GEOTHERMAL TRAINING AT THE INTERNATIONAL INSTITUTE FOR GEOTHERMAL RESEARCH IS PISA, ITALY: TWENTY- FIVE \EARS OF ACTIVITY

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Abstract

Since 1970 the International School of Geothermics, a branch of the IIRG, has trained 324 expens from 68 countries in its 22 long-term geothcrmal courses held in Pisa (Table 1). During the Same period the School has also held 3 shan courses. in Italy, Djibouti and China. attended by 79 geothermal technicians. Follow-up seminars have also been organized in Colombia, for ex-trainees from Latin-America, and in Thailand, for ex-trainees from Asia and Africa. The School also organized two international geothermal congresses, in Italy and Venezuela. As co-founders in 1989 of the International Summer School an Direct Application of Geothermal Energy. the School has collaborated in the organization of 4 shon courses. held in Macedonia/Greece, Macedonia, Bulgaria and Romania. for a total of 116 trainees.

1. INTRODUCTION

During the 1960s the lack of geothermal expens in the developing countries was such as to seriously jeopardize implementation of their geothermal projects. The international organizations were well aware of this problem, especially Unesco. and in July-August 1968 the latter convened a Group of Experts on Training in Geothermal Energy in Paris to define the number and type of expens that would be required in these countries in the years to follow. Based on the resolutions of this Group, and on the results of its own investigations. the International Institute for Geothermal Research in Pisa launched its geothermal training programme two years later, with the suppon of the Italian government and Unesco.

In January 1995 the Italian training centre completed lwenly-five years of activity, divided into two main phases: during the first phase. from 1970 to 1984, it operated as the International Post-Graduate Course in Geothermics, and, from 1985 on, as the International School of Geothermics.

2. INTERNATIONAL POST-GRADUATE COURSE IN GEOTHERMICS (1970 - 1984)

Two hundred students received training during the fifteen editions of this course (Fanelli, 1985). The courses were financed primarily by the Italian National Research Council (CNRI, which is the parent organization of the IIRG School. by the Italian Ministry of Foreign Affairs, by Unesco. and, in the period 1979 - 1983, by the Italo-Latin-American Institute.

The course syllabus was designed to meet the needs of the developing countries. The initial objective was to prepare 'geothermists', by covering all the aspects of a geothermal project from reconnaissance to exploitation. In other words, the aim of these courses was to train the coordinators of the geothermal projecls of the future. With a few modifications and improvements to keep pace with the growth in know-how and experience. this structure was to remain substantially unvaried until 1979. During that year the course objective became that of training expens in geothermal exploration. The course syllabus was also modified accordingly. Spanish was the official language of the courses for Latin-American trainees held in 1979. 1981 and 1983.

The courses during this 15 year period lasted from 10 months to a minimum of 5 months. The 5 month courses were considered too shun. and were abandoned after a trial period of 2 years. The average duration of the 15 courses held between 1970 and 1984 was 9 months.

The overall format. however. remained much the same. The courses were divided into two parts. The first pan, identical for all trainees, consisted of lectures and canfcrences on the theoretical aspects of geothermal research and development. During the second pan of the course each trainee was assigned a work project tailored to his panicular requirements. Between the two parts the trainees were taken an a visit to the Italian geothermal areas and power-plants.

At the end of these 15 years of activity we organized, with the support of the Italian Ministry of Foreign Affairs. a Seminario de Actualizacion, held in Bogotà in January 1984. The objectives of this Seminar were to bring together our ex-trainees from Latin-America for an update on geothermal methodology, and also to verify the results of our first 15 years of training

3. INTERNATIONAL SCHOOL OF GEOTHERMICS (1985 ON)

By 1984 several geothermal projects had reached the stage of exploitation in the developing countries. According to a repon prepared in 1984 by the United Nations Revolving Fund for Natural Resources Exploration (Donovan, 1985), however, over 40 developing countries had just begun geothermal research, or were about to do so. Consequently, there was likely to be an increase in the demand far technical and scientific personnel with a geothermal specialization, and to a cenain extent this demand was destined to shift from expens in exploration to expens in production. The International Institute far Geothermal Research in Pisa. in agreement with the sponsoring organizations. decided therefore, to create a more flexible structure, capable of a wider range of operation than the preceding Course. This new structure, launched in 1985, is our International School of Geothermics. The activities of the School were channelled in three directions: (a) long-term courses, (b) shon courses. and (c) seminars and conferences (Dickson and Fanelli, 1990).

3.1 Long-term Courses

The long-term courses of the School represented the natural continuation of the original International Post-Graduate Course in Geothermics. These courses were organized under the auspices of Unesca, like all our other activities, with the financial support of the Italian Ministry of Foreign Affairs, and the technical and scientific collaboration of Italian industry, especially Enel (Italian Electric Power Company). From 1985 to 1992 the Ministry of Foreign Affairs contributed to the running costs of the seven courses held in that period. and also pmvided 110 scholarships far participants from developing countries (an average of 16 per year).

At the end of 1993 the Italian government, in the process of re-defining their policy with regard to assistance to the developing countries, made drastic cuts to the budget set aside for training. Consequently, at the moment of writing (July 1994) the long-term courses organized by our School have been temporarily suspended.

The courses held between 1985 and 1992 lasted eight months. from November to June. The overall format was more or less that of the courses held between 1970 and 1984 (theoretical lectures and practicals. separated by field trips). The main objective was still that of training expens in geothermal exploration. A bricf description of these courses is given below.

The theoretical pan of the courses ran from November to March, and consisted of roughly 320 hours of lectures, an average of 5 hours/day, on the following topics: introduction to geothermal energy and its utilization (12% of total lectures). geology (15%). geochemistry (18%), hydrogeology (10%), geophysics (24%), drilling (6%), reservoir physics (8%), case histories of the Italian geothermal fields (7%). The lectures on different geothermal methodologies were construed in such a way as to provide some insight on the basic concepts of each methodology, and also the answers to the following questions: where. how. and with what results can this methodology be applied, at what

Table 1 Geothermal trainees of the long-term courses between 1970 and 1992

Africa		Americas		Asia		Europe	
Algeria	2	Argentina	23	Afghanistan	3	Belgium	
Cameroon	2	Bolivia	12	China	10	Bulgaria	
Chad	1	Brazil	3	India	18	Cyprus	
Egypt	3	Canada		Indonesia	17	Czechoslovakia	1
Equatorial Guinea	1	Chile	1	Iran	1	Greece	10
Ethiopia	9	Colombia	6	Iapan	1	Hungary	2
Guinea	1	Costa Rica	9	Korea	4	Italy	16
Kenya	4	Cuba	.	Mongolia	1	Macedonia	1
Madagascar	1	Dominican Rep	2	Myanmar	5	Poland	2
Marocco	1	Ecuador	6	Nepal	5	Romania	3
Rep. Cape Verde	1	El Salvador	11	Pakistan	2	Spain	2
Somalia	4	Guatemala	4	Philippines	19	U.K.	
Sudan	2	Haiti	2	Thailand	in	Yugoslavia	
Tanzania	4	Honduras	5	Turkey	8		
Tunisia	1	Mexico	5	Vietnam	9		
Uganda	3	Nicaragua	15				
Zaire	2	Panama	3				
Zambia	1	Paraguay	1				
		Peru	4				
		Trinidad					
		USA	1				
		Venezuela	3				
Total	**43**		**119**		**113**		**49**

cost, and how can we interpret the results?

The trainees were also taken on one-day excursions to research centres, and industrial concerns. During this 18 week period they also sat three written examinations to monitor their progress.

At the end of the theoretical period there were two field trips, a 4-day excursion to the Larderello and Travale-Radicondoli geothermal areas, and a 5-day hip to the Cesano, Latera and Mt. Amiata areas.

The practical part of the course lasted from the end of the field hips to the end of the course. The trainees received tuition from scientists of the International Institute for Geothermal Research, from ENEL, or from other scientific organizations or universities. depending on their project. Their practical work was aimed at providing the know-how for their future careen.

At the end of the course the trainees submined a report on their practical work. and received a Certificate of Attendance Beginning with the 1986-87 course. the trainees who achieved particularly good results received a Diploma instead of a Certificate. Their results were assessed on the basis of their marks in the three written exams. their work during the practicals, and their final report.

A total of 124 trainees attended the seven courses organized by our School between 1985 and 1992. Of the 103 trainees attending the 6 courses between 1986 and 1992, 50 received a Certificate of Attendance, 28 a Diploma with merit 'good'. 22 a Diploma with merit 'very good. and 3 a Diploma with merit 'excellent'.

Our 'very good' trainees were: T.Abebe (Ethiopia), N.W.Abuga (Kenya), Y. Arevalo (Honduras). A.L. Cazzola (Italy), A. Campos Romero (El Salvador), Do Duc Thanh (Vietnam), C.S. Dubey (India), F. Gazo (Philippines), E. Hernandez G. (El Salvador), T. Kavouridis (Greece), J.L. Lalonde (Canada). T. Mba (Cameroon), B.J. Mchwampaka (Tanzania). A.C. Namoglu (Turkey), 1. Navarro (Chile), G. Oktu (Turkey), S. Popovska (Macedonia). D. Rajver (Slovenia), M. Ramos (Philippines), M. Teklemariam (Ethiopia). Tian-Yao Hao (China). and Zhao Ping (China).

Our 'excellent' students were: S. Rellani (Italy), L. Lenkey (Hungary), and Y. Yioulí (Greece).

There lorg-term courses have been suspended since the academic year 1992-93.

3.2 Short Courses

The shon courses vary in duration from a few days to a few weeks, and deal with a specific topic or a local situation. They may be held in Italy or abroad, on the initiative of our School, or at the request of other organizations or countries that provide the necessary financial support

The first short c o m e was held in Pisa in September-November 1985 for 10 graduates from the People's Republic of China, and was organized in collaboration with Enel and Aquater. In December 1986 a short course was organized in the Republic of Djibouti, in collaboration with Aquater. for 12 technicians working an the Djibouti geothermal project. Bath courses were financed by the Italian Ministry of Foreign Affairs. A third short course was held in Wuhan. People's Republic of China. in May-lune 1988, in collaboration with China University of Geosciences, Wuhan. Fifty-seven participants attended this course an "Geophysics and Geochemistry in Geothermal Exploration". At the time of writing (July 1994), we are also organizing a short course on Advances in Geothermal Exploration (Geology and Geochemistry). to be held in Vietnam in December 1994.

With the objective of widening mining activity in the direct uses sector, and furthcr promoting scientific collaboration and the exchange of know-how with central-eastern Europe, the Faculty of Mechanical Engineering of the University of Skopje, the School of Agriculture of the University of Thessaloniki, and our training centre in Pisa, founded the International Summer School on Direct Application of Geothermal Energy (ISS) in 1989. One year later the ISS was fully operative, and in the years to follow three other organizations were to join the Summer School : BRGM (France). the University of Bitola (Macedonia), the University of Blagoevgrad (Bulgaria). and the University of Oradea (Romania). So far the ISS has held four courses, under the auspices of Unesco. FAO-CNRE, the EEC and the IGA : (1) Course on Direct Application of Geothermal Energy (Bansko-Macedonia and Thessaloniki-Greece. September 1990), with 29 trainees; (2) Course on Engineering Aspects of Geothermal Energy Use in Agriculture (Ochrid-Macedonia, May 1992). with 20 trainees; (3) International Course on Geothermal Energy: Technology, Ecology (Bansko-Bulgaria. May-lune 1993). with 37 trainees; (4) International Course on Geothermal Energy: District Heating and Industrial Uses (Oradea-Romania, May-June 1994). with 30 trainees. The ISS has a number of projects far the years to come. including the participation of almost all the countries of central-eastern Europe and the circum-Mediterranean basin. In September 1995, a course on Reservoir Engineering and Energetic Aspects of Balneology will be held in Murska Sobota-Slovenia.

In future the ISS intends to hold its short courses on non-electric uses of geothermal energy in a different country of central-eastern Europe each year.

The ISS has published textbooks, handbooks and local technical guidebooks in advance of each of its short courses.

3.3 Seminars and Conferences

The seminars are aimed at bringing together former trainees of our courses, and providing them with an up-date on the geothermal state-of-the-art . As well as the Seminar held in Bogotà in 1984, we have also organized an Afro-Asian Geothermal Seminar in Chiang Mai, Thailand, in November 1985, with 98 participants.

The School also collaborates with other institutions in the organization of conferences and workshops. On the request of the Unitar/Undp Centre on Small Energy Resources. Rome, we organized the Unitar/Undp Workshop an Small Geothermal Resources, held in Pisa in May 1987 and attended by 110 participants. In 1990, in collaboration with the Ministerio de Energia y Minas, and Petroleos de Venezuela

S.A., we organized a workshop on "Energia y Desarrollo en Venezuela" in Caracas.

Besides the activity described above, the School has promoted the research and utilization of geothmal energy through the dissemination of information and know-how.

From 1986 to 1993. the School acted as geothermal consultant to the Unitar-Undp Centre on Small Energy Resources. This Centre, which closed down in 1993, published a series of technical guidebooks that were coordinated by our Schwl and edited by renowned international geothermal experts. Since the Unitar office in New York also closed down, these guidebooks have been distributed by the School in Pisa.

Finally. the geothermal training centre in Pisa has also collaborated with the Engineering and Technology Division of Unesco and the International Technological University in Paris. editing a volume on Geothermal Energy for their Module on New and Renewable Energy, pan of an Energy Engineering Learning Package prepared by Unesco for graduates and engineers of the developing countries

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