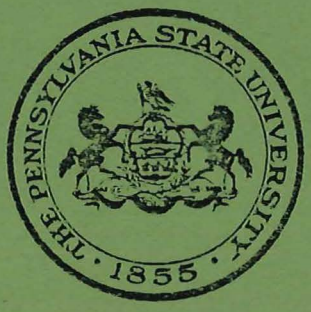
THE COLLEGE OF EARTH AND MINERAL SCIENCES

Contract No. S0144111
U.S. Department of the Interior
U.S. Bureau of Mines
Washington, D.C.

Final Report on

A STUDY OF RESEARCH AND DEVELOPMENT NEEDS OF THE COAL MINING INDUSTRY ON A PRIORITY BASIS

Robert Stefanko
R. V. Ramani



THE PENNSYLVANIA STATE UNIVERSITY

UNIVERSITY PARK, PENNSYLVANIA

OFR 51-78

THE COLLEGE OF EARTH AND MINERAL SCIENCES

Contract No. SO144111
U.S. Department of the Interior
U.S. Bureau of Mines
Washington, D.C.

Final Report on

A STUDY OF RESEARCH AND DEVELOPMENT NEEDS OF THE COAL MINING INDUSTRY ON A PRIORITY BASIS

Robert Stefanko
R. V. Ramani

THE PENNSYLVANIA STATE UNIVERSITY

UNIVERSITY PARK, PENNSYLVANIA

THE PENNSYLVANIA STATE UNIVERSITY

COLLEGE OF EARTH AND MINERAL SCIENCES

UNDERGRADUATE MAJORS:

Ceramic Science, Earth Sciences, Geography, Geological Sciences, Metallurgy, Meteorology, Mineral Economics, Mining Engineering, Petroleum and Natural Gas Engineering, Polymer Science.

GRADUATE DEGREE PROGRAMS AND FIELDS OF RESEARCH:

Ceramic Science, Fuel Science, Geochemistry, Geography, Geology, Geophysics, Metallurgy, Meteorology, Mineral Economics, Mineral Processing, Mineralogy and Petrology, Mining Engineering, Petroleum and Natural Gas Engineering.

INTERDISCIPLINARY GRADUATE DEGREE PROGRAMS:

Earth Sciences, Environmental Pollution Control, Mineral Engineering Management, Solid State Science.

ASSOCIATE DEGREE PROGRAMS:

Materials Technology, Mining Technology.

INTERDISCIPLINARY RESEARCH SECTIONS:

Coal Research, Mass Spectrometry, Mine Drainage, Mineral Conservation, Ore Deposits.

ANALYTICAL AND STRUCTURE STUDIES:

Wet Chemical Analysis of Rocks, Minerals, and Metals, X-Ray Fluorescence Spectrometry, Emission Spectrochemical Analysis, Infrared and Ultraviolet Absorption Spectrometry, Atomic Absorption Analysis, Transmission Electron Microscopy and Diffraction, Scanning Electron Microscopy, Electron Microprobe Analysis.

CONTINUING EDUCATION PROGRAMS:

Short Courses, Conferences, Correspondence Courses, Certificate Programs, Manpower Development Training Program (Elders Ridge), Mine Machine Operators Program (New Florence).

(this page replaces old Title Page)

REPORT DOCUMENTATION PAGE

1. Report No.	2.	3. Recipient's Accession No.
4. Title and Subtitle A Study of Research and Development Needs of the Coal Mining Industry On A Priority Basis		5. Report Date March 1975 6.
7. Author(s) Robert Stefanko R. V. Ramani		8. Performing Organization Report No.
9. Performing Organization Name and Address The Pennsylvania State University 110 Mineral Sciences Building University Park, Pennsylvania 16802		10. Project/Task/Work Unit No. 11. Contract or Grant No. S0144111
12. Sponsoring Organization Name and Address Office of the Assistant Director - Mining Bureau of Mines Department of the Interior Washington, D. C. 20241		13. Type of Report Final 14.

15. Supplementary Notes

16. Abstract

A series of workshops were conducted with invited participants from the coal mining industry to identify the most pressing research and development needs of the industry. Six workshops were held on the following subjects; Research Priorities for Mining-Oriented Universities, R&D Needs for Surface Coal Mining, R&D Needs for Deep Coal Mining, R&D Needs for Anthracite Coal Mining, R&D Needs for Coal Mine Health and Safety, and R&D Needs for Environmental Control in Coal Mining.

17. Originator's Key Words	18. Availability Statement		
19. U. S. Security Classif. of the Report Unclassified	20. U. S. Security Classif. of This Page Unclassified	21. No. of Pages 33	22. Price

FOREWORD

This report was prepared by The Pennsylvania State University, University Park, Pennsylvania under USBM Contract Number SO144111. The contract was initiated under the Coal Mine Health and Safety and Advancing Coal Mining Technology Programs. It was administered under the technical direction of the Division of Mine Systems Engineering with Mr. Lawrence L. Davis acting as Technical Project Officer. Mr. J. A. Herickes was the contract administrator for the Bureau of Mines.

This report is a summary of the work recently completed as part of this contract during the period June 29, 1974 to March 28, 1975. This report was submitted by the authors on March 28, 1975.

Final Report

on

A STUDY OF RESEARCH AND DEVELOPMENT NEEDS OF THE COAL MINING INDUSTRY ON A PRIORITY BASIS

Contract No. SO144111
U.S. Department of the Interior
U.S. Bureau of Mines

Submitted by:

Robert Stefanko, Professor
Mining Engineering

R. V. Ramani, Associate Professor
Mining Engineering

United States Department of the Interior

BUREAU OF MINES
WASHINGTON, D.C. 20240

Memorandum December 15, 1977

To: Director, Bureau of Mines

Through: Associate Director--Mineral and Materials Research and Development
Chief, Office of Mineral Information

From: Acting Assistant Director--Mining

Subject: Distribution of Contract Report

Approval is requested to place on X Open File X NTIS the report titled A Study of Research and Development Needs of the Coal Mining Industry.

The contractor was The Pennsylvania State University and the contract no. is S0144111. The TPO was Lawrence L. Davis and the WOSE was Lawrence L. Davis. The contractor ___ has X has not filed a DI-1217 (invention disclosure form)* Press release recommendation: ___ high ___ medium X low.

To make this report available to interested parties, it is recommended that two copies each of the report be placed on open file for public review in the Department of the Interior Library and at the Bureau facilities in Denver, Pittsburgh, Bruceton, Spokane, Twin Cities, and the DOE facilities in Morgantown, WV., and Carbondale, Ill. No copies are proposed for transmission to State Geologists.

In addition, if specified above, two copies will be placed with the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia, 22161 for reproduction and distribution.

Robert L. Marovelli

Recommended: JAN 04 1978 Approved: JAN 4 1978

Chief, Office of Mineral Information

Acting Director, Bureau of Mines
J. D. Morgan

(no press release)

Enclosures

*If Form DI-1217 has been filed, Solicitor's approval must accompany this document.

INTRODUCTION

During the project period June 1, 1974 to February 28, 1975, six conferences were held on Contract No. S0144111, "A Study of Research and Development Needs of the Coal Mining Industry on a Priority Basis":

1. "Conference on Research Priorities for Mining Oriented Universities," University Park, Pa. June 10, 1974.

2. "Conference on Research and Development Needs for Surface Coal Mining," St. Clairsville, Ohio, July 26, 1974.

3. "Conference on Research and Development Needs for Deep Coal Mining," Fairmont, W.Va., September 6, 1974.

4. "Conference on Research and Development Needs for Anthracite Coal Mining," Hazleton, Pa., October 4, 1974.

5. "Conference on Research and Development Needs for Coal Mine Health and Safety," Monroeville, Pa. November 15, 1974.

6. "Conference on Research and Development Needs for Environmental Control in Coal Mining," University Park, Pa., January 3, 1975.

The format was basically the same for each seminar. Principally, seminars were conducted in various coal producing areas in an attempt to get out among producers. At least one month before the scheduled event, invitations were extended to individuals and organizations thought to have the greatest interest in the specific subject area, with a hoped for number of participants between 20-25. Approximately two weeks prior to the conduct of each seminar, an agenda was distributed to those indicating an interest. While the seminars were basically unstructured, the agendas were provided to stimulate some advance thinking on the more pertinent areas. The agendas for each seminar are appended.

A list of the registrants for each conference is also appended. As can be seen, it was very difficult to maintain enrollments exactly in the desired 20-25 range, and thus enrollments were as little as 14 and as many as 42, with an average attendance of 25. However, the range of attendees for each conference was not that great to prove detrimental. More disappointing was the varied response to invitations. Coal producing companies did not participate to the extent envisioned. Furthermore, even

those representatives attending generally did not provide a great amount of input, although there were notable exceptions. The arguments given for not attending was the shortage of manpower in the industry, not permitting the freeing of personnel to participate in such meetings. Also, participants felt constrained from too active participation for fear of revealing propriatary information.

While the idea of going out to industry was a noble one, experience would indicate that choice of location should be tempered somewhat by practicalities. During many of the conferences in the more remote areas, those attending from afar had difficult plane-car rental arrangements. In the future, therefore, it is recommended that consideration should be given of locating the conferences near airports for the convenience of those arriving from afar.

EXTERNAL FORCES

It is difficult in such conferences to eliminate extraneous discussion especially when it influences greatly the development of the main theme. Unless one recognizes the factors, it is difficult to understand the response or lack thereof from the producers to support and initiate R & D efforts. Rightfully or wrongly, the coal producers feel persecuted relative to health and safety requirements and environmental considerations. This has created such anxiety within the industry that the necessary risks of opening up new mines are not being assumed, and unless a more clearcut national energy policy is established, there is little likelihood of much real expansion in the future. Too many operators feel that one will not be permitted to either mine or burn coal to justify the huge capital investments for new mine development.

The Federal Coal Mine Health and Safety Act of 1969 (Public Law 91-173) has had a serious impact on productivity although it is probably unfair to blame the entire loss of production on this one factor. Nevertheless one should recognize that certain features of the law are beyond present technology and others are of varied dubious safety benefit. It is hoped that future amendments will rectify these problems. It is widely recognized that the safest mine is the most productive mine and vice versa, and it is not suggested that the law be weakened. It is just recognized that production may be seriously hampered by the concommitant improvements in health and safety, and in fact, some parts may create greater hazards than was intended to be eliminated.

The industry recognizes the need for measures that would protect the environment. However, a distinction must be made between preservation of environment and the extraction of vitally needed minerals with adequate reclamation and rehabilitation. Our nation cannot exist without the development of its mineral resources and a suitable compromise must be made between energy and environmental needs. Thus, the responsible element of the industry recognizes the need for suitable but not repressive legislation.

Another most difficult barrier to increased production capability of the industry is the inability to obtain equipment. Orders for underground continuous miners are back ordered at a minimum of two to three years while for primary stripping equipment, deliveries lag orders by five years. In addition, severe shortages of such items as roof bolts and AN-FO explosives have resulted in serious production suspension. Spot shortages of pipe and other items have proven serious. In short, a national energy policy is needed to establish priorities in supplying essential industries.

While R & D efforts are recognized as vital, in each conference the lament of suitably trained manpower and the need for education and training emerged. Although this was beyond the subject matter and therefore will not be referred to further in the report, it would be a mistake not to allude to how serious such matters were considered by the participants. During the remainder of the report, specific areas will be discussed. Generally, unless referred to otherwise, the report is basically responsive to the bituminous coal mining industry

ROOF SUPPORT

Roof falls result in a greater number of fatalities than any other source, and it was therefore appropriate that an extensive research and development effort was universally recognized as a primary need. It was recognized that accidents can be eliminated by

(a) developing suitable monitoring equipment for early warning purposes,

(b) install a high degree of discipline so that no one goes under unsupported roof for any reason, and

(c) improve existing support techniques and develop more reliable new techniques to avoid falls.

It was pointed out that a considerable amount of money has been spent in an attempt to develop suitable monitoring equipment with little success. Furthermore, the complexities of the problem are such that there was quite widespread opinion that a completely reliable monitoring device was not conceivable in the near future. Therefore, while efforts should continue to develop such installations, it is felt that spectacular results should not be anticipated in the near future.

There undoubtedly will always be human errors where individuals will go under unsupported roof, so therefore the amount of unsupported roof should be minimized for optimum effect. This leaves (c) as the best approach to development of more foolproof support systems.

It is recognized that roof bolting has had a tremendous impact on improved safety in the industry, but it is also recognized that a tremendous amount of refinement is necessary to provide even more effective support. Better mechanical anchorage is desired and cheaper grouted bolts must be developed. However, more novel designs that would achieve more effective full-hole anchorage are required while improving the speed of installation. In short, better support materials must be designed.

Any number of studies reveal that the bottleneck leading to reduced productivity is the bolting cycle. While better drills and bits have become available and twin boom drills are available, generally speaking, roof bolting still remains as the bottleneck. Therefore, an entirely new concept has to be developed apart from the present cycling of roof bolter and miner from alternate places. A concurrent system of bolting must be developed and various designs are suggested. Most would divorce the bolter from a direct continuous miner mount. Instead, it is recommended that bolters be provided as an integral part of a self-advancing shield system or perhaps an integral part of a shuttle car to provide surge capacity with an appropriate canopy or shield to provide the necessary temporary support required prior to the permanent support installation.

VENTILATION

While roof control was recognized as the area requiring the greatest R & D effort, ventilation was a close second. Mining at greater depth and at faster rates of penetration with machines that produce finer coal has resulted in a greater incidence of gas and dust. Ventilation is the primary means of controlling both of these problems.

While the area of primary distribution is not the greatest problem, improvements can be made. Development of better drills to be able to sink air shafts closer would be beneficial. Tunnel driving machines that would permit larger more optimally shaped entries and thus reduce spans improving roof control would be beneficial. Improved stoppings and other control devices, installations and materials to cut down leakages would also be important.

It is in the face area, however, that is, from the last open crosscut to the face that the greatest energies must be expanded. The law requires that the line brattice or vent tubing be kept within 10 feet of the face at all times — very difficult to do in most instances. When mining with a 10-ft wide machine employing two passes, the length of the slot must be kept to 10 feet, because there is virtually no way of maintaining a line brattice within the slot. This entails considerable maneuvering of machine and therefore lost time. It is recommended that the mining machine be designed so that ventilation can be advanced with the machine automatically. Using a tubing terminating near the bits with an expandable connection to the rigid tubing system is to be recommended. There is no room on machines for this modification and the machines must be designed for the mount. Such similar schemes for automatically advancing ventilation with the movement of the machine is essential.

FACE HAULAGE

While the greatest number of accidents result from roof falls, haulage accidents are a very close second and even has held the dubious honor for the highest position in one year. Also, the standard of the industry is the shuttle car, an intermittent haulage device. Equipped with a trailing cable, the shuttle car is limited in reach and versatility. Also, the trailing cable is a hazard source as well as the result of production delays.

To increase the reach and versatility a R & D effort is needed to obtain a better mode of power for the shuttle car or similar wheeled vehicles. Improved battery development that would avoid premature discharge during the shift and therefore delays in battery changes plus greater power to be able to add some of the niceties such as power steering, elevated discharge, etc. is needed. An alternate to battery shuttle cars is the use of diesel powered cars. More research and demonstrations are needed to insure the safe and healthy operation of diesel equipment in mining environments.

The stretch car in conjunction with concurrent roof bolting has already been indicated. Needed is a reliable continuous transportation system. While a number of these has been introduced and re-introduced in recent years, they all seem to suffer from a lack of reliability and versatility. Cascading types demand close adherence to a very constrained mining plan and bolting is usually difficult unless two bolters are used. While the continuous belt conveyors that are extendable offer a greater potential, an inability to design a suitable cornering device has been a severe detriment. Certainly, R & D to develop a reliable, versatile, flexible, and reasonably priced continuous haulage system remains vital.

CONVENTIONAL MINING

While the trend to continuous mining in recent years would tend to indicate a nearly complete extinction of conventional mining in the near future, this is not seen to be likely by the experts. In fact, the legal requirements, union demands, and deteriorating natural conditions might indicate a reversal in the trend with an upswing in conventional mining. Since ventilation legal requirements combined with inadequate technology has virtually eliminated continuous miner cuts in excess of 10 feet in length, the typical continuous miner cut is now virtually the same as with conventional mining, leading to equal delays in place changes. If crew sizes are successfully raised to near conventional units, as appears to be largely advocated by the United Mine Workers of America, two of the greatest gains obtained with continuous mining will have been eliminated and some of the lost features in the relative lack of versatility with continuous miners looms larger, especially if some advances can be made in some of the conventional unit operations.

The haulage cycle has been reviewed already so will not be discussed. However, an alternate to the cutting cycle might be the use of a burn cut with a center auger hole providing the free face. Auger and long hole drills could be mounted in a jumbo configuration. With such equipment, the drilling of a long hole becomes feasible not requiring the movement of a cutting machine with each 10-ft. cut. Also, combined with such a cycle could be the use of AN-FO explosives underground. An auger hole could be drilled from 100-200 feet in length at a single set together with long blastholes and blasted in appropriate stages exceeding the conventional 10-ft. cut if so desired. While appearing only to modify one unit operation with this arrangement, actually the potential goes much further. It could provide sufficient flexibility to alter completely the present unit operations with conventional mining and produce more highly productive systems by minimizing delays

associated with traditional cycling. For example, it is envisioned that load-haul-dump units could replace loaders and shuttle cars and with the elimination of the cutting and coal drilling cyle, various new schemes could be tried.

The fact of the matter is that there will always be those natural conditions best suited for conventional mining. This is especially true with coal seams that possess hard intrusions or impurities and that vary widely in thickness. Thus the need for improvements in the conventional mining cycles will always remain.

ANTHRACITE MINING

The tremendous amount of water to be handled in underground anthracite mining operations is recognized as a great handicap. Since barriers between mines are either non-existent or so small as to permit water permeation, the net effect of any remaining active operation is to dewater a region. As the number of operations dwindled in a given district, additional burdens were placed on those remaining until the situation became intolerable, and the final result has been the almost complete demise of underground mining. Not only must the water be pumped but it also must be treated since industrial wastes cannot be discharged into any streams of the Commonwealth, and mine water is classified as an industrial waste. Except for some possible isolated areas, mostly in the southern field, it is felt that a government subsidy to pump and treat water is a virtual necessity if the anthracite mining industry is to be revived.

There is a considerable difference of opinion concerning the direction research and development should take in an attempt to revitalize the anthracite mining industry. A minority believe that government subsidy to handle the water alone is sufficient to encourage the opening of new mines today. However, most feel that while this may be true at today's highly inflated coal prices, coal prices have already dropped significantly from the recent highs and probably will go lower. Thus for an economically viable industry in the future, the present relatively costly minimally mechanized systems of mining must be replaced to achieve cost reductions through greater productivity.

Suggested R & D efforts run the gamut from modifications of existing systems to entirely new concepts. In the former area, rock tunnel driving equipment is recommended for driving the traditional rock haulways. However, the very difficult Pottsville conglomerate is a formidable task for any boring machine, and it is questionable whether this system of mining can be made economically feasible, although it is recognized

that some rock work will be necessary with any system of mining. The use of long hole drilling to a burn cut has proved attractive in the past and probably could be refined greatly with the better raise driving and augering equipment available today, although this method is not attractive from the conservation standpoint. Thus longwall has been touted as a better substitute, with and without gob packing. However, in spite of the heralded activity in pitch mining abroad, the ability to provide adequate self-advancing supports on heavy pitches has not been demonstrated. Thus while longwall mining may be an answer to pitch mining in the anthracite area, it requires a considerable capital risk investment which seems to be lacking at present. There also seems to be a question whether the roof can be controlled on pitches without backfilling the gob. Unfortunately, there is no fool-proof cheap way of determining some of these factors short of an extensive demonstration project.

Hydraulic mining has always appeared to be an attractive alternative on steep pitches and should be explored for anthracite. Earlier pioneering efforts by the Bureau of Mines proved that coal seams could be mined utilizing practical water pressure (4000 psi). Also, hydraulic mining is successfully practiced in a Canadian operation utilizing water at rates of 1500 gpm and at pressures approaching 2000 psi. Of course, anthracite coal is harder and perhaps other pressure-quantity distributions would be required. Furthermore, utilizing water power alone might not be the most economic route to follow but may have to be accompanied by the use of supplementary drilling and blasting.

Of course, irrespective of production techniques, a certain amount of development will be required. Past studies utilizing a boring machine loading onto a chain conveyor with steel arch support did not prove feasible. However, alternatives to the use of borers do exist today eliminating some of the clearance problems due to convergence. These will have to be explored and demonstrated to be effective.

Presently, most anthracite production is obtained from strip mining and surface mining still offers considerable potential. The multi-seam situation prevailing in most areas might permit mining by the open pit method. While the economics of carrying the overburden might prove favorable, the ecological problem would have to be carefully assessed. This too would involve a considerable research effort.

STRIP MINING

Approximately 50 percent of the U.S. annual coal production comes from strip mining, a figure that is expected to be maintained if not increased in the future. Therefore, research and development efforts that would affect improvements in health, safety and productivity in strip mining would be significant contributions.

Except for the bucket wheel excavator which to date has had limited application in this country, the production technique has been cyclic whether utilizing dragline, shovels or other minor equipment. Eliminating lost swing time could significantly improve production. This would require extensive revision to new equipment and probably require the employment of belt conveyors as stackers. The objective would be to try and obtain a continuous loading capability with the primary stripping equipment. This calls for considerable machine development, a task most machine manufacturers are unwilling to take when orders are already back logged for five years or more.

In addition to hardware development, basic studies are necessary to better conduct the digging or loading function of strip equipment. Obviously, the cutability of the overburden affects the choice of equipment and the various parameters must be assessed.

Because of simultaneous reclamation requirements with production, the use of tandem equipment becomes more attractive. However, the ultimate deployment of equipment is very risky and the ability to use digital computer simulation programs to try out a prospective system before it is purchases is paramount. However, good input data must be obtained for the program if the results are to have any value. Thus analytical methods of operation research can be very beneficial.

Considerable work needs to be done in determining good reclamation procedures. Unfortunately, sometimes legislation is so rigid that there is little opportunity to experiment. Yet, special equipment such as rock pickers for segregating the top soil from rock prior to stockpiling or after it has been placed back on the waste. In fact the whole area of erosion control and revegetation requires careful study.

IMPROVED MINE ENVIRONMENT

Mining affects both the internal and external environments, the former having a direct effect on the health and safety of miners while the latter affecting the ecology has a detrimental effect on society in general. The internal environments will first be considered.

Mining to greater depth with modern mining machines capable of high penetration rates and generally producing greater fines has aggravated the gas and dust problems, a trend that is expected to continue. Therefore, the old ways of handling these problems may be inadequate requiring either more refinement through modification or the development of new concepts entirely. The aggravated methane problem coincides with a critical shortage of natural gas and thus it is timely to look at solutions that would help alleviate both problems simultaneously, and methane degasification appears as one solution.

It has been demonstrated that methane can be obtained equivalent in quality to commercial pipeline gas by drilling vertical holes into virgin seams prior to mining. Stimulation techniques have shown that the permeability of coal seams can be greatly increased producing higher yields. However, the number of holes drilled to date and the amount of stimulation done have been inadequate to assess completely those techniques that provide optimum yield at the least overall cost. Also, experimentation on slant hole drilling techniques or side drilling techniques to increase hole surface area in the coal seam to increase methane collection is needed. Such holes drilled from the surface and remote from the mining activity provide the least possible hazard to the coal mining operation.

Economically, however, the drilling of horizontal holes from outside return entries ahead of and to the side of mining for demethanization purposes looks attractive economically. More work needs to be done on improving the directability of the drills for long hole drilling and perhaps utilizing perforated tubing to avoid hole closure, and assessing the feasibility of using stimulation techniques should be explored. One of the problems of internal collection has been the hazard introduced by the collection system underground. However, it would appear that the technology using monitoring equipment with automatic shutoff valves is sufficiently advanced to minimize such hazards. However, more work in this area should be conducted even apart from a demethanization program.

Some coal seams are known to liberate very little methane gas from vertical holes drilled into the virgin seam but produce tremendous quantities of gas in the gob area once caving occurs. Work needs to be done to establish mining plans to

isolate such gobs to maximize the gas collected. While most of these gob gases have lower Btu values than when collected from virgin seams (600 vs 1000 Btu per cu ft), the lower Btu gas is suitable for petrochemical purposes and even for firing on the site. Therefore, entirely new industries needing low Btu gas could be situated above a mine site.

Another solution to more effectively diluting the methane gas emitting from coal seams is to look at the present method of entry driving and make appropriate changes. With today's number of units in operation in a given mine, the need to carry 12-16 main entries is not uncommon. However, designing such entries with unfavorable W/H ratios and large spans create severe roof problems. Utilizing large circular holes could reduce the number of entries required, improve friction factors and minimize rubbing surfaces while improving roof stability. For example, one 20-ft diameter entry could be substituted for 4- 4 x 20 ft. entries with vastly improved roof conditions. The development of suitable tunnel driving machines could thus affect great economies.

Once respirable dust is generated and airborne, it will never settle out. Therefore, an ounce of prevention is worth a pound of cure and more attention needs to be focussed on minimizing the generation of dust. In a project funded by OCR, the authors demonstrated the very significant differences in size consist, as well as yield and impurities, between conventional and continuous mined material. Undoubtedly, similar studies of various continuous mining equipment and even with different bit lacings with a given machine would indicate significantly differing results. Also little has been done to match the machine to the seam. It would appear that considerable basic and applied research are necessary in this particular area.

External manifestations include the effects of subsidence, drainage, mine fires and refuse piles. All of these are affected by the basic mining plan. Designing mines to obtain the maximum extraction ratio employing suitable barrier pillars with partial mining extraction may appear inconsistent, but more work should permit this. Utilizing the critical area of mining concept, such mines can be changed to avoid surface subsidence effects, caving to aquifers and subsequent spontaneous combustion and firing of gob areas. Research is necessary to determine the critical factors affecting these problems: width of excavation, size of barrier pillars and depth. It may also be economically feasible to selectively backfill with refuse to seal and isolate gob areas for methane collection. Such sealed chambers may also prove to be repositories for the yellow boy precipitate resulting from water treatment that appears to be so difficult to dispose of. Thus several problems might be solved with one approach.

GENERAL NEEDS

While the tendency is to try and develop innovative methods and thus provide dramatic breakthroughs through research, the low availability of mining machinery gives pause to try and improve present techniques. Thus computer oriented analyses of mining systems become desirable. However, there is the great danger that these will become monsters because of an attempt to over sophisticate with complex mathematics and unnecessary and dubious functional relationships. Some specific application with this warning as a guide are:

1. Develop programs for scheduling and control of labor, materials, maintenance program.

2. CPM/PERT type analyses of unit operations.

3. Develop equipment replacement models for mining equipment.

4. Time study manuals for continuous miners, bolters and continuous and longwall mining systems. The Penn State conventional mining manual was thought to be a good format to follow.

5. Develop programs such that data, once acquired for any program, can serve as input to several programs, i.e. efficient use of computer memory, and acquired data.

6. Develop simple rules and guidelines to interpret computer-output for changing input conditions.

However, there are other factors that are not readily recognized as affecting productivity, health and safety and must be ordered on a priority basis. For example, most miners have qualitatively assessed that idle periods greatly aggravate roof conditions and therefore must be eliminated if possible. Thus a number of other analyses are needed such as:

1. A "Value Engineering" type analysis of the various provisions of the health and safety act to find the relative ordering of these provisions with regard to their contribution to health and safety.

2. Evaluation of 7-day 21-shift work week with various possible combinations.

(a) Crews working four 10-hour shifts a week.

(b) Management and work structure for (a).

(c) Stand-by units for maintenance for (a).

e.g. present system, is say 7 units, 5 days a week. One can visualize a system of 5 units, 7 days a week with 2 stand-by units.

3. Identification of externalities affecting mine production, and suggestion for eliminating these.

e.g. (a) Equipment availability from manufacturer.

(b) Transportation by railroad.

(c) Price structure stability.

CONCLUSIONS

In summary, the concensus is largely that research efforts in mining have been too little and too late and a considerable effort is required in all areas. Research should be considered on near-, intermediate- and long-term bases. Considerable refinement is necessary with existing systems to increase availability of machines and improve productivity, health and safety. These fall into the category of how best to advance face ventilation, how to assess better roof bolt anchorage, etc. Intermediate research sould focus on developing novel concepts of face ventilation and roof control far different than presently existing. Finally, that long term research should be conducted to develop highly sophisticated system providing as much remote control and automation as possible. These would differ markedly from and be completely unrecognizable from the existing systems.

A glance at the U.S. Bureau of Mines research program reveals that the suggested mix above does exist but patience must be practiced because research and development results appear slowly and can't be produced on a crash basis, unless huge sums are expended as per the moon space program.

CONFERENCE ON RESEARCH PRIORITIES
for
MINING ORIENTED UNIVERSITIES

June 10, 1974

Conference begins at 9:00 a.m. in Room 244 Deike Bldg., The Pennsylvania State University, University Park, Pa.

AGENDA

1. Welcome and Explanation of Objectives of the Conference -
   Robert Stefanko, Professor of Mining Engineering and Assistant Dean,
   The Pennsylvania State University

2. Research Philosophy and Concern of the U.S. Bureau of Mines -
   J. J. Yancik, Assistant Director for Mining Research, USBM

3. Present and Future Research priorities as Viewed by the USBM -
   William Schmidt, Head, Technology Transfer Group, USBM

4. Status of Mineral Engineering Research and Education Bill -
   Alvin Van Valkenberg, Coordinator, USBM University Relations

5. Remainder of day in free forum exchange of ideas.

SOCIAL EVENTS

:30 p.m. - Sunday, June 9, 1974 - Dinner at the Sheraton Motor Inn.

:30 a.m. - Monday, June 10,1974 - Continental Breakfast, 244 Deike Bldg.

:15 p.m. - Monday, June 10,1974 - Lunch at the Nittany Lion Inn.

CONFERENCE ON RESEARCH PRIORITIES
for
MINING ORIENTED UNIVERSITIES

June 10, 1974

Registration List

Arthur Baker, Dean
Dept. of Mining Engineering
UNIVERSITY OF NEVADA
Reno, Nevada 89507

Harve J. Carlson
UNIVERSITY OF ALASKA
5510 Hoover
Bethesda, Maryland 20034

George Clark, Director
Rock Mechanics & Explosives
Research Center
UNIVERSITY OF MISSOURI
Rolla, Missouri 65401

Robert M. Cox, Professor
Mineral Engineering Dept.
UNIVERSITY OF ALABAMA
Box 1466
University, Alabama 35486

Steve Crouch, Professor
Dept. of Civil & Mineral Eng.
UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

Larry Davis
U.S. BUREAU OF MINES
18th & C St., N.W.
Washington, D.C. 20240

Charles Fairhurst, Head
Dept. of Civil & Mineral Eng.
UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

Robert L. Frantz, Head
Dept. of Mineral Engineering
118 Mineral Industries Bldg.
THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pa. 16802

John W. Harbaugh, Professor
Dept. of Applied Earth Sciences
STANFORD UNIVERSITY
Stanford, California 94305

DeVerle Harris, Professor
Dept. of Mining & Geology Eng.
College of Mines
UNIVERSITY OF ARIZONA
Tucson, Arizona 85721

Robert W. Heins, Professor
College of Engineering
1509 University Avenue
Madison, Wisconsin 53706

Earl R. Hoskins, Head
Dept. of Mining Engineering
SOUTH DAKOTA SCHOOL OF MINES
Rapid City, South Dakota 57701

John R. Hoskins, Head
Dept. of Mining Eng. & Metallurgy
College of Mines
UNIVERSITY OF IDAHO
Moscow, Idaho 83843

Tice Johnson, Head
Dept. of Mining Engineering
COLORADO SCHOOL OF MINES
Golden, Colorado 80401

Jay H. Kelley, Dean
School of Mines
WEST VIRGINIA UNIVERSITY
213 Mineral Industries Bldg.
Morgantown, West Virginia 26506

J. Richard Lucas, Head
Div. of Mineral Engineering
213 Holden Hall
VIRGINIA POLYTECHNIC INSTITUTE
Blacksburg, Virginia 24061

L. A. Morley, Professor
Dept. of Mineral Engineering
118 Mineral Industries Bldg.
THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pa. 16802

James Paone
U.S. BUREAU OF MINES
18th & C St., N.W.
Washington, D.C. 20240

R. V. Ramani, Professor
Dept. of Mineral Engineering
118 Mineral Industries Bldg.
THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pa. 16802

Richard Sanford, Professor
Dept. of Mining Engineering
UNIVERSITY OF WISCONSIN — Platteville
Platteville, Wisconsin 53818

Lee W. Saperstein
Acting Section Head
Dept. of Mineral Engineering
118 Mineral Industries Bldg.
THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pa. 16802

William Schmidt, Head
Technology Transfer Group
U.S. BUREAU OF MINES
18th & C St., N.W.
Washington, D.C. 20240

Robert Stefanko, Assistant Dean
College of Earth & Mineral Sciences
THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pa. 16802

William Van Matre, Head
Dept. of Mining Engineering
MONTANA COLLEGE OF MIN.SCI. & TECH.
Butte, Montana 59701

Alvin Van Valkenburg, Coordinator
Office of University Relations
U.S. BUREAU OF MINES
18th & C St., N.W.
Washington, D.C. 20240

John E. Willson, Professor
Dept. of Mining Metal & Fuels Eng.
UNIVERSITY OF UTAH
315 Mineral Sciences Building
Salt Lake City, Utah 84112

Joseph J. Yancik
Assistant Director — Mining Research
U.S. BUREAU OF MINES
18th & C St., N.W.
Washington, D.C. 20240

T. M. Yegulalp, Professor
Henry Krumb School of Mines
COLUMBIA UNIVERSITY
120th St. & Amsterdam Ave.
New York, N.Y. 10027

Conference

on

Research and Development Needs for Surface Coal Mining

Place: Holiday Inn, St. Clairsville, Ohio

Time and Place: 8:30 A.M. -5:00 P.M., July 26, 1974

AGENDA

8:30 A.M. - 9:00 A.M.	Registration – Coffee and pastries will be available at this time
9:00 A.M. - 12:00 P.M.	Free Form Discussion
12:00 P.M. - 1:30 P.M.	Lunch at the Inn
1:30 P.M. - 5:00 P.M.	Free Form Discussion

The meeting is planned as a workshop so no formal presentations are listed although undoubtedly directed discussions will be provided by the conference organizers, R. Stefanko, Assistant Dean for Continuing Education and R. V. Ramani, Associate Professor of Mining Engineering, both of The Pennsylvania State University. The general object of the conference is to determine what areas of research might be most fruitfully supported by the U.S. Bureau of Mines which has received a sizeable appropriation from Congress for this purpose.

A brief outline of the material to be discussed includes:

1. Pre-Planning and Development
2. Drilling
3. Blasting
4. Stripping
5. Load-Haul
6. Reclamation
7. Environmental Impact
8. Health and Safety
9. Legalistic Restrictions
10. Mining Methods

We would hope that you might come to the conference having given some thought to the following questions since these are some of the points we would like to discuss:

1. What is the primary restriction limiting an expansion of surface mining production?
2. What do you think should be done on research and development for an action program?
3. What unit operation deserves greatest attention? What direction?
4. What natural conditions (rainfall, soil condition, etc.) affect your reclamation procedures and what research and development effort is needed to solve some of the problems?
5. What information difficult or impossible generally to get is necessary to plan surface mines effectively?

CONFERENCE ON RESEARCH AND DEVELOPMENT NEEDS

for the

SURFACE MINING INDUSTRY

St. Clairsville, Ohio
July 26, 1974

Registration List

George E. Aiken, Manager
Mining Engineering
KAISER ENGINEERS, INC.
300 Lakeside Drive
Oakland Ca. 94604

John P. Billiter, Admin. Eng.
BETHLEHEM MINES CORP.
Bethlehem, Pa. 18016

James Boyer, Manager
Environmental Control
BITUMINOUS COAL RESEARCH, INC.
350 Hochberg Road
Monroeville, Pa. 15146

Ted Canfield, Vice President
RECLAMATION & AIR SURVEY
R.F.D. 4
New Philadelphia, Ohio 44663

Douglass Cook
Assistant Director of Planning
AMAX COAL COMPANY
105 South Meridan Street
Indianapolis, Ind. 46225

Samuel Damron, Manager
Exploration & Properties
ISLAND CREEK COAL COMPANY
Lexington, Kentucky

Cecil M. Delloma, Vice President
Central Division
CONSOLIDATION COAL COMPANY
Cadiz, Ohio

Dennis M. DeWilde, Planning Eng.
CENTRAL OHIO COAL COMPANY
P.O. Box 98
Cumberland, Ohio 43732

9. W. E. Foreman, Assoc. Professor
Division of Minerals Engineering
College of Engineering
VIRGINIA POLYTECHNIC INSTITUTE
Blacksburg, Va. 24061

10. Vernon Gerst, Eng. Tech.
MARIETTA COAL COMPANY
St. Clairsville, Ohio 43950

11. John W. Greer, Gen. Supt.-Surface
Central Division
CONSOLIDATION COAL COMPANY
Cadiz, Ohio

12. Elmore C. Grim
Surface Mining Specialist
U.S. ENVIRONMENTAL PROTECTION AGENCY
National Environmental Res. Center
Cincinnati, Ohio 45268

13. John Gunnett
SKELLEY & LOY
2601 North Front Street
Harrisburg, Pa. 17110

14. Len Hansson, Dev. Engr.
BUCYRUS-ERIE COMPANY
South Milwaukee
Milwaukee, Wisc. 53172

15. Cartha Hosack, Gen. Supt.
Indiana-Ohio District
PEABODY COAL COMPANY
301 North Memorial Drive
St. Louis, Missouri 63102

16. James Kantzes, Environmental Chemist
Central Division
CONSOLIDATION COAL COMPANY
Cadiz, Ohio 43907

7. George W. Land
Director of Research
AMAX COAL COMPANY
105 South Meridan St.
Indianapolis, Ind. 46225

8. Emmett T. Lang, President
THE CENTRAL PA. COAL PRODUCERS' ASSN.
Suite 219, Masonic Building
Ebensburg, Pa. 15931

9. H. R. Martin, District Manager
BUCYRUS-ERIE COMPANY
South Milwaukee
Milwaukee, Wisconsin 53172

0. Jan M. Mutmansky, Assoc, Professor
WEST VIRGINIA UNIVERSITY
Morgantown, W.Va. 26506

1. George Nicolozakes, President
MARIETTA COAL COMPANY
Friends Church Road
St. Clairsville, Ohio

2. Brad Smith, Environmental Engr.
Central Division
CONSOLIDATION COAL COMPANY
Cadiz, Ohio 43907

Conference

on

Research and Development Needs for Deep Coal Mining

Place: Holiday Inn, Fairmont, W.Va.

Time and Place: 8:30 A.M. - 5:00 P.M., September 6, 1974

AGENDA

8:30 A.M. -	9:00 A.M.	Registration — Coffee and pastries will be available at this time
9:00 A.M. -	9:30 A.M.	R. Stefanko — Introduction and statement of objectives
9:30 A.M. -	12:00 P.M.	Free Form Discussion
12:00 P.M. -	1:30 P.M.	Lunch at Inn
1:30 P.M. -	5:00 P.M.	Free Form Discussion

The meeting is planned as a workshop so no formal presentations are listed although undoubtedly directed discussions will be provided by the conference organizers, R. Stefanko, Assistant Dean for Continuing Education and R. V. Ramani, Associate Professor of Mining Engineering, both of The Pennsylvania State University. The general object of the conference is to determine what areas of research might be most fruitfully supported by the U.S. Bureau of Mines which has received a sizeable appropriation from Congress for this purpose.

A brief outline of the material to be discussed includes:

1. Unit Operations in Room and Pillar Mining
   - Cutting
   - Drilling
   - Blasting
   - Face Haulage
   - Continuous Mining
2. Auxiliary Operations in Room and Pillar Mining
   - Ventilation
   - Roof Support
   - Power Distribution
   - Main Haulage
3. Longwall Mining
4. Shortwall Mining

The above list is not meant to be comprehensive and we would hope that you might come to the conference having given some thought to the following questions since these are some of the points we would like to discuss:

1. What is the primary restriction limiting an expansion of underground mining production?
2. What do you think should be done on research and development for an action program?
3. What unit operation deserves greatest attention? What direction?
4. What natural conditions (roof, bottom, seam impurities, etc.) affect your operational procedures and what research and development effort is needed to solve some of the problems?
5. What information difficult or impossible generally to get is necessary to plan deep mines effectively?

CONFERENCE ON RESEARCH AND DEVELOPMENT NEEDS

for

DEEP COAL MINING

Fairmont, W. Va.
September 6, 1974

Registration List

1. Squire Barrett
PEABODY COAL COMPANY
P.O. Box 3367
Evansville, Indiana 47732

2. D. M. Bondurant
WEST VIRGINIA UNIVERSITY
Morgantown, W.Va. 26506

3. Ed Calarie
CONSOLIDATION COAL COMPANY
Central Division
Cadiz, Ohio 43907

4. Walter E. Cook, Jr., Mining Eng.
J & L STEEL CORP.
P.O. Box 608
California, Pa.

5. R. H. Hamrick, Director
Occupational Health & Safety
WESTMORELAND COAL CO.
Big Stone Gap, Va. 24219

6. Eugene F. Harris, Staff Eng.
U.S. ENVIRONMENTAL PROTECTION AGENCY
National Environmental Res. Center
Cincinnati, Ohio 45268

7. Donald W. Hunter
Asst. to Vice Pres. of Eng.
ISLAND CREEK COAL COMPANY
465 East High Street
Lexington, Ky. 40508

8. Rex Jones
Coal Development Representative
CHESSIE SYSTEM
P.O. Box 27
Fairmont, W.Va. 26554

9. J. H. Kelley, Dean
School of Mines
WEST VIRGINIA UNIVERSITY
213 Mineral Industries Bldg.
Morgantown, West Virginia 26506

10. J. J. Ketz, General Manager
WESTMORELAND COAL CO.
Winding Gulf Division
Big Stone Gap, Va. 24219

11. Louis Kuchinic, Jr., Manager
Adm. Services — Coal
U.S. STEEL CORP.
500 Grant Street
Pittsburgh, Pa. 15230

12. George W. Land
Director of Research
AMAX COAL COMPANY
105 South Meridan St.
Indianapolis, Ind. 56225

13. Emmett T. Lang, President
THE CENTRAL PA. COAL PRODUCERS' ASSN.
Suite 219, Masonic Building
Ebensburg, Pa. 15931

14. J. Richard Lucas, Head
Division of Mineral Engineering
College of Engineering
VIRGINIA POLYTECHNIC INST.
Blacksburg, Va. 24061

15. W. J. McCutchen, Chief Eng.
WESTMORELAND COAL CO.
Winding Gulf Division
Tams, W.Va. 25933

16. Marvin Moore
AMAX COAL CO.
Wabash Mine
Kennsburg, Ill. 62863

17. Richard W. Phelps, Special Eng.
BETHLEHEM MINES CORP.
Bethlehem, Pa. 18016

18. Ben Powell
EASTERN ASSOCIATED COAL CORP.
1302 S. Eisehower Drive
Beckley, W.Va. 25801

19. Robert L. Raines
Mgr. - Special Projects
POCAHONTAS LAND CORP.
Bluefield, W.Va. 24701

20. Robert D. Saltsman
BITUMINOUS COAL RESEARCH, INC.
350 Hochberg Road
Monroeville, Pa. 15146

21. E. J. Sandy
WEST VIRGINIA UNIVERSITY
Morgantown, W.Va. 26506

22. H. E. Steinman, Chief Eng.
J & L STEEL CORP.
3 Gateway Center
Pittsburgh, Pa. 15230

23. John W. Straton
GATES ENGINEERING COMPANY
P.O. Drawer AF
Beckley, W.Va. 25801

24. A. A. Terchick
Section Supervisor, Res. Lab.
U.S. STEEL CORP.
125 Jamison Lane
Monroeville, Pa. 15146

25. Edwin B. Wilson, Eng.
Research Department
BETHLEHEM STEEL CORP.
Bethlehem, Pa. 18016

26. W. L. Zeller
U.S. STEEL CORP.
600 Grant Street
Pittsburgh, Pa.

Conference

on

Research and Development Needs for the Anthracite Mining Industry

Place: Holiday Inn, Hazleton, Pa.

Time and Date: 8:30 A.M. - 5:00 P.M., October 4, 1974

AGENDA

8:30 A.M. - 9:00 A.M.	Registration — Coffee and pastries will be available at this time
9:00 A.M. - 9:30 A.M.	R. Stefanko — Introduction and statement of objectives
9:30 A.M. - 12:00 P.M.	Free Form Discussion
12:00 P.M. - 1:30 P.M.	Lunch at Inn
1:30 P.M. - 5:00 P.M.	Free Form Discussion

The meeting is planned as a workshop so no formal presentations are listed although undoubtedly directed discussions will be provided by the conference organizers, R. Stefanko, Assistant Dean for Continuing Education and R. V. Ramani, Associate Professor of Mining Engineering, both of The Pennsylvania State University. The general object of the conference is to determine what areas of research might be most fruitfully supported by the U.S. Bureau of Mines which has received a sizeable appropriation from Congress for this purpose.

A brief outline of the material to be discussed includes:

A. Underground Mining
   1. Unit Operations in Room and Pillar Mining
      a. Development
      b. Production
   2. Possible newer mining concepts
      a. Longwall mining
      b. Shortwall mining
      c. Augering
      d. Long-hole drilling
      e. Other

B. Surface Mining
   1. Stripping
   2. Open-pit operations
   3. Other

C. Coal Preparation

D. Refuse Reclamation

E. Environmental Problems

F. Other External Problems

The above list is not meant to be comprehensive and we would hope that you might come to the conference having given some thought to the following questions since these are some of the points we would like to discuss:

1. What is the primary restriction limiting an expansion of underground mining production?

2. What do you think should be done on research and development for an active program?

3. What new markets and uses of anthracite do you envision for the near- and long-term future?

4. Given an x=number of dollars for anthracite research, how would you list the priorities?

CONFERENCE ON RESEARCH AND DEVELOPMENT NEEDS FOR THE ANTHRACITE MINING INDUSTRY

Hazleton, Pa.
October 4, 1974

Registration List

R. K. (Kris) Agarwal, Engr.
Coal Preparation & Mining
Coal & Coke Section
BETHLEHEM STEEL CORP.
Bethlehem, Pa. 18016

Arthur Borchert
U.S. BUREAU OF MINES
Wilkes-Barre, Pa.
Phone: 717-825-6811, Ext. 333

Robert Brennan
U.S. BUREAU OF MINES
Wilkes-Barre, Pa.
Phone: 717-825-6811, Ext. 333

Alex R. Chamberlin
R.D. 3
Bloomsburg, Pa. 17815
Phone: 717-384-4128

Laurence Chase, Acting Chief
Bituminous Coal Eastern Region
FEDERAL ENERGY ADMINISTRATION
New Post Office Building
12th & Pennsylvania Ave., N.W.
Washington, D.C. 20461

Adam L. Crist
Resource Conservationist
ECONOMIC DEVELOPMENT COUNCIL OF NORTHEASTERN PA.
P.O. Box 777
Avoca, Pa. 18641
Phone: 717-655-5581

Ki Boug Cho, Mining Engr.
INDUSTRIAL ADVANCEMENT ADMINISTRATION OF M.C.I.
Seoul, Korea

8. Lawrence Davis
U.S. BUREAU OF MINES
Washington, D.C.
Phone: 202-343-8077

9. Derwood DeHaven, Mining Engr.
MESA
19 N. Main St.
Room 510 Veterans Building
Wilkes-Barre, Pa. 18701
Phone: 717-825-6811, Ext. 321

10. William W. Everett
U.S. BUREAU OF MINES
Wilkes-Barre, Pa.
Phone: 717-825-6811, Ext. 333

11. Joseph J. Fauzio
GREENWOOD STRIPPING CORP.
Tamaqua, Pa. 18252

12. Edward G. Fox
1507 Mahantongo Street
Pottsville, Pa. 17901

13. Louis Giusti, Safety Coordinator
UNITED MINE WORKERS OF AMERICA #25
116 South Main Street
Wilkes-Barre, Pa. 18634

14. In Soo Han
KOREA MINING PROMOTION CORP.
Seoul, Korea

15. Arthur Hand, Mine Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
East Main Street
Hegins, Pa. 17938

16. Arnold H. Harvey, Liaison Officer
U.S. BUREAU OF MINES
P.O. Box 783
Harrisburg, Pa. 17108
Phone: 717-782-4474

17. Walter L. Herold
215 Hickory Street
Scranton, Pa. 18505
Phone: 717-343-1993

18. Roger J. Howell
Consulting Mining Engr.
417 W. Atherton Street
Taylor, Pa. 18517

19. Arthur Joyce, Mine Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
Box 184, R.D. 2
Elysburg, Pa. 17824
Phone: 717-672-2489

20. Clarence Kashner, Mine Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
904 W. Spruce Street
Shamokin, Pa. 17872

21. Walter Kraska, President
UNITED MINE WORKERS OF AMERICA #25
244 West Board Street
Hazleton, Pa. 18201

22. C. S. Kuebler
U.S. BUREAU OF MINES
Wilkes-Barre, Pa.
Phone: 717-825-6811, Ext. 333

23. Robert D. Laughlin
Bureau of Scientific & Technological Development
DEPARTMENT OF COMMERCE
Room 400 South Office Building
Harrisburg, Pa. 17120
Phone: 717-787-4147

24. Red Lee, Coal Mine Inspector
MESA
19 N. Main Street
Room 510 Veterans Building
Wilkes-Barre, Pa. 18701
Phone: 717-825-6811, Ext. 321

25. Yong Hwan Lee
BUREAU OF MINES
Seoul, Korea

26. A. F. MacDonald
BETHLEHEM MINES CORP.
Bethlehem, Pa. 18016

27. Clyde L. Machamer, President
INDEPENDENT MINERS & ASSOCIATES
Pottsville, Pa. 17901
Phone: 717-622-1019

28. Donald Markle, Jr.
Coal Mine Inspector
MESA
Room 510 Veterans Building
Wilkes-Barre, Pa. 18701
Phone: 717-825-6811, Ext. 321

29. Clarence Miller, Mine Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
Wiconisco Avenue
Muir, Pa. 17957

30. Norman Mutchler
BERGER ASSOC. INC.
P.O. Box 1943
Harrisburg, Pa. 17105

31. James Paone
U.S. BUREAU OF MINES
Washington, D.C.
Phone: 202-343-5992

32. Jaz Sim Park
GEOLOGICAL & MINERALOGICAL INSTITUTE OF KOREA
Seoul, Korea

33. Heinz G. Pfeiffer, Manager
Technology & Energy Assessment
PP & L
Allentown, Pa.

34. Richard Phelps
BETHLEHEM MINES CORP.
Bethlehem, Pa. 18016

35. Leon Richter
INDEPENDENT MINERS & ASSOCIATES
Pottsville, Pa. 17901
Phone: 717-647-9604

36. Alfred B. Riedel
Civil & Mining Engineer
409 East Main Street
Hegins, Pa. 17938
Phone: 717-628-3098

7. John Schimmel
U.S. BUREAU OF MINES
Wilkes-Barre, Pa. 18701
Phone: 717-825-6811, Ext. 333

8. John Shutack
MESA
19 N. Main Street
Room 510 Veterans Building
Wilkes-Barre, Pa. 18701
Phone: 717-825-6811, Ext. 321

9. Gordon E. Smith
Consulting Engineer
R.D. 2
Pine Grove, Pa. 17963

0. John G. Sulka
Executive Safety Director
UNITED MINE WORKERS OF AMERICA
1437 K Street, N.W.
Washington, D.C. 20005

1. Ivor Williams
U.S. BUREAU OF MINES
Wilkes-Barre, Pa. 18701
Phone: 717-825-6811, Ext. 333

2. Henry Yaskowitz
Safety Coordinator, District #2
UNITED MINE WORKERS OF AMERICA
131 Harding Avenue
Revloc, Pa. 15948

Conference

on

Research and Development Needs
for
Coal Mine Health and Safety

lace: Holiday Inn, Monroeville, Pa.

ime and Place: 8:30 A.M. - 4:00 P.M., November 15, 1974

AGENDA

3:30 A.M. - 9:00 A.M.	Registration — Coffee and pastries will be available at this time
9:00 A.M. - 9:30 A.M.	R. Stefanko — Introduction and statement of objectives
9:30 A.M. - 12:00 P.M.	Free Form Discussion
2:00 P.M. - 1:30 P.M.	Lunch at Inn
1:30 P.M. - 4:00 P.M.	Free Form Discussion

he meeting is planned as a workshop so no formal presentations are listed although ndoubtedly directed discussions will be provided by the conference organizer, . Stefanko, Assistant Dean for Continuing Education of The Pennsylvania State niversity. The general object of the conference is to determine what areas of esearch might be most fruitfully supported by the U.S. Bureau of Mines which has eceived a sizeable appropriation from Congress for this purpose.

brief outline of the material to be discussed includes:

1. Falls of roof and rib
2. Mine gas and dust explosions
3. Health hazards due to dust
4. Ventilation requirements
5. Moving vehicle incidences
6. Human element in accidents
7. Ultimate design of machinery controls
8. Systems optimization
9. Electrical hazards
10. Remote and automated control.

he above list is not meant to be comprehensive and we would hope that you might ome to the conference having given some thought to the following questions since hese are some of the points we would like to discuss:

1. What is the greatest safety hazard existing today? Will it be tomorrow? For the future? What recommendations for research do you suggest?
2. What is the greatest health hazard occurring today? Will be tomorrow? For the future? What recommendations do you suggest?
3. Role of education and training.

CONFERENCE ON RESEARCH AND DEVELOPMENT NEEDS FOR COAL MINE HEALTH AND SAFETY

Monroeville, Pa.
November 15, 1974

Registration List

. Ed Calaria
CONSOLIDATION COAL CO.
Central Division
Cadiz, Ohio 43907

. Robert Dalzell
MESA Technical Support
4800 Forbes Avenue
Pittsburgh, Pa. 15213

. J. R. Eaton
REPUBLIC STEEL CORP.
Uniontown, Pa.

. Joseph Fako
GREENWICH COLLIERIES CO.
Ebensburg, Pa.

. James B. Girod
U.S. STEEL CORP.-Coal Operations
Room 5837, 600 Grant Street
Pittsburgh, Pa. 15230

. Len T. Hansson
BUCYRUS-ERIE CO.
P.O. Box 56
South Milwaukee, Wisc. 53172

. E. J. Harris
MESA Technical Support
4800 Forbes Avenue
Pittsburgh, Pa. 15213

. L. D. Kimmel, Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
1237 Washington Street
Indiana, Pa. 15701

, Joseph Kreutzberger
GREENWICH COLLIERIES
Ebensburg, Pa.

, J. E. Lamont, Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
505 Fourth Avenue
Punxsutawney, Pa. 15767

11. Donald F. Metheny
BETHLEHEM STEEL CORP.
Bethlehem, Pa.

12. Charles Meyer
Homer Research Labs.
BETHLEHEM STEEL CO.
Bethlehem, Pa.

13. Donald W. Mitchell
MESA Technical Support
4800 Forbes Avenue
Pittsburgh, Pa. 15213

14. Robert D. Saltsman
BITUMINOUS COAL RESEARCH, INC.
350 Hochberg Road
Monroeville, Pa. 15146

15. A. J. Salvador
BETHLEHEM MINES CORP.
Bethlehem, Pa.

16. Frank Shoaf, Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
524 Old Waynesburg Road
Carmichaels, Pa. 15320

17. Harry C. Verakis
MESA Technical Support
4800 Forbes Avenue
Pittsburgh, Pa. 15213

18. Barry S. Vlanich
BETHLEHEM MINES CORP.
Ellsworth, Pa.

19. John Wallace
U.S. Steel Research
U.S. STEEL CORP.
Monroeville, Pa. 15146

20. A. M. Williams, Inspector
DEPT. OF ENVIRONMENTAL RESOURCES
P.O. Box 333
Apollo, Pa. 15613

21. Richard P. Yantis
BATTELLE COLUMBUS LABS.
505 King Avenue
Columbus, Ohio 43201

22. Anthony Zona
MESA Technical Support
4800 Forbes Avenue
Pittsburgh, Pa. 15213

CONFERENCE
ON
RESEARCH AND DEVELOPMENT NEEDS
FOR
ENVIRONMENTAL CONTROL IN COAL MINING

CE; 244 Deike Building, Penn State Campus, University Park, Pa.

E AND DATE; 8:30 A.M. — 4:00 P.M., January 3, 1975

AGENDA

30 A.M. - 9:00 A.M. Registration — Coffee and pastries will be available at this time

00 A.M. - 9:30 A.M. R. Stefanko — Introduction and Statement of Objectives

30 A.M. - 12:00 P.M. Free Form Discussion

00 P.M. - 1:30 P.M. Lunch at Nittany Lion Inn

30 P.M. - 4:00 P.M. Free Form Discussion

meeting is planned as a workshop so no formal presentations are listed although oubtedly directed discussions will be provided by the conference organizers, Stefanko, Assistant Dean for Continuing Education and R. V. Ramani, Associate fessor of Mining Engineering, both of The Pennsylvania State University. The eral object of the conference is to determine what areas of research might be t fruitfully supported by the U.S. Bureau of Mines which has received a size- e appropriation from Congress for this purpose:

rief outline of the material to be discussed includes:

A. Internal Deep Mine Environment
   1. Gas and Dust Control
   2. Roof Control
   3. Drainage
   4. Future Considerations
      (a) Diesel applications
      (b) Inert atmospheres
      (c) Remote controls and automation

B. External Deep Mine Environment
   1. Mine Refuse
      (a) Acid water formation
      (b) Spontaneous combustion
      (c) Dust
      (d) Aesthetics
   2. Mine Water
      (a) Treatment
      (b) Sludge
   3. Preparation Plant
   4. Subsidence
      (a) Abandoned mine control
      (b) Active mine control

C. Surface Mines
   1. Water Erosion
      (a) Profiles
      (b) Pit control
   2. Reclamation
      (a) Mine control
      (b) Overburden handling
      (c) Revegetation

above list is not meant to be comprehensive and we would hope that you might
e to the conference having given some thought to the following questions since
se are some of the points we would like to discuss:

1. What do you think is the most severe internal environmental control problem and suggestions for remedy?
2. What do you think is the most severe external environmental control problem and suggestions for remedy?
3. What environmental problems exists or are nonexisting today do you envision for the future?

CONFERENCE
ON
RESEARCH AND DEVELOPMENT NEEDS
FOR
ENVIRONMENTAL CONTROL IN COAL MINING

STATE COLLEGE, PA.
January 3, 1975

John C. Anderson
Director Coal Preparation & Dist.
U.S. STEEL CORP.
600 Grant St., Rm. 5837
Pittsburgh, Pa. 15230

Richard S. Berkof
Manager, Adv. Technology
GULF & WESTERN
Advanced Dev. & Eng. Ctr.
101 Chester Road
Swarthmore, Pa. 19081

J. F. Boyer, Manager
Environmental Control
BITUMINOUS COAL RESEARCH, INC.
350 Hochberg Road
Monroeville, Pa. 15141

Louis Giusti
Safety Coordinator
U.M.W.A.
116 S. Main Street
Wilkes Barre, Pa. 18634

John D. Kalasky
Corp. Manager of Ventilation
Lexington, Ky.

Emmett T. Lang, President
CENTRAL PA. COAL CORP.
Suite 219, Masonic Building
Ebensburg, Pa. 15931

Jerry M. Lombardo
N. Washington Road
McMurray, Pa.

8. Milton L. McKenna
Manager, Marketing
GULF & WESTERN
Advanced Dev. & Eng. Ctr.
101 Chester Road
Swarthmore, Pa. 19081

9. Donald E. Raab, Engineer
Homer Research Labs.
BETHLEHEM STEEL CO.
Bethlehem, Pa. 18016

10. R. D. Saltsman
BITUMINOUS COAL RESEARCH, INC.
350 Hochberg Road
Monroeville, Pa. 15141

11. A. J. Salvador, Division Insp.
BETHLEHEM MINES CORP.
Ellsworth, Pa. 15331

12. Sheldon A. Spachner
Prin. Scientist & Asst. Chief Eng.
GULF & WESTERN
Advanced Dev. & Eng. Ctr.
101 Chester Road
Swarthmore, Pa. 19081

13. A. A. Terchick, Section Supv.
U.S. STEEL CORP.
Research Labs.
Monroeville, Pa. 15146

14. John C. VanVoorhis
Asst. Mine Inspector
BETHLEHEM MINE #51
Ellsworth, Pa. 15331