REPORT OF THE
JOINT SUBCOMMITTEE STUDYING

Ways To Reduce Emissions From Coal-Carrying Railroad Cars

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 58

COMMONWEALTH OF VIRGINIA
RICHMOND
1994

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LEGAL AND RESEARCH

Division of Legislative Services

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Alan B. Wambold, Senior Research Associate
Cynthia G. Liddy, Executive Secretary

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Thomas C. Gilman, Chief Committee Clerk of the Senate
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EXECUTIVE SUMMARY

Responding to the concerns of citizens in various parts of the Commonwealth about the detrimental effects of coal dust emissions on their quality of life, the General Assembly initiated study of the subject following introduction of legislation at its 1991 Session. Adopted by the Legislature in 1993, Senate Joint Resolution No. 201 continued the Joint Subcommittee (established pursuant to Senate Joint Resolution No. 1 in 1992) Studying Ways to Reduce Emissions from Coal-Carrying Railroad Cars.

In recent years, some citizens and businesses residing along various railroad lines have reported periodic problems arising from coal dust emissions. Occurring primarily during the hot, dry months of summer, incidents of coal dust blowing from trains have generated complaints of the dust settling on homes, automobiles, decks and outdoor furniture, necessitating their repeated cleaning. Citizens depict the coal dust as a costly nuisance that requires doors and windows to remain closed and children to be kept indoors.

Many complaints of coal dust emissions came from areas of the Commonwealth situated along tracks used for coal transport by Norfolk Southern Railway Company, a large Virginia-based railroad. Responding to the concerns of legislators and their constituents, as well as its interest in reducing material loss during transit, Norfolk Southern retained a consultant to conduct a comprehensive study of the issue. The Joint Subcommittee, at each of its meetings, received updates on the study's progress, and a report was presented to the panel in January of 1994.

Throughout its study, the Joint Subcommittee has endeavored to seek solutions to abate the fugitive coal dust problem without *over*-solving it, thereby balancing the interests of affected citizens and businesses, rail companies and coal producers, and protecting the Commonwealth's economic vitality. Ongoing evaluation of the issue by the Joint Subcommittee, Norfolk Southern and its consultant, affected residents and other interested parties prompted the panel to recommend continuing its study. The General Assembly concurred at the 1994 Session, adopting Senate Joint Resolution No. 27.

INTERIM REPORT OF THE JOINT SUBCOMMITTEE STUDYING WAYS TO REDUCE EMISSIONS FROM COAL-CARRYING RAILROAD CARS

to
The Governor and the
General Assembly of Virginia
Richmond, Virginia
1994

I. STUDY ORIGIN AND BACKGROUND

Adopted by the 1993 Session of the General Assembly, Senate Joint Resolution No. 201 (Appendix A) continued the Joint Subcommittee Studying Ways to Reduce Emissions from Coal-Carrying Railroad Cars. Senate Joint Resolution No. 1, adopted at the preceding session, initially established the Joint Subcommittee. The panel was comprised of nine General Assembly members: five members from the House of Delegates, appointed by the Speaker of the House; and four members from the Senate, appointed by the Senate Committee on Privileges and Elections. SJR No. 201 directed the Joint Subcommittee to submit its findings and recommendations to the Governor and the 1994 Session of the General Assembly.

Legislation presented to the 1991 Session served as the study's catalyst. Responding to complaints of coal dust emissions from a number of constituents, Senator Madison E. Marye introduced Senate Bill No. 566 (Appendix B). This bill and an identical measure, House Bill No. 1163 patroned by Delegate Richard C. Cranwell (by request), would have required railroad cars transporting coal to be covered so that their contents would not escape. During committee deliberations on the bills, industry representatives maintained that the cost of such a legislative mandate would be financially crippling. Norfolk Southern representatives testified that coal car covers would cost $700 apiece and the cost of loading and unloading each car would increase by $200. Opponents of the legislation successfully persuaded the General Assembly to study issues presented by the bills in lieu of passing the legislation. The measures were subsequently authorized for

subcommittee study by the chairmen of the committees to which they were referred: Senate Commerce and Labor and House Roads and Internal Navigation.

During the 1991 interim, the subcommittees met jointly and heard testimony regarding the nature of the fugitive coal dust problem for some citizens living along the tracks. The subcommittees recommended that they continue their study as a joint subcommittee, and SJR No. 1 was subsequently adopted by the 1992 General Assembly.

At the Joint Subcommittee's November 1992 meeting, representatives of Norfolk Southern (NS) informed the panel that a major component of the study being conducted by its consultant--operation of a "test water spray facility"--had been delayed. The facility, which was designed to test the effects of spraying selected cars with water, met construction delays because the permitting process took longer than expected. Anticipating the study's findings, the Joint Subcommittee recommended that its work be continued.

A July 1993 public hearing was the forum for the Joint Subcommittee to view--via videotape--operation of the NS test water spray facility. While experimentation with water spraying will continue, it appears to be of limited effectiveness. In the report delivered to Subcommittee members in January of 1994, the NS consultant recommended a one-year test period to evaluate different alternatives, including the use of chemical binders on the coal loads. With NS officials seeking a "self-imposed control strategy" and the Joint Subcommittee intent on resolving the issue, the panel recommended continuing its study.

II. WORK OF THE JOINT SUBCOMMITTEE

The Joint Subcommittee's two focal points throughout its work have been the concerns expressed by citizens and businesses adversely affected by dust emissions and the response and efforts of Norfolk Southern to address the problem. As a result, each meeting's intent was to achieve a more thorough understanding of the nature and extent of the emission problem and to learn what, if any, progress was being made in abating it. From its inception, the panel has convened five meetings, capsuled as follows:

- *July 9, 1991, Roanoke.* Citizen input was received at a well-attended public hearing.

- *September 4, 1991, Richmond.* Testimony was solicited from industry representatives, including Norfolk Southern, CSX Corporation and the Virginia Coal Association.

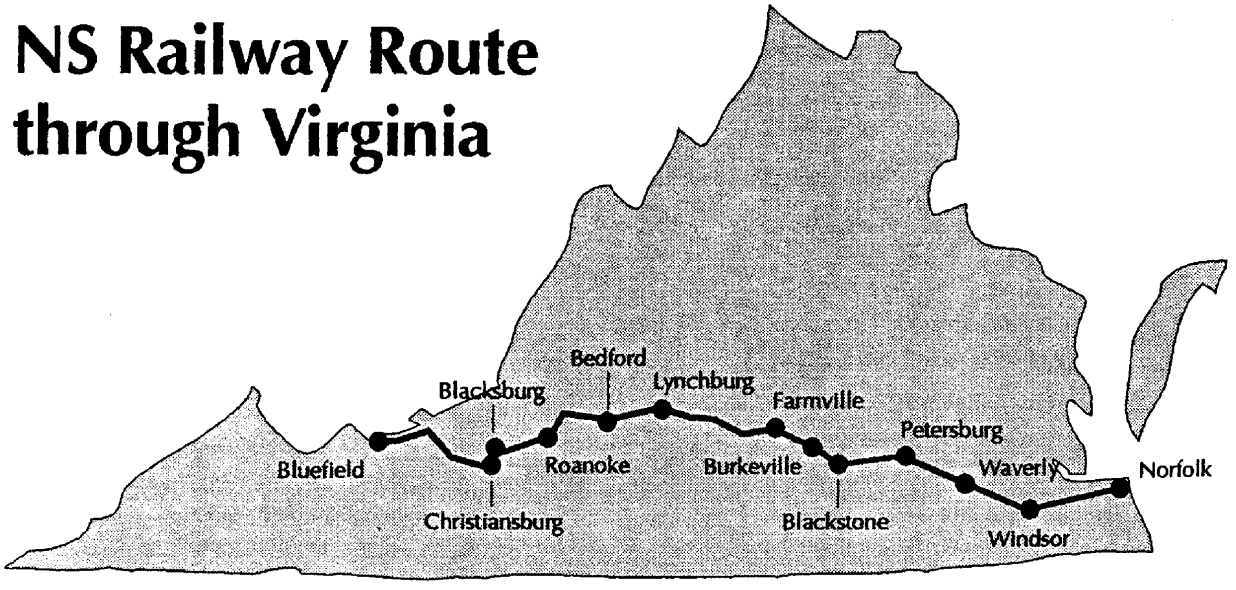
- *November 23, 1992, Richmond.* The Joint Subcommittee was apprised of the status of the NS study, and received comments from affected citizens and businesses.

- *July 9, 1993, Salem.* The public hearing was highlighted by a viewing of a videotape prepared by NS, showing the operation of its recently implemented test water spray facility. Another videotape, presented by an Altavista employer, illustrated the continued concerns of residents and businesses.

- *October 7, 1993, Norfolk.* This public hearing featured over 20 speakers from the Hampton Roads area, many of whom related their experiences with coal dust originating from an NS terminal at Lamberts Point.

Coal Transport in the Commonwealth

The mining of coal and its transport continue to fuel Virginia's economic engine. Mine workers, coal suppliers, coal transporters and end users all rely on the production of coal and its journey from the mines of Southwest Virginia to the ports of Norfolk. The route of Norfolk Southern trains carrying coal through the Commonwealth is illustrated below.



The NS fleet of coal cars numbers about 45,000, with each car in a typical 180-car train carrying approximately 100 tons of coal. The types of coal vary in size and composition, depending on customer specifications. Steel makers, utilities and other customers have increasingly demanded that coal producers provide finer and drier types of coal, responding in part to air pollution laws requiring that users

burn cleaner and higher-energy coal. The coal is not owned by the railroad, but by the coal companies.

Coal Dust Complaints

Testimony before the Subcommittee consistently indicated that the fugitive coal dust problem had begun, or intensified, over the past several years. Many witnesses contrasted the finer types of coal currently being transported with the lumpier coal that used to be shipped and speculated that finer coal has been the reason for the increase in reported emissions.

In presentations to the panel, videotapes, pictures, materials, coal dust samples and other visual aids illustrated some of the problems encountered by persons subjected to coal dust emissions. Homes and cars need repeated washing, windows and doors must stay closed and outdoor activity is curtailed because of the coal dust. Patio furniture and gardens are said to glisten with coal dust.

A so-called "blowout," typically occurring during extreme meteorological conditions, can result in 40-foot-high clouds of dust billowing upward. Particularly bad episodes have reportedly forced some vehicles traveling along Route 29 to turn on headlights or pull off of the road. Homeowners have made claims with NS in exceptional cases to pay for the cleaning of their homes. In several instances the company has reimbursed them in amounts ranging from $750 to $3,000.

For those so affected, the constant presence of coal dust was characterized as a burden that diminishes their quality of life. The dust leaves a greasy black film wherever it lands, settling on windowsills and finding its way through cracks and crevices. Although documentation has not been available, some citizens exposed to emissions expressed concerns about the potentially harmful health effects of coal dust exposure.

An Altavista employer and town officials testified as to their specific concerns. Upon investing $1.3 million to upgrade its facility roofing system, the employer has had to periodically have it cleaned at a cost of $3,000 per cleaning because it is being discolored by coal dust. Company representatives told the panel it was working with the roof's manufacturer to determine if premature material failure might result from exposure to coal dust (a memorandum prepared for the Subcommittee is attached as Appendix C). In addition, a constant complaint among the company's employees is that coal dust accumulates on their vehicles in parking lots.

Terming the effects of coal dust emissions "detrimental and destructive" to its citizens and businesses, Altavista's town manager informed the panel of the Central Virginia Planning District Commission's resolution (Appendix D) in

support of "the need for a positive approach to resolving this problem on behalf of the citizens of the Commonwealth."

In Norfolk, the Subcommittee heard from area residents who have been subjected to emissions from the NS terminal at Lamberts Point. Although the panel's focus from the outset has been on resolving problems associated with fugitive coal dust from moving trains, Tidewater citizens expressed problems and concerns akin to those previously articulated by persons residing along the tracks on the train route from Southwest Virginia to the port.

Industry Initiatives

Intent on formulating its own coal dust control strategies as opposed to having a mandate imposed by the legislature, NS has invested in excess of one million dollars toward seeking a solution to the fugitive dust problem. Retained in 1991, consultant Simpson Weather Associates was directed by NS to quantify coal losses during transit; determine the key physical factors responsible for fugitive emissions from coal shipments; derive key emission factors; and select, assess and evaluate dust control options. The consultant addressed these issues in a series of field and laboratory experiments entitled "Norfolk Southern Rail Emission Study" (NSRES, Appendix E)."

Test Water Spray Facility. One facet of the study was operation of a facility designed to test the effects of spraying certain coal cars with water. Constructed over six months in Giles County at a cost of $380,000, the test water spray facility became operational in May 1993. The computer-controlled system sprays loaded coal cars with water when a dispatcher in Roanoke notifies the engineer that conditions are appropriate to do so. The engineer guides the train through the facility at five miles per hour while computers and sensors activate the system. Each car is sprayed with 30 gallons of water from two stations that have the capacity to spray 300 gallons per minute. Excess water is collected in fiberglass retention ponds located under the track, thereby minimizing overspray and water waste. After spraying, the computer collects information and generates reports that are sent by modem to NS's main offices.

To obtain reliable results, an instrument package was developed for mounting on the top of a loaded coal car. The system provided details on the environmental stresses and dust emissions in close proximity to the coal surface and throughout the trip from the mines to the port. In addition, a robotic vision system was developed to assess the wind erosion losses from all cars that passed under its arrangement of video cameras. In conjunction with the field study, laboratory experiments were also conducted to study how atmospheric conditions and the type of coal transported affect emissions (NSRES, p. 1).

Study Findings. According to the NSRES, significant progress has been made in understanding and quantifying fugitive coal dust emissions. The types of coal used for the study were selected because they are considered by NS and its customers to be among the dustiest coals being transported. The consultant determined that under similar environmental and transportation stresses (e.g., coal surface temperatures, coal moisture, coal particle size, surface wind speed, etc.), different coals produce varying intensities and frequencies of emissions. Estimates are that an average of 0.31 tons of tested coals (approximately 600 pounds) are lost from each car during the rail trip between the mine and the port. Coal loss ranged from 0.0 to 0.8 tons per car. It was emphasized that coals considered to be dusty represent only 10 percent of NS originated coal and that these losses are the worst case scenario for an inherently dusty coal being transported under dry and stressful conditions (NSRES, pp. 1, 3).

The most intense dusting occurs when trains traveling in opposite directions meet at normal track speeds. In addition, tunnels, trestles and open fields often cause emissions due to lateral wind stresses. In evaluating a variety of mitigation techniques, the consultant found that spraying water on the surface can be effective for a limited period. As treated cars move farther from the spraying facility, water evaporation and other factors decrease effectiveness. The most successful mitigation technique appears to entail modifying the load profile of coal cars followed by application of a chemical binder. The consultant recommended a one-year test period during which evaluation of prescriptions for dust control products, load profiles and surface binder applications could be optimized and performance monitoring procedures could be refined (NSRES, pp. 4, 6, 8).

Pilot Project. Reminding Subcommittee members that railroads do not own the coal they ship and coal companies are wary of adding chemicals that might affect the coal's combustibility, NS representatives informed the panel at its October 1993 meeting that the company was negotiating an agreement with a coal producer to conduct an experiment with a chemical sealant. Subsequently, Subcommittee Chairman Elliot S. Schewel announced (Appendix F) that Norfolk Southern and Consolidation Coal Company had agreed to participate in a one-year pilot project, beginning in the Spring of 1994, having two principal elements: changing loaded coal car profiles so that the load is less likely to give off dust and applying surface treatments and/or bonding agents to loaded coal that should inhibit dusting.

Citizen Hotline. Responding to a suggestion from the Subcommittee, Norfolk Southern agreed to incorporate a citizen reporting component into the study. In April 1993, its consultant installed the Dust Information Telephone Line to receive coal dust complaints (1-800-621-0772). Thirty-seven calls were reported by the end of the year, most of them coming from the western part of Virginia around Shawsville, Altavista and Whitehorne.

III. CONCLUSION

Recognizing the importance of providing relief from coal dust emissions for the citizens and businesses of the Commonwealth so affected, while not unduly burdening an industry vital to Virginia's economy, the Joint Subcommittee recommended that its study be continued to assess and evaluate potential solutions to the problem. The General Assembly concurred, adopting Senate Joint Resolution No. 27 (Appendix G) at the 1994 Session.

The Joint Subcommittee believes that significant progress has been made toward resolving the fugitive coal dust problem. Citizen input at several public hearings and the preliminary findings and recommendations from the Norfolk Southern-commissioned study have provided the panel with a more thorough understanding of the nature and extent of coal dust emissions. The Subcommittee's accomplishments include providing citizens with a public forum to express their concerns, recommending institution of the telephone hotline on which they can quickly and formally register their complaints and prompting the industry to responsibly address the problem. Moreover, findings from the industry's upcoming pilot project promise to provide the panel with key information as it prepares to present its final recommendations to the 1995 Session of the General Assembly.

Respectfully submitted,

Elliot S. Schewel, Chairman
Robert B. Ball, Sr., Vice Chairman
Richard J. Holland
Yvonne B. Miller
Madison E. Marye
George W. Grayson
Alan E. Mayer
S. Wallace Stieffen
Raymond R. Guest, Jr.

SENATE JOINT RESOLUTION NO. 201

Appendix A

Continuing the Joint Subcommittee Studying Measures to Reduce Emissions from Coal-carrying Railroad Cars.

Agreed to by the Senate, February 2, 1993
Agreed to by the House of Delegates, February 23, 1993

WHEREAS, in recent years, some residents whose dwellings are in close proximity to certain rail lines have reported problems with fugitive coal dust; and

WHEREAS, coal dust blowing off trains onto nearby homes and automobiles is said to be a costly nuisance that also might pose health hazards to affected residents; and

WHEREAS, Senate Bill 566 and House Bill 1163 were introduced at the 1991 Session of the General Assembly to address these citizen concerns; and

WHEREAS, a joint subcommittee was established pursuant to Senate Joint Resolution No. 1 of 1992 to study the issues presented by the legislation; and

WHEREAS, the Joint Subcommittee determined that citizens and businesses residing along these lines continue to experience periodic problems arising from coal dust emissions; and

WHEREAS, the Joint Subcommittee wishes to receive the results of a study by a Virginia-based rail coal carrier in 1993; and

WHEREAS, the Joint Subcommittee believes that finding an equitable solution for all parties is in the best interests of the citizens of the Commonwealth; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Joint Subcommittee Studying Measures to Reduce Emissions from Coal-carrying Railroad Cars be continued to review the results of the rail company's study and to make appropriate recommendations, if necessary. The membership of the Joint Subcommittee shall remain the same with any vacancy to be filled by the Senate Committee on Privileges and Elections and the Speaker of the House of Delegates, as appropriate.

The Joint Subcommittee shall complete its work in time to submit its findings and recommendations to the Governor and the 1994 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

The indirect costs of this study are estimated to be $8,465; the direct costs of this study shall not exceed $4,860.

Implementation of this resolution is subject to the approval and certification of the Joint Rules Committee. The Committee may withhold expenditures or delay the period for the conduct of the study.

1991 SESSION

LD5046124

SENATE BILL NO. 566

Offered January 10, 1991

A BILL to amend the Code of Virginia by adding a section numbered 56-428.1, relating to covers on certain railroad rolling stock; penalty.

Patrons—Marye and Schewel; Delegate: Putney

Referred to the Committee on Commerce and Labor

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding a section numbered 56-428.1 as follows:

§ 56-428.1. Certain rolling stock to be covered; contents not to escape; penalty.—Except in cases of emergency occurring on the road which will not permit compliance with this section, it shall be unlawful for any person operating a railroad as a common carrier in the Commonwealth to run or permit to be run over its tracks, outside of yard limits or in transfer service, any railroad car being used to transport coal unless it is so covered as to prevent its contents from blowing, dropping, sifting, leaking, or otherwise escaping.

Any violation of this section shall constitute a misdemeanor punishable by a fine of not more than $100. Each car operated in violation of this section and each day during which a car is operated in violation of this section shall constitute a separate offense.

Official Use By Clerks	
Passed By The Senate	**Passed By The House of Delegates**
without amendment ☐	without amendment ☐
with amendment ☐	with amendment ☐
substitute ☐	substitute ☐
substitute w/amdt ☐	substitute w/amdt ☐
Date: _____	Date: _____
_____	_____
Clerk of the Senate	Clerk of the House of Delegates

ROSS LABORATORIES

P.O. Box 479, Altavista, Virginia 24517
(804) 369-3211/Telecopier: (804) 369-3245
A DIVISION OF ABBOTT LABORATORIES, USA

DENNIS K. JANIAK
PLANT MANAGER

November 20, 1992

Commonwealth of Virginia
Senate Study Committee

Reference: SJR # 1 / Coal Dust

During the last three years, the Ross Laboratories plant in Altavista has spent over $1.3 million upgrading the facility roofing system. Extra insulation was added and a white roofing system was installed to reflect summer heat and reduce energy consumption. The roof is being discolored by coal dust which requires Ross to periodically clean the roofing system at a cost of $3,000 per time. We are incurring both the cost of cleaning and the cost of energy inefficiency.

Ross continues to work with the roof material manufacturer to determine if the coal dust will result in premature material failure.

As a separate item, coal dust particulate on employees' vehicles in our parking areas is a constant complaint.

Ross Laboratories would support actions taken by the Senate Study Committee to reduce these particulate emissions.

Sincerely,

Dennis K. Janiak
Plant Manager

sw

cc: Daniel J. Johnson, Manager, Plant Engineering

Resolution No. 92-8

RESOLUTION OF THE CENTRAL VIRGINIA PLANNING DISTRICT COMMISSION

COAL DUST EMISSION FROM TRAINS

WHEREAS, The 1992 Virginia General Assembly passed a study Resolution, SJR 1, to investigate the effects of coal dust emissions from moving trains by a Joint Study Committee of the Legislature, and

WHEREAS, Several of those affected by the emission of coal dust from trains traveling through the Town of Altavista, VA have voiced their concerns, and

WHEREAS, The Town Council members of Altavista, in a regularly scheduled meeting November 10, 1992 expressed their serious concern for this problem, and the deleterious effect coal dust from trains has on its citizens both corporate and residential, and

WHEREAS, The Central Virginia Planning District Commission voted in its regular monthly meeting November 12, 1992 to support Altavista in its efforts at calling attention to this problem, and

WHEREAS, Trucks have been required by law to prevent the escape of their loads by covering or binding, then

BE IT RESOLVED THAT; The Central Virginia Planning District Commission hereby requests that legislation be recommended by the study committee that will cause any and all rail companies with trains traveling thru the Commonwealth to take whatever action is appropriate and necessary to minimize the escape of coal dust, and

BE IT FURTHER RESOLVED, That this Resolution be provided to the Joint Study Commission for SJR 1 to support the need for a positive approach to resolving this problem on behalf of the citizens of the Commonwealth.

By: _____
E. Anthony Ware, II, Chairman
CENTRAL VIRGINIA PLANNING
DISTRICT COMMISSION

ATTEST:

_____
Dennis E. Gragg

NORFOLK SOUTHERN RAIL EMISSION STUDY

prepared for:

Norfolk Southern Corporation
Roanoke, VA

prepared by:

Simpson Weather Associates, Inc.
Charlottesville, VA

30 December 1993

INTRODUCTION

Fugitive coal dust emissions from rail cars has become an increasingly important issue from the perspective of coal transporters, coal suppliers, legislators and their constituents. This interest is based upon essentially two concerns: material and thus revenue loss during transit and the continuance of coal dust complaints.

Prior to this study, much of the evidence of coal dust emissions during rail transport came from anecdotal reports of dust plumes or coal deposition along rail corridors. Previous efforts to establish material losses by weighing coal cars at their terminus did not produce convincing results. However, the amounts and characterizations of these losses remain critical issues to be resolved before efficient control strategies can be prescribed. Norfolk Southern Corporation (NS) has contracted Simpson Weather Associates, Inc. (SWA) to address these issues in a series of field and laboratory experiments entitled "Norfolk Southern Rail Emission Study (NSRES)".

To obtain reliable results for this comprehensive study, new technology had to be designed and implemented, as there was no off-the-shelf instrumentation to produce the appropriate information. An instrument package called RTEPS (Rail Transport Emission Profiling System) was developed for mounting on the top of a loaded coal car. RTEPS provided details on the environmental stresses (wind, temperature, precipitation) and dust emissions in close proximity to the coal surface and throughout the entire mine-to-port trip. In addition a robotic vision system was developed to assess the wind erosion losses from all cars that passed under its arrangement of video cameras.

SWA has made significant progress in understanding and quantifying fugitive coal dust emissions. The primary findings of this NSRES are:

- Reliable measurements of material losses during transport have been obtained for coals that were selected because they are considered by NS and its customers to be among the dustiest coals being transported. Observations based on these coals cannot, therefore, be used to estimate total losses for all NS coal shipments. Clearly, it would be an over solution to require all coals to be treated as if they had the same dusting potential as the coals used in this study.

- Factors responsible for fugitive dust emissions are better understood and found to be measurable. These factors involve a complex array of environmental and operational stresses.

- We have identified and studied key environmental/operational stresses affecting coal dust emissions from in-transit coal cars:

    1) wind speed over the coal surface;
    2) coal surface temperature;
    3) effects of precipitation; and
    4) effects of operation such as slack action, acceleration, track switching, passing trains, movement through tunnels, etc.

- Under similar environmental and transportation stresses (e.g.,coal surface temperatures, coal moisture, coal particle size, surface wind speed, etc.), different coals produce varying intensities and frequencies of emissions. There are indications that most coal shipments produce no measurable or visible dust or material loss.

- Achievement of a substantial reduction in material loss from coal cars by wind erosion appears to be reasonable.

- To obtain a substantial reduction in material loss, potential solutions to be evaluated should include critical slope management of load top profiles and use of chemical binders.

While material loss from coal cars during transit has been studied on several occasions over the last twenty years, an extensive search of the public literature has produced very little information. Attempts to measure coal dust losses have been conducted by chemical vendors or individual coal and rail companies but the results have been regarded as proprietary. A notable exception is the multi-year study conducted by the Environmental Protection Service (EPS) of Canada.

Between 1973 and 1985, the EPS conducted laboratory and field studies with the objective of reducing in-transit dust emissions from coal cars over a 500-mile route along the Fraser River rail corridor, from western Alberta to Vancouver, British Columbia. In terms of determining the coal losses, the results of the study were essentially inconclusive for the following reasons: (1) no direct measurements or characterization of fugitive coal dust emissions were made, (2) no end-point (i.e., "before and after") car weights were measured, and (3) rain uptake/moisture loss were not taken into account. However, based on its study the EPS estimated coal losses of one-half to three percent during transit and convinced Canadian coal producers to implement a dust control plan. The dust control plan involved loading the cars below the sill level and applying a crust-forming topical treatment. The target was to have the coal cars reach their terminus with 85% crust retention and it was assumed that the implementation of this plan would eliminate 85% of fugitive emissions. However, subsequent evaluations by SWA have shown that 85% crust retention does not necessarily produce an 85% emission reduction.

It has been suggested that NS apply the Canadian "solution" to the coals transported from western Virginia to the Norfolk port facility. The Canadian approach is not appropriate for such NS coal movements because:

1) the Canadian coal car fleet consists of identically sized and shaped cars, allowing simple, standardized load leveling and chemical application. The wide variety of shapes and sizes of the NS fleet does not allow for simple load leveling and application of topical treatments.

2) contrary to the situation in western Canada, the coal NS transports exhibits a wide range of chemical and physical attributes. In addition, each mine that NS serves processes and prepares its coal differently. This makes it extremely difficult to treat dusty coals successfully with a single chemical.

REVIEW OF OBJECTIVES

The rail emission study had the following stated objectives:

- Quantify coal losses during transit;
- Determine the key physical factors responsible for fugitive emissions from coal shipments from the mines to the port facility;
- Derive key emission factors and characterize their spatial variation along the rail corridor; and
- Select, assess and evaluate dust control options.

FINDINGS

For the entire rail trip between the mine and the port, selected and untreated metallurgical coals lost a total amount of coal averaging 0.31 tons per car (ranging from 0 to 0.8 tons). This is equivalent to a loss of approximately one pound per mile per car and is less than one quarter of an ounce per acre per car within the areas that are 500 ft on either side of the track. (Note: the top one inch of soil over an acre weighs approximately 4,000,000 ounces.) These weight loss findings are based on scale weight changes using a scale monitor car, corroborated with direct measures of erosional changes of load top profiles and passive collection of detrained material. It should also be noted that the coals considered to be dusty represent only 10% of Norfolk Southern originated coal. We emphasize that these losses are the worst case scenario for an inherently dusty coal being transported under dry and stressful conditions. Furthermore, even under the high stress conditions some coals showed no measurable material loss.

Figure 1 shows the NS research caboose used during the course of the study, coupled to a scale monitor car of known weight. The weight of the monitor car was used as a reference for coal cars weighed throughout the study. We stress that the weight loss figures are based primarily upon the study of metallurgical coals from a limited number of selected mines.

Figure 1. Norfolk Southern's research caboose coupled to a scale monitor car of known weight.

Weight changes due to wind erosion losses can be affected by rainfall, often rendering the use of mine and port weights unreliable in assessing material losses. In addition, wind erosion is strongly dependent on coal surface temperature. For example, a coal that emits intense and frequent emissions during the hot, dry daytime hours is less prone to dusting during the cooler nighttime hours.

Fugitive emissions from those coals that produce dust under the aforementioned conditions show a non-linear relationship to train speed. The most intense dusting events occur when trains traveling in opposite directions meet at normal track speeds. In addition, tunnels, rock cuts, trestles and open fields frequently result in emission episodes due to lateral wind stresses. Instruments mounted on the top of coal cars (Rail Transport Emission Profiling System - RTEPS) have shown that the frequency and intensity of emissions are significantly higher during acceleration through a speed (e.g., 30 mph) than deceleration through that same speed. While a train is stopped or moving slowly, the coal surface will heat and dry out making it more susceptible to dusting when the train begins to move again. The resulting enhanced supply of dry coal particles that participate in emissions during acceleration are quickly depleted and not available for dusting during subsequent deceleration.

Some of the coals studied can produce nearly continuous fugitive emissions during hot dry periods when relative wind speed over the surface exceeds 30 miles per hour. According to RTEPS, simply reducing speed for trains transporting dusty coal would reduce some material loss but would not eliminate the visible dusting or reduce the perception of dusting.

Leveling the load without chemical binders or loading below the top of the car (light loading) appears to only modestly reduce material losses during transit and neither of these tactics eliminates severe dusting events. Severe dusting events can occur in load leveled or light loaded cars and are the results of the turbulent air flow caused by preceding coal cars - normally loaded or otherwise - producing wind scouring even below the top of the car.

Settling appears to be on the order of 2 to 9 inches between the mine and the port. This amount of settling offers challenges to the structural integrity of chemical binders. The amount of settling is based on approximately 200 photographic transects taken during the course of the study. These transects were taken at sequential locations along the rail corridor and before-and-after comparisons were used to calculate the amount of settling. Figure 2 on the following page depicts an example of the photographic transects taken at Bluefield, WV. Because such settling often leads to the cracking and ultimate failure of chemical binders, it may be important to select a binder pliable enough to remain intact under 2 to 9 inches of settling during transit.

Chemical binders field tested to date are only partially effective against dust losses unless load profile modification occurs prior to chemical application. The use of chemical binders is one of several fugitive dust control strategies assessed. Dust suppression options investigated include:

1) load leveling only,
2) load leveling plus wetting,
3) load leveling plus compaction and wetting,
4) chemical binders applied to normally loaded cars,
5) chemical binders applied to leveled load profiles,
6) chemical binders plus surfactants to normally loaded cars,
7) surfactants applied to normally loaded cars (Celco facility), and
8) water only applied to normally loaded cars (Celco facility).

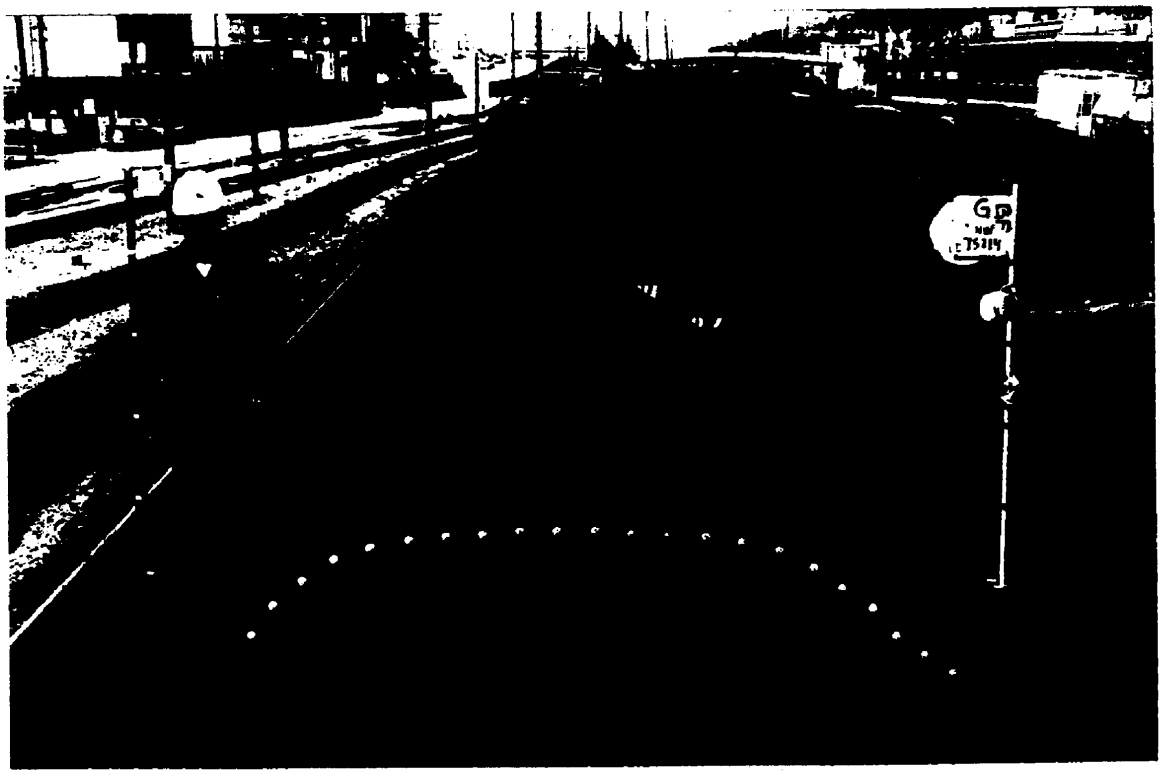


Figure 2. Photographic transect of a load profile. These photographs were taken sequentially along the rail corridor to evaluate settling during transit.

Figure 3 is an example of a coal car that was manually load leveled, wetted and compacted.

Figure 3. As part of the topical treatment evaluation, this car (NW145062) was load leveled, wetted and compacted.

After investigating a variety of mitigation techniques, the most successful combination appears to be load profile modification followed by application of a chemical binder.

SPECIAL STUDIES

Throughout the NSRES a series of special studies have been conducted, including assessment of the Celco spray facility, infiltration and retention of rain water in coal cars and a dust information telephone line to log and respond to dusting complaints.

On selected metallurgical coals during relatively stressful rail trips, spraying water on the surface from the Celco facility is an effective dust mitigator for a limited period. This time frame varies depending on the hydrophobicity of the coal and the environmental and transportational stresses. Approval to conduct a limited set of experiments involving a surfactant application at Celco was granted by the Virginia Department of Environmental Quality. One test indicated that adding a surfactant to the spray appears to prolong the dust mitigation for up to several hours depending on the coal's physical characteristics and the stresses (e.g., tunnels, passing trains, temperature, solar radiation) to which it is subjected after application. The Celco facility continues to be a valuable research tool for evaluating dust control chemicals and strategies. Figure 4 shows coal cars being sprayed with water at the Celco facility.

Figure 4. This photograph depicts RTEPS in the foreground as water is being applied to the load tops at the Celco facility.

The infiltration rate and retention of water into various coals has been studied. Findings indicate that at an average rate of 0.35" precipitation/day, a less hydrophobic coal such as a coarse steam coal can produce approximately 35 gallons of leachate per day; this is about 300 lbs weight change per day. It is likely that the more hydrophobic coal such as finer metallurgical coals would show a slower rate of weight change as the water infiltration rate is less.

In April 1993, SWA installed the Dust Information Telephone Line to receive coal dust complaints. To date we have responded to 37 calls. These complaints have been concentrated in the western part of Virginia around Shawsville, Altavista and Whitethorne.

CONTINUING EFFORTS

Efforts are continuing to establish the basis for prescribing the optimum solution to control fugitive coal dust emissions. Presently, SWA/NS are developing laboratory techniques to assign a specific SARTDX (Seasonally Adjusted Rail Transport Dusting Index) to individual coals transported to the port facility. This index will be seasonally adjusted, i.e., we will delineate between coals that dust for say 8 months of the year - and therefore require more consistent treatment - from coals that dust only during the hot summer months. Again, we must avoid the over-solution that would result from treating all coals under all conditions. Instead, the goal is to treat coals only when they are likely to encounter stress conditions that produce fugitive emissions.

SWA is continuing pre-field/laboratory screening of dust control products. These are phased laboratory evaluations to determine if specific dust control products are viable candidates for further field testing. Products are evaluated not only for their dust control properties but also for their impact on coal moisture content.

Recognizing that (1) weighing cars at the mine and again at the port cannot be relied upon to assess material losses and that (2) many cars from many mines need to be evaluated to achieve any statistical significance, SWA, with a subcontract to the University of Virginia, has developed a prototype of a Coal Car Load Profiling System (CCLPS). CCLPS is designed to detect and estimate wind erosion losses during transit. The prototype CCLPS has been used to supplement scale weight measurements and we expect that the final version of CCLPS will play a major role in monitoring the success of any dust control strategy that is implemented. Figure 5 depicts the CCLPS prototype.

Figure 5. The robotic-vision CCLPS system just after profiling a test train near Pembroke, VA.

RECOMMENDATIONS

- We believe that the most promising solutions to fugitive coal dust emissions from rail cars include critical slope management of load top profiles and use of chemical binders.

- We recommend that a test plan be made for evaluating potential solutions. Such a plan should include one or more coal suppliers who will install load profile management equipment and make chemical applications.

- We recommend the development of success criteria and monitoring procedures for a fully implemented dust control plan.

- We recommend a one year (all seasons) test period during which evaluation of prescriptions for dust control products, load profiles, and surface binder applications can be optimized and performance monitoring procedures can be refined.

COMMONWEALTH OF VIRGINIA

ELLIOT S. SCHEWEL
23RD SENATORIAL DISTRICT
CITIES OF LYNCHBURG, BEDFORD
COUNTIES OF AMHERST, BEDFORD
CAMPBELL, PART OF NORTHWESTERN
P O BOX 6800
LYNCHBURG, VIRGINIA 24505
OFFICE (804) 528-3000

COMMITTEE ASSIGNMENTS:
EDUCATION AND HEALTH, CHAIRMAN
COMMERCE AND LABOR
FINANCE
GENERAL LAWS
RULES

SENATE

RICHMOND, VA -- State Senator Elliot S. Schewel today announced an agreement between Norfolk Southern Corporation and Consolidation Coal Company - One of Norfolk Southern's principal coal shippers - to participate in a one-year pilot project designed to reduce coal dust emissions from hopper cars.

According to Senator Schewel, Chairman of the Virginia General Assembly's joint subcommittee that has been considering complaints concerning such emissions, Norfolk Southern and Consolidation will share the costs of the project which has two principal elements: changing loaded coal car profiles so that the load is less likely to give off dust and applying surface treatments and/or bonding agents to loaded coal that should inhibit dusting.

"I am pleased that Norfolk Southern has reached this important agreement with Consolidation," Senator Schewel observed. "As I have said on several occasions, we intend to see that concerns about coal dust emissions are addressed responsibly. I believe the Norfolk Southern and Consolidation managements share that objective and are responding constructively."

The pilot project is expected be begin when Consolidation has completed necessary modifications to a coal loadout at its Buchanan mining complex, probably around April 1, 1994.

The agreement calls for Norfolk Southern and Consolidation to cooperate in deciding the frequency and types of coal load profiles that will be used and the treatments and/or bonding agents that will be applied to the loaded coal. Consolidation will be responsible for implementing these decisions.

For additional information, contact J. W. Fox, Jr., Norfolk Southern, at 703/985-6740 and Thomas F. Hoffman, Consolidation Coal, at 412/831-4060.

# # # # #

1994 SESSION

LD3116733

SENATE JOINT RESOLUTION NO. 27

Offered January 18, 1994

Continuing the Joint Subcommittee Studying Measures to Reduce Emissions from Coal-Carrying Railroad Cars.

Patrons—Schewel, Holland, R.J., Marye, Miller, Y.B. and Saslaw; Delegates: Ball, Grayson and Mayer

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Referred to the Committee on Rules

WHEREAS, the General Assembly established the Joint Subcommittee in 1992 pursuant to Senate Joint Resolution No. 1 in response to complaints by residents and businesses in close proximity to certain rail lines in the Commonwealth of blowing coal dust; and

WHEREAS, the Joint Subcommittee determined that periodic problems arising from coal-dust emissions do exist for some of the Commonwealth's citizens; and

WHEREAS, a consultant to a Virginia-based rail carrier has conducted a study to examine issues presented by fugitive coal dust; and

WHEREAS, significant progress has been made in determining the amount of coal losses during transit and the key factors responsible for fugitive emissions; and

WHEREAS, the consultant's December 1993 report recommended that the most promising solutions to fugitive coal dust emissions from rail cars include critical slope management of load-top profiles and use of chemical binders; and

WHEREAS, the consultant further recommended a one-year test period during which dust-control products, load-top profiles and surface-binder applications can be evaluated; and

WHEREAS, an agreement has been reached between the rail carrier and a coal shipper to conduct a pilot project in 1994 that involves changing loaded-car profiles and applying surface treatments and bonding agents to loaded coal; and

WHEREAS, the Joint Subcommittee believes it should monitor and evaluate this project; and

WHEREAS, the Joint Subcommittee determined that citizens and businesses continue to experience episodes of coal dust emissions; and

WHEREAS, the Joint Subcommittee and the General Assembly believe that finding an equitable solution for all parties is in the best interests of the Commonwealth; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Joint Subcommittee Studying Measures to Reduce Emissions from Coal-Carrying Railroad Cars be continued to receive comments from affected parties, monitor and evaluate the pilot project and make appropriate recommendations, if necessary. The membership of the Joint Subcommittee shall remain the same with any vacancy to be filled by the Senate Committee on Privileges and Elections and the Speaker of the House of Delegates, as appropriate.

The direct costs of this study shall not exceed $4,050.

The Joint Subcommittee shall complete its work in time to submit its findings and recommendations to the Governor and the 1995 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for processing legislative documents.

Implementation of this resolution is subject to subsequent approval and certification by the Joint Rules Committee. The Committee may withhold expenditures or delay the period for conducting the study.