

1.7 Some examples of fire propagation research in Spain

Lacasta A., Spain

Workshop Barcelona 5-6 July 2010
Cost Action IFER Integrated Fire Engineering and Response



COST ACTION TU0904 – IFER
Integrated Fire Engineering and Response

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Some examples of fire propagation research in Spain

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EPSEB
SCHOOL OF BUILDING CONSTRUCTION

Some examples of fire propagation research in Spain

1. CERTEC
2. CIMNE
3. FIRE LAB - EPSEB
4. FIRE BRIGADES OF CATALONIA
5. CONCLUSIONS

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1. Center for Technological Risk Studies (CERTEC)


Main interests: accident identification, transportation of hazardous materials, environmental impact of accidents and mathematical modelling of major accidents (fires, explosions, toxic releases).

➤ **Hydrocarbon fires**

Infrastructure: experimental premise for the analysis of hydrocarbon pool fires of up to 6 m in diameter.

Research has been performed on the subjects:


- Temperature distribution.
- Flame shape and size.
- Thermal radiation from flames.
- The influence of the wind.



Another experimental plant: study of propane jet-fires (up to 10 m length).

➤ **Forest fires:**

- Modelling of fire spread
- Analysis of the influence of fire retardants



CERTEC
Department of Chemical Engineering – UPC

http://certec.upc.es

Contact: Joaquim Casal
joaquim.casal@upc.edu

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2. International Center for Numerical Methods in Engineering (CIMNE)

➤ **Particle finite element method (PFEM)**

Finite Element (FE) Methods

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PFEM

Particle (P) Methods

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PFEM

The method can be applied to problems involving the interaction of fluids and structures

The PFEM uses an updated Lagrangian description to model the motion of nodes (particles) in both the fluid and the structure domains

The method has been successfully applied to several engineering problems. Some examples:

- ship hydrodynamics
- breaking waves in harbours
- spill-ways in dams

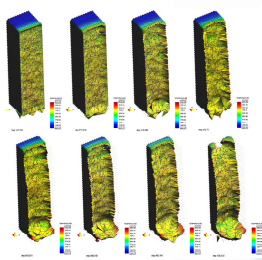
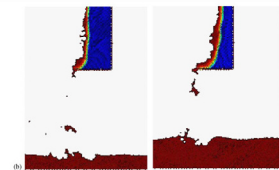
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2. International Center for Numerical Methods in Engineering (CIMNE)

The PFEM shows promise to simulate the melting and dripping of polymers in fire

CIMNE

http://cimne.com

Contact: Julio Marti
martijm@gmail.com

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3. Fire Lab - EPSEB

Some research lines:

➤ **Passive fire protection**

Experimental: Focused on obtaining mortars formulated with low-grade magnesium by-products which undergo endothermic decompositions in a range between 300°C and 800°C.

Modeling: Based on the analysis of the underlying kinetic behavior under different heating rates.

Fire Lab - EPSEB
http://firelab.upc.edu
Contact: Ana Lacasta
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➤ **Flame retardants**

- New formulations to improve the behaviour of epoxy mortars at high temperatures

➤ **Computational simulations of fire propagation**

using the Fire Dynamics Simulator (FDS).

- Housing fire studies
- Fire spread on building facades
- Fire propagation in train carriages

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3. Fire Lab - EPSEB

Fire spread on building facades

Pilar Giraldo, ETSAB (UPC)

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3. Fire Lab - EPSEB

RAILCEN Project: Fire evolution in railway vehicle due to internal materials according CEN/TS 45545-2 (2008-2011)

Partners:

- CIDEMCO-TECNALIA
- TALGO
- FAINSA
- UPC

Comparative study at three scales:

- Small scale: calorimetric cone
- Medium scale: burning of one seat
- Large scale: burning of one train carriage

Small scale: cone

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3. Fire Lab - EPSEB

Medium scale: one or two seats

Large scale: train carriage

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4. Fire Brigades of Catalonia

➤ SGL for USaR project
(Second Generation Locator for Urban Search and Rescue Operations)

European project with 21 partners
Coordinator: National Technical University of Athens
www.sgl-eu.org

➤ SIS (Sistema de investigación de siniestros)

Research Group
Objective: To create up a database with information about real fires

NFPA-901:2006 Standard classifications for incident reporting and fire protection data.

DGPEIS
<http://www.gencat.cat/dirip>
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4. Conclusions

I have presented some examples of research in the field of fire propagation.

They are initiatives that go beyond the academic sphere, moving closer to real fire risks and seeking the necessary interaction with fire brigades.

Thanks for your attention

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