DYNASTEE
NEWSLETTER ISSUE 2020/17

Foreword

As the pandemic continues, we adapt to the situation by working from home and having digital meetings, lectures and conferences. Although this way of working has many limitations from an interpersonal point of view, it also has some positive implications: As many as 110 participants took part in the online DYNASTEE Summer School on Dynamic Calculation Methods for Building Energy Performance Assessment. You'll find an article on the webinars and its evaluation below.

Pandemic or not, our work continues. In this 17th newsletter, you'll find a summary of two recently published studies by CIEMAT, on the analysis of different aspects of data-based modelling to assess the thermal performance of walls and whole building envelopes. In Salford (UK), construction has started on the Energy House 2.0; an impressive large-scale building test facility.

This newsletter also contains a call for papers for a special issue of the Journal Sustainability on Understanding and measuring the Building Fabric Performance of Low Carbon Dwellings. Finally, a pre-announcement of the DYNASTEE Summer School 2021 is included, which can hopefully take place physically in Almería (Spain) in June next year.

Top: Impression of Energy House 2.0; Bottom: Energy House 2.0 Construction

Twan Rovers, Saxion University of Applied Sciences

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Construction begins on Energy House 2.0 Building Test Facility at University of Salford (UK)

By Richard Fitton, University of Salford, UK

Construction has begun on the University of Salford's Energy House 2.0, a £16 million home energy test laboratory in which scientists can undertake research around energy use in homes and small buildings in different weather conditions.

In the new facility the University's energy and environment academics will be able to create snow, rain, wind or solar exposure in two giant chambers. Different conditions can be generated by a state-of-the-art heating, ventilating and air conditioning system. Temperatures can be plunged to -20°C and raised to 40°C, meaning environmental conditions experienced by 95 per cent of the world's population can be replicated.

In Energy House 2.0, four furnished houses will sit within the chambers – two in each – with a total footprint of more than 1,000 square meters. Octopus Energy's future technologies division, the main partner in the project, will enable the lab to have access to 100 percent green electricity, Octopus's ground-breaking time-of-use tariffs and state-of-the-art energy hardware. The homes will be fitted with smart energy technology including smart meters, in-home displays, and vehicle-to-grid solutions.

There will be space to park electric vehicles and connect them to the homes in order to test vehicle-to-grid (V2G) technology – where renewable energy stored in a car battery pushes power back to the grid – in different weather. The chambers will also be accessible by vehicles to allow for offsite methods to be researched.

The project is the largest of its kind in Europe and has been part-funded by the European Regional Development Fund. The University has expertise in buildings and energy efficiency with research undertaken for over ten years in the original Salford Energy House built in 2011.

Greg Jackson, CEO and founder of Octopus Energy, said: "At Octopus, we use technology to make energy cheaper and greener – so we are delighted to supply the energy and smart technology for one of the most exciting research projects in the UK that is doing just that."

Update on construction and a live feed of the building activities can be found at: www.energyhouse2.com.

Evaluation of the DYNASTEE training webinars, September 2020

By María José Jiménez, CIEMAT, Spain

In the spring of 2020, the DYNASTEE board decided that it would support online training as an alternative to the annual Summer School, which the pandemic has made impossible. It has been implemented as a series of webinars. Each webinar was composed of two lectures and an exercise was introduced using benchmark data that was made available to the participants for training.

Note that these webinars cannot be compared with the traditional and physical Summer School that DYNASTEE has organised for the last eight years, where a close interaction between lecturers and participants is taking place. The webinars should be considered as a helping hand to get started with Dynamic Calculation Methods for Building Energy Performance Assessment.

The organisers are very happy with the total number of participants to each webinar. Usually the physical Summer School attracts not more than the maximum of 25 participants, that has been set for guaranteeing an interactive exchange between lecturers and participants. The organisers are fully aware of the fact that in the case of webinars, this interaction is very limited and in particular with the huge number of participants. There have been 110 different participants that joined at least one of the five webinars; 51 persons attended three or more webinars, of which 27 attended four or all five webinars. To get an impression of what these webinars are about, an extensive paper presenting the data analysis process applied to high quality data from an outdoor experiment, can be downloaded for free from the DYNASTEE website.

The webinars took place in September 2020, each Wednesday from 10 to 12 o'clock:

Webinar 1 (72 p) Presenting DYNASTEE and its history; training at the Summer School

Webinar 2 (76 p) Introduction to dynamic methods and the software tool LORD.

Webinar 3 (43 p) Presenting the experimental set-up and used measurement equipment

Webinar 4 (45 p) Introduction to CTSM-R and its application with PSA data

Webinar 5 (33 p) Conclusions and Questions & Answer

A survey has been prepared and mailed to all 110 participants; 11 replied before the deadline.

Q1: What is your main reason for attending these webinars?

Q2: How did you hear about these webinars? Most of the participants through the DYNASTEE Newsletter and web-site at www.dynastee.info

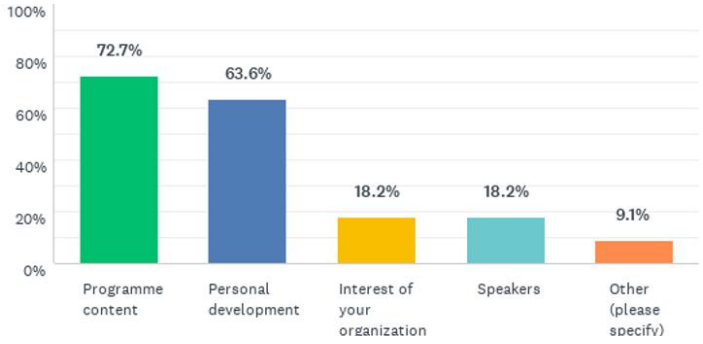
Q3: Please rate these webinars in terms of meeting your expectations. Note that 11 participants gave feedback to the survey.

Q4: Do you intend to apply one of the presented methods (LORD, CTSM-R) to the supplied data?

Q5: Are you considering participation in the physical Summer School to be held on 16-23 June in Almeria, Spain? 6 out of 11 intend to participate.

More information about the Summer School 2021 can be found in this Newsletter.

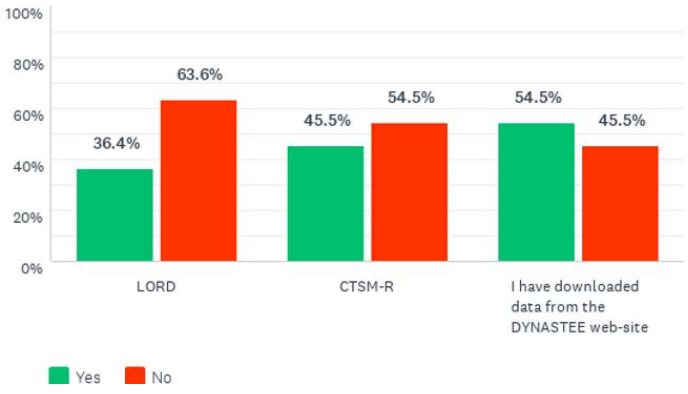
The organisers thank all participants for attending the DYNASTEE webinar series, hopefully they found it not only enjoyable but informative.



Q1: What is your main reason for attending these webinars?

Webinar	# Participants	Very Good	Good	Average	Poor/ Very Poor	I did not attend
1. Presenting DYNASTEE and its history; training at Summar School	72	4	4	1	0	2
2. Introduction to dynamic methods and software tool LORD	76	3	5	3	0	0
3. Presenting the experimental set-up and measurement equipment	43	4	5	1	0	1
4. Introduction to CTSM-R and application with PSA data	45	4	3	0	0	4
5. Conclusions and Questions & Answers	33	1	5	0	0	5

Q3: Please rate these webinars in terms of meeting your expectations



Q4: Do you intend to apply one of the presented methods (LORD, CTSM-R) to the supplied data?

Analysis of several key aspects of two data based modelling approaches for assessing the in-situ thermal performance of buildings, toward the application at on-board monitoring level

By María José Jiménez, CIEMAT, Spain

Two research works, aiming to analyse different aspects of data based modelling applied to assess the thermal performance of walls and whole building envelopes, have been published recently by CIEMAT. These two works have used benchmark data series from a test campaign conducted in a Round Robin Test Box (RRTB) constructed in the framework of Annex 58 EBC IEA and tested at Plataforma Solar de Almería. This Test Box can be seen as a simplified building and its simplicity, detailed and accurate knowledge are key characteristics to develop and validate assessment procedures, giving strong support to reinforce and complement the validation criteria. Both works are focussed on the assessment of the thermal performance of buildings from in-situ tests (obtaining the U value for the walls, and the UA value and gA value for the whole buildings, assuming that the construction is very tight with negligible infiltration).

One of these papers (1), considers the application of an integrated dynamic method. This method intends to be a kind of generalisation of the Co-heating test to be applicable to any weather conditions of buildings in-use. It is based on the integration of differential energy-balance equations, considering an integration period long enough to make the accumulation term much lower than the other terms, and using averages to estimate integrals. Several aspects of this approach have been systematically analysed. On the one hand, the minimum integration period that allows this simplification has been identified and, on the other, several candidate models considering different approximations for the energy-balance equations have been evaluated. The robustness of the method has been analysed by comparing the results from an eight-month period including different test and weather conditions. Significant differences have been observed in the accuracy obtained for the different integration periods: from insufficient daily averages to optimum six-day averages for the walls and four-day averages for the whole building.

The other paper (2), reports the application of RC dynamic models. The following aspects which are relevant to this approach have been systematically analysed: The effect of the solar radiation on the heat flux through the opaque walls versus the performance of the models including this effect, the optimum number of nodes required to represent the thermal systems, the assignment of inputs and outputs and the length of the test period. Additionally, several options modelling relevant effects using unmeasured variables were studied to evaluate the feasibility to reduce the cost and intrusiveness of the measurement devices required to obtain accurate results. Data series recorded under different experimental conditions were considered to analyse the robustness and validity of the results. The performance of the models for each of these different test conditions is discussed. Model selection has driven to accurate results (around 3%). The feasibility to model relevant effects using unmeasured variables has been demonstrated.

The analysis reported in these papers added to other published works constitute a collection of methods systematically applied and validated by means of their application to high quality benchmark data. This material provides strong background and support to the development of procedures for in-situ performance assessment of the building fabric, from data recorded by the on-board monitoring systems, from experimental campaigns conducted under a wide variety of dynamic conditions. The used data are available for further research.

References

1. Applied Thermal Engineering. 152C, 287-307. https://doi.org/10.1016/j.applthermaleng.2019.02.065

2. Energies. 13(18), 4800; https://doi.org/10.3390/en13184800

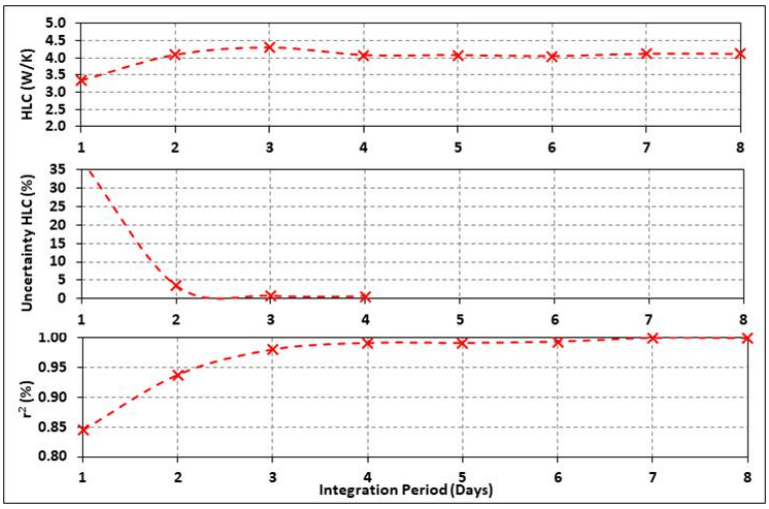


Figure 1. Dynamic Integrated Method. HLC and validity indicators, showing significant improvement of the accuracy as the integration period is increased. Accuracy around 3% is achieved for a two-day integration period and better accuracies can be achieved for longer integration periods

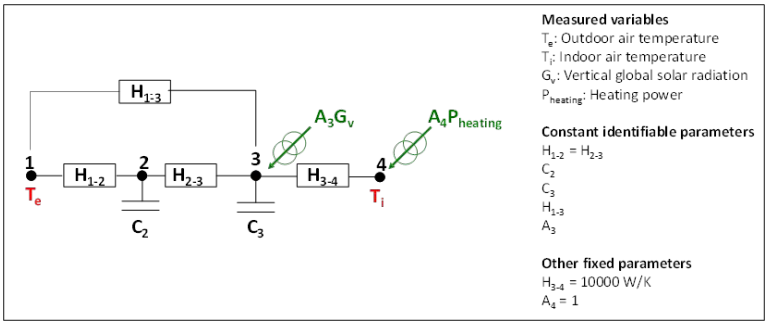


Figure 2. RC Model used to obtain the HLC of the RRTB

Pre-announcement Summer School 2021 in Almeria, Spain

By Hans Bloem

For the 9th time DYNASTEE will organise a Summer School in 2021 on ***Dynamic Calculation Methods for Building Energy Performance Assessment***.

More than 190 PhD students and researchers have participated in the eight preceding Summer Schools and their enthusiastic response has made us decide to continue organising this dedicated course.

Dates

16 - 23 June 2021

The six day course will be intermitted by a weekend. We have learned that a break is very much welcomed and a social event will be organised during the break.

Venue

CIESOL at the University of Almeria, Spain

Fee

The participation fee will be announced on the DYNASTEE website by the end of March.

Accommodation

The organisers will announce a special booking arrangement for early registrations together with the participation fee.

What is new

Arrival in the morning of 16 June. During the afternoon of the first day a get-to-know and poster presentation is scheduled. Participants and lecturers will learn about the work and level of experience of the participants on testing and analysis. Three days will be devoted to linear regression and discrete time methods (LORD) and after the weekend three days are devoted to continuous time methods (CTSM-R). The course concept will remain the same as in previous years which means that about half of the time is devoted to lectures and the other half to performing exercises using benchmark data. Departure during the afternoon/evening of Wednesday 23 June.

Feel free to contact mjose.jimenez@psa.es or hans.bloem@inive.org to be placed on the mail-list and you will receive updates of the announcement.

Seaside along the University of ALMERIA

Call for papers: Understanding and Measuring the Building Fabric Performance of Low Carbon Dwellings

By Richard Fitton, University of Salford, UK

Prof. Dr. David Johnston (Leeds Beckett University) and Dr. Richard Fitton (University of Salford) are editing a special issue of the Journal Sustainability on Understanding and measuring the Building Fabric Performance of Low Carbon Dwellings.

Authors are invited to submit original papers or state-of-the-art reviews dealing with the issues surrounding the thermal performance of the building fabric in new build dwellings and new, novel or existing techniques that can be used to assess, measure and quantify the fabric performance of new dwellings in-use. The submission of papers that develop the area of cost-effective and rapid solutions of building performance measurement is encouraged.

The closing date for submission of papers is 31 December 2021.

More information on this special issue can be found on its website.

ABOUT DYNASTEE

DYNASTEE stands for: "DYNamic Analysis, Simulation and Testing applied to the Energy and Environmental performance of buildings". DYNASTEE is a platform for exchange of knowledge and information on the application of tools and methodologies for the assessment of the energy performance of buildings. DYNASTEE functions under the auspices of the INIVE EEIG and it is open to all researchers, industrial developers and designers, involved in these subjects.

The EU energy research projects PASSYS (1985-1992), COMPASS and PASLINK created the initial European network of outdoor test facilities, developed test methods, analysis methodologies and simulation techniques. It resulted eventually into the PASLINK EEIG network (1994). The network profiled itself as a scientific community of experts on Testing, Analysis and Modelling. In 1998, PASLINK EEIG started a new project: PVHYBRID-PAS, on the overall performance assessment of photovoltaic technologies integrated in the building envelope. The use of the outdoor test facilities in several member states situated in different climates, together with the available expertise on analysis and simulation techniques, offered the ingredients for more successful projects: IQ-TEST (2001), focusing on quality assurance in testing and analysis under outdoor test conditions, as well as evaluation techniques of collected in-situ data. The expertise of the network was also offered to other European projects, such as DAME-BC, ROOFSOL, PRESCRIPT, IMPACT and PV-ROOF.

In 2005, the EEIG was converted into an informal network that today is known as DYNASTEE. It is offering a network of excellence and should be considered as an open platform for sharing knowledge with industry, decision makers and researchers. It has been very active in supporting projects such as the IEA-EBC Annex 58 and more recently the IEA-EBC Annex 71 'Building energy performance assessment based on in-situ measurements'.

DYNASTEE