MLSYSTEM - heatable, integrated photovoltaics with insulated glass units

Rapports

Informations projet

MLSYSTEM

N° de convention de subvention: 673917

Site Web du projet

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10.3030/673917

Projet clôturé

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22 Avril 2015

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SOCIETAL CHALLENGES - Secure, clean and efficient energy

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€ 50 000,00

Coordonné par
ML SYSTEM SPOLKA AKCYJNA
Poland

Ce projet apparaît dans...

4 Decembre 2015

Periodic Reporting for period 1 - MLSYSTEM (MLSYSTEM - heatable, integrated photovoltaics with insulated glass units)

Période du rapport: 2015-05-01 au 2015-10-31

Résumé du contexte et des objectifs généraux du projet

Unique semi-transparent multifunctional (heating, insulation, energy generation via photovoltaics) window/facade system for new ultra-low energy buildings

The subject matter of the project is the implementation of the invention: "Multiple glazed unit", being a part of window fixtures and building's front wall facades, containing rigid flat glass plates, one of which is covered with a thin electrically conductive layer, furnished with electrodes supplied by voltage and active photovoltaic system with a face sealed around its entire circumference with a compound resistant to water, moisture and temperature variations.

The main objective of the project is manufacturing implementation by ML System of innovative technological solution that is used worldwide for a period of no more than 3 years, resulting in worldwide marketing of a new product, which is photovoltaic panel integrated with multiple glazed unit.

The specific objectives of the project are:
1. broadening the scope of offer and marketing of a new product by ML System
2. raising qualifications of production staff of ML System associated with operation of modern machinery and equipment within the scope of planned purchase of processing line.

Both the main objective and the specific objectives shall be achieved by 31.12.2018.

The project objectives will be realized through the investments consisting in implementation of a new, proprietary technology and starting on its basis, manufacturing of new product - photovoltaic panel integrated with multiple glazed unit.

The scope of the project will embrace research and development works necessary to implement new, proprietary technology, which includes inter alia:

• Research of surface resistance of the materials used
• Determination of optical parameters and research of surface morphology
• Examination of chemical composition
• Upscaling and demonstration studies

We can differentiate following elements of different stages of tasks:
1. Development of designs, drawings, plans and other documentation to create new product which will be multiple glazed unit.
2. Integration of existing components into one system of multiple glazed unit
3. Development of a prototype of glazed insulating glass unit.

The objective of the research is to optimize material and electrical parameters of heating in respect of using other conductive components in developing a simple and compact design of universal multiple glazed unit.

The new technology has the form of technical knowledge not covered by the patent at the moment, which has been filed for patent protection under no.P.402500 (the invention protected by patent application dated 21.01.2013 and has not yet been deployed to manufacturing).

The objectives of elaboration of this feasibility study (along with business plan) were:
• selection of the best variant for the implementation of investment project;
• checking whether the project is feasible at the selected technology / assumptions;
• checking whether the project is feasible, with no risk of losing financial liquidity;
• making it possible to select the most effective solutions if there are more proposals than available resources;
• optimization of financing.

The analysis has proved that:
• The project is feasible. In order to mitigate the identified technical risks, which indicate the possible threat to project execution, the strategies for mitigation of risks and alternative ways of project implementation were developed.
• The documentation gathered to date provides sufficient evidence for the feasibility of the project (from engineering and technical, marketing, management, implementation, environmental protection points of view, etc.).
• There are indications to believe that the project will be of a permanent nature, i.e. Income from the operations will allow covering operating expenses.
• ML System has demonstrated the alternative solutions for project implementation.

• The project is financially and socially viable - implementation of the project shall add value for project beneficiaries.

Travail effectué depuis le début du projet jusqu'à la fin de la période considérée dans le rapport et principaux résultats atteints jusqu'à présent

o date, the following actions aimed at project implementation were taken:
1. The main objective of the project and the specific objectives were identified.

2. Patent Application No. P.402500 was filed.

3. Schedule of works and expenditures of the project was defined.

4. Initial research plan for the project was defined.

5. Technical, financial, economic (market) and environmental risks and methods of their neutralization / minimization were identified.

6. Key resources required for the success of the next stage of the product development (HR, technical, localization resources) were identified.

7. Market analysis for the following: demand, market size, competitors, business partners was carried out.

8. Business strategy: sales channels, pricing and volume of sales, suppliers, were selected.

9. Financial viability analysis of the project was carried out.

The objective of this feasibility study was to assess the economic and financial situation, nature and profitability of the project.
The technical part of report was described in point 1b. of the Feasibility Study, while the financial and market part was described in the Business plan.

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Progrès au-delà de l'état des connaissances et impact potentiel prévu (y compris l'impact socio-économique et les conséquences sociétales plus larges du projet jusqu'à présent)

The main research problem, which ML System plans to solve in the next stage of the project, is related to determination of the optimum conductive parameters of layers. Multiple glazed unit invented by ML System (researched in stage I) fulfils its utility performance characteristics, however, the glass with tin oxide coating doped with fluoride (FTO SnO2) supplied for its manufacturing may be purchased only with the resistance of 8 or 240 ohm. For application in glass pane, 240 ohm glass is possible, and the heat output of such glass panel depends on the distribution of the electrodes, moreover, it is only possible to purchase a layer applied on glass. The scope of research works relating to multiple glazed panel, planned for the next stage before the commercialization, will cover primarily the research of the resistant layer, that generates heat by flow of electric current (new, innovative layers could be used as photovoltaic filler - or enriching the unit with additional functionalities e.g. to control its transparency, which is currently the subject of other research works). The planned research will be aimed at optimizing material and electrical parameters of heating layer for use of other conductive components - e.g. indium oxide doped with tin as a layer of ITO, silver oxide, tin oxide doped with fluoride and carbon materials such as graphene, graphene flake, carbon nanotubes and other composite materials. For these materials the application methods will be tested, e.g. screen printing, ink jet, or optionally (in case of a purchase of appropriate research equipment by magnetron methods). Also laser ablation methods shall be examined, and different kinds of electrode deposition technologies will be researched (e.g. ultrasonic, ink jet).

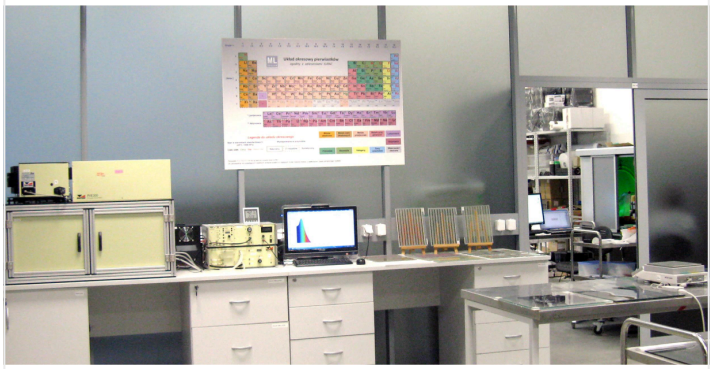
Examined and determined will be the substrate optical parameters with overlaid thin resistive layer, i.e. reflectance, transmittance, absorbance in a wide range of electromagnetic waves (from UV to medium infrared). Also the absorption and transmission coefficient will be determined. Also transparency of layers as a function of length of the electromagnetic wave will be examined. Also the thickness of thin layers and their chemical composition will be determined. The micrography by scanning electron microscope with X-ray adapter will allow for detailed examination of surface morphology. ML System laboratory team has prepared a range of tests that will be clarified after the

purchase of research equipment for the Photovoltaic Research and Development Centre.

The objective of ML System's innovative technology is to contribute to solving one of the European's main environmental problem i.e. global emissions of carbon dioxide (CO2) from fossil-fuel combustion. ML System intends to reduce an energy needed to heat (and air condition or other uses requiring electrical energy) commercial and institutional real estates (at the first stage of market introduction), what will be an important step towards achieving the EU goals for low-carbon economy. It will be possible thanks to MLSYSTEM, that is a novel multifunctional window, which is a façade glass unit for building integration with 3 main features:
• provides semi-transparent heating of the interior of the building,
• uses semi-transparent photovoltaic to generate electricity and
• delivers superior thermal insulation properties of the whole system. Its implementation will allow to reduce one of the main problem of real estate industry i.e. heat losses caused by window's heat transfer and air leakage.

Implementation of ML SYSTEM's innovation will greatly reduce problems associated with CO2 emission. The basis of MLSYSTEM's value proposition is the fact that buildings account for over 40% of primary energy consumption and 36% of Europe's CO2 emission.[Report: Glass for Europe]. If we consider that 30% of energy consumed in buildings is used unnecessarily or inefficiently [Report: U.S. Environmental Protection Agency; 2007], above mentioned data of an energy consumption's structure indicate crucial environmental and economic problem. Because this means that around 13% of global primary energy consumption is wasted, and about 12% of CO2 overproduced because of buildings energy inefficiency.
The potential area of enhancing building's energy efficiency relates to main sources of energy waste. Tests carried out on high-rise commercial and residential buildings, schools, super markets and houses have shown that between 30-50 % of energy loss is attributed to air leakage and heat transfer. [Report: Oak Ridge National Laboratory; 2004] As recent studies shows, one of the main sources of these losses (10% to 40%) are windows.[Press releases of: Mosby Building Arts, 2013; European Commission, 2014; Cornell University College, 2006] In this case, reduction of heat losses will have a significant impact on building's energy efficiency what will result in decrease of energy costs (real estate owners) and CO2 emissions (environment).
MLSYSTEM makes possible to achieve real savings of CO2 emission, because every kilowatt-hour [kWh] of electricity generated from solar power saves 0,718 kilos of carbon dioxide and greenhouse gases, which equals the amount emitted from using 0.081 gallons of gasoline.[University of Buffalo: An Initiative of the Office of Sustainability]. Assuming an average office room, annual savings could reach 557.28 kWh. Moreover, if we assume, that only one per cent of European production of insulated glass units will be replaced by ML System innovative solution, and will be use in EU constructions – at least 39 thousands of tons reduction of CO2 emissions will be achieved every year (equal 4.4 million gallons of gasoline saved). For office owners it will be an energy costs reduction of at least €6.5 million every year.
Moreover the European efficiency-related construction market is expected to double to €140 billion by 2020 (in relation to 2011) [European Patent Office News; 2011]. Thanks to the innovative solution the company is ready to exploit this business opportunity. ML System faces unmet market needs and they would like to be a global leader in this field.

The application of company cost-effective innovation will greatly facilitate the implementation of EC's long-term strategy of a competitive low carbon EU economy [COM(2011) 112]. Thanks to primary energy savings, MLSYSTEM is in line with the EU energy efficiency targets [Directive 2012/27/EU]. Moreover their innovative system is an answer to global trends of energy efficiency increasing by optimizing buildings energy consumption [World Energy Council Report; 2013]. Limitation of the above-mentioned problems and their impact are the main objective of the proposed innovation.



Since the product so far is covered by business secret, we enclose the picture of our laboratory

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Permalink: https://cordis.europa.eu/project/id/673917/reporting/fr