Saudi Arabian Section

Combustion Institute

Section Report 36th Symposium

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1. Section Overview

The Saudi Arabian Section currently has around 103 members — a 70% increase from last year — SAS-CI now draws members from a number of research institutions, including King Abdullah University of Science and Technology (KAUST), King Abdulaziz City for Science and Technology, King Fahd University for Petroleum and Minerals, King Abdulaziz University, the Royal Commission of Yanbu' Research Center, Taif University, Taibah University, Jubail University College, and Prince Mohammed Bin Fahd University. Since its initiation, the Saudi Arabian Section of the Combustion Institute has been organizing annual meetings. This annual event aims at promoting the combustion science within the Kingdom through fostering a well-connected research community and providing a forum for young combustion researchers from academia and industry to present and discuss their research work which spans a wide range of aspects of fundamental and applied combustion science. The five annual meetings were held in King Abdullah University of Science and Technology (KAUST) (2011), King Abdulaziz City for Science and Technology (KACST) (2012), Saudi Aramco (2013), KAUST (2014) and KACST (2015). The 6th SAS-CI meeting was held at Saudi Aramco, Dhahran, Eastern Province, KSA.

The current Section Committee is as follows:

Name	Affiliation	Role	Email
Dr. Amer A. Amer	Saudi Aramco	Chair	amer.amer.4@aramco.com
Prof. William Roberts	KAUST	Vice-Chair	william.roberts@kaust.edu.sa
Dr. Ahmed Al-Harbi	KACST	Vice-Chair	ahalharbi@kacst.edu.sa
Prof. Mani Sarathy	KAUST	Officer	mani.sarathy@kaust.edu.sa
Dr. Kai Morganti	Saudi Aramco	Officer	Kai.morganti@aramco.com
Prof. Nadeem Malik	KFUPM	Officer	namalik@kfupm.edu.sa
Dr. Jihad Badra	Saudi Aramco	Secretary	jihad.badra@aramco.com

2. New Board of Officers

The previous board of officers has elected a new board as per the section bylaws where the board can serve for a maximum of 4 years. The new board members are listed above. The current members represent some of the esteemed Saudi Arabian research institutions such as KAUST, Saudi Aramco, KFUPM and KACST.

3. 5th SAS-CI Meeting 2015

The Saudi Aramco Research & Development Center (R&DC) organized the Fifth Annual Meeting of the Saudi Arabian Section of the Combustion Institute. The meeting was held at King Abdulaziz City for Science and Technology (KACST) in Riyadh in May 2015, and brought together around 80 combustion scientists from research institutions in Saudi Arabia, Egypt, Turkey, the United Arab Emirates and the United States.

In a world where sustainability represents one of our greatest social challenges, it is important to consider the role of combustion science. In general terms, combustion science relates to the study of systems that convert chemical energy into so-called work. And although we may not realize it, these devices play a central role in our everyday lives.

"The engines in our cars, along with the gas turbines that power commercial aircraft are both examples of devices that convert the chemical energy within a fuel into work," says Amer Amer, Fuel Chief Technologist in the Saudi Aramco R&DC and Chairman of the Saudi Arabian Section of the Combustion Institute. "Additionally, consider how often you use devices that rely on electricity generated in power stations, such as cell phones, computers and kitchen appliances. All of these modern necessities have been made possible by combustion science," says Amer.

As a leading global exporter of energy, Saudi Arabia has a key role to play in the development of clean and efficient combustion systems. "The Saudi Arabian Section of the Combustion Institute is central to this objective, as it actively supports the development of the Kingdom's young combustion scientists," says Professor William Roberts, Director of the Clean Combustion Research Center at King Abdullah University of Science and Technology (KAUST) and Vice-Chairman of the Saudi Arabian Section of the Combustion Institute. "The establishment of our local section has also enabled greater collaboration between our best research institutions, as well as with those abroad."

Indeed, the scientific advances made by the Saudi Arabian combustion scientists could deliver a range of social and environmental benefits to the global community. Hong Im, Professor of Mechanical Engineering at KAUST's Clean Combustion Research Center says that developing

innovative solutions that contribute towards more sustainable energy systems requires a fundamental understanding of the basic combustion processes, the fuel chemistry and the formation of pollutant emissions in different combustion systems. “Our local researchers are actively engaged in both fundamental and applied combustion research that aims to address these needs,” says Im.

The Fifth Annual Meeting was the largest in the section’s history, and the first to be held over two days. In total, 36 researchers presented their findings at the meeting, with a further 26 researchers participating in the work-in-progress poster session. “The poster session provides an opportunity for our early career researchers to present preliminary results and network with their more experienced peers,” says Dr. Kai Morganti, a Research Scientist in the Saudi Aramco R&DC and one of the organizers of the Fifth Annual Meeting. “The interactive format of the meeting also strikes a balance between educating our young combustion scientists and enhancing their all-important soft skills.”

One of the young combustion scientists that presented his research at the Fifth Annual Meeting was Abdullah AlRamadan. “My current research aims to quantify the benefits of alcohol-based fuel additives by analyzing their basic combustion behavior,” says AlRamadan. “I overcame a big milestone – presenting for the first time at a technical conference in front of a large audience.” AlRamadan’s hard work and dedication has paid off, with the young combustion scientist recently accepted into the Saudi Aramco R&DC Advanced Degree Program. AlRamadan will commence his PhD studies in the fuel combustion field in 2016.

The Fifth Annual Meeting also featured two keynote speakers – Professor Robert Dibble from KAUST and Dr. Sibendu Som from Argonne National Laboratory, USA. “Professor Dibble and Dr. Som are at the forefront of combustion research in their respective fields,” says Morganti. “They are both highly respected within the international combustion community.”

4. 6th SAS-CI Meeting 2016

More than 100 scientists and engineers recently (May 2016) gathered at Dhahran’s Technical Exchange Center for the 6th Annual Meeting of the Saudi Arabian Section of the Combustion Institute (SAS-CI).

The two-day meeting included speeches by global leaders and technical forums to help disseminate knowledge among In-Kingdom researchers about the latest research in combustion science.

Working to be a technology leader

The sharing of new innovations in combustion science is occurring at an important time for the company and for the Kingdom — and at a time when Saudi Aramco is gaining notice for its investments in fuel-combustion research to find the optimal match between modern fuels and engine designs. This research is aligned with the company's aspiration to support the Kingdom's position as a global technology leader in energy and its uses in the transport industry.

The world is looking for scientific solutions to the crucial issues of energy efficiency and climate change, and Saudi Aramco's R&D Center is meeting that challenge, said Amer A. Amer, chief technologist at the R&D Center's Fuel Technology program.

Transport and oil are interlinked — about 95% of transport energy comes from petroleum-based fuels, and 60% of oil goes to make transport fuels, said Amer, adding that "There are significant opportunities to improve the transport efficiency while minimizing the environmental impact through innovations in synergistic fuel/engine systems.

"The understanding of combustion sciences on experimental and simulation fronts will enable such innovation," Amer added. "Research efforts in fuel combustion is particularly relevant to this country as one out of every eight barrels of the world's crude oil production comes from Saudi Arabia."

A growing flow of ideas

After only six years, SAS-CI is already starting to create ripple effects in the sheer volume of ideas shared, with an expected 38 papers to be published in the International Combustion Symposium this year, compared with 13 in 2014.

At the meeting, two keynote speakers were invited to share their expertise on major advances in combustion science. On the opening day, Bengt Johansson, a professor of combustion science at KAUST, gave a presentation on the most promising of the new fuel/engine system, called Partially Premixed Combustion, or PPC. The second day's keynote speaker, Fei Qi, a professor at Shanghai Jiao Tong University, gave a talk on the latest innovations in combustion chemistry. Other scientists gave more than 40 presentations on topics that ranged from environmental and economic assessment of combustion technologies and combustion chemistry to gas turbine combustion and experimental fuels.

Qi said energy efficiency has become one of his country's most fundamental energy challenges and that many scientists are studying this issue. "This is very useful for us to study, because it will help our society a lot to have more efficient use of energy," he said. "We are not in the early stages of this research, so I think we will start to see major improvements soon."

Johansson, the professor at KAUST, agreed. “We all have one common goal: to increase energy efficiency in transport engines and to use as little fuel as possible to get the most bang for the buck,” he said. “The big question is, ‘Where can we improve the process of combustion to give us the most efficiency?’”

5. International Combustion Symposium

There was a substantial growth in the number of accepted papers co-authored by Saudi Arabians for oral presentation at the 35th and 36th Symposium. In fact, 13 were accepted in the 35th Symposium as compared to 6 in the 34th with an increase of 116%. This trend continued with the number of papers accepted in the 36th Symposium. 38 papers co-authored by Saudi Arabian researchers will be presented in the 36th Combustion symposium in Korea. This is a staggering 176% increase from the Symposium.

6. SAS_CI Website

We have recently developed a website for the Saudi Arabian Section of the Combustion Institute. This is done jointly by Saudi Aramco and KAUST. The website can be found at: www.sas-ci.com.

7. Future Plans

The Fuel Technology R&DC is working on organizing the SAS-CI and improving it to compete with other active local sections to reflect the big efforts already and yet to be spent on combustion research in the Kingdom. The proposed short and medium term action plan is presented below,

- Getting more members registered from within the Kingdom and perhaps from the countries close to KSA.
- Frequently, arranging social gatherings for the members.
- Creating a bank account to handle all the in/out transactions.
- Electing a new board of officers.

Amer A. Amer
Chair, Saudi Arabian Section
20th June 2016