

South Korea
Member of ICHMT, AIHTC, AUTSE
(1) Overview

(Korea Standard Time, KST: UTC+9, Population: 51.8 million)

1. Major Societies

Most of Korean scientists and engineers in thermal science and engineering (or more specifically heat and mass transfer) belong to the Thermal Engineering Division of the Korean Society of Mechanical Engineers (KSME; approximately 27,000 registered members), Division of Nuclear Thermal Hydraulics of Korean Nuclear Society (KNS; approximately 5,000 registered members), Society of Air-conditioning and Refrigerating Engineers of Korea (SAREK; approximately 9,000 registered members), and/or Korean Society of Combustion (KOSCO; approximately 800 registered members). KSME-TED is a core society of heat and mass transfer in Korea.

2. Major Meetings

Thermal Engineering Conferences by KSME-TED
 during Spring (April) of KSME-TED and Fall Annual Meeting of KSME (November)
 Place: mostly Hotel or Convention Center around the country

Seasonal Conferences by KNS
 during Spring (May) and Autumn (October) Annual Meetings
 Place: mostly Hotel or Convention Center around the country

Seasonal Conference by SAREK
 during summer (June) and winter (November)
 Place: mostly Hotel or Convention Center around the country

Seasonal Conference by KOSCO
 during spring (May) and winter (November)
 Place: mostly Hotel or Convention Center around the country



3. Major Journals

- KSME
 - Journal of Mechanical Science and Technology (in English, monthly)
 - JMST Advances (in English, quarterly)
 - Transactions of the KSME A/B/C (in Korean, monthly)
- KNS
 - Nuclear Engineering and Technology (in English, monthly)
- SAREK
 - International Journal of Air-Conditioning and Refrigeration (in English, quarterly)
 - Korean Journal of Air-Conditioning and Refrigeration Engineering (in Korean, monthly)
- KOSCO
 - Journal of The Korean Society of Combustion (in Korean, quarterly)

4. Education (Undergraduate/Graduate School)

- Elementary School, 6 years; Middle School, 3 years; High School, 3 years; Undergraduate School, 4 years.
- In most universities, the first semester starts in March, while the second semester starts in September.
- Most of undergraduate school education is carried out by using English textbooks, and some of the lectures are taught in English.
- Master course is usually 2 years, and Doctor course is 4 years on average (integrated Ph.D. course is often 5 years).
- Recently, there exist growing needs for female or international faculty in engineering schools.

5. University System

- Tenure-track professors are usually independent and run their own laboratory (similar to the US university system).
- At most of universities, the retirement age is 65.

6. Foundations of Scientific Research

- National Research Foundation of Korea (NRF)
- Korea Institute of Energy Technology Evaluation and Planning (KETEP)
- Korea Evaluation Institute of Industrial Technology (KEIT)

7. Major Public Research Institutes

- Korea Institute of Machinery and Materials (KIMM)
- Korea Atomic Energy Research Institute (KAERI)
- Korea Institute of Science and Technology (KIST)
- Korea Institute of Energy Research (KIER)
- Korea Institute of Industrial Technology (KITECH)



8. Addendum

Korean is the national language of both North Korea and South Korea. Modern Korean is written in Hangeul, i.e., Korean alphabet that was originally developed by King Sejong in 1446. Modern Hangeul uses 24 basic letters (14 consonant letters and 10 vowel letters) just like the modern English alphabet.

便 : 사 · 새 · 내 · 문 · 무 · 이 · 文 · 나
 矣 · 소 · 로 · 이 · 훈 · 르 · 린 · 랫
 矣 · 마 · 스 · 이 · 록 · 고 · 전 · 矣
 矣 · 다 · 들 · 미 · 제 · 처 · 와 · 미
 矣 · 하 · 여 · 불 · 하 · 브 · 록 · 로 · 미
 矣 · 어 · 들 · 아 · 들 · 배 · 어 · 서 · 矣
 矣 · 수 · 빙 · 니 · 곶 · 아 · 시 · 린 · 矣
 矣 · 흥 · 수 · 불 · 아 · 엿 · 러 · 셔 · 도
 矣 · 루 · 겨 · 불 · 링 · 비 · 너 · 피 · 도
 矣 · 미 · 날 · 구 · 날 · 노 · 이 · 아 · 矣
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 矣 · 메 · 니 · 홀 · 씨

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|-----------------------|-----------------|--|
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| President of SAREK | Min Soo KIM | minskim@snu.ac.kr |
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South Korea, Member of ICHMT, AIHTC, AUTSE (2)

1. International Activities of Thermal Engineering Societies in Korea
 Bong Jae Lee and Ji Hwan Jeong

2. Report on Thermal Engineering Conference (Spring 2022)
 Hyunjin Lee and Bong Jae Lee

1. International Activities of Thermal Engineering Societies in Korea



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Most Korean scientists and engineers in heat and mass transfer belong to the Thermal Engineering Division of the Korean Society of Mechanical Engineers (KSME), Division of Nuclear Thermal Hydraulics of the Korean Nuclear Society (KNS), Society of Air-conditioning and Refrigerating Engineers of Korea (SAREK). The following are the past and future international conferences at which the aforementioned societies take leadership roles.

Internal Symposium on Oscillating & Pulsating Heat Pipe (ISOPHP), September 2019, KAIST, Korea

- Symposium consisted of 4 keynote lectures, 7 oral sessions, and 1 poster session.
- There was a panel discussion titled “Status of PHP Applications in Industry” organized by Prof. J. Thome.

13th International Energy Agency Heat Pump Conference (HPC2020), April 2021, Jeju, Korea

- There were 3 plenary lectures, 36 keynote lectures, 36 oral sessions, and 4 poster tracks.

27th IIR International Congress of Refrigeration (ICR2027), August 2027, Seoul, Korea

- Conference chair: Prof. Yong Tae Kang (SAREK President)
- Congress program will provide plenary sessions, short courses, technical sessions, panel and forum sessions, technical seminars for industrial sponsors, technical excursions, and general tours for accompanying persons as well as IIR meetings, reception, banquet, etc. during 5 days.

9th Korea-China Workshop on Nuclear Reactor Thermal-Hydraulics (WORTH-9), May, 2019, Chongqing, China

- Co-organizing of the conference
- Conference co-chair: Dr. Chul Hwa Song (Korea Atomic Energy Research Institute)
- There were 2 plenary lectures, 8 keynote lectures, 15 oral sessions, 6 post sessions and 100 participants.

11th Symposium Japan-Korea Symposium on Nuclear Thermal Hydraulics and Safety (NTHAS-11), November 2018, Busan, Korea

- Biennial international joint workshop between Korean and Japanese nuclear energy societies
- Conference chair: Dr. Young Seok Bang (Korea Institute of Nuclear Safety)
- There were 4 plenary lectures, 6 keynote lectures, 24 oral sessions, and 200 participants.

12th Symposium Japan-Korea Symposium on Nuclear Thermal Hydraulics and Safety (NTHAS-12), October 30-November 2, 2022, Miyazaki, Japan

- Co-organizing of the conference
- Conference co-chair: Prof. Jae Jun Jeong (Pusan National University)
- Conference program will provide plenary sessions, keynote lectures and technical sessions.

2. Report on Thermal Engineering Conference (Spring 2022)

April 20 – 22, 2022 in Gyeongju-si



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The Thermal & Fluid Engineering Division of KSME was established in 1980, and the first Thermal & Fluid Engineering conference was held in 1993. In 1998, the Thermal Engineering Division (TED) was separated, and the Thermal Engineering Conference has been independently held ever since. This year, KSME TED was able to organize a fully in-person conference from April 20–22 in Gyeongju-si, Korea. There were 535 attendees and 292 presentations (205 Oral and 87 Poster) about all areas of heat and mass transfer (see Fig. 2 below).

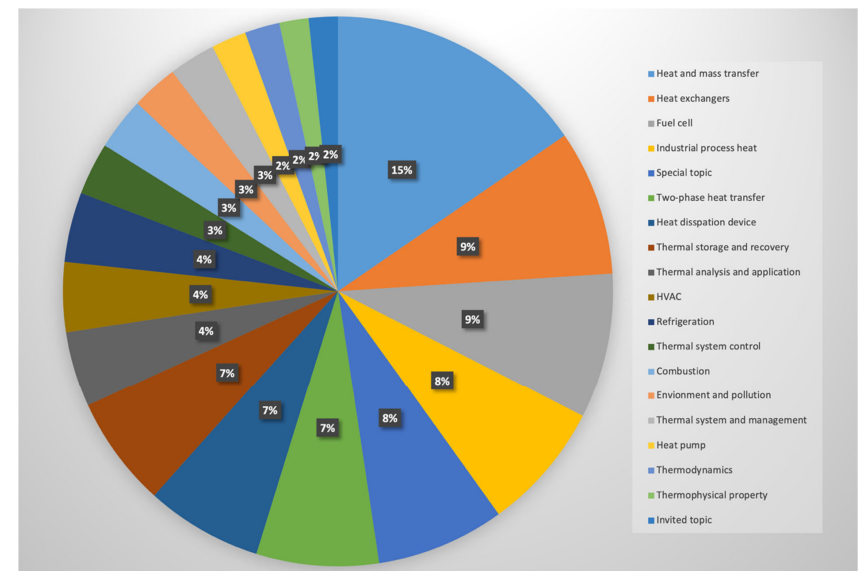


Fig. 2 Sessions (total 292 presentations)

South Korea, Member of ICHMT, AIHTC, AUTSE (3)

1. Report on the Korean Society of Mechanical Engineering (KSME) Annual Meeting 2022
Wonyoung Lee and Taesung Kim
2. Special Topics in Journal of the KSME
Wonyoung Lee and Taesung Kim
3. Industry-Academia Joint Lecture on Next Generation HVAC-R
Jaeseon Lee

1. Report on the Korean Society of Mechanical Engineering (KSME) Annual Meeting 2022



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KSME Annual Meeting took place face-to-face during November 9 to 12, 2022 in Jeju, South Korea. Totally 1206 papers were presented including 66 keynotes through 13 divisions in the conference. The share of number of the presentation in each division is seen in a pie chart below. In Thermal Engineering Division, totally 173 papers were presented including 5 keynotes through 29 sessions. Keynotes speeches were “Estimation of airborne virus transmission from indoor air-conditioning units” by Prof. Man Yeong Ha, Pusan National University, “Hydrogen turbine” by Prof. Tong Seop Kim, Inha University, “Thermal-hydraulic characteristic of fluids in open-cell porous metal fins” by Prof. Ji Hwan Jeong, Pusan National University, “Machine learning-based signal quantification in optical diagnostics for real-time monitoring of chemical reactors” by Prof. Moonsoo Park, Sungkyunkwan University, “Energy harvesting performance of thermoelectric generator and photovoltaic systems” by Prof. Tae Young Kim, Seoul National University of Science and Technology, and “Plasma applications” by Dr. Hyeong-U Kim, Korea Institute of Machinery & Materials.

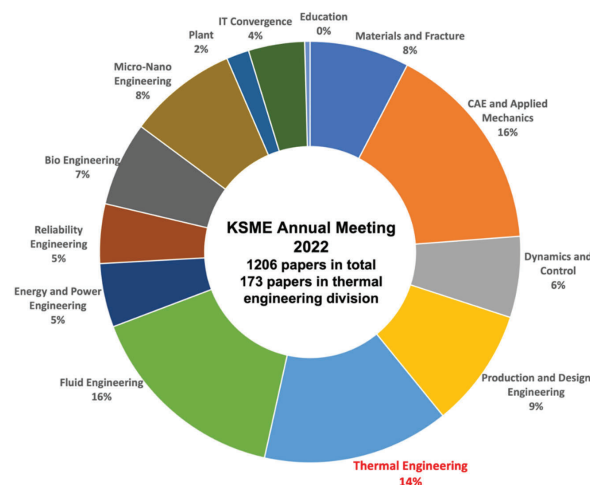


Fig. 2.1 Number of presentations at KSME Annual Meeting 2022

2. Special Topics in Journal of the KSME



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The Korean Society of Mechanical Engineering (KSME) publishes the monthly Journal of the KSME. In addition to the trends in mechanical engineering, this journal provides information on the Internet, new technologies, new products, software, laboratories, and patents. It also contains interesting stories about our daily lives, such as university club introductions, essays, health information, life medicine, leisure, and more. The latest issue in February, 2023 contains the special topics about the recent trends in air conditioning and refrigerating systems. Six articles are published, including “R1233zd refrigerant based turbo refrigerating systems” by Dr. Cheolmin Kim, LG Electronics, “Dehumidifying air conditioning systems” by Dr. Insoo Hwang, Jyung Dong Navien, “Thermal air-conditioning systems for carbon net-zero” by Dr. Sungmin Woo, Samjungtech. “Mix-matrix membrane based dehumidifiers” by Prof. Minsung Kim, Joongang Chung-Ang University, “Solar radiation model research and applications” by Prof. Hyunjin Lee, Kookmin University, and “Polymer-based rotary regenerator type heat exchangers” by Prof. Dong-Wook Oh, Chosun University.

3. Industry-Academia Joint Lecture on Next Generation HVAC-R



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The Thermal Engineering Division (TED) of the Korean Society of Mechanical Engineers (KSME) held a seminar on new technology trends related to next-generation HVAC-R in collaboration with industry and academia. This joint seminar was held between October 20 and 21, 2022 in Yeosu, a southern seashore city in South Korea. In the first session of the seminar, speakers from the industry gave presentations on changes in the refrigeration and air conditioning industry following energy efficiency improvements, environmental regulations, and carbon neutrality. Three speakers from the industry conducted the seminar, and the topics of each presentation were as follows.

- ‘Introduction of main technologies of turbo chiller applied with alternative refrigerant (R1233zd)’, Cholmin Kim, LG electronics Co.
 - ‘Domestic dehumidification cooling system’, Insu Hwang, Kyungdong Navien Co.
 - ‘The Role of Thermally Driven Chiller for Carbon Neutrality’, Sungmin Woo, Samjung Tech. Co.
- Three speakers from academia gave lectures related to the issue, and the following topics were given.
- ‘Dehumidification technology using non-porous mix-matrix membrane’, Minsung Kim, Dept. of Mech. Eng. Chungang Univ.
 - ‘Research and application of solar radiation model’, Hyunjin Lee, Dept. of Mech. Eng. Kookmin Univ.
 - ‘An experimental study on the application of polymer materials to rotary regenerative heat exchangers’, Dongwook Oh, Dept. of Mech. Eng. Chosun Univ.

This seminar became an opportunity for 30 researchers in addition to 6 presenters to share various technical discussions and exchanges. The seminar is an annual event hosted by KSME TED. It was held on-line last year due to Covid-19 and then this year, it was held off-line again, so the enthusiasm for participation was high. In 2023, it is expected that the industry and academia will gather together again to become a venue for exchange on various topics related to thermal engineering.



Fig. 2.2 Industry-Academia Joint Lectures

Korea, Member of ICHMT, AIHTC, AUTSE (4)

1. 2023 Spring Conference of Thermal Engineering Division, KSME

Honghyun Cho

2. Future Development Workshop 2023: Advances in Thermal Engineering

Hoseong Lee

1. 2023 Spring Conference of Thermal Engineering Division, KSME



Honghyun Cho, Dept. of Mech. Eng., Chosun University, hhcho@chosun.ac.kr

The annual Thermal Engineering Division 2023 Spring Conference of “The Korean Society of Mechanical Engineers,” held from April 19th to 22nd, 2023, at the Paradise Hotel in Busan, served as a forum for collaboration, knowledge exchange, and the unveiling of groundbreaking research. Under the stewardship of conference Chairman, Professor Jung-ho Lee, the Organizing Committee orchestrated an intellectually invigorating gathering that showcased the pinnacle of thermal engineering expertise and innovation. With the Chairman of the Thermal Engineering Division, Professor Young Soo Chang, delivering the opening speech, the conference commenced on a note of utmost significance, setting the tone for four days of scholarly discourse, collaboration, and knowledge dissemination. In particular, Vice President Saik-ee Oh from LG Electronics delivered a lecture on “Case Studies of Industrial-Academia Cooperation in Thermal Engineering Applied to Home Appliances and Air-Conditioning Products.”

With a total of 635 participants from various fields, the conference exemplified the global reach and collaborative spirit of the scientific community. These diverse perspectives not only enriched the discussions but also fostered an environment ripe for interdisciplinary insights and cross-border collaborations. The focal point of the conference lay in the multitude of papers and presentations that encapsulated the cutting edge of thermal engineering. An impressive total of 341 papers were presented, showcasing a depth of ongoing research efforts in the field of energy storage, heat and mass transfer, fuel cell, phase change heat transfer, thermal system control/measurement, conduction/radiation heat dissipation technology, and refrigeration and cryogenic technology. Furthermore, Professor Byung Ha Kang from Kookmin University and Professor Jaeseon Lee from UNIST were honored with the Thermal Engineering Academic Award. Additionally, Professor Hyungsoo Lee from Chung-Ang University and Professor Seong Kyun Im from Korea University received the Young Researcher Awards.

Five informative lectures functioned as foundational sources of knowledge, delving into fundamental aspects of thermal engineering, disseminating invaluable insights, and stimulating discussions on critical subjects. The conference featured an impressive lineup of 16 keynote speeches, each representing a reservoir of wisdom that steered participants through the forefront of innovation and technological advancements within the field. Notable presentations included "Introduction to Research on Eco-Friendly Thermal Energy Systems and High-Efficiency Heat Exchangers" by Professor Chan Woo Park from Chonbuk National University and "The Future of Heat Pump Technology and Latest Research Trends" by Professor Minsung Kim from Chung-Ang University, among others.

Moreover, five special sessions, hosting 37 presentations, provided a concentrated examination of topics including energy solutions, chemisorption heat pump systems employing an electrochemical compressor, advancements in heat pipe heat exchangers utilizing phase change activation, and innovations in plus-energy-building. These sessions facilitated profound insights and fostered engaging debates, contributing significantly to the scholarly discourse in thermal engineering. A total of 132 oral presentations and 156 poster presentations offered a dynamic platform enabling researchers to effectively communicate their findings, exchange ideas, and gain invaluable feedback from their peers.



2. Future Development Workshop 2023: Advances in Thermal Engineering



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The Future Development Committee held its annual workshop, a spring academic lecture series, at Chosun University from July 3rd to 4th, 2023. The workshop aimed to address the growing global demand for energy and explore sustainable solutions for efficient energy supply and consumption.

Professor Seong Hyuk Lee at Chung-Ang University, Vice Chairman of Thermal Engineering Division and Chairman of the Future Development Committee, delivered the opening address. Professor Sunmi Shin from the National University of Singapore presented research on thermal engineering using photonic structures, focusing on the coherent thermal emission in a single nano-object. Professor Hyung Sub Sim from Sejong University discussed the development of smart functional nanoengineered materials for future hypersonic propulsion systems. Professor Joon Sang Kang from the Korea Advanced Institute of Science and Technology presented findings on high, low, and switchable thermal conductivities in solids. Professor Jeong-Heon Shin from Hongik University shared insights into the study of heat transfer phenomena in microchannels. Professor Dong In Yu from Pukyong National University introduced research on visualizing interface phenomena.

The workshop provided a platform for experts to exchange knowledge on cutting-edge research in thermal engineering, laying the groundwork for future advancements in the field. The event successfully brought together renowned scholars and researchers, fostering collaboration and innovation in the pursuit of sustainable energy solutions.

