

BROADCOMASTER

INTERNATIONAL OXYGEN MANUFACTURERS ASSOCIATION

SEPTEMBER 2017
ISSUE 3 | www.iomaweb.org

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Japanese Progress on Expansion of the Platform of Hydrogen Refueling Stations

BY MORIYUKI FUJIMOTO, GENERAL MANAGER OF HYDROGEN ENERGY DEPARTMENT, IWATANI CORPORATION.

1. Introduction

The Basic Energy Plan approved at Cabinet Meetings in April 2014 mentioned hydrogen as one of new secondary energies contributing to stable supply of energy and global warming countermeasures, and presented efforts aimed at realizing a “hydrogen society.” In June of the same year, the “Council for a Strategy for Hydrogen and Fuel Cells” consisting of experts from industry, academia and government formulated the strategic roadmap for hydrogen and fuel cells.

In light of circumstances, in which various efforts had been advanced since the formulation of the roadmap, including the increased adoption of fuel cells for home use, the launch of fuel cell vehicles (FCVs) onto the market, and steady progress in the hydrogen infrastructure preparation involving building hydrogen refueling stations (HRSs), the contents of the roadmap was revised in March 2016.

The roadmap (Revised version) sets the targets for the adoption of FCVs at 40 thousand vehicles in FY2020, 200 thousand vehicles in FY2025 and 800 thousand vehicles in FY2030. Being tailored to these targets for the adoption of FCVs, the targets for the building of HRSs are set at 160 stations in FY2020 and 320 stations in FY2025.



Iwatani HRS in Shibakoen

In accordance with the goal set by this revised roadmap, sales of FC forklifts started in November 2016 and those of FC buses started in 2017. The revised roadmap also aims at the full-fledged introduction of hydrogen power generations in 2030.

2. Efforts geared towards the adoption of FCVs and the hydrogen infrastructure preparation involving building HRSs

In January 2011, aiming at the launch of FCVs onto the domestic market and hydrogen infrastructure preparation involving building HRSs, both of which hold the key to the realization of a hydrogen society, a total of 13 companies consisting of 10 energy companies including industrial gas companies, oil companies and city gas companies in addition to three major automobile manufacturers issued a joint statement. The contents of this statement were as follows: Automobile manufacturers made it a goal to release mass-produced FCVs for general users in 2015 in order to reduce the amount of CO2 emissions in the transportation sector. Energy companies aimed to construct hydrogen supply infrastructure in accordance with a sales forecast of mass-produced FCVs in preparation for the creation of the initial market of mass-produced FCVs.

In response to this joint statement, for the spreading in use of FCVs, support measures for the purchase of FCVs and the construction / operation of HRSs were taken by the national government and others. As for FCVs, “MIRAI” of Toyota Motor Corporation and “CLARITY FUEL CELL” of Honda Motor Co., Ltd. were commercially supplied as scheduled. As of the end of 2016, about 1,800 FCVs were running all over Japan. Meanwhile the construction of HRSs had been progressed at the rate of

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74th Annual Meeting in Dubai Approaching

IOMA 2017

IOMA's 74th Annual Meeting is scheduled for November 11–15, 2017 in Dubai, UAE. We look

forward to welcoming our member company representatives and their spouses/companions to Dubai, one of the most intriguing cities in the world. The attendees will have plenty of opportunities for business networking and learning more about this fascinating area.

In addition to the various tours and networking events, our Annual Meeting Program Committee has assembled an excellent speaker program entitled *Discovering the Middle East—Rich in Resources, History and Culture*. The attendees will hear from regional cultural speakers and from an industry panel on *Conducting Business in the Middle East*.

FEATURED SPEAKERS



Nizar Al-Adsani
Deputy Chairman and
Chief Executive Officer
Kuwait Petroleum Corporation



Rashid Ahmed Al Tamimi
Senior Cultural Presenter
Sheikh Mohammed Centre for
Cultural Understanding

Continued on next page



PROGRAM AT-A-GLANCE

SATURDAY, NOVEMBER 11

All Day Major Arrivals

9:00 am–4:30 pm **Optional:** Abu Dhabi Heritage Tour

6:00 pm–9:00 pm Welcome Dinner

SUNDAY, NOVEMBER 12

7:00 am–10:00 am Breakfast

7:30 am–2:00 pm **Optional:** IOMA Golf Tournament at The Address Montgomerie Golf Club

9:00 am–3:30 pm **Optional:** Old Dubai Heritage Tour with Lunch

9:00 am–3:30 pm **Optional:** Desert Adventure in the Dubai Desert Conservation Reserve

6:30 pm–10:00 pm Reception & Dinner at Armani Pavilion at Burj Khalifa

MONDAY, NOVEMBER 13

6:30 am–8:30 am Breakfast

8:30 am–12:00 pm First General Session

12:00 pm–3:00 pm **Optional:** Scent Masterclass—7 Wonders of the Emirates with Lunch

1:00 pm–4:30 pm **Optional:** Old Dubai Heritage Tour

1:00 pm–3:00 pm Global Committee Meeting

3:15 pm–5:00 pm Board of Directors Meeting

6:30 pm–12:00 pm President's Banquet

TUESDAY, NOVEMBER 14

6:30 am–9:00 am Breakfast

8:30 am–12:00 pm Second General Session

1:00 pm–4:30 pm **Optional:** Modern Dubai Tour

6:30 pm–8:00 pm Closing Reception

8:00 pm–until Dine-Out Night

WEDNESDAY, NOVEMBER 15

6:30 am–10:00 am Continental Breakfast

All Day Major Departures

INDUSTRY PANEL

The Program Committee also has assembled a panel of gas industry speakers from three of our member companies to discuss *Conducting Business in the Middle East*. The panel includes: **David Edmondson**, vice president and project executive, Global Engineering & Manufacturing for Air Products & Chemicals; **Mathieu Giard**, executive vice president of Air Liquide's Africa/Middle East/India operations; and **Mike Huggon**, chief executive officer of Gulf Cryo. It will be moderated by **Naji Skaf**, partner with Heidrick & Struggles.

SPECIAL EVENTS IN DUBAI

IOMA is offering several optional activities and tours to help you explore Dubai and the surrounding area.

The Annual Meeting kicks off on Saturday, November 11, which is the major arrival day and when attendees pick up their registration packets from the IOMA Service Desk. This year we're offering an optional tour to Abu Dhabi on Saturday for those arriving early. And we have our traditional Welcome Reception & Dinner at the hotel, which provides an opportunity for you to catch up and network with your colleagues.

On Sunday morning, we're offering an optional golf tournament and two tours. You have the option to participate in either the golf tournament at The Address Montgomerie Golf Club, an Old Dubai Heritage Tour, or a Desert Adventure Tour. On Sunday evening we have a special reception and dinner at Armani Pavilion, which is set at the base of the iconic Burj Khalifa, the world's tallest skyscraper, and next to the famous Dubai Fountain.

On Monday following our First General Session, IOMA is offering the optional Old Dubai Heritage Tour and a Scent Masterclass taking place at the Ritz-Carlton. And Monday evening is IOMA's President's Banquet at The Ritz-Carlton—an IOMA tradition! The reception and dinner will be followed by awards presentations and dancing in the hotel's ballroom. The dress code this year is business attire, not formal.

On Tuesday afternoon following the Second General Session, IOMA is offering an optional Tour of Modern Dubai, which includes the world famous Burj Khalifa observation deck and Dubai Mall. And on Tuesday evening, we will conclude the meeting with our Closing Reception at the Ritz-Carlton. This will be followed by the traditional Dine Out Night.

Please refer to the meeting registration brochure for more details on all these events. ■





IOMA MEMBER NEWS

Air Products to Supply LG Chem in South Korea

Air Products & Chemicals, Inc. (Allentown, PA, USA) announced it has been awarded the oxygen supply for the new production facility of LG Chem (LGC), Korea's number one chemical company and one of the largest chemical companies in the world.

Air Products will supply gaseous oxygen through an on-site PRISM® vacuum swing adsorption (VSA) oxygen generator to LGC's new facility in central South Korea. The oxygen will be used for the production of materials used in secondary batteries. On-site gas generation helps sustainability-minded customers lower carbon footprint, boost energy efficiency, increase throughput, enhance end product quality, and improve environmental performance.

Air Liquide CO₂ Capture Plant in Australia to Support Food Processing

Air Liquide S.A. (Paris, France) recently inaugurated a carbon dioxide (CO₂) Recovery Plant, in partnership with AGL Energy, a leading Australian energy supplier. The new plant will capture 50,000 tons per year of CO₂ released by AGL Energy's power plant, located in Torrens Island, Adelaide—South Australia. CO₂ produced by the power generation is now captured, concentrated, purified, liquefied and then delivered by Air Liquide to its South Australia's customers. Air Liquide's state-of-the-art CO₂ recovery plant converts industrial emissions of carbon dioxide into a food-grade gas certified for food processing and beverage carbonation. According to the most demanding food standards, this purified CO₂ is used for food modified atmosphere packaging, as well as for freezing and chilling applications. This plant also provides industrial customers with carbon dioxide for water treatment, pH regulation, welding gases and dry ice in particular.

Air Products' Pipeline Supplying HP in Malaysia

Air Products and Chemicals, Inc. (Allentown, PA, USA) announced that its pipeline in Batu Kawan Industrial Park, Penang, Malaysia for global leading printing company HP has come on-stream. As the Park's first gases pipeline, which extends from Air Products' existing network in Prai, this infrastructural investment represents the company's further commitment to the social and economic development of Northern Malaysia and the rest of the country. The comprehensively planned Batu Kawan Industrial Park is rapidly developing into one of Penang's major industrial hubs in recent years. Strategically located, it offers excellent accessibility and high standard infrastructure facilities. HP's facility in the Park serves as the company's global consumer ink business headquarters and manufactures ink supplies by utilizing its innovative and environmentally-friendly technologies. Air Products has been serving Malaysia since 1974 and is recognized for its excellence in safety, reliability and operations. With eight state-of-the-art production facilities and depots strategically located throughout the country, the company produces high-purity and high-quality industrial gases to diverse markets including steel, electronics, chemicals processing, metals processing, food, glass and more.

Praxair Starts Up ASU JV in East China Petrochemical Park

Praxair, Inc. (Danbury, CT, USA) recently announced the start up its new air separation plant for Nanjing Jinling Huntsman New Materials Co., Ltd., a joint venture between SINOPEC Jinling and Huntsman. Through a long-term contract, the 900-ton-per-day plant will supply on-site oxygen in the Phase II (Yudai area) of Nanjing Chemical Industrial Park (NCIP), a chemical production facility in Nanjing, East China. Jinling Huntsman will use the oxygen in its state-of-the-art propylene oxide (PO) and methyl tertiary butyl ether (MTBE) plant. PO is used to make polyurethane materials and MTBE is a clean fuel additive. Additionally, Praxair will build a pipeline in the park to meet the industrial gas requirements of other customers and will also supply liquid products to the market in Jiangsu province.

Air Products Forming Coal-to-Syngas JV with Lu'An Clean Energy in China's Shanxi Province

Air Products and Chemicals, Inc. (Allentown, PA, USA) announced it has signed an agreement to form a \$1.3 billion joint venture (JV) with Lu'An Clean Energy Company, which will significantly expand Air Products' scope of supply serving Lu'An Mining (Group) Co., Ltd.'s syngas-to-liquids production in Changzhi City, Shanxi Province, China.

Air Products has already invested \$300 million to build, own and operate four large air separation units (ASUs) to supply the Changzhi City site. Under the new agreement, Air Products will contribute the ASUs and invest a further \$500 million for a 60 percent ownership in the new JV. With this majority position, Air Products will fully consolidate the JV financial results. Lu'An will contribute the gasification and syngas clean-up system, will receive \$500 million of cash and will have a 40 percent ownership in the new JV.

The new joint venture, to be called Air Products Lu'an (Changzhi) Co., Ltd., will own and operate the ASUs and gasification and syngas clean-up system. The JV will receive coal, steam and power from Lu'An and will supply syngas to Lu'An under a long-term, onsite contract. Closing is expected as soon as possible, pending initial operational start-up and government and regulatory approvals.

Air Products' 3 ASUs in Mongolia Now On-Stream

Air Products and Chemicals, Inc. (Allentown, PA, USA) announced its three large air separation units (ASUs) in Hangjinqi, Inner Mongolia, for Inner Mongolia Yitai Chemical Co. Ltd. (Yitai Chemical) have come on-stream. The world-scale facilities supply more than 9,000 tons per day of gaseous oxygen, four pressure levels of gaseous nitrogen, instrument air, and plant air to Yitai Chemical's leading fine chemical demonstration project, which produces 1.2 million tons of high-quality fine chemical products annually.

Yitai Chemical is wholly owned by Inner Mongolia Yitai Group Co. Ltd., a leading coal group and one of the top 10 private companies in China. It is also the largest coal group in Inner Mongolia, which also has major coal-to-energy and chemical investments in Xinjiang.



IOMA MEMBER NEWS

BRIEFS

MATHESON (Basking Ridge, NJ, USA) recently announced the retirement of **William Kroll**, a member of the Board of TNSC and Executive Chairman of MATHESON. Bill's career spans 15 years in the Semiconductor Technology area, 24 years with MATHESON and a total of 35 years in the Gas and related Chemicals industry. IOMA wishes Bill all the best in his retirement and future endeavors.

The Linde Group (Munich, Germany) announced that the company will engineer and supply a modular hydrogen manufacturing unit for St1 Refinery in Gothenburg, Sweden. Linde's Engineering Division will start the engineering and construction of the unit immediately, with the completion estimated for the end of 2018.

Air Liquide S.A. (Paris, France) announced that it has completed the sale of Air Liquide Welding, its subsidiary specialized in the

manufacture of welding and cutting technologies, to Lincoln Electric France SAS, subsidiary of Lincoln Electric Holdings, Inc.

Air Products and Chemicals, Inc. (Allentown, PA, USA) signed an agreement with Dhahran Techno Valley Company to build and develop a world-class technology center to serve the Kingdom of Saudi Arabia and Middle East region.

Messer Group GmbH (Bad Soden, Germany) is currently investing in the construction of a plant producing the air gases oxygen, nitrogen and argon at the industrial site of Trata in Škofja Loka, Slovenia. Presently a complex lifting procedure is being used to assemble the heart of the air separation plant, involving a column 52 meters tall and weighing 175 tons.

Air Liquide S.A. (Paris, France) has inaugurated in Thiès, Senegal, the first Oxygen House, a central location for the Access Oxygen offering, aimed at making medical oxygen accessible to small health posts and health centers. These structures offer a first level access to healthcare for patients living in suburban and rural areas in emerging countries. ■

Japanese Progress on Expansion of the Platform of Hydrogen Refueling Stations

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92 locations as of the end of 2016. We have built and are operating 22 locations among them.

In order to increase the number of HRSs, however, it is necessary to decrease the construction cost, which is thought to be about 0.5 billion yen per one station, by reviewing regulations and promoting technological innovations.

3. Efforts towards the review of regulations concerning HRS

Private companies also have been making efforts towards the review of regulations concerning HRS. Here, our participation in such regulation reviewing activities will be introduced in a form of Q & A.

Q1: *What kind of activities towards the review and harmonization of regulations have we been involved in? When did we participate in such activities?*

A1: Private companies' efforts towards the review of regulations concerning HRS in Japan have been made mainly under the coordination of the Fuel Cell Commercialization Conference of Japan (FCCJ). The FCCJ is an industrial association consisting of energy companies including major industrial gas companies, oil companies and city gas companies in addition to major automobile manufacturers as members. We have also been deeply committed to the activities of the FCCJ.

The FCCJ extracts items subject to the review of regulations, which have caused a barrier to the expansions of HRSs, from energy companies, sums up opinions of energy companies, prioritizes items extracted, and addresses the review of related regulations in cooperation with the national government. We participated in the FCCJ in 2001, and have been engaged in activities geared to the review and harmonization of regulations.

Q2: *What does each activity has as a target?*

A2: In the FCCJ, the "Hydrogen infrastructure sub-working group" is organized by experts from member companies. Furthermore, there are task forces for reviewing regulations under the sub-working group. Under the leadership of promotion leaders, who were assigned to items prioritized as described in question A1 above, the task forces have been coping with each item. For example, we have played a role of promotion leader in the task called "Preparation of standards for liquid hydrogen storage type HRS"

so far, and are now engaged in the task called "Preparation of standards for HRS requiring a liquid hydrogen pump" as the leader.

As for the rest, legal actions such as the revision of ministerial ordinances for 13 items subject to the review of regulations have been completed, and at the present, 11 items are under study towards reviewing.

Q3: *What kind of results have been achieved so far?*

A3: Noticeable results are as follows:

- Preparation of standards for HRS with a normal operation pressure up to 40MPa (in March 2005)
- Establishment of HRS combined with a gas station (in May 2012)
- Preparation of standards for HRS with a normal operation pressure up to 82MPa (in December 2012)
- Preparation of standards for liquid hydrogen storage type HRS in November 2014
- Abolishment of upper limit of stockpile of hydrogen in urban areas in December 2014
- Enabling of unattended operation of pre-cool facilities (in February 2016)

Q4: *How have activities described above been related to the production plan of hydrogen-fueled cars and the schedule towards further increase in construction of HRSs?*

A4: When it comes to hydrogen-fueled cars, streamlining efforts have been made in relation to the type approval of on-board container. The movement towards reviewing regulations is progressing to allow the line production of hydrogen-fueled cars in the same way as existing gasoline-fueled cars.

As for HRSs, the review of regulations so far has enabled them to be established attached to gas stations and has led to the enactment of installation standards for HRSs at urban areas, so that it has become possible to establish HRSs in the right places.

Furthermore, the review of regulations leading to the reduction of cost is also advancing. From now, the infrastructure preparations for HRSs are expected to be accelerated. It is also anticipated that the increase of the number of HRSs will lead to the improvement of usefulness on the part of FCV users. ■



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IOMA BROADCASTER: The printed edition of the Broadcaster is published quarterly in March, June, September, and December. The online edition of the Broadcaster is regularly updated.

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RELATED ASSOCIATION NEWS

EIGA Documents

The European Industrial Gases Association (EIGA) (Brussels, Belgium) now has the following new or revised publications available:

Subject: BN 21/17—The Safe Preparation of Lung Function Test Gas Mixtures Containing Flammable and Oxidant Components

“Code of Practice—Nitrogen Trifluoride”—Doc 92/17 (Revision of Doc 92/10)

“Hydrogen Pressure Swing Adsorber (PSA) Mechanical Integrity Requirements”—Doc 210/17

“Recommended Precautions to be Taken by EIGA Members Vehicle Drivers”—Safety Alert SA 34/17

“Use of Mobile Gas-Cookers in Truck Cabs”—Safety Alert SA 35/17

“Guidelines on Environmental Management Systems”—Doc 107/17 (revision of Doc 107/10)

You can view or download many other publications at the following address: www.eiga.eu

IOMA & INDUSTRY EVENTS CALENDAR

2018

JANUARY 24–25

EIGA Winter Seminar
Brussels, Belgium

APRIL 22–26

CGA Annual Meeting
Wesley Chapel,
Florida, USA



**SEPTEMBER 29–
OCTOBER 3**
IOMA's 75th
Annual Meeting
Grand Hotel Wien
Vienna, Austria

2019

OCTOBER 5–9

IOMA's 76th Annual Meeting
Mandarin Oriental Hotel
Washington, DC, USA

