Japan-India YNU Symposium 2019

on

Development of Sustainable Environment/Energy Technologies in South India

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Supported by

-Department of Science and Technology, India (DST)

-Japan Society for the Promotion of Science (JSPS)

-Yokohama National University (YNU)

Introduction:

India-Japan joint seminar was a broad platform to exchange ideas on Environment/Energy technologies for Sustainable Development Goals (SDG), where the program gathered technical experts and students from related fields. The program actively involved people from Government, Academia and Industry, because the goals could only be achieved by the synergism of these three fields.

Overview:

DAY 0 (15/12/2019)

We reached Narita Airport at 4:00 PM and took JR Narita Express to reach Yokohama station. After that we took JR Keihin Tohoku line to reach Sakuragicho station and walked to Sakuragicho Washington Hotel. The place was very beautiful to view in the night. We met Prof.Nakamura at the lobby at 8:00 PM and were well informed about the schedule of the program.

DAY 1 (16/12/2019) - Yokohama Environment and Information Sciences International Forum 2019

Early morning we had a nice breakfast at hotel then started to YNU with Prof.Nakamura. At 9:30 AM, the forum was started by Prof. Hideo Otani (Dean, YNU). The First session was the Introduction session of Universities including Prince of Songkla University, Panjab University, Vellore Institute of Technology, Yokohama National University. Later there were two oral sessions by 6 research students. Many recommendations were given to research ideas by the forum experts. After the lunch, we had the honour to meet to President of Yokohama National University. The ideas of India-Japan exchange program were discussed.

Later Poster session was organised where the students were given ample time to look around their peer posters. The session was very interactive and useful. The 35 posters displayed had their own novel ideas. The poster by Hiroki Namba (YNU): "**What to survey? – Review on choice of biological groups assessing ecological impacts of metals in streams and rivers."** was very interesting to me. I feel that the importance of cause-effect related studies are to be focused for all environmental research. Especially the oral description was very clear and logical. Following that, the Tea ceremony at tatami room was a great spiritual experience, where we had given opportunity to make Traditional Japanese tea on our own. The Tea was very "***Oishii***". At the end of the day, we had party where we enjoyed the food especially the Sushi and Wine.

DAY 2 (17/12/2019) – DST-JSPS Bilateral Joint Seminar Program 2019

We had seminar at Landmark Tower (YNU Minato-Mirai Campus) where there were 6 speakers. The talk by Prof. Chetty and Prof. Koichi Matsuzawa was in depth related to hydrogen fuel cells and its applications. Fuel cells are one of the important research focuses that deals with the production of electricity from chemical energy. The efficiency of the production of electricity depends on various factors including catalyst doping, membrane nature etc.

The second session by Prof. Mahesh and Prof. Hiroki emphasized the importance of sanitation and protection of water environment for sustainable society.

The third session by Prof. Anupama and Prof. Akihiko had a great exposure about the waste to energy concepts. Nanocomposites have wide applications in chemical and environmental applications.

DAY 3 (18/12/2019) - DST-JSPS Bilateral Joint Seminar Program 2019

Today there were 7 speakers, where the first speaker Prof.Kanmani talked about water environment in India and technology for its protection. The talk covered all the existing technologies including physical, biological and chemical treatment for water and wastewater treatment.

The second speaker Prof.Satoshi talked about the challenges in the production of lipids from wastewater using microorganisms. The research work was well demonstrated by research data and experiments.

The third speaker Prof. Sivakumar talked about the Electrocoagulation, which is one of the advanced treatment for the effluent to remove Total Suspended Solids, Heavy metals, Oils and BOD. Electrocoagulation seems to be very effective before the application of RO membranes as this reduces the fouling of membrane pores.

The fourth speaker Prof. Noriaki talked about International cooperation in Sewage Sludge Management. This was very informative and useful presentation as it helped us to better understand next day's factory tour.

The fifth speaker Prof.Mohan gave the advancements in membrane technologies and Zero Discharge Process. He emphasized on the importance of Hydrophilic membranes to prevent membrane clogs and reduction of RO reject and management.

The sixth speaker Prof.Rajib Bandyopadhyay talked about Catalytic oxidation of Toluene to yield desirable product Benzaldehyde using microporous and mesoporous materials like Silicalite-1, MCM-22, MCM-41, and SBA-15. Copper was doped and performance evaluation was presented, where MCM-22 showed better performance.

The last speaker Prof. Maduya Bandyopadhyay talked about Porous materials for Biodiesel Production. Her presentation was very interesting from the point of catalytic activity evaluation. I had some great discussion with her regarding separation of catalyst after reaction.

After the session we went to an Indian restaurant named Khazana and had a nice dinner.

DAY 4 (19/12/2019) – FACTORY TOUR

We vacated the rooms by 10:00 AM and started to Hokubu Sludge treatment plant, Yokohama City. We were shown two videos consisting of working of Sewerage system in Yokohama and Hokubu Sludge Treatment plant.

Working of Sewerage system in Yokohama:

- Yokohama is a densely populated city with 435 Km^2 land area with 3.7 million population.
- Total wastewater generated is ~ 1,600,000 m^3 per day.
- There are 11 Wastewater Treatment Plants and 2 Sludge Treatment Plants (Hokubu and Nanbu Treatment Centre).
- 14,000 tonnes per day of sludge is generated and after treatment there is 40 tonnes of incinerated ash remaining.
- Two kinds of sewer line :Separate and Combined sewage system
- Total length of sewer line in Yokohama is 11,000 km.
- Facilities in Wastewater Treatment plant include Grit Chamber, Primary Settling Tank, Aeration tank, Final Settling Tank, Disinfection Facility and Sludge Transportation facility.
- Grit Chamber separates inorganic sand and large wastes.
- Primary Settling Tank gives retention time for the settling of the suspended solids.
- In Aeration tank, microorganisms remove the organic wastes present in the wastewater.
- The sludge settles down in Final Settling Tank.
- After Disinfection the treated water is let into rivers and ocean.
- The Sludge is processed in 4 successive modes: Thickening, Digestion, Dehydration and Incineration.
- Methane gas from Digester is been used for electricity generation and fuel for incinerator.
- Incinerated ash is used as improved soil for construction, by addition of excavated soil.
- Reclaimed water is also used for watering football ground and various other purposes.

- Wastewater Service charge includes Repayment of debt for Sewerage development, Treatment of wastewater Payment of interest.

Hokubu Sludge Treatment Centre (Centralised Sludge Treatment System)

- The Received sludge has about 1~2% solids, Thickened sludge has 5% solids, Digested sludge has 3% solids and dewatered sludge has 20% solids.
- The received 8000 tonnes/d sludge turns out to be 20 tonnes incinerated ash in Hokubu STC.
- Sludge Transportation is through underground with 40~50m/min transportation speed.
- Screening separator to separate hair and rubbish materials.
- Then the sludge goes to centrifugal thickener separates 70% of moisture.
- The 12 Egg shape digesters (25 m above ground, 8 m below ground and diameter of 22 m) volume of 6800m^3 made up of Reinforced concrete.
- Less surface to volume ratio lowers heat loss for temperature maintenance.
- Agitator at the centre is located for mixing.
- The digester is maintained at 36 degrees Celsius for 25 to 30 days for digestion by Anaerobic bacteria (Acidogenesis and Methanogenesis) to produce 35% CO_2 and 60% CH_4.
- Dewatering facility reduces the moisture by 85% by Centrifugal Dewatering facility.
- Dewatered sludge (Sludge cake) is taken to incinerator.
- Dewatered sludge is taken to Fluidised Bed furnace (850 deg C) for rapid heat transfer by agitated heated sand particles.
- $CaCO_3$ is added to incinerator to move sulphur.
- The Exhaust is sent to Treatment system for Desulfurization before discharge into atmosphere.
- **Valuable Waste**: Digester gas, Incinerator Ash, Reclaimed Wastewater and Grit.
- The Calorific value of Digester gas 25MJ/m^3 half of that of city gas.
- Digester Gas is utilised as power generator and sludge incinerator.
- Incinerator Ash is used as improved soil (cement material).
- Reclaimed water is used to clean pipeline.
- Grit is separated and used for public works projects.

DAY 5 (20/12/2019) – Japan India Exchange Platform Program (JIEPP)

This day we went to the sports museum, shrine and visited Embassy of India in Japan. We had the honour to meet the chancellor of Indian Embassy and had discussion about student exchange programs between Indian and Japanese educational Institutions. After the lunch, we went to University of Tokyo to attend JIEPP, the second symposium of the MEXT supported project Inter-University Exchange Project Platform Building Program. The panel discussion was very interesting and we had a great time talking to Dr.Aruna Rohra Suda (Founder and CEO of Saora Inc.)


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DAY 6 (21/12/2019)

We started back to India at 2:20 PM Cathay Pacific Airlines feeling thankful to YNU and Japan for giving us such knowledge and hospitality during our stay.

Conclusions:

- The program was a complete platform to interact with academic, industry and government people.
- The program was well organised and scheduled and we were overwhelmed by the hospitality of our host Prof. Nakamura.
- The Factory tour was very interesting and as an environmental Student I could enjoy witnessing the conversion of waste to valuable resources.
- I look forward to pursue my post-doctoral stint in Japan.

Once again, we feel thankful to Prof. Nakamura and other organisers for honouring us with this opportunity.