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Abstract

The Climawin DA Project has completed its 36 months work. In the second period it succeeded in developing and realising 6 pilot installations (demonstration sites) and monitoring their performance in real conditions. A seventh has now been added (August 2016). Business and commercialisation developments were completed including a branding strategy, economic decision making models, and market entry strategies and a comprehensive business plan. Promotion wise, open days have been held, trade show attended and video testimonials created and made available online along with computer animations and news pieces. At the close of the project, commercial orders have begun to materialise with the partners being in receipt of a €1m order for Climawin windows on a prestigious new housing and commercial project in Austria as well as order in Denmark.

KEYWORD LIST:

Ventilation, Supply Air Window, IAQ, Heat Recovery, Energy Efficient, Ventilation window, intelligent ventilation window, passive heat recovery.

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ABBREVIATIONS

FP7; EU 7th research Programme

Ho; Horn Vinduer (SME)

Rau; Rauh Fenesterbau (SME)

SAL; Solearth (SME)

SME: Small to medium enterprise partner

RTD; Research partner.

CW; Climawin Windows

LP; Licenced Production Partners

1 Publishable Summary (Overview)

CLIMAWIN is an advanced ventilation window system developed by Solearth Architecture in Dublin, Ireland, Rauh Fenesterbau in Sassendorf, Germany and Horn Vinduer in Lunderskov, Denmark with funding from the EU FP7 Programme's Research for the Benefit of SME initiative and with the (previous) R&D assistance of Fraunhofer Institute, Aalborg University, Denmark and The Electronics Department of the University of Minho, Portugal

Windows and ventilation are a significant source of heat loss, and discomfort particularly in older buildings, across Europe. The new technology improves energy efficiency by direct (passive) heat recovery through windows in cooler climates or seasons and in warmer climates or seasons by transmitting daylight without (unwanted) solar gain. It also improves comfort and air quality greatly. Climawin technology is suitable for both residential and commercial buildings, is ideal for renovation and is particularly appropriate for renovation of older domestic buildings in which energy efficient ventilation systems are rare. The new windows have static U values as low as 0.7W/m²K and can reduce annual energy consumption by 20% annually on an average modern European house.

The Climawin DA Project has completed its 36 months work and the partners have succeeded in perfecting the earlier window prototypes, evolving them into high quality wooden and aluclad frames for different architectural styles and applications, developing bespoke components (valves, controls and electronics) specific to Climawins functioning, and have developed state of the art manufacturing facilities at in Lunderskov and Sassendorf.

In the second period of the project, 7 pilot demonstration testbeds have been installed in Denmark, Ireland, Portugal, Germany and Italy and site monitoring of their performance is being carried out. Results show the windows performing as expected (preheating incoming air by up to 10 degrees and maintaining air quality (CO₂ and RH) at a comfortable level) and most are available to see online. Monitoring will continue until at least 12 months data has been gathered on each site. Open days have been held at each of the pilot sites and interviews about the experience of ordering, and using the windows, and the benefits experienced, have been made and are also online at <http://climawin.eu/links-to-testimonials/>

Climawin will be made available to customers in 2 ways, firstly by direct production and sale of completed Climawin windows (by 2 of the founding partners) and subsequently by sales of Climawin technologies to licenced production partners to enable them to offer their own Climawin windows (with full quality control) in local markets across Europe. Marketing, enquiries and IP protection will be managed by a new central company owned by the 3 partners. A business plan with a tool for assisting customers and others to make informed cost benefit evaluations about whether to, and how to, install Climawin has also been developed.

The partners have achieved a number of significant milestones in terms of marketing and promotion of Climawin as well as trailing and soliciting feedback from testbed users, visitors to the Open Days held at the Pilot Sites. During the project, Climawin window products (of all architectural styles) and components were put on exhibit at 12 major trade fairs/expos in Denmark, Norway, Germany and Italy. Brochures have been made and translated into 6 languages and are available at <http://climawin.eu/brochures/>

Patent and trademark protections have been activated for the products.

Climawin has now been brought to market as a high quality certified and guaranteed window product available across Europe through www.climawin.eu/ Climawin is intended to be scaled up in terms of market availability by the creation of licensed partnerships with window manufacturers across Europe with companies who wish to incorporate CLIMAWIN technology and know-how in their product catalogues. Applications from companies are invited at <http://climawin.eu/licenced-production-partners/>

The manufacturing partners are reporting the beginning of order pipelines being developed based on these and

other dissemination efforts.

2 Executive Summary

The Climawin DA Project has completed its 2nd and final period (27 months work) to bring it to the close of the project.

Over the second period of the project, the final tasks of the work have been completed.

6 pilot demonstrations have been installed (with 1 more just completed) in 5 countries and site monitoring of performance has been carried out for periods of 12 to 3 months upon them (the monitoring will continue until at least 12 months data has been gathered on each site). Open days have been held at each of the pilot sites and interviews about the experience of ordering, and using the windows and the benefits experienced have been made and are online.

A market entry strategy involving 2 synergistic go-to-market strands has been decided upon. These comprise I) production and sale of completed Climawin windows by 2 of the founding partners and ii) sales of Climawin technologies to licenced production partners for them to offer their own Climawin windows in local markets across Europe. The marketing will be managed by a central company mutually owned by the 3 partners. A business plan and economic model for decision makers have been developed.

14 Trade Fairs have been attended and an enthusiastic response has been noted. The manufacturing partners are reporting the placing order by commercial scale companies (as of now on projects in Austria and Denmark) itself being an indicator of the solid foundation participating in the DA project has placed the product on.

Patent protection has been applied for on the ventilation valve system (Denmark is granted and other countries are at PCT stage) and the name Climawin has been trademarked for Europe.

3 Dissemination of Project Results

Climawin is a collaboration between SMEs; Horn Vinduer, Denmark, Rauh Sr Fensterbau Gmbh. Germany, Solearth Architecture, Ireland.

All partners have agreed to share the foreground knowledge generated from the Climawin project with each having joint rights to use the knowledge commercially as outlined below.

The knowledge emanating from the R and D work carried out under the project shall be joint property of the 3 partners including the intellectual property rights of the products, designs, algorithms and specifications. Partners alone or together will claim the right to protect future developments.

The former RTD performers are expected to make case by case requests of the 3 partners to use the knowledge which will under normal circumstances be considered positively.

Based on these project results, a distribution of the benefits and knowledge emanating from the completed CLIMAWIN Project has been established according to the exploitation capabilities and commercialisation potentials of each participating company. The results, the foreseeable benefits from the exploitation of these results, and the available capabilities of the SMEs for exploiting these are detailed below.

3.1 Dissemination Measures

Over the course of the project copious outreach and public communication and dissemination and activities have

been initiated. These range from creation of websites, publishing of animation illustrating Climawin (functioning and parameters), TV, Press and Journal articles, Open days (and online testimonial interviews) and Trade Show expositions.

3.2 Disseminating The Knowledge

Climawin project knowledge was disseminated, in a sequencing that mirrored the increasing readiness of the emerging products and knowledge on the final windows. As the project programme dictated a focus on early craft scale production (frames and profiles, dissemination comprised press articles, and an early (information) version of the website. As prototypes became early products the emphasis changed to trade shows, technical brochures etc and later as pilot installation were realised, open days, video interviews and performance results.

3.2.1 Website and Internet

The [website www.climawin.eu](http://www.climawin.eu) has been created and updated to be the main portal for information on Climawin and the first port of call for sales or technical enquiries on it. It covers areas as diverse as; Climawin principles, components, how it works (including links to a You Tube video animation, pilot locations, testimonials and results (links to), primary research done and result/certification achieved, contact details for ordering through the manufacturing partners, FAQs and is publicly disseminatable deliverables of the project.

A specially made [video](#) animation of Climawins principles and operation in different modes and in different climate zones was specially created in 2 languages, for the project and made publicly available on the Internet/You Tube.

<http://www.rauh.de/index.php?id=20/>

<https://www.youtube.com/watch?v=9WAnEBUz5B8&feature=youtu.be%3Fhd%3D1/>

3.2.2 Newspapers and Television

Partners pursued various press and marketing activities that resulted in the publication of a number of articles on Climawin in many different press and trade publication and in different languages and countries over the course of the project.

The table below specifies the publications.

Publications

No.	Title	Nature	Location	Reference>Date	Access Level
1	Glasswelt	Trade Periodical	South Germany	June 2013	Public
2	Fraenkircher	Newspaper	Germany	May 2013	Public
3	Bundespreis	Trade Literature	Frankfurt	February 2014	Public
	Other	There have been numerous other TV pieces and journal/newspaper articles			

3.2.3 Trade Fairs

Climawin partners have attended 14 trade fairs and product shows in 5 countries over the course of the project.

3.2.4 Open day events and testimonials

6 open days have been held at the pilot sites in Ireland, Denmark, Germany and Portugal. Video interviews with key customer representatives, specifiers or users have been made available [online](#)

<http://climawin.eu/links-to-testimonials/>

4 Exploitation of The Foreground Knowledge.

4.1 IP Protection

The Climawin consortium have succeeded in putting in place the following IP protections;

Type of IP Rights	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant (s) (as on the application)
European Trade Mark EU Class 06, 19, 35	011374022	“Climawin” as trademark for the Climawin Modular Ventilation unit.	Patrade A/S on behalf of Climawin Techniq Aps., RAUH SR Fensterbau Solearth Architecture.
PCT International Application	PCT/DK2013/050411	Climawin Modular Ventilation unit	Patrade A/S on behalf of Climawin Techniq Aps., RAUH SR Fensterbau Solearth Architecture.
European Patent Application	P19801 13860005.1/	Climawin Modular Ventilation unit	Patrade A/S on behalf of Climawin Techniq Aps., RAUH SR Fensterbau Solearth Architecture.

In Canada the protection is pending and is reserved by the partners until December the 4th 2018 by which time we must trigger (and pay for) examination and start up proceedings.

In US the protection is also pending and we expect the next official procedure to be enacted by Year End 2016. We have not asked for expedited examination which could speed up the process.

In Europe the application is also pending and in June 2016 we asked for examination and are now awaiting a reply from the EPO –which is expected later this year. On January 25, 2016 we had received from confirmation from Patrade A/S (following their prosecution of a Supplementary European Search Report from the European Patent Office) that the application and the invention to which it relates seem to meet the requirements of the EPC. Quote “we can thus obtain a patent on the invention, as we have described it initially. The comments from the European Search Report refer to Rule 71 (3) EPC.

The process is progressing as is standard expected and nothing seem to have taken a turn into an unexpected situation.

4.2 Exploiting the Intellectual Property

4.2.1 Exploitable Innovations

5 results major exploitable results (3 products/components and 2 technology integration/conceptual innovations) have emanated from the project:

The following table summarises these exploitable innovations



Innovative Function	Regions	Maritime / North and Coastal Europe	Continental Europe
1.Ventilation. Comfort Improvements	Comfortable (temperature adjusted) background ventilation in winter as needed (in the colder areas)	Comfortable (temperature adjusted) background ventilation in winter over the whole year winter	Comfortable (temperature adjusted) background ventilation in winter
2. RH and CO ₂	Climawins control system and sensors monitor and adjust valves (air flow) to maintain optimum level of room CO ₂ and Relative Humidity		
3. Energy Reductions – Heat		Energy (heat) recovery over most of the year.	Energy (heat) recovery from Spring to autumn
4.Energy Reductions – Light	Allows (along with controllable blinds) transmission of daylight without ingress of unwanted solar gain –thus saving on cost of artificial lighting		Allows (along with controllable blinds) transmission of daylight without ingress of unwanted solar gain –thus saving on cost of artificial lighting during warmer periods
5. Regulatable Valve and Bypass Inlet	Allows proportionate (time controlled) direct ventilation and self cooling air flow.	Allows proportionate (time controlled) background ventilation year round and direct ventilation in summer	Allows proportionate (time controlled) background ventilation and direct ventilation for warmer periods
6 Control Systems	Reduces manual involvement and risk of interference in pre set (optimised) control scenarios, increasing effectiveness/energy efficiency. Short term user (manual) override increases usability		
7. Wireless Communication	<p>Speeds up communication between room sensors, extraction system and window controls/electronics (also internet connections) etc and thus reduces installation impact (need for hard wiring).</p> <p>When controlling extraction system, optimises system energy efficiency by co-ordinating fan extract to when window inlet (controlled by algorithm) requires air inlet.</p>		
8 Integrated (Power)	Integrated (autonomous) power combining PV panels, rechargeable batteries (and manual recharge port) to create a plug and play installation without specialist (electrical) construction work.		
9. Integrated Blinds	Blinds provide privacy but in combination with valve (in self cooling mode) allows transmission of daylight without unwanted solar heat gain.	Blinds provide privacy but in combination with valve (in self cooling mode) allows transmission of daylight without unwanted solar heat gain –warmer periods	
10.	Climawin operation App and online programme allows building owners adjust set points, deploy blinds or change ventilation mode from a distance and prepares Climawin for full connection to Internet of Things		
11. Security,	Climawin reaches exemplary level of performance at acoustic privacy, security,		

Acoustics, Static Thermal performance	cleanliness (all panes and panel open and can be cleaned) and as static window reach passive house window standards.
12. Climawin Concept	The overall concept for an autonomous intelligent (regulatable in real time and connected to extraction, sensors and distant control by the internet) ventilation window combining preheating (passive heat recovery) and self cooling (daylight without heat) is a major innovation in and of itself (across all climate zones).

4.2.2 Pathway to Commercialization

Following a comprehensive review of the possible go to market scenarios, the Climawin consortium have agreed that partner Rauh will be the exclusive manufacturer of Climawin technology components for us in any and all Climawin windows howsoever brought to market. This will be administered by the consortium's new mutual Company (Climawin (Group) Ltd under the terms of a commercial agreement between the three partners. Under this agreement these completed components may be used by the 3 partners directly (to make their own Climawin windows) or sold onward by them for distribution to the Licensed Production Partners LPs to make their Climawin windows in the different markets and regions.

The window producers, Rauh and Horn will sell complete windows to their respective home markets and customers and all three partners will pursue long term license agreements with third party window producers (LPPs) in order to penetrate the bigger market in a logical sequence and at a timely pace.

Following this strategy important new commercial scale (as opposed to pilot scale) reference projects will be completed in the local markets by the two window producing partners assisting in further penetration of new markets by themselves and the LPPs.

4.2.3 Implementation

The three partners have agreed on a partner (commercialisation) agreement by which the aforementioned route to market strategy will be realised.

This agreement which comes into force in October 2016 sets the particulars of IP (ownership of IP Rights, Patents, trademarks and Climawin knowledge), financial /investment by partners to bring the product to market (management, stocking, marketing), component manufacture and quality control (mass production) and stipulations as to partners permissions and obligations to create distribution across Europe..

Under it component manufacture rights and duties are granted to partner Rauh who will manage ongoing and upscaled manufacture, stocking and shipping of said components to partners for onward distribution to producers of Climawin windows all over Europe..

It also defines the principles by which the components will be priced and sets out each partners home regions in which they are permitted and incentivised to set up (sub) partnerships with duly licensed window producers who will then be able to make and sell their own ventilation windows using the Climawin name. In following is route it is anticipated that we can have up to 8 producers and suppliers of Climawin windows operating across the European market within 24 months.

5 Socio-Economic Impact

Climawin will improve European building stock (new and existing) by the integration of its simple low complexity approach to improving the energy efficiency of buildings homes and classroom, enhancement of the occupant comfort and health and avoidance of more energy and material intensive alternatives previously employed to achieve similar objectives. It is both a high quality thermal window and a heat recovery ventilation system in one and as such assists in the reduction of materials used in manufacture, and economises on energy used in the running of separate window and ventilation systems.

Energy Benefits

Preliminary estimates suggest that Climawin could reduce energy use of a typical recently built European home by 3000kWh/ year (or 20% of the home comfort related energy cost). Based on our revised business planning forecasts, this means Climawin products installed would benefit the EC to the tune of the following energy reductions.

	2017	2018	2019	2020	2025
No of house equivalents per year	73	94	144	231	1156
Energy reductions kWhr	220,291	283,044	433,342	693,896	3,469,480
Energy Reduction mWhr	220.29	283.04	433.34	693.90	3,469.48
Energy Reduction gWhr	0.22	0.28	0.43	0.69	3.47 (GigaWattHours)

Employment

In addition to energy reductions, Climawin will create employment across the European Union (depending on type and location of activities). Our revised business planning indicates the following employment opportunities;

Year	2017	2018	2019	2020	2025
Jobs	5	13	28	42	222

Tax revenue

Additionally we expect the commensurate tax take benefit for various jurisdictions across the EU to approximate the following;

Year	2017	2018	2019	2020	2025
Tax €	236,881 €	298,313 €	447,461 €	701,680 €	3,582,520

6 Conclusion

The project work for Climawin DA has been completed. 7 pilots are installed. Performance monitoring is ongoing and indicating positive function in line with predictions. 14 trade shows have been attended and other promotional / dissemination activities (website, brochures, animations online, open days) have been completed. Business research, branding and market entry strategies have been finalised and applied to a viable business plan.

The consortium is already in receipt of substantial post FP7 commercial orders and the prospects for Climawin selling well and proving the benefits promised look good.