

FINAL PROGRESS REPORT

**Department of Mechanical and Industrial Engineering
Master of Environmental Health and Safety Program
University of Minnesota Duluth
Duluth, Minnesota 55812**

OCCUPATIONAL SAFETY AND HEALTH TRAINING

October 1, 2002 – June 30, 2005

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TABLE OF CONTENTS

	<i>Page Number</i>
TITLE PAGE	1
TABLE OF CONTENTS	2
ABSTRACT	3
SIGNIFICANT FINDINGS	
A GOALS	4
B TRAINEES' ACHIEVEMENTS/PERFORMANCE	5
B.1 Semiconductor Research Scholarship Competition	5
B.2 Industry Outreach	6
B.3 Trainees' Travel	6
REPORT AND CONCLUSIONS	
A PROGRAM STRUCTURE AND PLAN	7
B ADMISSION	9
C TRAINEES DURING THE REPORTING PERIOD	9
D FACULTY COMMITMENT	10
E MEHS PROGRAM ADVISORY BOARD	11
F TRAINING FACILITIES AND RESOURCES	11
F.1 Ergonomics and Occupational Biomechanics/Work Physiology Labs	11
F.2 Industrial Hygiene and Environmental Health Laboratory	12
F.3 MEHS Online Resource Library – Donated by J.J. Keller	12
F.4 MEHS Design and Digital Medial Training Laboratory	12
F.5 Other Laboratories Shared by Mechanical and Industrial Engineering	12
G CONCLUSION	12
LIST OF PUBLICATIONS	13

ABSTRACT

In the 21st century, concerns for the health and safety of the workers, as well as for the preservation of our natural environment, have never been greater. Progressive organizations have demonstrated that while strong environmental health and safety programs require a commitment of considerable dollars, in the long run this commitment saves money, maximizes profits, prevents injuries, saves lives, and preserves our natural resources. Therefore, the demand for qualified environmental health and safety personnel should continue to grow. The University of Minnesota Duluth, Master of Environmental Health and Safety program has a time-honored reputation for preparing highly qualified graduates for these most rewarding fields of endeavor.

In response to this growing demand, the Master of Environmental Health and Safety (MEHS) program strives to prepare graduates for professional careers in environmental health and safety which include, but are not limited to, occupational safety and health and other related general fields. The coursework includes analysis of occupational safety and health problems, accompanying problem-solving and decision-making techniques, and the application of established principles of accident prevention, control, and reduction in occupational settings. Since its foundation in 1975, the program has had about 650 graduates with approximately 100 percent placement within the professional fields identified. The overall program purpose is to continue to satisfy the ongoing demand for academically trained and competent occupational health and safety practitioners, by training highly qualified and skilled graduates capable of assuming the day-to-day responsibilities of safety professionals. Program objectives include training graduates with a MEHS degree for professional careers in environmental health and safety which include, but are not limited to, occupational safety and health and other related fields; attracting and recruiting highly qualified graduate students; and maintaining high quality graduate training in occupational health and safety.

Trainees are required to successfully complete 36 credit hours. All full-time students take the same core courses during the fall Semester. Trainees, based on their background and interest, may select elective courses in spring to complete the required credit hours. All trainees are required to complete a significant Plan B project through a cooperative internship in an industrial, government, or other organization that has an established occupational safety and health program or is in the process of implementing a program. Some trainees complete the project through an internship position with a firm and others may complete the project while in a full-time job with a firm. Trainees formally graduate upon completion of the Plan B projects.

Primary sites of training included the University of Minnesota Duluth, Department of Mechanical and Industrial Engineering and its laboratories -- Industrial Hygiene lab, Ergonomics lab, Biomechanics and Work Physiology lab, Industrial Ventilation lab -- and several collaborating industries throughout the Northern Minnesota region.

During the reporting period 57 students have gone through the MEHS program; 39 were selected and received a total of \$123,494 from the NIOSH training grant. The following is a report of the significant findings and the conclusions in this period.

SIGNIFICANT FINDINGS

The Master of Environmental Health and Safety program at the University of Minnesota Duluth has been in existence since 1975, although it was initially labeled the Master of Industrial Safety program. The program prepares graduates for professional careers in environmental health and safety which, include but is not limited to, occupational safety and health and other related fields. The coursework includes analysis of occupational safety and health problems, accompanying problem-solving and decision making techniques, and the application of established principles of accident prevention, control, and reduction in occupational settings. To date, the program has had over 650 graduates with approximately 100 percent placement within the professional fields identified.

The mission of the Master of Environmental Health and Safety Program at the University of Minnesota Duluth is to provide tools, concepts, and a deep hands-on understanding of theories and applications for students to develop, implement, and manage processes and programs to assess, control, and manage occupational safety and health risks in industry, government, and businesses.

A. GOALS

The overall program goal is to provide the highest quality of academically trained competent and safety practitioners for business and industries as well as for government and municipalities in Minnesota and nationwide. Program objectives include training graduates with hands-on working knowledge and general understanding in all aspects of occupational health and safety. The areas of training include, but are not limited to, safety regulations, environmental health, ergonomics and biomechanics, risk assessment and risk management, insurance and workers' compensation, construction safety, fire safety, transportation safety management, organizational and behavioral aspects of safety, environmental aspects, and legal implications.

The specific objectives for the reporting period were:

1. To attract and recruit highly qualified NIOSH trainees for the occupational safety and health program through the available stipends budget.
2. To acquire instructional resources to enhance the program curriculum and applied research
3. To acquire state-of-the-art laboratory and teaching equipment.

All objectives for the reporting period were achieved.

Goal One: A total of 39 trainees were provided stipends and tuition (\$123,494.00) during the reporting period. The number of NIOSH trainees is 68% of the total students who have completed their course work and have started their professional careers in EHS. The Table below illustrates the total number of students who have been enrolled in the MEHS program and also the number of NIOSH Trainees who have completed their course work and Plan B project.

YEAR	TOTAL ENROLLED	NIOSH TRAINEES	NIOSH TRAINEES WITH COMPLETED COURSE WORK	NIOSH TRAINEES WITH COMPLETED PLAN B
2002-03	20	15	15	13
2003-04	13	11	11	5
2004-05	24	13	13	2
<i>Total</i>	57	39	39	20

Goal Two: In the spring of 2004, the MEHS program was awarded a grant by J.J. Keller and Associates. The grant includes the use of all their electronic and online media materials

as well as access to their printed programmatic materials for regulatory compliance. The grant also provides computers and the financial support for one student per semester as technical resources for the systems. This is an exceptional tool for maintaining currency in the regulatory arena, and an excellent opportunity for both students and faculty development.

The MEHS Program Web Page has been under major development to be used as an effective tool for instructional purposes as well as a resource for the MEHS Alumni and other practitioners. The MEHS Web will be used to post all projects, training materials, and other documents that might be of use for the practitioners in the field.

Goal Three: In the fall of 2004, we began to develop the MEHS Digital Media and Training Research Laboratory. Some equipment has been purchased, with some purchases still in progress. This lab should be completed by fall of 2006. Once this lab is completed students will be able to develop specific training modules on CDs or other media using digital photos and digital movie clips that they will produce and direct for a specific subject.

B. TRAINEES ACHIEVEMENTS/PERFORMANCE

During the reporting period, trainees have been involved with several academic learning experiences as well as hands-on activities. As a result of their active participation in conducting applied research, and their active involvement with outreach activities with local industry, the MEHS trainees have gained valuable experience.

B.1. Semiconductor Student Research Scholarship Competition

Under the supervision of Dr. Dale Krageschmidt, CIH, CHMM, and with the assistance of other MEHS faculty, trainees were encouraged to pursue student research scholarship projects through the Semiconductor Environmental Safety and Health Association (SESHA). SESH is affiliated with over 15 universities throughout the United States and overseas. Each year, SESH provides scholarships to support student research opportunities in critical health, safety, and environmental challenges within the electronics and related high technology industries.

The MEHS program has had the most scholarship winners among all participant universities during the 24 years of SESH. Below is a list of MEHS scholarship winners during the reporting period. Only the top three research papers from all student competitors are published in the organizations journal. The following Table illustrates names of NIOSH Trainees who received the SESH scholarship, and the topic of their research. Three of these research papers were published in the SESH journal.

SESHA Scholarship Winner Trainees

<i>Year</i>	<i>Trainee</i>	<i>Topic</i>
2005	Crystal Gilbertson	"Safe Decontamination of Shock Sensitive Materials Used in the Semiconductor Industry"
2005	Jennifer Kavanagh	"Evaluating the Options: Recycling Hydrofluoric Acid" *
2005	Phillip Sayles	"Effects of ACGIH Proposed Reduction in the TLV of Arsine on the Semiconductor Manufacturing Process"
2004	Jon Liesmaki	"The Disposal/Recycling of Semiconductor Components from Artificial Pacing Devices"
2003	Rebecca Anderson	"Behavioral Based Safety: Solution of the Past or Key to the Future?" *
2003	Adam Feia	"Phytoremediation of Copper"
2003	Tom Moibi	"Environmental Health & Safety Concerns of Thin-Gate Oxide Materials"
2003	Nancy Tario	"Erin Brokovich or Chicken Little? Addressing the Semiconductor Industries' Concerns Regarding Perfluorooctane Sulfonate (PFOS)" *

* Also chosen for publication in the SESH Journal

B.2. Industry Outreach

The MEHS program provides a network of services in various aspects of occupational safety and health to industries in need of such services through the trainees' participation in field work in area industries. During the reporting period, MEHS trainees, under faculty supervision, took the responsibility to conduct numerous services for the local industries including ergonomics evaluation, safety audits, noise exposure survey, supervisory and workers training, ventilation evaluation, respiratory test fitting, hearing conservation program, air sampling, hazard communication, etc. These services are provided on a no-fee basis. Trainees gain substantial field experience and the industries benefit from the outcome of the projects. Some of the local industries that have been benefiting from such services in 2002-05 are:

- Louisiana Pacific
- Murphy Oil Company
- Diamond Brands, Inc.
- Home Depot
- Scuba, Inc.
- Target
- Georgia Pacific
- US Steel - Minntac
- Kenwood Liquor Store
- Lakehead Construction Company
- Great Lakes Gas Transmission Company
- Western Lake Superior Sanitary District (WLSSD)
- Lake Superior Brewing Company
- Pro-Print Commercial Printing Company
- Cirrus Design
- UPS
- Hibbing Taconite
- Walgreen
- MN Pollution Control
- Ski Hut
- Super One
- UMD Mail Room
- Lakehead Painting Co.
- Piggly Wiggly
- Saratoga Liquor Distributor
- University Liquors
- UMD Facilities - Painting
- UMD-ITSS
- Regis Salon
- Swanstrom Tools
- UMD – Food Service
- Cub Foods
- Pizza Luce
- Human Development Center
- Arrowhead Printing, Inc.
- Stora Enso Paper
- MinDOT

B.3. Trainees' Travel

The NIOSH trainee travel support, with in-kind support from the department, enabled student trainees to attend local as well as national conferences such as the Construction Safety Council's Conference in February 2002, 2003, and 2004. The lodging and food expenses were underwritten by the Construction Safety Council and St. Paul/Traveler Company. Other local conferences such as Minnesota Safety Council or General Contractor conferences and out-of-town conferences such as American Society of Safety Engineers (ASSE), and Semiconductor Environmental Safety and Health Association Conference were highly beneficial to student trainees. Attending such conferences, trainees:

- interacted with other safety professionals in the field and helped to build their networking system
- were exposed to most updated information and vendors
- gained visibility in the job market which helped them with their placement
- assisted recruiting other potentially qualified trainees
- presented papers/posters on EHS topics.

In 2005, Katherine Schofield, NIOSH Trainee, presented her research paper and poster on "Nanotechnology Changing the EHS Field" at the SSHA Conference in Scottsdale Arizona, ASSE Conference in New Orleans, Louisiana, and at the American Chemical Society Conference in Washington D.C..

REPORT AND CONCLUSIONS

The Master of Environmental Health and Safety program at the University of Minnesota Duluth has been in existence since 1975, although it was initially labeled the Master of Industrial Safety program. The program prepares graduates for professional careers in environmental health and safety which include but is not limited to occupational safety and health and other related general fields. The coursework includes analysis of occupational safety and health problems, accompanying problem-solving and decision making techniques, and the application of established principles of accident prevention, control, and reduction in occupational settings. To date, the program has had over 650 graduates with approximately 100 percent placement within the professional fields identified.

A. PROGRAM STRUCTURE AND PLAN

The Master of Environmental Health and Safety Program is an advanced degree offered through the UMD Department of Mechanical and Industrial Engineering. The department also offers a Bachelor of Science in Industrial Engineering and a Master of Science in Engineering Management

While some MEHS candidates continue their employment while enrolled, the degree is recommended for students who can spend time in concentrated daytime study and feel comfortable learning and contributing in a work team environment.

The Master of Environmental Health and Safety degree is best suited to students with solid background in engineering, technology, natural science, and health who are interested in further specialization in occupational safety and health. Applicants must have a baccalaureate degree from an accredited college or university, preferably with a major in technology, engineering, science, or other appropriate field. Baccalaureate degree holders with other relevant backgrounds or qualifications will also be considered. If academic deficiencies exist (chemistry, statistics, etc.), candidates may be accepted into the program contingent upon the successful completion of certain courses designed to correct them.

All MEHS candidates are given thorough preparation in problem-solving methods, decision-making techniques, record-keeping procedures, training and presentation skills, cross-organizational communication, and leadership.

In addition to studying safety principles and practices, MEHS program candidates learn how to analyze data and assess human situations, often drawing on personal experience in occupational settings. Shared information, group discussion, and the give and take of opinions help develop the sound professional judgment and practical knowledge that are of immediate value to prospective employers.

Students are also encouraged to join professional organizations where they have opportunities to learn from resource people in industrial safety, hygiene, and ergonomics; and establish professional contacts. In addition, the American Society of Safety Engineers (ASSE) student chapter brings in guest speakers and program alumni. Other student organizations include the American Industrial Hygiene Association (AIHA) and Human Factors Ergonomics Society (HFES).

Trainees are required to successfully complete 36 credit hours. All full-time students take the same core courses during the Fall Semester. Trainees, based on their background and interest, may select elective courses in the spring to complete the required credit hours.

Table below shows core and elective courses during the nine month full-time course work.

Fall Semester Core Courses (17 cr.)

Safe 6002.....	Regulatory Standards and Hazard Control (3)
Safe 6011.....	System Safety and Loss Control Techniques (3)
Safe 6101.....	Principles of Industrial Hygiene (3)
Safe 6213.....	Principles of Ventilation and IAQ (3)
Safe 6301.....	Occupational Biomechanics and Work Physiology (2)
Safe 6401.....	Environmental, Safety and Legal Implications (2)
Safe 6821.....	Organization and Administration of Safety Programs (2)

January Term (2 Elective cr.)

Safe 6402.....	Environmental Control Operations & Design (2)
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Spring Semester Core Courses (13 cr.)

Safe 6012.....	Risk Management and Workers' Compensation (2)
Safe 6051.....	Construction Safety (2)
Safe 6212.....	Noise Control Engineering (3)
Safe 6302.....	Occupational Ergonomics and Injury Management (3)
Safe 6802.....	Leadership, Teamwork, and Behavior in EHS (3)

Spring Semester Electives (12)

Safe 6102.....	Advanced Industrial Hygiene and Health Physics (2)
Safe 6121.....	Epidemiology and Industrial Toxicology (2)
Safe 6201.....	Fire Prevention and Emergency Preparedness (2)
Safe 6211.....	Transportation Safety (2)

Plan B Type Project (3)

Safe 6997.....	Internship in Environmental Health and Safety (3)
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Completion of Master's Plan B Project is a Requirement for Graduation

All MEHS trainees are required to do a significant Plan B project through a cooperative internship in an industrial, government, or other organization that has an established occupational safety and health program or is in the process of implementing a program. Some trainees complete the project through an internship position with a firm and others may complete the project while in a full-time job with a firm. Trainees formally graduate upon the completion of the Plan B projects. Traditionally, this project is completed within three to nine months after completion of all course work. An extension may be given due to special circumstances.

B. ADMISSION

Trainees were selected through an extensive process utilizing a set of metrics that employ high quality standards. The trainees' academic as well as practical experience in occupational safety and health were reviewed. Trainees who met the qualifications were personally interviewed by a selection committee to verify their qualifications and evaluate their level of enthusiasm and commitment for the field. Trainees admitted were expected to:

- a) remain in the program as a full-time student until graduation
- b) limit outside work to a maximum of 16 hours per week
- c) maintain high academic performance (3.0 GPA or better).

Trainees' academic performance in the occupational safety program was closely monitored each semester. One or more of the following conditions would have resulted in disqualifying a trainee from receiving stipends

- changing major from occupational safety and health
- accepting a full-time employment position
- failing to maintain a GPA of 3.0 for two consecutive semesters, or
- frequent absenteeism in classes and laboratory sessions resulting in performance below a "B" level.

Students granted traineeships had baccalaureate degrees from accredited schools in engineering, science, or any field with a strong physical or chemical science component. Funding support was requested for stipends and tuition traineeship as well as traveling to attend local and national conferences. In-kind support from professional organizations as well as the department was available for trainees' travel expenses.

C. TRAINEES DURING THE REPORTING PERIOD

Trainees during the reporting period were awarded a total of \$123,494 stipends and/or tuition. During the academic year 2002-03, 15 trainees were awarded a total of \$48,000, ranging from \$1,000 to \$6,000. During the academic year 2003-04, 11 trainees were awarded a total of \$40,000, ranging from \$1,000 to \$6,000. During the academic year 2004-05, 13 trainees were awarded a total of \$35,494, ranging \$1,000 to \$5,000. A list of trainees and their employers and location of their employment is provided below.

Trainees in 2002-2003

Kristi Adams, Loss Control Associate	Berkley Risk Administrators, Mpls., MN
Rebecca Anderson, EHS Specialist	Palo Alto Research Center, Palo Alto, CA
Sarah Bolgren, Risk Control Consultant	St. Paul Companies, St. Paul, MN
Adam Feia	Active Duty, Kuwait City, Kuwait
Christina Hagen, Risk Control Advisor	St. Paul Companies, St. Paul, MN
Chrissy Jerrick, Compliance Specialist	Golder Associates, Jacksonville, FL
Gina Mannino, Advanced Safety Engineer	3M, St. Paul, MN
Tom Moibi, Safety Engineer	Honeywell, Minneapolis, MN
Greg Olek, Safety Manager	Jammar Construction, St. Paul, MN
Andi Perrizo, Safety Representative	Hibbing Taconite Company, Hibbing, MN
Blake Pfaffendorf, EHS Specialist	Marathon Ashland Petroleum, St. Paul, MN
Abby Schimenek, Safety Director	J.R. Filanc Construction Co., Inc., Oceanside, CA
Justin Stevens, Safety Investigator	Minnesota OSHA, St. Paul, MN
Nancy Tario, Safety & Health Specialist	Louisiana Pacific, Two Harbors, MN
Andrew Zeitler, Safety Engineer	Sandia National Laboratory, Albuquerque, NM

Trainees in 2003-2004

Joe Batdorf, EHS Engineer	Perkin-Elmer Electronics, Santa Clara, CA
Steve Koslucher	MN-OSHA, St. Paul, MN
Jon Liesmaki, EHS Specialist	EORM, New Port Beach, CA
Rick Lorenz, Safety Director	Duininch Companies, Prinsburg, MN
Lindsey Maas, Staff Environmental Professional	E2M, Englewood, CO
Ann Mariucci, Safety Consultant	Zenith Insurance Co., San Diego, CA
Dustin Priette, EHS Consultant	McNeil, Grand Rapids, MN
Nicole Stengle, Safety Engineer	3M, St. Paul, MN
Ian Vagle, Safety & Compliance Associate	Veit Environmental, Rogers, MN
Luke Waller, EH&S Specialist	Redwing Shoes, Redwing, MN
Kasandra Wiederholt, Safety & Health Rep.	Zenith Ins. Co., Sarasota, FL

Trainees in 2004-2005

Kristin Bigham, Safety Trainer	Midwest Safety Counselors, Eden Prairie, MN
Jamie Denninger, EHS Intern	Medtronic, Santa Rosa, CA
Jennifer Kavanagh, Supervisor Safety & Health	Wausau Paper, Groveton, NH
Amy Gallagher, Industrial Hygienist	MN-OSHA, Duluth, MN
Crystal Gilbertson, Loss Control Specialist	Wausau Ins., Wausau, WI
Eric Heizman, Safety Engineer	3M, Sioux Falls, SD
Maryann Johnson, Loss Control Rep	The Zenith Insurance Company, Sarasota, FL
Amy Lindgren, Safety Intern	Louisiana Pacific, Two Harbors, MN
Nong Nopakun, Safety Consultant	McNeil Environmental, Minneapolis, MN
Phillip Sayles, Process Engr & Safety	Broin Companies, Sioux Falls, SD
Katie Schofield, Loss Control Specialist	The Builder's Group, Inver Grove, MN
Kent Swanson, Safety Engineer	US Steel, Pengily, MN
Sean Taylor, Loss Control Rep	The Zenith Insurance Company, San Diego, CA

D. FACULTY COMMITMENT

The Program Director, Dr. Hamid Fonooni, is a board-certified professional ergonomist and is a tenured full-time associate professor in the Master of Environmental Health and Safety (MEHS) program. He has over 18 years of experience in teaching and research in occupational and industrial ergonomics, has published numerous papers in refereed professional journals, and has presented numerous papers at national and international conferences. As a key program faculty and NIOSH Program Director, he devotes 10% time during the academic year and 100% time during the summer to the NIOSH Training Grant. The MEHS faculty advises the NIOSH Program Director on matters related to the training program, including selection of NIOSH trainees.

Including the NIOSH Program Director, there are three full-time faculty and seven adjunct faculty serving on the training program. There are two faculty who are Board-Certified in industrial hygiene; one faculty is a Board-Certified Safety Professional. The seven adjunct faculty are highly experienced safety professionals and are actively involved in the occupational safety and health profession in the area. The adjunct faculty also bring hands-on experience to our classes and promote student involvement in actual real life projects.

<u>CORE FACULTY</u>	<u>AREA OF COMPETENCY</u>	<u>TEACHING & RESEARCH AREA</u>
Hamid Fonooni, CPE	Ergonomics/System Safety/Risk Mgt.	Ergonomics/Biomechanics/Risk Mgt.
Dale Krageschmidt, CIH	Environmental Health/Industrial Hygiene	Exposure Assessment/Environmental
Vacant Position	Behavior Based Safety/Hazard Control	Behavior Safety/Safety Process

<u>ADJUNCT FACULTY</u>	<u>AREA OF COMPETENCY</u>	<u>TEACHING & RESEARCH AREA</u>
Harvey Burski, CSP.....	Safety Program Management.....	Regulations/Hazard Prevention
Norbert Norman, CIH.....	Industrial Hygiene.....	Risk Assessment/Noise Control
Jim Stauber.....	Occupational Safety/Loss Control.....	Loss Control/Fire Prevention
Doug Mroz.....	Construction Safety.....	Construction Safety
Chuck Bailey.....	Human Resources/Safety Psychology.....	Behavior Based Safety
Ritter Humphrey.....	Safety Management.....	Safety Organization and Admin
Ron Lund.....	Fleet Safety.....	Transportation Safety

E. MEHS PROGRAM ADVISORY BOARD

The Board consists of prominent members of the community having relevant background and experience in occupational safety and health. Current members are:

Charles Bailey, President, Bailey & Associates
(Committee Chair)

Bruce Beckstrom, HR Manager, Hibbing Foundry

Donald J. Bezek Jr., Manager, Home Depot

Thomas Broderick, Executive Director, Construction Safety Council

James Collins, CSP, Manager, Occupational Safety & Health, General Mills

Michele DeNoble, CIH, CSP, Consultant, Great Northern Services, Inc.

David Ham, Manager of Site Services, Palo Alto Research Center

Stephen Jones, Safety Director, Lakehead Constructors Inc.

Karen Maupins, CIH, Sr. Supply Chain Associate, Eli Lilly, Lilly Corporate Center

John McMurtry, CIH, CSP, Manager, Corporate Safety & Health, Northwest Airlines

Eric Mead, CIH, CHMM, EHS Manager, U.S. Environmental Protection Agency

Wende Morrell, RN, MS, CRRN, CCM, QRC, President, Morrell Incorporated

Daniel Murphy, President, Allied North America

William Pomroy, Industrial Hygienist, Mine Safety & Health Administration

Kristin Poppenberg, Attorney At Law, Faegre & Benson LLP

Brian Rauzi, Safety Engineer, US Steel Minntac

Kristi Ross, Sr. EH&S Specialist, Boston Scientific

Lonnie Schock, Corporate Safety Manager, Intel Corporation

Mark Salo, CSP, Manager, Safety US Steel

Paul Siciliano, Safety Consultant

Larry Thompson, CSP, Director of Health & Safety, MinDOT

The MEHS Board members meet twice a year in October and in May. Meeting minutes are kept, and Board suggestions are acted upon accordingly.

F. TRAINING FACILITIES AND RESOURCES

Facilities specifically dedicated to the MEHS program are an Industrial Hygiene lab, Ergonomics lab, Biomechanics and Work Physiology lab, Industrial Ventilation lab, classrooms and an office suite, workroom, resource center, and reception area.

F.1. Ergonomics and Occupational Biomechanics/Work Physiology Lab

Most class projects are done on-site at local industries. However, to increase trainees' working knowledge of measurement techniques and theoretical models state-of-the-art equipment are procured and will be updated through the NIOSH Training Grant.

F.2. Industrial Hygiene and Environmental Health Laboratory

The Industrial Hygiene and Environmental Assessment courses utilize two laboratories, one for teaching purposes and one for research purposes. Both labs have hoods for working with chemicals and biohazards safely, and have been constructed and configured to accommodate IH/Env testing by students and faculty.

F.3. MEHS Online Resource Library Donated by J.J. Keller

In spring of 2004, J.J. Keller and Associates donated all of their electronic and online media materials as well as access to their printed programmatic materials for regulatory compliance. They have also donated computers and the financial support for one student per semester as technical resources for the systems. This is an exceptional tool for maintaining currency in the regulatory arena, and an excellent opportunity for both students and faculty development.

F.4. MEHS Design and Digital Media Training Laboratory

Currently, this laboratory is in process of completion. By 2005-06 this lab should be ready for use by trainees. Students will be able to develop specific interactive training modules on CDs. This lab contains two computers equipped with graphical design software and hardware, scanner, a digital camera, a digital camcorder, and a color printer.

F.5. Other Laboratories Shared by Mechanical and Industrial Engineering

Other laboratories that are shared with the Mechanical and Industrial Engineering program include: Design and Manufacturing lab, Material Science lab, Materials Processing lab, Facility Planning, Simulation lab, Automation and Robotics lab, CAD/CAM lab, Manufacturing System Integration lab, Design of Industrial Systems lab, and Machining and Machine Tools lab.

G. CONCLUSION

During the reporting period of 2002-2005, the NIOSH Training Grant has provided a valuable opportunity for the individuals with qualification and passion to gain high quality education and hands-on experience through the Master of Environmental Health and Safety Program of the University of Minnesota Duluth. During the grant's three years, 39 NIOSH Trainees have completed the program and have joined the professional community as practitioners. The feedback from their employers is very positive. The trainees are grateful for the support they received from NIOSH that enabled them to concentrate on their education in an accelerated program such as the MEHS. As a result of the training grant, the MEHS program has been enhanced substantially. This is attested to by the presence of many top national firms on UMD campus every year recruiting the MEHS graduates

LIST OF PUBLICATIONS

Kavanagh, J., Krageschmidt, D., 2005, "Evaluating the Options: Recycling Hydrofluoric Acid," *Journal of the Semiconductor Environmental Safety and Health Association* (accepted for publication).

Xu, X., Krageschmidt, D., 2004, "Multicultural Health, Safety & Environmental Management: A Challenge or an Opportunity," *Journal of the Semiconductor Environmental Safety and Health Association*.

Tario, N., Krageschmidt, D., 2003, "Erin Brokovich or Chicken Little? Addressing the Semiconductor Industries' Concerns Regarding Perfluorooctane Sulfonates (PFOS)," *Journal of the Semiconductor Environmental Safety & Health Association*.

Anderson, R., Krageschmidt, D., 2003, "Behavioral Based Safety: Solution of the Past or Key to the Future?," *Journal of the Semiconductor Environmental Safety & Health Association*.