Worldwide Training in Air Pollution Control

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A survey of academic training in air pollution control was recently conducted for the APCA Education Council. Questionnaires were sent to faculty at over 200 universities in the United States and 150 universities around the world. This paper lists the schools which completed the questionnaire and includes the number of both undergraduate and graduate courses available, the academic department, and the range of research projects presently underway. The findings indicate that air pollution is a subject being taught worldwide. Most schools predict that their current level of instruction will not change in the next five years. Additions and corrections are requested on a sample questionnaire.

Over the last 20 years there has been an increased awareness of air pollution by the people of many countries. Industrialized countries were concerned with changes in air quality and the desire to improve conditions of those exposed to an industrial environment and the community as a whole. Nonindustrialized countries became concerned with how they could avoid these problems in the first place and still have the growth they desired. In the United States 20 years ago, professionals who were forced to deal with the problems had no formal training in air pollution control. Often they were individuals with degrees in various engineering disciplines and/or with some background in public health.

Much progress was made and much was learned. Standards have been set that would protect the public health. Most of the easy problems have been solved and now complex problems remain. One can understand why the most qualified people are needed to work on these solutions for both industry and the regulatory agencies.

It is helpful to know where both training and research are carried out. This has been documented in the U.S. and Canada in several recent studies.[1,2] Dr. Christopher Barthel and the staff of the National Clean Air Society (and the International Union of Air Pollution Prevention Associations) collected information on UK universities offering 3-year degree or postgraduate courses in environmental subjects.[3] This formed the basis of the motivation for the present study.

Objective

It was desired not only to update information on what was currently being done in the U.S. but also expand Barthel's work. Questionnaires were sent to all the faculty the author knew might be involved in air pollution control teaching or research (Appendix A). In addition, directories and lists of programs were consulted. It became clear that it was difficult to get a questionnaire that would substitute for a personal interview. The questionnaire was written in English.

In spite of the many limitations, good response was achieved on the initial attempt. This paper will summarize some of the results.

Results

In the U.S. 160 colleges and universities responded by completing questionnaires in 1982 and 1983. Academic programs with air pollution control training were identified in many other countries. A complete list of the results is given in Appendices B and C.

Appendix A. Questionnaire used in survey.

APCA EDUCATION COUNCIL SURVEY UPDATE

Please complete this questionnaire at your earliest convenience.

Number of different air pollution courses taught last year at university:
Undergraduate _____ Graduate _____

Number of air pollution related research projects:
None _____ 1 to 5 _____ 5 to 10 _____

Which of the following fits your program:
1. All students in major take one air pollution class.
2. Students in major can elect to take air pollution classes.
3. Students in major must take course covering air, water and other pollution control.
4. Students in which other majors will take one air pollution class:

CE
ME
ChE
CHEM
ENV
MET

How do you feel your program will change in the next few years?
1. It will remain the same.
2. It will be phased out.
3. It will be _____

Please make comments in space below. Include respondent's name and address.

_____

_____

Return to:
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Appendix B. U.S. universities with air pollution control training.

State	University	Department	U[a]	G[b]	Res[c]
Alaska	U of Alaska-Anchorage	CE	0	1	0
Arizona	Arizona State U	CE	0	1	—
	U of Arizona	ME	2	2	1
California	Cal Poly Pomona	Aero Engr	3	1	1
	Cal Poly San Luis Obispo	CE, EnvE	8	5	1
	California Inst of Tech	EnvE Sci	0	5	—
	Humboldt State U	EnvR E	2	0	—
	Stanford U	ME	1	1	—
	U California-Los Angeles	CE	3	1	1
	U of California-Berkeley	CE, ME, ChE, Chem	2	10	—
	U of California-Davis	CE	3	7	—
	U of California-Irvine	ME	3	3	—
	U of California-Riverside	Env Sci			
Colorado	Colorado School of Mines	Env S Eng	1	2	1
	Colorado State U	AtmSci, ME	0	3	1
Connecticut	U of Hartford	ME	1	0	0
Delaware	U of Delaware	CE, ChE	1	1	—
Florida	Florida Inst of Tech	Env Sci, Engr	3	3	1
	Florida International U	CE, EnvE Tech	1	4	—
	U of Central Florida	CE, Env Sci	1	1	1
	U of Florida	EnvE Sci	1	5	1
Hawaii	U of Hawaii-Manda	Engr	0	2	0
Idaho	U of Idaho	ChE, Chem	3	0	1
Illinois	De Paul U	Chem	1	0	1
	Illinois Inst of Tech	EnvE	1	7	—
	Northwestern U	CE	0	1	—
	S Illinois U-Carbondale	ThE, EnvE	3	1	2
	S Illinois U-Edwardsville	Geo	1	1	1
	U of Illinois-Chicago	PH, Env & Occ H Sci	1	5	2
	U of Illinois-Urbana	CE, EnvSt	1	9	2
Indiana	Purdue U	CE, ME	3	3	1
Iowa	U of Iowa	CE, EnvE	2	2	—
Kansas	U of Kansas	CE	1	3	1
Kentucky	Eastern Kentucky U	EnvH Sci	3	0	0
	U of Kentucky	ChE	1	1	1
	U of Louisville	ChE, EnvE	1	1	—
Louisiana	McNeese State U	Bio, Env Sci	2	1	1
Maryland	The Johns Hopkins U	EnvH	0	4	2
	U of Maryland	Met	3	1	1
Massachusetts	Harvard	PH	0	6	—
Michigan	Ferris State College	EnvQ Con	1	0	1
	Michigan State U	CE Sanitary Engr	0	3	2
	Oakland U	Chem	1	0	1
	Wayne State U	ChE			
Minnesota	U of Minnesota	EnvH, ME	0	5	—
Missouri	U of Missouri-Rolla	CE	0	2	—
	Washington U	ME	2	2	—
N. Carolina	Duke U	CE, EnvE	1	1	—
	NC State U	ChE, Air Cons	2	5	2
	U of NC-Chapel Hill	EnvE Sci, Engr	0	8	1
New Jersey	NJ Inst of Tech	CE & EnvE	10	9	—
	Rutgers U	Env Sci, Met	1	3	1
New York	City Coll of NY	CE	0	3	—
	Cooper Union	Engr	9	0	—
	Cornell U	CE, ChE	0	2	—
	Manhattan College	ChE	0	1	1
	New York U-Medical Center	Inst Env Med	0	4	2
	Polytechnic Inst. New York	ChE	0	0	1
	Rensselaer Poly Inst	CE, EnvE	1	3	—
	SUNY-Oswego	Erth Sci	1	0	1
	Syracuse U	CE	0	1	—
Ohio	Hocking Tech College	EnvInd H	1	0	0
	Muskingum Area Tech College	Eng Sci Div	3	0	0
	Ohio U	ChE	1	1	1
	U of Cincinnati	CE, EnvE, ChE	1	14	3
	U of Toledo	CE	4	9	1
Oklahoma	East Central U	Env Sci			
	Oklahoma State U	ChE	0	1	1
	U of Oklahoma	CE, EnvE			
Oregon	Oregon Graduate Center	Env Sci	0	6	2
	Oregon State U	ME	1	2	1
	Portland State U	ME	2	1	1

Appendix B continued

State	University	Department	U[a]	G[b]	Res[c]
Pennsylvania	Carnegie-Mellon U	ME, CE	2	2	2
	Drexel U	Env St Inst	0	8	
	Lafayette Coll	Chem, ME, CE, MetE	5	0	0
	Penn State U	ME, ChE, CE, Met	24	7	2
	U of Pittsburgh-GSPH	EnvH Sci	0	7	2
	Villanova U	ChE	0	2	—
S. Carolina	Clemson U	Env S Engr	1	3	2
S. Dakota	SD School of Mines & Tech	Inst AtmSci	0	1	1
Tennessee	East Tennessee State U	EnvH	1	2	—
	Tennessee Tech U	ChE			
	U of Tennessee-Chattanooga	ChE, Env Sci	1	1	
	U of Tennessee-Knoxville	CE	1	5	2
	Vanderbilt U	CE, EnvE	2	3	—
Texas	Lamar U	Env Sci	2	0	—
	Texas A&M U	Pl Path, Micro	0	1	1
	Texas Tech	ChE			
	U of Houston	Env Mg, ChE	1	2	1
	U of Texas-Arlington	CE	1	3	—
	U of Texas-Austin	CE			
	U of Texas-Dallas	Env Sci	0	5	2
	U of Texas-El Paso	CE	5	4	—
Utah	Brigham Young U	ChE, Therm Inst	1	0	1
	U of Utah	ChE	3	0	1
	Utah State U	CE, EnvE	1	2	1
Vermont	Norwich U	Engr, Env Tech	4	0	1
Virginia	Virginia Polytechnic Inst	CE	2	3	1
Washington	Washington State U	CE, EnvE	2	7	2
	U of Washington	CE	3	4	2
West Virginia	WV College of Grad St				
Wisconsin	Marquette U	CE	2	0	—
	U of Wisconsin-Madison	ME	1	1	1

[a] Number of undergraduate courses.
[b] Number of graduate courses.
[c] Number of research projects: 0 = none; 1 = 1 to 5; 2 = 6 to 10; — = not reported.

Abbreviations Used

Aero Engr	Aeronautical Engineering
Air Cons	Air Conservation
AtmSci	Atmospheric Science
Bio	Biology
CE	Civil Engineering
ChE	Chemical Engineering
Chem	Chemistry
Engr	Engineering
Eng Sci Div	Engineering Science Division
EnvE	Environmental Engineering
EnvInd H	Environmental & Industrial Health
EnvE Sci	Environmental Engineering & Science
EnvH	Environmental Health
EnvH Sci	Environmental Health Science
Env Mg	Environmental Management
Env S Engr	Environmental Systems Engineering
EnvE Tech	Environmental Engineering Technology
Env&Occ H Sci	Environmental & Occupational Health Science
EnvQ Con	Environmental Quality Control
EnvR E	Environmental Resources Engineering
Env S	Environmental Service
Env Sci	Environmental Science
EnvSt	Environmental Studies
Env St Inst	Environmental Studies Institute
Env Tech	Environmental Technology
Erth Sci	Earth Science
Inst Atm Sci	Institute of Atmospheric Science
Inst Env Med	Institute of Environmental Medicine
Geo	Geography
ME	Mechanical Engineering
Met	Meteorology
MetE	Metallurgical Engineering
Micro	Microbiology
PH	Public Health
Pl Path	Plant Pathology
San Engr	Sanitary Engineering
ThE	Thermal Engineering
Therm Inst	Thermochemistry Institute

Appendix C. World air pollution control training.

Country	University	Number of courses U	Number of courses G	Level of research[a]	Department
Australia	U of Melbourne	0	2	C	Faculty of Engineering
	U of New South Wales	1	1	B	Chemistry
Brazil	U Federal de Minas Gerais	0	0	A	Engenharia Sanitaria
Canada	Mount Royal College	4	0	B	Chemical and Biological Science
	U du Quebec C Montreal	0	1	B	Dept de Physique
	U of British Columbia	0	1	B	Chemical Engineering
	U of Toronto	1	5	C	Chemical Engineering
		2	8	B	Environmental Engineering
	U of Windsor	1	2	B	Chemical Engineering
	U de Sherbrooke	1	1	B	Chemical Engineering
England	Leeds U	1	0	C	Fuel and Energy
	The City U	1	0	B	Civil Engineering
	Trent Polytechnic	1	1	A	Building & Env Health
	U of Newcastle Upon Tyne	3	1	B	Civil Engineering
	U of East Anglia	1	0	B	Environmental Science
	U of Exeter	1	0	A	Chemical Engineering
	U of Lancaster	2	0	B	Environmental Science
	U of Salford	1	0	B	Chemical Engineering
	U of Southampton	0	0	A	Civil Engineering
	U of York	1	0	A	Biology
Finland	Lappeenranta U of Technology	0	0	B	—
	U of Helsinki	0	1	B	Physics
	U of Oulu	2	2	C	Botany
Germany	Tech U Berlin	1	9	B	Fachgebiet Luftreinhaltung
	U Stuttgart	0	1	B	Abteilung Biologie
Holland	Eindhoven U of Technology	1	1	B	—
India	Andhra U	0	5	B	Meteorology
Japan	Res Inst for Pollution Control	0	1	B	—
	Shizuoka U	1	1	C	Chemical Engineering
Mexico	U Autonoma-Azcapotzalco	—	—	—	—
Netherlands	Agricultural U	3	1	C	—
	Eindhoven U of Tech	—	—	—	—
	U of Utrecht	1	2	B	Psychology Lab
	U of Toernodiveld	1+	1+	C	Botanisch Laboratorium
New Zealand	U of Canterbury	0	1	B	Joint Center for Studies
Poland	Agricultural U	1	2	B	Katedra Ochrony Shodowiska
	Technical U	6	8	C	—
Scotland	U of Strathclyde	1	0	B	Civil Engineering
Singapore	Singapore Polytechnic U	1	0	A	Math & Science
Sweden	Swedish U of Ag Sci	0	0	B	Plant and Forest Protection
Taiwan	Academic Sinica	0	2	B	Institute of Physics
	Tungai University	2	0	B	—
Thailand	Asian Inst of Technology	0	Some	B	Environmental Engineering
Turkey	Ankara U	0	4	B	Pharmacy F. Toxicology
Yugoslavia	U of Ljubljana	3	1	B	—

[a] Level of research: A = 0 projects; B = 1 to 5 projects; C = 6 to 10 projects.

In the U.S., many universities offer one or two courses in air pollution control. The number with more extensive programs is limited. The academic programs are centered in many different departments, as shown in Figure 1. Details on curriculum are covered elsewhere.[1,4,5,6] Typically, many schools indicated they have from one to five research projects related to air pollution. Those with more extensive programs can be identified either by the number of courses offered or the number of research projects.

The training in countries outside of the U.S. is centered in schools of Engineering, Environmental Science, Geography, Medicine and Agriculture.[7] Detailed information on the programs in other countries was not obtained because it was desired to keep the questionnaire as short and uncomplicated as possible.

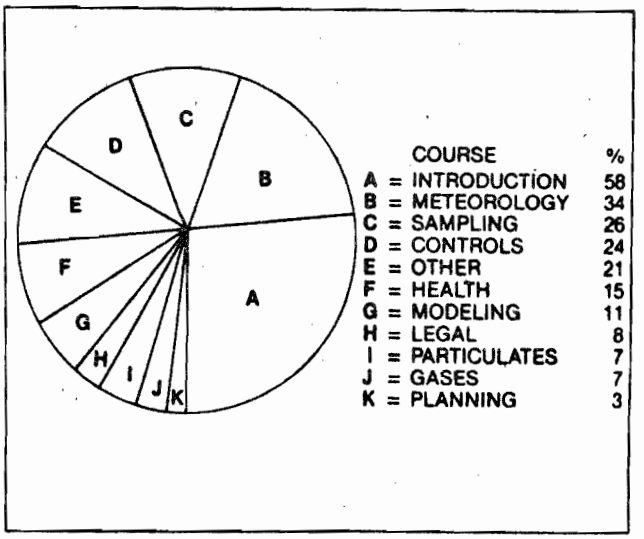

Figure 1. Air pollution courses at 65 U.S. universities.

Conclusions

It is clear that air pollution control is a subject being studied and taught at universities worldwide. It would be useful for the faculties to know what type of work is going on in other

countries and by whom. In addition, this information would be useful to prospective students and employers such as control agencies and industry.

It is difficult for any one individual or association to collect and interpret all the information. It must be recognized that this study is not complete. It is hoped that by publishing the results the present effort can be expanded. It would be helpful if the reader would let the author know of any errors or omissions in Appendix B or C. In addition, it would be helpful if graduates of universities not included in the Appendices would inform the author. This can be done by either completing the questionnaire in Appendix A or sending the name and complete address of the faculty involved the program.

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