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WSSET World Society of Sustainable Energy Technologies NEWSLETTER

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SET 2017
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Wishing you all a very happy & prosperous New Year!

SET 2017, Bologna, Italy – 17th – 20th July 2017

WSSET is proud to announce the 16th International Conference on Sustainable Energy Technologies (SET 2017). SET 2017 will be hosted by the Alma Mater Studiorum – Università di Bologna, the oldest university in the Western world. The conference will take place on the 17th – 20th July 2017. SET 2017 is a multi–disciplinary, peer-reviewed international conference on sustainable energy sources and technologies that provides a forum for the exchange of latest technical information, the dissemination of high-quality research results, the presentation of new developments in the area, and the debate and shaping of future directions and priorities for sustainable development and energy security. Contributions are invited on the topics within the conference scope of sustainable energy technologies. All contributions should be of high quality, original and not published elsewhere or submitted for publication during the review period. All accepted papers will be presented orally or by poster, and included in the conference proceedings. Selected papers will be published in our partner journals. Abstract submission is by 10th February 2017. All WSSET members will get a 20% discount on conference registration fees. Please visit the website for more information including a timeline for abstract, paper submission & registration www.set2017.org
We look forward to seeing you in Bologna!

Important dates to remember

10th February 2017	Abstracts must be submitted – SET 2017
1st March 2017	Deadline for entries – WSSET 2017 Innovation Awards
17th – 20th July 2017	SET 2017 conference in Bologna, Italy

Research Cooperation in Renewable Energy Technologies for Electricity Generation (REELCOOP)

by Professor Armando Oliveira, University of Porto, Portugal

REELCOOP (REnewable ELectricity COOPeration) is an EU funded research and demonstration project aiming to develop and disseminate renewable electricity generation solutions, as well as promoting cooperation between EU and other Mediterranean countries. With a duration of 4.5 years, it will be completed in March 2018. It involves 15 different partners from the EU and MENA regions, including universities, research organisations and companies.

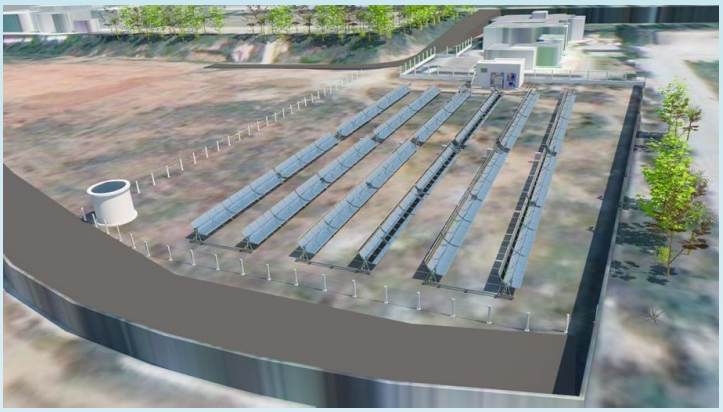
In REELCOOP three different renewable electricity solutions and prototypes have been developed, and will serve as demonstrators for the related technologies. Prototype 1 is a building integrated PV system, using the concept of ventilated façade. After developments in both Si and DSC solar cells, 48 c-Si PV modules were installed in an existing building in Turkey (Izmir), with a total area of 57.6 m^2, and a nominal output power of 7.4 kW. The PV modules use an innovative glass-glass configuration with high mechanical stability, without the need of an aluminium frame. Installation of the modules followed a procedure developed by Onyx Solar and was accomplished within 5 working days (façade and all electrical connections). The system is operating since February 2016 and the annual estimated electrical output is equal to 4.2 MWh.

Prototype 2 uses novel evacuated CPC solar collectors (stationary) combined with a biomass boiler burning olive oil waste, to drive an ORC power cycle with a micro-expander, and with the possibility of using useful heat from the ORC cycle condenser and boiler recovery; this prototype is under installation in Morocco (Benguerir). The CPC collectors - a new development by MCG Solar - are able to provide a high operating temperature (outlet temperature of 177ºC) with a high efficiency (51% at a solar radiation level of 1000 W/m^2). The system has a nominal output power of 6 kW, with an average electrical efficiency that may vary from 8 to 14%, depending on the solar/biomass share used. The annual predicted electrical output, when operating 24 hours/day, is equal to 50.6 MWh.

Prototype 3 uses sun-tracking parabolic trough solar collectors with direct steam generation combined with biogas, to drive an ORC power unit; this prototype is under installation in Tunisia (Tunis). The parabolic collectors are an improved model manufactured by Soltigua, able to support high pressure inside the evacuated tubes. The ORC turbo-generator unit is a new development by Zuccato Energia, and is adapted to variable operating conditions from the solar field. The biogas boiler may be fed from gas generated through anaerobic digestion of food waste, and in the future by syngas obtained through a gasification process. The system has a nominal output power of 60 kW, with an average electrical efficiency of 10% when using biomass as backup to the solar field. The annual predicted electrical output, when operating 24 hours/day, is equal to 515 MWh.

More information about REELCOOP and related actions can be found in its website: www.reelcoop.com.

Prototype 1 (view of ventilated façade)



Prototype 3 (simulated view of solar field and auxiliary building)

Sensor-based Energy Management

by Professor Li Shao, School of Built Environment, University of Reading, UK

This article provides an overview of energy monitoring and management, and in this context reports a case study on energy demand reduction in buildings through behaviour change informed by wireless monitoring systems for energy, environmental conditions and people positions. Energy Saving of 77% has been identified, through device and personal level energy data disaggregation.

The built environment professionals face a collective challenge to close the yawning gap between design and in-use performance, which affects a wide range of new and existing technologies for low carbon retrofit or new build.

Against this background there has been increasing evidence of the major energy saving potential of energy monitoring and management, based on the latest ICT and control technologies, which integrates holistically the optimisation of building energy systems, and the engagement of users and facilities management (FM) in the process. Major energy and carbon savings have been repeatedly demonstrated. For example, savings of 27% (CIBSE, 2012) have been achieved across the retail and office building stock of one of the largest commercial landlords of the UK, based on an energy monitoring and optimisation process and through working with building occupiers and FM. Some individual buildings within a given portfolio would achieve even higher reduction rates. Indeed, individual office building case studies have revealed savings of 40% and higher (CIBSE, 2011; Carbon Trust, 2010) often reflecting better practices in monitoring and action by building users and FM.

Further remarkable features of this energy monitoring and management approach include the lower costs of its implementation compared to fabric- or HVAC-based building retrofit solution. The cost difference is often an order of magnitude, with the former enjoying rapid payback in many cases, thus greatly increasing the likelihood of its uptake. The two approaches are not mutually exclusive, though it makes a lot of sense to reduce the demand first by improving energy efficiency and minimising waste, using energy monitoring and management, which may lead to cheaper HVAC and fabric interventions at a later stage.

Building user engagement facilitated by the ICT feedback of the energy monitoring and management system is probably one of its most valuable features as it deals with the source of energy use and waste much more effectively. Active and continuous user participation in identifying and removing the energy waste form an integral part of the energy monitoring and management solution, leading to lasting energy efficiency and durable behaviour change. Many of the faults and problems resulting in the gap between design and in-use performances were identified and resolved this way, which would have been much harder to track down otherwise.

A non-domestic case study (Shao, 2016) has explored the use of wireless energy and people location sensors and the delivery of feedback information for energy management (Figure 1). The non-domestic case study system utilises a real time location tracking system; this uses of a package of software to exploit a building's Wi-Fi network and locate wearable radio-frequency identification (RFID) badges. The signal signature identified by an RFID badge is used to approximate its location to an accuracy of 1-3 metres. Small battery powered infrared (IR) transmitters or location "beacons" were installed which provide sub 1 metre accuracy. The beacons were placed in areas of poor accuracy and at participants' workstations to improve the quality of the data.

Electrical appliance level monitoring was carried out using a system based on a ZigBee wireless communications protocol to transfer power load measurements, from 20 plug-in loggers, to a 'smart hub' which then transfers data to the a server via an Ethernet connection.
Figure 1 shows an example of the type of detailed information that can be collected and fed back to building occupants; for this participant a computer was continuously left in an active state, prior to receiving feedback, however he regularly turned off his monitor. Around 77% of this participant's workstation electricity consumption occurring when he was away from his desk and presented an opportunity to reduce energy consumption significantly.

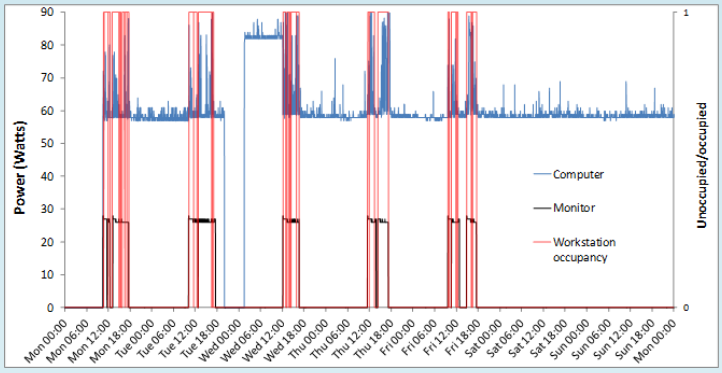


Figure 1. Feedback information for building occupant.

References

1. Carbon Trust (2010) *Monitoring and Targeting- In Depth Management Guide*. Carbon Trust
2. CIBSE Journal, pp38-42, September 2012
3. CIBSE Journal, pp40-44, November 2011
4. L Shao; F Foster; M Coleman; K Irvine; M Lemon; Y Hao (2015); Wireless Energy Behaviour monitoring (Wi-be) for office buildings, International Journal of Low-Carbon Technologies 2015; doi:10.1093/ijlct/ctv031

Development of Vacuum Insulation Panel technology and its Application in Regeneration Transportation

by Ankang KAN, Jin HU, Zhipeng GUO

Contacts: Dr. Ankang Kan (ankang0537@126.com) or Dr. Jin Hu (jin.hu@heig-vd.ch)

Composed of core porous materials, gas barrier membranes and getters, the Vacuum Insulation Panel (VIP) is made after the getters are embraced in the core materials and air is extracted before the core and getters are thermal sealed in the gas barrier envelopes. For this project, superfine fiber glass coil is selected as core materials and some prior simulations of optimum physical parameters are properly implemented. The perfect diameter of fiber glass is found to be 2μm - 7μm and the wonderful vacuum degree is less than 1 Pa (Shown in FIG.1). The core material should be taken per-treatment before VIP is made. Alternating current heating and vacuum craft are proposed by authors to deeply and promptly dry the core material. The nest barrier envelopes are designed by authors to decrease the gas permeation. Therefore, thermal conductivity of VIP, made by the authors, is less than 0.0020W(m·K)-1, and the thermal resistance is 10 times higher than that of conventional thermal insulation materials with the same thickness.

As a new environmentally-friendly and energy-efficient material, VIP is employed in many kingdoms, such as building envelopes, cold storages, reefer containers, trailer houses, fridges, freezers and so on. However, the panel shape confines its application in special fields, such as, pipes, boilers, furnaces, etc. To solve this constrained problems, many types and shapes of VIPs are developed by the authors (e.g. FIG.2a) to expand the application of VIPs.

For thermal insulation purpose, VIP is assembled within an insulation composite wall of refrigeration cabinet and thermal insulation models are developed to find the best location of VIP in the composite walls. Theoretically and experimentally studies are conducted. It was found that VIP composite assembly as an external insulation system exhibited greater effects on energy efficiency in comparison with the other locations.

As plug-in adiabatic panel, VIP is employed in medical incubator (as shown in FIG.2b) for vaccine, human organs and blood transportation purpose. The composite wall with polyurethane and VIP as an external insulation panel is designed. Under the same exterior summer condition in Shanghai of China, our experimental result show that the internal temperature of VIP incubator can be constantly maintained at -20℃ for 6.3 hours, which is 3.5 hours longer than that in conventional incubator.

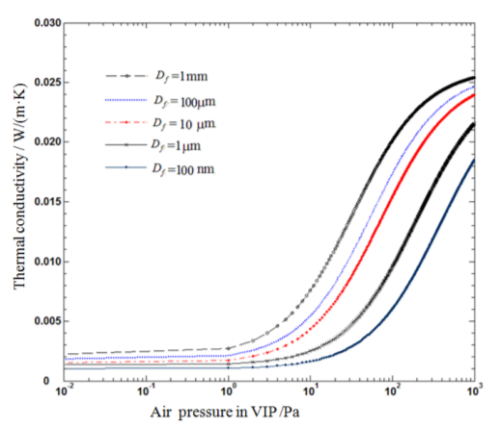


Fig.1 Thermal conductivity of VIP versus air pressure and diameters of fiber glass

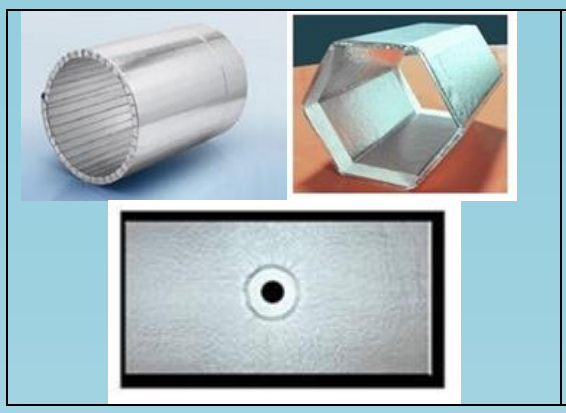


Fig. 2a The appearance of various VIPs

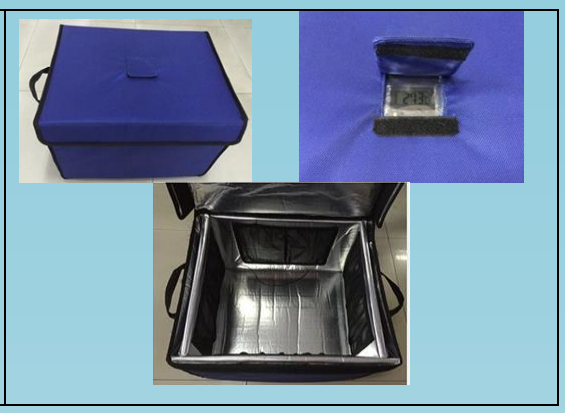


Fig. 2b Medical incubator with VIP adiabatic system

Project Partners: Merchant Marine College, Shanghai Maritime university; Institute of Industrial Bio-energy Systems, the University of Applied Sciences and Arts of Western Switzerland

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Major Process Intensification Project Addresses Applications in Solids Handling

by Professor David Reay

David Reay and Associates (DRA) is one of 22 partners across Europe in an HORIZON 2020 (H2020) project in the area of Process Intensification (PI), funded by the European Commission to the tune of approximately €10 million. The project – called Intensified-by-Design® (IbD®) is led by IRIS. IRIS, a Spanish organisation based in Barcelona, is an advanced engineering company that specializes in process monitoring and control solutions and novel technologies for process optimization (an area highly relevant to the IbD project), with headquarters in Barcelona and facilities in Dublin. (See www.ibd-project.eu)

DRA, which has been active in process intensification for about 20 years, plays a fundamental role in several of the work packages, which include the supervision of the chemical process design methodology and management of the Process Intensification Implementation Team (PIIT), as well as coordinating the cohesion of several PI case studies. DRA is utilising tools – state-of-the-art reviews, 'expert system analyses', and numerical simulations, among others – to contribute towards the success of this project.

For those less familiar with the concept of Process Intensification (PI), it arose from a fundamental re-evaluation of the capital cost structure of process plant which was performed by ICI in the 1970's, led by Professor Colin Ramshaw, one of our Associates. At that time the conventional approach was to aggregate the cost of the Main Plant Items (MPI), e.g. heat exchangers, reactors, distillation columns etc., and then to multiply this by a factor (called the Lang factor) based on experience regarding ancillary equipment such as foundations, piping, installation costs, instrumentation etc. With this factor being typically in the range 4 to 8, if a dramatic reduction in equipment size could be achieved WITHOUT compromising the plant output, then the extraneous cost elements embodied in the Lang Factor could be significantly reduced. This also results in other benefits:

- Improved intrinsic safety via lower hazardous inventories.
- Reduced environmental impact via less obtrusive plant.
- Fast response times facilitate just-in-time manufacture, leading to lower warehouse storage costs.
- On-board processing /distributed manufacture can be realised via intensified mobile plant.
- Full data are given in (1).
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The IbD project commenced in September 2015 and runs for three years. IbD will create a holistic platform for facilitating process intensification in processes in which solids are an intrinsic part. (Of course this is one of the most challenging areas of PI as one normally associates intensification with much reduced plant sizes and unit operations having small channels etc.) The IbD approach is hinged on the use of robust data about a process to 'redesign', modify, adapt, and alter that process, possibly transforming it into a continuous, intensified system. Statistical, analytical, and risk management methodologies are being applied in the design, development, and processing of high quality, safe and tailored chemicals, pharmaceuticals, minerals, ceramics, etc. based on intensified processes.

As a major outcome, the IbD Project is directed at delivering to the EU process industries an affordable and comprehensive devices-and-processes design platform to facilitate process intensification. While IbD is concerned primarily with processes handling solids, the approach, as far as PI analysis is concerned, will not be totally limited to solid materials processing. Six PI industry case studies will be implemented in mining, ceramics, pharmaceutical (two cases), non-ferrous metals, and chemical processes using the IbD approach and to validate the IbD methodologies. The Platform includes design modules for some common intensified reactors - Rotating fluidized beds, micro-structured reactor, and spinning disk reactor, among others, as well as a generic Module Builder - equipped with a set of both proprietary and third parties design tools - for designs carried out on the basis of radically novel ideas. The IbD Platform output is basically a dataset that comprises the intensified reactor design - ready to be built or assembled, an optimised whole process design including the upstream/downstream intensified unit operations and their solids handling capability, as well as cleaning methods, etc., and the expected economic and environmental quantitative impacts. The visualisation of this summary of work is found in the Figure below.

Reference:

Reay, D.A., Ramshaw, C. and Harvey A.P. (2013). Process Intensification: Engineering for Efficiency, Sustainability and Flexibility. 2nd Edition, Butterworth-Heinemann, Oxford.

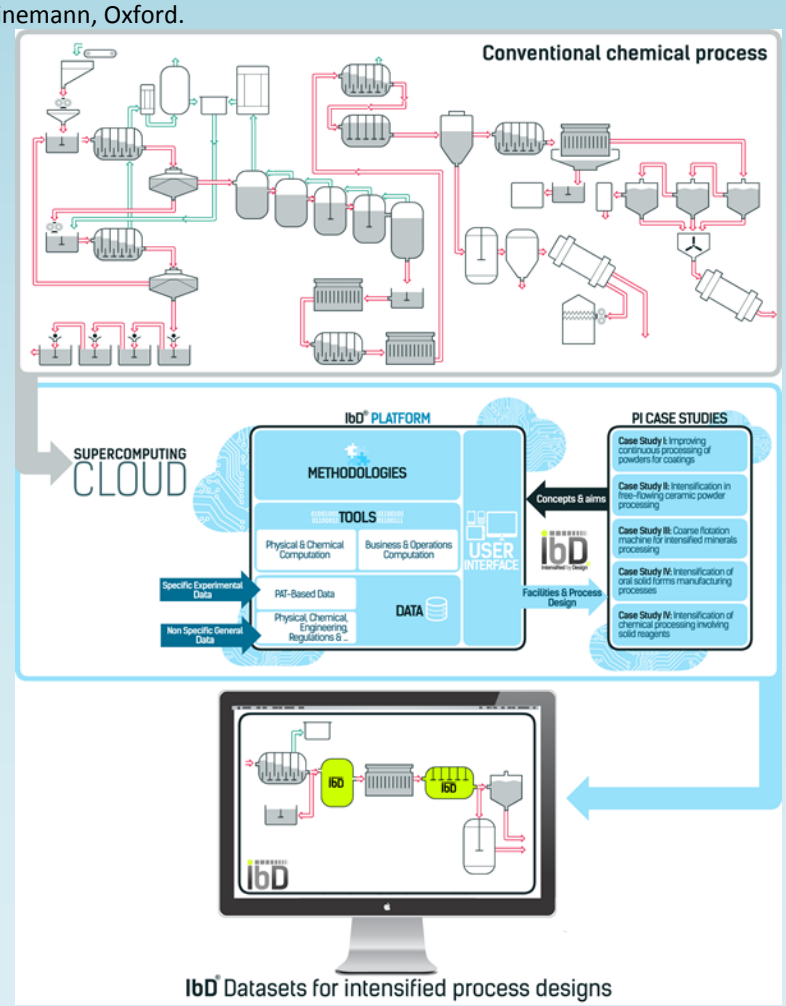

Figure: The IbD® platform is essentially a comprehensive devices-and-processes design-platform for the industrial realisation of PI involving solids handling – either from scratch or by transforming existing processes into intensified ones (Figure courtesy of IRIS, www.iris.cat).

Thermal energy storage (TES) for Building Cooling Heating and Power (BCHP) systems

by Yin Zhang and Xin Wang, Tsinghua University, Beijing, China

Building cooling heating and power (BCHP) is a novel kind of building energy supply system which shows high energy efficiency, low pollutions emission and good economic benefit. However, the energy supply units in a BCHP system show poor thermal performance under part load working conditions, due to the non-synchronized and fluctuating thermal and electrical demands. Introducing thermal energy storage (TES) equipment into BCHP systems proves to be an effective way to improve the part load performance of the whole system and saving the primary energy consumption. Furthermore, compared to sensible heat storage, latent heat storage with phase change materials (PCMs) is of relatively high energy storage density, which has great energy saving potential after integrated with BCHP system.

The typical BCHP system with PCM-TES is shown in Fig. 1. The gas turbine is driven by natural gas and the mechanical energy is further changed into electricity power. At the same time, the absorption chiller utilizes the exhaust gas to produce cooling water. To improve the part load performance of the whole system, PCM-TES equipment is added and it can be placed to the absorption chiller upstream or downstream.

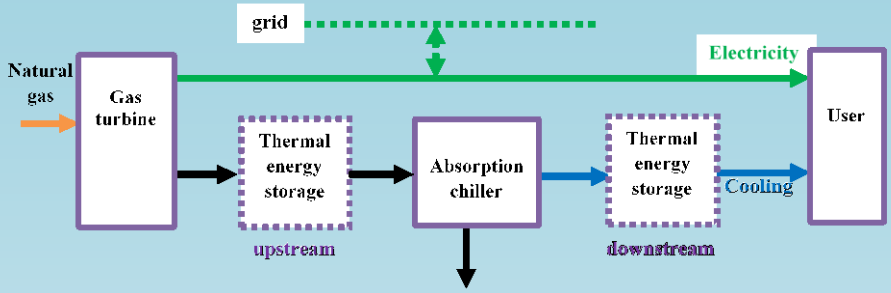

Fig. 1 Schematic diagram of a TES-BCHP system

The system gives priority to meet cooling or heating demand, and electricity can be bought from the power grid to compensate for the insufficient electrical load. The PCM-TES equipment location in a BCHP system and its thermal performance have a great influence on the primary energy consumption of the whole system. Considering the practical hourly fluctuating user loads, a simplified model of PCM-TES-BCHP system is established to investigate the influence of different TES locations (upstream and downstream) on the primary energy saving ratio (PESR) of the whole system. Moreover, the impact of NTU of the PCM-TES equipment is analyzed for a typical hotel and an office building in Beijing respectively. The results are shown in Fig. 2.

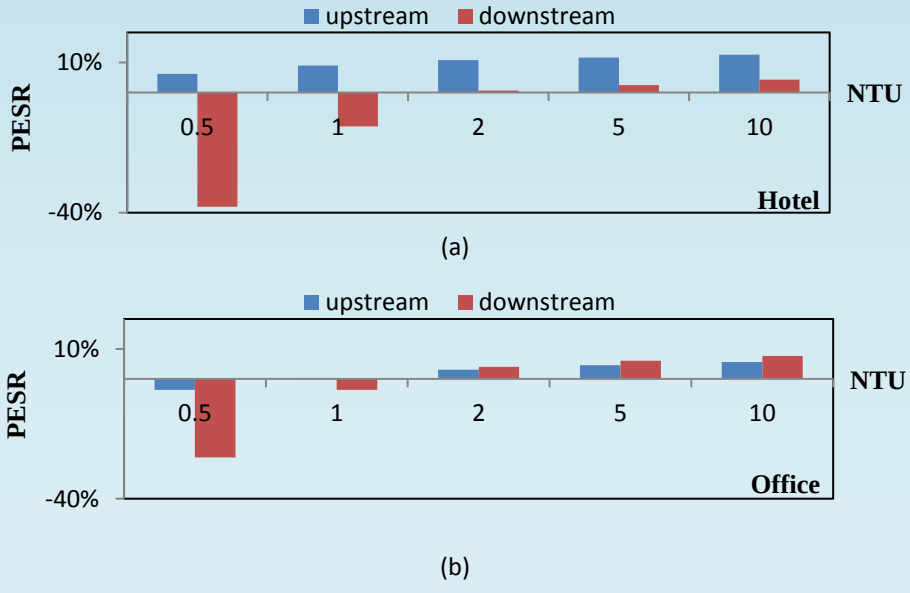

Fig. 2 PESR variation of different NTU values in a typical summer day (a) hotel; (b) office

It can be seen that primary energy saving ratio always increases with increasing NTU, for both such the hotel and the office building. Furthermore, primary energy saving ratio may become negative when NTU is lower than the critical value, which means that PCM-TES-BCHP system consumes more energy than the one without TES, due to the bad thermal performance of the thermal energy storage equipment.

Secondly, comparing the upstream and downstream TES locations, it is found that primary energy saving ratio of BCHP system with downstream PCM-TES is more sensitive to NTU, than that with upstream one, in terms of that primary energy saving ratio increases with increasing NTU faster for downstream location.

Thirdly, comparing the hotel and office building, it can be seen that the influence of upstream and downstream location on primary energy saving ratio is different. For such a hotel, primary energy saving ratio of upstream TES is always higher than that of downstream. Nonetheless, for such an office building, downstream location becomes more preferable with increasing NTU.

To sum up, the optimal PCM-TES location in BCHP system highly depends on the user load characteristics and the thermal performance of practical equipment. This work can provide guidance for practical TES-BCHP system design.

For more information please contact: Dr. Yin Zhang (cdzhangyin@163.com) or Associate Prof. Xin Wang (wangxinlj@tsinghua.edu.cn), Department of Building Science, Tsinghua University, Beijing, China.

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Dew Point Air Conditioner Employing a Novel Guideless Complex Heat Exchanger

by Professor Xudong Zhao, University of Hull, UK

A water-based, extremely low energy consuming dew-point air conditioner makes uses of a novel guideless complex heat exchanger and intermittent water supply has been developed in University of Hull.

The novel complex heat exchanger which, compared to conventional flat-plate heat exchangers, removed the use of the channel supporting guides and implemented the corrugated heat transfer surface, enables the reduced air-flow resistance and increased heat transfer area. This can increase the heat transfer area by around 40%, thus leading to the increase of the same percentage of heat transfer rate. Further, this can also decrease air flow resistance by around 50-56%.

The heat exchanger comprises numerous complex heat exchanging sheets, each of which is the combination of a dry material layer (i.e. a specific aluminium with high elasticity) and a wet material layer (i.e. Coolmax-2 with excellent water absorption/diffusion/evaporation capacity) by using an excellent marine adhesive (i.e. Sikaflex®-291i). This provides the sheets with high flexibility in complex shape formation (i.e. flat geometry at the inlet/outlet portions and corrugated geometry at the main heat transfer portion), and creates the perfect water absorption, diffusion and evaporation effect on the wet surface, thus significantly improving its cooling performance. Further, the Coolmax-2 fibre layer has a very thin thickness (0.1-0.2 mm) that leads to the reduced thermal resistance and increased heat transfer rate. The fibre has the features of high durability, low pressure drop, easy of shaping, cleaning & replacement, and thus is particularly suitable for indirect evaporative cooling application. All these innovations together enable the formation of a low cost, high efficiency and durable heat exchanger with 11% to 38% higher wet-bulb cooling effectiveness compared to conventional flat-plate heat exchangers.

Furthermore, the excellent absorption capacity of the wet material layer enables it to retain water for a long period, thus creating an intermittent water supply opportunity that can minimize the water usage and water pump power consumption, and also enables the fibre layer to remain in saturation and meanwhile, prevent the formation of the water film on the surface that could restrain the evaporation of water.

Combination of the above innovations has resulted in the increased cooling capacity and decreased power consumption, thus yielding a significantly higher energy efficiency (COP) (i.e. 37.4 to 52.5) than that of existing dew point air conditioners (i.e. 18 to 20), and notably lower electrical energy use (reduced by around 50% to 70%). Compared to the traditional mechanical vapour compression air conditioners which have the COP of around 3, the new dew point air conditioner has 10-16 times higher COP, leading to reduction in electrical power consumption by around 90% to 95%.

The novel dew point air conditioner was developed through a research project entitled “Key Technologies for Enhancing Energy Efficiency of the Dew Point Air Cooler and its Manufacturing”, which is funded by Engineering and Physical Sciences Research Council (EPSRC), Innovate UK and Ministry of Science and Technology of China (EP/M507830/1). The novel dew point cooling technology will bring about enormous economic, environmental and sustainability benefits to the UK, China and worldwide.
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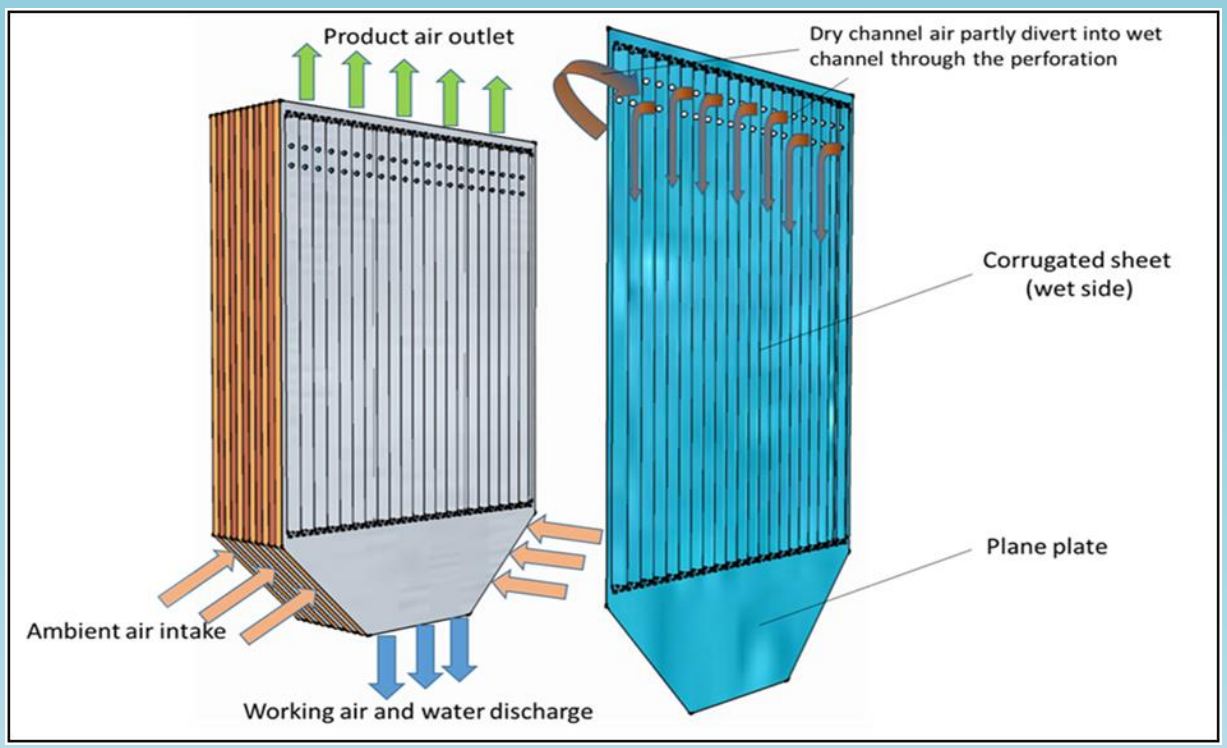


Novel guideless complex heat exchanger

4kW lab prototype system

WaterGEN project

by Dr David Tetlow, Architecture, Energy & Environment Research Group, University of Nottingham, UK

The WaterGEN project aims to develop an innovative and highly efficient, micro-CHP using steam ejector/water turbine (WaterGEN) system. This is based on the integration of steam-ejector and water-turbine technology for heat and power generation. The low cost system would reduce carbon reduction by the utilisation of renewable energy sources, waste heat or hybrid sources (e.g., waste heat/natural gas). For safety, stability and cost, water would be ideal for use the working fluid.

The new technology will address fundamental energy supply problems. UK targets for reducing carbon emissions conflict with an aging power generation system, operating close to its maximum capacity risking power cuts, especially during winter peak demand. Renewables, notably wind, PV and biomass are becoming increasingly important, but alone cannot meet the predicted short term generation gap. Being based on existing technology, WaterGEN system could be rapidly introduced to reduce the UK generating gap and improve the energy supply security through buffering the intermittent output of renewables. The system is an off-grid electrical production system designed for operation in environments where access to grid energy is restricted or prone to failure. Its basis is the use of waste or process heat directed into a specially designed Venturi jet-pump, this entraining water from a storage source through an enclosed pipe network. Motive steam converted to water kinetic energy is drawn from the system via a DC turbine in series to the circuit with residual heat being extracted for use as a supply source.

It is envisioned WaterGEN will be used in applications that could include:

- Existing industrial systems that generate high waste heat at a consistent rate to produce electricity to be used at source, thus mitigating the sites reliance on grid electricity. This being a relevant issue considering the numbers of old coal powered stations being taken off line in the coming decade.
- Locations where access to grid based electricity is limited, such as fringe settlements in large countries (i.e. Canada, Russia, etc.) having a large supply of heat generating source such as biomass. Electricity generated in these cases would be used to power vital systems such as lighting, etc.
- Locations were human access is limited and a consistent reliable electrical source is required (i.e. nuclear reactors, deep sea locations, etc.). The electricity provided in these cases be used to power vital systems, etc.

The WaterGEN project represents a unique example of collaboration between industry and academics with the final technology developed being highly innovative. The system developed is unique as the pump is based on a block device, with no moving parts that uses fluid mechanics principles to generate the water flows for the turbine electrical extraction (see *Figures 1* and *2*). Thus the system is highly reliable, and once established has negligible servicing costs, with all other components being *off the shelf*. It is highly adaptable and can be used with any heat source feasible to generate the water flows to drive its turbine, thus enabling its adaption into large-scale renewable systems.

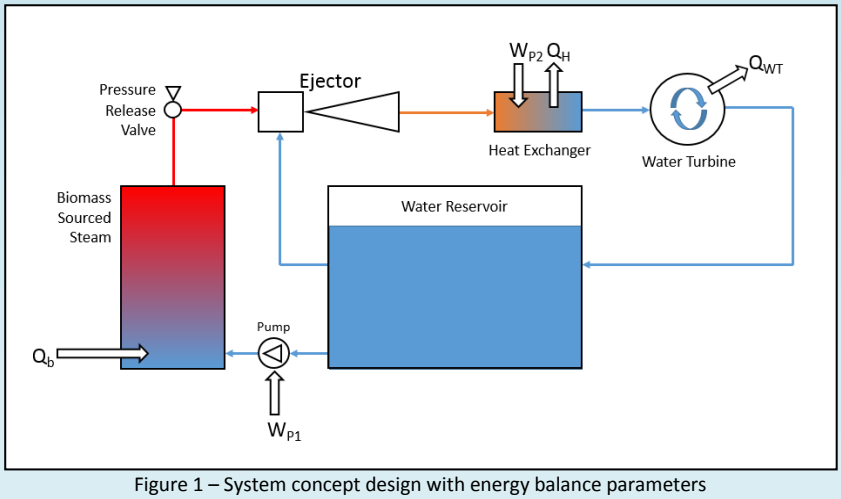


Figure 1 – System concept design with energy balance parameters

Figure 2 – Completed prototype installation (pipework leading to tank and exchanger out of picture)

Benefits:

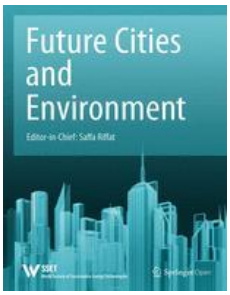
This project will provide benefits though focus on the following market opportunities:

1) Conversion of heat from various sources (e.g., biomass, industrial waste heat, solar or hybrid sources such as waste heat/natural gas) for power generation. For instance, ~1 TWh/y of industrial waste heat might be converted to electricity mainly from hot flue gas in the high temperature process industries (cement, iron and steel, glass, ceramics and chemicals).
2) Buffering the intermittent output of renewables, notably biomass, wind and PV. In 2011, the Grid gave wind power generators £10m in constraint payments for power that could not be taken. The high temperature WaterGen would allow this excess power to be used for a combination of power generation and process/space heating. The potential value of the market will increase from £10m/y as the UK becomes increasingly reliant on wind power.
3) CHP for commercial and industrial space heating. This offers a significant opportunity to generate electric power both to make the grid more resilient simultaneously minimising energy costs for building occupants.

The combined UK 2009 industrial and commercial space heating requirement was 235 TWh, equivalent to ~24 TWh of power if it was produced by the WaterGEN system at 10% conversion. Assuming an equipment cost of £1000/kW installed then the total value of this equipment for this market would be ~£60m and the payback would be ~ 2 years. A 10% market penetration is a conservative estimate should WaterGen prove as effective as anticipated.

Journals WSSET recommends - Future Cities & Environment

Along with the successful ***International Journal of Low Carbon Technologies*** (http://ijlct.oxfordjournals.org/), Professor Saffa Riffat would like to invite you to submit articles to his newest Journal from Springer publishers: ***Future Cities & Environment*** *http://www.futurecitiesenviro.com/*



Scope of the journal - Future Cities and Environment publishes high quality multi-disciplinary research which aims to reduce the environmental impact of cities. Considering research in the areas of transport, urban planning, architecture and design, and energy and infrastructure, it publishes fundamental and applied research, critical reviews and case studies. This includes experimental development, demonstration and computer modelling. Future Cities & Environment is an open access journal. Articles related to the topics of Future Cities & Environment are all welcome, and should be submitted using the above link.

WSSET exclusive offer – IJLCT

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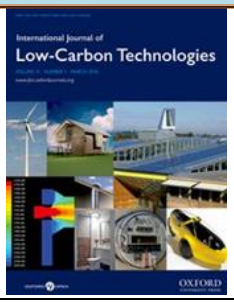

WSSET in conjunction with the International Journal of Low-Carbon Technologies (IJLCT) are introducing a 50% discount to the APC (article processing charge) for WSSET members wishing to publish a paper in IJLCT (open access). This would cost WSSET members £375 as opposed to the full charge of £750. The authors will need to quote they are WSSET members when it comes to payment. Please visit: http://ijlct.oxfordjournals.org/

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All WSSET members are kindly invited to submit articles for publication in future WSSET newsletters. Articles can be on a range of topics surrounding the word of sustainable energy technologies. With over 1000 active members, the WSSET newsletter provides a great opportunity to publicise new ideas, technologies or products – all free of charge!

Articles should be no more than 400-500 words and one or two photographs would be very much appreciated. Submissions should be emailed to secretay@wsset.org

Furthermore please contact secretay@wsset.org regarding any conferences, seminar or symposiums relating to topics of sustainable energy technologies that wished to be advertised in the newsletter.

Once again WSSET wishes to thank the continued support of its members.

Donations are welcome and greatly appreciated!
We would like to remind our members that WSSET is a non-profit organisation, hence providing free membership. We would not be able to play a significant role in consolidating practical partnerships between academic and industrial organisations without the help of our members.
Whether you would like to get more involved or contribute financially, please get in touch with us at secretary@wsset.org

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