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INNOVATION TECHNOLOGY ISSUES FOR ENERGY SAVINGS AND ENVIRONMENTAL CONTROL: THE EXPERIENCE OF TICASS REGIONAL INNOVATION HUB

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Abstract: The paper describes the role and experience of Innovative Technologies for Environmental Control and Sustainable Development (TICASS) as a non-profit organization promoting research activities, and transferring excellence technologies in the energy and environment management practices. The main areas of work as well as current projects have been highlighted. Special attention is paid to research activities and technological innovations in the fields of energy and environment to improve the life quality and sustainable development. Training programs for Master and PhD Students specialized in renewable energy technology are described. The examples of projects TICASS is currently involved in are given.

Recent public policies and financial incentives, especially in EU, have created current and future job opportunities in sustainability industries. International agreements on CO₂ abatement and European directives on the expansion of renewable energy generation ensure that the recent rapid growth in renewable energy installations will continue.

According to these recent trends TICASS – acronym for Innovative Technologies for Environmental Control and Sustainable Development – was established in March 2010. It is a non-profit Consortium, composed of research

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authorities and large, medium and small companies, which performs, promotes and enhances research activities, as well as transferring excellence technologies in the “Energy and Environment” area with regards to Sustainable Development and Quality of Life.

The consortium role is also the coordination of the above mentioned activities at regional, national and international level. Its main goal is to widen knowledge and introduce innovative technologies by the cross-border cooperation, with universities and other public and private bodies.

TICASS promotes highly profiles training courses such as PhD courses, I and II-level Master degrees, through the award of scholarships, research grants and collaboration contracts.

Since May 2011, according to the Delibera Regionale n.553 del 20/05/2011, is officially recognized as managing body of the “Energy-Environment” Regional Innovation Hub.

The Hub goal is therefore to expand the know-how and introduce innovative technologies to be applied to key areas of development identified in the framework of European cooperation and integration and to set up active collaboration with universities and public and private bodies.

TICASS is the managing authority for the hub whose role is to aggregate companies with different expertise in planning, research, production focused on environmental themes (air, water, energy, waste, noise, geotechnics, chemical hazard, etc.) which allow interdisciplinary developments.

The Consortium brings together the expertise of different companies and private research centers and public putting a common factor skills, knowledge, laboratories and equipment resources to achieve their goals. At present the consortium is composed of 39 members including large medium and small enterprises and the following University Departments: Department of Chemistry and Industrial Chemistry (DCCI), Department of Physics (DIFI), Department for Land Study and Resources (DISTAV), Department of civil, chemical and environmental engineering (DICCA), Department of Mechanical, Energetics, Industrial and Transport Engineering (DIME).

TICASS leads research activities and technological innovations in the fields of energy and environment to improve the life quality and the sustainable development. Consortium activities are finalized to carry out, promote, diffuse, transfer and exploit research and innovative technologies for: energy saving, environmental control and management, sustainable development, improvement of life quality.

In each of the above domains, TICASS carries out research and training activities based on an interdisciplinary approach bridging together private and public bodies in order to promote an active and fruitful interaction. Moreover, TICASS aims to support valorization and exploitation of outcomes of University’s research and promoting technology transfer and cross fertilization processes.

Increasing attention is being paid to energy saving domain, first of all because numerous of TICASS’s companies are actively involved in this specific sector. Moreover, energy conservation is acquiring interest by the political and scientific communities, representing a compulsory choice to reach the international target regarding the reduction of greenhouse gas emissions in the atmosphere. TICASS, according to the Guideline 2002/91/CE, regarding the “Energetic performances in the building sector set up principles, conditions and

modalities to improve the building energetic performance”, proposes to identify solution to cope with the UE recommendation about the research and development of new technologies.

In this field TICASS has been involved in the last year into different activities in the research and training areas.

Training Activities

Skills shortages in this sector are already being identified and the expected growth will only exacerbate the situation. Within the rapidly expanding European renewable energy industry, an urgent demand exists for more post-graduate trained staff, specialized in renewable energy technology.

Based on these hypothesis TICASS is actively involved in training activities such as: Tempus project GreenMA “LLL training and master in innovative technologies for energy saving and environmental control for Russian universities, involving stakeholders” and the University Master in Green Building and Refitting.

GreenMa project, coordinated by University of Genova, involves 21 partners, between them eleven Russian Universities, it started last autumn and lasted thirty-six months. GreenMa’s objective is to train specialists not only for power industry sector and for public authorities having control tasks but to equip students with environmental technology knowledge.

It is one of the growth sectors, but it also offers career perspectives for experienced managers. Whoever is willing to leave corporate structures may get an opportunity to manage tremendous growth and contribute to a more sustainable economy at the same time. Deficits in management skills, SMEs and public authorities, facing expansion steps, often have to decide whether to bring about their growth themselves in an organic way, or whether they should use outsourcing. They may well be innovative and competent in terms of technology, but have deficits as far as management is concerned. Decision makers in the environmental technology sector have to enhance the awareness of result and customer orientation. Therefore they have to appoint the management to an experienced manager who takes over the organizational structuring in the context of corporate development. Improving energy efficiency is a major macroeconomic challenge.

In this context TICASS is involved in the Scientific Committee in charge of programming an intensive course in Energy Saving for Environmental Protection and Control. This course is a program that proposes a multi-disciplinary educational approach to train next-generation managers and professionals interested in leading the change towards a sustainable future. Intensive course aims to build up the capacity of higher education institutions in the partner countries and the EU, particularly for international cooperation and for a permanent modernization process. The main scope of the courses is the harmonization of academic approaches to energy saving and renewable energy generation for environmental protection and control, by means of analysis and best practices, aimed at developing new master study programs to be implemented in Russia.

At the same time TICASS is programming, in cooperation with Università di Genova, a second level master course in “Green building and refitting”,

which aims to train professionals, engineers and designers capable of understanding and managing the dynamics behind environmental strategies and transforming the need to address the problem of energy consumption in buildings as a creative opportunity. A multidisciplinary course, encompassing engineering, architecture, chemical and material science disciplines, is taught by a variety of professionals, experts and researchers associated with the built environment, and explores sustainable design principles and issues at an advanced level. It provides students with the knowledge, skills and tools to be able to design, plan, evaluate and advise on the creation of low-carbon, sustainable buildings as well as evaluate the environmental impacts of their decisions.

Master's innovative concept is the focus on potential areas for renovation and refitting: considering the techniques of passive solar design to improve the heating and cooling of the building, looking at the condition of the exterior brick, stone or wood, to check how this may impact on internal temperature. Renovating an old house or simply refitting is perhaps the most sustainable means of construction. If the outer shell is kept, and the project needs no major building effort, then the potential environmental damage of sourcing and bringing in new materials and machinery is reduced or is none at all. This is what should be aimed at in the process of renovating and refitting an existing building, as well as using materials and a potential eco-redesign that seeks to make the building more ecologically sustainable.

Research Activities

By the research and development perspective, TICASS is partner of different regional research projects, in particular: "Nano-material and innovative technologies for energy re-qualification for existing buildings" and "CO₂ recovery and valorization from industrial gas emission through innovative membrane technologies".

TICASS adopt a market driven approach to all projects in which is involved, thanks to its nature of slim private company that aggregates large public research bodies, large companies as well as SMEs. TICASS is able to support a market driven innovation perspective, linking together companies' technology needs with public and private research activities to improve the regional overall competitiveness. This approach aims to improve success's probabilities of outcomes of research projects.

The first project is complementary to the above mentioned training initiatives. In the green building sector TICASS could offers specific knowledge, high skilled human resources and core competences, based on consortium interdisciplinary approach. The research project aims to match these complementary competencies to develop innovative solutions in terms of:

- Efficient energy management;
- Low energy consumption systems to guarantee thermal and hygrometrical optimal conditions;
- Utilization of nanomaterials to enhance thermal insulation;
- Smart management of energy systems by means of ICT technologies...

The project includes different partners public as well private and it pays special attention to market impact and to industry competitiveness.

In the green building sector, technologies areas interested are: thermal insulators (combining low apparent conductivity to the implementation of vertical axis wind turbines), photovoltaic technologies, new materials, geothermal energy, ICT system for intelligent management and control.

These four “pillars” are considered the most important in order to obtain a low energy consumption building. Particularly, the design phase is very relevant and it results to be of fundamental importance to perform detailed studies by means of computer simulations, in order to put in place detailed actions acting on relevant sources of inefficiency.

The second project, “CO₂ recovery and valorization from industrial gas emission through innovative membrane technologies”, is based on University/TICASS historic collaboration in the membrane research area, in this case applied to the CO₂ recovery and capitation field. The innovative technology in development should allow the adsorption and the extraction of CO₂ in steam reforming and combustion processes and the complete recovery of CO₂ in the gas stream. Project includes pure research activity to define chemical and physical CO₂ adsorption technologies.

**Иновационные технологии для энергосбережения
и экологического контроля: опыт ассоциации TICASS –
регионального инновационного центра**

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Ключевые слова и фразы: инновации; технологии; TICASS-консорциум; экологический контроль; энергосбережение.

Аннотация: Рассмотрен опыт регионального инновационного центра TICASS, занимающегося вопросами внедрения инновационных технологий в области экологического контроля и проблемами устойчивого развития. Некоммерческая организация TICASS содействует развитию научно-исследовательской деятельности, а также внедрению передовых технологий в практику энергетического и экологического менеджмента. Отмечены основные направления работы и проекты консорциума TICASS. Особое внимание уделяется научно-исследовательской деятельности и технологическим инновациям в области энергетики и сохранения окружающей среды для улучшения качества жизни и устойчивого развития. Дана оценка учебным программам по подготовке специалистов в области энергосберегающих технологий. Рассмотрены примеры проектов TICASS по улучшению качества жизни и сохранению окружающей среды.

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