation of development ends was by means of auxiliary ducts and fans drawing air from the main supply. Overall ventilation improved as progressively greater quantities of air were supplied to the mines.

In the latter half of the period, emphasis was laid on rapid development, and multi-shift blasting in development was often practised, with a suitable re-entry period. The use of twin development ends assisted in the application of multi-shift blasting and facilitated rapid development.

Dust conditions improved particularly over the first half of the period by the conscientious application of the dust suppression measures by the improvement in ventilation and the standardization of drill specifications. Filters were introduced at tips, the large bulky sawdust filters first used were displaced by flannel bag filters in horizontal arrangement, and these in turn largely displaced by vertical multi-tube filters. Electrostatic precipitators were introduced but did not find permanent acceptance.

By the year 1928 the average weight of dust had fallen from about 5 mg per cu m to under 1·0 mg per cu m and in 1938 when the average concentration had fallen to 0·6 mg per cu m, the sugar-tube was discontinued as the sampling instrument. The konimeter which had been increasingly in use became the accepted instrument for routine dust sampling. The change was effected partly because the sugar-tube method ceased to be accurate at the low concentrations existing and partly because number concentration which tends to emphasize the smaller particles was considered of greater significance than the weight.

The technique in using the konimeter was modified from time to time until the final method of dark-field microscope counting after ignition and acid immersion was adopted in 1929. The records available show that the average results reported by mine dust inspectors in 1932 and in 1945 ranged between 100 and 140 ppcc (using an immersion first technique which gives about half the results with the present ignition first technique). The Thermal Precipitator was introduced as a sampling instrument more specifically for research purposes in 1936. Its introduction was accompanied by considerable dramatic effect and alarm when it revealed counts of several thousand ppcc during drilling as against the few hundred ppcc indicated by the konimeter. The alarm was later considerably abated when it was shown that while some of the additional count was due to fine particles not revealed with the konimeter technique, the larger proportion was derived from mine water salts resulting from the fact that T.P. slides were not acid treated. For a considerable time the necesity to acid treat T.P. slides was hotly debated, until finally the acid treatment was adopted, since when T.P. counts have shown but slight difference from average konimeter counts. The accuracy of the T.P. has continued to make it a desirable instrument in special investigations.

Unfortunately, the T.P. misdirected attention excessively on drilling, and other sources of dust production tended to be ignored.

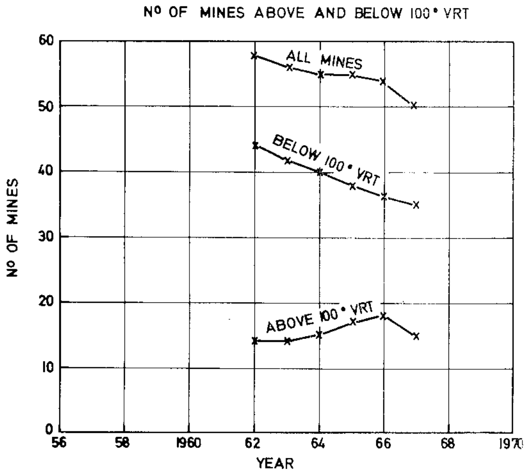
Perhaps the most striking feature of the latter part of this period was the gradual realization that drilling dust was no longer the main source of dust and that mechanical scraping was the most important cause of high dust concentrations. Investigations have confirmed that the major source of the dust in mines is the moving and transport of broken rock. This has highlighted the importance of keeping broken rock wet and applying adequate water to the footwall in scraper paths.

Many valuable investigations were carried out during this period and many improvements in dust prevention have been made on the mines.

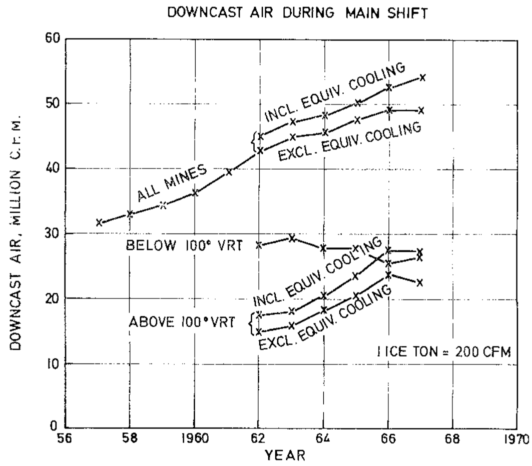
The silicosis hazard was reduced but by no means removed. It was difficult to assess any improvement in the incidence of silicosis over this period due to changes in legislation and the basis of diagnosis. The average time to contract silicosis increased from 8 to 22 years by 1950 and remained at this figure to the end of the period.

Aluminium therapy was introduced overseas, but was not accepted for practice in this country.

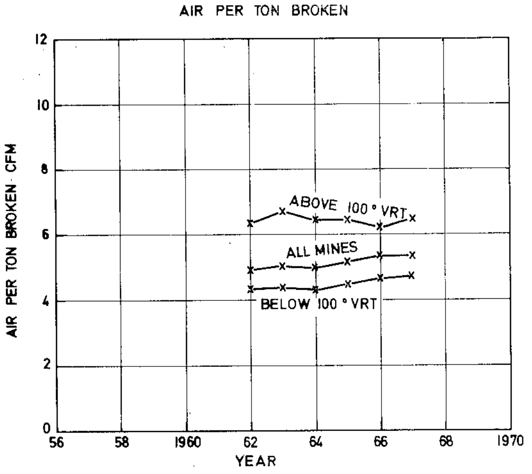
In the latter part of this period, the impression was gained that improvements in dust conditions had reached their limit and that dust concentrations had flattened out to a constant value, if not actually increasing. Mine ventilation officials returned an average konimeter count of about 170 ppcc, but a Chamber survey carried out in stopes indicated a konimeter concentration averaging 236 ppcc.



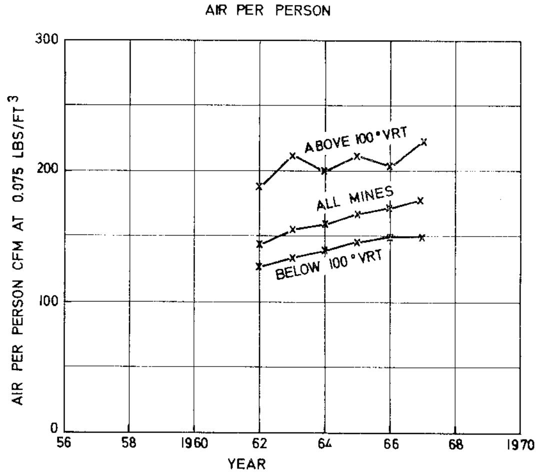
Graph 1.



Graph 2.



Graph 3.



Graph 4.

PERIOD 1960–1970

I have taken this period to represent the present stage of development. In my opinion, this is a period of considerable flux, a period of exploring and striving for a break-through to different and improved ventilation methods to enable us to cope with actual and potential changes in mining. Mining is not only being carried out at greater depths, bringing the expected associated problems in its wake, but traditional methods of mining may well be in line for drastic reform.

Mining depths in the deepest mines have reached over 11,000 ft, and the majority of mines operate at weighted mean rock-breaking depths between 4,000 and 8,000 ft. Many of the older mines have stopped production, and as newer mines take their place, these without exception operate workings at lower depths and higher rock temperatures.

Graph 1 indicates the change in number of mines at different rock temperatures over the period. (VRT at mean weighted working depth.)

The requirement in ventilation for these stringent conditions is demonstrated by the fact that ventilation volumes have reached a total of nearly 50,000,000 cfm, with some mines supplying up to 2,000,000 cfm and over. To circulate quantities of this proportion, fan pressures of up to 24 in wg are used. Even over the period under discussion, the total ventilation volumes supplied to mines has increased by 50 per cent., mainly due to increased volumes in the high-temperature mines. The amount of air per ton is 5·3 cfm per ton broken, and the average supply of air per person is 175 cfm.

Graphs 2, 3 and 4 indicate the trend for these quantities over the period under review.

In order to transmit such large quantities of air economically through the shafts to the underground workings at depth, importance is attached to keeping down the resistance of these shafts. New shafts are circular in section and are fitted with prefabricated semi-streamlined steel buntons, with 20 ft spacing, resulting in friction factors K of the order of 0·010 (lb/sq ft). This represents about half the resistance of a circular shaft with standard section steel buntons, and a quarter of that of the old rectangular timbered shafts.

Further, for the most economic utilization of the ventilating air, satisfactory distribution of the air must be achieved in the stopes. Ideally, all the air available should be usefully applied to ventilate the working faces and the scraper gulleys. With the usual mining technique of working stopes in scattered positions, there is great dependence on the walls and brattices used in the stope to ensure that the air current is directed and confined to the working face. Considerable advances have been made in the type of brattices used, and studies into this aspect under practical conditions have led to a selection of the most suitable materials, generally made of plastic, and the most suitable methods of erecting and fixing the materials to walls and packs.

In spite of these improvements in brattices, it is the considered opinion of many ventilation officials that the utilization factor for the air underground is far from 100 per cent., and that considerable room for improvement still exists, mainly in the way of overcoming practical operating difficulties.

In the case of the deeper and hotter mines, more longwall stopes are coming into use in order to concentrate the mining area and enable more effective use of air, which generally is subject to cooling in air-cooling plants. Large volumes can be made available, up to about 80,000 cfm, which course up the longwall faces and ventilate several stopes in series. In this way, high air velocities at the face are achieved, and stope face velocities up to 800 fpm are not uncommon in these stopes.

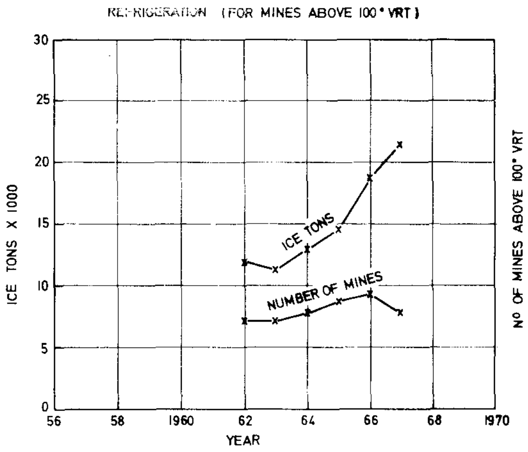
The average stope face velocity for all mines over the period is about 125 fpm, and for mines operating at deep levels about 200 fpm.

In order to maintain suitable conditions in the working places in deep mines, cooling of the air supply is required. Cooling plants are now invariably installed underground, and plants have total capacities up to 5,000 tons of refrigeration. Total refrigeration quantities in terms of ice-tons, in mines operating above 100°VRT, have increased by nearly 100 per cent. in the period under review.

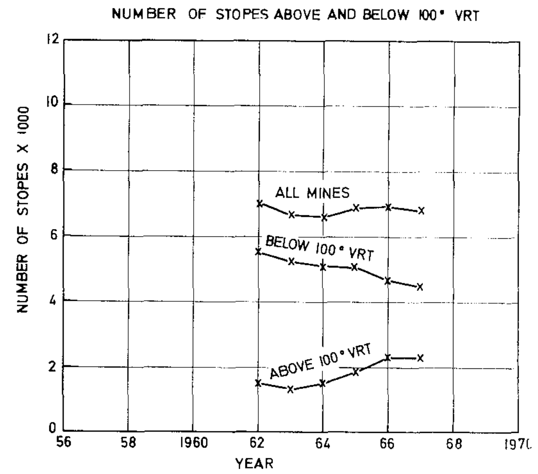
Graph 5 indicates the trend in air cooling capacities.

It is interesting to note that in spite of the continual increase in depth of the mines, the bulk of the output from the gold mines is still derived from relatively non-deep workings, which are not associated with intense heat problems. This is illustrated by the number of stopes in operation, as shown in *Graph 6*.

One of the outstanding features in the period under review is the intensity of interest and effort that is being exercised in regard to the heat problem in mines and the application of air cooling. Extensive investigations have been carried out on the flow of heat from rock to air in mining excavations, using both the theoretical and practical approaches, in order to provide basic data for the purpose of predicting air temperature rise and determining the best way of minimizing heat pick-up. Considerable investigations are proceeding, based on first principles and also using empirically the knowledge accumulated from existing



Graph 5.



Graph 6.

mines and installations, to find the optimum method of cooling working places at deep levels and maintaining safe and workable conditions in them, and to enable the forward planning of ventilation systems for projected deep mines. Details of this aspect of ventilation have been described in the proceedings of this Society and the Institution of Mining and Metallurgy, and I propose only to mention the following considerations that have received attention:

(a) The economic point at which increased ventilation should be replaced by refrigeration.

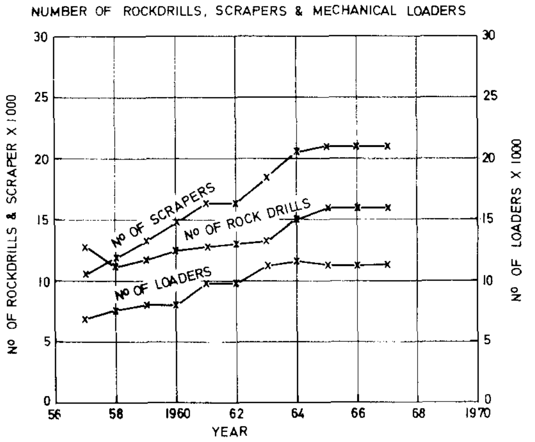
(b) The best tactical methods of applying cooling, e.g. the optimum range of air temperatures between which to operate and the number of cycles of cooling during passage up the longwall to achieve this.

(c) Optimization of ventilation and refrigeration, i.e. the value of actually reducing the ventilation volume and using refrigeration to make up for it, and the optimum ratio for these.

Another feature during this period has been the efforts to apply dry-mining or semi-dry-mining methods as far as possible and reduce or control the use of water, in order to improve conditions from the heat point of view. Dry shafts and intake airways have been proved practical, and it has been shown in the case of a large mine that meticulous control measures to prevent evaporation and the excessive use of water can go a long way towards improving conditions before the need for refrigeration arises.

Dust conditions appear to have reached a plateau or rough equilibrium, set by the tussle between increased mechanization and more difficult mining conditions on the one hand, and intensified dust suppression efforts on the other.

Graph 7 indicates the rate of increase of mechanical scrapers and loaders over this period.



Graph 7.

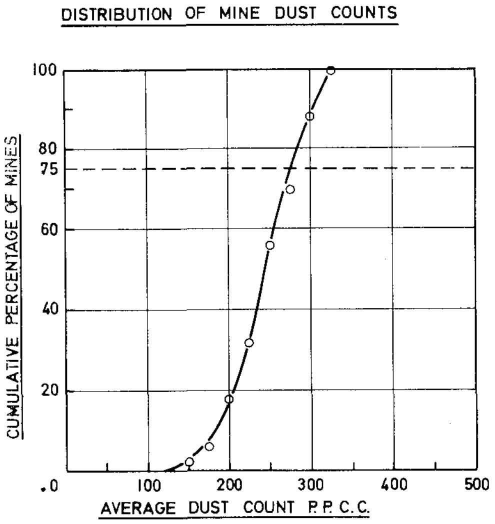
TABLE I

DUST COUNTS IN STOPES

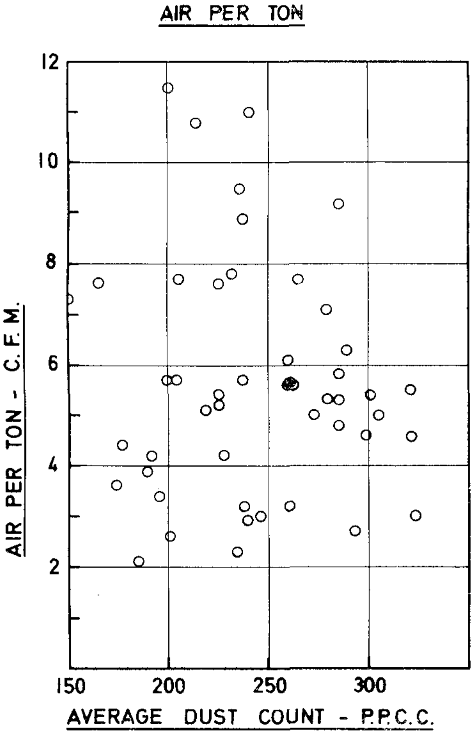
ALL MINES (1965/66)

OPERATION	STOPES		
	No. of Samples	Average ppcc	% Over 400
Barring	702	334	23
Watering down	470	313	21
Lashing	6741	302	21
Lashing behind scatterpile	382	310	23
Tramming	401	256	14
Scraping—face	382	527	55
Tipping into scraper path	85	305	24
Scraping—gulley	345	428	39
Scraping behind scatterpile	16	537	56
Drilling	3568	337	27
Pipes and tracks (incl. Vent.)	282	279	16
Timbering	2224	299	20
Stone walling and bratticing	645	269	16
Sweeping, cleaning	857	319	22
Blowing out holes	82	422	43
Charging	31	357	33
Charging gelignite	87	270	11
Charging ANBA	81	293	20
Driving winch	562	350	28
Travelling, not working	3860	280	19
Miscellaneous	3619	293	22
TOTALS AND AVERAGES	25422	309	22

No. of Persons:	Europeans	2,506
	Bantu	52,711



Graph 8.



Graph 9.

Konimeter returns from mines show an average dust count of 190 ppcc, representing a slight increase over the average of the previous 10 years. Detailed surveys carried out first by the Anglo American Group and later by the Chamber of Mines on a personnel exposure basis indicate that the overall average is nearer 250 ppcc for all mines (with 15 per cent. of the samples over 400 ppcc), and in stopes about 300 ppcc.

Table I illustrates the dust conditions in stopes averaged over all mines in 1966. The dust production from scraping is clearly shown and it is of note that in this operation over 50 per cent. of samples are over 400 ppcc.

Graph 8 shows the distribution of the dust counts in the separate mines.

The figures show that 75 per cent. of the mines have concentrations under 275 ppcc and 50 per cent. under 250 ppcc. It seems practical to suggest as a first step that *all* mines should reduce their average counts to these figures.

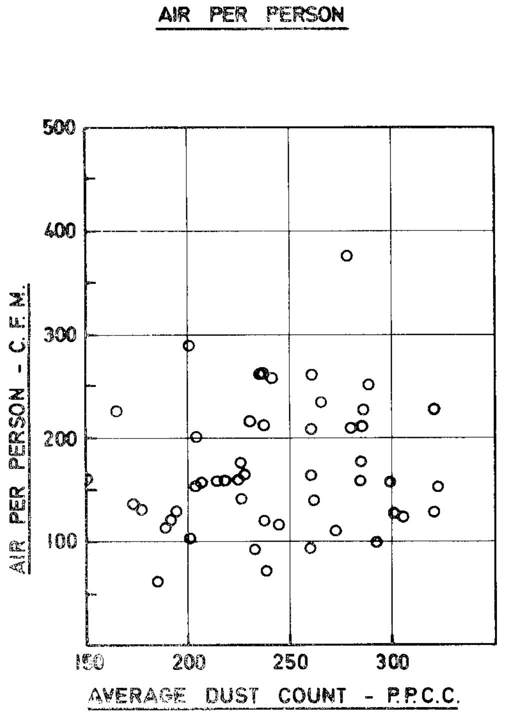
There appears to be no relationship between the average count on a mine and the quantity of ventilation.

Graphs 9 and 10 show the distribution of dust counts with air supply.

Main feature in the suppression of dust is the attention to the effective use of water. Adequate wetting down of scraper paths is practised and the use of drip feeds is being extended. Owing to concern over the effect of excessive water in aggravating the heat problem, the judicious rather than indiscriminate use of water is being stressed. The use of nozzles or sprays to obtain good coverage is encouraged. Investigations are proceeding on the use of installed sprays and off-shift wetting to replace or complement the hand-held hose.

In drilling, the sealed spline machine is exclusively used, and dust from this source has been practically eliminated. In this machine the possibility of compressed air leaking past the piston and atomizing the water is considerably reduced.

The application of filters at tips and loading boxes is extending, as shown in



Graph 10.

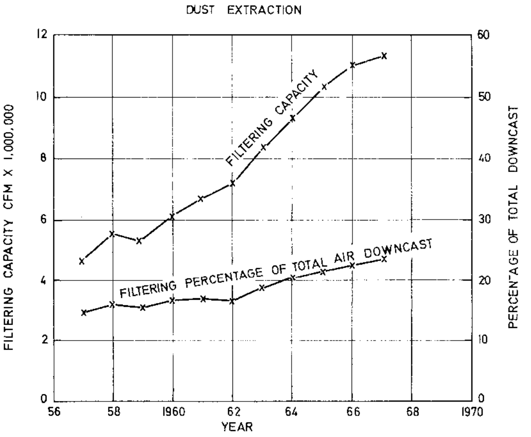
Graph 11. Vertical multi-tube filters are mainly used, with woollen cloth as filter material, but other synthetic filter materials that withstand fungal attack are continually being investigated.

In multi-shift blasting, attention is being given to prevent abuse of the re-entry period to ensure that miners are not exposed to blasting dust and fumes.

The large quantities of air used in the mines no doubt also have an effect on dust reduction.

Training of ventilation personnel has been intensified by the appointment of a full-time Training Officer and the introduction of intensive courses. A vigorous Anti-Dust Campaign led by specially appointed officials in each Group has been instituted to bring propaganda for dust suppression to the miners concerned.

A considerable amount of investigation into dust suppression is proceeding. No evidence is available that the incidence of silicosis has either decreased or increased, but it has been reported that the cases of silicosis that now occur are of a far less virulent type than previously, so this may be a heartening indication that our dust suppresion efforts are bearing some fruit.



Graph 11.

In regard to legislation, a revision of the Mining Regulations has been made and dust prevention is very fully covered.

Sampling of dust concentrations has received considerable attention. The system of sampling carried out by mines is under review. The konimeter was improved by strict standardization, but the development of the modified Thermal Precipitator in a form suitable for underground use has raised the possibility of replacing the konimeter with this instrument for routine mine samping. An automatic counter, DISA, has made it possible to greatly facilitate the counting of T.P. slides and eliminate microscope work. More attention is being paid to the distinction between operational or positional sampling and personnel sampling.

PERIOD 1970 ONWARDS (The Future)

In contemplating the future, I will confine myself to the dust problem. In my opinion, three considerations stand out clearly:

(i) Unless the efforts to suppress dust are sustained at the highest level, dust conditions under the increasingly difficult mining situations which will arise are bound to deteriorate.

(ii) New methods and systems of dust control will be required to suppress dust effectively, in order to cope with advances in mining techniques.

(iii) Methods which do not involve the use of water must be sought, in view of the increasing severity of the heat problem.

In spite of the level of investigations which is proceeding into mine dust problems, there has not yet been a " break-through " leading to new solutions. Most of the investigations are based on modifications of existing methods and invariably depend on the use of water.

Perhaps I may be permitted to submit some of my thoughts and ideas on these aspects. Some of these suggestions may sound farfetched, but I believe that they are not without merit and it must be remembered that suitable measures may have to differ quite drastically from our preconceived ideas.

A fairly obvious possibility is the use of respirators. The respirator must be light, easy to wear and able to stand up to strenuous conditions. It need not be 100 per cent. or even 99 per cent. efficient, provided it can reduce the dust inhaled to relatively harmless concentrations. A respirator with, say, 90 per cent. efficiency would be adequate, and the possibility of making such a respirator acceptable to the miner is far greater than if a complex design to achieve higher efficiency is used. The application of such a respirator would, in fact, be an extension of the idea of the micro-climate, i.e. the provision of a small local atmosphere round the individual by using a hood or suit suitably supplied with air, heat, coolth or whatever is required, instead of treating the whole of the air supply of which only a fraction is utilized by the person.

A number of years ago Mr. J. P. Rees using the figures for certification of silicosis issued by the Bureau, and comparing them with known dust concentrations, showed that it is not necessary to completely eliminate dust to prevent silicosis, but that a moderate improvement in dust concentration can result in such a considerable reduction in the silicosis rate as to reduce it to practically negligible proportions. (See *M.V.S. Journal*, August, 1960.) More recent studies of incidence rates appear to support this contention. If this conception is correct, it offers substantial support to the suggestion to use low-efficiency respirators.

Investigations in the Chamber's research laboratories are proceeding on the fundamental factors on which the production of dust from broken rock depend. For example, one of the things we do not know with any certainty is whether dust is raised from the finely divided particles already present in the broken rock mass or whether fresh particles are produced as the pieces of rock roll over one another. For the sceptical, remember how difficult it is to disperse fine dust in the air once it has aggregated and also remember that an empty scraper makes nearly as much dust as a full one. Furthermore, why do we often still get relatively high dust concentrations from rock which has been completely wetted down. Certainly there are limits to the effectiveness of water. If we can understand the exact mechanism by which dust is produced, we may break through to a suitable method for its prevention, possibly and preferably, not involving water.

At present we supply large quantities of air to dilute the dust produced in underground operation. The air is thereby contaminated and the same air has to serve as breathing air for personnel. Can we separate the air used to remove dust from that supplied for breathing purposes? Only a small proportion need be used for dust removal since, if this portion of the air is not used for ventilation, the dust can be carried away in very high concentration. This is, after all, the method used in any industrial operation where fumes are produced—the fumes are carried off usually by way of a hood, by a separate air supply which is then delivered to a remote position and is not used for supplying breathing air. Our method of ventilating tips by downcasting with a small amount of air is, in fact, a similar application. Is it possible to apply this concept on a large scale to general mining operations?

The question arises whether our present method of ventilation in series by ascentional air currents over large ventilating districts is necessarily the most efficient method of utilizing the air supply, as dust concentrations build up in the air passing from one stope to the next. Is it possible to apply a more parallel type of ventilation using a large number of separate air currents or, in other words, a large number of smaller districts, including only one or at most two levels?

Dry drilling has been practised in the past, but its use has failed mainly because of the inadequacies connected with the dust filtration system. There are certain technical difficulties in using dry drilling, e.g. in regard to drilling speed, sticking of the steel, etc. Should, however, circumstances indicate the use of dry drilling, fresh views on the method of applying it could lead to its successful application. The essence of the solution is that the dust-laden exhaust from the drill or from several drills used in nearby working places should be delivered outside of the stope or development end to a common delivery point where a suitable large filter is established. The arrangement involves the provision of a " dust main," i.e. in the same way as a compressed air main, water main and ventilation mains are provided, there should be provided a pipe possibly 6 in to 8 in in dia, referred to as a " dust main " and serving a circuit of working places. This main is under suction of a high pressure fan and leads to the central filter plant. Whenever any dust is exhausted from any operation, e.g. drilling, it should be possible to connect up to this main and thus have the dust-laden air delivered to the central filter. One can visualize such a dust main serving to collect dust from several miscellaneous operations, for example, sweeping, or blowing out compressed air pipes, etc. Instead of a filter, a wet scrubber may be used, as the problem is one of recovery rather than purification of the air.

The above are suggestions which will, if at all feasible, require considerable development and experimentation before becoming practical propositions. Until such new procedures become available, it will be important to apply our present methods as effectively as possible. Ventilation personnel will have to be trained to a high standard for ventilation requirements since the intensity of mining, greater depths, presence of gas, the heat problem, mechanization and new methods of operation will demand far greater competence in the future than has been the case in the past.

VOTE OF THANKS BY J. De. V. LAMBRECHTS

Mnr. die Voorsitter, here, dit is vir my 'n voorreg om vandag 'n paar woorde te kan sê by geleentheid van ons uittredende President se rede. Naas sy eerste liefde, chemiese ingenieurswese, het mnr. Rabson oor die jare heen ook baie tyd bestee aan aspekte van ventilasie in ons myne en het hy baie bygedra tot vordering wat gemaak is. Waar hy vandag 'n oorsig gegee het oor gebeure oor 'n langtermyn, moet onthou word dat hy self 'n aansienlike gedeelte van hierdie gebeure beleef het en dus uiters bekwaam is om so 'n oorsig te waag.

Mr. Chairman, it is perhaps fitting that someone should, from time to time, give a review of what went before, what is happening at present and what is likely to be the future trend. It is on writings of this kind that the chronicler of the future will in turn base his long-term history. Bearing this in mind, I am tempted today to reflect a little on how the thermal precipitator dust sampling instrument had an important influence on the mining industry's efforts to reduce the dust hazard—an influence which, in fact, can only be regarded as an unfortunate setback. Many of today's members of this Society may be unaware of the long drawn out controversy which centred round the thermal precipitator, and more specifically about the acid-treatment of slides, or rather the lack of it. This may appear to be a trivial detail, but I wish to place on record my belief that the initial misuse of the instrument had a profound influence on the whole subject of dust prevention in the gold mines of this country.

With the general introduction of water for dust allaying, round about 1916, and particularly wet drilling, careful thought was given to the effect of spray or atomization particles on dust counts and it was decided, with very good reason, to acid-treat konimeter slides before counting them, with the object of removing the numerous non-silicious particles.

Then followed a period of very active and enthusiastic campaigning for the elimination of dust. This enthusiasm was not confined to dust inspectors and other ventilation officials, but was shared in full measure by senior mining men, mine managers and consulting engineers. There was nothing patronizing about the effort, and mining men vied with one another in bringing out and applying new ideas.

To those of us who were doing konimeter sampling *with* acid treatment during the mid-1930's it came as a surprise when we were suddenly called upon, with the introduction of the thermal precipitator, to dispense with acid treatment. Dust counts shot up from a few hundred to many thousand ppcc, in most cases where wet drilling was taking place. By comparison, processes such as lashing, scraping, tipping and even dry drilling seemed to have become quite unimportant, and the result was almost dramatic in two directions: (1) People lost faith in the konimeter; (2) Wet drilling was singled out as the main culprit, to the exclusion of others.

This was the stage at which the dust campaign was temporarily lost. Mining men probably argued, and with some justification, that while the " dust experts " were arguing about whether or not to acid-treat and what instrument to use, they would get on with the main job of mining. There followed a period of declining enthusiasm, lasting over perhaps 20 years, and one cannot help feeling that in this way, that excellent instrument, the thermal precipitator, was responsible initially for more harm than good.

Fortunately, active dust campaigning has again got under way in the last few years, as mentioned by Mr. Rabson, and one looks forward to the next pneumoconiosis conference in this country, when it should be possible to report real progress on the engineering side after an initial setback, roughly between 1940 and 1960.

Mr. Rabson has done well to review the situation with respect to dust and ventilation in this country, and I have much pleasure in proposing a hearty vote of thanks for his address.

PROCEEDINGS OF AN ORDINARY GENERAL MEETING HELD IN KELVIN HOUSE, JOHANNESBURG, ON THURSDAY, 12th SEPTEMBER, 1969, AT 9.30 a.m.

Present:

Mr. M. P. J. Sandys (President) (in the Chair) and 69 members and visitors.

In Attendance:

Mr. M. Baskin (Secretary).

In opening the meeting, the President announced with regret the death of Mr. G. Ramsay (Associate Member), who joined the Society in the 1948/1949 session and died on the 7th August, 1968. Out of respect for the deceased and in sympathy with the bereaved, the meeting rose and observed silence for a few moments.

The President extended a welcome to all present, particularly those members who had come from distant places, and to the anti-dust lecturers who were present.

1. MINUTES.

The minutes of the Ordinary General Meeting held on the 15th February, 1968, published in the Journal of the Society in Vol. 21, No. 5, May, 1968, were confirmed.

2. ANNOUNCEMENTS.

(a) *Woordelys*: The President announced that copies of the Woordelys had been placed on the table and were available to