



British - French Flame Days 2009
Le Nouveau Siecle, Lille, France
March, 9-10, 2009



IFRF and its activities

L.Tognotti
IFRF Headquarters,
Livorno, Italy



Agenda

- What is IFRF and how is organised
- Networking activities
- Research at IFRF: the Members' Research Programme
- Services



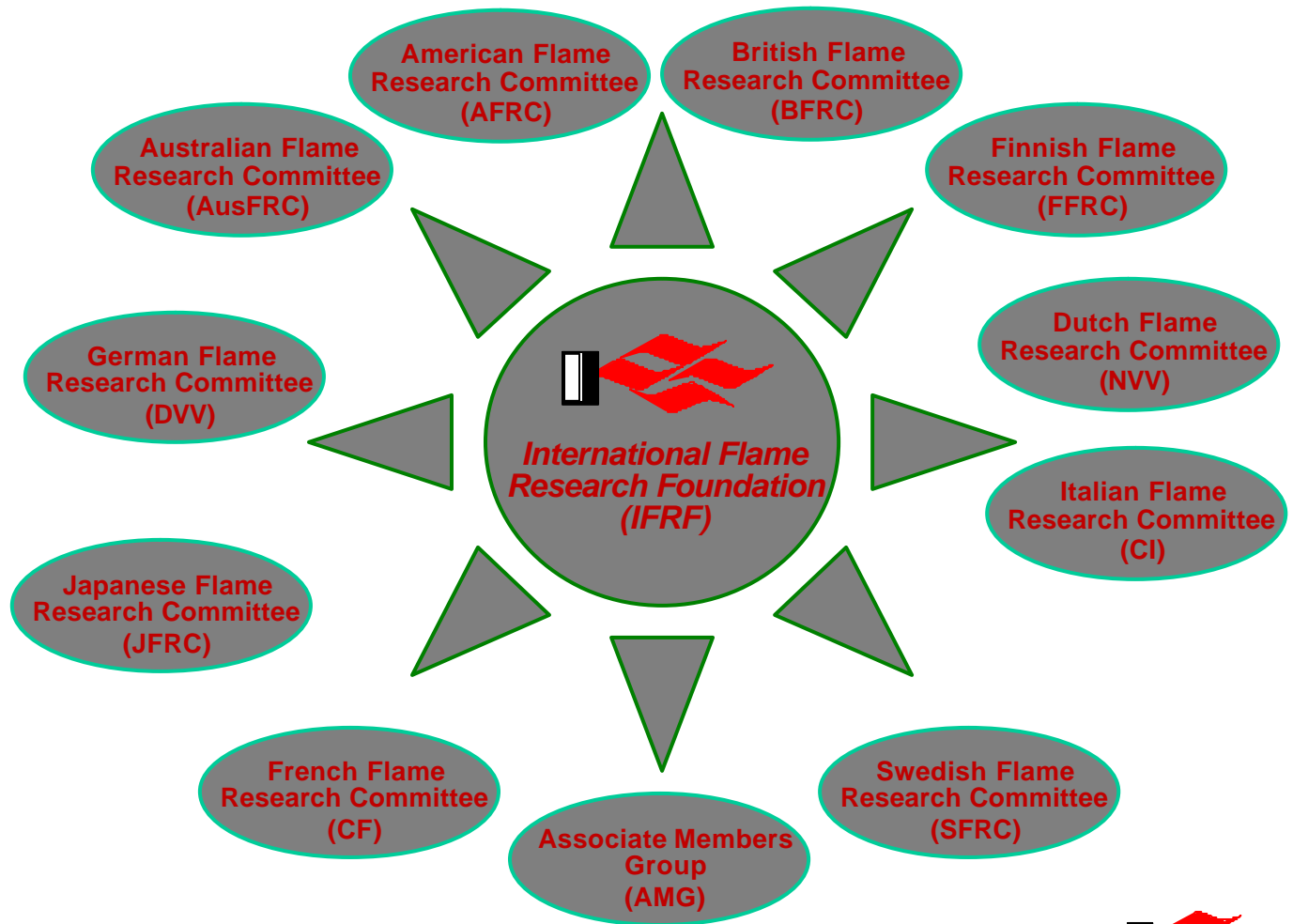
Mission of the IFRF

- Mission set by statutes:
 - ◆ *the attainment of knowledge and experience bearing upon combustion in an efficient and environmentally acceptable manner;*
 - ◆ *to accumulate this knowledge within an international centre of excellence;*
 - ◆ *to place this knowledge at the disposition of others for further development and industrial application.*
- A “not for profit” Foundation
- Managed by its Members’ representatives



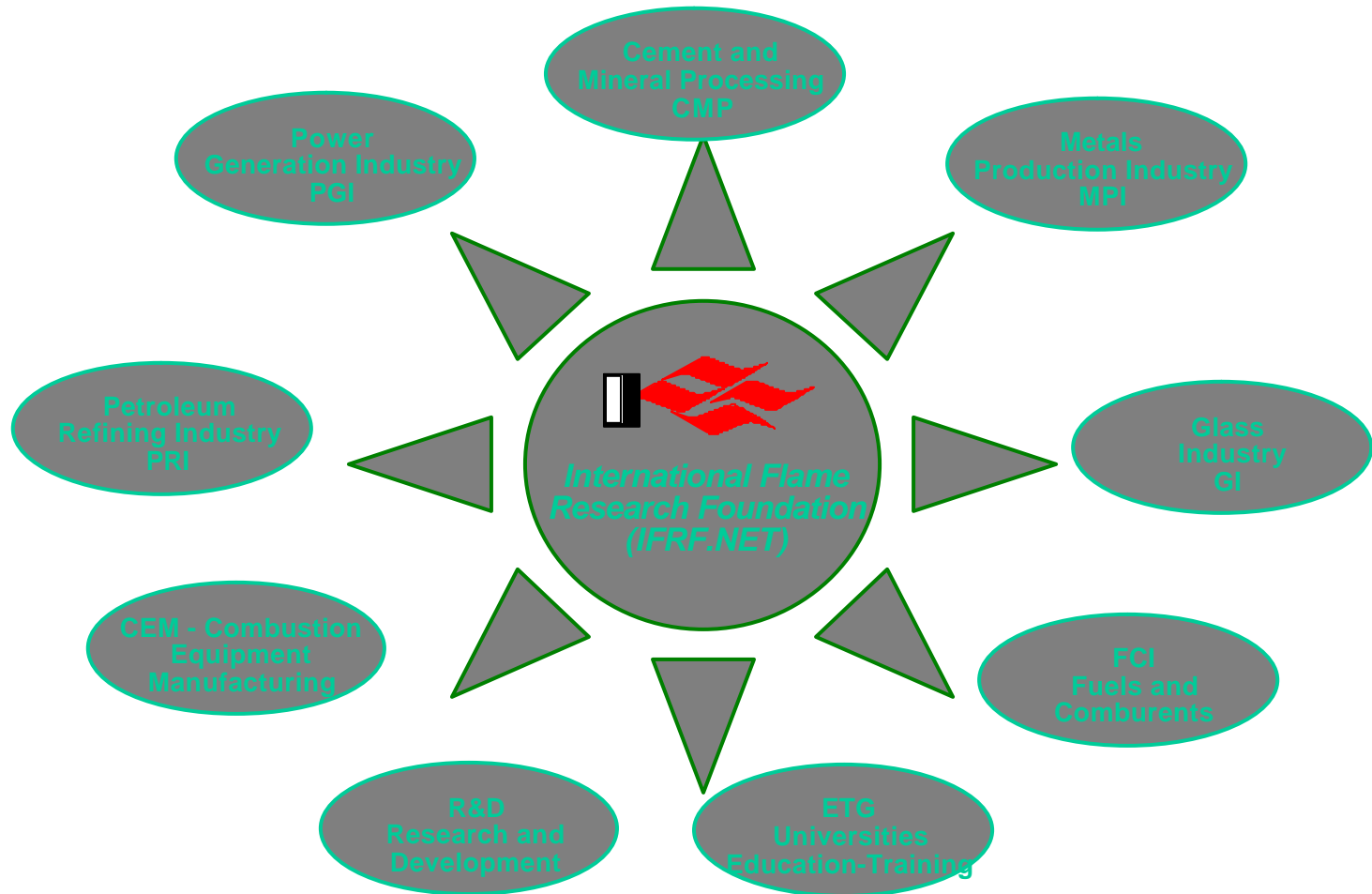
The IFRF – International: 146 member organisations

IFRF is a Network of Combustion Related People Around 1200 people in 23 countries

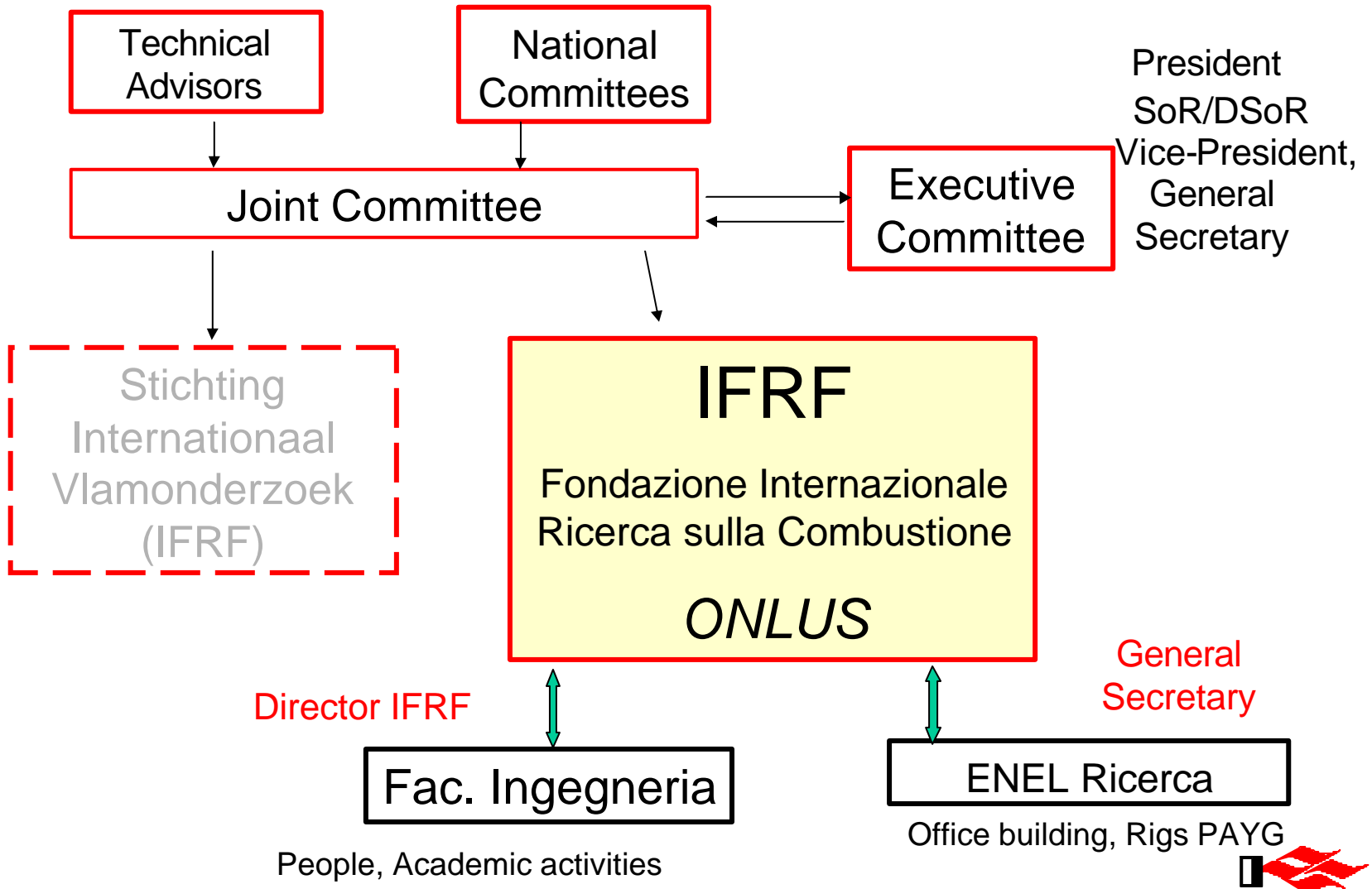




The IFRF – Multi-Sector



IFRF – New Structure -2007



IFRF Officers- Executive Committee

- President: **Dr. Richard Waibel** John Zink Co., USA
- Vice President: **Mr. Jacques Duguè**, TOTAL, France
- General Seretary: **Dr. Gennaro De Michele**, ENEL Ricerca, Pisa, Italy
- Superintendent of Research: **Prof. Helmut Spliethoff**, Technical University of Munich, Germany
- JC Representative: **Dr. Susumo Mochida**, Nippon Furnace Co., Japan
- Deputy Superintendent of Research: **Dr. Neil Fricker**, Glamorgan University, UK



Join Committee Members

A members: National Committes representatives

- **Philip Smith**, AFRC (USA)
- **Roger Dudill** , BFRC (UK)
- **Willi Nastoll**, CF (France)
- **Giuseppe Girardi**, CI (Italy)
- **Frank Sowa**, DVV (Germany)
- **Erkki Valimaki**, FFRC (Finland)
- **Susumu Mochida**, JFRC (Japan)
- **Jochem Groot**, NVV (Nederland)
- **Truls Liliedahl**, SFRC (Sweden)

B Members: technical advisors

- **Klaus Hein**, (Stuttgart University, Germany)
- **Christian Mueller** (Clyde Bergemann, Germany)
- **Tsuneaki Nakamura**, (Tokyo Gas, Japan)
- **Mikko Hupa** (Abo Academy, Finland)
- **Jost Wendt** (Reaction Engineering, USA)



IFRF staff

Staff

- ◆ Director (part-time) (LT)
 - ◆ Investigator (GC)
 - ◆ Administration and Communication (TB)
 - ◆ Consultant : (NF)
 - ◆ A second investigator (JH) from Oct.07
-
- ◆ Accountant (dr. L.Bonaccorsi)
 - ◆ Internal auditor (dr. A. Irilli)



ENEL Experimental Area- Engineers and Technicians (12 FTE)

ENEL and UNIPI support for MRP- (Agreements in force)

- Mario Graziadio (ENEL reference)
- One PhD student, two MSs, other students for project work

-
- IT services: IVIN (Dutch) , CPR (Pisa, It)
 - Editing and web insertions: (P.Lavery)
 - Editor of Journal (Pat Hughes)



People participating to oxy-combustion programmes (experimental and modelling)

- **IFRF:** G.Coraggio, M.Laiola
- **ENEL, Experimental Area, Livorno :** D. Cecchini, M. Bernardoni, L. Carrai, A. Birindelli, M. Monticelli, F. Costanzi, R. Miliani, E. Calvetti, A. Baldini, S. Cerri,
- **ENEL Research, Pisa:** D. Cumbo, N. Rossi, E. Tosi, S. Gasperetti, J.Brunetti
- **University of Pisa, CPR:** C.Galletti, M.Falcitelli, E.Biagini, A.Parente,
- Graduate students



Capabilities of the IFRF

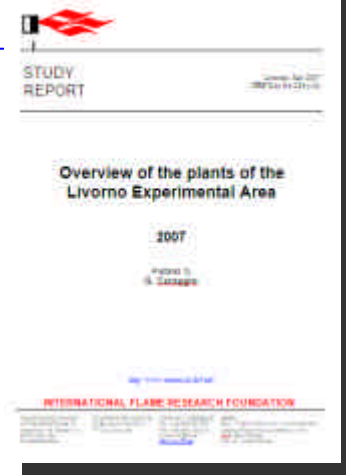
- At its new location the IFRF has access to a number of **test facilities** of ENEL, Livorno Research Station, which form the basis for the research activities from 2007.
- **IFRF has access for fixed periods to these state-of-the-art experimental facilities**, from lab to industrial scale, operated by dedicated personnel and with large availability of strategically important fuels.
- The facilities are available for undertaking the IFRF Members Research Programme and Members' test work over the whole range of industrial process sectors, and on a confidential basis as well.





Capabilities of the IFRF

- **Isothermal plug flow reactor (IPFR)**
- **100 KWT Furnace, 500 KWT Furnace**
- **CASPER** (6.5 MWt for liquid/gas burners)
- **FOSPER** (FOrnace SPERimentale) (*Furnace #1*)
- **CIRO** (100 kWt circulating fluidized)
- **SCR** (Catalytic Denitrifier 10-300 Ncm/h of flue gas)
- **Bagfilter, Electrostatic Precipitator**
- **SPLIT** (0.5-2 MWt gas turbine combustor, atmospheric)
- **Hitac/Flameless Combustors**
- **Atomisation rig/ spray characterisation**
- *Aerodynamic lab. for “cold” characterisation*
- *Optical Diagnostic lab.*



Capabilities of the IFRF

- A number of different **probes** for measuring high temperatures in flames and for sampling reactive species in flames are available.
- Particular emphasis is devoted to rebuild IFRF measurement probes, and to develop new diagnostic equipment;
- At ENEL and University of Pisa laboratories, **physical and chemical characterisation** of fuels, fuel mixtures, residues and deposits are also available for Member Research Programme and for member services.
- **Advanced computing capabilities** (*CRAY XD1 with 48 AMD Opteron processors, CRAY SV1, CRAY HPC cluster*) and CFD software (commercial and in-house developed) are available



European Combustion Laboratory Network Background

- Expressions of Interest for new IFRF location: the start of the EFRI (I = 'Idea') :
 - nine EU Member Organisations responded
 - After selection of Pisa/Livorno proposal, all nine confirmed their interest in forming an EU Combustion Laboratory Network
- Other IFRF Member organisations also interested
- IFRF Members invited to discuss the idea at MC15
- 24+ Member Organisations attended or asked to be represented at Livorno on June 15th 2007
- First rig list – 32 participants
- January 2008: decision was taken of preparing a proposal for FP7 Infrastracure Programme



PLANNING
DOCUMENT

Livorno, October 2007
IFRF Doc No D26/y01

Draft List of Organisations Interested in Forming a

European Network of Combustion Laboratories under
the IFRF's
European Flame Research Initiative (EFRI)

Compiled on behalf of the IFRF by

Patrick Lavery & Neil Fricker

INTERNATIONAL FLAME RESEARCH FOUNDATION

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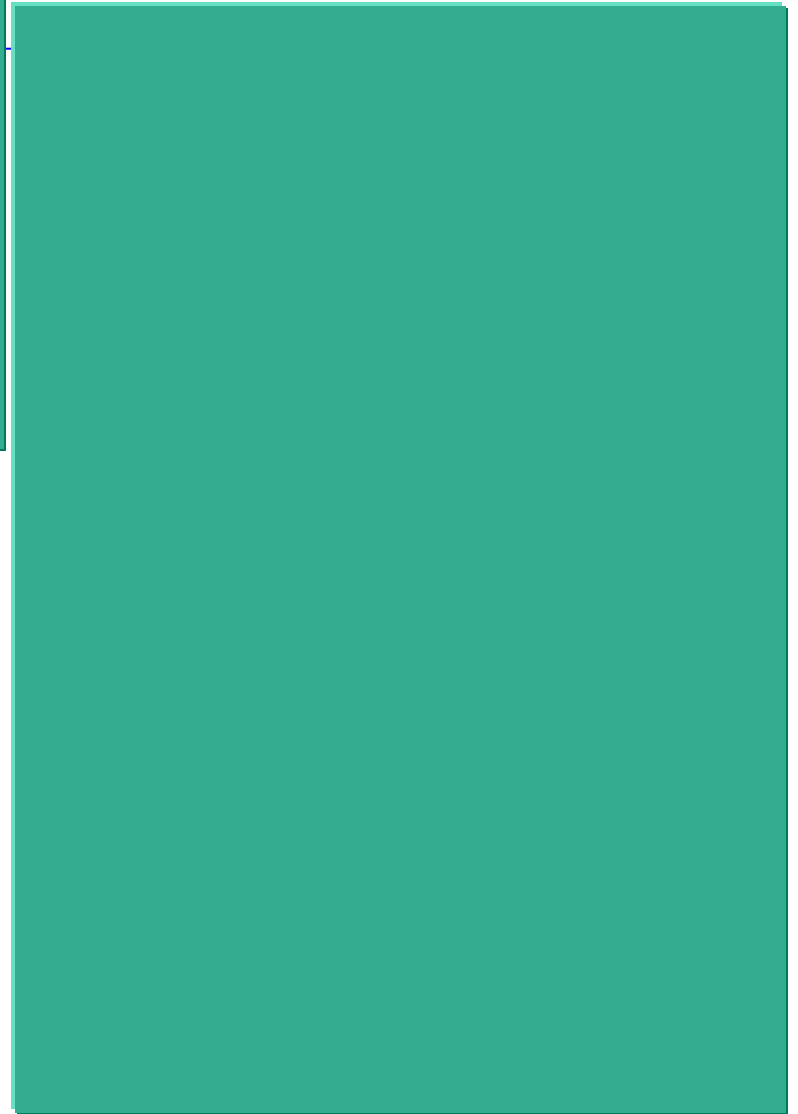


The network of combustion facilities

“ European Flame Research Initiative”

- “The concept of the **European Flame Research Initiative (EFRI)** is a network of *Research Infrastructures*, regionally distributed throughout Europe and comprising all the (major and unique) **large scale combustion facilities** owned by Industries and Consortia, as well as a number of Universities and Research Centres offering **complementary experimental activities, from lab to semi-industrial scale**, focused on fuel conversion technology and clean and efficient combustion processes”
- A total of **21** founding organisations planned to share their infrastructures (**35 research installations in all**) with the aim of enhancing both the **quality** and the **quantity** of the research activities and services provided by each single unit.





European Flame Research Initiative EFRI

- European Commission has been unable to fund the ***European Flame Research Infrastructure*** proposal submitted in February 2008
 - IFRF coordinated
 - 20 partners
 - 10 Million Euro, 4 year, Infrastructure programme
 - Well evaluated by EC (13/15)
 - EFRI proposal ranked 29th out of 135 received that met the minimum evaluation criteria (9/15)
 - Available funding exhausted for first 25 proposals (scoring $\geq 13.5/15$)
- **IFRF reconvened an EFRI meeting** January 2009
 - to initiate Europe wide exchanges and
 - plan for future funding applications (2010)



European Flame Research Infrastructure

EFRI

Short and Medium term Objectives

- Create the European Facilities Database
- facilitate the definition and sharing (through *benchmarking*) of measurements on different facilities, **protocols and procedures** for testing components and systems
- create opportunities to share **novel/advanced measurement techniques and diagnostics**, making possible the use of measurement methodologies developed at lab scale in large scale combustion facilities
- by means of the creation of **databases**, allow the development and validation of modelling tools (i.e. CFD) which could enhance existing capabilities to interpret the outcomes generated by the installations.



IFRF research in the past: IFRF Online Library

- Cataloguing over 3500 IFRF Numbered documents.
- Developing and populating a searchable on line index of all IFRF Documents
- Preparing PDF images of all 60,000 Pages of archived documents. The majority of IFRF Documents created over the last 50 years still exist as hard copy in our archives.

These three elements form the basis of a **new Library facility.**



The screenshot displays the IFRF website interface. At the top, a red banner reads "The Monday Night Mail" with the URL "www.mnm.ifrf.net". To the right of the banner, it says "copyright 1999 - 2008 IFRF :: Wednesday 23 January 2008 ::". Below the banner, there is a "Go to week:" section with dropdown menus for "02" and "2008", and a "Go" button. On the left side, there is a navigation menu with the IFRF logo and the following items: "Menu", "What is it?", "Latest Edition", "Search", "Archive", "Log into backroom", "IFRF Sub-Sites", and a list of links including "Home", "About us", "Facilities", "Research", "Journal", "MNM", "Handbook", "Conferences", "Events Calendar", "Library", "Exchange", and "Academy". The main content area features a headline "IFRF opens its Report Archive" from the IFRF Office, contributed by Neil Fricker, Deputy Superintendent of Research in Livorno, Italy, on Monday 7th January 2008. A link is provided: <http://www.library.ifrf.net/archive.html>. Below this, a paragraph states: "During 2006, a complete inventory of the IFRF's physical and intellectual assets was undertaken as part of the transfer of the IFRF from the Netherlands to Italy. In the case of intellectual assets, the contents of the IFRF Reports Archive and the IFRF Library were entered into two electronic databases. PDF images were also made of all the archived IFRF reports to facilitate the dissemination of these documents electronically." A final paragraph confirms that an on-line search of all archived IFRF reports and documents is now available from the IFRF website at <http://www.library.ifrf.net/archive.html>, allowing searches by title, abstract, or full text, as well as by author. It also mentions that searches can be broadened or restricted using AND or OR conditions.





Document Archive Search Engine

www.library.ifrf.net

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- :: Home
- :: About us
- :: Facilities
- :: Research
- :: Journal
- :: MNM
- :: Handbook
- :: Conferences
- :: Events Calendar
- :: Library
- :: Exchange
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IFRF Forums

16th IFRF Members Conference

Field: Title/Subtitle Relation: Contains Search Term(s): delete

new criterion

Welcome to the searchable index of the IFRF Document Archive.

Here you can search some 4000 documents representing almost 60 years of IFRF research work and administration. Documents include technical and scientific studies, reports and published papers as well as facilities and planning records. The archive includes all documents published up until 31 December 2005. IFRF Members can directly download current reports (i.e. those published after 31 December 2005) from <http://www.research.ifrf.net/research/new.html>

This archive search facility is freely available to the public. PDF images of the documents are available on email request, and can be ordered by quoting the IFRF Document No.

If your organisation has membership of the IFRF, please ask your Main Contact Person to place the order for you in order to benefit from zero or reduced charges and to access a wider range of documents. Non-members will be charged Euro 200 per report ordered.

To request copies of reports click [here](#)

- ◆ There is a steadily increasing demand for PDF images of archived IFRF reports
- ◆ You can search the archive at <http://www.library.ifrf.net/archive.html>



Planning the research

PLANNING
DOCUMENT

Livorno, October 2007
IFRF Doc No D 00/y/36

Triennial Report 2004-2006

and

Research Planning

By

Hartmut Spliethoff

Superintendent of Research

Neil Fricker

Deputy Superintendent of Research

Leonardo Tognotti

Director

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What is important for the
IFRF Members?:

Network activities
and
experimentally based
research at a
reasonable scale:

**the Members'
Research Programme**





IFRF Members Research Programme

ISSN 1607 - 9140

www.research.ifrf.net

I F R F

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- Members Research
- Home
- Current reports
- Programmes
- Search
- Special programmes

Administration

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- :: Home
- :: About us
- :: Facilities
- :: Research
- :: Journal
- :: MNM
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- :: Conferences
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IFRF Forums

16th IFRF Members Conference

Download 2007 IFRF Annual Report

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Current reports

Current Reports are those published between January 2006 and the present date. They may be downloaded only by registered IFRF members and a valid user name and password will be requested. To access the IFRF's searchable database of archived reports (published prior to January 2006) go to [Search Document Archive](#).

Published in 2008

E110/y/01 - In flame measurements of aerodynamic and chemical composition profiles

Authors: Giovanni Coraggio

Publication date: October 2008

[Open Information](#) ◀

Related programme: [Validation of combustion modelling for practical combustion systems](#)

E 36/y/02 - Realisation of IFRF Solid Fuel Database Phase 1

Authors: Jarek Hercog, Leonardo Tognotti

Publication date: March 2008

[Open Information](#) ◀

Related programme: [IFRF Solid Fuel Database](#)

D 10/y/01 - IFRF Solid Fuel Database - SFDB Phase 1

Authors: J. Hercog, L. Tognotti

Publication date: January 2008

[Open Information](#) ◀

Related programme: [IFRF Solid Fuel Database](#)

Published in 2007

D00/y/36 - IFRF Triennial Report 2004-2006 and research planning

Authors: Hartmut Spliethoff, Neil Fricker, Leonardo Tognotti

Publication date: Oct 2007

[Open Information](#) ◀

Related programme: [Triennial Planning](#)

G19/y/06 - Cost Abatement for Effective NOX Reduction in PF Coal-fired Power Plants

State-of-the-Art Overview of NOX reduction techniques and associated costs

Authors: Giovanni Coraggio, Neil Fricker, Patrick Lavery, John Smart, Michael Welbourne

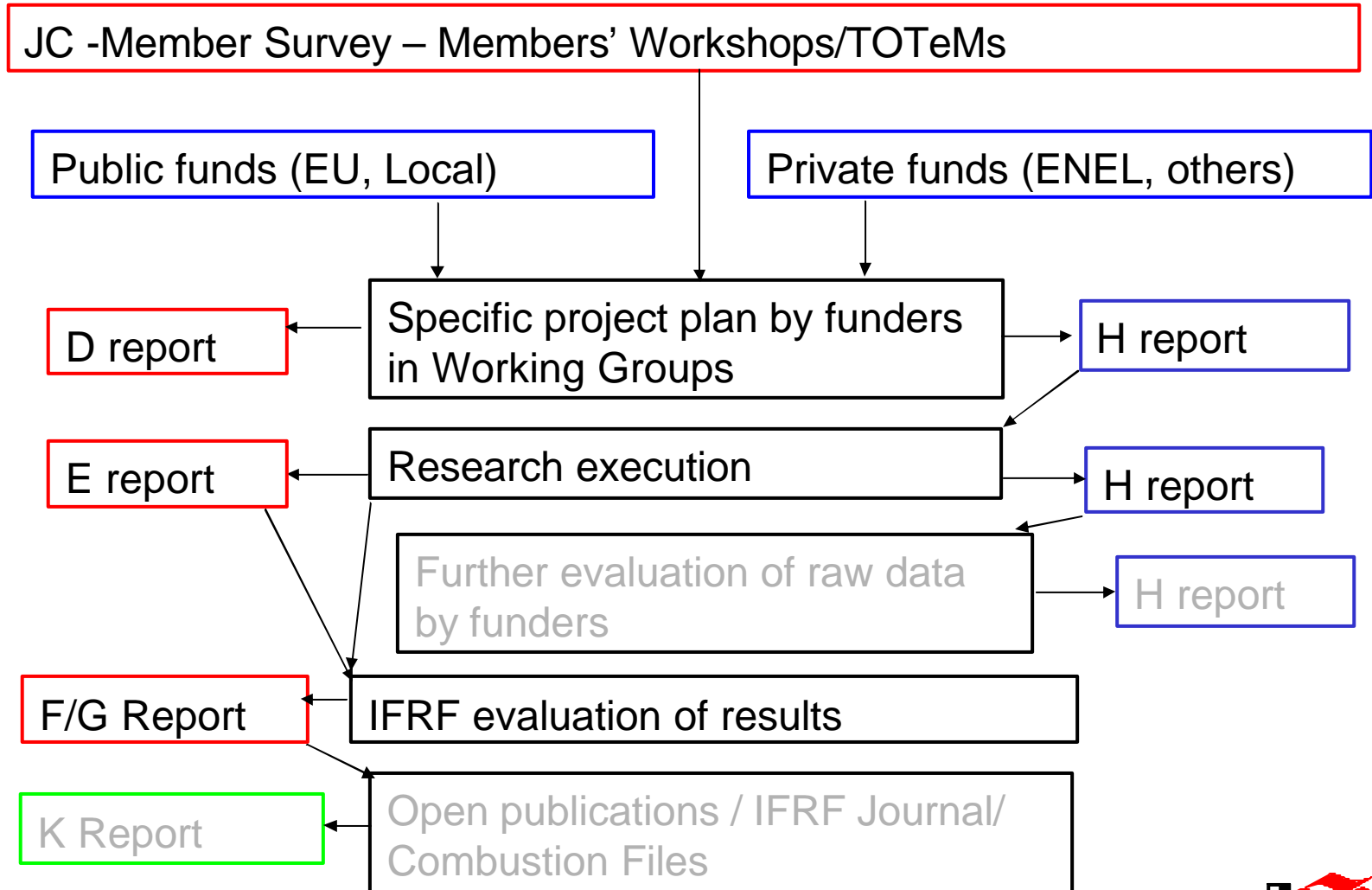
Publication date: May 2007

[Open Information](#) ◀

Related programme: [Cost Abatement for Effective NOX Reduction in PF Coal-fired Power Plants](#)



Application to Current MRP



Project n.1: Validation of combustion modelling for practical combustion systems

- “New” processes (Oxy-fuel, HiTAC/flameless, gasification,) and new fuels (syngas, biofuels, wastes,..) are a challenge for mathematical modelling.
- The principal objective of this research work will be to individuate and test (develop) **reliable** computational tools for **quantitative** prediction of *operational/design parameters* for industrial-scale combustion systems using CFD simulations in **realistic** amounts of computing time.
- **Validation** is an essential part of the development of codes:
 - ◆ collection of “*in-flame*” data
 - ◆ “*ad hoc*” experiments for *sub-models*
 - ◆ Databases for fuel properties (*fuel models*)



IFRF tasks (1)

- Identifies and defines industrial test cases on which to develop the validation activities:
 - providing detailed and complete data sets for validation/benchmarking activity, from existing data sets (archive) and from **new campaigns**.
 - undertaking specific trials/tests to provide insights into unresolved modelling issues (i.e. fuel submodels)
 - inviting members to suggest case studies on the basis of the availability of data sets (EFRI) or specific interest in funding experimental campaigns



IFRF tasks (2)

- Coordinates discussion about/ defines guidelines/protocols/standards for:
 - Experimental data generation (EFRI)
 - Data quality verification and validation (EFRI)
 - Creation of databases of validation cases (EFRI)
 - Validation activities: definition of parameters and model settings
 - Presentation of modeling outputs and their comparison with experimental data
 - Acceptance/validation criteria
- *IFRF should not act as code developer*



Fothcoming reports



@@@@@
REPORT

Livorno, January 2009
IFRF Doc. No. @@@@

Estimation of Confidence in Experimental Data for Model Validation

Members Research Project:
Validation of combustion modelling for practical
combustion systems

Prepared by
A. Parente, G. Coraggio, C. Galletti and L. Tognotti



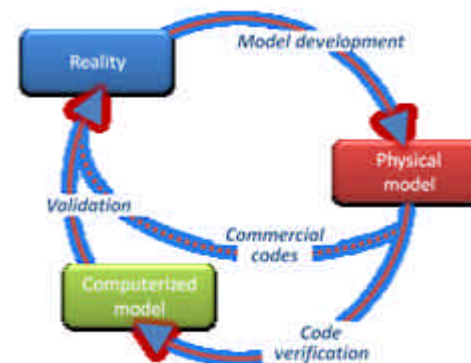
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REPORT

Livorno, January 2009
IFRF Doc. No. @@@@

CFD modelling of pulverised coal combustion experiments in the IFRF furnace n°1: comparison between experimental and predicted data through a formalized procedure

Members Research Project:
CFD modelling of coal combustion experiments in
the IFRF furnace

Prepared by
C. Galletti, A. Parente and L. Tognotti



Generation of new data

- Access to the combustion facilities at Livorno and the creation of a Network enable the IFRF to continue with the generation of in-flame measurements required for validation of mathematical models.
- In the past, **Furnace #1** has served as a reference case for numbers of mathematic modellers requiring validation of their computer codes. Now the key facility is the 3 MW **FOSPER**, a replica of **Furnace #1**.
- ENEL funded measurement campaigns:
 - IFRF Aerodynamically *Air Staged Burner (AASB) and TEA-C* burner;
 - Natural gas and coal; air and oxyfuel conditions
 - Isothermal Plug Flow Reactor characterisation of solid fuels



Fothcoming report



Oxy-flame combustion at IFRF, past, present and future

L. Tognotti

INTERNATIONAL FLAME RESEARCH FOUNDATION



TEST DATA REPORT

Livorno, February 2009
IFRF Doc. No E 110/y/02

In-flame measurements in air and oxy-combustion environment

Friendly Coal Project:

Prepared by
G. Coraggio and M. Laiola

Approved by
L. Tognotti

<http://www.research.ifrf.net>



Project n.2 :Development of a solid (coal and secondary) fuel data base

Demands from Utilities and from Research

- Need of wide data of fuels' properties for enhancing flexibility of utilisation
- Predict their impact on performance (e.g. efficiency, emission, corrosion, slagging, etc.)
- Definition of quick and easy-to-use indices for design
- Development of tools for predicting behavior of fuel blends
- Need of more sophisticated and detailed data/properties for predicting **process performances** and for **model validation** (e.g. NMR analysis, FTIR profiles, etc.)



Project n.2 :Development of a solid (coal and secondary) fuel data base

The aim of this project is to provide combustion engineers with a database to be used in the design and operation of industrial solid fuel fired combustors and gasifiers.

- 1. Collect data samples, organise these in simple electronic form, and circulate amongst IFRF Members for feedback and suggestions;
- 2. Create a fully flexible, efficient, secure and internet-based electronic database;
- 3. Fill the database with wide and reliable data, and equip it with mathematical tools.



Solid Fuel DataBase (SFDB): available on request



PROGRESS
REPORT

Livorno, March 2008
IFRF Doc No E 36/y/02
DRAFT

IFRF Solid Fuel Database Phase 1

Prepared by
HERCOG-J

Revised by
TOGNOTTI L

<http://www.research.ifrf.net>

INTERNATIONAL FLAME RESEARCH FOUNDATION

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55105, Pisa, Italy				e-mail: info@ifrf.net	Swift: BPAIT22XXX
CF: 93059960506				http://www.ifrf.net	VAT no.: 01807000508

First Phase consisted of:

- Collection of the IFRF Isothermal Plug Flow Reactor (IPFR) data on devolatilization, char combustion and nitrogen release
- Defining preliminary structure of SFDB using *MS Access*
- Proposing the standardisation procedures for most common characterisation tests (devolatilisation/char combustion)



SFDB: Plans for the future

- Experimental tests in Isothermal Plug Flow Reactor (IPFR) (*ENEL funding*):, (**including oxy-combustion conditions**) on coals and biomasses- from 2009
- Add new data from other DTFs (*from Members- EFRI*)
- Extend data of other experiments on DTFs (i.e. deposition, slagging, etc , EFRI)
- Add slagging/fouling related properties of fuels (F.Freundsen DTU)
- Add new tools in SFDB for:
 - ✓ *calculation of model parameters*
 - ✓ *grouping, averaging, comparing*
 - ✓ *filling-in empty spaces*
 - ✓ *calculation indices*
- Development of “user-friendly” professional version



IFRF – Members Research Programme 2009

- **Main IFRF test rigs** (FOSPER = No 1 furnace and IPFR) have been **upgraded to Oxygen** operation.
- First tests on FOSPER initiated as part of the **FP7 Friendly Coal** project (IFRF activity covered by ENEL and EU funding). FO.SPER. runs in oxy-fuel conditions: **2009 programme to be circulated**
- **Upgrades to probe carriages and in-flame measuring instruments** in progress: IFRF will focus on re-establishing the measurement capabilities of the new IFRF Investigator team, and undertake to **quantify the uncertainties in in-flame/furnace measurements** as a first step to providing validation data for CFD codes and sub-models (see forthcoming reports)
- *DEBCO* (Full scale co-combustion demonstration, EU) runs will be initiated



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[[Moderator Control Panel](#)]

Last visit was: 19 Feb 2009 17:41

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FORUM	TOPICS	POSTS	LAST POST
 CFD Computational Fluid Dynamics - Working Group to develop a hierarchical approach to validating combustion sub-models within CFD codes. Moderator: leonardo.tognotti	2	2	by leonardo.tognotti  on 10 Feb 2009 06:27
 SFDB Solid Fuels Data Base - Working Group to develop a data base for sharing combustion characterisation data for solid fuels Moderator: leonardo.tognotti	2	2	by leonardo.tognotti  on 16 Feb 2009 19:25
 EFRI European Flame Research Initiative - a network of owners and users of European Combustion Test Facilities Moderator: leonardo.tognotti	3	8	by peter.roberts  on 17 Feb 2009 11:58

WHO IS ONLINEIn total there is **1** user online :: 1 registered, 0 hidden and 0 guests (based on users active over the past 5 minutes)Registered users: [leonardo.tognotti](#)**STATISTICS**Total posts **16** • Total topics **8** • Total members **35**[Forum index](#)[The team](#) • [Delete all board cookies](#) • All times are UTC

Members' Services

- Training and Mobility
- IFRF web site/ communications
- Meetings, Conferences



Training/mobility/education

In the past: trained combustion engineers

◆ World wide

- over 80 former investigators – European, Japanese, Americans, Australians, Canadians

◆ European Union:

IFRF – ENEL- Cardiff University (EuroFlam)

- 200 Graduates in 10 years – 30% women

Today: Thesis at Engineering Faculty (Agreement UNIPI)

- ◆ Four graduates in Chemical Eng.
- ◆ Two graduates in Energy Eng.
- ◆ Three “Dipl-ing” in Energy Eng.



Training/mobility/education

1. Advanced courses in 2008-2009

First IFRF Training Course held at Livorno in September 2008

Clean Industrial Fuel Conversion

- K.Hein coordinator
- 25 participants
- 5 days
- High quality speakers from Industry and Academia
- Highly rated by participants

Further courses under consideration

2. Reactivation of mobility of investigators from industry on the MRP and through courses





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- :: Research
- :: Journal
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The IFRF - International Flame Research Foundation, an international centre of excellence for combustion research, technology and information.

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Combustion Journal	The Monday Night Mail	Combustion Handbook
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Conferences, TOTeMs and Workshops	Events Calendar	Library
Papers Search Archive		Search Document Archive
Members' Exchange	IFRF Academy	European Flame Research Initiative
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IFRF Publications

- IFRF Journal
 - ◆ three papers published in 2008
 - ◆ Re-launch needed
 - Hupa now Chairman of Editorial Board
 - Editorial board to be strengthened and re-invigorated
 - Review outcome at JC156 Boston, June 2009

- On-Line Combustion Handbook
 - ◆ No new Combustion Files published in 2008
 - ◆ Re-launch needed
 - Jacques Dugué now Chairman of Editorial Board
 - Focus on Excel based combustion calculations in 2009





List of Published Articles

Date	Corresponding Author (s)	Title
Nov-08	F Tabet	A Comparative Study of Turbulence Modelling in Diluted Hydrogen Non-premixed Flames
May-08	Olof Stålnacke	Experimental method to verify the real residence-time distribution and temperature in MSW-plants
Jan-08	Magnus Marklund	A Self-Consistent CFD-model for Pressurised High Temperature Black Liquor Gasification
Aug-07	Helmut Ranner	Optical windows for combustion research and control applications: Anti-fouling strategies
July-07	Ben Burggraaf	Towards industrial application of High Efficiency Combustion
June-07	James G. Seebold	Elevated Flare Pulsation Due To Seal Drum Surging – Prediction, Prevention & Proof
Mar-07	Jani Lehto	Development of an experimental laminar flow reactor and a test method for determination of the rate of pyrolysis of high-volatile-content solid fuels
Jan-07	Eduardo A. Brizuela	Scalar variance and the Beta Probability Density Function
Nov-06	Yang Weihong	CFD as applied to high temperature air combustion in industrial furnaces
Sept-06	Ted Grandmaison	High Temperature Oxidation of Steel in an Oxygen-enriched Low NOX Furnace Environment
May-06	Manuel Garcia - Pérez	Evaporation and Combustion Characteristics of Biomass Vacuum Pyrolysis Oils
Dec-05	N Orfanoudakis	Design, evaluation measurements and modelling of a small swirl stabilised laboratory burner
Dec-05	Anna Pitkänen	Numerical Study of Silica Particle Formation in Turbulent H ₂ /O ₂ Flame
Nov-05	Ying-Ling Chen	Time-resolved temperature images of laser-ignition using OH two-line laser-induced fluorescence (LIF) thermometry
Oct-05	James G. Seebold	Combustion Driven Oscillation in Process Heaters





IFRF CONFERENCES, TOTeMs and WORKSHOPS

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Menu

[Papers](#)
[Search](#)
[Archive](#)
[Login](#)

IFRF Sub-Sites

[:: Home](#)
[:: About us](#)
[:: Facilities](#)
[:: Research](#)
[:: Journal](#)
[:: MNM](#)
[:: Handbook](#)
[:: Conferences](#)
[:: Events Calendar](#)
[:: Library](#)
[:: Exchange](#)
[:: Academy](#)
[:: EFRI](#)

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Events in 2009

TOTeM 33 - Challenges in Rotary Kiln Combustion Processes

Pisa, Italy, 11-12th February, 2009
Start date: 18-02-2009 Completed on: 23-02-2009

Events in 2008

TOTeM 32 "Efficient solid fuel utilisation: How to overcome ash related restrictions"

Freising Germany, 15th, 16th December 2008
Start date: 15-12-2008 Completed on: 16-12-2008

TOTeM 31 "Oxy-Combustion technologies and applications"

ENEL Auditorium, Pisa 13,14 November 2008
Start date: 19-11-2008 Completed on: 24-11-2008

Validation of combustion modelling for practical combustion systems

IFRF Workshop held at TUM, June 17, 2008
Start date: 07-07-2008 Completed on: 07-07-2008

Solid Fuel Database Workshop

IFRF Workshop held at TUM, June 18, 2008
Start date: 07-07-2008 Completed on: 07-07-2008

Events in 2007

TOTeM 30 "Computational Fluid Dynamics - Simulation of Combustion Processes"

Waikoloa, Hawaii, USA, 25, 26 October 2007 - Chair: C. Jian
Start date: 14-12-2007 Completed on: 30-12-2007

15th Members' Conference - Combustion in an efficient and environmentally acceptable manner

Pisa 13-15, June 2007
Start date: 13-07-2007 Completed on: 16-07-2007

TOTeM 29 "Characterisation of biofuels for co-combustion"

Technical University Munich, 12-13 October 2006 - Chair: H. Spliethoff





I F R F

Menu

- Papers
- Search
- Archive
- Login

IFRF Sub-Sites

- :: Home
- :: About us
- :: Facilities
- :: Research
- :: Journal
- :: MNM
- :: Handbook
- :: Conferences
- :: Events Calendar
- :: Library
- :: Exchange
- :: Academy
- :: EFRI

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TOTeM 33 - Challenges in Rotary Kiln Combustion Processes

Pisa, Italy, 11-12th February, 2009

Background Information: ◀

1 - TOTeM 33 Programme

Authors: Honghi Tran
Publication date: February 2009

2 - TOTeM 33 Introduction

Authors: Neil Fricker, IFRF
Publication date: February 2009

3 - Rotary Kiln Operation - Problems and Solutions

Authors: Tom Lowes, CINAR Ltd
Publication date: February 2009

4 - Chemical Issues in Cement Production

Authors: Kim Dam-Johansen, Technical University of Denmark
Publication date: February 2009

5 - Chemical Issues and Ring Formation in Lime Recovery Kilns

Authors: Honghi Tran, University of Toronto
Publication date: February 2009

6 - Lime Kiln Flue Gas Emissions - Present Status and Challenge

Authors: Mika Kottila, Andritz Oy
Publication date: February 2009

7 - Burning Alternative Fuels in Cement Kilns

Authors: Morten Boberg Larsen, F.L. Smidth
Publication date: February 2009

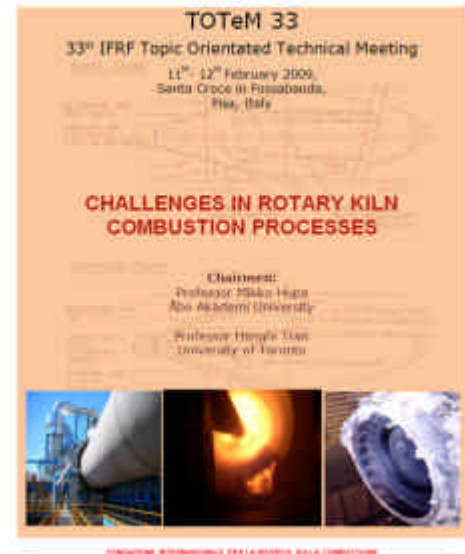
8 - Burning Alternative Fuels in Pebble Lime Kilns

Authors: Cliff Rennie, Kiln Flame Systems
Publication date: February 2009

9 - Effects of Alternative Fuel Combustion on Lime Kiln Flames



INTERNATIONAL FLAME RESEARCH FOUNDATION



The Rotary Kilns TOTeM
Pisa, 11th & 12th February 2009

Conclusions from TOTeM33

Prepared by:

*Honghi Tran, University of Toronto
Mikko Hupa, Åbo Akademi
Terry Adams, TN Adams Consulting
and Neil Fricker, IFRF*

IFRF Doc No D 121.r/22 part 4





Calendar of technical events

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Menu

- [Events by class](#)
- [Events by date](#)
- [Events by country](#)
- [Search](#)
- [Submit event](#)
- [Contact us](#)

[Log into backroom](#)

Coming events:

- [9th-10th Mar 2009](#)
British French Flame Days
- [14th-17th Apr 2009](#)
European Combustion Meeting ECM 2009
- [14th-17th Apr 2009](#)
ECMEI 5
- [3rd Jun 2009](#)
British Flame AGM
- [8th-10th Jun 2009](#)
16th International IFRF Members' Conference

IFRF Sub-Sites

- [:: Home](#)
- [:: About us](#)
- [:: Facilities](#)
- [:: Research](#)
- [:: Journal](#)
- [:: MNM](#)
- [:: Handbook](#)
- [:: Conferences](#)
- [:: Events Calendar](#)
- [:: Library](#)
- [:: Exchange](#)
- [:: Academy](#)
- [:: EERT](#)

Events in chronological order

[Archive](#)

March 2009

British French Flame Days
Le Nouveau Siècle, Lille, France

9th-10th Mar, 2009
[IFRF Flame Days](#)

April 2009

ECMEI 5
5th European Conference on Economics and Management of
Energy in Industry
Vilamoura, Algarve, Portugal

14th-17th Apr, 2009
[Other Combustion meetings](#)

European Combustion Meeting ECM 2009
Vienna University of Technology

14th-17th Apr, 2009
[Other Combustion meetings](#)

June 2009

British Flame AGM
Hamworthy Combustion Engineering Ltd.

Wed, 03 Jun, 2009
[IFRF National Technical Meetings](#)

16th International IFRF Members' Conference
Combustion and sustainability: new technologies, new fuels,
new challenges
Boston, USA

8th-10th Jun, 2009
[IFRF Members Conferences](#)

IFRF Joint Committee Meeting
Boston Hilton Back Bay Hotel, Boston, USA

11th-12th Jun, 2009
[IFRF Administration Meetings](#)

IFRF Executive Committee meeting
Boston Hilton Back Bay Hotel, Boston, USA

Thu, 11 Jun, 2009
[IFRF Administration Meetings](#)





INTERNATIONAL FLAME RESEARCH FOUNDATION

- ◆ Home
- ◆ Theme
- ◆ Deadlines
- ◆ Programme
- ◆ Venue
- ◆ Accommodation
- ◆ Registration Form
- ◆ Social Events
- ◆ Papers Submission
- ◆ Who are the IFRF
- ◆ Boston Links
- ◆ Contact us

16th IFRF Members' Conference

**Combustion and Sustainability:
New Technologies, New Fuels
New Challenges**



Boston, USA · June 8-10, 2009

16th Members' Conference, June 8-10, 2009, Boston (USA): Topics

- *Fuel characterization: bio-, fossil, secondary fuels*
- *Ash/mineral matter and related problems*
- *Oxygen Combustion and other technologies for CCS*
- *New combustion concepts (HiTAC, flameless, MILD ,etc.) and their application*

- *Ultra low NOx boilers and heaters for different applications*
- *Matching for new/revamped/upgraded applications: flame and combustion chamber matching for new or revamped furnaces; burner-boiler matching for new or upgraded boilers*
- *Flares for Oil&Gas and other sectors*

- *Combustion modeling Verification & Validation (comprehensive codes and sub-models)*
- *Diagnostics and in-flame measurement techniques*



TOTeM 34: the first time in Japan

Advanced Combustion and Heating Technology for Industrial Furnaces

Reducing cost, increasing production, improving product quality, meeting environmental targets – these are often the conflicting goals of the furnace user and designer.

Topics for discussion include:

- **Combustion in furnaces (flame, burner, thermal distribution, etc.)**
- **Burning alternative fuels (fuel characterization, burning behaviours)**
- **Operating issues (heat transfer, energy efficiency, emissions, etc.)**
- **Simulation and modelling (CFD, dynamic, thermodynamic)**
- **Sensors, diagnostics and control**
- **Emerging issues**



The IFRF Agenda

- Act as a **facilitator for cooperative projects** with or between members and promote **networking activities** (EFRI)
- **Promote, execute and report Members' Research Programme**
 - Pursue and **report current ENEL funded projects**
 - Pursue and develop **CFD (sub) modelling verification and validation** criteria and procedures
 - Pursue and disseminate **coal and solid fuel combustion characteristics** through IFRF SFDB
 - Run dedicated **FORA**
- **Collect and disseminate combustion data and studies** through Conferences, TOTeMs, workshops, web-based publications and archives (*Members only*).
- **Reactivate training/mobility** of investigators from industry on the MRP and through courses

