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National Occupational Health Survey of Mining Query System

Janet M. Hale, Dennis W. Groce, and Frank J. Hearl

National Institute for Occupational Safety and Health,
1095 Willowdale Road, M.S. 121, Morgantown, West Virginia 26505-2888

The National Institute for Occupational Safety and Health (NIOSH) conducted a project called the National Occupational Health Survey of Mining (NOHSM) from 1984 to 1989. The NOHSM consisted of 491 mine surveys. The mines were selected so as to be statistically representative of the entire U.S. mining industry. At each mine, NIOSH employees obtained data regarding occupational hygiene programs, potential exposure to chemical and physical agents, and bulk dust samples. The NOHSM survey data have been automated in the NOHSM Query System. This system allows queries to be processed against the data collected during the NOHSM survey. The NOHSM Query System was developed to be user friendly so that end-users can process their own queries against the NOHSM data. This was accomplished by making the system key driven with on-line help, and simplifying the query formulation process by minimizing the selections. There are two steps in formulating a query. Step one is deciding which data to retrieve or how to retrieve the data (selection criteria). Step two is deciding what information to view once the query is processed (output variables). After the NOHSM Query System was developed, NIOSH began work on an integrated system called the National Occupational Health Information System (NOHIS). The purpose of the NOHIS is to establish a centralized repository for certain occupational safety and health data and to provide users with a single point of access to the data, which come from various sources including NIOSH, the Occupational Safety and Health Administration, and the Mine Safety and Health Administration. The NOHIS supports multiple ways for users to view the data. It also provides options for the user to browse the data, create a standard or custom report, and query the database by building a new query or using a previously saved query. HALE, J.M.; GROCE, D.W.; HEARL, F.J.: NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING QUERY SYSTEM. APPL. OCCUP. ENVIRON. HYG. 10(4):274–282; 1995.

The National Institute for Occupational Safety and Health (NIOSH) conducted the National Occupational Health Survey of Mining (NOHSM) over a 6-year period beginning in May 1984 and ending in August 1989. The NOHSM consisted of four segments, with each segment covering a different set of mineral commodities such as coal, gold, and platinum. NIOSH surveyed 70 mining industries, gathering data from 491 mines nationwide. The goal of the survey was to inventory and characterize the health-related agents to which U.S. miners are potentially exposed. NOHSM was conducted at the request of the Mine Safety and Health Administration (MSHA).

The NOHSM data were collected in three parts: a questionnaire, an inventory of substances and chemicals, and a worksite observation survey.

- The questionnaire data consisted of 51 questions which were answered by mine management.
- The inventory consisted of all substances found on the mine site and the annual usage for each item.
- The worksite data were collected by the surveyors observing the workers during a normal work day.

The NOHSM was observational in that, during the worksite visit, the surveyors recorded potential exposures. A potential exposure indicates that the NOHSM surveyor determined that a health-related agent was in sufficient proximity to a worker such that the agent was likely to enter or contact the body of the worker. No exposure concentrations were measured by NIOSH. The surveyors also collected settled bulk dust samples which were analyzed for asbestos, silica, and 32 elements.

For each potential exposure, the occupation, location in the mine, process operation, and controls used while performing the job were recorded. The worksite data were collected for seven potential exposure categories:

- generic chemicals,
- trade name products,
- physical agents,
- musculoskeletal overload conditions,
- welding processes,
- grinding metals, and
- bulk settled dust.

There were 2451 generic chemicals recorded in the NOHSM and 49,799 trade name products recorded. These products (chemicals and trade names) fall into 614 unique product use categories such as "starter fluid" or "hand cleaner."

Some of the achievements from the NOHSM to date include:

- the publication of the quartz analysis of bulk dust samples;[1]
- the distribution of inventory reports to all 491 survey sites; and
- the generation of various special reports for MSHA, the Environmental Protection Agency, the American Conference of Governmental Industrial Hygienists, and NIOSH.

```
NQ9001          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING        04/21/93
                              QUERY SYSTEM - HELP

    WELCOME TO THE NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING (NOHSM)
    database system.  Before using the database, please read the
    following under the HELP key <F1> for an understanding of the system:

              INTRODUCTION TO NOHSM
              INTRODUCTION TO THE NOHSM DATABASE
              DATA DISCLAIMER
              DATA ASSOCIATIONS
              TERMS AND DEFINITIONS
              QUERY RESTRICTIONS
              FORMULATING QUERIES

    Under this help key, are Examples of different types of queries.
    If you need help, press the HELP key when main menu is displayed.


                        Press return to continue:
```

FIGURE 1. NOHSM Query System: introductory screen.

In addition, NIOSH is now preparing reports on the questionnaire data, the welding products, and the survey methodology with summary findings.

From the NOHSM, site reports were generated and sent to each participating facility. Reports summarizing the data for each commodity were generated and sent to MSHA. A PC-based database was produced. The database is titled the NOHSM Query System. This system was designed using Computer Associates Clipper® Software, which creates a stand-alone executable program. This allows the end-users to utilize the NOHSM Query System without purchasing software. Currently the system occupies 300 megabytes on a hard drive. This system was not designed to answer all possible queries concerning the NOHSM data; rather, it was designed to make the data available to all interested groups.

NOHSM Query System Demonstration

When the user enters the NOHSM Query System, an introductory screen is displayed (Figure 1), which suggests that the user read about the database by pressing the ⟨F1⟩ help key. Once the user has read this screen, he/she presses ⟨Enter⟩ to continue. There are four screens in addition to the introductory screen.

The main menu screen (Figure 2) allows the user to formulate a query. At the top of the main menu screen, a list of all the active keys is displayed. In the middle of the screen, the two components of formulating a query are displayed, and at the bottom of the screen is a current position indicator. The first phase in formulating a query is setting up the selection criteria. This allows the user to tell the system what data to include in the output. The second phase in formulating a query is marking the output variables, which allows the user to indicate the items he or she wants to see on the output. Figure 3 shows all of the available options for the main menu screen. The video screen only allows eight options to be shown at one time.

The valid items selection screen (Figure 4) allows the user to choose specific data items from a list of valid items. At the top of the selection screen, the active keys are displayed; in the middle of the screen the valid data items are displayed; and at the bottom of the screen is a current position indicator.

The report status screen (Figure 5) allows the user to view the status of the query. Since some of the queries may take some time to complete, this status screen appears when ⟨F7⟩ (run report from the main menu) is pressed. It shows the user the maximum number of records that will be searched, the number of records processed, and the number of records selected.

```
NQ0000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING        04/21/93
                              QUERY SYSTEM - MAIN MENU

Help                  <F1>  Key Definitions      <F2>  Option Definitions <F3>
Select Option      <ENTER>  Change Option Col.   <←→>  Down One Option      <↓>
Up One Option         <↑>   Next Page          <PG DN>  Previous Page    <PG UP>
Clear Option          <F4>  Clear All Options    <F5>  Review Selections   <F6>
Run Report            <F7>  Cancel RUN Report   <ESC>  Exit System         <F10>

    SELECTION CRITERIA                    OUTPUT VARIABLES

    Independent Commodities               Commodities
    Combined Commodities                  Chemicals
    Chemicals                             Trade Names
    Trade Names                           Manufacturers
    Manufacturers                         Product Use Terms
    Chemicals/Trade Names                 Physical Agents
    Product Use Terms                     Musculoskeletal Overloads
    Physical Agents                       Welding Processes

    Record:  2 of 26                      Record   1 of 37
```

FIGURE 2. NOHSM Query System: main menu screen.

```
NQ0000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING          04/21/93
                          QUERY SYSTEM - MAIN MENU

Help                  <F1>  Key Definitions      <F2>  Option Definitions <F3>
Select Option      <ENTER>  Change Option Col.  <←→>  Down One Option     <↓>
Up One Option         <↑>   Next Page          <PG DN>  Previous Page    <PG UP>
Clear Option          <F4>  Clear All Options    <F5>  Review Selections  <F6>
Run Report            <F7>  Cancel RUN Report   <ESC>  Exit System        <F10>

    SELECTION CRITERIA                    OUTPUT VARIABLES

    Independent Commodities               Commodities
    Combined Commodities                  Chemicals
    Chemicals                             Trade Names
    Trade Names                           Manufacturers
    Manufacturers                         Product Use Terms
    Chemicals/Trade Names                 Physical Agents
    Product Use Terms                     Musculoskeletal Overloads
    Physical Agents                       Welding Processes
    Musculoskeletal Overloads             Welding Metals
    Welding Processes                     Grinding Metals
    Grinding Metals                       Job Titles
    Independent Controls                  Locations
    Combined Controls                     Operations
    Job Titles                            Controls
    Locations                             Bulk Dust Types
    Operations                            Number of Workers (Summary)
    Questions                             Number of Workers (Detail)
    Projected Annual Usages               Projected Annual Usage (Summary)
    Number of Workers                     Projected Annual Usage (Detail)
    Bulk Dust Types                       Bulk Dust Percent (Summary)
    Bulk Dust Percentages                 Bulk Dust Percent (Detail)
    Welding Chemicals                     Number of Workers (All workers)
    Welding Trade Names                   Number of Workers (Males)
    Grinding Chemicals                    Number of Workers (Females)
    Grinding Trade Names                  Count of Chemicals
                                          Count of Trade Names
                                          Count of Product Use Terms
                                          Count of Physical Agents
                                          Count of Musculo. Overloads
                                          Count of Welding Processes
                                          Count of Grinding Metals
                                          Welding Process Chemicals
                                          Welding Process Trade Names
                                          Grinding Chemicals
                                          Grinding Trade Names
                                          Employment Level Summary

    Record:  1 of 26                      Record   1 of 37
```

FIGURE 3. NOHSM Query System: main menu options.

The browse report screen (Figure 6) allows the user to view the query results. At the top of the screen the active keys are displayed; in the middle of the screen the report is displayed; and at the bottom of the screen is a current position indicator. At the beginning of the report, the query formula is displayed showing the selection criteria and the output variables.

Several example queries will illustrate the use of the system. For each example, the process of formulating the query and viewing the results is described.

Example 1

QUERY. How many workers are potentially exposed to flotation agents?

```
NQ1000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING          04/21/93
                QUERY SYSTEM - COMBINED COMMODITIES SELECTION

Help                  <F1>  Key Definitions      <F2>  Item Definitions   <F3>
Select Item        <ENTER>  Down One Item         <↓>  Up One Item          <↑>
Next Page          <PG DN>  Previous Page     <PG UP>  Contains String  <HOME>
Next Contains         <TAB>  Move Position       <INS>  Select All Items   <F8>
Clear Selection       <F4>  Cancel Contains     <ESC>  End Selection      <END>

   ALUMINUM
   ANTHRACITE COAL
   APLITE
   ASBESTOS
   BARITE
   BERYL
   BITUMINOUS COAL
   BORON MINERALS
   CEMENT
   CLAY

    Record:          1  of          70
```

FIGURE 4. NOHSM Query System: valid items selection/screen (example).

```
NQ4000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING          04/21/93
                      QUERY SYSTEM - REPORT PROCESSING

          Press the <ESC> key to abort report

          Patience Please ... Creating report file

          Out of              1 record to be searched (maximum)

                              0 records have been processed and

                              0 records have been selected.

                              0 % Complete.
```

FIGURE 5. NOHSM Query System: report status screen.

STEP 1. On the main menu screen, place the highlighted bar in the selection criteria column on the "combined commodities" option and press ⟨Enter⟩ to display the valid items selection screen; press ⟨F8⟩ to select all of the commodities; press ⟨Enter⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 2. To select the product use term "flotation agent," place the highlighted bar on the "product use terms" option under the selection criteria column and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Home⟩ to locate a use term that contains the string "flot"; type in "flot" at the enter prompt; press ⟨Enter⟩. The system will locate the first instance where a use term contains the string "flot." The system finds the string "reagent, flotation" and positions the cursor on that item. To select the item, press ⟨Enter⟩. Since this is the only use term we are interested in, press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 3. We have finished the first phase in formulating a query. Now we need to start the second step: marking output variables. Place the highlighted bar in each of these output variable options and press ⟨Enter⟩: "product use terms" and "number of workers (summary)." Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 4. We have finished the query formula and are ready to process the query by pressing ⟨F7⟩. The report status screen is displayed. Once the query is completed, press ⟨Enter⟩ to display the report. Figures 7 and 8 show the results of this query. There were 1392 workers observed in all of the commodities to be potentially exposed to flotation agents. Using the observed number, a statistical projection was performed estimating that 4129 (2%) of all workers in the mining industries are potentially exposed to flotation agents. To return to the main menu, press ⟨End⟩.

Example 2

QUERY. Which flotation agents are used in the platinum group commodity.

STEP 1. On the main menu screen, place the highlighted bar in the selection criteria column on the "independent commodities" option and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Ins⟩ to move the cursor to the option starting with the input string "platinum"; type in "platinum" at the enter prompt; press ⟨Enter⟩. The system finds the first instance where a commodity name begins with the string "platinum." The system finds "platinum group" and positions

```
NQ5000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING          04/21/93
                      QUERY SYSTEM - REPORT FILE BROWSE

Key Definitions      <F2>  Save to DOS File    <F7>  Print Report        <F8>
Move Position        <F9>  Down One Line        <↓>  Up One Line         <↑>
Next Page         <PG DN>  Previous Page     <PG UP>  Stop Browse       <END>

SELECTION CRITERIA/OUTPUT VARIABLES

Combined Commodities:

ALUMINUM
ANTHRACITE COAL
APLITE
ASBESTOS
BARITE
BERYL
BITUMINOUS COAL
BORON MINERALS

   Record:          1  of          93
```

FIGURE 6. NOHSM Query System: report browse screen (example).

```
NQ5000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING        04/21/93
                        QUERY SYSTEM - REPORT FILE BROWSE

Key Definitions      <F2>  Save to DOS File     <F7>  Print Report        <F8>
Move Position        <F9>  Down One Line         <↓>  Up One Line          <↑>
Next Page         <PG DN>  Previous Page     <PG UP>  Stop Browse        <END>

SELECTION CRITERIA/OUTPUT VARIABLES

Combined Commodities:

ALUMINUM
ANTHRACITE COAL
APLITE
ASBESTOS
BARITE
BERYL
BITUMINOUS COAL
BORON MINERALS
CEMENT
CLAY
COPPER (PORPHYRY)
COPPER (SEDIMENTARY)
FELDSPAR
FLUORSPAR
GEMSTONES
GILSONITE
GOLD
GRANITE (CRUSHED & BROKEN)
GRANITE (DIMENSION)
GYPSUM
IRON ORE
KYANITE
LEAD/ZINC (LEAD)
LEAD/ZINC (ZINC)
LEONARDITE
LIGNITE COAL
LIME
LIMESTONE (CRUSHED & BROKEN)
LIMESTONE (DIMENSION)
LITHIUM
MAGNESITE
MANGANESE
MARBLE (CRUSHED & BROKEN)
MARBLE (DIMENSION)
MERCURY
METAL ORES, NEC
MICA
MOLYBDENUM
NONMETALLIC MINERALS, NEC
OIL SHALE
PERLITE
PHOSPHATE ROCK
```

FIGURE 7. NOHSM Query System: results from query 1, part 1.

the cursor on that item. To select the item, press ⟨Enter⟩. Since this is the only commodity we are interested in, press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 2. To select the product use term "flotation agent," place the highlighted bar on the "product use terms" option under the selection criteria column and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Home⟩ to locate a use term that contains the string "flot"; type in "flot" at the enter prompt; press ⟨Enter⟩. The system will locate the first instance where a use term contains the string "flot." The system finds the string "reagent, flotation" and positions the cursor on that item. To select the item, press ⟨Enter⟩. Since this is the only use term we are interested in, press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 3. We have finished the first phase in formulating a query. Now we need to start the second phase: marking output variables. Place the highlighted bar in each of these output variable options and press ⟨Enter⟩: "chemicals" and "trade names." Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 4. We have finished the query formula and are ready to process the query by pressing ⟨F7⟩. The report status screen is displayed. Once the query is completed, press ⟨Enter⟩ to display the report. Figure 9 shows the results of this query. There are two chemicals and five trade name products listed. To return to the main menu, press ⟨End⟩.

Example 3

QUERY. Are industrial hygienist or medical services provided where AERO 350 xanthate is used in the platinum group commodity?

STEP 1. On the main menu screen, place the highlighted bar in the selection criteria column on the "independent commodities" option and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Ins⟩ to move the cursor to the option starting with the input string "platinum"; type in "platinum" at the enter prompt; press ⟨Enter⟩. The system finds the first instance where a commodity name begins with the string "platinum." The system finds "platinum group" and positions

```
PIGMENT MINERALS
PLATINUM GROUP
POTASH
PUMICE
PYRITES
RARE EARTHS
SALT (EVAPORATED)
SALT (ROCK)
SAND AND GRAVEL
SANDSTONE (CRUSHED & BROKEN)
SANDSTONE (DIMENSION)
SHALE (COMMON)
SILVER
SLATE (CRUSHED & BROKEN)
SLATE (DIMENSION)
SODIUM COMPOUNDS
STONE, CRUSHED & BROKEN, NEC
STONE, DIMENSION, NEC
TALC, SOAPSTONE & PYROPHYLITE
TITANIUM
TRAPROCK (CRUSHED & BROKEN)
TRONA
URANIUM
URANIUM (SOLUTION)
URANIUM - VANADIUM ORES
VANADIUM
VERMICULITE
ZIRCON

Product Use Terms:

REAGENT, FLOTATION

OUTPUT VARIABLES:

Product Use Terms
Number of Workers (Summary)

================================================================================
Commodity:            Combination of various commodities
Product Use:          REAGENT, FLOTATION
# of Observed:                      1392   (All Workers)
# of Projected:                     4129   (All Workers)
% of Workers:                          2   (All Workers)
--------------------------------------------------------------------------------
Message:              END OF REPORT
================================================================================

    Record:           1  of          93
```

FIGURE 8. NOHSM Query System: results from query 1, part 2.

the cursor on that item. To select the item, press ⟨Enter⟩. Since this is the only commodity we are interested in, press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 2. To select the trade name "AERO 350 xanthate," place the highlighted bar on the "trade names" option under the selection criteria column and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Ins⟩ to move the cursor to the option starting with the input string "AERO 350"; type in "AERO 350" at the enter prompt; press ⟨Enter⟩. The system finds the first instance where a trade name begins with the string "AERO 350." The system finds "AERO 350 xanthate" and positions the cursor on that item. To select the item, press ⟨Enter⟩. Since this is the only trade name we are interested in, press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 3. To select questions 11 and 25 from the questionnaire data, place the highlighted bar on the "questions" option under the selection criteria column and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Ins⟩ to move the cursor to the option starting with the input string "ques 11"; type in "ques 11" at the enter prompt; press ⟨Enter⟩. The system finds the first instance where a question begins with the string "ques 11." The system finds "ques 11: formal health unit" and positions the cursor on that item. To select the item, press ⟨Enter⟩. Since we are interested in another question, press ⟨Ins⟩ to move the cursor to the option starting with the input string "ques 25"; type in "ques 25" at the enter prompt; press ⟨Enter⟩. The system finds the first instance where a question begins with the string "ques 25." The system finds "ques 25: individuals for prevention of illness" and positions the cursor on that item. To select the item, press ⟨Enter⟩. Press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 4. We have finished the first phase in formulating a query. Now we need to start the second phase: marking output variables. Place the highlighted bar in each of these output variable options and press ⟨Enter⟩: "trade names," "questions," and "number of workers (summary)." Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 5. We have finished the query formula and are ready to process the query by pressing ⟨F7⟩. The report status screen is displayed. Once the query is completed, press ⟨Enter⟩ to display the report. Figure 10 shows the results of this query. For

```
NQ5000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING        04/21/93
                        QUERY SYSTEM - REPORT FILE BROWSE

Key Definitions      <F2>  Save to DOS File     <F7>  Print Report        <F8>
Move Position        <F9>  Down One Line         <↓>  Up One Line          <↑>
Next Page         <PG DN>  Previous Page     <PG UP>  Stop Browse        <END>

SELECTION CRITERIA/OUTPUT VARIABLES

Independent Commodities:

PLATINUM GROUP

Product Use Terms:

REAGENT, FLOTATION

OUTPUT VARIABLES:

Chemicals
Trade Names

================================================================================
Commodity:            PLATINUM GROUP
Chemical:             SULFURIC ACID
--------------------------------------------------------------------------------
Commodity:            PLATINUM GROUP
Chemical:             PENTANOL, 2-, 4-METHYL-
--------------------------------------------------------------------------------
Commodity:            PLATINUM GROUP
Trade Name:           AERO 350 XANTHATE
--------------------------------------------------------------------------------
Commodity:            PLATINUM GROUP
Trade Name:           CYANAMID AERO 3477 PROMOTER, AQUEOUS SPS. NO. 15054
--------------------------------------------------------------------------------
Commodity:            PLATINUM GROUP
Trade Name:           AQUALON CMC-T, TYPE 7LCT
--------------------------------------------------------------------------------
Commodity:            PLATINUM GROUP
Trade Name:           MARK VIII HEAVY DUTY BUTYL DEGREASER AND ALL PURPOSE
                      CLEANER
--------------------------------------------------------------------------------
Commodity:            PLATINUM GROUP
Trade Name:           PHILLIPS 66 ORFOM P407
--------------------------------------------------------------------------------
Message:              END OF REPORT
================================================================================
    Record:            1  of          40
```

FIGURE 9. NOHSM Query System: results from query 2.

question 11, the only answer was "no," which indicates that 63 percent of all the workers in the platinum group commodity are potentially exposed to AERO 350 xanthate and have no formal health unit at the facility. For question 25, the only answer was "yes, but not a certified industrial hygienist," which indicates that 63 percent of all the workers in the platinum group commodity are potentially exposed to AERO 350 xanthate and have an individual responsible for the prevention of illness, but that individual is not a certified industrial hygienist. To return to the main menu, press ⟨End⟩.

Example 4

QUERY. What controls or personal protective equipment are used in the platinum group commodity where AERO 350 xanthate is a potential exposure.

STEP 1. On the main menu screen, place the highlighted bar in the selection criteria column on the "independent commodities" option and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Ins⟩ to move the cursor to the option starting with the input string "platinum"; type in "platinum" at the enter prompt; press ⟨Enter⟩. The system finds the first instance where a commodity name begins with the string "platinum." The system finds "platinum group" and positions the cursor on that item. To select the item, press ⟨Enter⟩. Since this is the only commodity we are interested in, press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 2. To select the trade name "AERO 350 xanthate," place the highlighted bar on the "trade names" option under the selection criteria column and press ⟨Enter⟩ to display the valid items selection screen; press ⟨Ins⟩ to move the cursor to the option starting with the input string "AERO 350;" type in "AERO 350" at the enter prompt; press ⟨Enter⟩. The system finds the first instance where a trade name begins with the string "AERO 350." The system finds "AERO 350 xanthate" and positions the cursor on that item. To select the item, press ⟨Enter⟩. Since this is the only trade name we are interested in, press ⟨End⟩ to return to the main menu. Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

STEP 3. We have finished the first phase in formulating a query. Now we need to start the second phase: marking output variables. Place the highlighted bar in the each of these output variable options and press ⟨Enter⟩: "trade names" and "controls." Each selected item will have a star (*) that appears to the left of it, indicating that the item has been selected.

```
NQ5000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING        04/21/93
                      QUERY SYSTEM - REPORT FILE BROWSE

Key Definitions      <F2>  Save to DOS File    <F7>  Print Report        <F8>
Move Position        <F9>  Down One Line        <↓>  Up One Line         <↑>
Next Page         <PG DN>  Previous Page    <PG UP>  Stop Browse        <END>

SELECTION CRITERIA/OUTPUT VARIABLES

Independent Commodities:

PLATINUM GROUP

Trade Names:

AERO 350 XANTHATE

Questions:

QUES 11:  FORMAL HEALTH UNIT
QUES 25:  INDIVIDUALS FOR PREVENTION OF ILLNESS

OUTPUT VARIABLES:

Trade Names
Questions
Number of Workers (Summary)

================================================================================
Commodity:            PLATINUM GROUP
Trade Name:           AERO 350 XANTHATE
Question:             QUES 11:  FORMAL HEALTH UNIT
Answer:               No
# of Observed:                      233 (All Workers)
# of Projected:                     233 (All Workers)
% of Workers:                        63 (All Workers)
--------------------------------------------------------------------------------
Commodity:            PLATINUM GROUP
Trade Name:           AERO 350 XANTHATE
Question:             QUES 25:  INDIVIDUALS FOR PREVENTION OF ILLNESS
Answer:               Yes, but not a certified industrial hygienist
# of Observed:                      233 (All Workers)
# of Projected:                     233 (All Workers)
% of Workers:                        63 (All Workers)
--------------------------------------------------------------------------------
Message:              END OF REPORT
================================================================================

    Record:            1  of           40
```

FIGURE 10. NOHSM Query System: results from query 3.

```
NQ5000          NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING        04/21/93
                      QUERY SYSTEM - REPORT FILE BROWSE

Key Definitions      <F2>  Save to DOS File    <F7>  Print Report        <F8>
Move Position        <F9>  Down One Line        <↓>  Up One Line         <↑>
Next Page         <PG DN>  Previous Page    <PG UP>  Stop Browse        <END>

SELECTION CRITERIA/OUTPUT VARIABLES

Independent Commodities:

PLATINUM GROUP

Trade Names:

AERO 350 XANTHATE

OUTPUT VARIABLES:

Trade Names
Controls

================================================================================
Commodity:            PLATINUM GROUP
Trade Name:           AERO 350 XANTHATE
Controls:              62% DILUTION VENTILATION
                        7% NATURAL VENTILATION
                        1% NO CONTROL
                        6% PARTICULATE FILTER RESPIRATOR WITH HALF FACEPIECE
--------------------------------------------------------------------------------
Message:              END OF REPORT

    Record:            1  of           25
```

FIGURE 11. NOHSM Query System: results from query 4.

TABLE 1. NOHIS Categories

NOHIS Category	Data Source
Chemical/trade name products	• NIOSH Registry of Toxic Effects of Chemical Substances • DLA Hazard Material Information System • NIOSH National Occupation Exposure Survey
MSHA/BOM	• MSHA address and employment • MSHA accident, injury, and illness • MSHA coal mine respirable dust • MSHA coal mine quartz dust • BOM mine inspection data analysis system
NIOSH	• Health hazard evaluations • NOHSM • Coal mine X-ray surveillance
OSHA	• Inspection data • Sampling data • Citation data

STEP 4. We have finished the query formula and are ready to process the query by pressing ⟨F7⟩. The report status screen is displayed. Once the query is completed, press ⟨Enter⟩ to display the report. Figure 11 shows the results of this query. The percentage preceding the control title indicates the percentage of workers in the platinum group commodity who use that control while the potential exposure to AERO 350 xanthate occurs. To return to the main menu, press ⟨End⟩.

NOHSM Query System Availability

The NOHSM Query System is available through the NIOSH internal Local Area Network (LAN). It can also be installed on a local machine using floppies or CD-ROM. NIOSH will also provide special reports upon request. To obtain a copy of the floppy diskettes or the CD-ROM, contact NIOSH at:

National Institute for
Occupational Safety and Health
Attention: NOHSM Database Manager
MS H-121
1095 Willowdale Drive
Morgantown, WV 26505-2888

Data Enhancement Project

There has been recent interest in the development of an occupational exposure database.[2] One of the data enhancement projects NIOSH is working on is to integrate NOHSM, trade name ingredients, MSHA inspection data, Occupational Safety and Health Administration (OSHA) inspection data, NIOSH survey data, and Bureau of Mines (BOM) data. NIOSH calls this integrated system the National Occupational Health Information System (NOHIS). Table 1 shows the four categories of NOHIS information and the data sources for those categories.

An example of a query that can be processed under the NOHIS is: List the mines that have MSHA respirable dust samples, were included in the NOHSM survey, and use the chemical with the Chemical Abstracts Society number 14808-60-7. This query links three of the NOHIS categories (MSHA/BOM, NIOSH, and chemical or trade name products).

Conclusion

Anyone interested in the results of the NOHSM should contact NIOSH in Morgantown, West Virginia. In addition, we would be pleased to update anyone who is interested on the progress of the NOHIS system as it unfolds during the coming years.

NIOSH recognizes the importance of database integration and encourages the development of occupational exposure databases that are compatible. Our work on the NOHIS is one example of how past occupational exposure data can be integrated in spite of dissimilarities.

References

1. Greskevitch, M.F.; Turk, A.R.; Dieffenbach, A.L.; et al.: Quartz Analyses of the Bulk Dust Samples Collected by the National Occupational Health Survey of Mining. Appl. Occup. Environ. Hyg. (1992).
2. Gomez, M.R.: A Proposal To Develop a National Occupational Exposure Databank. Appl. Occup. Environ. Hyg. (1993).