UNITED STATES
ENVIRONMENTAL PROTECTION
AGENCY

OFFICE OF NOISE
ABATEMENT & CONTROL
WASHINGTON, DC 20460

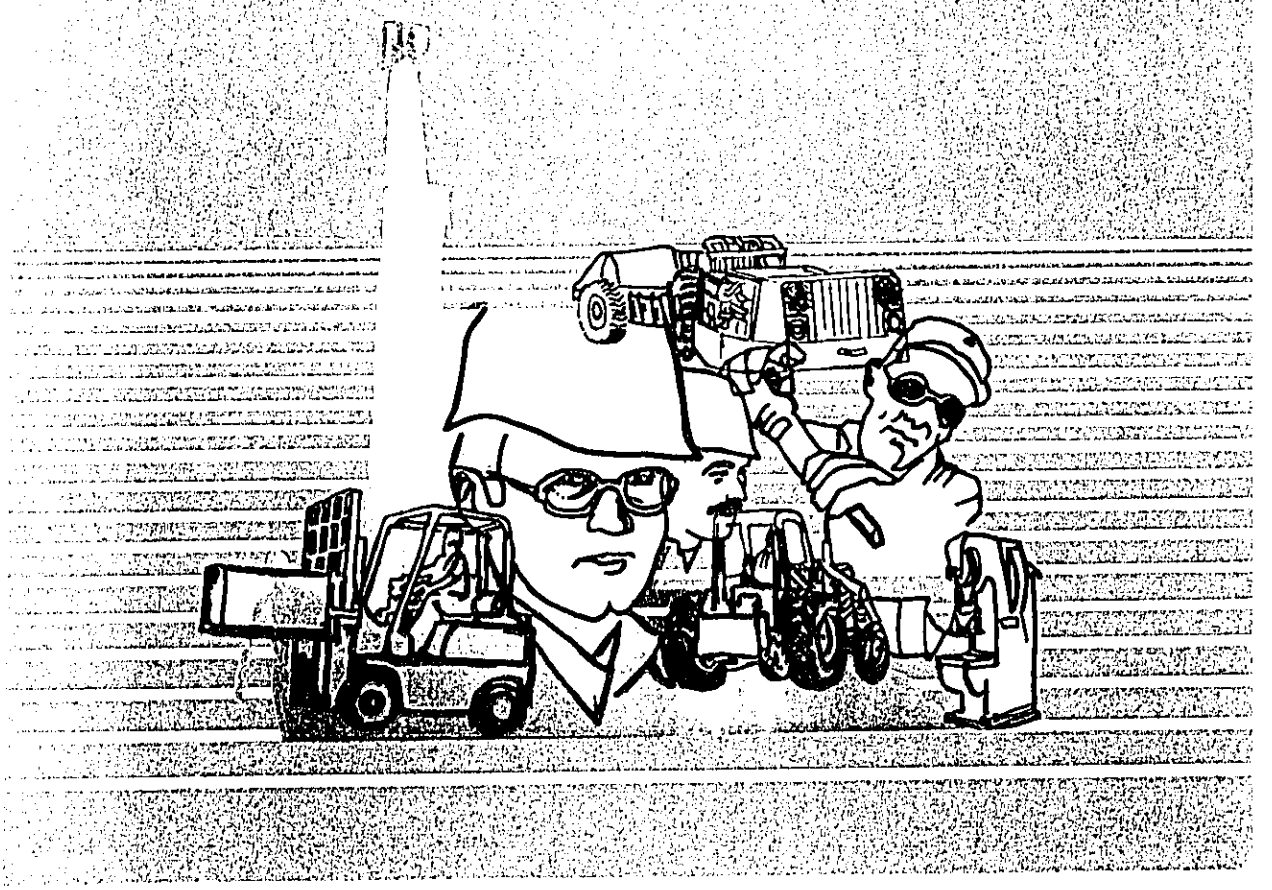
EPA 550/9-80-317
JULY 1980

Noise

EPA

FEDERAL AGENCY NOISE CONTROL TECHNOLOGY

Research, Development, and Demonstration Projects on Industrial Manufacturing, Mining and Construction Equipment During the Fiscal Year 1980



FEDERAL AGENCY NOISE CONTROL TECHNOLOGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROJECTS ON INDUSTRIAL MANUFACTURING, MINING AND CONSTRUCTION EQUIPMENT DURING THE FISCAL YEAR 1980

JULY 1980

OFFICE OF NOISE ABATEMENT AND CONTROL
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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ACKNOWLEDGMENT

This report was prepared by ORI, Inc. under EPA Contract No. 68-01-5040. Preparation of the report constituted one task under the contract. The task manager for the project was Dr. William Benson of ORI.

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I. PREFACE

This report has been compiled in response to the requirement* that the Administrator of EPA:

> coordinate the programs of all Federal agencies relating to noise research and noise control...[and] On the basis of regular consultation with appropriate Federal agencies ... shall compile and publish, from time to time, a report on the status and progress of Federal activities relating to noise research and noise control. This report shall describe the noise control programs of each Federal agency ....

In addition, the Quiet Communities Act of 1978 directs the Administrator to support, "... investigation, development, and demonstration of noise control technology for products subject to possible regulation...." by direct Federal action." This report has been undertaken in partial fulfillment of these two responsibilities.

The report continues the process of reporting Federal activity in the research, development, and demonstration of noise control technology. A similar previous report is Federal Research, Development and Demonstration Programs in Machinery and Construction Noise, by the Federal Interagency Machinery and Construction Noise Research Panel, published in 1978. In 1979, a symposium was held to determine what the technology needs of the private sector are, and the proceedings were published under the title Noise Technology Research Needs and the Relative Roles of the Federal Government and the Private Sector.**

*Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978.

**See Bibliography, Section on EPA

II. SCOPE

The scope of this report is limited to research, development, and demonstration of technology of industrial manufacturing, mining, and contruction equipment to control occupational and environmental noise, and the report consists of descriptions of projects of Federal agencies that fall within this scope. Only projects that were active, recently completed, or impending as of January 1980 and reported by the Federal agencies are described, and only publications that appeared in 1978, 1979, or 1980 are listed in the bibliography.

III. PURPOSE

There are a number of purposes for preparing this report on research in noise control technology. It will encourage communication as well as dissemination of research results among Federal agencies. It will provide information to support Federal regulatory agencies in their enforcement efforts. It will inform the private sector of Federal research activity and support dissemination of the results of Federal research to the private sector.

IV. SUMMARY

This compilation of Federally sponsored research projects in the areas of industrial machinery, mining, and construction equipment includes more than 35 projects by 12 Federal agencies. Twenty-seven of these projects are being performed by 16 contractors and subcontractors. Three contracts are to be awarded soon. Five projects involve interagency agreements and cost sharing, and four of the interagency agreements include EPA.

The total amount of money being spent on projects for which information is available is about $8.1 million.* The Bureau of Mines sponsors contracts totaling more than $3.6 million, which accounts for about half of the total being spent. The Department of Energy has two projects with more than $500 thousand devoted to them, and NIOSH sponsors three projects for a total of slightly less than $500 thousand. USDA, EPA, the Corps of Engineers, FHWA, NASA, TVA, and NSF account for the remaining expenditures, which range between $100 and $300 thousand for each agency. The total money being spent and the number of projects for each agency appear in Table 1. Figure 1 provides bar charts that permit comparisons to be quickly made among agencies.

These research projects cover a dozen industrial activities including basic natural resources (e.g. coal mining), intermediate industrial products (e.g. textiles), and final demand consumer products (e.g. furniture). The industries studied by these projects are shown in Table 2. The types of research involved may be classified into three categories:

- Performing noise assessments or developing guidelines
- Developing and/or demonstrating noise control for existing technology
- Developing and/or demonstrating innovative noise technology designs.

Seventeen of the projects involve performing noise assessments, fifteen involve developing controls for existing machines, and eleven involve developing innovative noise abatement techniques.

Table 3 identifies and categorizes each of the noise technology research projects described in the report. The industrial group that has surprisingly little work going despite its importance in the economy of the U.S. is manufacturing.** NIOSH, NSF, NASA, and EPA in its joint project with the Navy are

*This money represents neither appropriations for FY 1980 nor appropriations for any one year. It represents the total dollar value of projects in progress in FY 1980. The dollar value of a project may involve several years of appropriations or just one year of appropriations. A project underway in FY 1980 may in fact be supported by FY 1978 and FY 1979 funds. The following examples serve to illustrate this point. A joint EPA/TVA project is underway in FY 1980, yet EPA's contribution comes from FY 1978 and FY 1979 appropriations. A project of the Corps of Engineers involving shielding of structures from impulse noise is funded at $165,000 and covers a five-year period from 1978 to 1983.

**The term "manufacturing" is used here as it is defined in the Standard Industrial Classification Manual (See Table 2 for reference). The term "includes establishments engaged in the mechanical or chemical transformation of material or substances in new products," and it does not include agriculture, mining, construction, or utilities.

presently supporting projects dealing with manufacturing noise. The total program support for the projects in these areas is about $824 thousand. Only NASA, NIOSH, and NSF are currently supporting research projects in manufacturing noise control. The joint EPA and Navy projects, as well as the joint EPA and TVA project*, are not research projects but demonstrations of available technology.

The projects of the Department of Energy (DOE), the National Institute of Occupational Safety and Health (NIOSH), the National Science Foundation (NSF), and the National Aeronautics and Space Administration (NASA) might be considered occasional efforts. The DOE projects were undertaken to address noise problems that arose from particular energy projects. The NIOSH and NSF** projects were not necessarily sponsored because of need for noise research, but resulted from grants to university researchers based on the technical merits of the research proposals. Similarly, NASA's Technology Transfer Program has no resources set aside specifically for noise researchers.

The Bureau of Mines has a well-established noise control program that addresses noise emission problems of the mining and mineral processing industry. Programs involve coal, metal, and non-metal mining and include both surface and underground operations.

*Electric utility is classified by the Department of Commerce under the industrial code of transportation, communication, electric, gas, and sanitary services. It is not classified in manufacturing.

**It should be pointed out that two additional NSF projects have been included in the Appendix. The fact that NSF has begun to support research in fundamental mechanisms of noise generation and in kinematics of machinery could be considered a significant development.

TABLE 1

FEDERAL NOISE RESEARCH PROJECTS BY AGENCY

Agency	Number of Projects	Total Contract & Grant Funds for Projects ($\times 10^{-3}$) [1,2]
Agriculture		
Forest Service[3]	4	$ 50
Science and Education Adm.	2	in house
Army Corps of Engineers		
Construction Engineering Research Laboratory[3]	3	225
Energy		
Office of Health and Environmental Research	2	77
Solar Energy Research Institute	2	1036
Environmental Protection Agency		
Office of Noise Abatement and Control[3]	4	395
Health and Human Services		
National Institute of Occupational Safety and Health	3	460
Interior		
Bureau of Mines[3]	16	3618
Labor		
Mine Safety and Health Administration	1	in house
National Aeronautics and Space Administration		
Office of Space and Terrestrial Applications	1[4]	105
National Science Foundation	1	159
Navy		
Naval Sea Systems Command[3]	1	1650
Tennessee Valley Authority[5]	1	100

TABLE 1 (cont.)

Agency	Number of Projects	Total Contract & Grant Funds for Projects (x 10-3) 1,2
Transportation	1	225
Federal Highway Administration[2]		
Total		$8100

Notes:

1) This money represents neither appropriations for FY 1980 nor appropriations for any one year. It represents the total dollar value of projects in progress in FY 1980. The dollar value of a project may involve several years of appropriations or just one year of appropriations. A project underway in FY 1980 may in fact be supported by FY 1978 and 1979 funds. The following examples serve to illustrate this point. A joint EPA-TVA project is underway in FY 1980, yet EPA's contribution comes from FY 1978 and FY 1979 appropriations. A project of the Corps of Engineers involving shielding of structures from impulse noise is funded at $165,000 and covers a five-year period from 1978 to 1983.

2) Project funds identified do not reflect in-house funds for staff.

3) A group with a specific noise mission has been established, and, consequently, a sustained program of activity can be expected at this agency.

4) Only technology transfer programs have been included. The state of Georgia is also contributing an additional $110,000 directly and through the Georgia Institute of Technology.

5) TVA has an in-house noise group dealing with environmental and occupational noise. TVA does not support noise research projects as a rule.

FIGURE 1. MONEY ALLOCATED FOR CONTRACT OR GRANT AWARDS FOR RD&D IN NOISE CONTROL TECHNOLOGY.

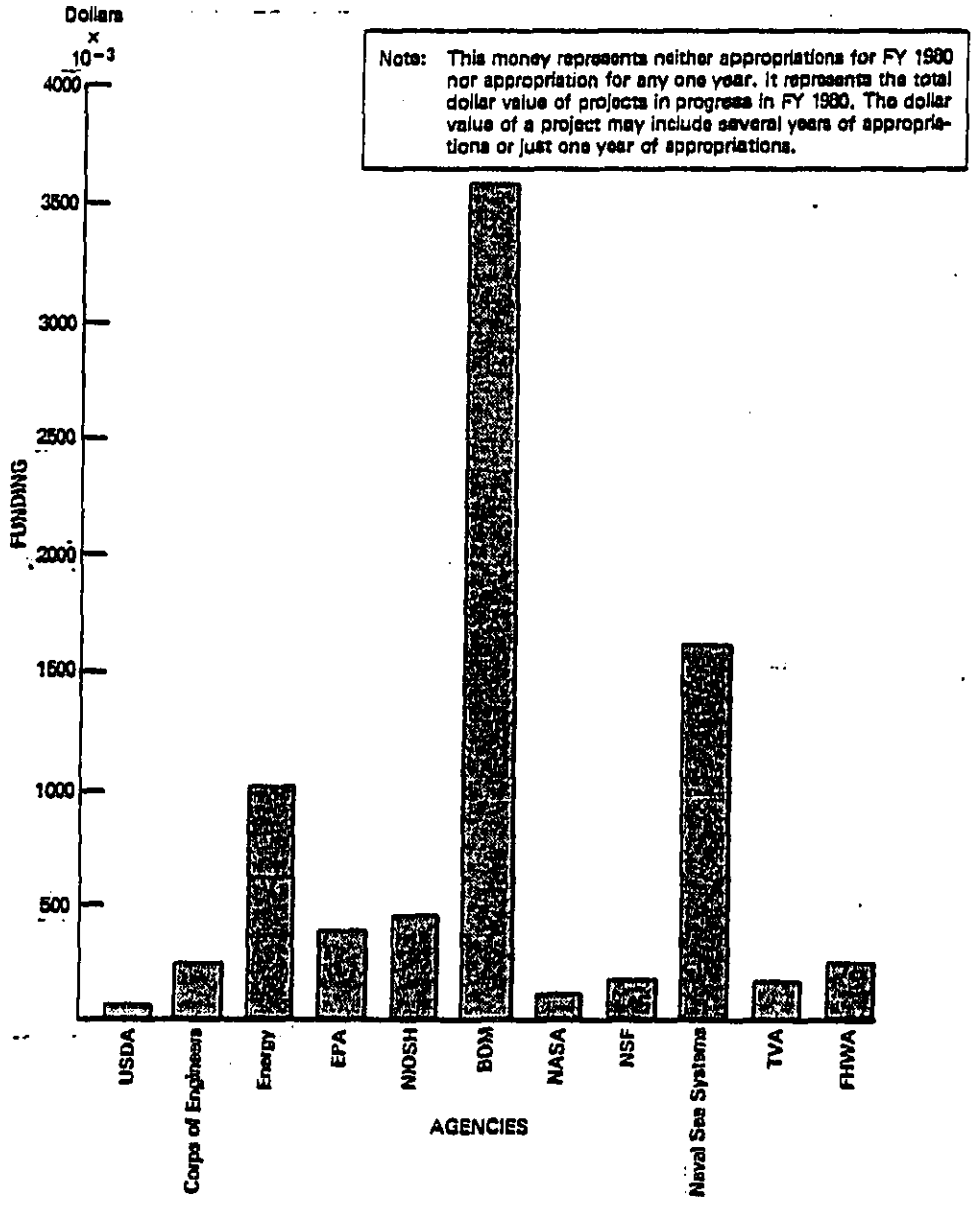
Dollars
×
10-3
4000
3500
3000
2500
2000
1500
1000
500
FUNDING
Note: This money represents neither appropriations for FY 1980 nor appropriation for any one year. It represents the total dollar value of projects in progress in FY 1980. The dollar value of a project may include several years of appropriations or just one year of appropriations.
USDA
Corps of Engineers
Energy
EPA
NIOSH
BOM
NASA
NSF
Naval Sea Systems
TVA
FHWA
AGENCIES

TABLE 2

INDUSTRIAL ACTIVITIES INVOLVED IN THE FEDERAL NOISE RESEARCH PROJECTS FY 1980

Standard Industrial Classification Code[1]	
08	forestry (Forest Service)
10	taconite processing
11-12	coal mining
12	coal preparation
14	quarying
15-17	construction
20	poultry
22	textile (cotton and other)
25	furniture
33	forging
37	shipyards
49	electric power-conventional and wind powered

[1] Standard Industrial Classification Manual. Office of Management and Budget, 1972.

TABLE 3

SUBJECT AREAS OF NOISE CONTROL TECHNOLOGY RESEARCH

Subject Areas[1]	Federal Agency	SIC Division or Major Group[2]	Page Number[3]
Mining and Mineral processing	BOM	B	5-32--5-60
Acoustical materials	USDA	7	5-6
	Corps of Engineers	C	5-9, 5-22
	Navy	44	5-12
	EPA	16	5-22
	BOM	B	5-34
	NIOSH	D	5-28
	NASA	20	5-64
Blasting	Corps of Engineers	15, 16	5-9, 5-10
Environmental impact	USDA	8	5-4
	Corps of Engineers	C	5-10, 5-22
	DOE	49	5-15--5-19
	EPA	16	5-22, 5-24
	NASA	49	5-16
	FHWA	16	5-24
Shipboard noise	Navy	44	5-12
Energy related	BOM	B	5-12--5-60
	DOE	49	5-15--5-19
	EPA	49	5-69
	NASA	49	5-16
	TVA	49	5-69
Metal fabrication	Navy	34, 37	5-21
	EPA	34, 37	5-21
	NSF	34	5-67
Agricultural	USDA	7,8	5-5, 5-6

TABLE 3 (cont.)

Subject Areas[1]	Federal Agency	SIC Division or Major Group[2]	Page Number[3]
Barriers	USDA	8	5-3
	Corps of Engineers	16	5-22
	Navy	34, 37	5-21
	EPA	16, 34, 37	5-21, 5-22, 5-24
	MSHA	8	5-62
	FHWA	16	5-24
Food processing	USDA	20	5-7
	NASA	20	5-64
Textile and furniture manufacturing	NIOSH	22, 25	5-29, 5-30

[1]These areas are not based on any standard classification system; rather, they are based on activities included in projects, and they are taken as indicating topics of current interest.

[2]A major group in the SIC is the familiar two-digit code. A division in the SIC can be denoted by a letter and comprises several major groups. For example, B, C, and D indicate mining (SIC 10-14), construction (SIC 15-17), and manufacturing (SIC 20-39), respectively.

[3]A project may appear in more than one subject area. For example, a project dealing with metal working machinery (5-21) is listed under both metal fabrication and barriers because it is concerned with both, and it is listed with the Navy and EPA because it is a joint project.

V. PROJECT DESCRIPTIONS

The project descriptions contained in this section were compiled from reports submitted by Federal agencies at the request of the Deputy Assistant Administrator of the Office of Noise Abatement and Control of EPA. The intent was to achieve as far as possible a uniform format presenting information relevant to the projects. It should be understood, however, that, with wide diversity in methods of operation and mission among agencies, achieving a completely uniform format would be virtually impossible. The project descriptions for each agency are preceded by a brief introduction describing how the projects fit in with the mission of the agency. Since the projects described in the report are based only on responses to requests for information, it was inevitable that some projects would not be reported. However, it is very likely that only a small percentage of the total population of projects has escaped inclusion in this report.

DEPARTMENT OF AGRICULTURE (USDA)

Research in noise control technology is conducted by two branches of USDA, the Forest Service and the Science and Education Administration (SEA). The Forest Service has two responsibilities that require a commitment to research in noise control: management of the national forest system and technical assistance to state and privately managed forests. In managing the national forest system, the Forest Service must ensure that multiple uses of the national forests do not conflict, for one use of the forest must be controlled to the extent that it interferes with other uses. Since noise is an environmental factor important to forest management, the Forest Service undertakes work to fulfill this function. In-house studies are currently being performed at the Equipment Laboratory of Forestry Research in San Dimas, California.

The Science and Education Administration (SEA) has the responsibility for providing research services and technical assistance to the entire agricultural community. Thus, SEA must be able to assist the agricultural community in controlling environmental noise and in controlling the impact of noise on the employees engaged in agricultural production. The science portion of SEA is concerned with developing noise control techniques for the processes of agricultural production, and the education portion of SEA is concerned with disseminating the information to the agricultural community. In-house studies are currently being performed at USDA Research Laboratories of the Agricultural Research Service in Lubbock, Texas and Stoneville, Mississippi.

PROJECT DESCRIPTION

TITLE:	Methods to improve the acoustical quality of urban environments by use of forest vegetation.
OBJECTIVES:	To determine ways in which forest vegetation influences sound attenuation through basic research on the relationship between components of urban trees-canopy, tree bole, and forest floor--and sound attenuation. Models will then be developed to determine total attenuation potential. Research will also include effects of topography, atmospheric conditions, and urban structures on noise attenuation properties of urban forests.
ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:	A number of basic studies have been completed on the way in which components of urban forest stands influence sound attenuation. The general conclusion is that trees can be effective in reducing noise if they are planted in sufficiently wide strips. Space in urban areas often reduces the potential to use trees to reduce noise. However, when uses in conjunction with topography and physical structures in urban environments, trees can contribute significantly to noise control.
SCHEDULE:	Starting date--March 1976; completion--March 1981.
FUNDING:	USDA Forest Service: $50,000/year.
PROJECT OFFICER(s)	Howard Halverson, Project Leader, USDA/FS (814-723-1935). Gordon Hiesler, Project Scientist (814-723-1935).
SPONSOR(S):	USDA Forest Service; Consortium for Environmental Forestry Studies; Penn State University; and SUNY College of Environmental Science and Forestry.
TYPE OF AGREEMENT:	Continuing Research Program and Cooperative Agreements between Forest Service and Universities.
INVESTIGATOR:	See Project Officers.

PROJECT DESCRIPTION

TITLE: Noise Pollution Prediction Method

OBJECTIVES: Develop a method which will allow Forest managers and planners to predict the environmental impact of intrusive noises common within National Forests. Identify and demonstrate land management and noise abatement techniques to facilitate compatiblity among various activities on public lands.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980: A noise pollution prediction method has been developed, refined and field tested. Reports are in preparation. The method has been presented at several professional society seminars. It is being used by many planning organizations. A field demonstration of the method is scheduled for May 27, 1980, near Fredericksburg, VA for public and Government agencies.

FUNDING: In-house

SPONSOR: Forestry Research, Equipment Laboratory, San Dimas, CA.

PROJECT DESCRIPTION

TITLE: Impact of off-the road vehicles (ORV)

OBJECTIVES: Evaluate noise generated user conflict. Develop a logical ORV classification system. Monitor research on damage from ORVs. Advise on noise enforcement, etc.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980: Completed in-depth studies of off-road vehicle noise, its measurement and mitigation, and its impact on National Forest users. Prepared a model ORV plan noise element and guidelines for ORV noise management. Prepared an inspection standard for off-road motorcycles.

FUNDING: In-house

SPONSOR: Forestry Research, Equipment Laboratory, San Dimas, CA.

PROJECT DESCRIPTION

TITLE:	Noise Reduction of Forest Service Equipment
OBJECTIVES:	Identify sources of hazardous noise and apply engineering noise reduction methods.
ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:	Identified several pieces of Forest Service equipment that exceed OSHA noise standards. Developed a silencing package for fire camp generators. Evaluated forest roads and trails maintenance equipment. Currently preparing information on silencing road construction.
FUNDING:	In-house
SPONSOR:	Forestry Research, Equipment Laboratory, San Dimas, CA.

PROJECT DESCRIPTION

TITLE: Noise Reduction in Cotton Gins

OBJECTIVES: To determine methods of reducing noise in cotton gins.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:

Noise control - Lubbock, TX. Treatment of a small-scale ginning system with acoustical wall and ceiling insulation and special long-brustle doffing brushes reduced noise levels inside the gin work area by approximately 6 dBA. A decible reduction of this magnitude represents a highly significant 50 percent reduction in sound pressure level and a 75 percent reduction in indicated sound power level. These results document the potential for reducing worker exposure to cotton gin noise by engineering control methods.

Reduction of seed cotton conveyance noise - Stoneville, MS. The acoustical technology necessary to eliminate the noise produced by the pneumatic conveyance of seed cotton was developed. The most effective acoustical treatment, an elbow internally lined with vulcanized rubber and externally lined with fiberglass and lead, reduced the noise level about 38 dBA. Other treatments that provided smaller reductions were developed. Field application of this technology will significantly lower the noise levels near gin employees.

Reduction of fan noise - Stoneville, MS. Methods to reduce the noise produced by low-pressure fans in gins were developed. Acoustical mufflers and insulation reduced the noise levels to 10 dBA (67%), whereas an airfoil-type centrifugal fan produced 16 dBA (84%) less noise than did a conventional vane-axial fan. In addition, the airfoil-type fan used about 20% less electrical energy. This improvement lowers the noise level near the gin employees.

FUNDING: In-House.

SPONSORS: Agricultural Research Service, USDA Research Laboratories in Lubbock, TX and Stoneville, MS.

PROJECT DESCRIPTION

TITLE:	Noise Reduction in Poultry Processing Plants
OBJECTIVES:	To determine methods of reducing noise in poultry processing.
ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:	Project completed. Published report on reduction of noise from steam injection (see bibliography).
FUNDING:	In-House.
SPONSOR:	Agricultural Research Service, USDA Research Laboratory, Athens, GA.

DEPARTMENT OF DEFENSE

Department Of The Army
Corps of Engineers

The Corps of Engineers of the U.S. Army is responsible for the construction of Army bases and Air Force bases involving the design of buildings on Army and Air Force bases, operation of Army bases, and master planning for Army bases. The Army civil works program is separate and distinct from its military-related operations and receives its own congressional appropriations distinct from the annual defense budget. The Army civil works program involves such activities as the dredging of the nations harbors and rivers, construction of hydro-electric dams for electric energy and flood control, flood control, and congressionally delegated responsibility, over all construction involving the nation's waterways.

The Construction Engineering Research Laboratory (CERL) as a laboratory of the Corps of Engineers conducts research on many different aspects of noise, providing support to the Army for both the military operations as well as the civil public works projects. CERL is the only activity within the Army engaged in environmental noise research relating to the subject matter of this report. Its noise efforts involve many different aspects. Development of master plans entails planning for environmental noise, which includes environmental assessment, land use planning in the vicinity of Army Bases, and predicting and mitigating noise impact. CERL research supports this effort. Particular emphasis is given to predicting and mitigating impact from sources unique to the Army, artillery, small arms, helicopters, ground-to-ground rockets, and, to some extent, tracked vehicles. These unique sources are also given particular consideration in research on acoustical design of buildings for mitigation of noise from these sources. Noise generated by construction activity is not a problem unique to the Army, but, since such a large part of the Corp's activity involves construction, control of noise generated by construction is also a part of research program of CERL.

There are other noise research activities underway within the Army, but these are areas other than machinery and construction. There are also noise control efforts underway within the Army such as the environmental impact assessment and noise control activities of the Army Environmental Hygiene Agency of the Army's Health Services Command, but these efforts are not classified as research.

PROJECT DESCRIPTION

TITLE:	Mitigation of Blast Noise with Aqueous Foam
OBJECTIVE:	To investigate the reduction of blast noise when the explosives are covered with a layer of aqueous foam.
ACCOMPLISH-MENTS and STATUS AS OF JANUARY 1980:	The use of high expansion foam (250:1) has been investigated for bare charges and scaling laws developed. Reductions of 14 dB on a one-pound charge and 9 dB with a five-pound charge were achieved. Lower expansion foam (30:1) and buried charges will be investigated.
SCHEDULE:	Starting date was March 1979; completion date September 1980.
FUNDING:	U.S. Army Corps of Engineers: $60,000
PROJECT ENGINEER:	Dr. R. Raspet, Principal Investigator 217-352-6511
SPONSOR:	U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, P.O. Box 4005, Champaign, IL 61820.

PROJECT DESCRIPTION

TITLE: Shielding of Structures from Impulse Noise

OBJECTIVES: To develop methods to reduce vibrations and otherwise shield structure occupants from secondary effects of impulse noise. Survey data indicate that structure vibrations and secondary noises are the primary factors contributing to the adverse response to impulse noise. Simple means to mitigate this impact will reduce complaints and adverse public reactions.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980: The test structure has been constructed and instrumented. The noise source to produce the systematic impulse waveforms is the CERL biaxial shock test facility. A set of impulse waveforms has been developed. Baseline data have been taken and are currently analyzed. Of particular interest are the vibration spectra of various structural members.

SCHEDULE: Starting date was October 1978; completion expected in October 1983.

FUNDING: U.S. Army Corps of Engineers: $165,000.

PROJECT OFFICERS: Dr. P. D. Schomer, Principal Investigator, 217-352-6511;
Dr. S. D. Hottman, Associate Investigator, 217-352-6511.

SPONSOR: U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, Post Office Box 4005, Champaign, IL 61820.

PROJECT DESCRIPTION

TITLE: EPA/CERL Construction Site Noise Control Program

OBJECTIVES: See section on Environmental Protection Agency for a description of this project.

DEPARTMENT OF DEFENSE

Department Of The Navy

The function of Department Of The Navy is the research, development, design, acquisition, and life cycle support of ships and their installed equipment. Noise is an important aspect of ship design and operation in two aspects. The radius of detectibility by sound detection devices must be minimized, and shipboard personnel are continuously exposed to noise. The Navy thus has a continuing need to make ship operations quieter and to evaluate effects of noise exposure on shipboard personnel. The Naval Ocean Systems Center and the David W. Taylor Naval Ship Research and Development Center have performed extensive research for the Navy.

PROJECT DESCRIPTION

TITLE: Quieting of Shipboard Machinery

OBJECTIVES: The development of techniques for reducing the noise generated by shipboard machinery at its source and for interruption of its transmission path. Determine acceptable noise levels at various locations within the ships and at shore facilities.

ACCOMPLISHMENTS and STATUS AS OF JANURARY 1980: Procedures and measurement equipment are being developed and evaluated to determine acceptable levels of environmental noise on board ship and at shore facilities that minimize a) susceptibility to hearing damage, b) interference with sleep and comfort, and c) interference with effective speech communication. A new standard for measurement procedures and criteria for shipboard equipment is being prepared and will be issued late summer of 1980.

Effort is in progress to correlate shipboard noise levels exposure with effects on personnel performance (sleep, communication, hearing damage, and comfort). This information has been statistically analyzed and trends developed to predict the response of personnel to noise. A report has been published.

An investigation is underway to determine whether hearing protectors used on Navy ships interfere with the ability of engineering personnel to aurally detect machinery malfunctions. Experiments are in progress to measure the effect of hearing protectors on the ability of personnel to detect, identify, and locate source of machinery noise. Laboratory evaluations are underway using tape recorded sounds from various shipboard locations. A progress report on the laboratory evaluations will be issued by September 1980.

A study has been initiated to determine whether limits need to be placed on the infrasound levels of machinery.

An efficient and practical shipboard backfit system for reducing the active sonar generated airborne noise levels transmitted through the hull into shipboard spaces is being developed. An improved transmission loss material has been developed.

Methods for quieting ship ventilation systems that can be fitted into available shipboard space are being investigated. The use of honeycomb material on the tail cone of the fan rotor has been demonstrated as effective in reducing both tonals and broadband noise.

Quieting of high pressure air compressors is being developed. New quiet design reed values have been developed, and mufflers are being evaluated.

A less expensive and lighter weight airborne noise control treatment than previously installed on ships has been developed. The treatment of shipboard bulkheads and overhead structures utilizes a specially developed flexible laminate of glass cloth and MYLAR film (TUFFSKIN) over fibrous glass acoustic installation provides the same acoustical absorption as the old system. A $90,000 saving per ship with a weight reduction of 3 tons has been achieved on new construction frigates.

SCHEDULE: The U.S. Navy Airborne Noise Quieting R&D Program is a long-term program with numerous specific tasks as described above.

FUNDING: It is difficult to separate the funding directly related to airborne noise from that used for reduction of other types of noise which affect the ships military characterisitcs. The approximate U.S. Navy funding related to airborne noise is $1,600,000 per year.

PROJECT OFFICER: S. M. Blazek, Naval Sea Systems Command (SEA 05HB) 202-697-2464

TYPE OF AGREEMENTS: Task assignments to various U.S. Navy laboratories and contracts.

INVESTIGATORS: Naval Ocean Systems Center, San Diego, California; David W. Taylor Naval Ship Research and Development Center; various contractors

PROJECT DESCRIPTION

TITLE: Federal Shipyard Sheet Metal Shop Noise Control Demonstration

OBJECTIVES: See section on Environmental Protection Agency for a description of this project.

DEPARTMENT OF ENERGY (DOE)

DOE has no organizational unit that is exclusively devoted to the study of the technology of noise control. Rather, DOE initiates studies in noise control when it appears that an energy project may have an adverse environmental impact. It was in this fashion that the Wind Division of the Office of Conservation and Solar Applications became involved in noise studies. Since environmental impact analysis indicated a possibility that wind energy conversion systems may constitute a noise problem, studies were initiated to assess the extent of the noise effects and develop design changes or changes in operational procedures to alleviate them. The Environmental Control Technology Division of the Office of Environmental Compliance and Overview does environmental control engineering in response to control technology needs for all recognized pollutants. There is no group in this division specifically devoted to noise control technology, but noise control studies will be initiated when a need is identified for a particular project.

PROJECT DESCRIPTION

TITLE: Small Wind Energy Conversion Systems Noise Assessment

OBJECTIVES: The objectives of this effort are to: 1) measure in a controlled and systematic manner the noise generated by commercially available and prototype small wind energy conversion systems (SWECS) being tested at Rocky Flats Small Wind Systems Test Center, 2) make a limited effort to locate the source of noise from each machine, and 3) compare the noise generated with the existing range of federal and community standards.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:

Make noise measurements (in an area free of SWECS noise) as a function of wind speed with and without an acoustically "soft" wind shield in front of the microphone.

Generate a noise level map around representative turbines in light, "rated," and high winds.

Interpret the signficance of the measurements to noise nuisance potential.

Survey EPA regulations, codes, and acoustics literature to allow a comparison of noise data with acceptable noise levels in community situations.

Noise measurements have been made around three small wind energy conversion systems.

SCHEDULE: Starting date was October 1978. Work will be multi-year project.

FUNDING: DOE/WESD: Not identified separately

SPONSOR: Conservation and Solar Applications, Department of Energy

PROJECT OFFICER(S): George Tennyson, DOE/WESD, 505-844-4659

TYPE OF AGREEMENT: In-house

INVESTIGATOR: DOE/Rocky Flats: Margaret Hickey, 303-441-1353
Craig Hansen, 303-497-4946

PROJECT DESCRIPTION

TITLE: Noise Evaluation at Wind Turbine Generator Sites

OBJECTIVES: To measure and document the noise generated by wind energy conversion systems (WECS) at selected wind system sites, and to relate the measurements, their analysis, and appropriate noise tolerances into a handbook to aid in future design and siting of WECS.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980: A few measurements of noise at the MOD-0 WECS site at Plum Brook, Ohio, were made by Battelle Columbus Laboratories in 1977. Additional noise measurements were taken by the NASA Lewis Wind Energy Project Office. These measurements provided preliminary information relating the sound level and spectra to the WECS operating power.

Measurement and analysis of sound pressure levels from several locations around the MOD-1 WTG site at Boone, North Carolina, was started in October 1979, shortly after test operations of the WECS began. It was found that the WECS radiation extends from infrasound through the audible range of the spectrum.

A small technical services contract has been initiated with Pennsylvania State University for computer modeling of sound propagation at the MOD-1 WECS site. Purchasing has been initiated for specialized acoustic equipment required for field measurements. Plans are being formulated to develop a measurement, analysis, and verification program which will provide design criteria for wind turbine generators.

SCHEDULE: Starting date was October 1979. Estimated completion date for field noise measurements is January 1981. Preparation of noise handbook will continue into FY 82.

FUNDING:

DOE/WESD:	FY 79	$150,000
	FY 80	186,000
	FY 81	700,000
Total		$1,036,000

PROJECT OFFICER(s): Neil Kelley, DOE/SERI, 303-231-1013
James P. Couch, NASA LeRC, 216-433-4000, x6152

SPONSORS: Conservation and Solar Applications, Department of Energy

TYPE OF AGREEMENT: Subcontract

INVESTIGATOR: Pennsylvania State University
Prof. Dennis Thomson, 814-863-1585

Others to be determined.

PROJECT DESCRIPTION

TITLE:	Assessment of the Need for Noise Control Research on Electric Power Transformers and Reactors
OBJECTIVES:	To identify and quantify needs for noise control research on power transformers and reactors used by electric utilities. Needs are defined with respect to compliance with state noise regulations.
ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980:	A national assessment of the noise impact of utility substations with growth projections for the next 20 years and cost estimates for noise control technology has been completed. A final draft report is currently under review (See bibliography).
SCHEDULE:	Will be completed 1 July 1980.
FUNDING:	$67,000
PROJECT OFFICER(S):	Douglas Boehm, Environmental Control Technology Division, DOE
SPONSOR:	Environmental Control Technology Division, DOE
TYPE OF AGREEMENT:	Contract
INVESTIGATOR:	David N. Keast Bolt, Beranek, and Newman, Inc. 50 Moulton Street Cambridge, MA 02238 617-491-1850

PROJECT DESCRIPTION

TITLE:	Audible Noise of Constant-Speed, Horizontal-Axis Wind-Turbine Generators: A Preliminary Analysis
OBJECTIVES:	To assess possible noise impact of wind-turbine generators currently under development by DOE.
ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980:	Theoretical calculations have been performed as a preliminary prediction of noise generation of wind-turbine generators currently under evaluation and planned by DOE. A final draft report is currently under review (See bibliography).
SCHEDULE:	Will be completed 1 July 1980.
FUNDING:	$10,000
PROJECT OFFICER(S):	Douglas Boehm, Environmental Control Technology Division, DOE
SPONSORS:	Environmental Control Technology Division, DOE
TYPE OF AGREEMENT:	Contract
INVESTIGATOR:	David N. Keast Bolt, Beranek, and Newman, Inc. 50 Moulton Street Cambridge, MA 02238 617-491-1850

ENVIRONMENTAL PROTECTION AGENCY (EPA)

A goal of the Division of Technology and Federal Programs of the Office of Noise Abatement and Control (ONAC) is to encourage Federal agencies to undertake initiatives in the control of occupational and environmental noise. For this reason, ONAC's projects in noise control technology are not undertaken alone. Rather, interagency agreements are used to foster cooperation and communication among agencies. The projects described here deal with construction noise and industrial noise.

PROJECT DESCRIPTION

TITLE: Federal Shipyard Sheet Metal Shop Noise Control Demonstration

OBJECTIVES: To identify employee overexposure to noise within a naval shipyard and sheet metal shop, develop a plan of abatement to reduce the overexposures, demonstrate the availability and effectiveness of abatement measures, and disseminate the program's approach and results among the Federal and private sectors. Employee overexposure, noise levels, noise sources, and abatement measures are to be determined.

ACCOMPLISHMENT and STATUS AS OF JANUARY 1980: A sheet metal shop at the Navy's Charleston shipyard was selected as the site for study and evaluation. A study identifying employees' noise exposures, noise sources contributing to overexposure, and approaches to abatement was completed. The study's report has been circulated for review and comment among the Navy's eight shipyards. The following equipment was found to be causing employee overexposure at Charleston: bandsaw, friction saw, grinder, router, shear, nibbler, and sander. From the noise survey, it was found that employee work patterns, over-exposures, and machine use rates varied highly. This particular list of equipment therefore applies only to those conditions existing at the Charleston shipyard. Charleston has already implemented some abatement measures: grinding areas were enclosed; partitions were installed; several pieces of high noise equipment were replaced. Charleston is now in the process of implementing further recommended abatement measures.

SCHEDULE: Evaluation and study phase completed. Demonstration phase in progress. Project to be completed by December 1980.

FUNDING: EPA: $100,000; Navy: In-house funds.

PROJECT OFFICER(S): Roger Heymann, EPA/ONAC 703-557-2126
Richard Patterson, Navy 703-692-8604

SPONSOR(S): Office of Noise Abatement and Control (EPA), and NAVSEA, Department of the Navy

TYPE OF AGREEMENT: Contract

INVESTIGATOR:

Bolt Beranek and Newman
Cambridge, MA 02238
Paul Janson 617-491-1850

Naval Sea Systems Command
Department of Navy (073)
Washington, D.C. 20367
Richard Patterson

PROJECT DESCRIPTION

TITLE: EPA/CERL Construction Site Noise Control Program

OBJECTIVES: To study and demonstrate available retrofit technology and administrative controls mitigating noise from general construction equipment. Noise control for a piledriver was selected for this study. Specific objectives include administrative measures such as utilizing bid documents to require the construction contractor to design and implement state-of-the-art noise control measures, and to document the cost and degree of noise reduction which can be accomplished.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: Noise control options were demonstrated at a construction site for driving piles. These options consisted of designing and fabricating a piledriver enclosure, installing an OEM muffler, applying a damping material to the piles, using soft impact cushions, and substituting a quieter vibratory piledriver for the standard unit. Noise reductions of approximately 10 dB when measuring L_{eq} were realized for the standard unit when silenced. The vibratory piledriver was an additional 2 dB quieter than the silenced unit.

This program, in addition to demonstrating noise control techniques, showed:

1. That the bid document can be a means for requiring noise control measures to be utilized,
2. That a contractor can prepare noise abatement measures without extensive instruction or use of a consultant,
3. That a construction contractor is capable of providing a realistic estimate of costs for noise control,
4. That a contractor with little expertise in noise control is capable of designing and fabricating an equipment noise enclosure. Though the test period for this demonstration program was too short to determine the production times for driving piles using the different configurations, rough estimates of the costs to implement the various noise control measures were obtained.

The final report is being written and is in draft form.

SCHEDULE:	Starting date was June 1977. Will be completed in June 1980.
FUNDING:	EPA: $95,000; CERL*: $35,000 plus in-house
PROJECT OFFICER(S):	Thomas L. Quindry, EPA/ONAC 703-557-2126 Paul Schomer, USA-CERL-ENA, 217-352-6511
SPONSOR(S)	EPA, Office of Noise Abatement and Control and U.S. Army Corps of Engineers, Construction Engineering Research Laboratory
TYPE OF AGREEMENT:	Contract

INVESTIGATOR:	USA-CERL-ENA Champaign, Illinois	Dames & Moore Cranford, N.J.
	Paul Schomer 217-352-6511	Fred Kessler 201-272-8300

*Previous work by CERL investigating the cost-effectiveness of noise abatement measures amounted to $135,000.

PROJECT DESCRIPTION

TITLE: Analysis and Abatement of Highway Construction Noise

OBJECTIVES: To investigate the noise associated with highway construction, to demonstrate the effectiveness and viability of implementing specific noise mitigation measures, and to develop an analytic model that will be used to access potential noise impact and to plan abatement measures. The model is to be developed for use by state and local governments and the private sector.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980: A variety of available noise control options for use in highway construction were demonstrated on-site and results of the demonstration are now being analyzed. A first approximation of the prediction model has been completed. Further development of the model as well as validation of completed elements are now underway.

An extensive compilation of information was gathered regarding construction noise abatement treatments. Information was gathered by literature review, discussions with construction equipment manufacturers, and inspection of new equipment.

Working papers have been developed that identify typical types of highways and define highway and bridge construction phases. These are very important for the development of the noise prediction model.

The noise prediction model, in its final user form, will have the following capabilities: 1) reliable prediction for fenceline and community noise levels by personnel with minimal acoustical training, 2) noise prediction techniques for use during project planning and bidding phases, 3) evaluation of noise abatement alternatives involving equipment selection and usage, 4) evaluation of noise abatement alternatives involving scheduling and existing of activities, and 5) propagation characteristics prediction over varied terrain including barriers and vegetation. Detailed source emission levels and time and motion (duty cycle) data for individual pieces of equipment will be included in the bank of data for the model. Algorithms have been developed for point, line, and area noise sources, and geometrical formats of sources have been developed.

Numerous site boundry and activity noise measurements have been made at four different construction sites throughout the country. Time and motion studies were also performed. The activity noise measurements and the time and motion studies will

be used as a data base to be included in the noise level prediction model. The site boundry measurements will be used for verification of the model. During verification of the model, care will be taken to assure that the activity noise data base will not have been measured simultaneously with the site boundry measurements being used in the verification procedures.

A demonstration and evaluation of the effectiveness of earth berms as a construction noise abatement technique was made. Simultaneous measurements were made of scraper passbys with microphones situated on both the construction and residential sides of an earth berm. Similar measurements were made during a concrete paving operation. Computations which include noise propagation effects will be made to determine berm effectiveness.

A demonstration of equipment substitution was performed. A portable concrete breaker with an exhaust muffler was substituted for a standard unmuffled breaker, and a portable air-compressor meeting the EPA noise emission standard was substituted for an older compressor not subject to the standard. An 11 dB reduction was obtained for the quieted breaker and a 19 dB reduction was obtained for the quieted compressor.

A demonstration of the effectiveness of installing replacement mufflers and providing enclosures for stationary equipment was performed. Noise reductions of 2-4 dB were obtained by replacing existing mufflers. Noise levels around a well point pump were reduced by approximately 7 dB.

All testing, field measurements, and data analysis have been completed. Dating is being coded for implementation into the noise prediction model.

Final program output will consist of a working, validated, noise prediction model in computerized form, and it will consist of a report documenting the program including key findings, conclusive results of the noise abatement demonstrations.

SCHEDULE: Starting date was July 1978. Will be completed in October 1980.

FUNDING: EPA: $100,000 FHWA: $225,000

PROJECT OFFICER(S): Thomas L. Quindry, EPA/PNAC 703-557-2126
Fred Romano, DOT/FHWA 202-426-4980

SPONSOR(S) EPA, Office of Noise Abatement and Control and DOT Federal Highway Administration

TYPE OF AGREEMENT: Contract

INVESTIGATOR:

Wyle Research
El Segundo, California

William Fuller
213-322-1763

PROJECT DESCRIPTION

TITLE: Occupational Noise Control (Electrical Generating Plant)

OBJECTIVES: See section on Tennessee Valley Authority for a description of this project.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

National Institute of Occupational Safety and Health (NIOSH)

NIOSH conducts research and demonstration related to the safety and healthfulness of working conditions through its system of grants. NIOSH seeks "innovative methods, techniques, and approaches for dealing with occupational safety and health." An important feature of the manner in which the grants are administered is that there is no allocation of funds to the various disciplines within the area of occupational safety and health. Consequently, a proposal competes with all other proposals on the basis of scientific merit alone when it is reviewed by the Safety and Occupational Health Study Section. However, NIOSH does place particular emphasis on the area of control technology among others, such as, cause and prevention of occupational disease and safety. In general, grants are open to competition from universities and other non-profit organizations. After a grant application has been approved for funding, the project is monitored by the Physical Agents Control Section of the Control Technology Research Branch of the Robert A. Taft Laboratories. Contract work is only done to disseminate information on noise control technology.

PROJECT DESCRIPTION

TITLE:	Revised Compendium of Materials for Noise Control (RCMNC)
OBJECTIVES:	To provide a listing of currently available noise control materials to those who design noise control systems. It is also to be used in concept with revised Industrial Noise Control Manual (see Bibliography).
ACCOMPLISHMENTS and STATUS AS OF MARCH 1980:	Revised Compendium has been completed. The RCMNC catalogs the commercial noise reduction materials and systems for plant engineers, industrial hygienists, acoustical consultants and others engaged in noise control. It can be used to determine the availability of noise control products, their characteristics and specifications, and their supply sources. Also includes is a technical discussion of operating principles, uses, and limitations of the products listed.
SCHEDULE:	Starting date was October 1978. Will be completed in July 1980.
FUNDING:	NIOSH: $80,000.
PROJECT OFFICER:	William N. McKinnery, Jr., NIOSH, 513 684-4442
SPONSOR:	NIOSH
TYPE OF AGREEMENT:	Contract
INVESTIGATOR:	IIT Research Institute, Robert A. Hedeen, 312 567-4800.

PROJECT DESCRIPTION

TITLE:	Textile Industry Noise Technology Research Program
OBJECTIVES:	To expand the body of technical information available to the textile industry for use in determining and achieving feasible reductions of employee exposure to occupational noise.
ACCOMPLISH-MENTS and STATUS AS OF MARCH 1980:	This study is a continuation of work begun under a previous 5-year grant that expired in September 1979. The previous work emphasized development of technology that could be applied with relatively short delays. The present work will place greater emphasis on long-term solution by control of noise at its source. Work in the following areas: (a) intensive study of the weaving with the shuttleless loom, (b) weaving with the fly-shuttle loom, (c) ring spinning, (d) winding/coneing/ spooling, and twisting, (e) texturing, and (f) developing guidelines for determining economic feasibility.
SCHEDULE:	Starting date was December 1978. Will be completed in December 1982.
FUNDING:	NIOSH: $220,000
PROJECT MONITOR:	William H. McKinnery, Jr., NIOSH, 513-684-4442.
SPONSOR:	NIOSH
TYPE OF AGREEMENT:	Grant
INVESTIGATOR:	Paul D. Emerson, School of Textiles, North Carolina State University, Raleigh, North Carolina 27650, 919-737-3231.

PROJECT DESCRIPTION

TITLE:	Control Technology Demonstration - Furniture Industry.
OBJECTIVES:	To explore alternative control strategies and develop an overall noise control plan based on the best available technology. The final report will provide demonstration of the technology and procedures employed, the reduction in hazarous exposure achieved, and a detailed cost impact accounting.
ACCOMPLISH-MENTS and STATUS AS OF MARCH 1980:	Manufacturing facility has been selected for this demonstration project. In-plant measurements have been made to determine the contribution to the total noise environment made by each machine and the extent of the exposure at each work station. Detailed information has been collected on the tooling and operational characteristics of each machine.
SCHEDULE:	Starting date was June 1979. Will be completed in June 1981.
FUNDING:	NIOSH: $160,000.
PROJECT MONITOR:	William N. McKinnery, Jr., NIOSH, 513-684-4442.
SPONSOR:	NIOSH
TYPE OF AGREEMENT:	Grant
INVESTIGATOR:	Franklin D. Hart, Center for Acoustical Studies, North Carolina State University, Raleigh, North Carolina, 919-737-2373.

DEPARTMENT OF THE INTERIOR

The Bureau of Mines

The Bureau of Mines (BOM) conducts research to control noise emissions from equipment and mining techniques used in coal, metal, and non-metal mining operations and in mineral processing. The areas included in the scope of the BOM program are:

- Underground mining equipment
- Surface mining equipment
- Surface processing operations
- Measurement of worker noise exposure
- Technology transfer to private industry

All research projects are carried out by private contractors.

Research is directed primarily at reducing noise at its source. Though a most desirable approach to the problem of excessive noise in mining operations is through development and use of quieter equipment, accomplishing this in a reasonable length of time would require very high funding levels and would ignore the problem of noise from existing equipment. Thus short term research efforts are primarily concentrated on identifying existing problems and developing retrofit techniques to control the noise. The cooperation of both manufacturers and coal companies is usually sought because of the high cost and limited availability of mining machinery. The noise controls developed must be cost effective, readily implemented on a retrofit basis, and cause no interference with normal operations of the machine. Current technology development efforts are principally directed at retrofit measures.

A discussion of the program of BOM would be incomplete without discussing its relationship to the Mining Safety and Health Administration (MSHA). A Noise Research Review Committee receives recommendations for research projects and uses them in formulating its recommendations for research to BOM. The committee comprises three members from BOM and three members from MSHA. Of the three members from both organizations, one member is chosen from the technical support branch of the organization, another is chosen from the coal mining branch, and the third is chosen from the metal and non-metal branch. Thus, research activities in noise control technology by BOM is supportive of needs identified by MSHA inspection activities.

PROJECT DESCRIPTION

TITLE: Investigation and Control of Noise Generated During Coal Cutting

OBJECTIVES: To develop practical methods of abating the airborne noise generated by the cutting and extraction of coal by current and next-generation mining machines. The airborne noise generated during cutting and extraction will be investigated by laboratory experimental techniques as well as by actual in situ tests. A generalized noise prediction model will be developed to identify and evaluate noise control modifications and redesigns for cutting and extraction devices. Hardware shall be developed to determine the effectiveness of the changes. This is a continuation of an ongoing effort that has completed the laboratory testing phase.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: In Phase I, a laboratory investigation of coal cutting mechanics and noise was completed. These experiments were performed using a linear cutting apparatus (LCA) that operates over a broad cutting range speed. The experimental study established the levels and character of coal cutting noise as well as its dependence on cutting tool geometric and operational parameters. The theoretical study established the causality relationship between coal fracture mechanisms and noise generation, using the parametric data required during the experimental study to formulate an analytical model of coal cutting noise.

The results of this investigation suggest that the noise that is radiated from the coal face during cutting can be reduced if the proper choice of coal cutting methodology is made. It is concluded that coal cutting noise can be reduced without reducing productivity by cutting coal with bits that have high values of cutting efficiency and that use deeper depths of cut at slower cutting speeds than is currently being used in continuous mining machines.

It should be noted that slow and deep cutting, which would reduce in-mine noise levels, has also been recommended to reduce the level of respirable dust at the face and eliminate methane ignition from bit ablation.

During Phase II, in-mine noise survey of a Lee-Norse 265 continuous miner was conducted. The results of this survey indicate that the predominant sources of noise at the operator's position are (1) coal cutting noise from the face

sources of noise have approximately equal impact on the operator -- each producing broadband noise with a noise level of 97 dbA. Overall noise levels experienced by the operator during coal extraction are about 100 dbA for a fully operational miner.

SCHEDULE: Starting date for Phase I was September 1977 and for Phase II, September 1978. Phase I will be completed in May 1980 and Phase II in September 1981.

FUNDING: DOI/USBM: Phase I, $211,000
Phase II, $568,000

PROJECT OFFICER(S): John G. Kovac, USBM/PRC, 412-675-6483

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Wyle Laboratories
Huntsville, AL 35807

Phase I, R. S. Becker

Phase II, J. E. Robertson

205-837-4411

PROJECT DESCRIPTION

TITLE: Fire Hazard Criteria for Noise Control Products Used in Underground Coal Mines

OBJECTIVES: To develop practical and safe flammability criteria and guidelines for the use of acoustic materials in underground coal mines. The acoustic materials used in underground mines will be categorized, and the quantity and mounting configurations of materials necessary to noise control of specific mine-machine systems by assessing available noise control technology will be determined. Using this information with existing flammability information, an overall hazard potential will be determined. This is a continuation of an ongoing effort.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: In June of 1979 a final report was received from IIT Research Institute which evaluated sample of 116 acoustic materials for flammability according to ASTM Designation E-162: Standard Method of Test for Surface Flammability of Materials Using a Radiant Heat Energy Source. Absorption, barrier, vibration damping, and vibration isolation materials were selected for testing. Of the 116 products tested, 72 materials had flame spread indices of 100 or less with 42 of these having flame spread indices less than 25.

To minimize the hazards of fire in underground mines, the Mine Safety and Health Administration has adopted interim criteria for the acceptance of products for use in such mines. The effect of these criteria on underground application of acoustical materials for noise control is particularly severe in light of the IIT study since many of these materials do pose a potential fire hazard. The interim MSHA standard in many instances may be overly stringent for various acoustical treatments. A low flame spread index is needed for large quantity items but a much higher flame spread index may be acceptable for a vibration isolator. In addition, for various acoustical materials the ignition temperature, rate of heat release, difficulty to extinguish, and other factors may be important in determining usage. This research intends to develop criteria specifically for noise control materials that would insure the miner's safety, allow maximum use of noise control products, and take into account a small sales volume in the mining industry.

A request for proposal was circulated and the response made by Wyle Laboratories, Huntsville, Alabama was selected for award of contract. The contract was awarded on September 28, 1979.

To date, an extensive computer literature search has been performed and publications obtained and catalogued. Other fire hazard criteria have been reviewed. Specific fire tests aimed at measuring specific fire hazards or flammability characteristics have been perused. A list of current and future end-use applications for noise control materials in underground coal mines has been compiled. Evaluation of the interim MSHA Criteria has been integrated in a decision tree logic diagram with conclusions of their applicability to noise control materials.

Work is progressing toward the development of a Fire Hazard Specification for acoustic materials detailing how and why each fire criteria was developed.

SCHEDULE: Estimated completion date 3-28-81.

FUNDING: DOI/USBM: $73,000

PROJECT OFFICER(S): Gerald W. Redmond, ScD. DOI/USBM
412-675-6482

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR: J. Robertson
Wyle Laboratories
7800 Governors Drive
Huntsville, AL 35807

PROJECT DESCRIPTION

TITLE: Noise Study of Longwall Mining Systems

OBJECTIVES: To develop quieter longwall mining equipment. The noise problems of longwall systems shall be identified, and feasible engineering controls that achieve quieter operation without affecting production shall be assessed and demonstrated. It is anticipated that the demonstration phase will involve a cooperation effort with a longwall equipment manufacturer. The identification and assessment phases were initiated in FY 1979.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: A study was made to assess the state-of-the-art in longwall mining in the United States. The results of this study indicate that longwall mining is in a state of change in terms of machinery and the technology behind that machinery. However, it is possible to discern trends in the evolution of longwall mining systems and to infer conclusions about the sources of noise from up-to-date longwall mining machinery.

Specifically, double-drum shearing machines will probably dominate the American market place over competitive plows and single-drum longwall shearers for the foreseeable future.

Increased motor horsepower for shearer drives is distinctly evident. State-of-the-art machinery employing motors up to 500hp are likely to be surpassed in attempts to take deeper cuts in order to produce less respirable dust.

Remote controlled operation of shearing machines is a foreseeable reality. Remote control using an umbilical cord is standard on at least one model of shearing machine, and fully automated shearer operation is currently under development.

Shearing machines are the predominant noise source in longwall mining, generating noise levels often in excess of 100 dbA at the operator's position.

Noise from shearing machines is greatest during cutting operations. It remains to be determined whether this noise is principally a result of loading the mechanical subsystems of the machine or of the cutting drum/coal face interaction. Also, the noise from double-drum shearers is greatest at the leading operator's position.

Several mechanical subsystems on longwall shearing machines have been identified as potentially significant contributory noise sources. These secondary sources are, for example, electric drive motors, hydraulic pumps, and gear boxes. The relative importance of the noise generated by these subsystems has not yet been determined.

Controls for the noise generated by the coal cutting process depend upon the nature of the noise source being addressed. Existing damping and stiffness methods may be adequate to control noise from the cutting drum. It may be necessary to modify the cutting process itself in order to reduce direct, airborne fracture noise and noise fracture radiated from the coal face.

SCHEDULE: Starting date was September 1978.
Project will be completed in December 1980.

FUNDING: DOI/USBM: $300,000

PROJECT OFFICER: John G. Kovac USBM/PRC
412-675-6483

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Wyle Laboratories
Huntsville, Alabama 35807

R. M. Slone, Jr.
205-837-4411

PROJECT DESCRIPTION

TITLE: Development of Quiet Resilient Screens for Use in Coal Preparation

OBJECTIVES: To develop quiet resilient decks for coal screening and to demonstrate their durability, maintenance considerations, acoustical effectiveness, and costs under long-term production conditions. Operational constraints to be investigated include wear and separation problems, blinding, material accumulation, and interference with production.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: Work has just started on this project. The following narrative provides background information and discusses the objectives of this project.

Under Bureau of Mines Contract H0155155, "Demonstrating the Noise Control of a Coal Preparation Plant," a study is being made to demonstrate the feasibility of applying industrial noise control technology to a coal preparation plant. The Georgetown Plant, a Consolidation Coal Company coal preparation plant, is the demonstration site. The sources of noise in the Georgetown Plant have been identified and noise control treatments for each source have been designed and installed. At present, these treatments are being monitored to evaluate their overall performance in terms of noise reduction and wear/life characteristics.

One of the most prevalent sources of noise in the Georgetown Plant is screen noise. The problem of screen noise was solved only partially by replacing conventional steel screens used on secondary shakers or RIPL-FLO vibrators with resilient screens consisting of a layer of elastomer bonded to steel. While this treatment was successful from the standpoint of noise reduction, the overall performance of the resilient screens was less than that of the conventional screens which they replaced. The resilient screens failed either by blinding or by delamination. Also, these specific failure modes are not observed in noncoal processing operations where resilient screens are commonly used because of their long wear life. So, it seems likely that the operational environment of a coal preparation plant is somehow the cause of resilient screen failure.

The engineering design problems posed by the way resilient screens failed in the Georgetown Plant must be solved before such screens can be counted as a feasible noise control treatment for coal preparation plants. What is required as a first step towards solving these problems is a basic understanding of how resilient screens fail in operation. Apart from indicting the environment of a coal preparation plant as the cause of resilient screen failure, there are no theories which account for the specific causes of failure and there is no empirical evidence which can decide the case in favor of one theory or another. A theory of resilient screen failure confirmed by experiment, besides clarifying how resilient screens fail, would provide engineering insights into the design and development of resilient screens for use in coal preparation plants.

SCHEDULE: Starting date was January 1980.
Project will be completed in March 1981.

FUNDING: DOI/USBM: $115,000

PROJECT OFFICER(S): John G. Kovac USBM/PRC
412-675-6483

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Wyle Laboratories
Huntsville, Alabama 35807

Roger Coupland
205-837-4411

PROJECT DESCRIPTION

TITLE: Assessment of Whole Body Vibration Levels of Coal Miners

OBJECTIVES: Assess the extent and nature of whole body vibration for the United States worker population for aboveground and underground coal mines.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: The Federal Mine Safety and Health Act of 1977 mandated that unhealthful conditions in the nation's mines must be identified and corrected. Exposure to excessive whole body vibration may be a serious occupational safety and health problem. Excessive vibrations may lead to the impairment of the job function, thus causing the equipment to be operated unsafely.

The extent to which miners are exposed to whole body vibration is largely unknown. Also, the sources of whole body vibration have not been identified and characterized. The purpose of this contract is to identify which mining occupations expose the workers to excessive whole body vibrations and to document the vibration intensity levels. Additionally, a literature search will be conducted to identify any documented cases were exposure to whole body vibrations, similar to those found in the mining environment, may have caused physiological changes.

The contract was officially awarded during November 1979. At the present time, in-mine measurements have not yet started. Field surveys will be initiated during May 1980 at an eastern Kentucky surface mine.

Accomplishments to date include: 1) A visit and meeting with personnel in the Bioacoustics Section, NIOSH, Cincinnati, Ohio. Discussions were held regarding potential problems associated with the in-mine data collection, and 2) The report for Phase II has been received. Phase II of this contract consists of identification of the most probable occupations (both surface and underground) that are exposed to excessive whole body vibration. The Phase I report, which is also due to be delivered soon, will list the results of the computerized technical bibliography search for information on studies of physiological effects from whole body vibration.

SCHEDULE: Starting date was November 16, 1979. The estimated completion date is February 16, 1981.

FUNDING: DOI/USBM: $80,792

PROJECT OFFICER(S): Thomas G. Bobick, USBM/PRC, 412-675-6673

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR:

Bolt, Beranek and Newman, Inc.
50 Moulton Street
Cambridge, MA 02138

Dr. Paul Remington
617-491-1850

PROJECT DESCRIPTION

TITLE: Environmental Testing of Personal Auto Dosimeters

OBJECTIVES:

- To identify and quantify those environmental factors potentially affecting in-mine performance of PAD's
- To define environmental test criteria for PAD's
- To conduct pilot environmental tests on commercially available PAD's

This is a new RFP.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980:

Regulations in support of the Mine Safety and Health Act of 1977 to control the exposure of mine workers to excessive noise rely on the concept of noise dose to identify those instances when noise becomes an occupational health problem. Utilizing state-of-the-art electronic technology, compact noise dosimeters that can be personally worn by a worker were developed. Dosimeters overcome a major shortcoming of using time and motion study procedures to determine dose with a sound level meter by providing an automatic and continuous assessment of noise dose.

Based on the results of a September 1977 public hearing conducted by the National Institute for Occupational Safety and Health concerning in-mine use of dosimeters, the Mine Safety and Health Administration revised its existing noise regulation to permit the use of noise dosimeters in the coal mining industry effective October 1978.

Because no national performance standards exist for noise dosimeters, questions arise about the reliability of the devices when used in the mining environment. These include instrument error, accuracy of measurement techniques, and survivability of the PAD when subjected to environmental agents in the mine. This research is intended to evaluate the durability and functioning of the noise dosimeter package for the instantaneous and long-term effects due to dust, moisture, temperature, shock and vibration.

A Request for Proposal was prepared and circulated to test commercially available PAD's that will be deployed in both surface and underground mines. The test procedures must simulate on a laboratory scale those features of both mine environments that affect PAD performance; specifically, the

instantaneous and long-term effects due to dust, moisture, temperature, and shock. The test procedures should unambiguously lend themselves to translation into environmental performance criteria for PAD's.

SCHEDULE: Completion of project anticipated 13 months after effective date of contract.

FUNDING: Project funding is not disclosable because of contract procurement procedures.

PROJECT OFFICER(S): Gerald W. Redmond, ScD. DOI/USMB
412-675-6482

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Contract to be awarded.

PROJECT DESCRIPTION

TITLE: Noise Control Guidelines for the Coal Mining Industry--Handbook

OBJECTIVES: To develop a noise control handbook for the coal mining industry. The handbook will be in two volumes. Volume I will provide general noise control techniques applicable to mining machinery. Volume II will give detailed examples of mining machinery that has been successfully noise controlled.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: This is a new RFP; the following narrative provides background information and discusses the intent of this project.

Because noise is an occupational health problem to the coal miner, the Mine Safety and Health Act of 1977 seeks to protect the miner by regulating his exposure to excessive noise. The regulation relies on the concept of noise dose or exposure to define those instances when a miner is overexposed to noise. When a worker's exposure is found to be excessive, the utilization of engineering methods is required to abate the noise.

While engineering control of a noise problem is the preferred solution, in practice there are numerous obstacles that limit the coal industry's reliance on engineering controls. In some cases, feasible noise control technology is not available. Moreover, the mining industry is concerned about the initial investment required, maintenance costs, reliability, and a potentially negative impact on productivity. Because of the noise problem confronting the mining industry, the Bureau of Mines has engaged in a comprehensive research, development, and demonstration activity aimed at providing feasible noise control technologies. By working with the mining community, progress is being realized principally in the demonstration of retrofit controls for existing machinery. A complementary, but longer range effort to design inherently quieter mining equipment is also underway. Other Federal agencies are also conducting or sponsoring research with potential application to the mining noise problem. On an individual basis, some manufacturers and mine operators are addressing specific aspects of the problem.

The state-of-the-art in mining noise control technology is rapidly changing and this situation has led to an

unequal distribution of knowledge and information in mining relative to available noise control technology. Because of the lack of a technology data base on which industry and regulatory personnel can both rely, conflicts unnecessarily arise that actually impede progress toward the achievement of a quieter working environment for the miner. So, there is a need to assess and synthesize currently available noise control information and disseminate it within the mining community.

SCHEDULE: Contract has not been awarded.

FUNDING: Project funding is not disclosable because of contract procurement procedures.

PROJECT OFFICER(S): John G. Kovac USBM/PRC
412-675-6483

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract has not been awarded.

PROJECT DESCRIPTION

TITLE: Abatement of Noise of Continuous Mining Machines

OBJECTIVES: Develop and demonstrate both retrofit and design noise control measures on a continuous mining machine. Participation of the contractor with an equipment manufacturer and a mine operator is included. Emphasis is to be placed on the testing and demonstration of the noise control measures in the mining environment.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980:

Under this contract, significant progress has been made toward controlling the noise from the chain conveyor. These conveyors, which are common to both loading machines and continuous miners, are a significant noise source for the operator of the equipment. Therefore, successful control of conveyor noise constitutes a major step in the reduction of the full-shift noise exposure of the operator and his helper.

The noise generated by the chain conveyor will vary due to differences between specific models of continuous miners, changes in the mode of equipment operation, and also, to the physical condition of the chain conveyor and continuous miner. Generally, however, the chain conveyor will exceed 100dbA at the operator's position. A design goal of reducing the chain conveyor noise to 90 dbA has been set.

As part of this contract, a conveyor test facility was previously established at the Jeffrey Mining Machinery Division, Columbus, OH, to evaluate possible noise control treatments aboveground. Modifications which prove to be durable in the surface test facility will then be installed on a continuous miner conveyor in a cooperating mine for underground evaluation.

At the conveyor test facility, the noise of an empty conveyor, measured at the operator's position, has been reduced from 101.5 dbA to 93.0 dbA. The reduction in noise level because of various modifications is presented:

	Modification	Measured Noise Level
1.	Baseline (conveyor untreated)	101.5 dbA
2.	Top and bottom conveyor decks damped	96.5 dbA
3.	Conveyor sidewall damping	95.0 dbA

Modification	Measured Noise Level
4. Isolated tail roller	93.5 dbA
5. Blocked guide plate hole	93.0 dbA

The performance of the damping treatment and the modified tail roller was found to be satisfactory after an extended period of operation in the conveyor test facility. The damping treatment has already been installed on a Jeffrey 120M continuous miner for underground evaluation; a similar installation is planned for the modified tail roller.

The other treatments listed previously are undergoing additional design work for improved acoustic performance and durability before they are used in the underground environment.

SCHEDULE: Starting date was June 30, 1975. The estimated completion date is March 1982.

FUNDING: DOI/USBM: $742,730

PROJECT OFFICER(S): Thomas G. Bobick, USBM/PRC 412-675-6673.

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR:
Bolt, Beranek and Newman, Inc.
50 Moulton Street
Cambridge, MA 02138

Dr. Anthony Galaitsis
617-491-1850

PROJECT DESCRIPTION

TITLE: Machine Design Concepts for Noise Control

OBJECTIVES: To influence the next generation of mining equipment by identifying, evaluating, and providing applicable machine design concepts to the industry that will result in the development of low-noise emission products. Noise control techniques are to be addressed on a design basis and cover the entire scope of noise generating and radiating mechanisms. Continuation of a new project initiated under FY79 funding.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: The Federal Mining Safety and Health Acts of 1969 and 1977 set forth standards that specify maximum noise levels permissible at various exposure times for personnel in the mining industry. Bureau and MSHA studies have identified numerous noise sources. The main thrust of the current Bureau effort has been to develop retrofitable noise control technology easily incorporated into existing or new machinery. In these cases, noise control techniques are being designed around available equipment. In the long run, the machine or mining process should be designed to be quiet to provide the most effective noise control. There is currently limited information available on how to design quiet equipment. Under this program, a dialogue will be initiated among acoustical, mining, and machine design specialists to identify and assess machine design concepts that may produce quieter mining equipment in the future.

An RFP was circulated and the technical proposals received in response have been evaluated. The contract is in the process of being awarded to Wyle Laboratories, Huntsville, Alabama.

SCHEDULE: Completion of project anticipated 18 months after effective date of contract.

FUNDING: Project funding is not disclosable because of contract procurement procedures.

PROJECT OFFICER(S): Gerald W. Redmond, ScD. DOI/USBM
412-675-6482

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Contract in the process of being awarded to Wyle Laboratories, Huntsville, Alabama.

PROJECT DESCRIPTION

TITLE: Abatement of Taconite Plant Noise Sources

OBJECTIVE: To develop and demonstrate practical engineering noise controls for equipment used in taconite plants. Prior work in this area determined the noise sources in taconite plants and concentrated on secondary crushers. This effort shall be aimed at quieting screens, rodmills, autogenous and semiautogenous mills, penumatic rappers, and vacuum disk filters. Solutions developed shall be implemented in selected plants and evaluated to assess acoustic effectiveness, durability, and costs. This is a continuation of an ongoing effort.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: The Mine Safety and Health Act of 1977 specifies the permissible noise exposure for miners in the metal/nonmetal industries. Early surveys by Bureau and MSHA showed that many of these miners are exposed to levels that exceed that allowed by the Act. Thus, the Bureau has initiated research to abate noise in mining operations.

Of particular interest to the Bureau is noise in taconite processing plants. This process involves crushing and grinding to reduce the ore to a size where the iron oxide can be liberated from the waste, and agglomeration. Because of the extreme hardness of the ore, the size of the processing machines and the enormous power they require, the noise levels generated in these plants is found to be very high.

In recognition of this problem in the taconite industry, the American Iron Ore Association and its member producers have been cooperating with the Bureau. Through previous surveys conducted in four plants, it was found that over 40 percent of the workers were subjected to levels greater than 90 dbA. A second study previously performed under the current contract J0377014, Source Diagnosis and Abatement Techniques in Taconite Plants, Bolt Beranek and Newman was directed at source diagnosis and assessment techniques. These products provided a preliminary identification of the following machinery classes as potential candidates for which noise control efforts should be made:

- secondary crusher
- crusher circuit sizing screens
- rod mills
- autogenous and semi-autogenous mills
- fine screens with pneumatic rappers

It was recognized early on that secondary crushers were not amenable to source control. This problem has been approached on a retrofit basis by utilizing an acoustic enclosure. Under contract H0387016, (Installation and Evaluation of Crusher Noise Control, Industrial Acoustics Company) secondary crusher noise control was demonstrated using an acoustic enclosure. The enclosure is designed to allow easy access to the crusher which requires frequent adjustments and reduces noise coming from the crusher from 105-106 dbA to below 90 dbA.

Presently under the above mentioned contract J0377014 with BBN, the following scope of work is in progress.

- Supplementing and extending the diagnostic measurements made in mills, fine screens with pneumatic rappers, and crusher sizing screens.
- The design of prototype noise control treatments for each machine.
- Installation of the noise control techniques on in-service machines and monitoring of their acoustic performance, mechanical durability and cost.

The work is still in its initial stage of obtaining extensive diagnostic measurements.

SCHEDULE: Starting date of initial noise surveys in the Taconite Industry 1976, starting date of current work under contract J0377014 May 1979, expected end date May 1981.

FUNDING: DOI/USBM: $28,000 (Contract J0377014 current effort)

PROJECT OFFICER(S): Roy C. Bartholomae
Bureau of Mines 412-675-6732

SPONSOR(S): Department of Interior
Bureau of Mines

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Bolt Beranek and Newman
Cambridge, Mass. 02138

Richard Madden
617-491-1850

PROJECT DESCRIPTION

TITLE: Retrofit of Underground Load-Haul-Dump Machines with Noise Control Packages

OBJECTIVES: Develop retrofit noise control technology for specific models of LHD machines. Noise control techniques shall be applied to the equipment and evaluated underground for a period of 1 year. This contract is a continuation of ongoing efforts to quiet LHD's through retrofit means.

ACCOMPLISHMENTS AND STATUS AS OF JANAURY 1980: Under a previous Bureau of Mines contract, H0262013, research was sponsored to demonstrate the noise control on a new Wagner LHD, Model ST-5A. A 7 dbA noise reduction was achieved by that research program. There are, however, a great number of LHD's currently operating in underground mines nation-wide. They are all candidates for noise abatement. This research, which is a continuation of the previous contract, will install noise controls on 4 different Wagner machines to demonstrate the effectiveness of the retrofit package. Before-modification and after-modification surveys will be conducted underground to determine the effective noise reduction. The performance of the abatement package will be monitored regularly every 3 months for a 1-year period.

During the second quarter of FY 80, an agreement was made with a mining company located in Arizona to cooperate with the contractor. The machine to be modified will be a Wagner ST-2B. The baseline survey will be conducted during the third quarter, FY 80. The LHD will then be shipped to the contractor's facilities in Denver, CO for treatment. Additionally, the contractor has initiated discussions with 2 other companies to secure a cooperating agreement. As each subsequent machine is selected, it will be cycled into the retrofit shop for treatment. The follow-up survey will begin shortly after each LHD is returned to production.

SCHEDULE: The starting date was June 4, 1979. The estimated completion date is August 1981.

FUNDING: DOI/USBM: $224,585

PROJECT OFFICER(S): Thomas G. Bobick, USBM/PRC, 412-675-6673

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR:

Lake Shore, Inc.
P.O. Box 809
Iron Mountain, MI 49801

Mr. Lyle Jarvis
906-774-1500

Bolt, Beranek and Newman, Inc.
(Subcontractor)
50 Moulton Street
Cambridge, MA 02138

Dr. Richard Madden
617-491-1850

PROJECT DESCRIPTION

TITLE: Vibrating Screen Noise Abatement

OBJECTIVES: To field test and evaluate a prototype noise-abated, low head, sizing screen used in metal and nonmetal mineral processing. The screen will be installed in a processing plant and tested under actual production conditions to evaluate noise, screening performance, and durability.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980:

Vibrating screens are a noise problem in the preparation and processing plant sectors of the mining industry. Recent studies conducted under contract to the Bureau of Mines indicate that noise levels of this equipment range from 95 to 103 dbA.

In order to develop feasible noise control technology for vibrating screens, two problems must be solved. First, it is important to know how the noise controls alter the performance of the screen. Second, it must be demonstrated whether or not the noise controls have sufficient wear life under operational conditions. The purpose of this program was to demonstrate noise control technology for vibrating screens for extending prior development work performed by Allis-Chalmers during the four years prior to contract award. In particular, acoustic and screening performance of six commercial nonmetallic decks and a steel wire cloth deck, operating with three different materials being processed; coal, granite, and dolomite, was established and a prototype noise controlled Low-Head screen was demonstrated and life tested.

Nonmetallic decks provide from 2 to 7 dbA noise reduction but at a loss of efficiency, as compared to a steel wire cloth deck of the same open area. In practice, however, most steel decks have more open area than do the nonmetallic decks, and therefore have a larger capacity at the same efficiency. The overall performance, both noise reduction and screening efficiency, of a particular deck depends on the material being screened.

By using constrained layer damping treatments on the screen sidewalls and vibration isolators for the mechanical drive an unloaded noise level of 77-79 dbA was obtained one meter away from the noise controlled Low-Head screen. This means when combining the Low-Head noise control and the nonmetallic deck results, the noise generated by the material would still be the limiting factor. Sound levels with the best performing nonmetallic decks are still over 90 dbA.

SCHEDULE:	Project was started June 1978, it will be completed in March 1980.
FUNDING:	DOI/USBM: $197,000
PROJECT OFFICER:	John G. Kovac USBM/PRC 412-675-6483
SPONSOR(S):	DOI/USBM
TYPE OF AGREEMENT:	Contract
INVESTIGATORS:	Allis-Chalmers Corporation Milwaukee, Wisconsin 53201 K. Hennings 414-764-7100

PROJECT DESCRIPTION

TITLE: Application of Quiet Stoper Drill Technology to the Redesign of Jumbo Drills

OBJECTIVES: To develop a quiet, jumbo-mounted drill through redesign techniques rather than through retrofit methods. The study shall involve noise control of both the drill body and the drill steel. Cooperation of a drill manufacturer is considered essential, since manufacturing expertise is required, and the final prototype drill shall be field-tested to assess its long-term noise level, drilling efficiency, and other operational parameters. This is a continuation of an ongoing effort.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: One of the most severe noise sources is metal and nonmetal underground mines is the jumbo-mounted drill. Levels of 115-120 dbA during drilling are common with an average exposure time of four hours at these levels. Moreover, operation of these pneumatically-powered percussive drills for any length of time above a 115 dbA noise level is in violation of Federal regulations.

Jumbo drills typically are used to drill hard rock where percussion drills are the only effective drilling technique (rotary drilling would not work). Therefore, the development of a reduced noise jumbo drill is a high priority item.

The objective of the immediate program is to design, develop, and demonstrate noise-reducing technology that will be applicable for future designs of jumbo-mounted drills and that will have the potential to produce drills that can be cost-effectively manufactured and used in the mining environment. Reducing noise from large percussion drills is a difficult problem and redesigning the drill to be inherently quieter rather than developing retrofit noise control packages holds the best promise for the long term reduction of jumbo drill noise because there are less constraints with a new equipment being designed. Because jumbo drills are one of the most serious noise problems in Metal and Nonmetal mining, dual contracts were awarded to Ingersoll-Rand (H0395029) and IRAD GAGE, with Joy Machinery as subcontractors (H0395025) with the intent to selecting the best performer on the initial demonstration phase to further fund to develop a commercially manufacturable design. Both contractors have completed the demonstration phase and the results of their efforts are summarized in the following paragraphs.

The approach IRAD GAGE/Joy Machinery used was to place a shroud/muffler around the drifter and a collapsible coil spring noise shroud over the drill steel. Under Contract H0395025 they have developed these concepts to a point where their demonstration noise controlled drill produces noise reduction in excess of 20 dbA and the techniques used appear to be feasible for manufacture and use in the mining environment.

The approach Ingersoll-Rand (IR) used was to enclose the entire drifter and drill steel into one large enclosure. The enclosure is composed of a constrained layer damped outer shell with an internal lining of acoustic absorption material. Noise reductions obtained at the operator's position was about 15 dbA.

The Bureau is presently in the process of selecting one of these contractors to further fund the development of a prototype preproduction commerically manufacturable jumbo drill. Because jumbo drills are large, expensive pieces of equipment, this phase of the work will be a multi-year effort.

SCHEDULE: Scheduled starting date - February 1979. Demonstration drill phase will be completed April 1980.

FUNDING: Funding Department of the Interior Bureau of Mines, $249,000 for both contracts for the demonstration drill phase.

$112,000 - Contract H0395025, IRAD GAGE/Joy Machinery
$137,000 - Contract H0395029, Ingersoll-Rand

PROJECT OFFICER(S): Roy C. Bartholomae - Department of the Interior, Bureau of Mines (412-675-6732).

SPONSOR(S): Department of the Interior, Bureau of Mines

TYPE OF AGREEMENT: Contract

INVESTIGATOR(S):

IRAD GAGE
Etna Road
Lebanon, NH 03766

Peter Runstadler
603-448-4445

Ingersoll-Rand
Box 301
Princeton, NJ 08540

N. Matteo
609-921-9103

PROJECT DESCRIPTION

TITLE: Preparation Plant Design for Quiet Operation

OBJECTIVES: To demonstrate state-of-the-art noise control technology for preparation plants by redesign rather than by retrofit techniques. This effort is a cooperative agreement with a preparation plant designer and constructor, a noise control consultant, and the Bureau. Acoustical consultants will work with the builder during the design phase to specify and select equipment, processes, and techniques that will result in a facility that complies with the Federal noise regulations.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: The research contract for this project is being negotiated. The following narrative provides background information and discusses the intent of this project.

The Bureau of Mines has an ongoing research program directed toward noise controlling coal preparation plants. For the most part, this program has concentrated on noise control for existing preparation plants. As an example, under Contract H0155155, "Demonstrating the Noise Control of a Coal Preparation Plant", retrofit noise control treatments were developed for most unit operations in the Georgetown Plant, a Consolidation Coal Company preparation in Cadiz, Ohio.

The development of feasible noise control technology for existing preparation plants is only part of the solution to the problem of noise overexposure of plant workers. Although advances in coal preparation technology occur relatively slowly compared to other areas of the mining technology, the mix and type of equipment deployed in new coal preparation plants is changing. This means that noise control technology developed for existing plants may not necessarily be the most efficient or practical for coal preparation plants yet to be built.

The objective of this research effort is twofold: First, to determine how state-of-the-art noise control technology can best be incorporated into the design of new coal preparation plants and second, to demonstrate that noise control can be effectively achieved in the design stage of new coal preparation plant. The results of this proposed project would be an essential step toward a feasible, long-term solution to the problem of noise overexposure of coal preparation plant workers.

SCHEDULE:	Contract is being negotiated. Expected start date in in FY 80; projected completion date is FY 85.
FUNDING:	Project funding is not disclosable because of contact procurement procedures.
PROJECT OFFICER(S):	John G. Kovac, USBM/PRC, 412-675-6483
SPONSOR(S):	DOI/USBM
TYPE OF AGREEMENT:	Contract
INVESTIFATOR:	Contract is being negotiated.

PROJECT DESCRIPTION

TITLE: Noise Control of Channel Burners

OBJECTIVES: To determine if a new technique in quarrying using channel burners is feasible and practical. The new technique offers advantages in noise and dust control and involves remote drilling of rows of holes.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980:

One of the worst noise offenders in the quarry industry is the channel burner. The channel burner uses a high velocity flame jet to cut through heat spallable rocks and mineral; the flame jet generates operator noise levels of 125-130 dbA. Exposure to these noise levels is not permitted by noise regulations mandated by the Mine Safety and Health Act of 1977.

Under the current project, Browning Engineering has developed a quieter flame drilling system that matches the performance of the channel burner. In contrast to the 125-130 dbA noise levels generated by conventional channel burners, noise levels of 100 dbA are achievable with the flame drilling process. The flame drilling technique involves the drilling of rows of holes; where continuous, open channels are required, drilling of individual holes must be followed by web removal. Unlike the conventional channel burner, the operation is remotely controlled. Because flame drilling cuts through rock at a faster rate than conventional channeling, the new process is a viable commercial alternative to the new method. Program plans call for the flame drilling system to be field tested in operating quarries.

SCHEDULE: Project was started in July 1978. Estimated completion date is June 1981.

FUNDING: DOI/USBM: $110,000

PROJECT OFFICER: John G. Kovac, USBM/PRC
412-675-6483

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Browning Engineering
Hanover, NH 03755

J. A. Browning
603-298-8400

PROJECT DESCRIPTION

TITLE: Demonstration of Noise Control Techniques for the Crushing and Screening of Nonmetallic Minerals

OBJECTIVE: Develop and demonstrate retrofit noise control techniques for the crushing and screening of nonmetallic minerals. Specifically, the noise controls developed in this project will be demonstrated on the crushing and screening operations at three processing plants used as test sites. Particular emphasis will be placed on controlling the noise sources in portable plants.

ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980: Nonmetallic minerals, such as sand and gravel or crushed stone, are recovered by dredging or blasting and digging. Before the product can be used commercially, it must be prepared. This preparation process consists of crushing the produce to a smaller size and then washing and screening it. High levels of noise are generated during the processing cycle. Nonmetallic mineral processing plants consist of both stationary and portable types. Since the total number of plants is approximately 12,000, the overall impact of excessive noise is widespread and severe.

The contract was officially awarded on February 7, 1980. At the present time, in-field measurements have not yet started. The contractor has, however, secured the cooperation of companies located in North Carolina, Alabama, and Massachusetts to permit on-site data collection. A maximum of ten plants will be surveyed. From those surveyed, three plants will be selected as candidates for the installation of noise control techniques.

SCHEDULE: The starting date was February 7, 1980. The estimated completion date is July 7, 1981.

FUNDING: DOI/USBM: $216,917.00

PROJECT OFFICER(S): Thomas G. Bobick, USBM/PRC, 412-675-6673

SPONSOR(S): DOI/USBM

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Foster-Miller Associates, Inc.
350 Second Avenue
Waltham, MA 02154

Mr. David Monaghan, 617-890-3200

DEPARTMENT OF LABOR

Mine Safety and Health Administration (MSHA)

MSHA has a mandate to protect mine workers through inspection of mines and enforcement of health and safety requirements, and, pursuant to fulfilling this mandate, it establishes limits for occupational noise exposure for miners, inspects mines, and enforces noise regulations. MSHA and the Occupational Safety and Health Administration (OSHA) are parallel organizations in the Department of Labor, for OSHA fulfills the same function for the remainder of the work force. In contrast to The Bureau of Mines (BOM), MSHA performs no research, but it provides technical support to its enforcement and conducts noise development and control projects designed to provide retrofit solutions that can be applied within a short period of time. MSHA also performs a major service in identifying noise problems for research and by serving jointly with BOM on their Research Review Committee. See the discussion of BOM for more information on the relationship between these two organizations.

MSHA's responsibilities are divided into two areas, coal mines and metallic and non-metallic mines. All of MSHA's development work is done in house at the Pittsburgh Technical Support Center or the Denver Technical Support Center. The Technical Support Center provides support to both areas of MSHA.

PROJECT DESCRIPTION

TITLE:	Improving Barrier Insertion Loss
OBJECTIVES:	To demonstrate methods of increasing barrier insertion loss by using resonators attached to the edges of the barrier facing the noise source.
ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:	This project details two attempts at increasing barrier insertion loss by using two different systems of resonators attached to the edges of the barrier facing the noise source. The first system consists of quarter wavelength resonators and the second systems consists of the quarter wavelength resonators containing fiberglass wedges. They system of quarter wavelength resonators was an attempt to achieve an acoustically soft edge condition. An acoustically soft edge condition theoretically can increase the insertion loss of a barrier up to 30 dB depending on the orientation of the noise source, receiver and barrier while a perfectly absorptive edge can increase the insertion loss when compared to a hard surfaced barrier up to 6 dB. The results indicate that both systems more closely approximates an absorptive edge condition than an acoustically soft edge condition. Noise control techniques developed in this report are most applicable to large stationary noise sources that contain pure tone components. Some examples of this type of noise sources in the mining industry are ventilation fans, power transformers and vacuum pumps.
SCHEDULE:	Undergoing final review before publfcation as a Mine Safety and Health Administration Informational Report.
FUNDING:	In-House
PROJECT OFFICER:	Michael P. Valoski, Mine Safety and Health Administration, Pittsburgh Technical Support Center, Physical Agents Branch, Pittsburgh, PA
SPONSOR (S):	Mine Safety and Health Administration, Pittsburgh Technical Support Center, Pittsburgh, PA.
TYPE OF AGREEMENT:	N/A
INVESTIGATOR:	In-house Michael P. Valoski, 412-621-4500

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

One of NASA's Congressionally mandated responsibilities is promoting benefit to the nation's economy and productivity by facilitating the transfer of aerospace-generated technology. NASA's means of meeting this objective is its Technology Transfer Program, the purpose of which is to provide aerospace technology for productive application in industry. The Technology Transfer Division of the Office of Space and Terrestrial Applications is the focal point for this activity, and it provides access to the technical resources of NASA. NASA can contribute a level of technological sophistication to noise control that is not commonly found outside of the aerospace industry. Some examples of applications of NASA's expertise to noise control technology are: NASTRAN, a computer program for analysis of complex structures, traction drive, and high technology materials. NASA is also cooperating with DOE on one of its wind turbine generator projects (See p. 5-16).

PROJECT DESCRIPTION

TITLE: Poultry Processing Plant Noise Control

Two Phases:

Phase 1: A study of Poultry Processing Plant Noise Characteristics and Potential Noise Control Techniques

Phase 2: A study of Poultry Processing Noise Control techniques utilizing NASA technology, experience, and expertise.

OJBECTIVES: The objectives of the total program are to identify the noise problem with the poultry processing industry, to identify and develop controls, and to demonstrate their applicability and effectiveness. Of particular interest are those controls that are compatible with the environment found in food processing plants and meet with the health related requirements of the USDA.

With respect to noise controls, the objectives of Phase 1 were directed to identifying those controls that had been tried (both working and non-working), and those with a strong potential for working. The objectives of Phase 2 with respect to noise control were to develop noise control techniques drawing expertise and utilizing aerospace technology. Controls are to be developed and validated through development of prototype testing.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980: Phase I completed in January 1980, and a report has been issued. Noise levels representative of the typical poultry processing plant in the industry have been identified. Noise exposures, equipment and specific noise generating mechanisms causing the noise problems were identified. A principal finding of the study was that there were two or three sources of noise causing the poultry processing noise problem (lung guns and chillers). The effects of the acoustical properties of the plant spaces were studied. Another principal finding was that the acoustical reverberance of the poultry plant spaces, caused by hard reflective surfaces, was a main cause of the noise problems. Available acoustically absorptive materials were studied and tested. Some were found to be adequate except for durability needed to survive the food processing cleaning environment.

Phase 2 is now in process and was started in January 1980. It is to be directed at developing and validating controls. Initial efforts are being directed at obtaining acoustically absorptive materials compatible with the food processing environment.

Present efforts are being directed at seven types of material used to wrap the absorptive material.

Attention may also be directed to one type of reactive acoustic absorber. Attention will be directed to noise controls later in the program.

SCHEDULE: Phase 1 completed January 1980
Phase 2 initiated January 1980 and in progress

FUNDING: Phase 1. Total $116,000
NASA $50,000
Georgia Institute of Technology $16,000
State of Georgia $50,000

Phase 2 Total $99,000
NASA $55,000
State of Georgia $44,000

PROJECT OFFICER(S): Craig Wyvill 404-894-3623
Georgia Institute of Technology

Ray Gilbert 202-755-2420
NASA Headquarters
Washington, D.C. 20546

SPONSOR: Phase 1 Georgia Department of Agriculture
National Aeronautics and Space Administration, (NASA)
Office of Space and Terrestrial Applications (Technology Transfer Division.

Georgia Institute of Technology
Engineering Experiment Station
Technology and Development Laboratory
(Project Encouragement - Georgia Poultry Federation)

Phase 2 Georgia Department of Agriculture
NASA Office of Terrestrial Applications

TYPE OF AGREEMENT: Contract

INVESTIGATOR: Craig Wyvill
Georgia Institute of Technology
Atlanta, Georgia

Sanford F. Tingley
Lewis Research Center
NASA
Cleveland, Ohio

NATIONAL SCIENCE FOUNDATION

The Division of Applied Research sponsors research in the physical sciences, and the Section for Applied Physical, Mathematical and Biological Sciences and Engineering sponsors the project described on the following page. There are no funds set aside for noise control technology so that any proposal for a grant must compete with other proposals in the general area of the physical sciences. Also see Appendix for project descriptions received too late for inclusion in the main body of the report.

PROJECT DESCRIPTION

TITLE:	Noise Reduction and Increased Productivity in Forging
OBJECTIVES:	To provide the information necessary to develop source noise control methods for forge hammers that will also increase productivity.
ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:	The approach taken in this work is to develop noise control methods by means of tooling design and hammer construction. A survey of hammer forges in the United States has been conducted, laboratory simulations have been performed, and field measurements are currently being performed to measure sound pressures, vibrations, stresses, and forces.
SCHEDULE:	To be completed summer of 1981.
FUNDING:	$158,738 for 18 months.
PROJECT OFFIER(S):	Richard I. Schoen
SPONSOR(S):	National Science Foundation
TYPE OF AGREEMENT:	Grant
INVESTIGATOR:	Alfred A. Hendrickson Metallurgical Engineering Department Michigan Technological University Houghton, Michigan 49931

TENNESSEE VALLEY AUTHORITY

TVA operates facilities for generation of electrical power. The Division of Occupational Health and Safety has the responsibility of providing inspections, consulting services, and technical support throughout TVA, and a group within the Safety and Industrial Hygiene Branch within the Safety and Health Division provides consulting services in both occupational and environmental noise control for all TVA plants. All work in noise control is generally done by personnel in the Safety and Industrial Hygiene Branch. TVA does not, as a rule, support research. EPA and TVA have undertaken a joint project to demonstrate noise reduction techniques in a coal-fired electrical power generating plant and to demonstrate the availability of applicable noise control techniques.

PROJECT DESCRIPTION

TITLE: Occupational Noise Control Demonstration (Electrical Generating Plant)

OBJECTIVES: The project has two basic objectives:

- To determine the need for and demonstrate the control of power plant employee noise exposures by systematic application of noise control engineering supplemented by administrative and personal protective measures.
- To demonstrate specific engineering measures which could be used in coal-fired power plants to eliminate or significantly reduce hazardous noise emissions.
- This project is consistent with and complements. TVA's ongoing efforts to protect employees from occupational hearing loss. These efforts include manditory hearing protection in all areas of the power plant exceeding 90 dBA and a medical audiometry program.

ACCOMPLISHMENTS and STATUS OF JANUARY 1980: Sound level surveys in the main plant equipment spaces have been completed. Noise exposure estimates have been made and related to specific noise generators in the plant. These estimates indicate that, without the benefit of hearing protection, a significant portion of power plant workers could experience exposures ranging from 100 percent to 300 percent of the OSHA permissible exposure limit.

SCHEDULE: Starting date was October 1978. Planned completion date for engineering studies is October 1980 depending on plant schedules.

FUNDING: EPA: $100,000; TVA: In-house (Study plus demonstration)

PROJECT OFFICER(S): Roger Heymann - EPA/ONAC 703-557-2126
David M. Trayer - TVA, Safety and Industrial Hygiene Branch 205-386-2311

SPONSORS: Tennessee Valley Authority, Industrial Hygiene Branch; and EPA Office of NOise Abatement and Control.

TYPE OF AGREEMENT: Interagency Agreement

INVESTIGATOR: C. C. Thornton, TVA, Safety and Industrial Hygiene Branch, Muscle Shoals, AL 35660, 205-386-2026

VI. BIBLIOGRAPHY OF RECENT REPORTS

Since the main purpose of this report is to keep Federal personnel up to date on current developments in noise control technology, only reports from the years 1978, 1979, and 1980 have been listed. In listing information on availability, the abbreviation NTIS is used for the National Technical Service, and GPO is used for the U.S. Government Printing Office. Information on prices, accession numbers, and titles of publications available from NTIS can be obtained by calling 703-557-4650, and written orders should be sent to the following address:

National Technical Information Service
U.S. Department of Commerce
Operations Center
5285 Port Royal Road
Springfield, VA 22161

Orders to GPO should be sent to the following address:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

The present report is also available from NTIS. Unfortunately, an accession number could not be assigned prior to publication.

Department of Agriculture

Forest Service

Hearing Protection for Forest Service Blasters, SDEDC, 796701, November 1979

Helicopter Skiing Noise, SDEDC 7967-1208, November 1979

Protect Your Hearing, SDEDC, 796700, December 1979

Science and Education Administration

Low-noise versus standard brush cylinders for gin machinery, W. S. Anthony and O.L. McCaskill. Trans. of ASAE, 21(6):1045-1050; 1978.

Noise Levels of cotton ginning systems, W. S. Anthony, R. A. Wesley, and O. L. McCaskill. Trans. of ASAE, 21(2):574-580; 1980.

All the noise in lint cleaners, W. S. Anthony. The Cotton Ginners' Journal & Yearbook, 46(1):19,22,24,26,27,30,52; 1978.

Noise of low pressure fans, W. S. Anthony. Cotton Gin and Oil Mill Press, 79(14):24-26; 1978.

Department of Energy

Office of Environmental Compliance and Overview

Audible Noise of Constant-Speed, Horizontal-Axis Wind Turbine Generators: A Preliminary Analysis. D. N. Keast and R. C. Potter; Bolt, Beranek and Newman, Inc.; Report No. 4281 for U.S. Department of Energy; January 1980.

Available From: Draft Final Technical Report now in review; Douglas Boehm, Environmental Control Technology Division, telephone no. 353-5511, will have current information on the status of the report.

Review of State/Federal Environmental Regulations Pertaining to the Electrical Effects of Overhead Transmission Lines: 1978. K. R. Shah; Shah and Associates Inc.; DOE/EV-0048/1; October 1979.

Available from: NTIS
Accession No. DOE/EV-0048/1
Cost: $6.00

Feasibility Study of an Active System for Transformer Noise Abatement. D. Yannucci, Westinghouse Electric Corporation; COO-4376-T1; May 1979.

Available from: NTIS
Cost: $5.25

Potential Environmental Effects of 765-kV Transmission Lines: Views Before the New York State Public Service Commission, Cases 26529 and 26559, 1976-1978. B. Scott-Walton, K., M. Clark, B. R. Holt, D. C. Jones, S. D. Kaplan, J. S. Krebs, P. Polson, R. A. Shepherd, and J. R. Young; SRI International; DOE/EV-0056; November 1979.

Available from: NTIS
Accession No. DOE/EV-0056
Cost: $7.25

Noise Control Needs in the Developing Energy Technologies. D. N. Keast; Bolt, Beranek and Newman, Inc.; COO-4389-1, March 1978.

Available from: NTIS

Assessment of the Need for Noise Control Research on Electric Power Transformers and Reactors. D. N. Keast and C. G. Gordon; Bolt Beranek and Newman, Inc.; Report No. 42.89 for U.S. Department of Energy, March 1980.

Available from: Draft final report now under review; Douglas Boehm, Environmental Control Technology Division, telephone no. 353-5511, will have current information on the status of the report.

Environmental Protection Agency

Noise Technology Research Needs and the Relative Roles of the Federal Government and Private Sector, EPA 550/9-79-311, May 1979.

Available from:	Documents Clerks Technology and Federal Programs Division Office of Noise Abatement and Control ANR-471 U.S. Environmental Protection Agency Washington, D.C. 20460 Telephone No. 703-557-7370
Cost:	None
Available from:	NTIS
Accession No.:	PB-296-828
Cost:	$12.00

Federal Research, Development and Demonstration Programs in Machinery and Construction Noise. The Federal Interagency Machinery and Construction Noise Research Panel; EPA 550/9-78-306; February 1978.

Available from:	Documents Clerk Technology and Federal Programs Division Office of Noise Abatement and Control ANR-471 U.S. Environmental Protection Agency Washington, D.C. 20460 Telephone No. 703-557-737-
Cost:	None

Department of Health and Human Services

National Institute of Occupational Safety and Health

Industrial Noise Control Manual (revised edition) NIOSH 70-117, 1979.

Available from: GPO.
Stock no. 017-033-0036-9
Cost: $6.00

Department of the Interior

The Bureau of Mines

Demonstrating the Noise Control of a Coal Preparation Plant, 79-104, 1979.

Available from: NTIS
Accession no.: PB 299 963

Noise Control Report - Jeffrey 100-L Auger Miner and Jeffrey 94-L Bridge Conveyer, 79-010, 1979.

Available from: NTIS
Accession nos.: PB 292 387
(Vols. 1, 2, 3) PB 292 388
PB 292 389

Mantrip Noise Control, 78-133, 1978.

Available from: NTIS
Accession no.: PB 289 711

Development of Other Pneumatic Drills - Evaluation of Design Concepts, 78-070, 1978.

Available from: NTIS
Accession No. PB 283 774

Development of a Quiet Rock Drill - Sources of Drill Rod Noise, 78-132, 1978.

Available from: NTIS
Accession No. PB 289 716

Noise of Surface Coal Mining Equipment, 79-098, 1979.

Available from: NTIS
Accession No. PB 299 538

Noise Control of Underground Load-Haul-Dump Machines, 78-125, 1978

Available from: NTIS
Accession No. PB 288 854

Noise Reduction of Jumbo Mounted Percussive Drills - Development of Noise Treatment, 78-106, 1978.

Available from: NTIS
Accession No. PB 286 109

Noise Control in Surface Non-Coal Plants and Mills, 78-003, 1979

Available from: NTIS
Accession No. PB 291 584

A complete list of the publications of The Bureau of Mines can be obtained from NTIS or The Bureau of Mines, U.S. Department of the Interior, 2401 E Street, N.W., Washington, D.C. 20240.

Department of Labor

Mining Safety and Health Administration

IR 1072 - MSHA Test procedures and Acceptability Criteria for Noise Dosimeters, by Dennis A. Giardino, John P. Seiler, and Timothy Y. Yen, U.S. DOL, MSHA 1978, 11 pp., 2 tables.

Available from: MSHA Office of Information
Ballston Tower #3, Room 902
4015 Wilson Boulevard
Arlington, Virginia 22203

Tel. No.: 703-235-1452

Cost: None

Instruction Manual for the Construction of Wraparound Mufflers, by Noise Section Personnel, Denver Technical Support Center, U.S. Dept. of Int., Mining Enforcement and Safety Administration, D15 21-H120, 14 pp.

Instruction Manual for the Construction of Cylindrical Mufflers, by Noise Section Personnel, U.S. Dept. of Interior, Mining Enforcement and Safety Administration, DB31-H73.

Available from: Glen W. Sutton
Denver Technical Support Center
P.O. Box 25367
Denver Federal Center
Denver, CO 80225

Tel. No. 303-234-4824

Cost: None

National Aeronautics and Space Administration

A Study of Poultry Processing Plant Noise Characteristics and Potential Noise Control Techniques. J. C. Wyvill, A. D. Jape, L. J. Moriarty, R. D. Atkins, and R. A. Cassanova; Georgia Institute of Technology; 1980.

Available from: NTIS

Department of Transportation

Noise Abatement Techniques for Construction Equipment, DOT-TSC-NHTSA-79-45, HS-803 293, August 1979.

Available from: U.S. Department of Transportation
Research and Special Programs
Adminstration
Transportation Systems Center
Cambridge, MA 02142
Attn: Rober Mason
Tel: 8-837-2443 FTS
(Supply limited)

National Technical Information Service
Springfield, Virginia 22161
Cost and Accession Number not known.

VII. APPENDIX

The project descriptions in this section were received too late to be included in the main section of the report. They are appended here so that the report could be made as nearly complete as possible.

DEPARTMENT OF COMMERCE

National Bureau of Standards

PROJECT DESCRIPTION

TITLE:	Building and Architectural Acoustics: Sound Absorption and Room Acoustics
OBJECTIVES:	This project focuses upon the improvement of measurement technology for quantifying the performance of building elements in establishing the building user's acoustic environment. The improved measurement technology will increase building design productivity and improving the building acoustic environment will increase the producitivity of the building user. The project focuses upon the technical areas of sound absorption and room acoustics.
ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980:	Sound Absorption and Room Acoustics: This task has been initiated during the current fiscal year and focuses upon determining the applicability of Sabine's theory for quantifying the sound absorption characteristics of building materials. The research is progressing using the development of an Absolute Sound Power source as a first step in the effort. In the future, laboratory measurements will be conducted to test the applicability of Sabine's theory to laboratory measurements and the application of results to acoustic design of building spaces.
SCHEDULE:	The planned effort will continue through fiscal year 1985 and result in improved measurement methodologies cumulating in the development of a design guide for building noise control and architectural acoustics in fiscal year 1986.
FUNDING:	$100,000 per year until completion.
SPONSOR:	U.S. Department of Commerce; National Bureau of Standards
PROJECT OFFICER(S):	
TYPE OF AGREEMENT:	In-house
INVESTIGATOR:	

PROJECT DESCRIPTION

TITLE: Building and Architectural Acoustics: Impact Noise Measurement and Rating

OBJECTIVES: This project focuses upon the improvement of measurement technology for quantifying the performance of building elements in establishing the building user's acoustic environment. The improved measurement technology will increase building design productivity and improving the building acoustic environment. The improved measurement technology will increase building the productivity of the building user. The project focuses upon the technical areas of impact noise measurement and rating of building structure.

ACCOMPLISHMENTS and STATUS AS OF JANUARY 1980: Impact Noise Measurement and Rating: This task has been initiated during the current fiscal year and focuses upon the quantification of football impact noises. A literature review has been conducted to establish the parameters characterizing the impact forces generated by live walkers. A draft report has been prepared describing the state-of-the art of impact noise in buildings and discusses the measurement, characterization, and subjective response aspects of the problem. Future efforts will comprise impact force measurements using live walkers. The data resulting from these tests will be used to improve the design of the mechanical tapping machine currently used to measure impact noise insulation of floor-ceiling assemblies. This effort will be followed by field measurements of impact noise to develop an improved test methodology that relates impact sound insulation rating to the building user's subjective response.

SCHEDULE: The project is planned to continue through fiscal year 1985 with the results being incorporated in a design guide for building noise control and architectural acoustics in fiscal year in 1986.

FUNDING: $100,000 per year until completion.

SPONSOR: U.S. Department of Commerce; National Bureau of Standards

PROJECT OFFICER(S):

TYPE OF AGREEMENT: In-house

INVESTIGATOR:

PROJECT DESCRIPTION

TITLE:	Building and Architectural Acoustics: Building Noise Isolation and Insulation
OBJECTIVES:	This project focuses upon the improvement of measurement technology for quantifying the performance elements in establishing the building user's acoustic environment. The improved measurement technology will increase building design productivity and improving the building acoustic environment will increase the productivity of the building user. The project focuses upon the technical areas of measurement of building element noise insulation properties and building noise isolation characteristics and the relationship to laboratory measurements.
ACCOMPLISH-MENTS and STATUS AS OF JANUARY 1980:	Building Noise Isolation and Insulation Measurements: This task focuses upon the development of improved measurement methods for characterizing noise isolation performance of building spaces and noise insulation characteristics of building elements. Currently, a field measurement capability is being developed to establish a data base for improved measurement methodologies. A literature review has been conducted and draft reports have been prepared in the areas of sound transmission and structure-borne noise describing the state-of-the-art in noise technology. Future effort comprises the conduct of field measurements and application of theory aimed at improving the accuracy of standard test methods.
SCHEDULE:	The planned effort comprises completion of the development of improved noise isolation and field measurement methodologies by the end of fiscal year 1984. During fiscal year 1985, the design criteria developed for building noise control and architectural acoustics during fiscal year 1986.
FUNDING:	$100,000 per year until completion.
SPONSOR:	U.S. Department of Commerce, National Bureau of Standards
PROJECT OFFICER(S):	
TYPE OF AGREEMENT:	In-house
INVESTIGATOR:	

PROJECT DESCRIPTION

TITLE: Method for Assessing Costs of a Model Noise Control Code for Buildings

OBJECTIVE: This project focuses upon the development of a methodology for assessing the costs of implementing the provisions of a model building code addressing noise control.

ACCOMPLISHMENTS AS OF JANUARY 1980: The effort is currently in progress. The work is being conducted by the staff of the Center for Building Technology. The elements of the methodology have been established and a data analysis phase is nearing completion. Regression analyses have been conducted to establish construction cost as a function of the noise insulation characteristics of building elements or components. These data comprise basic standard architectural designs including doors, exterior walls, glazing, interior walls, and floor ceiling assemblies. A method has been developed for calculating the noise insulation requirement for each element of a multi-element wall so that the composite wall noise insulation specification is achieved at the minimum construction cost. Costs related to administration and to testing required by the model building code are currently being assessed.

SCHEDULE: To be completed during FY 80.

FUNDING: $75,000

SPONSOR: U.S. Environmental Protection Agency/Office of Noise Abatement and Control

PROJECT OFFICER(S):

TYPE OF AGREEMENT:

INVESTIGATOR:

NATIONAL SCIENCE FOUNDATION

PROJECT DESCRIPTION

TITLE:	An Investigation of the Vibratory and Acoustical Characteristics of Flexible Mechanical Systems on Vibrating Foundations
OBJECTIVES:	This project will examine generation of noise by flexible mechanical systems so that engineers will be able to predict the noise characteristics of machinery at the design stage.
ACCOMPLISHMENTS AND STATUS AS OF JANUARY 1980:	Project scheduled to begin in July 1980.
SCHEDULE:	July 1980 through June 1982
FUNDING:	$120,000 for two years
PROJECT OFFICER(S):	David K. Anand
SPONSOR(S):	National Science Foundation, Division of Civil and Mechanical Engineering Mechanical Sciences and Engineering Group
TYPE OF AGREEMENT:	Grant
INVESTIGATOR:	Brian Thompson and Adnan Akay Department of Mechanical Engineering Wayne State University Detroit, Michigan 48202