PRODES

Promotion of Renewable Energy for Water production through Desalination

www.prodes-project.org

Deliverable 3.4:

Report from the implementation and feedback of the Course for Professionals

WP3 – Task 3.5

ProDes is co-financed by the Intelligent Energy for Europe programme

(contract number IEE/07/781/SI2.499059)

Intelligent Energy Europe

Acknowledgements

This publication has been produced as part of the ProDes project. The logos of the partners cooperating in this project are shown below and further information about them and the project is available on www.prodes-project.org :

Intelligent Energy Europe

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Summary

Following the planned actions for WP3.5, PRODES courses on Desalination with Renewable Energies were implemented in Italy (Universiy of Palermo), Greece (CRES), Portugal (LNEG) and Spain (PSA-CIEMAT), namely (by chronological order):

• a 3 days Pro-course at Almeria by the PSA-CIEMAT, 19 to 21 October 2009, with an attendance of 23 professionals;

• a 2 days Pro-course at "Ordine degli Ingegneri della Provincia di Palermo" by the University of Palermo, 11 and 12 December 2009, with an attendance of 20 professionals;

• a 1 day Pro-course at CRES Central Building by CRES, 24 of February 2010, with an attendance of 34 professionals;

• a 2 days Pro-course at the University of Algarve by LNEG, IP, 24 and 25 of February 2010, with an attendance of 47 professionals;

• a 2 days Pro-course at "Ordine degli Ingegneri della Provincia di Agrigento" by the University of Palermo, 26 and 27 February 2010, with an attendance of 12 professionals.

The scope of the courses was to provide professionals, experts, investors, and researchers from both fields with the latest technological developments in Desalination and RES technologies, and their matching. The course programmes where adapted, in each country, both to the level of the attendants and to the duration of the course.

The courses reached a total of 136 professionals (32 in Italy, 34 in Greece, 47 in Portugal and 23 in Spain), and were mainly directed to national attendants, exception for the course in Spain, which was directed to an international attendance.

It is worth mentioning the cooperation among partners in some of the courses, with PSA-CIEMAT giving some lectures in the Portuguese course, for instance.

The present report summarizes the information gathered from these five different actions, describing its implementation, justification and attendant's feedback to a common questionnaire.

In general, professionals' response to the course was quite enthusiastic, with some suggestions of inclusion of more case study materials.

Course programmes, leaflets, certificates and lists of attendants are presented in Annex.

3 days Pro-course at Almeria by the PSA-CIEMAT (19 to 21 October 2009)

CIEMAT-PSA

Plataforma Solar de Almería (PSA) belongs to the public research institution CIEMAT (Centre for Energy, Environment and Technology Research). PSA is one of the biggest and most complete existing facilities dedicated to the research, testing and development of solar technologies and applications. It is located next to the village of Tabernas, about 35 km of Almeria city. One of its departments deals with solar desalination and water treatment. The experimental installations of solar desalination of PSA are the most advanced in the Mediterranean area. Amongst others, there is a 14-effect multi-effect distillation plant powered by a solar field and coupled to a double-effect absorption heat pump, a test-bed for research and evaluation of membrane distillation modules also fed by solar energy and several other solar energy devices that can be coupled to small-scale decentralized desalination units.

Justification of the course

The interest and expertise of PSA on solar desalination research is parallel to academic, as PSA directs a specific module on that topic in the Master Course on solar energy organized with the University of Almería. The organization of the PRODES course on the use of "Renewable Energy for water production through Desalination" for students seemed a logical step from that. However, CIEMAT has strong links with the industry and the course for professionals was also deemed very interesting. Hence the organization of this course "Desalination Powered by Renewable Energy" offered to experts, professionals and researchers to provide them with the latest knowledge of the different existing technologies involving the use of renewable energies to drive desalination.

Implementation of the course

The course took place from 19th to 21st of October 2009 at Hotel Tryp Indalo Almería during the first day, spending the middle day at PSA for lectures and practical work. Theory lessons were complemented with practical visits and activities at PSA. Lectures were given by scientists from PSA-CIEMAT, complemented with experts from University of Sevilla, Instituto Tecnológico de Canarias (ITC) and BEFESA. The full program of the course is shown in Annex I. Accommodation in the hotel, lunches, coffee breaks, a gala dinner and transportation to and from the PSA were included in the course fee. The course was limited to 25 attendants in order to guarantee an effective learning. The number of applications almost doubled that limit. Annex II shows a list and a basic statistic profile of the attendants.

Lecture on High Capacity Solar Thermal Desalination at Plataforma Solar de Almería

Lecture on Desalination using solar PV energy at Hotel Tryp Indalo

Practical work in the experimental MED plant in Plataforma Solar de Almería

Feedback on the course

In general, the course was organised in a strong logical sequence, with the previous experience and feedback from the course for students helping to improve on the weaknesses detected. The presence of external experts to present specific topics of interest with insight into state of the art research was an added bonus.

In general, the response was quite enthusiastic for most of the course lectures. At the end of the course an anonymous questionnaire (Annex IV) was distributed to the attendants and collected. The questions reported in the questionnaire were:

1) Were the course aims made clear at the start?

2) Were the lectures well prepared and in logical order?

3) Was the course starting point at the right level?

4) Were slides/overheads adequate and well prepared?

5) Was the subject matter clearly explained?

6) Was the material covered relevant to your work?

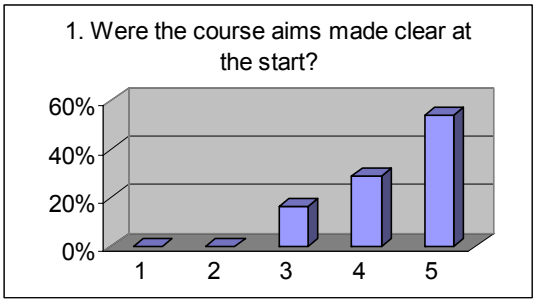
7) Were the lecturers responsive to questions?

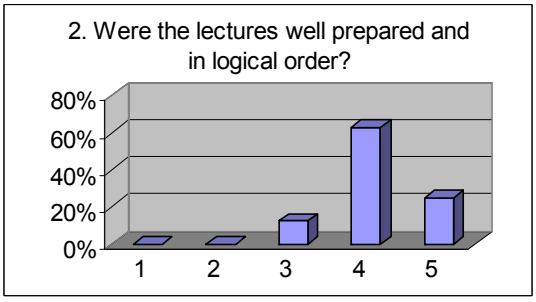
8) Did the lecturers project enthusiasm about the course?

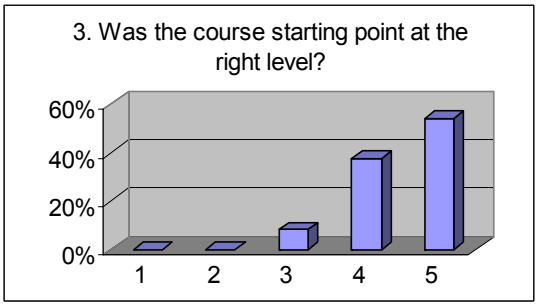
9) Was the lecturers' teaching very good overall?

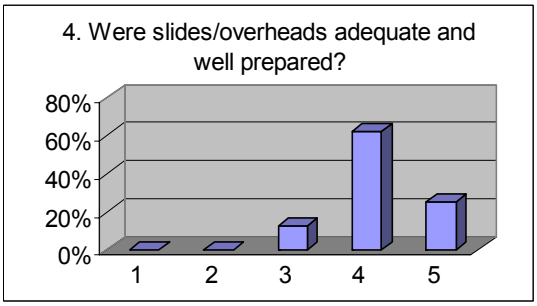
10) What proportion of the lectures did you attend?

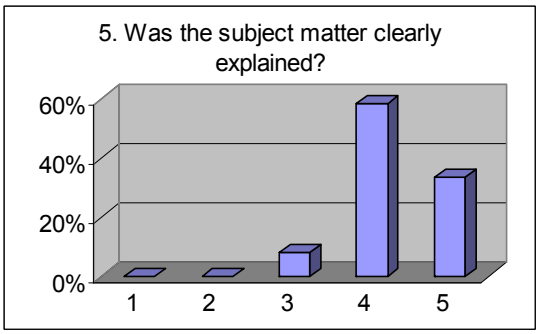
For each question students were required to assign a mark from 1 (very poor) to 5 (very good). The results of such assessment are graphically summarised in the following:

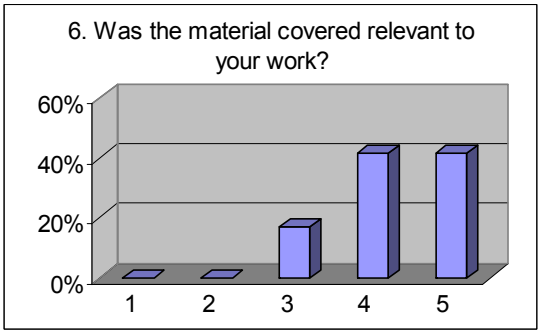


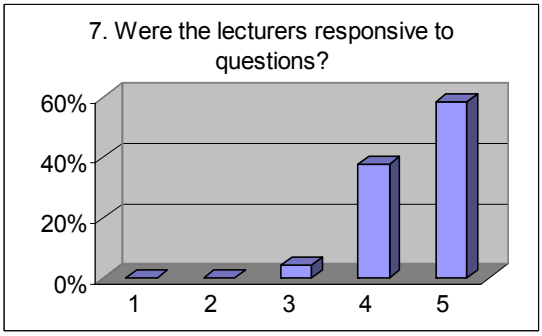


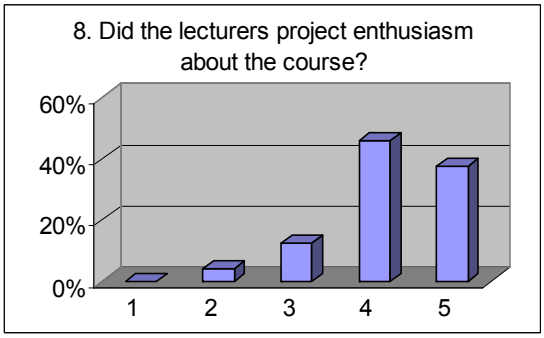


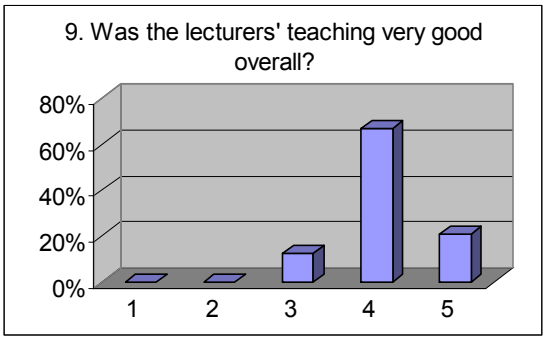


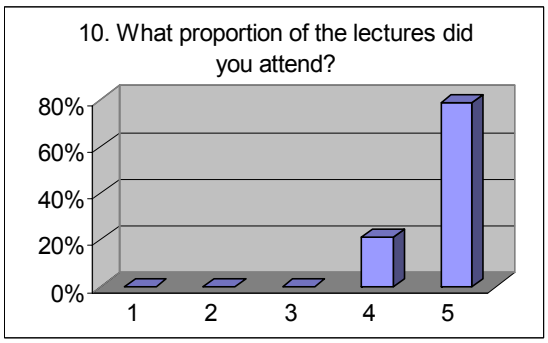












These results show that the course was received with enthusiastic appraisal by the majority of attendants. As for their comments, most of them had to do with aspects of the organization as the tight scheduling and dense agenda.

2 days Pro-course at “Ordine degli Ingegneri della Provincia di Palermo” by the University of Palermo (11 and 12 December 2009)

The “Ordine degli Ingegneri della Provincia di Palermo”

The “Ordine degli Ingegneri della Provincia di Palermo” (OrdIngPA) is the most important Sicilian association of chartered engineers. It counts about 5000 members and it represents the reference entity for all professionals working in the district of Palermo. Moreover, OrdIngPA is often involved in the organisation of courses for its professionals in several areas of engineering science and technology.

Justification of the course

The “Ordine degli Ingegneri della Provincia di Palermo” has expressed its interest in organising course for professionals in all the thematic areas related to the environment, green energies, water management, etc. Thanks to strong connections between UNIPA and the OrdIngPA, due to several collaboration activities in different research fields, it has been possible to propose a course on Renewable Energy desalination, to be organised in collaboration with it.

Implementation of the course

The course has been carried out in the teaching room of the OrdIngPA. The organisation of the course was performed also with the support of a subcontractor (SINTESI), which was in charge of all secretariat work and logistics (advertising, coffee breaks, attendance certificates, covering expenses for external speakers, etc.). The course duration was about 8hrs and the course was held in two subsequent days (11-12 December 2009), Friday afternoon and Saturday morning, in order to meet the time availability of most working professionals.

The course structure developed in Task 3.2 has been fully met and a detailed description of the topics presented and of internal and inviter speakers is reported in the Course Agenda attached. Theoretical lectures, presentation of practical cases and open discussions were alternated during the whole course.

The course was held by internal lecturers (Lucio Rizzuti, Giorgio Micale and Andrea Cipollina) and by two invited speakers, who presented the actual situation of desalination industry in Sicily and in small islands around Sicily. The first invited speaker, Mr. Carmelo Mineo, is responsible of the MED-TVC desalination plant in Trapani and acts as consultant for some of the Sicilian desalination plants. The second invited speaker, Mr. Giuseppe Campagna, is the General Manager CEO of SOFIP, the company which manages the desalination plants in the small islands of Pantelleria, Lampedusa and Linosa.

Time for open discussions was left after each speech, in order to promote the active involvement of participants who showed a real interest in practical aspects related to potential applications of RE-desalination technologies.

Some pictures relevant of the course are shown in the following figures.

Mr. Giuseppe Campagna presenting the actual situation of desalination plants in the small islands around Sicily

Course speakers and participants attending the course

Lecturers' comments and feedback on the course

In general, the course has been organised with a specific focus on the most important aspects for professionals working in the field of Energy and Water management. Short speeches (20-30 mins) with alternation of speakers allowed to keep a high level of attention among attendants. Coffee breaks have shown to be very important moments for continuing personal discussions between speakers and attendants who continued asking specific questions relevant to their professional experiences with energy and water management and to the potentials of technologies presented during the course.

Finally the presence of invited speakers currently involved in the use of desalination as a fresh water source in dry areas of Sicily has rose a strong interest among attendants who asked questions about costs, maintenance problems and revamping pans for desalination plants operating in Sicily.

Professionals' feedback on the course:

In general, professionals' response to the course was quite enthusiastic. Most of them have expressed gratitude for being invited and a strong interest in being informed on following activities of the PRODES project. Indeed a number of course attendants have registered and participated also to the Workshop organised on the 16th of March (within the activities of Work Package 4).

Some attendants have suggested to give more room to the presentation of case studies and practical examples of RE-desalination applications, with particular regards to commercial or pilot units installed and operated in Sicily (these are not yet available at the moment, but some pilot systems will be installed during 2010-2011).

1 day Pro-course at CRES Central Building by CRES (24 of February 2010)

Introduction

The course for professionals entitled "*Renewable Energy Technologies and Desalination*", was implemented in February 2010. The scope of the course was to provide professionals, experts, investors, and researchers from both fields with the latest technological developments in Desalination and RES technologies, and their matching. More specifically, the course instructs participants on the basic principle of wind, solar and geothermal energy, conventional desalination and on the state-of-the art of the most promising RES Desalination couplings, as well as market progress and legislation procedures.

CRES has a significant experience on the organization of workshops, seminars on RES in collaboration with Public or Private Entities. Also has participated in a significant number of exhibitions regarding RES, Energy Saving and environment.

Implementation of the Course

The one day course was organised by CRES, giving to the participants a good overview of the existing renewable energy technologies, desalination technologies, possible combinations of RES with Desalination, costs, market and framework. The course took place on 24th of February. Lectures were given by scientists from several departments of CRES. The lectures were implemented at the Central Building of CRES at Pikermi. The room has a capacity of 35-40 people.

The course was advertised mainly by CRES site and by email. The course was successful with 34 participants attending. The participants were also invited to visit CRES Energy, Wind park in Keratea on 5th of March, (on the same date where the visit of students from the 2nd

course has been arranged to be held). The thematic areas were analyzed during the course was as follows:

- Solar Energy – Photovoltaic Systems
- Solar Energy – Solar Thermal Systems
- Geothermal Energy
- Wind Energy
- Desalination Technologies
- RES Desalination

Visit at CRES 3MW Wind Park and CRES Energy Park, Keratea Attikis

Presentation of the 3MW CRES Wind park – Visit to a Wind Turbine, (ENERCON 500kW)

Presentation of CRES Energy Park

Visit to the demonstration units:

- Biomass unit
- Geothermal unit
- Hydrogen unit
- Dual Axis Photovoltaic Mover
- PV Pumping unit
- Solar Desiccant Evaporative Cooling System
- Practical Visit to the Autonomous Hybrid (PV/Wind) RO unit for seawater desalination

Faculty

Colleagues from five departments of CRES are participated for the implementation of the course. These are as follows:

CRES Departments	Lecture's Name
Wind Department	E. Tzen
	S. Tentzerakis Dr. K. Rossis
Solar Thermal Energy Department	D. Chasapis
Photovoltaic Department	I. Nikoletatos
Geothermal Energy Department	Dr. K. Karytsas
Hydrogen Department	Dr. Elli Varkaraki

Participants

The number of the participants was 34, came from technical, water-treatment, RES companies, owners of small hotels in Greek islands, architectural companies, mechanical engineers, consultants and students.

Feedback on the course

In general, the response was quite enthusiastic for most of the course lectures. A special interest is noticed on photovoltaic, geothermal energy and RES desalination lectures. At the end of the course an assessment form regarding the lectures quality distributed to the participants. The results of the assessment form are provided in the following figures.

1) Were the course aims made clear at the start?

2) Were the lectures well prepared and in logical order?

3) Was the course starting point at the right level?

4) Were slides/overheads adequate and well prepared?

5) Was the subject matter clearly explained?

6) Was the material covered relevant to your work?

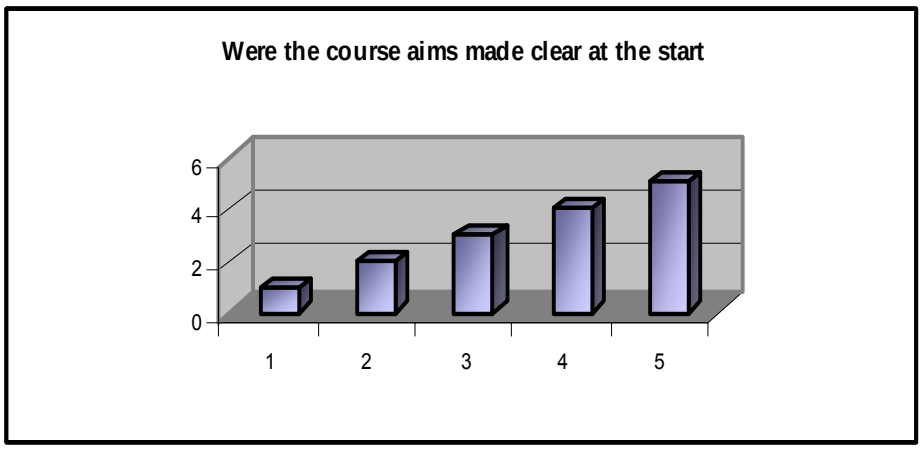
7) Were the lecturers responsive to questions?

8) Did the lecturers project enthusiasm about the course?

9) Was the lecturers' teaching very good overall?

10) What proportion of the lectures did you attend?

1



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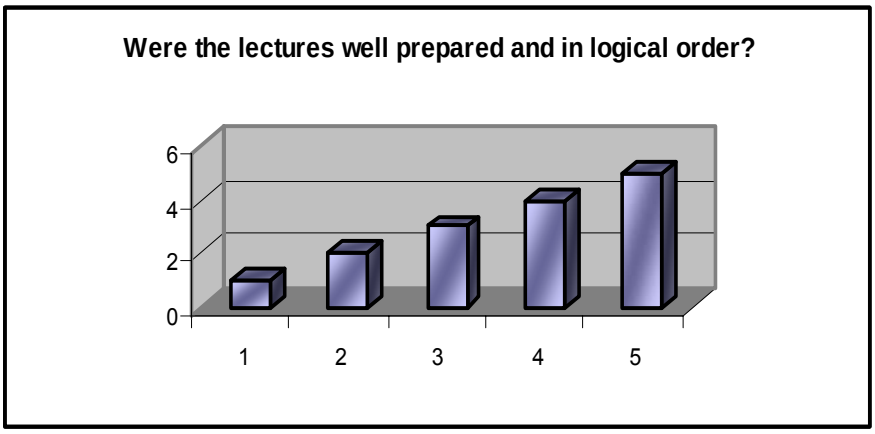
Were the lectures well prepared and in logical order?
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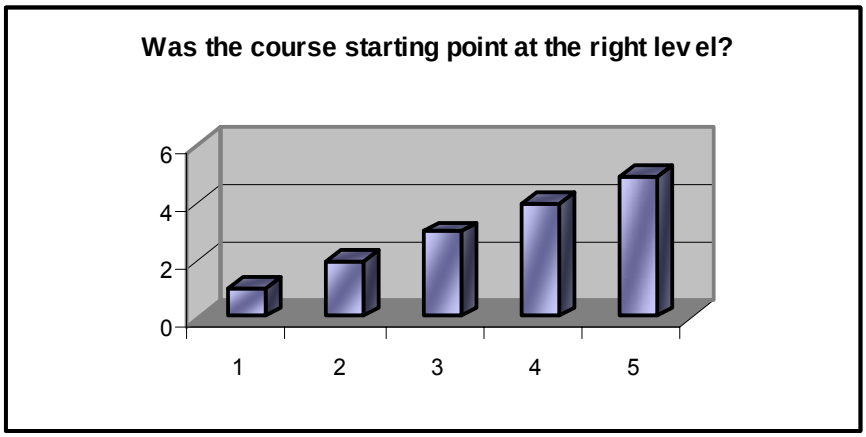
Was the course starting point at the right level?
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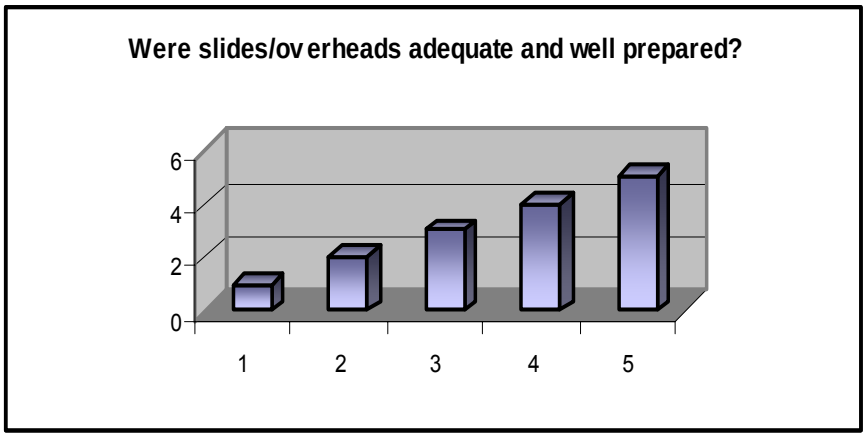
Were slides/overheads adequate and well prepared?
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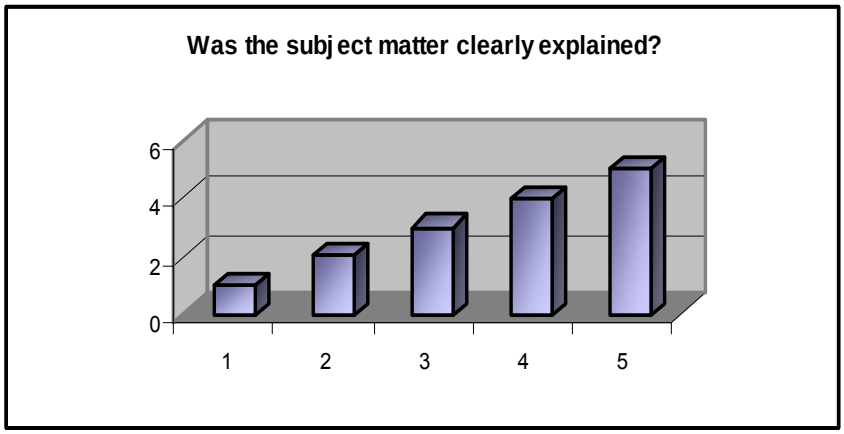
Was the subject matter clearly explained?
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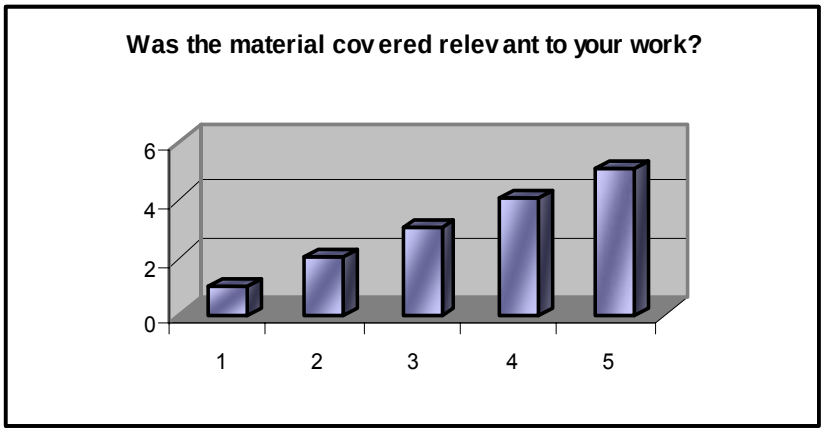
Was the material covered relevant to your work?
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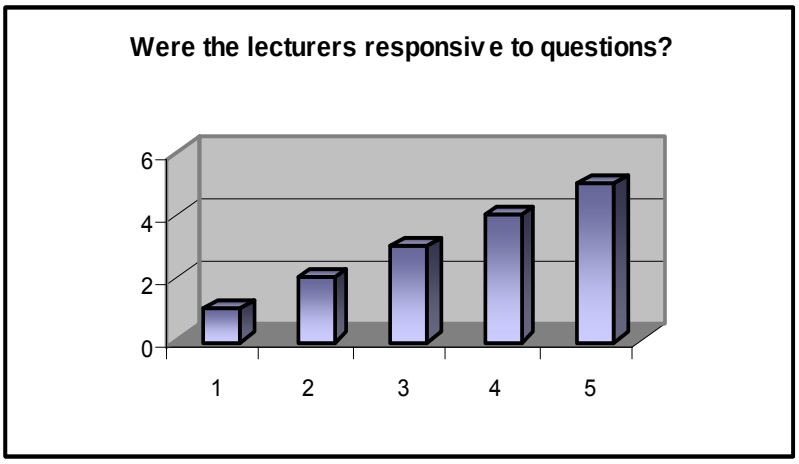
Were the lecturers responsive to questions?
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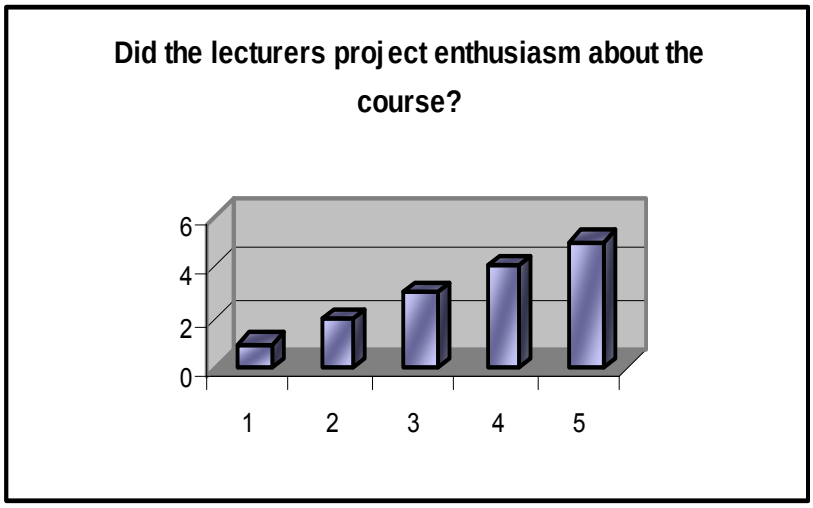
Did the lecturers project enthusiasm about the course?
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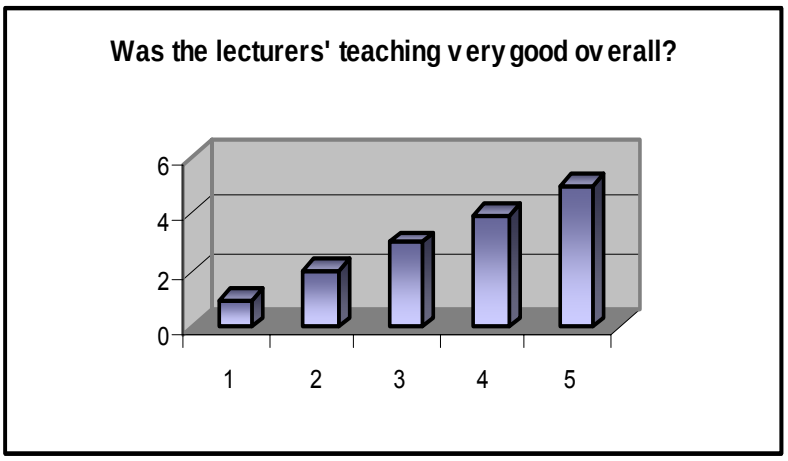
Was the lecturers' teaching very good overall?
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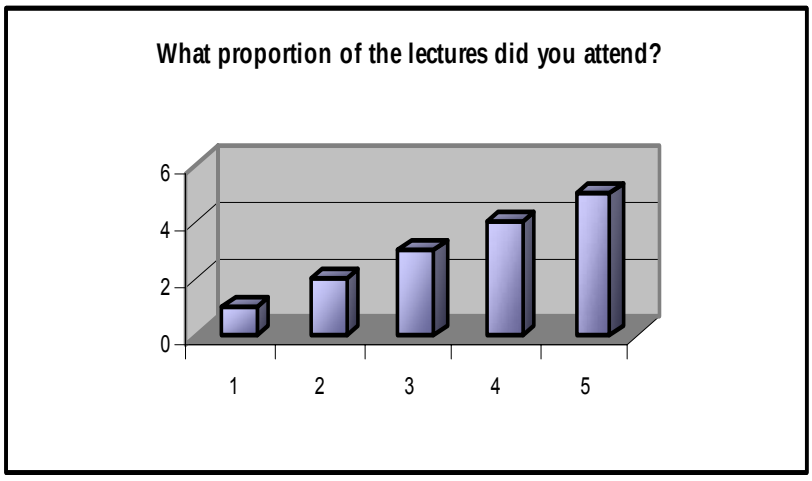
What proportion of the lectures did you attend?
6
4
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0
1
2
3
4
5

Photos from the Course for Professionals

Photos from CRES Wind Park, Energy Park

2 days Pro-course at the University of Algarve by LNEG, IP (24 and 25 of February 2010)

LNEG background in Renewables and Desalination

From the early 80's, research in Renewable Energies became one of the main activities of LNEG (former INETI), a public research institute created in the late 70's. The development of research activities in different vectors of renewable energies, wind, wave, biomass or solar, has crossed the field of desalination in different projects, mainly in its connection with solar thermal or solar PV technologies (solar pond, small RO-PV unit, humidification/dehumidification, solar fed double effect heat pump coupled to MED process, Organic Rankine cycle for heat and power purposes in desalination).

Together with research activities, LNEG has long promoted training courses in different fields of renewable energies, both to technical, professional or scholarship audiences. One of the most recent examples of such activities is the participation of LNEG in the Master in Energy & Environment Engineering of the Sciences College of Lisbon University.

Justification of the course

While the use of renewable energy technologies is becoming widespread, with a growing number of companies providing products and services especially in the fields of solar thermal, solar PV or wind energy, its use together with desalination has not been assessed yet.

Considering the need of raising awareness and providing a technical background to these market actors, the PRODES course for professionals aimed at providing information about desalination technologies and the potential for the use of different RE forms in such processes to professionals of both energy and water sectors.

Considering the country's geographical potential for the use of desalination, with the southern region of Algarve being the one gathering the major potential both from the side of water resources (existence of saline intrusion problems, high seasonal loads, etc) and economic activities (tourism is the main economic activity), the course was offered with the logistical contribution of the University of Algarve.

The University of Algarve is a young state university located in the southeastern part of Portugal. It was established in 1979 and over the years the institution has acquired a sound international reputation. The University has witnessed significant growth in terms of its student population, modern facilities and the quality and diversity of programmes on offer.

Implementation of the course

The course has been carried out in the Engineering Institute Dept. building. An auditorium has been provided by the head of the department to give the lectures to about 50 participants.

Fig.1 Engineering Institute of University of Algarve

The course had free attendance and was organized in two five hour classes, on the 24th and 25th of February 2010. The course structure developed in Task 3.2 has been fully met and a detailed description of teaching activities is reported in the following Table 1.

Table 1. Lectures timetable:

Lecture Argument	***Type of lecture***	***Date and duration***	***Lecturers***
Introduction Conventional desalination processes and technologies. Renewable energies in relation to desalination	Theoretical	24th February 2010, 2.5hrs	P. Horta F. Mendes
Solar Stills Solar Ponds High capacity solar thermal distillation	Theoretical	24th February 2010, 2.5hrs	P. Horta F. Mendes
Solar Thermal Membrane Distillation Solar thermal humidification/dehumidification Solar photovoltaic and desalination	Theoretical	25th February 2010, 2.5hrs	P. Horta F. Mendes
Wind energy and desalination Other renewable energy sources and desalination Overview of demonstration installations	Theoretical	25th February 2010, 2.5hrs	P. Horta F. Mendes

Fig.3 – PRODES Pro-course lectures at Faro

The course has been advertised by LNEG with email invitation addressed to approximately 300 entities from the professional sectors as water, energy, water municipalities, energy agencies and national authorities and by informing several national associations of those sectors.

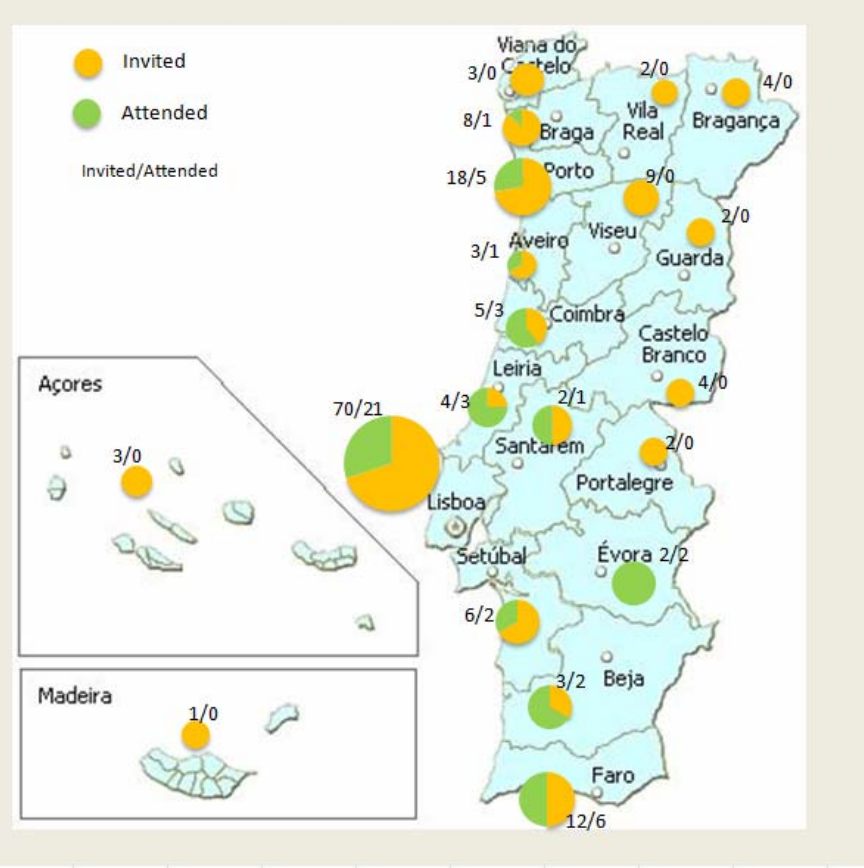


Fig.4 – PRODES Pro-course geographical distribution of invitations and attendance

The course was attended by a maximum of 47 professionals. The attendance statistics is represented in figure 2.

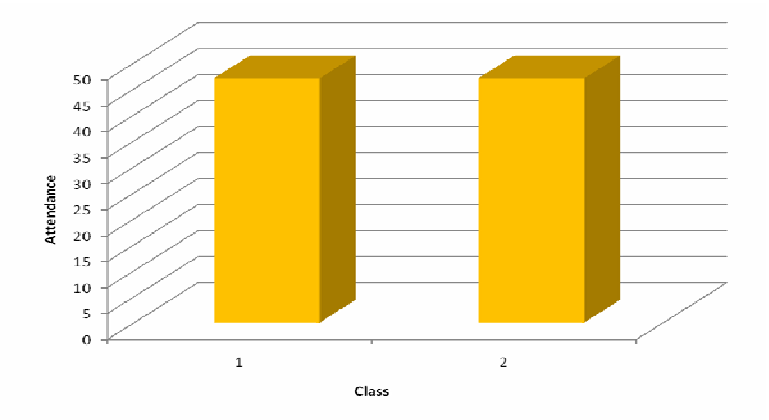


Fig.2 Attendance statistic Pro course

Lecturers' comments and feedback on the course

In general, the course has been organised in a strong logical sequence, with the topics and the structure of each lecture being developed step by step during the course itself on the basis of the student's response to the discussed topics. A good balance has been also kept between theoretical lectures and tutorials, which is advisable to keep also for the other course editions besides some students had preferred to do the practical exercises together with the teacher in order to get clearer and easier understanding of the subjects.

It was recommended to create a Support Manual for Designing and Performance Analysis of Desalination Systems together with specific software.

Students' feedback on the course:

In general, students' response to the course was quite enthusiastic for most of the course lectures. At the end of the course an anonymous questionnaire (Annex IV) was distributed to the students and collected. The questions reported in the questionnaire were:

1) Were the course aims made clear at the start?

2) Were the lectures well prepared and in logical order?

3) Was the course starting point at the right level?

4) Were slides/overheads adequate and well prepared?

5) Was the subject matter clearly explained?

6) Was the material covered relevant to your projects/business?

7) Were the lecturers responsive to questions?

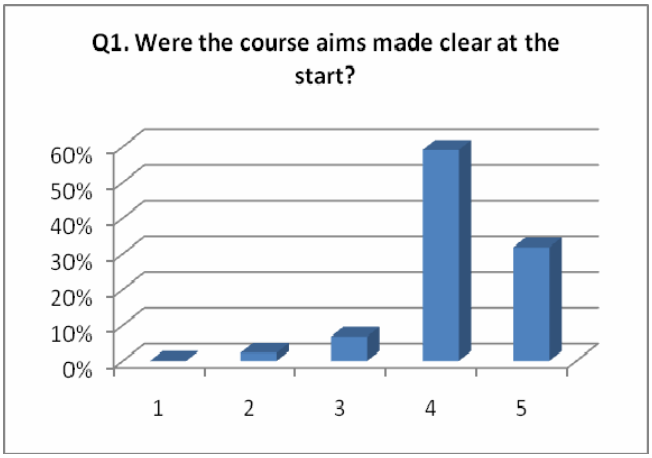
8) Did the lecturers project enthusiasm about the course?

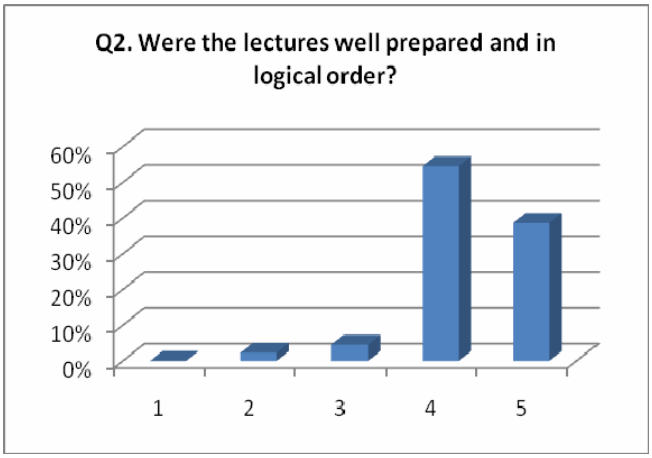
9) Was the lecturers' teaching very good overall?

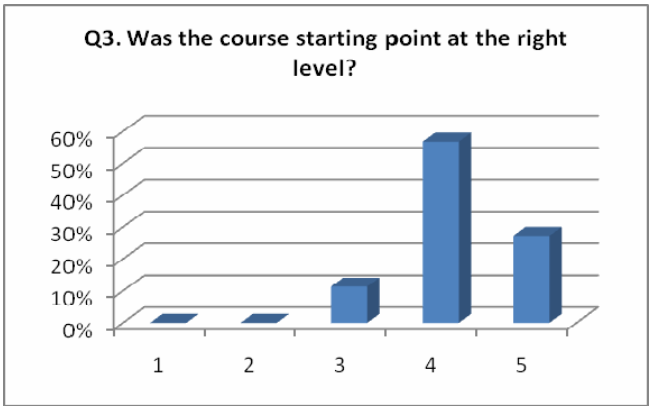
10) Total work load compared to other courses

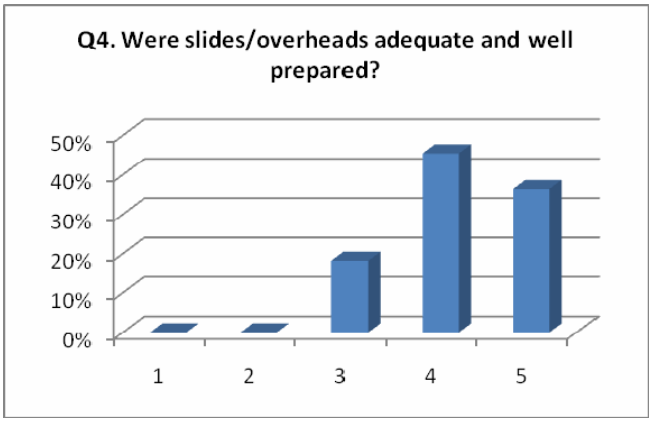
11) Do you consider important to establish more desalination courses for professionals?

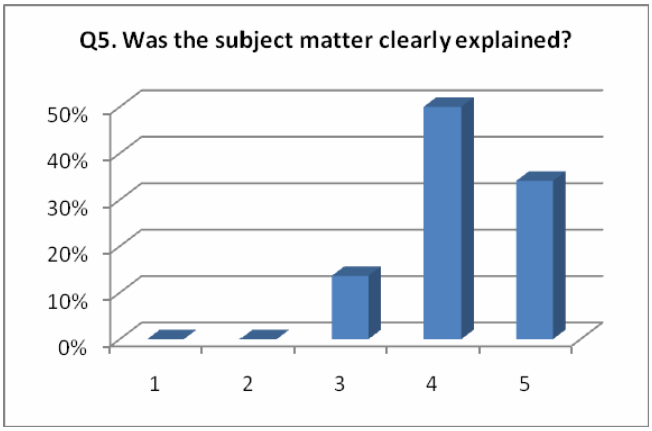
For each question students were required to assign a mark from 1 (very poor) to 5 (very good). The results of such assessment is graphically summarised in the following:

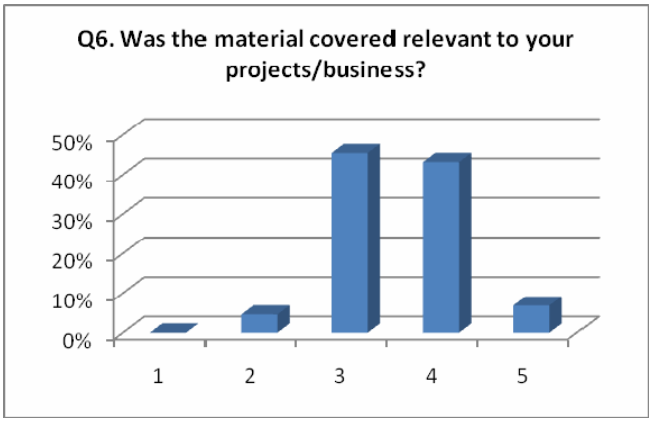


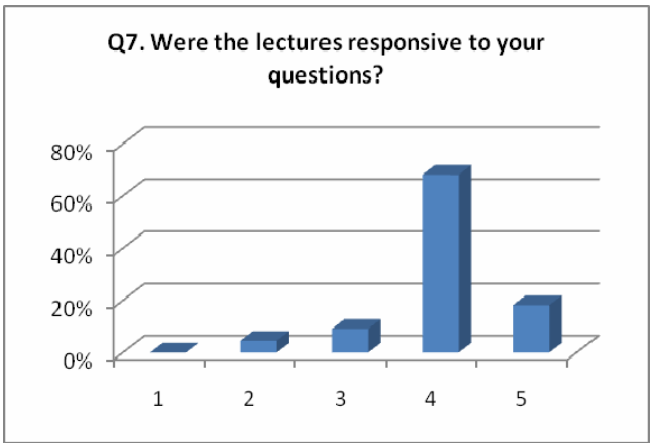


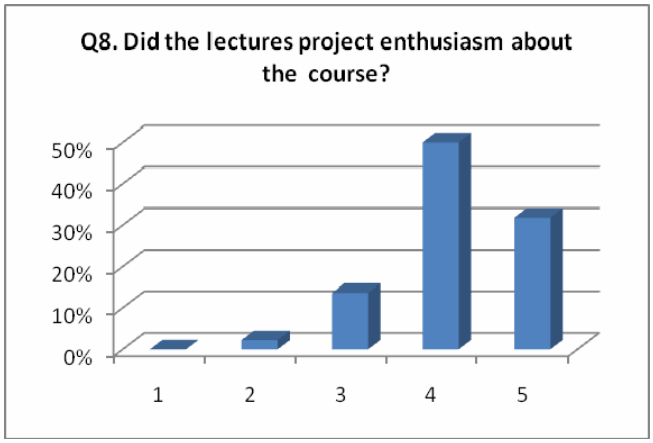


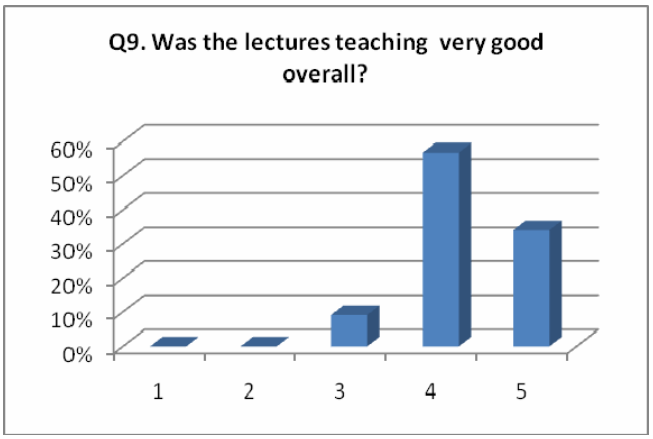


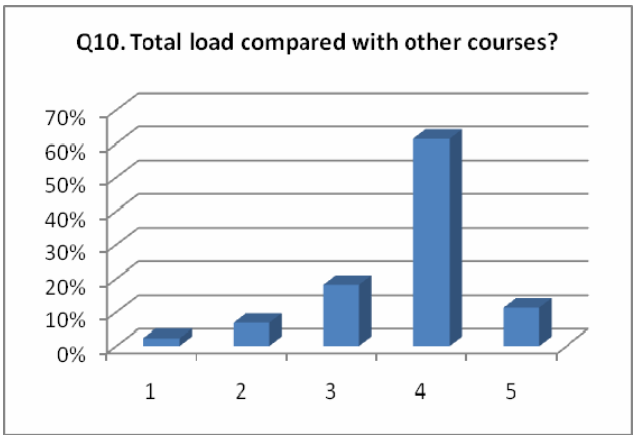


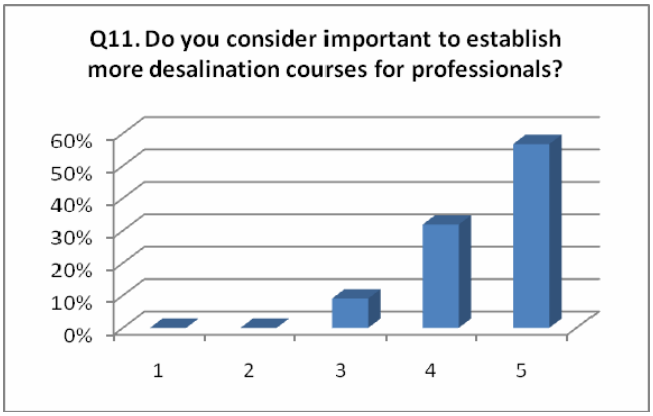



Q7. Were the lectures responsive to your questions?
80%
60%
40%
20%
0%
1
2
3
4
5


Q8. Did the lectures project enthusiasm about the course?
50%
40%
30%
20%
10%
0%
1
2
3
4
5


Q9. Was the lectures teaching very good overall?
60%
50%
40%
30%
20%
10%
0%
1
2
3
4
5


Q10. Total load compared with other courses?
70%
60%
50%
40%
30%
20%
10%
0%
1
2
3
4
5


Q11. Do you consider important to establish more desalination courses for professionals?
60%
50%
40%
30%
20%
10%
0%
1
2
3
4
5

2 days Pro-course at "Ordine degli Ingegneri della Provincia di Agrigento" by the University of Palermo (26 and 27 February 2010)

The "Ordine degli Ingegneri della Provincia di Agrigento"

The "Ordine degli Ingegneri della Provincia di Agrigento" (OrdIngAG) is the association of chartered engineers of the district of Agrigento, a southern Sicilian district, which has suffered in the last decades of a dramatic problem of water scarcity which has lead to the use of several desalination facilities. It counts about 1000 members and it represents the reference entity for all professionals working in the above mentioned district. Moreover, it is often involved in the organisation of courses for its professionals in several areas of engineering, and it promotes

Justification of the course

The "Ordine degli Ingegneri della Provincia di Agrigento" has expressed its interest in organising courses for professionals in all the thematic areas related to the environment, green energies, water management, etc. Thanks to strong connections between UNIPA and the OrdIngAG, and to several discussion has on potential collaborations between the two entities, it has been possible to propose a course on Renewable Energy Desalination, to be organised in collaboration with the association.

Implementation of the course

The course has been carried out in the Conference room "Emerico Guggino" within the main building of the OrdIngAG, in Agrigento. The organisation of the course was performed also with the support of a subcontractor (SINTESI), which was in charge of all secretariat work (advertising, coffee breaks, attendance certificates, covering expenses for external speakers, etc.). The course had a duration of about 8hrs and it was held in two subsequent days (26-27 February 2010), Friday afternoon and Saturday morning, in order to meet the time availability of most working professionals.

The course structure developed in Task 3.2 has been fully met and a detailed description of the topics presented and of internal and invited speakers is reported in the Course Agenda attached. Theoretical lectures, presentation of practical cases and open discussions were alternated during the whole course.

The course was held by internal lecturers (Lucio Rizzuti, Giorgio Micale and Andrea Cipollina). Notwithstanding the initial invitation the two external speakers, these could not participate, but they sent the teaching material which was used to complete the course agenda.

Time for open discussions was left after each speech, in order to promote the active involvement of participants who showed a real interest in practical aspects related to

potential applications of RE-desalination technologies. Moreover a final short presentation was given by Ing. Ivano Midulla from the local company Saiphil Sunny SrL, one of the few Sicilian companies producing PV panels and installing large capacities PV plants also integrated into greenhouses. The speech was focused on PV panels production issues and on the potentials for integrating PV units into greenhouse roofs, eventually presenting the possible coupling with a RO desalination unit which could provide fresh water to irrigate the greenhouse crops.

Some pictures relevant of the course are shown in the following figures.

Prof. Lucio Rizzuti introducing the course

Course speakers and participants attending the course

Lecturers' comments and feedback on the course

The course has been organised with a specific focus on the most important aspects for professionals working in the field of Energy and Water management in the district of Agrigento, which is one of the most active in the promotion and use of Renewable Energy and which is also using a large amount of fresh water produced by conventional desalination plants. Short speeches (20-30 mins) with alternation of speakers allowed keeping a high level of attention among attendants. Coffee breaks have shown to be very important moments for continuing personal discussions between speakers and attendants who continued asking specific questions relevant to their professional experiences with energy and water management and to the potentials of technologies presented during the course.

A close contact with the local reality and examples of application of RE-desalination installations in areas similar to Sicily have also generated a strong interest in attendants, who have expressed their interest in participating to future events on this topic.

Professionals' feedback on the course:

In general, professionals' response to the course was quite enthusiastic. Most of them have expressed gratitude for being invited and a strong interest in being informed on following activities of the PRODES project.

Some attendants have suggested to give more room to the presentation of case studies and practical examples of RE-desalination applications, with particular regards to commercial or pilot units installed and operated in Sicily (these are not yet available at the moment, but some pilot systems will be installed during 2010-2011).

Some of them also expressed their interest in visiting the laboratories of UNIPA to see the RE-desalination utilities currently used in Palermo and one of them has proposed a collaboration on these areas, which has now led to the preparation of a project proposal on the development of Solar PV greenhouse coupled to desalination.

Annex I. List of participants attending the courses

3 day course at Almeria, PSA-CIEMAT, Spain		
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3 day course at Almeria, PSA-CIEMAT, Spain		
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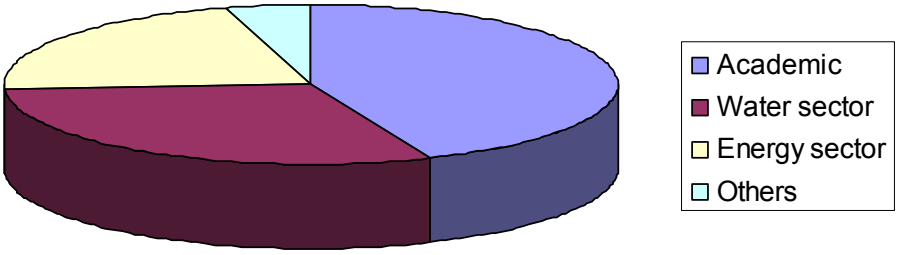

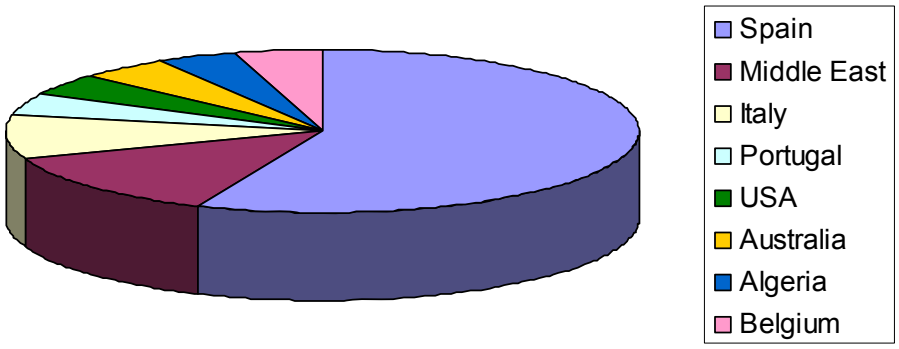

2 days Pro-course at "Ordine degli Ingegneri della Provincia di Palermo", U.Palermo, Italy		
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1 day course at CRES Central Building, CRES, Greece

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28	XATZILIADIS IOANNIS	HOTEL ALBATROSS, Serifos Island		hotelalbatro@gmail.com
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33	FIKARIS KOSTAS		PRODUCTION & MANAG. ENG.	kostasfikaris@yahoo.gr
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2 days Pro-course at "Ordine degli Ingegneri della Provincia di Agrigento", U.Palermo, Italy		
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Annex II. Course advertisement

3 days Pro-course at Almeria by the PSA-CIEMAT, 19 to 21 October 2009

DESALINATION POWERED BY RENEWABLE ENERGY

A 3-day Intensive Course in Almeria (Spain) October 19-21, 2009

Organized by Plataforma Solar de Almería (CIEMAT)

Course partially financed by the European Commission within the ProDes project (contract number: IEE/07/781/SI2.499059), co-financed by the Intelligent Energy for Europe programme.

PRODES

Promotion of Renewable Energy for Water production through Desalination

Intelligent Energy Europe

Objectives:

The purpose of this course is to provide experts, professionals and postgraduate students with the latest knowledge of the different existing technologies involving the use of renewable energies to drive desalination. More specifically, the course will instruct scientists and technicians on the basic principles of desalination using renewable energies, the state of the art of the most promising technologies and the experiences acquired so far. Theory lessons will be complemented with practical visits and activities at the experimental installations of solar desalination of Plataforma Solar de Almería, the most advanced in the Mediterranean area.

Contents:

The course is organized in six modules:

A) Introduction to desalination
1. Definition, fundamentals and historic review.

B) Conventional desalination
2. Conventional technologies of desalination, state of the art of the industry, evolution and outlook.
3. Design and operation of desalination plants (pre-treatment; post-treatment; control, etc.). Experience applicable to the renewable energy case.

C) Renewable energy technologies
4. State of the art of renewable energy technologies suitable for application in desalination.

D) Solar thermal energy and desalination
5. Solar ponds.
6. Solar stills.
7. High capacity solar thermal distillation: multi-effect distillation (MED) and multi-stage flash (MSF) desalination.
8. Solar-powered membrane distillation.
9. Technologies of humidification and dehumidification for desalination.

E) Desalination associated to other renewable energy sources
10. Desalination using solar photovoltaic energy.
11. Desalination using wind energy.
12. Desalination using wave, tidal and geothermal energy.

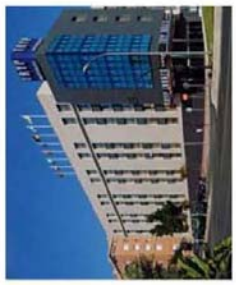
F) Sustainability
13. Economic and environmental aspects of desalination powered by renewable energy.

Theory and practical lectures will be given by researchers and scientists from Plataforma Solar de Almería (CIEMAT-PSA), Instituto Tecnológico de Canarias (ITC), University of Sevilla, and Befesa Agua.

Venue:

The host of the course will be Plataforma Solar de Almería. This research centre, belonging to the public research institution CIEMAT, is one of the biggest and most complete existing facilities dedicated to the research, testing and development of solar technologies and applications. It is located next to the village of Tabernas, about 35 km of Almería city, in the Southeast corner of Spain.

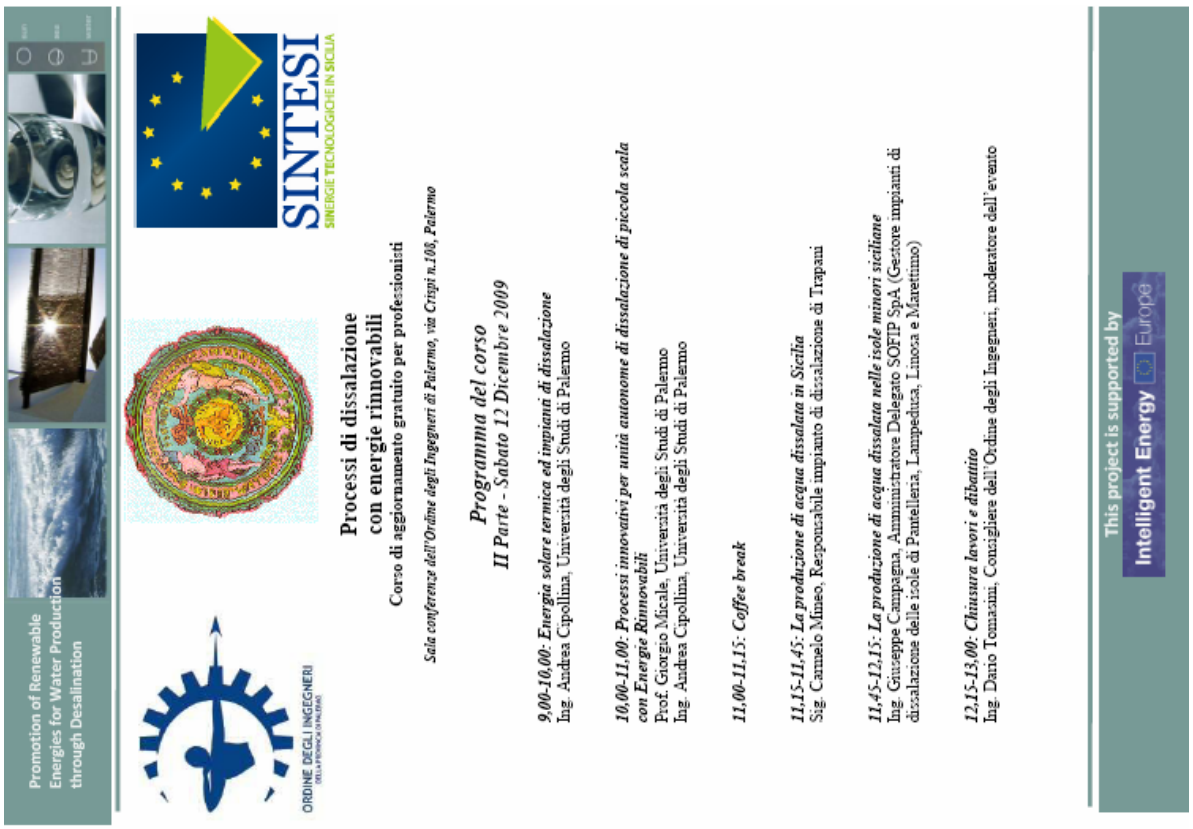
The course will take place at Hotel Tryp Indalo Almería during the first and last day, spending the middle day at Plataforma Solar de Almería for lectures and practical work. The Tryp Indalo Almería is a 4-stars hotel opened in 2004, beautiful yet modern, spacious and comfortable, providing ideal facilities and services for both business and leisure travellers, including the finest hi-tech meeting and congress venue in Almería. The hotel is located on the prestigious Mediterraneo Avenue, only 15 minutes from the beach, near the centre of the city of Almería.



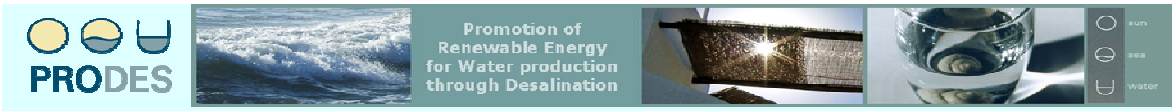
Hotel Tryp Indalo in Almería

Aerial view of Plataforma Solar de Almería

2 days Pro-course at "Ordine degli Ingegneri della Provincia di Palermo" by the University of Palermo, 11 and 12 December 2009



1 day Pro-course at CRES Central Building by CRES, 24 of February 2010,



Promotion of Renewable Energy for Water Production through Desalination
ProDes Contract No: IEE/07/781/SI2.499059
ProDes Project, www.prodes-project.org

Seminar Announcement

The Centre for Renewable Energy Sources and Saving, CRES within the ProDes project, organizes the seminar entitled

«Renewable Energy Technologies and Desalination»

Location: CRES
19 klm. Marathonos, Pikermi,
Central Building

Date: 24th of February 2010

Attendance: free of charge, registration requested

Organizer: Eftihia Tzen, Wind Energy Department

Seminar Programme

24/2/2010

1st Session - RENEWABLE ENERGY SOURCES (RES)

9:00 – 10:00 Solar Energy – Photovoltaic Systems
I. Nikoletatos, PV DEPARTMENT

10:00 - 11:00 Solar Energy – Solar Thermal Systems
D. Chasapis, SOLAR THERMAL DEPARTMENT

Coffe Break

11:30 - 12:30 Geothermal Energy
Dr. K. Karytsas, *GEOTHERMAL DEPARTMENT*

12:30: - 13:30 Wind Energy
S. Tentzerakis, WIND ENERGY DEPARTMENT

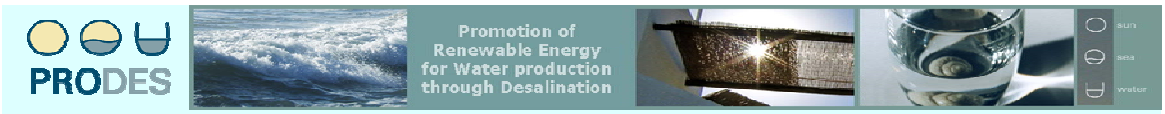
Light Lunch

2nd Session - DESALINATION WITH RES

14:30 – 16:00 Desalination Technologies
E. Tzen, WIND ENERGY DEPARTMENT

16:00 – 17:30 RES Desalination
E. Tzen, WIND ENERGY DEPARTMENT

Discussion



Registration Deadline : **17/02/2010.**

Please send the registration form to
etzen@cres.gr or by fax
Fax no : 210 6603301, 210 6038210
Tel. no 210 660 3361, 210 660 3247

A visit to CRES Wind Park and Energy Park at Keratea Attikis will be held in 5/3/2010 at 10:00am.

Promotion of Renewable Energy for Water Production through Desalination
ProDes Contract No: IEE/07/781/SI2.499059
ProDes Project
www.prodes-project.org

Registration Form

SURNAME:	
FIRST NAME:	
COMPANY NAME	
FIELD OF INTEREST	RES ☐ DESALINATION ☐
CONTACT DATA	
ADDRESS	
CITY	
Postcode	
TELEPHONE	
EMAIL	

2 days Pro-course at the University of Algarve by LNEG, IP, 24 and 25 of February 2010

Programa do Curso

Dia 1 (24-02-2010)

- Introdução
- Processos e Tecnologias convencionais de dessalinização
- Energias Renováveis ligadas à Dessalinização
- Dessalinizadores solares
- Lagos solares
- Destilação solar térmica de alta capacidade

Dia 2 (25-02-2010)

- Destilação solar térmica por membrana
- Humidificação/desumidificação solar térmica
- Energia fotovoltaica e a dessalinização
- Energia eólica e a dessalinização
- Outras fontes de energias renováveis e a dessalinização
- Exemplos de sistemas instalados

Mapa de Localização

Curso de Dessalinização com recurso a Energias Renováveis para Profissionais

24 e 25 de Fevereiro 2010 das 9h00 às 14h00
Sala 6 - Instituto Superior de Engenharia - Universidade do Algarve
Inscrição gratuita até 10 de Fevereiro 2010 para ruben.hilario@ineti.pt
(Indicar nome Entidade e número de participantes)

CURSO DE DESSALINIZAÇÃO COM RECURSO A ENERGIAS RENOVÁVEIS PARA PROFISSIONAIS

A dessalinização da água do mar ou de águas salobras apresenta-se hoje como uma tecnologia corrente para a produção de água em zonas com escassos recursos hídricos. As tecnologias disponíveis assentam, contudo, no consumo de consideráveis recursos energéticos, apresentando potenciais impactes associados ao consumo de fontes energéticas convencionais. Acresce a estes impactes que o custo da água produzida é fortemente afectado pelos custos da energia consumida.

Num contexto de aumento dos custos de energia, o desenvolvimento de tecnologias de dessalinização associadas à utilização de energias renováveis apresenta potenciais vantagens não apenas do ponto de vista económico como do ponto de vista ambiental, especialmente considerando a coincidência entre necessidades de água e recursos renováveis disponíveis.

LNEG

www.lneg.pt

Intelligent Energy Europe

Curso de Dessalinização com recurso a Energias Renováveis para Profissionais

24 e 25 de Fevereiro 2010 das 9h00 às 14h00
Sala 6 - Instituto Superior de Engenharia - Universidade do Algarve
Inscrição gratuita até 10 de Fevereiro 2010 para ruben.hilario@ineti.pt
(indicar nome da entidade e número de participantes)

Parceria: UNIVERSIDADE DO ALGARVE www.ualg.pt

PRODES

PROmotion of Renewable Energy for Water Production through DESalination

O Projecto "PRODES - Promotion of Renewable Energy for Water production through Desalination" (Ctr. Nr. IEE/07/781/S12.499059), co-financiado pelo Programa Intelligent Energy for Europe, promove a implementação de tecnologias de dessalinização com o recurso a energias renováveis através da aproximação das indústrias relacionadas à comunidade científica, promovendo o contacto entre indústria, investidores e potenciais utilizadores, propondo uma melhoria do quadro de políticas de promoção à implementação destas tecnologias e promovendo o conhecimento das suas vantagens entre o público em geral.

www.prodes-project.org

2 days Pro-course at "Ordine degli Ingegneri della Provincia di Agrigento" by the University of Palermo, 26 and 27 February 2010

SCHEDA DI REGISTRAZIONE

Cognome e nome

Indirizzo

Cap - Località

e-mail

Telefono

Professione/Aree di interesse professionali

Si prega di inviare la scheda di registrazione entro il 19 Febbraio 2010 per e-mail o fax alla Segreteria dell'Ordine.
e-mail: ordine@ordineingegneriagrigento.it
Tel. 0922 21594, Fax. 0922 29092

Coordinamento:
Vincenzo Di Rosa, Presidente dell'Ordine degli Ingegneri di Agrigento
Andrea Cipollina, Università di Palermo
091 23863780 – 333 7521739
cipollina@dicpm.unipa.it

Corso organizzato da

Ordine degli Ingegneri della Provincia di Agrigento

Università degli Studi di Palermo

SINTESI

Supportato dal Progetto Europeo ProDes
(Promotion of renewable energy for seawater DESalination)
www.prodes-project.org

PRODES

Intelligent Energy Europe

Università degli Studi di Palermo

Ordine degli Ingegneri della Provincia di Agrigento

Corso di formazione per professionisti

Processi di Dissalazione con Energie Rinnovabili

26-27 Febbraio 2010
Sala conferenze dell'Ordine degli Ingegneri di Agrigento
Via Gaglio, 1 – 92100 Agrigento

Il problema dell'approvvigionamento idrico oggi risulta di primaria importanza, specie in tutte quelle aree in cui l'incertezza della disponibilità idrica compromette o impedisce lo svolgimento delle attività civili, agricole ed industriali.
Da alcuni decenni la dissalazione viene proposta come utile strumento per la risoluzione di crisi idriche in molti paesi del mondo, garantendo una fonte di approvvigionamento idrico di sicura qualità, di sicuro accesso, con costi sostenibili (ormai ben al di sotto di 1 €/m³ di acqua prodotta), a dispetto dell'imprevedibilità della disponibilità idrica legata ai livelli di piovosità annuali.
L'elevata richiesta energetica dei tradizionali processi di dissalazione, però, ha posto dei vincoli importanti legati ai costi di produzione, ad aspetti ambientali ed alla disponibilità di fonti energetiche, ad esempio di fondamentale importanza quando la produzione di acqua dissalata risulta necessaria in un sito isolato difficilmente raggiungibile da mezzi di trasporto e/o dalla rete elettrica. Alla luce di ciò, l'accoppiamento con fonti di energia rinnovabile può costituire un importante gradino verso uno sviluppo sostenibile di tali tecnologie.
Obiettivo di questo corso è quello di presentare una rassegna delle più recenti tecnologie per la dissalazione di acque marine e salmastre, con riferimento sia a quelle convenzionali che alle più innovative soluzioni che prevedono l'accoppiamento di energie rinnovabili al processo di dissalazione.
Il corso si inquadra all'interno di un programma di attività supportate dal Progetto di Ricerca Europeo ProDES (www.prodes-project.org), di cui l'Università di Palermo, promotore del corso insieme all'Ordine degli Ingegneri di Agrigento, è partner attivo. In particolare, il progetto ProDES è finalizzato alla promozione dell'utilizzo di Energie Rinnovabili per la produzione di acqua potabile attraverso tecnologie di Dissalazione.

Ing. Vincenzo Di Rosa
Prof. Lucio Rizzuti

Programma del corso

I Parte - Venerdì 26 Febbraio 2010

15.30-16.00 - Saluti del Presidente e presentazione agenda
Ing. Vincenzo Di Rosa, Presidente dell'Ordine degli Ingegneri della Provincia di Agrigento

16.00-16.30 - La crisi idrica e l'approvvigionamento idrico da fonti non-convenzionali
Prof. Lucio Rizzuti, Università degli Studi di Palermo

16.30-17.15 - Tecnologie termiche convenzionali per la dissalazione delle acque
Prof. Giorgio Micale, Prof. Lucio Rizzuti, Università degli Studi di Palermo

17.15 - 17.30 - Coffee break

17.30-18.15 - Tecnologie a membrana convenzionali per la dissalazione delle acque
Prof. Giorgio Micale, Prof. Lucio Rizzuti, Università degli Studi di Palermo

18.15-19.15 - Energie rinnovabili per l'accoppiamento con processi di dissalazione
Ing. Andrea Cipollina, Università degli Studi di Palermo

19.15-19.30 - Chiusura lavori e dibattito

II Parte - Sabato 27 Febbraio 2010

9.00-9.30 - Dissalazione con energia eolica e solare fotovoltaica
Prof. Giorgio Micale, Università degli Studi di Palermo

9.30-10.00 - Energia solare termica per la dissalazione
Ing. Andrea Cipollina, Università degli Studi di Palermo

10.00-10.45 - Processi innovativi per unità autonome di dissalazione di piccola scala con Energie Rinnovabili
Prof. Giorgio Micale, Ing. Andrea Cipollina, Università degli Studi di Palermo

10.45-11.00 - Coffee break

11.00-11.30 – Aspetti ambientali legati alla dissalazione
Ing. Andrea Cipollina, Università degli Studi di Palermo

11.30-12.00: La produzione di acqua dissalata in Sicilia
C.D.M. Carmelo Mineo, Responsabile impianto di dissalazione di Trapani

12.00-12.30: La produzione di acqua dissalata nelle isole minori siciliane
Ing. Giuseppe Campagna, Amministratore Delegato SORIP SpA (Gestore impianti di dissalazione delle isole di Pantelleria, Lampedusa, Linosa e Marettimo)

12.30-13.00: Chiusura lavori e dibattito

Annex III. Course's certificate of attendance

2 days Pro-course at "Ordine degli Ingegneri della Provincia di Palermo" by the University of Palermo, 11 and 12 December 2009

Promotion of Renewable Energies for Water Production through Desalination

Università degli Studi di Palermo
Dipartimento di Ingegneria Chimica dei Processi e dei Materiali

Attestato di partecipazione

Si attesta

che l'ingegnere Alfredo Galasso, nato a Castrate Primo (PV) il 02.04.1971, codice fiscale GLS LRD 71D02 B988J, ha frequentato il corso di aggiornamento per professionisti ***"Processi di dissalazione con energie rinnovabili"*** di n. 8 ore, tenutosi a Palermo nei giorni 11 e 12 dicembre 2009, presso la sala conferenze dell'Ordine degli Ingegneri di Palermo .

14 dicembre 2009

Il responsabile scientifico del progetto PRODES
Lucio Rizzuti

Il presidente di SINTESI
Giuseppe Silvestri

PRODES project is supported by Intelligent Energy Europe

1 day Pro-course at CRES Central Building by CRES, 24 of February 2010

Promotion of Renewable Energy for Water Production through Desalination
ProDes Contract No: IEE/07/781/SI2.499059
ProDes Project

CERTIFICATE OF ATTENDANCE

This is to certify that

Mr. Proiskos Spilios

has attended the course entitled

"Renewable Energy Technologies and Desalination"

held in Athens on 24th of March 2010. The one day intensive course implemented within the ProDes Project.

24 February 2010

Course Organizer
Eftihia Tzen
CRES Wind Energy Department

Ioannis Agapitidis
President

ΚΑΠΕ CRES | CENTRE FOR RENEWABLE ENERGY SOURCES AND SAVING

2 days Pro-course at the University of Algarve by LNEG, IP, 24 and 25 of February 2010

2 days Pro-course at "Ordine degli Ingegneri della Provincia di Agrigento" by the University of Palermo, 26 and 27 February 2010


Promotion of Renewable Energies for Water Production through Desalination

SINTESI

Università degli Studi di Palermo
Dipartimento di Ingegneria Chimica dei Processi e dei Materiali

Attestato di partecipazione

Si attesta

che l'ingegnere Angelo Carliani, nato a Montallegro (AG) il 08.12.1942, codice fiscale CRNNGL42T08F414T, ha frequentato il corso di aggiornamento per professionisti ***"Processi di dissalazione con energie rinnovabili"*** di n. 8 ore, tenutosi ad Agrigento nei giorni 26 e 27 febbraio 2010, presso la sala convegni E. Guggino di Agrigento .

04 marzo 2010

Il responsabile scientifico del progetto PRODES
Lucio Rizzuti

Il presidente di SINTESI
Giuseppe Silvestri

PRODES project is supported by Intelligent Energy Europe