ILLINOIS POLLUTION CONTROL BOARD
November 1, 1979

IN THE MATTER OF:	)	
	)	R78-11
FUGITIVE PARTICULATE EMISSIONS FROM INDUSTRIAL SOURCES	)	

OPINION OF THE BOARD (by Mr. Goodman):

The Clean Air Act Amendments of 1977, Public Law No. 95-95, amending the Federal Clean Air Act, 42 U.S.C. §7401 et seq., imposed new requirements on the State of Illinois. Section 172 of the Clean Air Act requires that Illinois provide for the attainment of the National Ambient Air Quality Standard (NAAQS) for total suspended particulate (TSP) by December 31, 1982. The provisions for attainment are to be included in the State Implementation Plan (SIP), which must "contain emission limitations, schedules of compliance, and other such measures as may be necessary...." Clean Air Act §172(b)(8). Such limitations, schedules and measures will be contained primarily in the Board's Air Pollution Control Regulations; the amendments made in this proceeding will partially fulfill the mandates of §172.

Pursuant to the 1977 Clean Air Act Amendments, the Illinois Environmental Protection Agency (Agency) reevaluated the SIP to determine which portions should be amended in order to attain and maintain NAAQS for all pollutants. After identifying geographical areas which are nonattainment for TSP levels, the Agency determined which sources were contributing to high TSP levels. The Agency found that the highest monitored TSP levels were generally located in the vicinity of large industrial sources of fugitive emissions (R.283). The sources consisted of stockpiles, plant roads, conveyor transfer points, material handling, etc. Hence, the Agency proposed amendments to the Board's fugitive particulate emissions standard.

On September 13, 1978, the Agency filed a proposal to amend Rule 203(f) of the Air Pollution Control Regulations (Chapter 2 of the Board's Rules and Regulations). The Board docketed the proposal as R78-11 and ordered hearings set. The Agency submitted revisions to its proposal on March 15,

---

The Board acknowledges the assistance of Carolyn S. Hesse, Technical Assistant, and Ken F. Kirkpatrick, Administrative Assistant, in the drafting of this Opinion, and the assistance of Roberta Levinson in serving as Hearing Officer.

1979 and March 22, 1979, which were published in the Board's Environmental Register, Numbers 179 and 180. Public hearings were held in the following locations:

October 30, 1978	Springfield
November 14, 1978	Chicago
December 6, 1978	Peoria
December 8, 1978	Chicago

Pursuant to Public Act No. 80-1218, Ill. Rev. Stat. ch. 96 1/2, §7401 et seq., the Illinois Institute of Natural Resources on March 28, 1979, filed IINR Doc. No. 79/06, The Economic Impact of Proposed Regulations to Reduce Particulate Emissions from Steel Mills and Industrial Fugitive Sources. Hearings on the economic impact were held in the following locations:

May 3, 1979	Oglesby
May 4, 1979	Chicago
May 16, 1979	Belleville
May 17, 1979	Springfield

On March 29, 1979 the Board proposed an Interim Order to meet the federal deadline for submittal of SIP revisions pursuant to the Federal Clean Air Act. On July 12, 1979 the Board proposed a Final Draft Order and published it in the Illinois Register on August 10, 1979, pursuant to the Illinois Administrative Procedures Act, Ill. Rev. Stat. ch. 127, §1001 et seq. The public comment period ended September 24, 1979. On October 4, 1979 the Board adopted a Final Order in this proceeding. This Opinion supports that Order.

TOTAL SUSPENDED PARTICULATE MODELING STUDIES

In order to determine if existing particulate emission limitations were sufficient to meet NAAQS for TSP and to offer technical support for their proposal, the Agency either performed or reviewed air quality simulation modeling studies for the following metropolitan areas in Illinois: St. Louis (Ex.2/7a,7b*), Peoria, (Ex.2/8), Macon County (Ex.2/9), and the Quad Cities (Ex.2/10). Due to problems with obtaining an emission inventory for Lake and Porter Counties in Indiana, the study for the Chicago area had not been completed at the time of the hearings (R.204). When the point-source modeling results were compared with actual monitoring data, it was

---

* When R78-10, R78-11, and R79-3 were consolidated, the records from these proceedings were marked as Exhibits 1, 2 and 3 in the consolidated record, respectively. Consequently, "Ex.2/7a" refers to the document that was admitted as Exhibit 7a in the R78-11 record, which is Exhibit 2 in the consolidated record. "Ex.5" refers to Exhibit 5 of the consolidated record.

found that the models underestimated the TSP levels. The Agency believes that part of the reason for this underestimation was that fugitive particulate sources were not included in these studies (R.207). The Agency also found that even if all studied sources were in compliance with the existing rules and regulations, violations of NAAQS for TSP would still occur in Illinois (R.207).

When traditional fugitive dust emission sources were modeled for these five areas, the Agency found that the maximum contribution to annual air quality levels ranged from less than 1 $\mu g/m^3$ to more than 40 $\mu g/m^3$ (R.205-6). If these sources were controlled by reasonably available control technology, the modeling results projected that air quality would improve by as much as 20 $\mu g/m^3$. Hence, the Agency concluded that substantial improvements in air quality will result from controlling traditional fugitive particulate emission sources (R.207). [Exhibit 2/1 contains several tables which show the contribution of traditional fugitive particulate emissions to TSP levels in various nonattainment areas in the state and the improvement in air quality levels that would be expected with the implementation of reasonably available control technology.]

Several questions were raised during hearings on the appropriateness of using the Climatological Dispersion Model (CDM) to model fugitive particulate matter (R.176). For example, the CDM used in the Peoria, Macon County and Quad Cities studies did not take gravitational settling or wet or dry deposition into account. In addition, the CDM treats air pollutants as though they were unreactive gases (R.244). The Agency did not include all particulate sizes in the CDM modeling studies since it would be inappropriate to include larger-sized particles which would rapidly settle out of the air. Only the particulate matter which was smaller than 30 micrometers (μm) aerodynamic equivalent diameter was used (R.252).

The modeling study, with all its problems, is still a useful tool for assessing the contribution of traditional fugitive particulate emissions to TSP levels. The Agency compared data from monitors which showed violations of the NAAQS and were located near sources of traditional fugitive particulate matter, with pollution reduction estimates which were derived from the modeling studies. This comparison showed that an improvement in ambient air quality would result if traditional fugitive particulate matter was controlled. Since the Board's Final Order does not require control on as many sources as the Agency's original proposal, the expected improvements in air quality will not be as great as predicted in the modeling studies, which were based on the original proposal.

SOURCES

Traditional sources of controllable fugitive particulate matter include the following:

1) Material loss from conveyors, which primarily occurs at feeding, transfer and discharge points or from spills;

2) Emissions during loading and unloading of bulk materials into transportation vehicles, which arise mainly from mechanical agitation of the material as it strikes the sides and bottom of the vehicle and from air turbulence created as the material is moved into and out of the vehicle;

3) Load-in (addition) and load-out (removal) operations from storage piles, vehicular traffic around storage piles, and wind erosion of the surficial material from storage piles (R.13);

4) Material handling operations, such as railcar side dumping, motorized car side chute dumping, clam shell bucket loading and material sizing at screening operations (R.20); and

5) Vehicular traffic on dust-laden plant roads, which can lead to dust reentrainment (R.28).

CONTROL TECHNOLOGY

Although one can calculate annual emissions from a storage pile to determine if the pile should be controlled, it would be difficult to develop an enforceable emission limitation. Consequently, the Rules under 203(f)(3) as amended do not specify emission limitations but instead require that control technology be utilized which has been determined to be reasonably available. The proper use of any of these listed control technologies for a given source satisfies the regulations; the phrase "or an equivalent method" is included to allow the operator latitude in selecting an alternate control technology which would be as effective in reducing emissions (R.294). In general, the listed control technologies minimize the amount of dust that might become airborne rather than reduce the quantity of dust after it becomes airborne.

Two major forms of control of fugitive particulate matter are wet suppression systems (spraying) and some form of enclosure. Wet suppression systems use water, chemicals or foam to reduce wind erosion of storage piles and at conveyor feed and discharge points. Several facilities in Illinois use such spraying (R.478-89). Spraying of plant roads can, under some circumstances, also reduce the amount of dust reentrained from

moving vehicles. Although spraying with water is relatively inexpensive, it is short-lived. The addition of chemical surfactants to water improves the effectiveness of spraying since they reduce the surface tension of water. This allows smaller particles to be wetted and agglomerated. Surfactants also permit the water to penetrate deeper into the storage pile (R.12). Some storage piles can be treated with a chemical crusting agent to form a nonerodible crust on the surface (R.27).

There are some problems associated with the use of wet suppression systems. An example is their use on storage piles in the cement industry. One of their materials is "clinker", which essentially is cement before gypsum is added to delay the "setting up" time. Since water causes cement to "set up", the addition of water to clinker could ruin the clinker (R.713-4). However, since clinker is usually stored in enclosures to protect it from precipitation, and is stored outdoors only during emergency conditions, it is unlikely that controls in addition to the enclosures would be necessary. Emissions from the outside storage piles would probably not exceed 50 tons per year. Another aspect of the problem is that the addition of water to limestone or to other raw materials used to manufacture cement may cause an upset condition in the kiln which could increase particulate emissions from the kiln (R.565). When these raw materials are stored outdoors, without covers, they get wet from precipitation (R.577-8).

The aggregate materials industry testified that there are problems with their product when water is added to the storage pile (R.727-34). However, there is no evidence suggesting that the pile would be affected other than at the surface which is already involved with moisture from rain and snow (R.577-8). When the piles are covered, compliance problems may not exist (R.711).

An additional problem associated with spraying is freezing in winter (R.177). However, if a crust of ice has formed on the top of a pile or if snow covers the pile, it is unlikely that spraying would be needed as a control. If spraying is needed, at least one firm sells an electrical heat tracing system which would keep spray systems from freezing in winter (R.664-5).

The second form of controlling fugitive emissions is enclosures or covers for storage piles such as storage silos, sheds, other structures, and wind breaks. The structures do not necessarily totally enclose the pile (R.27).

Control methods such as stone ladders, height adjustable stackers, telescopic chutes, and wind guards can be used to reduce emissions during storage pile load-in operations (R.15-16). Reducing the drop distance when using a clam shell bucket

can also reduce the amount of fugitive dust that becomes airborne (R.24).

Fine products (less than 20 mesh) are usually loaded into tank trucks or railcars by gravity feeding through plastic or fabric sleeves (R.32). Other dry collection techniques could utilize a hood or an enclosure to collect dust generated during various operations. The dust-laden air is then ducted through a particulate collection device such as a fabric filter (R.15,16,34). Pneumatic or screw conveyors can be used to reduce particulate emissions during some conveying operations (R.12). Although it is difficult to accurately determine the efficiencies of these methods, it has been estimated that they range between 70 and 90% (R.42).

OPACITY

Early versions of the Agency's proposal contained opacity limitations.* These proposals required that emissions of fugitive particulate matter not exceed 10% opacity from conveying operations, certain buildings, certain enclosed structures, and railcar dumping and bottom unloading operations. Visible emissions were to be limited to not more than 6 minutes during any 60-minute period for the certain sources.

Several industries described their problems in meeting these opacity limitations (R.178-9,472-3,747,749, S.515**). One example is the problem associated with loading fine particulate material into trucks inside a building. When the doors are opened for trucks to enter or exit, particulate matter escapes. One industry witness contended that the only way to comply with a rule requiring no visible emissions for 54 minutes of an hour was to operate for only 6 minutes of each hour.

Another witness contended that a mass emission rate can not be attributed to a given opacity reading since opacity is a function of particle size as well as grain loading (R.609-10, 701). There was also testimony that for a specific process opacity generally increases with an increase in grain loading (R.688).

---

* Opacity is the measure of the degree to which particulate matter (or smoke) reduces the transmission of light and obscures the view of an object in the background.

** Citations to page numbers in transcripts from the first four substantive hearings are designated with the letter "R". After this proceeding and R78-10 and R79-3 were consolidated, the transcript pagination started over with the number 1. Hence, citations to transcripts from the last four hearings are designated with the letter "S".

There are also problems with trying to read opacity from sources of fugitive emissions. Opacity measurements are normally read from a stack which is a point source; however, fugitive emissions do not come out of a stack. Hence, there is some uncertainty associated with determining where opacity should be read (R.427-8). The proposal industry made did not contain references to methods of measuring visible fugitive particulate emissions (Ex. 19).

The Board finds that although opacity levels and grain loadings may be correlated for a given process, opacity readings can not be used quantitatively to compare fugitive particulate emissions from other processes. The Agency's 10% opacity limitation would lead to only a minor improvement in air quality. Hence, the Board's Final Order in this matter contains no opacity limitations.

COMPLIANCE DATE

The compliance date for Rule 203(f)(3) is December 31, 1982, which is the latest compliance date allowed under the 1977 Federal Clean Air Act Amendments, and sources do not have to demonstrate reasonable further progress in controlling traditional fugitive particulate matter. The compliance dates are allowed since the NAAQS for TSP, currently being reviewed, may be replaced with an inhalable particulate standard as a primary standard (R.172). If an inhalable particulate standard is adopted which specifies a maximum size for inhalable particulates, such as 15 μm, some of the processes which would be under 203(f)(3) may no longer need to be controlled to meet the primary standard if their emitted particulates are larger than the size determined to be inhalable. However, control of particulate matter may still be required under a secondary standard.

Particulate Emission Factors Applicable to the Iron and Steel Industry (MRI Report, Ex.2/20) states that open dust sources within iron and steel facilities contribute 25% of those facilities' particulate matter smaller than 5 μm (Ex.20, p.24). Controls on such sources may be required even if an inhalable particulate standard is adopted and a secondary standard is not. At the current time, the Board has insufficient information to determine what effect an inhalable particulate standard might have on these sources. Consequently, the Board is allowing the latest possible compliance date so that, if necessary, the emission limitations for large traditional fugitive particulates can be revised in accordance with any new NAAQS.

RULE-BY-RULE DESCRIPTION

Most of the rules under 203(f) are self-explanatory and need no further clarification. However, certain rules need further explanation.

Rule 203(f)(1)

Rule 203(f)(1) remains unchanged. While various proposals suggested changing or omitting this Rule, the Agency's Third Amended Proposal, filed March 22, 1979, contained the current rule. The Board finds that the current rule, which is applicable statewide, should be retained.

Rule 203(f)(2)

Rule 203(f)(2) refers to Standard Industrial Classification groups, which are described in the 1972 edition of Standard Industrial Classification Manual, Statistical Policy Division, Office Management and Budget. The Board takes official notice of this standard reference work. The original Agency proposal called for statewide application of this rule. Subsequently, the Agency proposed narrowing the geographic scope to the counties of Cook, DuPage, Lake, LaSalle, Macon, Madison, Peoria, Rock Island, St. Clair, Tazewell, Will, and Winnebago (R.360). These twelve counties contain nonattainment areas and were selected on the basis of population and the presence of major point sources of particulate emissions (R.359-70). Later, the Agency narrowed the scope of its proposal to townships in those counties that contain fugitive sources which contribute significantly to nonattainment (Ex.2/54).

The scope of this rule should be narrow in order to avoid expenditures for controls which are not necessary for attainment of the NAAQS. The limits of geographic applicability of 203(f)(3) and 203(f)(4) are the areas within the physical boundaries of the townships listed in 203(f)(2). Any sources located in political units contained within the listed townships would be covered since the source is within the area defined by the township's outer boundaries. The physical boundaries of the townships included under the rule are those officially determined by the Secretary of State as of the date of the Final Board Order in this proceeding.

Rule 203(f)(3)

Rule 203(f)(3) requires that certain pollution abatement techniques be employed. The Board's authority to adopt regulations of this type, as opposed to specific emission standards,

was discussed in a memorandum prepared by the Agency (Ex.2/14). The Agency concluded that the Board had such authority. The Board agrees with this conclusion.

It is more practical to require the use of equipment to control traditional fugitive particulate emissions than to set specific emission limitations because of difficulties in determining compliance with specific limitations. For example, emissions from storage piles can vary with wind speed, disturbance of the storage pile, pile height and configuration, size and density of the particulate matter in the pile, moisture content of the pile, and type of control technology used, if any. Since many of these factors are beyond the control of the owner or operator, it would be difficult to set an equitable emission limitation. Requiring control technology would aid both the owner or operator and the Agency in determining compliance. As long as a source is controlled by specified or equivalent technology it will be in compliance.

Rule 203(f)(3)(A)

This rule requires that fugitive particulate emissions from certain storage piles be controlled. Facilities which would emit less than 100 tons of particulate matter per year if not controlled are exempt. The cutoff level below which controls are not required on an individual storage pile is 50 tons/year of uncontrolled emissions. These exemptions exist so that small facilities are relieved of the duty to install controls and submit an operating program.

The term "potential particulate emissions" refers to the amount of particulate matter which would be emitted if controls were not in use (R.391-2). Thus, in order for a source to determine if it should control its storage piles, it must calculate what its emissions would be from storage piles if those piles were not controlled.

Emission factors which have been empirically derived may be used to calculate fugitive particulate emissions. Such emission factors can be obtained from documents such as Fugitive Emissions from Integrated Iron and Steel Plants, Document No. EPA 600/2-78-050, March, 1979 (Ex.2/13) or Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions, Document No. EPA 450/3-77-010, March, 1977 (Ex.2/5). Site-specific emission factors may be determined through site-specific measurements. In order to calculate the emissions from a storage pile, various parameters such as the number of dry days per year, percent moisture in the surface material for storage piles, silt content, mean wind speed, etc., must be known (Ex.2/13).

During the hearings and in public comments, several industrial representatives requested that storage piles not contributing to ambient TSP levels be allowed exemptions. Since controlling storage piles could be expensive and since some storage piles are located below grade in quarries or within large tracts of land owned by that source, the Board allows an exemption for such storage piles. In order to qualify for the exemption, the owner or operator of the storage pile must prove that that pile is not a source of TSP beyond the property line of the facility within which the pile is located. In addition to proving that fugitive particulate emissions are not blown directly from the storage pile across the property line, the owner or operator must also prove that fugitive particulate matter from the pile which may have settled within the facility's property boundaries does not subsequently cross the property line through reentrainment. Reentrainment might occur, for example, when particulates are first blown from the storage pile onto the ground or onto a roadway and then the wind or a vehicle causes the dust to be resuspended in the air and blown outside of the property line.

Rule 203(f)(3)(B)

This rule is self-explanatory and needs no further clarification. Sources, control methods and operating programs are discussed elsewhere.

Rule 203(f)(3)(C)

This rule requires that all "normal traffic pattern" access areas and roads be paved or treated with dust suppressants. The term "normal traffic pattern" is included so that roads or other access areas which are used infrequently do not need to be controlled. The costs associated with the treatment of rarely-used roads outweighs any benefits which might be derived.

Rule 203(f)(3)(D)

This rule is included so that particulate matter which has been collected in pollution control equipment will not be suspended in the atmosphere when the control equipment is emptied or while the collected material is being transported.

Rule 203(f)(3)(E)

Highlines at steel mills are exempt from this rule. The only known method of controlling fugitive emissions from highlines is to enclose them. Since highlines are elevated approx-

imately 30 feet above ground level and are thousands of feet long, it would be extremely costly to build an enclosing structure. In addition, enclosures would make highlines difficult to operate (R.776-7).

Rule 203(f)(3)(F)

Rule 203(f)(3)(F) requires certain sources to be operated under the provisions of an operating program. The operating program must be "designed to significantly reduce fugitive particulate emissions." This requirement allows facilities needed flexibility to use the control system most appropriate for their sources. Although the Agency does not have approval power, it will review the operating programs to determine if they "significantly reduce fugitive particulate emissions." If the Agency feels a program is inadequately designed and the source disagrees, an action before the Board will be necessary to resolve the dispute. An enforcement action can also be brought against a source not following the provisions of its own operating program. The rule recognizes that circumstances will change and provides for amendment of the program by the owner or operator. Amendments are subject to Agency review, but do not need Agency approval. Any amended program must meet the design requirement of the original operating program. The minimum requirements of an operating program are contained in Rule 203(f)(3)(F).

Rule 203(f)(4)

The purpose of this rule is to limit emissions from any particulate collection equipment which may be used. The limitation contained in this rule can be met with the use of standard control equipment (R.109; P.C.7).

Rule 203(f)(5)

Rule 203(f)(5) provides for the so-called "wind speed exemption." The first part of this rule provides that Rule 203(f)(1) shall not apply when the average wind speed exceeds 25 miles per hour. This is a continuation of former Rule 203(f)(3). The second part of this rule provides that spraying pursuant to Rule 203(f)(3) is not required when the wind speed exceeds 25 miles per hour because spraying would be ineffective (S.164;S.424-6).

The last sentence of Rule 203(f)(5) allows onsite wind speed measurements to be used when the duration of operations subject to the rule is less than one hour. Under these conditions the use of hourly averages or hourly recorded values may be inapplicable or inaccurate (R.430).

Rule 203(f)(6)

Preexisting Rule 203(f)(6) stated that "Rule 203(f) shall not apply to emissions of water and water vapor from cooling towers." There has been no change in coverage with the new rule, despite this deletion (R.88). Rule 201 defines "fugitive particulate matter" as a type of particulate matter, and "particulate matter" as "any solid or liquid material, other than water, which exists in finely divided form" (emphasis added). Hence, water and water vapor are, by definition, excluded from the coverage of this rule and explicit exclusion is unnecessary.

ECONOMIC IMPACT

The Illinois Institute of Natural Resources submitted a document to the Board entitled The Economic Impact of Proposed Regulations to Reduce Particulate Emissions from Steel Mills and Industrial Fugitive Sources, IINR Doc. No. 79/06 (hereafter "Study")(Ex.6). The study's estimates were based on a previous proposal which required county-wide controls in fourteen counties. At one of the hearings, one of the authors presented cost estimates for county-wide controls in eleven counties (S.285; Ex.15). The final rule requires controls only in specific townships in eleven counties. Benefits were monetized for those counties for which Agency modeling data were available (Ex.6,p.3;S.298).

The estimation of control costs for the mining industry (SIC major groups 10-14) was an approximate one. Costs for a number of fugitive emission control strategies were presented in summary form (Ex.6, Table 3.2); a range of estimates was presented for the cost impact of control of storage piles, roads, and materials handling (Ex.6, Table 3.5). The best estimate for total annual cost was given as $2.4 million (S.287;Ex.15). These estimates were questioned during the hearings. Data were submitted indicating that the Study's estimates of control costs for storage piles and materials handling may be particularly low for aggregate producers (Ex. 12) since the size, number, and amorphous nature of their storage piles may present design difficulties for spray systems (S.195,261). Wet suppression control systems for aggregate producers can decrease the efficiency of screening and sizing equipment (Ex.12; S.203) and thus increase operating costs. The estimated cost of chemical treatment of unpaved roadways was strongly questioned also (Ex.12; S.244).

A number of aggregate industry representatives presented estimates of control costs. Some aggregate producers presumed plant enclosure (Ex.12,p.D1), conveyor enclosure (Ex.12,p.G2), or multiple baghouse systems (Ex.12,p.E1). While these control techniques are certainly permissible under the Rule, the Board

anticipates that the least expensive suppression system will be used. In many cases wet suppression, which is the standard against which "an equivalent method" must be compared, will be used.

The Study's estimates of control costs for the steel industry are of limited use because only totals are given (Ex.6, Table 3.6). These totals were supplied by the steel industry through the Illinois State Chamber of Commerce in summary form. One industry source estimated its annual operating costs to comply with the Board's Interim Order as $659,000 (S.492). However, it is unclear what went into this source's estimate which made it difficult to compare with the final rule.

The Study's analysis of the effect of fugitive particulate controls on electric utilities was in two parts. The first was a listing of control equipment costs. Not all of this equipment would be mandated by the Rule, e.g., baghouses at conveyor transfer points (Ex.6,p.46). The second part extrapolated oiling of coal at $1.45/ton (Ex.6,p.48). This control option, if adopted, would be costly; less expensive means of control might be preferred.

Although the rest of the manufacturing operations affected by this proceeding were discussed in the Study in brief qualitative terms (Ex.6,pp.49-50), the Board finds that the controls required by this regulation are economically reasonable. The controls necessary for these sources are similar or identical to those which would be used by the industries specifically examined in the Study.

The rules for control of particulates from roads and parking facilities are sufficiently flexible to insure that smaller sources will not be required to overcontrol. Embodied in the concepts of "regular basis" and "as needed" is the notion that control requirements decrease as potential emissions decrease. Thus, for example, requiring hourly sweeping of a small parking lot could hardly be justified due to the small emission potential.

A quantitative estimate of benefits due to decreased ambient concentrations of particulate matter was made. The estimate was made by combining Agency modeling results, population estimates, and damage coefficients. The damage coefficients attempt to translate ambient concentrations of particulate matter into monetary estimations of morbidity, mortality, and materials damage attributable to the particulates. These monetary estimates are very rough approximations. However, the discussion of the development of the damage coefficients was useful in pointing out impacted areas and the relative impact among the different areas. Damages due to soiling are a significant part of the damage coefficients (Ex.6,p.21; Ex.6, App.B, App.C).

The exception which has been added to Rule 203(f)(3)(A) will do away with certain control requirements. Although it is impossible to accurately quantify the savings that will result, it is clear that the savings could be substantial in light of some estimates of storage pile control costs (Ex.12).

As part of the benefits assessment, the authors attempted to quantify expected improvements in health among the residents of Illinois. However, due to a paucity of data, it was difficult to make estimates in terms of morbidity and mortality (S.9). One difficulty is associated with the interaction between different air pollutants. Due to the physical nature of particulate matter, it can readily mix with gases such as sulfur dioxide and produce a different toxic species. Few, if any, epidemiological studies have tried to relate the chemical composition of particulate matter to disease (Ex.6). Another difficulty is that too little information exists to relate specific diseases to particle size distribution (Ex.6, p.7). Particle size distribution has a significant impact on disease production since particle size and shape determine where a particle will deposit in the respiratory tract. Some experiments using human subjects have found that particles between 0.1 and 2 μm are the most irritating to the respiratory system. Other studies have found respiratory pathology to be associated with particles up to and larger than 15 μm. Consequently, the economic impact study considered changes in morbidity and mortality due to changes in levels of total suspended particulates and concluded that "most studies predict decreased levels of bronchitis, allergic manifestations, and asthma as well as an improvement in pulmonary function. Changes in other respiratory diseases, especially lung cancer, are not as clearcut, but some improvement would be expected" (Ex.6,p.11).

CONCLUSION

The final rule requires less control than the proposed rule upon which the study was based. Consequently, it has been difficult to determine exactly what the control costs will be. Based on the Study and other information in the record, the Board concludes that the regulation adopted is economically reasonable considering the public health impact and the Federally-mandated attainment of National Ambient Air Quality Standards for total suspended particulates.

Mr. Dumelle concurs.

Mr. Werner dissents.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify the above Opinion was adopted on the _____ day of _____, 1979 by a vote of _____.

_____
Christan L. Moffett, Clerk
Illinois Pollution Control Board