



Discussion summary: Coal ash dust in occupational and environmental hygiene control

A discussion of the scientific – professional team attended by international experts
Workshop on the environmental aspects of coal ash utilization
Tel-Aviv 16.12.2009

Participants (quoted lecturers): Dr. Yaacov Nathan, Dr. Asher Pardo, Dr. Ariel Metzger, Yoetz Deutsch, Dr. Ruud Meij, Dr. Robert Finkelman, Dr. Ing. Hans-Joachim Feuerborn

Background documents: Discussion platforms - 16.12.2009
Summary of the workshop's lectures
Presentations of the workshop's lectures
Review of dust standards in other countries

Topics discussed:

- Evaluation of risks involved in exposure to coal fly ash dust
- Validity of the definition of coal ash in Israeli dust standards in light of dust standards in other countries.

Presentation of the topics of discussion:

In Israel, coal ash is defined as a hazardous dust in the workplace safety regulations: "dust that may cause pulmonary diseases known as pneumoconiosis, or other health damage resulting from the material". This definition is based on the quartz content (crystalline silica) in the ash and on the fact that exposure to high concentrations of free crystalline silica in respirable dust may cause pulmonary diseases and silicosis.

This definition was discussed through two questions:

1. Is the quartz in the ash dust biologically active when in contact with pulmonary tissue?

The answer to this question is no. Tests of fly ash dust conducted in a power plant in Israel showed that the quartz concentration in the inhalable fraction (under 200µm aerodynamic diameter) is 2.3- 4.3%, and its the concentration in the respirable fraction (under 10µm aerodynamic diameter) is 2.5 - 2.9%. However, due to the chemical reactions occurring inside the power plant's boiler at 1,500°C, most of the quartz is coated with an alumino-silicate layer, and the percentage of free (exposed) quartz in the respirable fraction, according to tests conducted by Dr. Yaacov Nathan at the Geological Survey of Israel, does not exceed 1%. Therefore, most of the quartz surface does not come into contact with the pulmonary tissue.

2. Is definition of hazardous dust in Israel consistent with what is accepted around the world?

In other countries it was agreed that coal ash dust is not hazardous. OSHA (USA) does not include coal ash in its list of hazardous materials; in the Netherlands and some other countries, coal ash is



considered a nuisance dust; in England, COSHH regulations set for coal ash an occupational exposure threshold as that of nuisance dusts such as gypsum, cellulose and starch, meaning that coal ash is actually defined as a nuisance dust. The reason for this has been the one given above.

The Israeli workplace safety regulations (hazardous dust) define as hazardous any material containing any quantity of free crystalline silica, even if its concentration in the respirable dust is less than 1%, as opposed to the convention in the world, as shown above. In order for Dr. Nathan's (Israel Geological Survey) findings to bring about a change in this definition of the dust, the Ministry of Industry, Trade and Labor needs to adopt the conventionally accepted view in the world that exposure to dust particles containing less than 1% free quartz do not pose a risk of pulmonary diseases. If one neglects to distinguish between coated quartz and exposed quartz, one might erroneously get an overestimation for the concentration of biologically-active quartz in the fly ash, and, subsequently, also an overestimation of the concentration of biologically-active quartz in the air. It should also be noted that, using current measurement methods, it is quite difficult to technically separate quartz originating from the ash from quartz originating from other sources in the environment. Therefore, occupational control tools conventionally used for assessing ash-related risk to workers at power plants or at other sites at which coal ash is used, cannot be taken as reliable.

Main points raised in the discussion¹:

Dr. Ruud Meij (KEMA, The Netherlands)

- Studies by KEMA proved that there is no reason to consider fly ash as a hazardous dust in risk assessments. In the Netherlands, ash classification relied on these findings in determining that a. exposure to coal ash dust poses no risks to health, as long as the requirements for nuisance dust in the working space are observed, and b. that nuisance dust regulations should be applied to coal fly ash.

Dr. Yaacov Nathan (Geological Survey of Israel)

- It is not correct to estimate the quartz content in the air by measuring its percentage in the dust. What should be measured, as proposed by Dr. Meij, is the concentration in milligrams per cubic meter of air. That is because even if there is a small amount of dust, a high percentage of quartz might be obtained, although the air will contain only minute amounts of quartz. Hence, the right way for assessing environmental-health risk is to measure the absolute amount of quartz in the air volume containing the ash dust. This should be the reasonable regulation.
- Characterization test showed that bottom ash is inert, and therefore poses no problem as regards quartz, both inhalable and respirable.

¹ The full protocol is presented in the appendix in the original English and/or Hebrew as rendered from audio recording by Dan Shriki.



- Since Israel uses coal from sources similar to those used by other countries (e.g., the Netherlands), we should adopt the regulations in those countries that define coal ash dust as a nuisance dust.
- Current hazardous dust regulations put quartz, coal, coal ash and basalt under the definition of crystalline silica. I recommend that basalt and coal ash be excluded from this category of silica: basalt, since it does not contain quartz, and coal ash, because its quartz content is not active, i.e., the quartz concentration in the ash is irrelevant, since if it is inactive, it cannot cause harm, as active quartz does. For these reasons, I believe that coal ash should be classified as a nuisance dust, rather than hazardous dust.
- It is necessary to distinguish between workers who do not come in direct contact with coal ash and workers who do, such as workers at the power plant. Those who come in direct contact should wear protective gear, such as masks. For the general public, I believe that coal ash should be classified as a nuisance dust.

Dr. Ariel Metzger (Israel Electric Corporation)

- It is necessary to distinguish between coal ash and asbestos; these materials should not be categorized under one heading by the regulators. Fly ash is a nuisance dust, not a hazardous one. We should adopt what is already decided on in other countries, countries which have invested in much more research than we have. Our research confirms results obtained in other studies, and not only studies from the Netherlands. A research group in Lexington, Kentucky, USA arrived at this very same conclusion, namely that the quartz content in respirable particles is coated by an amorphous aluminosilicate layer, and therefore loses its ability to cause silicosis.

Yoetz Deutsch (Geological Survey of Israel)

- Quartz particles in fly ash dust are coated, and to my knowledge, it is only the exposed surface of the crystalline silica which can cause diseases. Therefore, it is not sufficient to look only at the concentration of quartz in the dust, but it is also necessary to consider the nature of this quartz. It is time to remove fly ash from the list of hazardous materials in the regulations, and to classify it as a nuisance dust.

Dr. Ing. Hans-Joachim Feuerborn (ECOA, European Community)

- Israel burns the same types of coal as other countries. This fact should be brought to the attention of the regulating authorities when asking to rely on the experience of others in this issue. The results presented by Yaacov Nathan and Ruud Meij show that in the matter of quartz, we need to focus on the fact that the particles' morphology, and in particular the surface of the particles, indicates that the particles do not cause fibrogenous effects. Attention should also be given to the ash generation process: The coal is burned at the power plants under a very high temperatures; this means that the quartz, whether it is coated by coal or exists as a free particle, even in the respirable fraction, underwent thermal treatment. To my understanding, this is a very good argument, since it means that even if there are respirable quartz particles, an examination of their surface will show that it has been fully altered.



Dr. Robert Finkelman (United States Geological Survey; University of Texas in Dallas, USA)

- The quartz content of the ash diminishes since part of it reacts with clay, creating an amorphous alumino-silicate phase.
- Knowing the coal's mineralogical composition, it is possible to deduce the expected mineralogical composition of the fly ash. This is done by calculating the silica-to-alumina ratio in the coal, from which it is possible to infer the quartz-to-clay ratio. When the silica-to-alumina ratio is 1:1, the coal ash will contain no quartz.

Dr. Asher Pardo (Israel Institute for Occupational Safety and Hygiene; Tel-Aviv University)

- Exposure to silica should not be measured according to the percentage of silica in the dust, but rather according to its concentration in the air.
- ACGIH (USA) sets the occupational exposure limit (OEL) for nuisance dust at 10 milligrams per cubic meter of air. I am not certain that this level should apply to coal ash, but in any case it should not be classified as a hazardous dust.
- It would be preferable to find a method or technique that enables, in a practical-regulatory manner, to identify the concentration of exposed quartz in the ash, that is, quartz that is not coated by an alumino-silicate layer. A laboratory capable of performing such analyses would also be necessary. If this is not possible, we should analyze the quartz in a representative sample of the respirable fraction.
- The classification of coal ash as a hazardous dust should be changed; it should be removed from this category and be classified under another category or regulation framework. The question remains how should the ash be classified, and should its OEL be as for nuisance dust or otherwise?



Meeting summary:

1. The quartz in fly ash is not biologically active, since most of its surface is not exposed, but rather coated by alumino-silicate. This is due to the high temperature in which the coal is burnt, and the thermal processes the quartz undergoes. This phenomenon is particularly important in respirable dust fraction, due to the increased chemical activity associated with the particles small size and consequently relatively large surface area.
2. Based on this finding, there is a consensus on the need to remove coal ash from the list of hazardous dusts in the regulations. Most of the participants agree that it should be classified as a nuisance dust. Another possibility raised was to define a special category and OEL for coal ash dust. However, this suggestion lacks any precedence or international criteria to rely upon as required by the Israeli regulatory authorities.
3. A correct evaluation of the amount of quartz in the coal ash dust should be based on quartz concentration in milligrams per cubic meter, not on the percentage of quartz in the dust particles.
4. It is recommended to establish a procedure for air sampling that separates, to the greatest extent possible, dust originating from coal ash from dust originating from other sources. In the absence of a standard method to distinguish between coated quartz and exposed quartz in the sample, it is suggested to rely on SEM analysis of the respirable ash dust, and derive from it an estimate of the exposed quartz in the dust.

The status of coal ash in Israeli regulations vs international regulations

USA

Coal ash does not appear in the list of hazardous materials², the concentration of which in air should be limited, in the OSHA regulations. In another OSHA regulation which refer to mineral dust³, a threshold limit values (TLV) for nuisance or inert dust are given as 5 mg/m³ of air and as 15 mg/m³ of air, for respirable dust and general (inhalable) dust, respectively. The same regulation determines that materials lacking available toxicological data are not explicitly listed in the list of hazardous materials for which unique TLV's have been defined; these are assigned the nuisance/inert dust TLV's. Coal ash is not included in the list of hazardous materials and therefore, it can be inferred that coal ash is considered as a nuisance dust in the USA.

This conclusion needs to be corroborated by examining how well coal ash conforms to the definitions and terms of OSHA for nuisance or inert dust. Reviews of OSHA documents showed that there was no explicit definition for nuisance/inert dust (in contrast to the ACGIH, which does define such dusts), although one of OSHA's documents dealing with PEL (Permissible Exposure Limits) suggested for various materials⁴ does establish, as stated in the previous paragraph, that all

² A link to the list in the review of international dust standards attached to the discussion platform (footnote 3).

³ See previous note.

⁴ Discussion on health effects and determination of final PEL



materials not included in the hazardous materials list may be classified as PNOR (Particulates Not Otherwise Regulated), namely that exposure to them may result in various physical effects but that there is no available data on their toxicity. "Physical effects" include irritation to the eyes and upper respiratory system, impeded vision and accumulation of particles in the eyes, ears, nose and mouth.

Dust standards in Israel adopt those of the ACGIH. The latter did define regulations for nuisance dust called "Particulates not otherwise specified" (PNOS). Using PNOS definitions, one finds a correlation between the characteristics of the ash and those of nuisance dust, and this has been discussed by Dr. Asher Pardo in his review in the National Coal Ash Board's⁵ workshop on the "Environmental aspects of coal ash utilization". This review shows that coal ash does meet PNOS definitions (with the exception of the concentration of radioactive elements in the ash which were not discussed in this review).

Again, the NIOSH does not refer directly to coal ash. It does however, give TLV's for PNOR, and these are identical to those of OSHA. NIOSH lists the following health effects from exposure to PNOR: irritation to the eyes, skin, throat and upper respiratory system. In contrast, health effects caused by exposure to respirable crystalline silica dust, according to NIOSH, are extreme and broad, including breathing difficulties, degradation of lung performance, silicosis and even risk of cancer.

England

The British standards we reviewed did not explicitly define nuisance or inert dust, nor were any permitted levels given for such dust. In contrast, one of HSE⁶ documents sets TLV's for pulverized fuel ash at 10 mg/m³ of air for general dust and 4 mg/m³ of air for respirable dust. These match the maximal values determined for "dusts of any kind" in COSHH⁷ regulations. Dust in concentrations exceeding these values is defined as hazardous to health. Nevertheless, since the HSE document lists the hazards involved in exposure to materials for which maximal values in the air have been defined, while no specific risk is related to exposure to ash or to the other materials whose TLV's were as that of ash, it may be concluded that HSE does not define ash dust as hazardous.

One of the UKQAA documents (United Kingdom Quality Ash Association⁸) does refer to an explicit classification of fly ash as a nuisance dust. Another document⁹ of this organization states that during 60 years of experience, there has not been any medical evidence of damage caused to the respiratory system or the lungs by exposure to fly ash dust.

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=PREAMBLES&p_id=770

⁵ Abstracts of the background material for the symposium (English)

⁶ List of workplace exposure limits (WEL) and other tables in:

<http://www.hse.gov.uk/aboutus/meetings/hscarchive/2004/091104/c06c.pdf>

⁷ The Control of Substances Hazardous to Health Regulations 2002.

⁸ Environmental code of practice for the sale and use of Pulverized Fuel Ash (PFA).

http://www.ukqaa.org.uk/Environment/Code_of_Practice_January_2003.pdf

⁹ UKQAA_MSDS, 2009 http://www.ukqaa.org.uk/Datasheets_PDF/Datasheet_9-0_Feb_2009.pdf



The Netherlands

The dust of fly ash is classified as a nuisance dust, since it consists of approximately 0.1% free crystalline silica in the dust respirable fraction. This value is beneath the 1% free crystalline silica required in the Dutch occupational exposure standard for defining a material as a hazardous dust. Much research done in the Netherlands led to this determination; this was presented by Dr. Ruud Meij in the National Coal Ash Board¹⁰ workshop on “Environmental aspects of coal ash utilization”. These findings have been published in one of KEMA institute’s reports (Status report on the health issues associated with pulverized fuel ash, 2003), which serves as a basis for regulatory efforts in the Netherlands. The Dutch safety data sheet for fly ash also states that the material is not toxic¹¹.

¹⁰ Abstracts in the symposium’s background material (English).

¹¹ Vliegasunie B.V., MSDS, 2004.



Appendix

Selectad excerpts from the protocol of the discussion on hygiene in the workplace

A. Pardo: The question is how coal ash (especially fly ash) should be classified, if it is to be removed from the hazardous dust regulations. Following results of studies performed for the National Coal Ash Board for the last two years, government officials tend to be convinced that this ash should be removed from the list of hazardous dusts in the regulations. However, they are still uncertain whether to classify it as a nuisance dust, as is done in other countries. Therefore, the question rises whether to classify the ash as a nuisance dust or to place it in an intermediate category, somewhere between nuisance and hazardous. In Israel, hazardous dust is defined as a material that may cause pneumoconiosis; this includes asbestos, free crystalline silica and talc. Talc itself is currently undergoing reevaluation.

Israel's classification of fly ash as a hazardous dust applies to any weight percentage of quartz content in the ash, even if it is less than 0.1%, which is the percentage of carcinogenic substances below which there is no requirement to even state it in the material's safety data sheet. Therefore, fly ash is classified as a hazardous dust regardless of the actual crystalline silica content in it. In addition, in Israel, unlike many other countries, the crystalline silica regulations hold not only for the respirable fraction which may cause silicosis or other lung diseases, but also for the inhalable fraction of the dust (general dust). This is in contrast with other countries, which agree that coal ash dust and dust containing less than 1% quartz, is not to be classified as an hazardous dust.

The respirable fraction of the particulate matter in bottom ash amounts to only 0.4% (w/w), and part of it never becomes airborne because it is trapped among very coarse particles. The concentration of respirable free silica in bottom ash is also very low.

Analysis conducted in Israel on fly ash dust showed that the quartz concentration in the inhalable fraction (below 200 μm aerodynamic diameter) is 2.3% - 4.3%, and the concentration in the respirable fraction (below 10 μm aerodynamic diameter) is 2.5% - 2.9%, and most of the quartz in the ash is embedded in the alumina while only a small part of it is exposed at the surface of the particles. It may be said that this quartz can be active, although we find no evidence that the quartz in fly ash is biologically active. The percentage of the available, biologically-active quartz in the ash in the respirable fraction does not exceed 1%.

If we could find a correlation between the properties of coal ash dust and those of nuisance dust defined as PNOS by the ACGIH, (whose regulations were adopted in Israel), with the exception of radioactivity-related issues, we would have been able to prove that ash can be classified as a nuisance dust. Related to this issue, coal ash is insoluble, although some of the metals it contains are soluble. However, in terms of occupational exposure, the concentration of heavy metals in the air is negligible and is even below 10 percent of the occupational standards, a threshold below which there is no need for medical surveillance or other special activities. Coal ash has a low toxicity, as required by the definition of PNOS. Coal ash is neither cytotoxic, nor mutagenic or carcinogenic (or at least no evidence has been found to assume otherwise). The issue of 1-5 percent of radiation above the background radiation level is debatable, but we have seen that with regard to the utilization of ash in



concrete, there is no restriction on the use of the ash in this respect. Coal ash also does not react chemically with the lungs and its biological activity is similar to that of nuisance dust.

In the USA, OSHA does not include coal ash in its list of hazardous materials. The Netherlands and other countries classify it as a nuisance dust. In England, COSHH regulations classify coal ash as nuisance dust. This is evident from the fact that the occupational exposure limit for coal ash is equal to that of other nuisance dusts, such as gypsum, cellulose and starch. So we have reliable sources from which we can learn and which we can use as a basis for the formulation of regulations.

Currently, the regulator demands that workers exposed to dust containing more than 1% crystalline silica, should undergo medical supervision, if the concentration in the air exceeds the action level, which is half of the occupational exposure limit.

In some mixtures of raw materials it is not possible to separate the silica content originating from coal ash from that originating from other components of the mixture. For example, in concrete mixtures there is also sand, which contains quartz as does coal ash.

If one fails to separate the surface crystalline silica from the embedded one, one may overestimate the relevant biologically-active quartz concentration in the fly ash and as a result this may also lead to an overestimation of the quartz concentration in the air.

At present, it is technically difficult in analyzing the results of occupational measurements to distinguish between quartz originating from fly ash and quartz originating from other sources, such as sandy soil on which, for example, power plants in Israel are located.

The relevancy of ash dust sampling for determining occupational exposure levels as conducted by the National Coal Ash Board, is limited. Using cyclones for collecting respirable matter by the standard method of sampling silica in the air yielded a quantity that was insufficient for detecting quartz by XRD analysis. The laboratory required a minimum dust quantity of 500 µg; silica concentration under such limitations can reach the action level even at the limit of detection, which is an absurd that means that we cannot use that data in order to determine what will be the expected concentrations of silica to which workers may be exposed. Also, samples were taken in the power plant at a specific point (beneath the area where ash is loaded into containers); this point is highly susceptible to the penetration of fly ash dust, and was chosen in order to collect as much pure ash as quickly as possible. However, it may not reflect the fly ash dust concentrations to which workers are regularly exposed to, since they usually do not stay at that location.

R. Meij: We conducted a comprehensive research at KEMA on coal and coal ash, with the participation of universities and other research institutions such as the Dutch ECN and TNO. The research was managed by the National Institute of Public Health and Environmental Protection, and addressed, among other issues, the health implications of working with coal fly ash.



TNO did much work on this matter. Experiments conducted on animals and living cells yielded results typical to normal levels of exposure, that is, below the threshold for nuisance dust which are not likely to have any significant health implications.

In any risk assessment procedure there is no reason to regard fly ash as a harmful dust. As long as requirements for nuisance dust in the occupational environment are met, there will be no increased health risk, and the standards for nuisance dust should be applied to fly ash.

KEMA conducted an extensive research on the quartz in coal dust and coal ash, with the cooperation of Prof. Borm. The results were presented by me (R.M.) in a leading international symposium on Particle Toxicology that was held in Maastricht in 1999. The research results, which were accepted by all the experts who participated in the symposium, were also accepted by the Dutch regulatory authorities as a reference for classifying fly ash as a nuisance dust.

KEMA's status report, which presents the occupational-environmental effects of exposure to coal ash, is quoted by governmental officials in the Netherlands and used as reference material for permit and licensing decisions. It is currently regarded as a reference document in the Netherlands.

Y. Nathan: It is incorrect to measure quartz content in the ash dust by measuring its percentage in the material. The parameter that should be measured is, as Dr. Meij suggested, the quartz concentration in milligrams per cubic meter of air. This is because if there is a small amount of dust in the air, a high percentage of quartz might be present in the dust particles while the air will contain only minute amounts of quartz. So, the way quartz content in the ash should be measured is not by percentage, but by absolute quantities. This should be the reasonable regulation. Bottom ash is comprised of coarse particles and therefore, by definition, it cannot be in the respirable or inhalable fraction. Characterization tests showed that bottom ash is inert, and as such it presents no risk as regards quartz, both inhalable and respirable.

The examination of fly ash particles using a scanning electron microscope showed that none of the inhalable particles contained quartz. It doesn't mean that there will be no inhalable dust which contains quartz, but still, the best way for determining quartz content in fly ash is to measure it as milligrams per cubic meter, as suggested by Dr. Meij. As long as this measurement is satisfactory, the material is a nuisance dust and not a hazardous dust, and not only because of quartz. Since we use the same type of coal other countries do, we should adopt the regulations of those countries (e.g., the Netherlands).

A. Pardo: The exposure to silica should not be judged by the percentage of silica in the dust, but rather by its concentration in the air.

A. Metzger: The inclusion of coal ash in the same category with asbestos should be reversed. Fly ash is a nuisance dust, not a hazardous one. We should adopt what was already decided on in other countries, countries which have invested in much more research than we had. Our research confirms results obtained in other studies, and not only studies from the Netherlands. In the USA there is a research group situated in Lexington, Kentucky, which arrived at the same conclusion – particles of



quartz in the respirable fraction are coated by an amorphous alumino-silicate phase and therefore lose their ability to cause silicosis.

Y. Deutsch: Quartz particles in fly ash dust are coated, and to my knowledge it is only the exposed surface of the crystalline silica which can cause diseases. Therefore, it is not sufficient to look at the concentration of quartz in the dust, but also one should consider the form of this quartz. It is time to remove fly ash from the list of hazardous materials in the regulations, and to classify it as a nuisance material.

B. Finkelman: NIOSH conducted studies on the bio-reactivity of the quartz in coal, and found that when the quartz was coated with clay or in quartz particles covered by alumina, there was no biological activity. The particles were biologically inert. There is another category of quartz in coal – epigenetic quartz, which was introduced after the formation of the coal, and it fills in the cracks in the coal. This is pure quartz, uncoated by clay. This type is likely to be biologically active. It is also much coarser and its particles reach a size of millimeters, compared to detrital quartz the particles of which are on the average less than 5 microns in size. So that is another distinction that needs to be recognized.

H. Feuerborn: Israel uses the same type of coal other countries use. This should be brought to the attention of the regulating bodies when relying on other countries' experience. The results presented by Dr. Nathan and Dr. Meij demonstrate that regarding quartz, we need to focus on the evidence that due to the ash dust morphology and specifically that of its particles' surface, it does not induce fibrogenic effects. The ash generation process should also be given attention. One burns coal at high temperatures, which means that the quartz, whether embedded in coal particles or available as single particles, especially in the respirable fraction, is thermally transformed. To my understanding, this is a strong argument, that even if there is quartz in the respirable fraction, the surface of its particles has been radically altered on account of the thermal exposure.

B. Finkelman: Earlier I talked about the quartz contained in the coal. If we know what's in the coal, we get a good idea of what will be in the fly ash. Quartz is not created out of thin air, and its content in the fly ash is reduced, because some of it reacts thermally with the clay to form an amorphous alumino-silicate phase. So, by knowing the mineralogical composition of the coal, we will be able to deduce the mineralogical composition of the fly ash. But there is even a simpler method to obtain this information: calculation. The silica-to-alumina ratio in the coal yields information on the quartz-to-clay ratio. Thus, if this ratio is up to 1:1, there will be no quartz in the coal¹².

A. Pardo: This issue needs to be examined from two aspects: on the one hand, it is clear that the ash needs to be excluded from the hazardous dust regulations. On the other, the question is whether to classify it as a nuisance dust or as another material with some classification that, at the end, will have some occupational exposure limit that we'll have to abide by. I think that our main goal should be to firstly exclude coal ash from the hazardous dust regulations. Whether the Ministry of Environmental

¹² From the ash's silica-to-alumina ratio, the presence or absence of quartz can be inferred: if the ratio is below 1, then the source of the silica in the ash will be alumino-silicates, and the ash will contain no free quartz. For example, Dr. Nathan of the Geological Survey of Israel found that South African (BB Prime) fly ash had such a ratio of 0.4.



Protection or the Ministry of Labor decide thereafter to classify it as a hazardous dust or as some other minimally toxic dust, is another matter. I do not believe we can do both in a single stroke, that is, excluding coal ash out of the hazardous dust regulations and then defining it as a nuisance dust. The committee of physicians needs to be convinced that the ash is not hazardous, before the Ministry of Labor will want to refer to it in any way.

Y. Nathan: Current hazardous dust regulations place quartz, coal, coal ash and basalt under the heading of crystalline silica. I recommend that basalt and coal ash be excluded from this category of silica; for basalt because it does not contain quartz, and for coal ash because the quartz it contains is not active, i.e., the quartz concentration in the ash is not relevant, because if it is not biologically active, it cannot cause any harm. For this reason I think that coal ash should be classified as a nuisance dust, not hazardous dust.

A. Pardo: The main recommendation to come out from this session is to change the classification of coal ash as a hazardous dust. It should be excluded from the hazardous dust category and be put under another regulation or category. The question remains how the ash should be classified, and whether the occupational exposure limit should be that of a nuisance dust or more severe.

As for international regulations, ACGIH (in USA) sets OEL for nuisance dust at 10 mg/m^3 of air. I am not sure whether this level should apply to coal ash, but in any case it shouldn't be classified as a hazardous dust.

An additional recommendation was to find a method or technique for determining the concentration of exposed quartz in the ash, meaning not the quartz that is coated with alumino-silica, and to find a laboratory capable of performing such analyses. If not, we should try to establish a procedure for representative sampling of the respirable fraction of the coal ash dust, and to estimate the exposed quartz content, using the results of studies and tests of quartz in coal ash¹³.

Y. Nathan: It is important to distinguish between workers who come in direct contact with fly ash and workers who do not, such as the workers at the power plant. Those who do come in direct contact with the ash should wear protective gear such as special masks. For the general public, I think that fly ash should be classified as a nuisance dust.

Edited by: Dan Shriki

¹³ For example, the analysis by SEM of 25 fly ash particles of South African origin and of 36 particles of Indonesian origin conducted by Dr. Yaacov Nathan; this analysis showed that the respirable fraction contained no free (uncoated) quartz.