ANNUAL REPORT
FOR THE YEAR 2007

OF THE

INTERNATIONAL ENERGY AGENCY
IMPLEMENTING AGREEMENT FOR
ENERGY CONSERVATION AND
EMISSIONS REDUCTION IN COMBUSTION

prepared by the
Executive Committee Secretariat

for

Jay Keller, Agreement Operating Agent
Sandia National Laboratories - California

Program of Research

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Sandia National Laboratories - California

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EXECUTIVE ABSTRACT

YEAR 2007 ACTIVITIES OF THE EXECUTIVE COMMITTEE

A SUMMARY OF RESEARCH ACTIVITIES

EXECUTIVE ABSTRACT

The purpose of the IEA Implementing Agreement on Energy Conservation and Emissions Reduction in Combustion program is to improve fundamental and applied combustion technology which is developed to provide predictive design capabilities for internal combustion engines, furnaces and gas turbines. This document summarizes the progress made in FY 2007.

Since 1978, IEA cooperative research by program participants has focused ondeveloping experimental and computational tools to aid combustion research and on developing advanced laser-optical diagnostic tools that permit in situ, time- and space-resolved measurements of combustion phenomena for achieving this end. The Agreement's Annex 1 has been planned to improve the modeling and simulation processes as well as the instrumentation required for the supporting experimental activities.

Programs of applied research are carried out in one or more of the following areas:

- Advanced piston engine technology;
- Furnaces and boilers;
- Fundamentals
- Advanced turbine technology

New collaborative multi nation initiatives are under way in the areas of hydrogen enriched lean premixed combustion for ultra-low emission gas turbines, fuel sprays, hydrogen-fueled internal combustion engines, and fuels for homogeneous charge compression ignition (HCCI) engines. Others are being planned to investigate soot formation and develop particulate diagnostics.

YEAR 2007 ACTIVITIES OF THE EXECUTIVE COMMITTEE

The Executive Committee (EC) of the International Energy Agency's (IEA) Program of Research, Development and Demonstration on EnergyConservation and Emissions Reduction in Combustion coordinates the cooperative efforts undertaken by participating institutions. The Committee met twice during the business year 2007. The first meeting was held at IEAHeadquarters in Paris, France, in May; the second took place following the Agreement's Twenty Ninth Task Leaders Meeting in September in Gembloux, Belgium.

Actions taken by the Executive Committee this year include:

Web Sites:
the successful launching of the Agreement's new public web site and the creation of a password protected web site for Executive Committee use.

Task Leaders Meeting:
The Twenty Ninth Task Leaders Meeting, sponsored by the Executive Committee which was held at the Hotel Les 3 Cles in Gembloux, Belgium in early September. Principal Investigators, Executive Committee members and invited guests gathered to hear papers presented on the Agreement's research

Executive Committee Meetings:
Minutes of the Executive Committee's meetings of May and September have been published and distributed totheIEA Headquarters and to participants. The Proceedings of the Twenty Ninth Task Leaders Meeting were published and distributed to IEA Headquarters and Executive Committee members for distribution to participants. The Agreement's 2006 Annual Report is available on the public web site.

Agreement Leadership:
At its September meeting,the Executive Committee unanimously chose as Chairman, Prof. Douglas Greenhalgh of the United Kingdom to direct the Agreement's activities for the forthcoming year, 2007 - 2008. Mr. Gurpreet Singh of the Unites States was elected vice-chair.

Future Meetings:
The Executive Committee scheduled its 2008 meetings for May at IEA Headquarters, Paris and September 2008 in Capri, Italy. The September meeting will be held immediately following the 30th Task Leaders meeting and at the same location.

Executive Committee members and their alternates as of September 30, 2007 were:

BELGIUM	Prof. Philippe Ngendakumana
Alternate:	Dr. Barbara Pesenti
CANADA	Prof. Ömer L. Gülder
Alternate:	Mr. Gregory J. Smallwood
FINLAND	Prof. Martti Larmi
GERMANY	Prof. Jürgen Warnatz
ITALY	Prof. Felice E. Corcione
Alternate:	Dr. Gerardo Valentino
JAPAN	Prof. Tomio Obokata
Alternate:	Prof. Yasuo Moriyoshi
NORWAY	Prof. Ivar S. Ertesvag
Alternate:	Prof. Inge R. Gran
SWEDEN	Dr. Bernt Gustafsson
Alternates:	Prof. Marcus Alden and Dr. Sven-Inge Moller
SWITZERLAND	Mr. Fabrice Rognon
Alternates:	Mr. Stephan Renz and Dr. Peter Jansohn
UNITED KINGDOM	Prof. Douglas Greenhalgh
Alternate:	Prof. Phillip Hutchinson
UNITED STATES	Mr. Gurpreet Singh

For the 2007 Agreement Year, the operating Agent for the Energy Conservation and Emissions Reduction in Combustion Implementing Agreement was Dr. Jay Keller, Sandia National Laboratories, Livermore, California, USA.

Effective December 1, 2007 the Executive Committee accepted with regret the resignation of Dr. Keller due to a shift in his management responsibilities at Sandia. He was replaced by Dr. Dennis Siebers also from Sandia.

Dr. Robert J. Gallagher has been engaged by the Executive Committee to fulfill the administrative responsibilities of the Operating Agent.

The Agreement's administrative liaison at IEA Headquarters, Paris is Mr. Thomas Kerr.

SUMMARY OF RESEARCH ACTIVITIES

AREA 1 ADVANCED PISTON ENGINE TECHNOLOGY

SUBAREA 1.1 INDUCTION PROCESSES

No active Subtasks

SUBAREA 1.2 FUEL-AIR MIXING

1.2C Italy
Air Motion Investigation in Diesel Engines

1.2H Finland
Fuel Spray Modeling for Diesel Combustion Simulation

1.2K1 Collaborative Task
Sprays in Combustion

1.2K3 Japan
An Experimental and Theoretical Study of Engine Sprays

1.2K4 Switzerland
Quantitative 2-D Soot Measurements by RayLIX

SUBAREA 1.3 IGNITION

No active Subtasks

SUBAREA 1.4 FLAME PROCESSES

1.4G Japan
Investigate Combustion in Premixed Charge Spark/Compression Ignition Engines

SUBAREA 1.5 EXHAUST PHENOMENA

1.5F Japan
Spray and Combustion in Diesel Engine

SUBAREA 1.6 COMBUSTION PERFORMANCE AND CHARACTERISTICS OF FUELS

1.6B1 Collaborative Task
Advanced Hydrogen Fueled Internal Combustion Engines

1.6B6 Belgium
Hydrogen-fueled internal combustion engines: Research at Ghent University

1.6B7 U.S.
Mixture formation and Combustion in a Hydrogen - Fueled Internal Combustion Engine

AREA 2 ADVANCED FURNACE TECHNOLOGY

SUBAREA 2.1 BURNER PHENOMENA

2.1H Belgium
Investigation on Combustion in Oil Burner Flames

2.1I Belgium
Study of Combustion and Heat Transfer Phenomena in Industrial Furnaces Fired with Gas Burners using Preheated Air

SUBAREA 2.2 GAS FLOWS

No active Subtasks

SUBAREA 2.3 FUEL-AIR MIXING

No active Subtasks

SUBAREA 2.4 FLAME PROCESSES

2.4F Belgium
Chemical Kinetics Studies of Flames and Soot Formation

SUBAREA 2.5 POSTFLAME PROCESS

2.5A Japan
Combustion Technology Reducing Environmental Impact

AREA 3 FUNDAMENTALS

SUBAREA 3.1 TURBULENT REACTING FLOWS

3.1C Norway
Experimental and Theoretical Investigation of Interaction Between Turbulent Structure and Chemical Kinetics in Flows

3.1D Japan
Analysis of Turbulent Combustion Flows

3.1E Japan
Experimental Study of High Intensity Combustion in Real Burner

SUBAREA 3.2 PHYSICAL AND CHEMICAL PROCESSES

No active Subtasks

SUBAREA 3.3 NUMERICAL MODELING

No active Subtasks

SUBAREA 3.4 DIAGNOSTICS

3.4B Japan
Investigate Dynamic Spray Characteristics by Image Processing

3.4C Japan
Analysis of Transient Chemical Composition in HCCI and Mechanisms Controlling Ignition

3.4S U.S. / Canada
Development of Laser-based Diagnostics for Soot Particulate Matter from Internal Combustion Engines

AREA 4 ADVANCED GAS TURBINE TECHNOLOGY

SUBAREA 4.1 COMBUSTION MODELING AND VERIFICATION

4.1A Collaborative Task
Hydrogen Enriched Lean Premixed Combustion for Ultra-Low Emission Gas Turbine Combustors

Switzerland
Fuel Variability Effects on Turbulent, Lean Premixed Flames at High Pressures