

## Hydrogen for 200 FCVs from Forest Thinnings Every Hour Source

Arranged by T. Homma

### 1. Governmental Measures

#### (1) Technological Standard Amendment for Hydrogen Filling Stations

On November 26<sup>th</sup>, the Ministry of Economy, Trade and Industry (METI) amended standards for hydrogen filling stations for fuel cell vehicles (FCVs). The technology standards for hydrogen filling stations accommodate 82 MPa, which was raised from 40 MPa, and hydrogen filling stations will be available in commercial and urban areas by securing the safety of filling facilities with 82 MPa. The major changes are; (1) the distance between a hydrogen filling facility and a public road is prescribed as 8 m or more due to increasing the maximum hydrogen pressure from 40 MPa to 82 MPa, (2) to avoid hydrogen flow from an 82 MPa to a 40 MPa facility a check valve has to be installed at a station which has both 40 MPa and 82 MPa filling facilities and (3) hydrogen in an accumulator must be released safely when the accumulator, which stores hydrogen, is in a dangerous situation such as a fire. The ministry expects that 82 MPa filling facilities will proceed to a demonstrational experiment phase with the technological standards amendment, and energy providers can plan 82 MPa filling equipment preparations. (The Nikkan Kogyo Shimbun, Nikkan Jidosha Shimbun, Architectures, Constructions & Engineerings News (Daily), The Chemical Daily, November 27, 2012)

#### (2) Reinstatement of Subsidy for Domestic FCs

METI will reinstate the subsidy for domestic fuel cells (FCs) by the end of FY 2012. The first subsidy scheme was ended in June due to termination of budget, but domestic FCs are still in demand. The scheme will be back immediately before the start of FY 2013 as a part of an economic stimulus measure. Approximately 50,000 units are expected to be newly installed with the subsidy scheme. From the FY 2012 reserve fund, ¥25 billion will be allocated for the scheme, and maximum ¥450,000 will be provided for each installation. Applications will be taken from

December. Approximately 30,000 units have been installed in Japan. The government plans to increase this to 1.4 million units by 2020 and 5.3 million by 2030 as mid- and long-term targets. The price of the FCs is expected to be cut down to ¥730,000 by 2016 by volume efficiency, which will attract consumers without subsidy. (The Nikkan Kogyo Shimbun, November 30, 2012; Jutaku Shimpo, December 4, 2012)

#### (2) Act on Promotion for Reduced Carbon Cities

On November 27<sup>th</sup>, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) announced that order for enforcement of the “Act on Promotion for Reduced Carbon Cities” had been decided at a cabinet meeting. Boilers, refrigeration equipment, circulation pumps, pressure governors, pipelines and other items were determined as heating facilities which are subject to sewage intake permission. Also, photovoltaic generators, FCs, storage batteries and other heating facilities were selected to be subjects for special facilities which can be used in urban parks. (The Denki Shimbun, November 28, 2012)

#### (3) The Industrial Structure Council

On December 5<sup>th</sup>, a sectional committee on safety under the Safety Subcommittee of the Industrial Structure Council had the first meeting to start investigation on deregulation for wind power generation. Also, it was decided to be ease the technology standards for piping materials of domestic FCs. (Nikkan Jidosha Shimbun, December 6, 2012)

On November 28<sup>th</sup>, the sectional committee on high pressure Gas under the Safety Subcommittee of the Industrial Structure Council added safety precautions to dispose of natural gas and hydrogen canisters for vehicles as a next task at the first meeting. (Nikkan Jidosha Shimbun, December 6, 2012)

### 2. Local Governmental Measures

#### (1) Takatsuki City

Takatsuki City, Osaka prefecture, has formulated “Takatsuki New Energy Strategy” to structure measures to promote renewable energy. The long-term target is to increase the ratio of new energy to 35% or more of the whole city’s electricity consumption by FY 2030, and a mid-term target is set for FY 2020. A notable project in the strategy is to install a generator at the Takatsuki Clean Center when replacing Plant No.1. The keys of the strategy are “Energy Creation” which promotes renewable energy and the switch over to alternative energy and secures power source for emergency such as a disaster, and “Energy Saving” which supports to improve energy efficiency at home and offices. For residents and business operators the subsidy scheme will be expanded for photovoltaic generators; a subsidy scheme will be set for domestic FCs and cogeneration system, and promotion will be carried out for building and energy management system (BEMS) and home energy management system (HEMS). (Architectures, Constructions & Engineerings News (Daily), November 28, 2012)

#### (2) Miyako City

On November 26<sup>th</sup>, Miyako City, Iwate prefecture and major firms announced a project to build a woody biomass generator in a disaster area of the city. Forest thinnings will provide electricity, heat and hydrogen. “Miyako City Blue Challenge Project Council” was established to operate the project by 12 organizations including the city, Toyota Motors and Mitsui Chemicals. The site area for the generator “Blue Tower” is approximately 1 ha. Woody chips of forest thinnings will be burned and gas from the combustion will be used to generate electricity. The gas engine supplies electricity and heat, and hydrogen will be produced by a refinery. Blue Tower is expected to output 3000 kW, have 3500 L/day (crude oil worth) thermal availability and produce 200 FCVs worth every hour. The approximately ¥2 billion is estimated for the construction. The first operation of the facility is aimed at 2014. (Iwate Nippo, November 27, 2012; The Kahoku Shimpo, November 30, 2012; The Denki Shimbun, Architectures, Constructions & Engineerings News (Daily), The Chunichi Shimbun, The Chemical Daily, December 5, 2012; Nikkan Jidosha Shimbun, December 17, 2012)

#### (3) Saitama City

On December 7<sup>th</sup>, Saitama city revealed a draft of its “City New Energy Policy (provisional)” to reduce energy consumption by 10% or more over the city by FY 2020. The policy will promote to introduce energy saving technologies to manufacturing businesses, to install insulation for buildings, to improve fuel efficiency of cars and to bring in next generation vehicles. FCs will be promoted and the utilization of exhaust heat from factories will be encouraged, as well as photovoltaic generators for houses and schools. The city plans to create four times or more of current production of renewable energy to fill 20% of the city’s energy consumption, including saved energy, by these activities. (The Saitama Shimbun, December 8, 2012)

### 3. Research and Development of FC Element Technology

On November 29, Japan Synchrotron Radiation Research Institute (JASRI) announced that vibration of iron atoms in the active site of “Hydrogenase”, a natural catalyst, had been successfully observed with organizations including the University of California, Davis of the US and Max Planck Society of Germany. The observation was carried out at a synchrotron radiation facility SPring8. Hydrogenase is an enzyme which helps catalytic reactions both generating hydrogen molecules from protons and separating protons from hydrogen molecules. Nickel and iron, low price metals, are used for the reactions. By using the strong laser of Spring8, vibration of iron atoms at an active site of the enzyme was examined with a nuclear resonance vibrational spectroscopy (NRVS) to detect only iron atoms’ vibration. Iron atoms were found stretching and shrinking the distance between neighboring atoms and changing angle to these atoms. Researchers have been interested in the catalytic reaction of hydrogenase because the expensive metal platinum is used to generate hydrogen for FCs. (The Nikkan Kogyo Shimbun, November 30, 2012)

### 4. Development and Application of Microbial Fuel Cell

#### (1) Gifu University

Associate Prof. Kayako Hirooka and Osamu Ichihashi, a researcher, of Gifu University developed a method to collect phosphorus, a material for fertilizer, from livestock waste by using microbial fuel cells

(MFC). Phosphorus is separated by using the property of a cathode becoming alkaline to crystallize phosphorus. The method treats sewage at same time, and the cost is expected to be lower than the conventional technology. A MFC uses microbes, which release electrons by digesting organic matters, on an anode surface. When the surface is in sewage, electric current is created by electrons of microbes flowing from cathode to anode. OH<sup>-</sup> is electrolytically generated from water on the anode side, which makes the side alkaline. Phosphoric acid, ammonia and magnesium in sewage tend to crystallize, and these stick to anode surface. 30% of phosphoric acid was collected from pig farm sewage which has much phosphoric acid and magnesium at an experiment. Crystals on cathode can be easily removed. The concentration of phosphoric acid is high enough for industrial purpose. 70% of organic matters in the sewage were removed and 2.3 W per 1 m<sup>2</sup> of electrode surface was produced. A further improvement is planned to increase generation and collection efficiency. (The Nikkei Business Daily, December 3, 2012)

#### (2) The Okinawa Institute of Science and Technology

A waste water treatment operator Create ES, Naha city, and a laboratory in Okinawa prefecture will develop a lower cost waste treatment facility, which suits Okinawa, together by using a MFC technology of the Okinawa Institute of Science and Technology (OIST). The MFC was created by Dr. Igor Goryanin of the Biological Systems Unit at OIST, and its patent application of the technology was filed in January, 2012. The system uses current generating bacteria to clean sewage and create electricity at same time. An experiment was already carried out in OIST's lab with current generating bacteria from sea bottom of Uruma city and waste water from distillery of Awamori and pig farm to prove the generation and clarification.

“Local Awamori distilleries can reduce cost for sewage disposal by treating waste water in the distilleries, and their business may be improved. Environmental load may also be reduced which leads to energy efficiency enhancement” says Dr. Goryanin. (Okinawa Times, December 5, 2012)

### 5. Business Plans of Ene-Farm

#### (1) Mitsui Fudosan Reform

Mitsui Fudosan Reform has made a demonstrational house of “Smart Reform” which places much value on the basic performance of a house. Demonstrational renovation was carried out on a 50 year-old wooden house in Jiyugaoka, Meguroku, Tokyo. The renovation package offers set price including anti-seismic reinforcement, refurbishing outside and inside and replacing equipment as well as suggesting passive design for improving insulation and ventilation. Additionally, energy saving facilities such as a solar water heater, FC and storage battery can be installed to meet customers' demand. “It's not worth installing energy saving equipment to a house which has less basic performance. Improving the house's performance should be first” of the firms concerns. (Jutaku Shimpo, November 20, 2012; The Mainichi Newspapers, November 22, 2012)

#### (2) Kagata Corporation

Kagata Corporation, Niigata city, will develop “Smart Town Nishino-nakanoyama” in Higashiku, Niigata city. Approximately 240 houses will all have HEMS which display data such as the electricity consumption of a day. Photovoltaic generators and FCs will be promoted for the houses. The developer aims to build an energy saving and environmentally friendly town with the residents. In the area, Misawa Homes will construct 10 show houses with photovoltaic generators, FCs and HEMS from December for a housing exhibition next March and collection of data prior to the exhibition. (The Niigata Nippo, November 27, 2012)

#### (3) Keiyo Gas

Keiyo Gas drew up a mid-term business plan for 2013 to 2015 with a core project to spend ¥5 billion over three years for seismic countermeasure and disaster control. To supply gas steadily, pipelines and pressure governors will be replaced to withstand disaster better with the Great East Japan Earthquake experience. Because electricity supply was an issue at the earthquake, the firm will put more effort to promote independent energy systems combined with photovoltaic generator Ene-Farm. (The Nikkan Kogyo Shimbun, December 6, 2012)

#### (4) Sekisui House

On December 7<sup>th</sup>, the Kanagawa Sales Administration Headquarter of Sekisui House handed

in an official letter “Promises to prevent global warming on housing construction 2012” to the Governor of Kanagawa prefecture Kuroiwa. The promises are to show the firm’s commitment for better “Generation, saving and storage of energy” of its houses to be built in the prefecture, including installation of a photovoltaic generator and domestic FCs as a standard feature hereafter. The letter contains four items; 1) a photovoltaic generator and domestic FC are installed as a standard feature, 2) area II next generation energy saving standard level (insulation standards of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT)), as the firm’s standard, 3) active promotion of electricity storage systems, 4) HEMS installation as a standard feature to visualize energy. (Architectures, Constructions & Engineerings News (Daily), Nikkan Kensetsu Sangyo Shimbun, The Nikkan Kensetsu Kogyo Shimbun, December 7, 2012)

#### (5) Tokyo Gas

The president of Tokyo Gas Tsuyoshi Okamoto told at Nikkan Kogyo Shimbun’s interview that the firm would accelerate to promote Ene-Farm by introducing new models in FY 2013. Two years since the last change, Ene-Farm will be remodeled with smaller dimensions and a lower price, and he showed the firm’s intention to sell the new product for ¥1 million or less with subsidy. Also, a small Ene-Farm for apartment units will be introduced in late FY 2013 to sell to new apartments. (The Nikkan Kogyo Shimbun, December 7, 2012)

#### (6) JX Energy

JX Nippon Oil & Energy will build an energy system to improve electricity independency of apartments largely on a contract by FY 2014. Gas FCs and a photovoltaic generator will be provided. Electricity purchase of an apartment house from a utility provider is expected to be reduced by up to 90%, and JX Energy plans to supply cheaper electricity than large firms such as Tokyo Electric Power Co. (TEPCO) to reduce energy cost of households. Maintenance will also be provided by the firm. The energy system is composed of FCs, a photovoltaic generator and a storage battery, and 80 to 90 % of electricity was provided by the system at a demonstrational experiment of employees’ residences in Yokohama and Kawasaki cities. (The Nikkei, December 9, 2012)

#### (7) Kokusai Kogyo

Kokusai Kogyo will start “Tagonishi Eco Model Town Project” in Tagonish area, a suburb of Sendai city. Construction will start for disaster restoration housing (176 units) with photovoltaic generators and EMS in the FY 2012 as well as houses (Smart Village area: 16 houses). The smart houses in the Smart Village will be built by a seven firms including a local firm Hokushu, Sekisui House and Sumitomo Forestry. Kokusai Kogyo will work out the design of the smart houses and their spatial design with Tohoku University. All the houses will come with photovoltaic generator and FCs with HEMS. (Nikkan Kensetsu Sangyo Shimbun, The Nikkan Kensetsu Kogyo Shimbun, December 14, 2012)

#### (8) Panasonic

Kazunori Takami, who is a Senior Managing Director of Panasonic and in charge of white goods, showed an intention to sell domestic FCs globally for the first time, and said that the products was planned to be introduced into the German market by late FY 2013. The FCs are under demonstrational experiment with a local boiler manufacturer, and their commercialization is now in sight. Panasonic’s Ene-Farm is the top seller in the market with over 50% share in Japan and targets oversea consumers with accumulated expertise. (The Yomiuri Shimbun, December 15, 2012)

### 6. Cutting Edge Technology of FCV & EV

#### (1) Kyoto University and Panasonic

On November 21, Kyoto University announced that a lithium-ion battery (LIB) had been developed with Panasonic. A polymer material is featured for the electrodes. A study group with Prof. Junichi Yoshida created a polymer material for the cathode. A 2 cm diameter and 1.6 cm thick pilot button cell was made with lithium, a metal, for anode to examine its performance. The result shows that the capacity was 1.4 times larger than that of a conventional cell, and it took two minutes to be charged fully. Also, capacity reduction was 17% after 500 times of charging and discharging, which is same quality as conventional products. The group plans to investigate usage to commercialize the battery as soon as possible. (The Nikkei, November 22, 2012)

Panasonic developed a general-purpose “Film

Capacitor” to store energy. The product is used in EVs to store high voltage and power current electricity and provide it steady to a driving motor. The production cost was reduced by approximately 20% by unifying size and shape to cut the expense of the designing and producing mold. The firm aims to increase the number of production unit to 2.5 times that of FY 2011 for FY 2015 by selling to automakers in the emerging markets such Asia including China. (The Nikkei, December 14, 2012)

#### (2) NEXCO West Japan

On November 28<sup>th</sup>, West Nippon Expressway Company Limited announced that the number of quick chargers for EVs would be increased to 29, which is over four times the current number, by FY 2013. Presently, quick chargers are installed in Osaka and Okinawa prefectures. To meet customers' demands, they will be prepared at major expressways in Kansai, Chugoku, Shikoku and Kyushu areas. The firm will choose chargers which refill a battery of an EV 80% in 30 minutes and the facility will be free of charge for while. (The Nikkei, November 29, 2012)

#### (3) GM

An exhibition of eco cars “2012 LA Auto Show” started on November 28<sup>th</sup>. Three US auto giants and other major automakers from Japan, Europe and Korea are displaying their latest strategic vehicles, and 24 cars including EVs are the first appearance globally. General Motors revealed its first commercial EV “Chevrolet Spark EV” with the “Combined Charging System” which is promoted by eight US/German automakers including GM and VW, and the battery is filled 80% in 20 minutes with a quick charger. The price is \$25,000 (approximately ¥2.05 million) including subsidy, which would appear an economically feasible pricing. According to Nissan Motor's estimation, approximately 80,000 EVs have been distributed. “EV Leader Concept” of the US and China seems to be starting slow. (The Nikkei, November 24, 29, and 30, 2012)

#### (4) EVs for Hire

EVs for hire have been struggling. The operation rates are approximately 40% in the metropolitan Tokyo area and approximately 30% in Okinawa prefecture where more EVs are prepared to be hired. The rate is far from petrol fed car's operation rate which is 70 to 80% in average. A shortage of charging

stations slows down the EV hire sales as well as the short driving range on a single charge. The price for hire has started going down in Okinawa prefecture. EV hire started fully in 2009 in Japan. Currently, more than 1,500 vehicles in total are believed to be in operation throughout Japan, and the majorities are in the metropolitan Tokyo area and Okinawa prefecture. (The Nikkei, December 8, 2012)

#### (5) Popularity of EVs

Mitsubishi Chemical Holdings Corporation (MCHC) will suspend its production increase plan of LIB materials which was expected to expand for EVs. Because EVs are spreading too slowly, the firm predicts that the products will fail to make profit at the moment. Nissan Motor, who has been leading in the EV field by selling Leaf from 2010, targets sales of approximately 1.5 million EV worldwide with Renault, the partner; however, it sold approximately 0.043 million EVs globally by the end of October. In Japan EV manufacturers including Nissan and Mitsubishi have sold approximately 0.03 million EVs. GS Yuasa, who provides batteries for EVs to Mitsubishi, has been largely failing to meet the expectation for its battery plant. Nissan suspended a construction of its EV battery plant which started in 2011 in Portugal. On the other hand, Wanxiang, an auto component manufacturer of China revealed on December 10<sup>th</sup> that it successfully bid for a battery manufacturer A123 Systems who had filed bankruptcy in the US. The bid price is estimated \$260 million. (The Nikkei, December 10 and 11, 2012)

#### (6) BYD

BYD, a large car and battery manufacturer of China, announced that it will launch a joint project to build electric buses in Bulgaria. An assembly plant will be constructed with a local energy firm Bulmineral taking an half the cost, and the first production is aimed at February, 2013. BYD produces electric buses and taxis as well as petrol-fuelled vehicles, and started to sell consumer EVs in China in October, 2011. (The Nikkei, December 13, 2012)

### 7. Technology Development Hydrogen Refining and Storage

#### (1) AIST

National Institute of Advanced Industrial Science and Technology (AIST) announced that a technology

had been developed to improve reaction and durability of nano metal particle catalyst largely when converting a hydrogen storage material ammonia borane into hydrogen. The technology uses “double solvent method” which utilizes hydrophilic and hydrophobic solvents, and catalytic nano metal particles are fixed evenly on pore surface without concentrating on porous coordination polymer external surface with the method. A platinum nano particle catalyst was made with the method to hydrolyze ammonia borane to release hydrogen for analysis. The result showed the hydrogen generation speed was twice that of the most efficient platinum catalysts. Also, no volatile by-products which reduce reaction of electrocatalysis in FCs were found at the thermal decomposition to release hydrogen. Additionally, the experiment confirmed that hydrogen can be generated at lower temperatures. Moreover, platinum particles were attached on pore surface of porous coordination polymers after the reaction, which showed high durability and allows catalyst activity stable. (Japan Metal Daily, November 30, 2012)

## 8. FC Related Business Plans by Corporations

### (1) Tokuyama

On December 1<sup>st</sup>, Tokuyama Corporation will launch a “Business Promotion Division” which is to be directed by the president in its research and development department. Business Promotion Division is designed to pick a project which is close to being commercialized in a R&D stage and helps the project to be introduced in the market within three years. As a start, three projects FC separator, super luminosity light emitting diode (LED) and sapphire substrate were chosen to be transferred to the division. In the projects, FC separators have already been distributed as paid samples, which is only one step before commercialization. Also, a six inch wafer has successfully produced for sapphire substrates. (The Chemical Daily, November 26, 2012)

### (2) Rohm

Rohm will sell a portable solid hydrogen FC next spring. The FC was developed with a venture firm Aquafairy. The development and production were carried out by Aquafairy, and Rohm will sell the products. The firms will begin with higher output

hydrogen FCs as a portable generator and larger capacity FCs for seismometers next spring, and then release FC chargers for smartphones and pocket size FCs to move into the market fully. Rohm will study application with power management technology. These polymer electrolyte fuel cells (PEFCs) use a solidified calcium hydride sheet which generates hydrogen with water, and characteristically realize higher output, capacity and smaller in size at same time by using reaction of synthesizing water to producing electricity. (Refer to Latest New 198, published on October 1, 2012) The powerful FCs to be released next spring are 200 W rated power, 200 Wh output, 1kW (1 second) peak power, 12/24 V (DC) rated voltage and FC cartridge type (external dimensions 26×4×12.5 cm, weight 750 g). The cells are stored in a 32×33×16 cm case and become 6 to 7 kg all together which makes the product light weight portable generator. (Dempa Shimbun, November 28, 2012; Fuji Sankei Business i, December 17, 2012)

### (3) MHI and Hitachi

On November 29<sup>th</sup>, Mitsubishi Heavy Industries (MHI) and Hitach will join businesses including thermal power generation. A joint enterprise is planned to be established by January, 2014 to consolidate the businesses. The total sales of the combined business of the two firms will be ¥1.1 trillion. The merging businesses include thermal power generation and geothermal power generation systems and FCs. (The Yomiuri Shimbun, The Asahi Shimbun, The Mainichi Newspapers, The Nikkei, The Denki Shimbun, Dempa Shimbun, The Nikkei Business Daily, The Nikkan Kensetsu Kogyo Shimbun, The Tokyo Shimbun, The Kyoto Shimbun, The Kobe Shimbun, The Shizuoka Shimbun and others, November 30, 2012)

### (4) Nakayama Steel Works

Nakayama Steel Works announced that its amorphous development would be separated to launch a joint enterprise with the Innovation Network Corporation of Japan (INCJ). The new firm “Nakayama Amorphous”, Osaka prefecture, will take over the technologies and rights of amorphous metal coating which is expected to be used for FCs. (The Asahi Shimbun, The Mainichi Newspapers, Decemeber 1, 2012; The Nikkei Business Daily, The Nikkan Kogyo Shimbun, December 3, 2012)

(5) Nanomir Corporation

Nanomir Corporation (Ota city, Gunma prefecture) developed a production method to make carbon nanohorns (CNHs) with a linear electron accelerator. Electron beam is fired from a linear electron accelerator at graphite, a raw material of CNHs, to melt and gasify. The firm considers that its method gives CNHs better durability and chemical properties than conventional methods. Specifically, the technology to fire 1.4 million volt electron beam was developed, and the products are expected to be used as electrode material of storage batteries and FCs. (The Chemical Daily, December 4, 2012)

(6) Toyo Tanso

Toyo Tanso established a process technology to make a material surface hydrophilic or hydrophobic with fluorine gas. The technology can be used on plastic and inorganic materials. An uneven surface such as a microfabricated product can be processed as well as complicated shapes due to the gas method. The firm sells the technology, which also gives powder the properties, and markets include medical instruments, FC separators, petrol tanks and electronic materials. (The Nikkan Kogyo Shimbun, December 17, 2012)

- This edition is made up as of December 17, 2012 -

## ***A POSTER COLUMN***

### Renewable & Hydrogen Energy System of Kansai International Airport

Kansai International Airport will undertake to change into a small smart-airport which has fewer impacts on the environment by making electricity consumption visible.

A MW-class hydrogen fed generation system will be installed in the airport in FY 2013 as one of a few cases. Within 2012, the management plans to apply for a project approval of “Kansai Innovation Global Strategic Comprehensive Special Zone” which is appointed by the state. The new management showed an intention to work on more environmental issues in its mid-term management plan with whole picture of the project unveiled in October.

The target ratio is 10% of the electricity consumption of the airport provided by natural energy such as a

hydrogen generator and a large scale solar plant. A hydrogen storage facility will be installed to supply hydrogen to buses, forklifts, FCVs and a large generator to power air conditioners and to be an emergency power source. Also, a centralized system will be installed to control energy consumption, including passenger terminal lighting and air conditioners, and generation in the air port from FY 2014.

In September, the airport management invited business operators who want to generate power by laying solar panels on the second part of the island where the low-cost carrier terminal is located as well as the terminal building roof. The output is planned to be 11.2 MW which is to be the largest in all the airports in Japan, and the operator will soon be selected. The management is also considering wind power generation. (The Asahi Shimbun, December 14, 2012)

### **26<sup>th</sup> FCDIC Seminar**

#### ***FCV Forum***

**Cosponsored by Tokyo Metropolitan Industrial Technology Research Center (TIRI)**

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