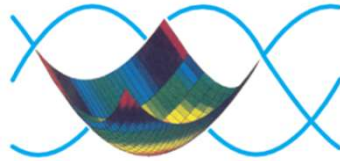# European Building Performance Symposium
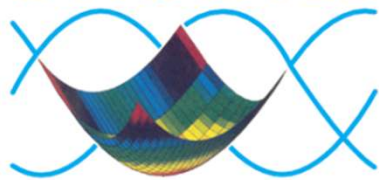
DYNASTEE

INIVE

International Network for Information on Ventilation and Energy Performance

Network of Excellence - SALFORD Training & Symposium

Richard Fitton - Salford, Maria-Jose Jimenez - CIEMAT, Hans Bloem - INIVE
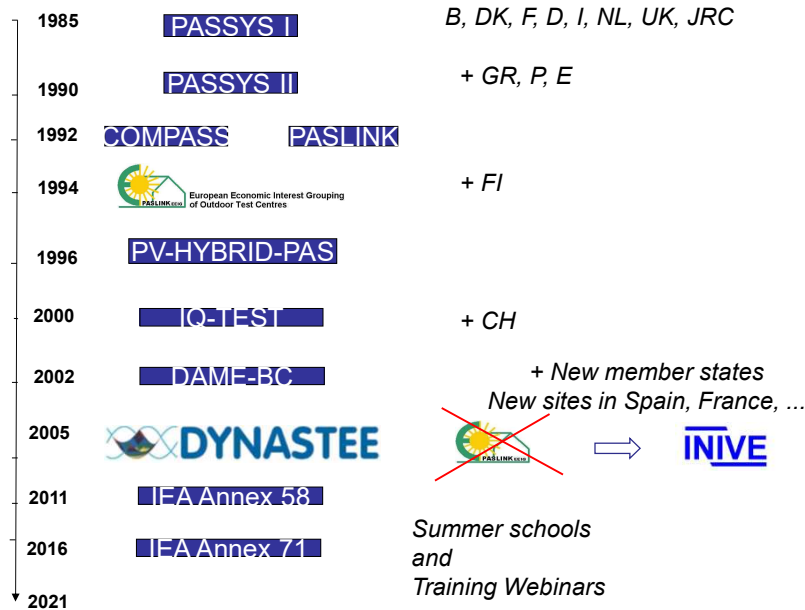

DYNASTEE

www.dynastee.info

#DNSTEE

Network for
- **DYN**amic
- **A**nalysis
- **S**imulation and
- **T**esting of
- **E**nergy and
- **E**nvironmental performance of buildings

DYNASTEE

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HISTORY

Year	Programme	Members
1985	PASSYS I	B, DK, F, D, I, NL, UK, JRC
1990	PASSYS II	+ GR, P, E
1992	COMPASS PASLINK	
1994	PASLINK EEIG — European Economic Interest Grouping of Outdoor Test Centres	+ FI
1996	PV-HYBRID-PAS	
2000	IQ-TEST	+ CH
2002	DAME-BC	+ New member states New sites in Spain, France, ...
2005	DYNASTEE	PASLINK ⟹ INIVE
2011	IEA Annex 58	
2016	IEA Annex 71	Summer schools and Training Webinars
2021		

INTERNATIONAL NETWORK

INIVE

International Network for Information on Ventilation and Energy Performance

TightVent Europe — BUILDING AND DUCTWORK AIRTIGHTNESS PLATFORM · AIVC · BUILD UP energy solutions for better buildings · DYNASTEE · ASIEPI

Under the patronage of INIVE vzw, the DYNASTEE group will offer its partners a platform to coordinate projects, exchange relevant information and share its expertise.

DYNASTEE

Who are we?

- Everyone and every organisation who recognises themselves in the network characteristics:
  - OUTDOOR TESTING
  - DYNAMIC EVALUATION
  - DYNAMIC MODELLING

What is our strength?

- An international network with interdisciplinary expertise of 30 years

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DYNASTEE - OBJECTIVE

- Global leading network on dynamic testing and evaluation of Energy Performance in Buildings
- Consolidation of existing knowledge
- Bringing together academic, industry and governmental experts
  - on the **test environment and experimental setup** as well as on the **data analysis** and **performance prediction**.
- Network of Excellence (Project SubTaskleader)

1994 Creation of the **PASLINK** EEIG network

2005 Conversion into **DYNASTEE** the informal network

2019 Future of the **DYNASTEE** network

25 YEARS ANNIVERSARY

BOARD MEMBERS

Change in the DYNASTEE Board
2020 - 2022

Previous : Peter Wouters, Luk Vandaele and Hans Bloem

- Maria-Jose Jimenez, Ciemat-PSA, Spain
- Aimee Byrne, Technological University Dublin, Ireland
- Richard Fitton, University of Salford. Energy House 2.0 UK
- Luke Smith, Build Test Solutions Ltd, UK
- Twan Rovers, Saxion University, the Netherlands
- Hans Bloem, DYNASTEE Chair
- Maria Kapsalaki, INIVE vzw, assists the DYNASTEE network.

The Network of Excellence

- The expertise developed in European research projects and lately the IEA-EBC Annexes 58 and 71 project remains available to the community of builders, designers, industrial developers, scientists and public authorities.

- The DYNASTEE platform will continue to act as the information exchange medium
  - Training Exercises, software and data
  - Training School: Dynamic Methods For Whole Building Energy Assessment
  - Collaboration with other international projects

EBC IEA EBC ANNEX 71

Major aim of the Annex-project is a collaboration in the EBC-context to:

- Develop the necessary knowledge and tools to achieve reliable *in-situ* **dynamic testing** and **data analysis methods** that can be used to characterize and label the effective **energy performance** of building components and whole buildings.

- The procedures should focus both on the **test environment and experimental setup** as well as on the **data analysis** and **performance prediction**.

COMMUNICATION

Dissemination by means of

- Web-site: www.dynastee.info
- Newsletters
  - two issues/year
  - 19 published so far
- Events
  - Webinars
  - Workshops
  - Training Schools

The Building as the Cornerstone of our Future Energy Infrastructure

The importance of dynamic and real data for reliable assessment

Wednesday 10 April 2019; 13:00 – Thursday 11 April; 13:00

@ 6th Expert meeting Spring 2019, Bilbao, Spain

Speakers are invited international experts on seven selected topics
Outcome will be published as a Journal article.

TOPICS

Buildings will produce energy: electricity that is partly delivered to the grid, and heat that is stored in the building or underground. The near future may see more self-consumption in buildings, including the electricity stored in electric cars.

One may conclude that buildings, in which presently 40% of final energy is used, will take a more prominent position in the energy infrastructure. Seven invited experts will present the challenges and innovation aspects that may facilitate the energy transition.

Measurement for validation *(in-situ and real data)* - Richard Fitton, Energy House, UK
Documentation of performance gaps and energy flexible buildings *(Annex 67)* – Søren Østergaard Jensen, DTI - DK
Urban dimension *(from building to city modelling; CityGML),* Volker Coors HfT Stuttgart DE
Building energy related standards – *CEN/ISO* - Jaap Hogeling - EPB Centre, NL
Renovation projects for buildings and cities *(EPBD, EED and the building stock)*– Gema Hernández Moral, Estefanía Vallejo Ortega- CARTIF, ES
Renewable Energy integration *(CITIES)* - Henrik Madsen - DTU, DK
Monitoring of Mobility Energy *(electrical storage)* – Nicola Ferrier, Argonne National Laboratory, USA

SPRING SCHOOL 2023
24-27 April

Building Energy Performance Assessment
University of Salford
MANCHESTER, UK

organised by DYNASTEE-INIVE, CIEMAT, and University of Salford,

DYNASTEE

SPRING SCHOOL OBJECTIVE

- Train a dynamic methodology to assess thermal characteristics of building components and assess whole building energy performance

- Support the Energy Performance of Buildings Directive that requires nearly-zero energy buildings (nZEB) for which a significant part will be taken by renewable energy technologies

- Approach by dealing with building physics as well as applied mathematics and statistics

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SPRING SCHOOL 2023

24 - 27 April

Building Energy Performance Assessment

LECTURERS

- María José Jiménez (CIEMAT, Spain),
- Irati Uriarte (UPV-EHU, Bilbao, Spain),
- Richard Fitton (University of Salford, UK),
- Peder Bacher (DTU, Lyngby, Denmark),
- Hans Bloem (INIVE-DYNASTEE, Brussels).

Summer School 2019

KNOWLEDGE

Expertise expressed in:

- Papers (Conferences, Workshops)
- Publications and Presentations
- Case Studies (double skin facades)
- Data (high quality benchmark data)
  – System Identification
- Analysis Tools (including training)
  – LORD, CTSM, MATLAB and R-routines

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WHAT IS DYNAMIC

Dynamic processes involve the aspect of TIME

To analyse dynamic processes,

dynamic mathematical techniques are required

to extract dynamic information from experimental observations

Dynamic behaviour due to thermal mass

Dynamic behaviour; up to 4 time constants

Appropriate testing should provide the requested information

Building Physics using Mathematical solutions
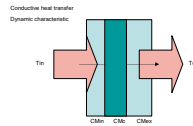

SUPPORT 2012 - 2020

Research requirements:

- Realistic testing of **innovative** and full scale building envelop elements

- **Understanding** the GAP between design and real performance figures

- **Reliable** in-situ measurements

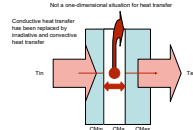- Application of **dynamic** calculation techniques for evaluation and simulation
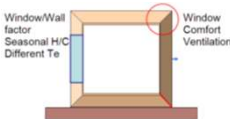
INCREASED COMPLEXITY

Distributed thermal mass

Conductive heat transfer

Dynamic characteristic

Tin — Tex

CMin CMc CMex

- **Conduction only heat transfer**
  - Distributed thermal mass

Wall with air-gap

Not a one-dimensional situation for heat transfer

Conductive heat transfer has been replaced by irradiative and convective heat transfer

Tin — Tex

CMin CMa CMex

- **Conduction, radiation and convection**

Window/Wall factor
Seasonal H/C
Different Te

Window Comfort Ventilation

- **Not measured phenomena**

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Performance Assessment

- Reduce building energy consumption (**Savings**)
- Improve Energy **Efficiency** (appliances and systems)
- Overall Energy **Performance** Assessment (including RE)
- **Dynamic** characteristics more prominent (time constants; gains, occupancy)
- Net Zero-Energy Building (**EPBD** - annual calculation);
- **Renewable Energy:** Solar passive design and energy storage, e.g. thermal mass.
- Energy balancing at infra structure level.
  Building as key element.

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SS23 CONCEPT

Training through
- 50% lectures by 5 lecturers
  - Up to 12 lectures
- 50% exercises, spread over the whole week
  - 12 sessions
- Homework exercises and data
- General approach
- How To Do and develop a Skill
- Learn to make decisions

TWO PERSPECTIVES (1)

Building Physicist and Statistician

Notable characteristics:
- Model should describe the process
- Seeks physical parameters
- Can cope with non-measurable phenomena
- Focus on Low frequency
- Static, steady state
- 7.1 °C

TWO PERSPECTIVES (2)

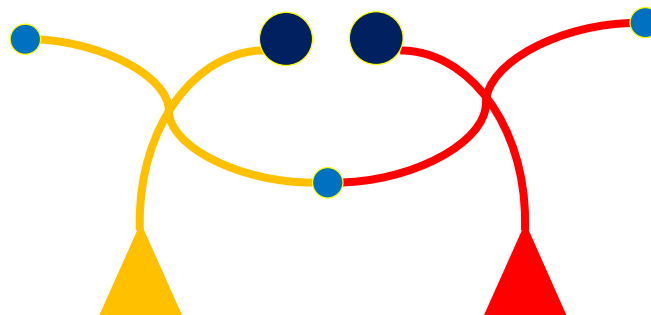Building Physicist and **Statistician**

Notable characteristics:

- Model should fit the data
- Seeks mathematical parameters
- Residual should be white noise
- Focus on High frequency
- Dynamic
- 7.089 °C

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WORKING TOGETHER

Building Physicist meets Statistician

That works well …… but

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The Measurement Gap

It may be that the way that we measure things is incorrect, and not comparable other peoples studies/or the values that are used in models (which are often the results of experiments).

One of the simplest and most common value is the U value (the thermal efficiency of an element, the higher the value the quicker heat will pass thorough it)

BENCHMARK DATA

- Simulated data homogenous wall
- In-Situ data from homogenous wall
- In-Situ data from composition wall
- Data from Round Robin box (research)
- In-Situ data from an air gap envelop
- Data from a whole building
- Data from a co-heating site experiment

Homework:

TWO TOOLS

Both perspectives will be discussed and applied using two tools on benchmark data

- LORD; lumped parameter model

- CTSM-R; continuous time model

- See extended description; document Software techniques applied to thermal performance characteristics
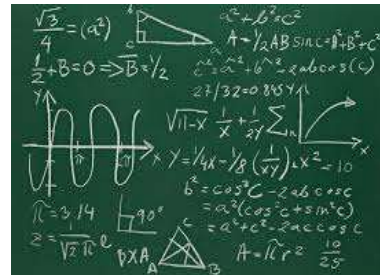
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GENERAL APPROACH

- Plot the data
- Average method
  - steady state
- Regression
  - Introduce dynamics
- ARX
- Grey Box
  - Apply physical knowledge

Input Dataset-1   Input Dataset-2

Data

Tools

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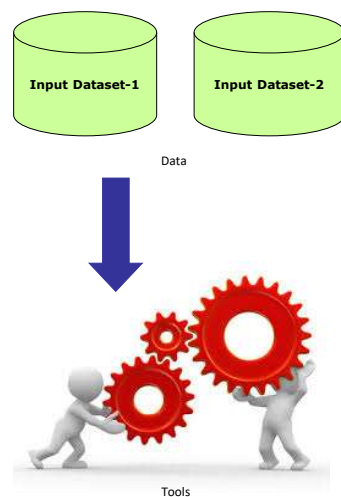
HOW TO DO

ANALYSIS SOFTWARE

- Environments
  - MatLab, Excel, R, …..
- Tools
  - LORD, CTSM-R …..
- Methods
  - OEM and PEM, LSM and MLH, …..
- Models
  - Many, …..

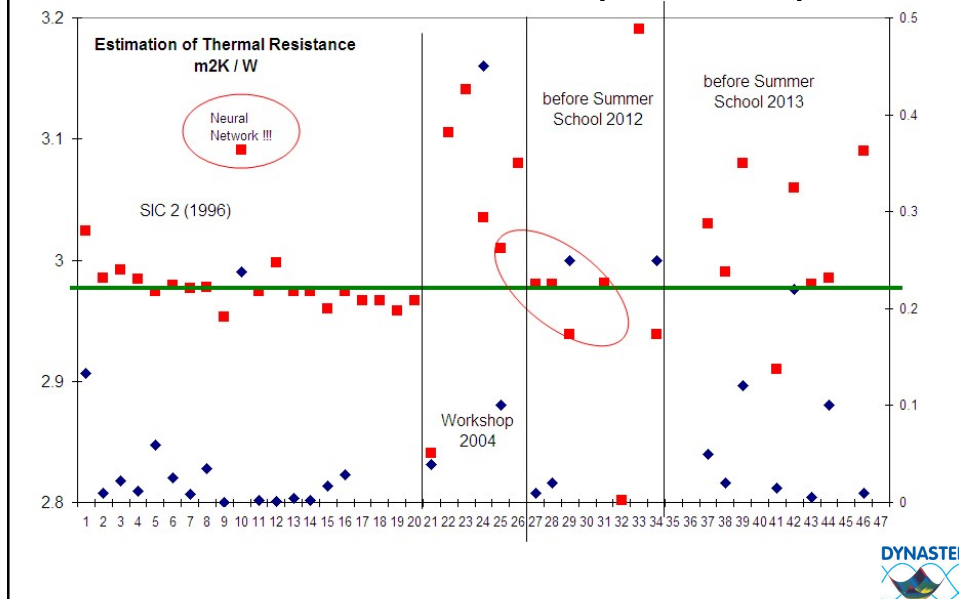
Methodologies/models/
algorithms/maths

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UNCERTAINTY - SIMULATION

The world is managed through models
Model is a simplification of reality
Made by **YOU**!
Based on your interpretation of reality

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CONCLUSION

"One needs a certain level of skill to perform well"

- Improve knowledge through Training and Competition

- After >25 years DYNASTEE states:

Training make sense

Future; 2023 and beyond

We will be using the forthcoming year to work on new topics for the summer school as follows:

- **Continuation organizing physical Training Schools**
- **Use of online data platforms such as weather API, renewable energy data**
- **Use of on-board systems such as connected thermostats**
- **Use of smart metering data for energy input**

Most countries now have access to at least most of these data, and some, all of it.

- The work and findings of IEA Annex 71 which focus on the data mentioned above to deem the energy performance of a dwelling. https://dynastee.info/new-iea-ebc-annex-71-building-energy-performance-assessment-based-on-in-situ-measurements/
- We will provide learning on not only the acquisition of these data using live API access to smart meter and controls, but the analytical tools to deem the building energy performance.

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Future; 2024

Last couple of years were a-typical; the decision was made to postpone the Summer Schools for good reasons and replace it by webinars.

However we are already planning the next summer school to take place in Almeria in Spain in 2024, this will be a full Summer School with classroom-based learning sessions and interactive sessions.

Contact E-mail : mjose.jimenez@psa.es

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