FY2015 Commissioned Project
by Ministry of the Environment

FY2015
Commissioned Project of Feasibility Study for JCM Projects Formation for Realization of a Low-Carbon Society in Asia

(Support Project for JCM Projects Formation through City-to-City Collaboration between Yokohama City and Batam City)

Final Report

March, 2016

Institute for Global Environmental Strategies (IGES)
City of Yokohama
iFORCOM Tokyo
Finetech Co., Ltd
AMCON Inc.
Pacific Consultants Co., Ltd.

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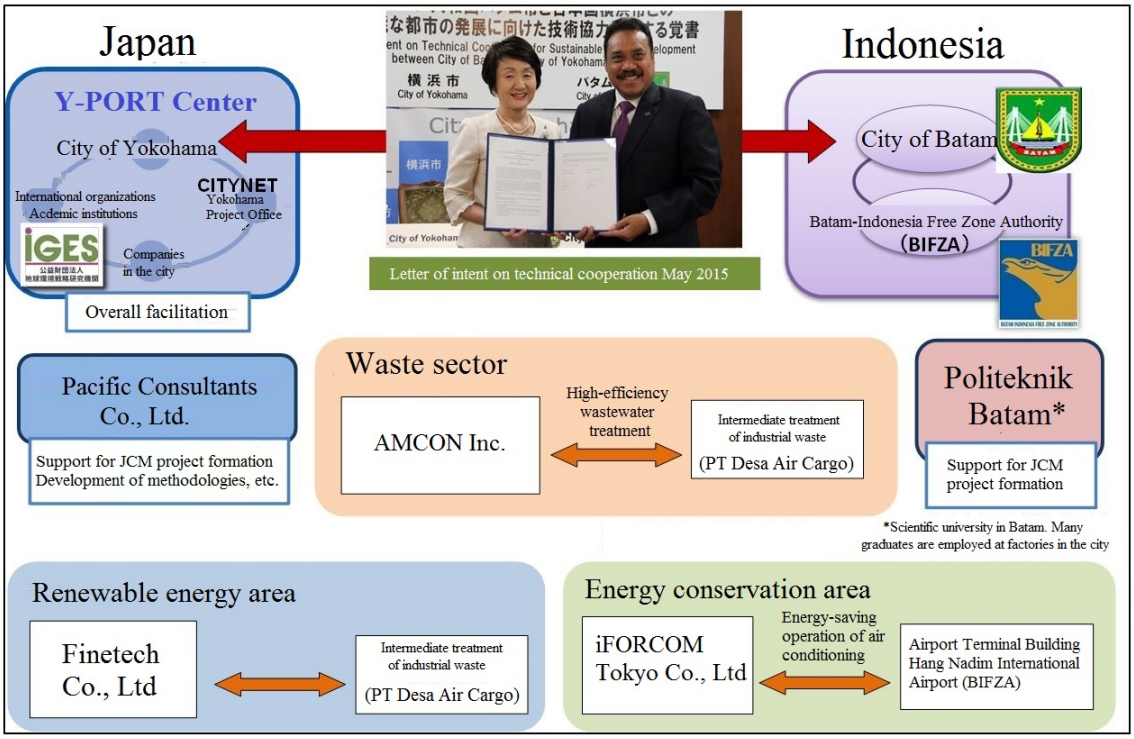
Summary

（1）Organizational Structure for Project Implementation



（2）Overall schedule

Implementation Dates	FS	Location
August 17-21, 2015	Inception Meeting	Batam
Oct. 19-23	JCM Workshop and Companies' Facilities Visits, etc.	Yokohama
Nov. 30-Dec. 1	Feasibility Study Additional Study and Discussion	Batam
Jan. 20, 2016	Final Report Meeting (including related companies, etc.)	Batam

(3) Potential CO2 Emission Reductions

Sector		Description	Potential Annual CO2 Emission Reductions (t-CO2/year)	Implementation Costs (Initial Investment)	Co-benefits
Energy Conservation	(FS-1) Air conditioner system energy-saving operation	Hang Nadim Develop new operating rules for airport building air condition, install inverters	1,005	40 million yen	Electrical cost savings

Sector		Description	Potential Annual CO2 Emission Reductions (t-CO2/year)	Implementation Costs (Initial Investment)	Co-benefits
Waste/ wastewater treatment	(FS-2) Install energy conservation equipment for industrial wastewater treatment	Install high-efficiency wastewater treatment equipment for industrial waste/wastewater intermediate treatment equipment	40	14 million yen	Electrical cost and labor cost savings Proper treatment of industrial wastewater
Renewable energy	(FS-3) Photovoltaic power generation	Rooftop/hybrid photovoltaic installation for industrial waste treatment plant Installation of electricity generation equipment	1,400	200 million yen	Electrical cost savings

1. Objectives of this Project

The City of Bama is located on Indonesia's island province of Riau, about 20 km from the Republic of Singapore's southern shores. The city's population is currently about 1.2 million people, but after the Batam Island Development Accord (1980) and Riau State Development Economic Cooperation Accord (1990), it has been one apex of the "growth triangle" for joint development along with Singapore and Malaysia's Johor State. The population has been growing steadily, and with it, issues such as waste and water treatment. In addition, the city is designated a free trade zone (FTZ), and many factories are located here particularly in industrial parks, but energy use is not yet as efficient as it could be.

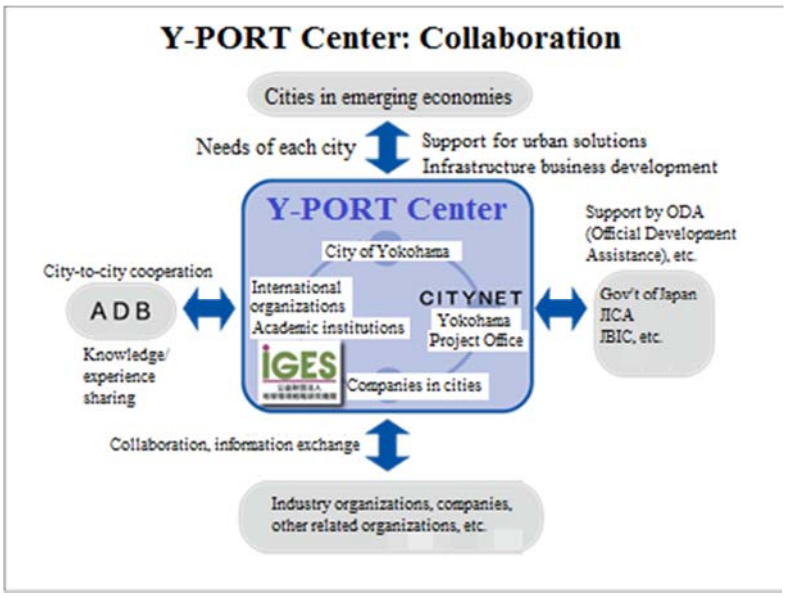
Yokohama has created "Y-PORT Project" (the label for the international technical cooperation program using Yokohama's resources and technologies) with a central project being a policy of "city businesses supporting overseas infrastructure businesses" in its new "medium term four years 2014 to 2017" plan. As a part of Y-PORT projects, the Y-PORT Center promotes joint projects with city businesses, international organizations, and other partners.

Batam City was also mentioned in the "17th Economic Infrastructure Conference" (Theme: Indonesia) (March 20, 2015), organized by Japan's Cabinet Secretariat and as leading examples for the Asian region, and is a city attracting attention as a development area for Japanese companies--for example in Ministry of the Environment assistance projects for JCM projects and for overseas loans and investment (via JICA) which are being discussed for support.

In addition, as an area to actively attract factories as part of a national policy, more than the City of Batam government, the industrial sector in Batam is under the jurisdiction of the Batam-Indonesia Free Zone Authority (BIFZA; currently associated with the Riau Island State Government), which is a related sector of the Investment Promotion Agency of the central government. Also, along with the City of Batam, BIFZA has an important role in terms of public services, to the extent of even being referred to as "Batam's second government"; it is responsible for transportation infrastructure such as for airports and marine harbors, which serve as the infrastructure for industrial development and attracting factories, as well as wastewater and sludge treatment.

Thus, this project, in parallel with collaborative relationship between the local governments, attention should be paid to the collaborative relationship with BIFZA, and while recognizing cooperation with the BIFZA Japan Office, an enhanced collaborative relationship with the Batam side is also desirable.

In addition, IGES supports/endorses programs such as Y-PORT, and is undertaking this study as a major project of the Y-PORT Center, in collaboration with the City of Yokohama; this effort is based on a letter of intent on collaboration and cooperation signed on March 3, 2015, with the purpose of "implementing joint projects for sustainable development in developing countries, and for realization of a low-carbon society."



Source: Y-PORT Center

2. Indonesia and Batam Policy and Project Environment

2.1 Batam Island General Conditions

Batam Island is at the entrance to the Strait of Malacca, an international maritime route connecting the Pacific Ocean and Indian Ocean, located strategically facing Singapore and Malaysia's Johor Baru, and said to be one of the world's busiest routes for shipping traffic coming and going. It is located 20 kilometers southeast of Singapore, a distance that can be crossed in a 60-minute ferry ride.

Batam Island has an area of 415 km^2, but development here has expanded the demand for land; as a result, in 1993, roads were constructed (including six bridges) to connect it with Lembang Island, Galang Island and other smaller islands nearby. The islands connected by these bridges is referred to as the Barelang region, and have a total area of 715 km^2, which is about 1.2 times that of Singapore, or Awaji Island in Japan.

Because Batam Island was developed as an export-oriented industrial zone, one could say that it does not compete with other industrial zones off the island that manufacture products for domestic markets. Also, because the Barelang region has received designation as a free trade zone (FTZ), capital goods and raw materials imported to produce export products are exempt from import duties, and products that are exported are also exempt from value added taxes and export taxes.

Batam Island is known as an industrial area, but today, it is also developing industrially, but also as a port for trade, tourism, and transshipment.

The following infrastructure has been developed here.

Hang Nadim Airport	Longest runway in Indonesia (4,025 meters) Fuel storage facilities: 52,000 kiloliters
Cargo ports	Three: Batu Ampar, Sekupang, Kabil Deepest: 12 meters
Ferry terminals	Four: Batam Center, Sekupang, Nongsa Pura, Waterfront
Electrical equipment	Stand-alone power generation: 125 MW, other 375 MW
Gas supply	Natural gas is supplied by underwater pipeline from Sumatra Island.
Roads	Arterial road and six bridges connecting Batam Island, Galang Island, Rempang Island, etc.

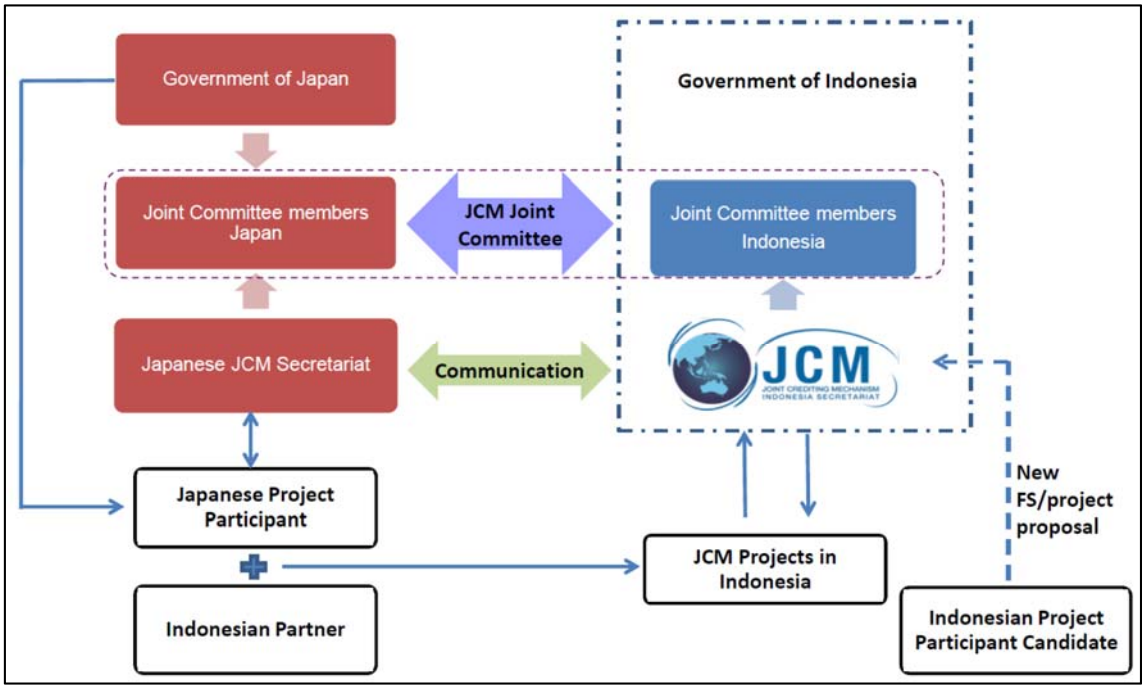
Source: BIFZA

Source: http: //www.batam-island-info.com/images/batam-island-map.gif

2.2 Climate Change and Environmental/Energy Policy

Indonesia formulated its National Action Plan for Reducing Greenhouse Gas Emissions (RAN-GRK) in 2011, committing to a 26% reduction in GHGs (or 41% if it receives international assistance) by 2020 relative to business as usual (BAU).

Also, when Indonesia signed the Joint Crediting Mechanism in 2013, in the context of the important topic of decarbonizing cities (which are a major emission source), the country is expecting to use the JCM to achieve its national targets.



Source: Indonesia JCM Secretariat

2.3 Project Environment from Perspective of Japan

(1) Batam-Indonesia Free Zone Authority (BIFZA)

BIFZA, which is responsible for management and operation of key infrastructure on the island, such as the Hang Nadim International Airport, has a central role in industrial development in Batam. Its predecessor was the Batam Industrial Development Authority (BIDA), established under Presidential Degree No. 41 of 1973.

The two countries of Indonesia and Singapore agreed to cooperate in this region through Special Economic Zones (SEZs) when they signed the Batam-Bintan-Karimun Special Economic Cooperation Accord on June 25, 2006.

In August 2007, in addition to Batam Island, the two countries established industrial areas on both Bintan Island and on Karimun Island, and in 2009, Batam Industrial Development Authority (BIDA), which had been under direct jurisdiction of the Indonesian President, underwent reorganization, and similar organizations were established on each of Batam, Bintan and Karimun islands, the three organizations were put under the umbrella of Riau Islands Province. The name of BIDA, which had only applied to Batam, was changed to the Batam-Indonesia Free Zone Authority (BIFZA).

This background explains that not only is BIFZA the suitable counterpart for the Japanese initiatives, but also has a high degree of institutional and financial credibility.

Furthermore, the Chairman of BIFZA has recognized the city-to-city collaboration between Batam and Yokohama, and has a cooperative stance toward the Japanese counterparts. In June 2016, he visited Japan, and aware of the high prices of electricity in Batam, showed a strong interest in Japan's technologies, including energy saving and renewable energy.

Currently, BIFZA is headquartered in Batam and not only has a branch in Jakarta, but also offices in Singapore and Japan, and actively holds investment seminars in Japan every few months (for example, "Corporate Investment Cases and Expansion Strategies in the Batam Free Zone" was held in Nagoya on June 12, 2015, with support from the Embassy of Indonesia, Japan Office of the Indonesia Investment Coordination Agency, the ASEAN-Japan Center, and the Japan-Indonesia Economic Association).

(2) Industries Appropriate for Batam

There are diverse opportunities for industrial businesses to set up in Batam, as there are practical constraints on overseas companies from doing so. However, some industries are more suited to Batam, and the largest industries there are related to electronics and computers, including the manufacture of computer equipment and parts, audio-visual equipment, automotive parts, and printed circuit boards, etc.

Batam has an abundant labor force, and these types of industries are relatively amenable to technical training, so they are seen as being well-suited to Batam

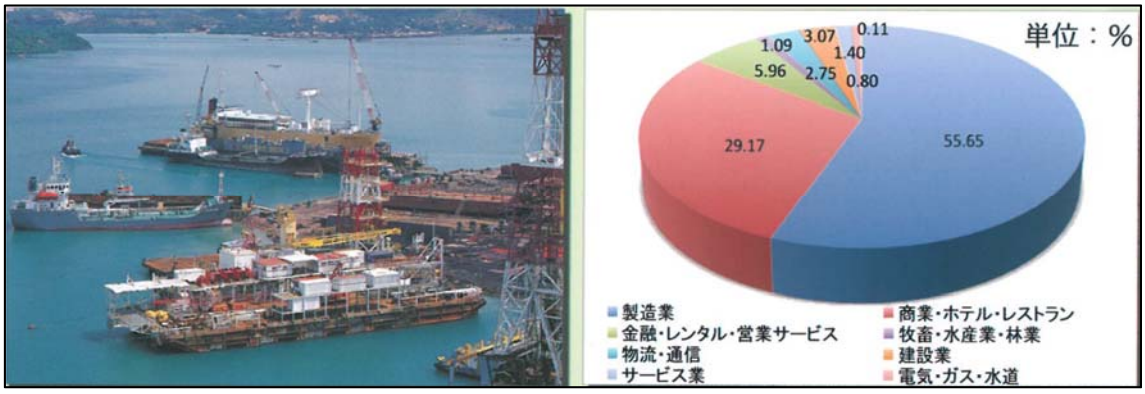
Other light industries include leather products, shoe-making, sewing, toys, daily-use items, household supplies, and health care equipment, etc.

Heavy industries present here include the manufacturing industries such as steel plating, pipe, pipe threading, oil drilling rigs, and offshore petroleum base platforms, etc. In addition, there are over 60 shipbuilding companies here, repairing old and building new ships. Chemical industries are also permitted, and there are currently chemical plants producing alcohol fats and oils, paint, pipe coatings, pharmaceuticals, and other products, although they are required to properly treat industrial waste.

Approximately 60 Japanese companies currently operate there, including Epson, Nippon Steel & Sumitomo Metal, Panasonic, Patlite, Sumitomo Wiring Systems, Tomoe Valve, Shimano, Nittoh Kogaku, Nippon Oil Sheet (NOK Corporation).

Below are some of the incentives offered for foreign investors in the Batam Free Trade Zone.

① Incentives in FTZ for 70 years from 2009
② Exemption from export duties, import duties, value-added taxes, luxury goods taxes, and consumption taxes.
③ 100% share ownership
④ No foreign currency controls
⑤ Competitive production costs
⑥ Application of preferential tariffs (Generalized System of Preferences, GSP) (USA, EU, Japan, etc.)
⑦ Tax treaties to avoid double taxation



Source: BIFZA

3. FS

3.1 Inception Meeting

(1) ESCO, Energy Saving Projects (9: 00 - 10: 40 a.m., August 18, 2015)

A meeting was held with the airport management authority for an overview of the facilities at Hang Nadim International Airport and to study the needs relating to energy conservation and environmental technologies.

① Participants (honorifics omitted)

Airport Management Authority: Subagyo (Head), Dendi K, Richard Silitong
Bahrin Iskandar (in charge of machinery), Arwin (in charge of electricity)
BIFZA: Jaka Prasetya, Anun Wibowo
(iFORCOM Tokyo) Ryosuke Itoh, Kengo Tanaka, Erwin Avianto
City of Yokohama: Masakazu Okuno, Yasuaki Nakamura. IGES: Sudarmanto Budi Nugroho. PCKK: Akifumi Nishihata

② Summary

History of Development: Hang Nadim International Airport

- This facility is an international airport with one of Indonesia's longest runways, in the 4,000 meter range. Lion Air, the largest airline in Indonesia, uses Hang Nadim as a hub airport.
- Expects future increases in the numbers of passengers and scheduled flights, the airport has expansion plans in two phases, with Phase 1 until 2018 and Phase 2 until 2033.
- The Phase 1 expansion plan includes a large-scale upgrade of Terminal Building 1, and new construction of Terminal Building 2.
- After its large-scale upgrade, Terminal Building 1 is expected to have the capacity to handle about 8 million passengers annually. Actual passenger numbers in 2014 were 4.7 million, and they are projected to exceed 5.0 million in 2015. The annual growth rate is about 9 to 10%.
- Meanwhile, freight transport at Batam Island is shifting from airport transport to ferry transport, and the recent trend has been stagnant for air freight handling volumes.
- The airport is anticipating increased demand over the next five years, and is implementing an expansion of facilities. In terms of investment costs, the large-scale upgrade of Terminal 1 is expected to cost 20 million dollars, and the Terminal 2 new construction 300 million dollars.

Air Conditioning Systems

- Hang Nadim airport has plans to develop as an eco airport, so it is important to implement facilities improvements in a way that conforms with international standards for an eco airport.
- In terms of systems and facilities necessary to be an eco airport, there is an awareness of environmental assessment implementation (AMDAL), waste treatment facilities, airborne infection isolation rooms, efficient air condition systems, and waste treatment facilities (incinerators, etc.), and so on.
- Hang Nadim Airport uses various types of air conditioners, and they could be broadly classified as six types.
- The airport takes pride in not being behind compared to developed countries in terms of electrical and machinery/equipment, etc., but has confirmed the need to consider efficient operational methods for air conditioning equipment. Thus, a positive response was obtained regarding considering introduction of energy management systems for air conditioning equipment, particularly with iFORCOM Tokyo.
- A separate meeting was later held with iFORCOM Tokyo and BIFZA. Design materials relating to current air conditioning equipment were provided (equipment list, plan views of air conditioner layout on each floor, chiller system chart, etc.).

Other

- The treatment facilities for wastewater from Hang Nadim Airport use basic processes, and include a sedimentation pond, filtration tank, and open air sludge drying bed, etc., but in reality they are not functioning at all.

- As an international airport, there is an awareness of the importance of environmental measures such as treatment systems for waste and wastewater, but the current situation requires a priority on airport facilities' expansion including new construction of a runway and terminal building, as well as their safety measures.
- The airport manager is in the process of tender procedures and calling for proposals from local consultants relating to reconstruction designs (design results will become basic design or preliminary detailed design) for wastewater treatment facilities.
- The detailed design and reconstruction of wastewater treatment facilities will depend on the final results of the basic design as well as the available budget, but details of the future reconstruction plans are not clear at the present time.
- It was confirmed that wastewater treatment facilities have not yet been considered for the Terminal 2 currently being planned, and that there are issues with compliance with environmental standards for waste and wastewater treatment.

(2) Renewable Energy Projects and Waste/Wastewater Treatment Projects (9: 00 - 12: 00, August 20, 2015)

A meeting was held with PT Desa Air Cargo (DAC) which has industrial waste intermediate treatment facilities, in order to ascertain the situation with intermediate waste treatment on Batam Island and to study the needs pertaining to energy conservation and environmental technologies.

① Participants (honorifics omitted)
PT DAC: Aas (Planning Manager), Dedi
BIFZA: Binsar Tanbunan
Finetech: Motoyuki Okada, Kikuo Sagawa
AMCON: Yuichi Hirose, Buntaro Shiono
City of Yokohama: Yasuaki Nakamura. IGES: Sudarmanto Budi Nugroho. PCKK: Akifumi Nishihata

② Summary
Overview of Facilities

- BIZFA manages a total of about 20 ha of facilities grounds, of which approximately half (10 ha) is occupied by industrial waste treatment facilities. In terms of tenants, there are 25 treatment companies, and DAC is the largest.
- Separately, there is approximately another 20 ha as facilities grounds, so that means there is room to introduce new energy conservation and environmental technologies and equipment, and increase handling capacity.
- The said facilities collect and accumulate waste materials from all sectors (industrial parks, ship-building sites, the port, etc.) and all areas of Batam Island, and that includes dangerous and hazardous materials (referred to as B3 waste).
- DAC processes about 890 tons per month of hazardous waste, consisting of 460 tons per month of solid waste and 430 tons per month of liquid waste (wastewater, effluent).
- The basic concept for industrial waste treatment is that, to the extent possible, organic material is converted to alternative fuel, and inorganic material is recycled as a resource. However, waste for which there is inevitably no effective use ends up disposed in landfill (by Prasadha Pamunah Limbah Industri (PPLi) and other firms).
- Of the waste, approximately 60% is processed on Batam Island (DAC), but the remaining approximately 40% cannot be processed on the island and is transported off island (e.g., to Java Island).
- As for the waste that is processed on the island, the processing contract prices to recipients are relatively low or the sellable waste is equivalent. For example, used fuel and oil sludge (sellable if over 2,500 calories) is equivalent to this.
- Of the approximately 60% of waste processed on the island, 20% is processed by electrolytic flocculation, 20% by incineration, and 20% by distillation.
- As for the waste that is processed off the island, the processing contract prices to recipients (e.g., cement companies) are relatively low or equivalent to B3 waste. For example, this corresponds to waste such as agricultural chemicals and organic or inorganic solvents, etc., of which about 400 tons are generated per month.
- The approximately 40% of waste processed off the island is transported to off-island cement plants, PPLI (landfill), Sinerga Indonesia (sludge containing metals, sulfuric acid, phosphoric acid, etc.).

Treatment Processes

- The electric flocculation processing equipment has been in service for approximately 7 or 8 years. This is used to process waste such as automobile engine refrigerants, factory effluent, and used oil, etc.
- The processing facilities consist of an electrolytic flocculation tank, a sludge sedimentation tank, and sludge dewatering equipment (filter press, belt press). The wastewater treatment volume is about 178 tons/day, typically operating Monday to Saturday, 8 a.m. to 5 p.m. However, it is

possible to extend the hours to operate from 8 a.m. to 9 or 11 p.m., as required (when high volume of wastewater is incoming).

- When a site visit was made to the oil sludge dewatering equipment, it was observed that it was low-efficiency and aging oil press filter equipment, which suggests that there is potential at least for the installation of high-efficiency dewatering equipment by AMCON.
- The introducing of high-efficiency dewatering equipment by AMCON would be expected to improve processing capacity of the electric flocculation processing equipment, so a sampling of about 2 liters was taken, for later analysis. Approximately 5 to 6 tons of sludge per day are generated, with thermal energy of over 2,000 kcal.
- Finetech also took one plastic bag sample sludge for analysis in Japan. However, Finetech had the impression that both the sludge volume (5-6 tons/day) and thermal energy were low.

3.2 JCM Workshop and Companies' Facilities Visits, etc.
(1) ESCO, Energy Saving Projects (honorifics omitted)

A site visit and discussion was conducted with BIFZA's Binsar and Richard, who are key persons on the Indonesian side for any project for installation of air conditioning equipment and energy efficiency systems at terminal buildings of Hang Nadim International Airport.

① Meeting with iFORCOM Tokyo (14: 00 - 17: 00, October 21, 2015)

Batam Airport A/C Energy Conserving Operations Project (Richard)

- The terminal has both old and new equipment, of which there are 3 new chillers (made in Mexico).
- There are plans to contract and introduce Azbil and Belcher (dealers) building automation systems (BAS). The BAS only controls chillers. For example, the switch turns off after people leave a room. Energy overall is not yet being addressed, only air conditioning. The BAS controls chillers and AHU. The BAS only controls newly added chillers. The remaining five chillers are not controlled by BAS.
- Richard is responsible for two (areas). One is air conditioning, and the other is electricity. For air conditioning, 2 chillers and BAS have been installed.
- However, BAS has not been installed for electricity. The reason is that the building is aging and rain leaks are significant, so those issues are believed to require attention first.
- There are 8 chillers in Terminal 1, and the three new chillers are controlled by BAS (in the arrivals terminal 2 out of 4 are new; in the departures terminal, 1 out of 4 is new). The chillers alone require 1.8 MW of power.
- There is on-site power generation, consisting of 4 units at 750 kW each.
- The expectation toward the Japanese side is not in BAS for chillers only, but for BAS for electrical systems as a whole. Not automatic, but managed. Would like to attach monitoring equipment.
  → (iFORCOM): Alone, that would only be a maintenance device, not resulting in energy conservation.
- If energy conservation could be guaranteed for the purpose of energy conservation, it could be done right away. Electricity costs are 20 million yen per month.

Energy Conservation Benefits (iFORCOM)

- According to data, the annual electricity costs are approximately 14.1 billion rupiah (approximately 12 million yen per month).
- The (potential) energy conservation is estimated at about 10%.
- The suggested approach, rather than to replace equipment, would be to take steps to improve the control of existing chillers and the overall way electricity is used. A BAS has already been introduced, but electricity costs have not decreased by that alone.
- This is the same experience as in Japan--that introducing a BAS alone does not reduce electricity costs.
- There are plans to hire an equipment consultant from Jakarta (contract not yet signed), but iFORCOM Tokyo is an energy conservation consultant so there will be no overlap.
- There are plan to connect the remaining 5 chillers to the BAS, without replacing them.
- iFORCOM Tokyo's technology is not automatic; it recommends how to operate air conditioning in response to the airport operating conditions.
- With the approval of Binsar and Arizal, it can be achieved quickly.
- Does the Azbil equipment include subsidies/funding?
  → (Richard): It came with the national government budget.
- When will the budget be decided?
  → (Richard): December is the fiscal year end. And the funds can be used from April onward. Budget requests are made in September. But budgets can be revised in July or August. Binsar is the person most responsible for budget coordination, so there is no constraint on timing.
- Can the current year's budget still be used?
  → (Richard): It can be coordinated/adjusted by Binsar and Arizal on their own. Of the 200

million yen, Richard is responsible for 70 million yen. BAS is a separate fund/allowance, but cable is also determined by tender, so we don't know how much can be used.

- Consulting alone is 5%. If you include chiller controls, it is an additional 5%. If it is only consulting, the cost can be kept low.
- BAS is equivalent to BEMS in Japan, but with that all you get is the potential for centralized control, and it does not automatically lead to energy conservation. Having said that, it is not clear if BAS and iFORCOM Tokyo systems are compatible. We generally know the BAS that Azbil is likely to introduce, we will prepare a number of system design stories that are compatible.

② Kashiwa-No-Ha Smart City Study Tour (10 a.m. - 12 p.m., October 22, 2015)

- Before the Tsukuba Express was planned, a golf course owned by Mitsui Fudosan Co. was located where today one finds Kashiwa-No-Ha Smart City, the company redeveloped the former golf site when it developed a train station.
- It has not only commercial facilities but also housing, and is the location of the Kashiwa Campus of The University of Tokyo, and a full complement of amenities including public space and business startup support space.
- As for energy conservation, the downtown district overall has achieved 10% energy conservation with photovoltaic panels installed on the buildings, storage batteries, and peak electrical load cutting.
- The downtown area consists of multiple city districts, and by sharing the photovoltaic panels and storage battery facilities among multiple districts, energy can be shared among them.
- In the energy control room one can see the real-time display of energy demand in each facility as well as the electricity received from the Tokyo Electric Power Company (the local utility).
- Not only can residents see their own energy consumption in real time, they can also receive energy conservation tips depending on the outdoor weather conditions, and there are other innovations that create incentives for energy conservation in lifestyles. For example, they can earn points that can be used in the facilities depending on their level of energy conservation.
- iFORCOM Tokyo was the company that provided and installed the electrical, gas, and water monitoring equipment in the residential facilities of District 2 of this redeveloped area.

Energy Building (houses storage batteries and other equipment).

Car share electric cars

③ Airport Energy Conservation Project Wrap-up (8: 30 - 10: 30 am, October 23, 2015)

- As also explained from the Batam side at the JCM conference, Batam's Hang Nadim Airport has been designated as an eco airport, and has significant motivation to become environmentally friendly.
- Two concrete ideas in that direction include the use of photovoltaic panels and the recycling of water.
- However, one direction that merits support is the energy conservation approach to operations, which is advantageous as it can utilize existing facilities.

- Notably, for cooperation by BIFZA to advance JCM project formation, the signing of the M/M between the City of Yokohama and City of Batam has already been done.
- In terms of the issue of tendering processes, as a part of cooperation for the above project formation, the BIFZA side also intends to investigate, going forward.
- In addition, with regard to electricity as one example, currently, multiple airline companies that use the airport have electricity purchasing contracts with PLN, but in the future they would like to rearrange it so that the airport has one main contract with PLN, and the BIFZA would be able to supply electricity from the airport to each airline company.

(2) Renewable Energy Projects (October 22, 2015) (honorifics omitted)

Finetech Co. provided a site visit and meetings for Dendi Purnomo (City of Batam), Binsar Tambunan and Memet Rahmat (BIFZA), and Kurniawan Chang (PT Desa Air Cargo), who are key persons on the Indonesian side for renewable energy projects at industrial waste intermediate treatment facilities.

- At the Finetech Co., Waste to Energy Test Equipment of the North Kanto Smart Green Facility, Binsar commented that currently the industrial hazardous waste that cannot be processed on the island in Batam included (a) copper smelting slag, (b) palm oil spent bleaching earth, (c) carbide, and (d) sand blasting.
- Besides the Waste to Energy testing equipment, Finetech also guided the guests to view photovoltaic power generation equipment, and other renewable energy equipment.
- Finetech indicated that for PT Desa Air Cargo the waste from food, tobacco, and textile factories had the potential for Waste to Energy projects, and the Indonesian side indicated an interest in gathering more detailed information.
- Also, it was decided to consider not only the potential for Waste to Energy project proposals, but also for installation of rooftop photovoltaic power generation equipment on the rooftops of PT DAC factory buildings.

(3) Waste/Wastewater Treatment Projects (October 21, 2015)

AMCON had discussions with Memet Rahmat (BIFZA) and Kurniawan Chang (PT Desa Air Cargo), who are key persons on the Indonesian side for wastewater treatment efficiency improvement projects at industrial waste intermediate treatment facilities.

- The following information was obtained from PT DAC in relation to current wastewater treatment equipment (flocculation and dewatering of solid constituents):
    - ✧ Wastewater treatment volume per day is 5 - 6 tons (1 ton per 1-hour batch, over 5 - 6 hours)
    - ✧ Current issues: (a) high maintenance costs (electrode replacement once every 1 - 2 months), (b) high electrical consumption and high electricity costs (4 million rupiah per month), (c) clogging of filter press is frequent and requires 6 workers to clean, consuming all their time, (d) water quality of effluent after wastewater treatment (BOD: 75 - 100 mg/l, COD: 150 - 200 mg/l) exceeds environmental quality standards (BOD: 50 mg/l, COD: 100 mg/l).

- PT DAC had the following requests for AMCON in terms of improving existing wastewater treatment equipment:
    - ✧ Would like to improve not only the filter press dewatering equipment, but also the entire wastewater treatment equipment, including electrolytic flocculation and separation equipment.
    - ✧ Would like to receive a proposal that includes an investment payback of about 3 years, and indicates initial investment cost, maintenance costs, and other costs.
    - ✧ After the improvements, hopes to see a significant reduction not only in electricity costs but also worker labor costs.

- Also, PT DAC is interested in ways to process industrial hazardous waste on the island that currently must be transported off island (to Jakarta, etc.). Also, if treatment costs of industrial hazardous waste can be reduced, the costs of the entire industry on Batam Island can decrease, with the benefit of boosting competitiveness.

3.3 Feasibility Study Additional Study and Discussion
(1) ESCO, Energy Saving Projects

① Interim Report to BIFZA (9: 15 - 9: 15 a.m., December 1, 2015)
Summary

A meeting was held to report on meeting results relating to energy conservation projects at the Hang Nadim International Airport, and discuss the details of the interim report workshop with BIFZA scheduled for December 3. BIFZA requested not only strong potential candidates for JCM equipment subsidies, but also wished to be shown a medium and long-term vision based on city-to-city cooperation.

Details (Honorifics omitted)
(IGES Asakawa)

- Reported on today's meeting with iFORCOM Tokyo relating to energy conservation projects for the Hang Nadim International Airport. This is because in today's meeting with the Hang Nadim International Airport Authority it was indicated that the Airport Authority is not able to make the decision on project implementation. Thus, the opinion was that there should be a report to and request for comment from BIFZA, the authority that has jurisdiction.

(BIFZA Binsur)

- How about if this project was reported as a flagship project of city-to-city cooperation at the meeting with the Chairman of BIFZA on December 3? Would like the proposal to the Chairman to be not only for airport energy conservation projects, but also medium and long-term proposals that lead to a greener vision for the city and island, including treatment of industrial wastewater and recycling of organic material. It might be a good approach to present airport energy conservation as the first flagship project.
- Would like to move ahead in such a way as to be able to have a letter of intent between iFORCOM Tokyo and BIZFA Airport Management Authority signed based on participation of the (Japan) Ministry of the Environment, plus the City of Yokohama, and related Indonesian authorities, at the January 2016 workshop.

(IGES Asakawa)

- At our visit with the BIFZA Chairman on December 3, we would like to make a proposal from our side along the lines of the suggestion just received.



Interim Report to BIFZA

② Building Energy Conservation Workshop with BIFZA Hospital Management Department (14: 30 - 16: 00, December 2, 2015)
Summary

It is hoped that the energy-conservation equipment being discussed for installation at the Hang Nadim International Airport terminals could also be introduced to public facilities, private buildings, and other structures, in the City of Batam. For this reason, a seminar about the use of JCM programs

was organized for entities including the BIFZA hospital management department and ferry terminal management company.

Details (Honorifics omitted)

- Mr. Nakamura of the City of Yokohama explained that the JCM study was progressing as the first project based on the Letter of Intent signed in May 2015 between the City of Batam and the City of Yokohama.
- Mr. Asakawa of IGES outlined the JCM programs and explained their merits.
- iFORCOM TOKYO gave an overview of projects currently being discussed for Hang Nadim International Airport, and explained the potential for similar hospital and ferry terminal projects in the city.
- Participants asked questions about the breakdown procedural flow for subsidies/funding from the (Japan) Ministry of the Environment, and about the equipment and services provided by iFORCOM Tokyo.

Scenes from the seminar

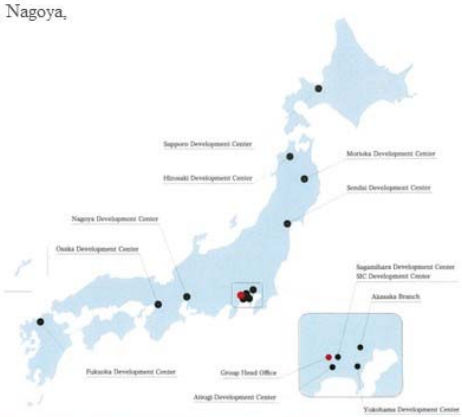
③ Presentation Materials 【iFORCOM Tokyo】

Company Profile

Company name	iFORCOM Co.,Ltd.
Address	Kagawa building, 1326 Nakano, Midori-ku, Sagamihara-shi, Kanagawa 252-0157
Telephone	+81-42-784-5700
Fax	+81-42-784-5540
Establishment	October 1985
Representative	Hiroshi Kagawa (Representative director)
Capital	¥100,000,000
Employees	350 persons (group whole)
Bank	Seibu Shinkin Bank・Bank of Yokohama・Yachiyo Bank・Shoko Chukin Bank・Bank of Tokyo-Mitsubishi UFJ
Certification	ISO / IEC 27001:2005 (Information Security Management) ISO 9001:2008 (Quality Management) ISO 14001:2004 (Environmental Management)

iFORCOM Co.,Ltd (Sagamihara)
iFORCOM Tokyo Co.,Ltd (Sapporo, Hirosaki, Morioka, Sendai, Yokohama, Sagamihara, Akasaka, Nagoya, Osaka, Fukuoka)
iFORCOM Smart Ecology Co.,Ltd (Sagamihara, Akasaka)

Representative office in Indonesia (Jakarta)
Representative office in Philippines (Manila)



【iFORCOM Tokyo】

2012 Electricity prices soaring
→Start power-saving consulting
【ECO-PRO Ver.4】

2011 Great East Japan Earthquake

2010 More than 2000 agreement

2004 Conclusion of the Kyoto Protocol
→Start operational improvement consulting
→Visualization of electricity consumption with the CO2 reduction goal
【ECO-PRO Ver.1】

2003 More than 1000 agreement

1996 Electric industry law revision →Start contract improvement consulting

Overview

Energy-saving operation system

Business to build the best energy-saving promotion platform in response to user needs, we have track records to introduce more than 2000 facilities in Japan, then have developed in the office building, factory and mall in Indonesia.

Specifically, by utilizing the following, it is possible to construct verified optimum energy saving promotion platform at airports.

1. Know-how of the rule of "Energy efficiency improvement due to human operation (AC, OA equipment, etc.)"
2. Design know-how of the incentive scheme based on behavioral science in order to comply with it
3. Know-how to apply the "automatic control by utilizing information technology (active automatic control of AC)."

Customer in Indonesia

住友商事 Polymatech カネパッケージ KANEPACKAGE CO.,LTD.

【iFORCOM Tokyo】

Track Record

iFORCOM

5

Track Record

iFORCOM

6

【iFORCOM Tokyo】

Offering Solution

We offer the following solution for the electricity usage reduction.

①Operational improvement on electricity usage of airport facilities

Check the usage of existing facilities, and by optimizing the operation method to reduce power consumption and achieve energy saving, saving CO2.

- Investigation in detail for the usage of office equipment, air conditioning (air conditioning related such as chiller, air handling units)
- Research and analysis for the optimal use development
- Rules formulated on how to use, documenting

②Inverter control of the chiller pump

It established the inverter to the pump (motor) that comes with eight chiller, to control the output (number of revolutions). Check the operational status, if possible, it can also be carried schedule operation.

③Installation of the monitoring system

We will set up equipment to monitor the electricity usage of the entire airport.

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Calculation

We have calculated the electricity bills that can be reduced in Hang Nadim International Airport, from data on electricity usage that we receipt on the investigation on site on August 18, 2015.

①Operational improvement on electricity usage of airport facilities

- Improvement of operation method on air conditioning (air conditioning related such as chiller, air handling units)

  Reduction = 413,448kWh/year

- Improvement of operation method on office equipment

  Reduction = 215,812kWh/year

②Inverter control of the chiller pump

Reduction = 568,374kWh/year

Total reduction = 1,197,634kWh/year

⇒reduced approximately 10%

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8

【iFORCOM Tokyo】

Tentative Schedule

Schedule

January	2016	Sign LOI on introduced solutions
February	2016	Site investigation for the final implementation details, and adjustment of the terms and conditions.
May	2016	Application to Equipment Subsidy from the Ministry of the Environment
June	2016	Adoption of the propriety of application's equipment grant from the Ministry of the Environment, the determination of subsidy
June	2016	Final quotation, and contract with subsidy.
July	2016	Kickoff (research, design, and installation)
November	2016	Installation is completed

iFORCOM

Phase approaching Project

CO_2

Generation 1 ← Where we are

- Energy-saving A/C System Project, supporting Eco-Airport Plan

Generation 2

- Energy-saving Ferry terminal Project
- Energy-saving Hospital Project
- Energy-saving Hotel Project

iFORCOM

【iFORCOM Tokyo】

Contact us

iFORCOM Tokyo Co., Ltd.

Ryosuke Itoh

Erwin Avianto

mail: r.itoh@iforcom.jp
e.avianto@iforcom.jp

Tokyo office
Tel :(+81)3-5510-5757
Fax:(+81)3-5510-5756

Representative office in Indonesia
Tel :(+62)21-2960-7507
Fax:(+62)21-2960-7501

(2) Renewable Energy Projects

① Meeting with PT Desa Air Cargo (DAC) (9: 30 a.m. - 12: 00 pm, December 2, 2015)

Summary

PT DAC (industrial waste treatment company, introduced by BIFZA) and Finetech Co. met to discuss topics including the potential to introduce renewable energy, and the expected merits of doing so.

Details (Honorifics omitted)

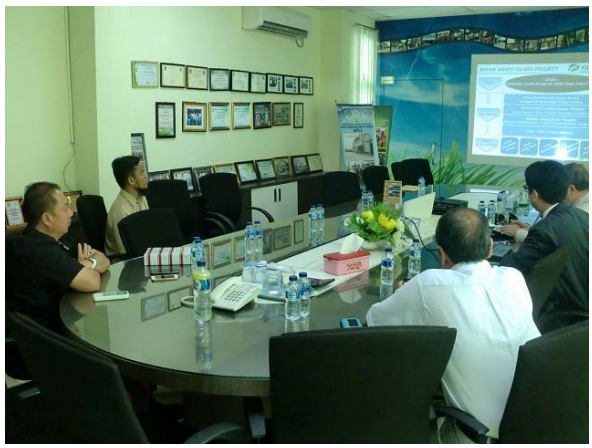
Finetech Co., Ltd

- After explaining the introduction of photovoltaic (PV) systems, as well as phased project plans to expand to include (other) renewable energy, batteries, and integrated power control systems for WTE electric power generation, would like to confirm next steps going forward.
- Based on older bird's-eye view photos of buildings, supplemented by information on potential space (area) for installing PV systems, it was estimated that about 0.5 MW could be generated, but with permission, would like to take aerial photos by drone in January 2016.
- Explained the approach of phased project development, and obtained consent from PT DAC president.
- Requested information including building drawings; made approximate calculations of rooftop area of prefab plants of the subject buildings, and conducted confirmation on site at plants.

(PT DAC)

- This is a private sector company, so we must consider both the business dimension and the environmental dimension. The combination of Japanese PV technology and the environment of Indonesia, right on the equator, is a very good combination. Would like to introduce more PV systems to Indonesia.
- However, would like to receive by e-mail, etc., the data for confirmation of business plans. Our company was established as a pilot project of BIFZA, so we are receiving government support. Would like to also promote project development to the government, with an open attitude. Would like to confirm the business plan that considers both environmental awareness and business perspective.
- With regard to the business plan, it was decided that Finetech would prepare the plan, based on information/materials obtained this time.

Office building of PT Desa Air Cargo


Meeting with PT Desa Air Cargo

Meeting with PT Desa Air Cargo

Plant roof (being considered for PV panel installation)

Plant roof (being considered for PV panel installation)

Plant roof (being considered for PV panel installation)

② Presentation materials 【Finetech Co.】

Indonesia – Japan JCM Scheme
"Smart Green Island Project / Batam"
（Creating a Proposal for Low-Carbon Technology）

August, 2015 – February, 2016

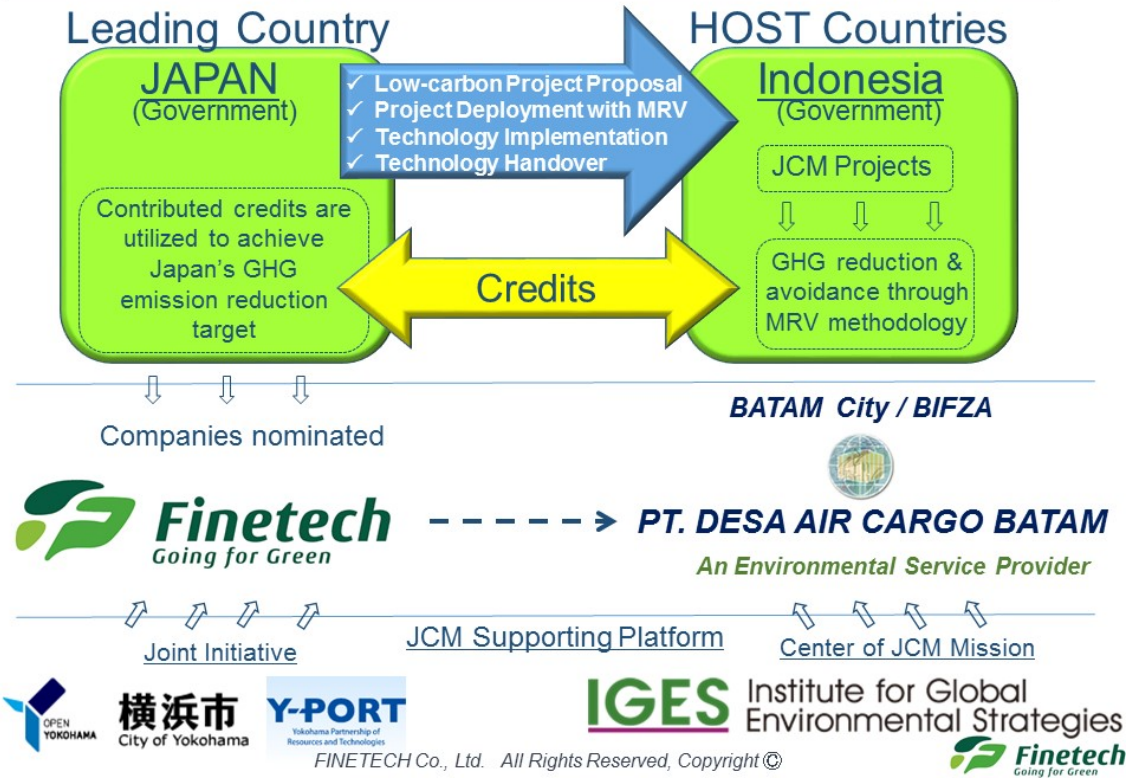
Going for Green

January 20, 2016
at BATAM, INDONESIA

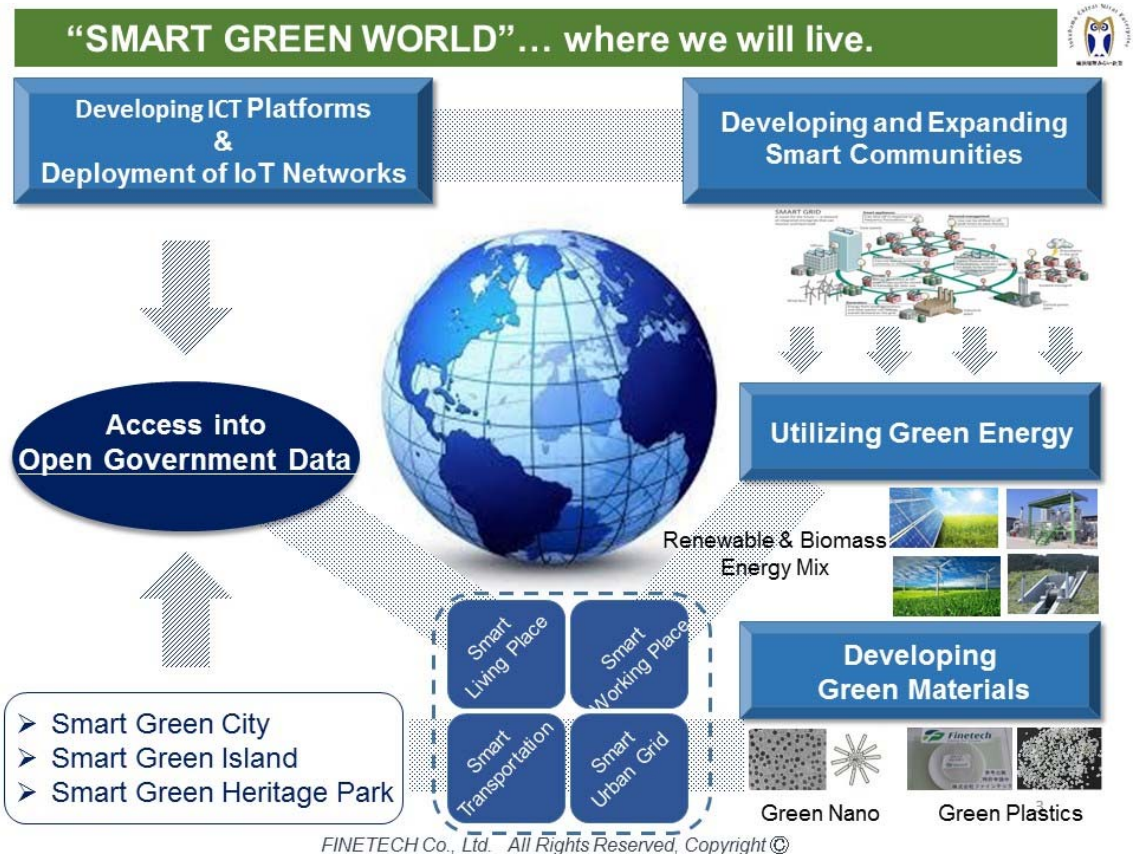
Finetech
Going for Green

www.finetech.co.jp

Basic Concept of the Joint Credit Mechanism (JCM)



【Finetech Co.】


"SMART GREEN WORLD"… where we will live.
Developing ICT Platforms & Deployment of IoT Networks
Developing and Expanding Smart Communities
Access into Open Government Data
Utilizing Green Energy
Renewable & Biomass Energy Mix
Smart Living Place
Smart Working Place
Smart Transportation
Smart Urban Grid
Developing Green Materials
Smart Green City
Smart Green Island
Smart Green Heritage Park
Green Nano
Green Plastics
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Smart Green Island Project Conceptual Mapping
Smart Renewable Energy
Smart Traffic & Transportation
Smart Living Place
BATAM ISLAND MAP
www.batam-island-info.com
Batu Ampar
Nongsa
Nagoya
Batam Center
Tanjung Uncang
Waterfro
Kabil
Duriankang
The Near Future of Workforce Technology
Smart Working Place
Smart Urban Grid
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Finetech
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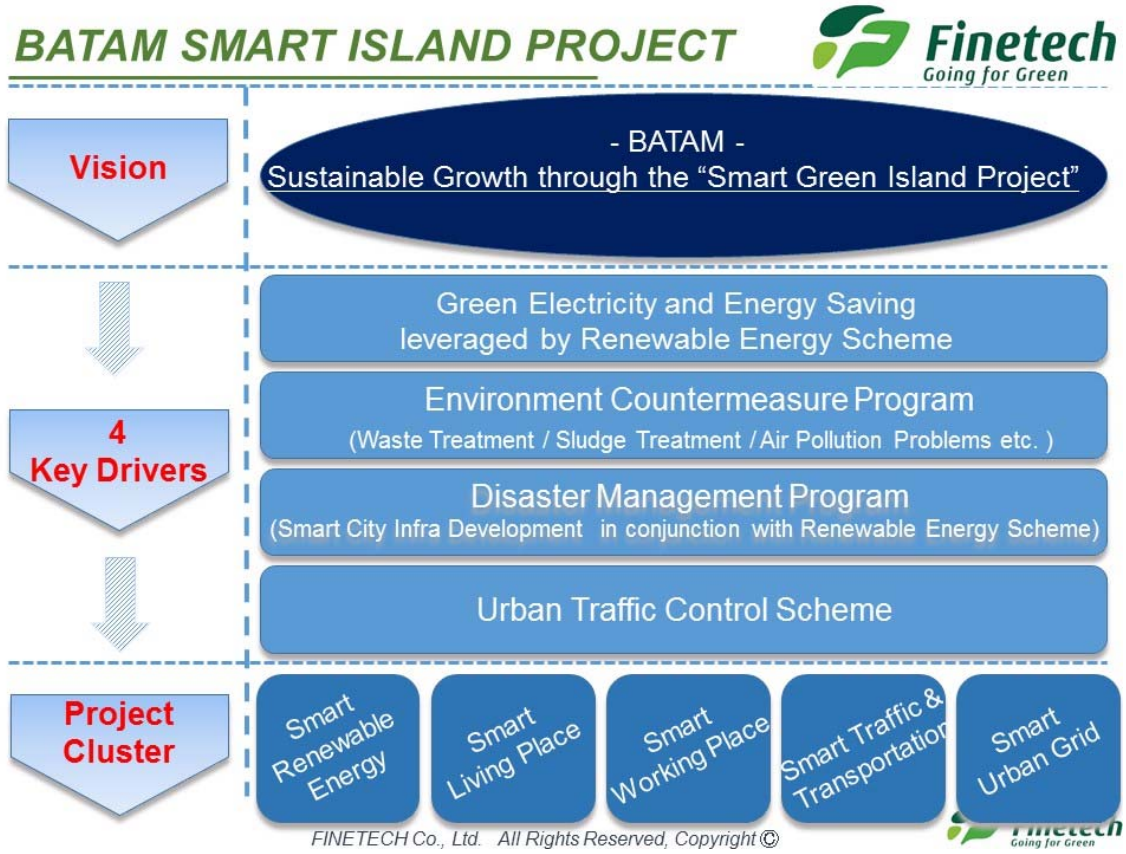
【Finetech Co.】


BATAM SMART ISLAND PROJECT
Finetech
Going for Green
Vision
- BATAM -
Sustainable Growth through the "Smart Green Island Project"
4
Key Drivers
Green Electricity and Energy Saving
leveraged by Renewable Energy Scheme
Environment Countermeasure Program
(Waste Treatment / Sludge Treatment / Air Pollution Problems etc.)
Disaster Management Program
(Smart City Infra Development in conjunction with Renewable Energy Scheme)
Urban Traffic Control Scheme
Project
Cluster
Smart Renewable Energy
Smart Living Place
Smart Working Place
Smart Traffic & Transportation
Smart Urban Grid
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Smart Green Island Project : OFFICIAL SITE VISIT
By BATAM CITY Government / BIFZA / PT DESA AIR CARGO
FINETECH received the BATAM Delegation
at the "FINETECH's SMART GREEN PARK"
on October 22, 2015
Smart Green Park
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Finetech
Going for Green

【Finetech Co.】

JCM Opportunities found through surveys

- Hybrid Roof-top PV Solar System Installation, covering for electricity consumption in the factory at PT DESA AIR CARGO with innovative functions for demand monitoring & controlling through Dashboard Management. (Same opportunities are found in premises of BATAMA City Office Building and BIFZA Office Building.)

- Waste-to-Energy Technology implementation at PT MUSIM MAS Palm Oil Refinery Factory, focusing on Spent Bleaching Earth from which oil essences could be separated and recovered for re-usage at the factory. Recovered oil could be used for boiler, vehicle , equipment etc. in the factory

PT DESA AIR CARGO

BATAM CITY / BIFZA

PT MUSIM MAS

Generation Approach

Phase approaching Project from Gen.1 to Gen. 3

Where we are

Generation 1:

- Roof-top Hybrid PV System with Demand Control Implementation Project

Generation 2:

- Waste-to-Energy (Edible-oil Refinery) Project
- PV System with Advanced Demand Control Implementation Project

Generation 3:

- Add-on Biomass (Waste)-based Power Generator with Advanced Demand Control Implementation Project

【Finetech Co.】

Smart Working Place Concept : PT DESA AIR CARGO

PT. DESA AIR CARGO BATAM

An Environmental Service Provider

Smart Dashboard Control for Factory Operation:

PV Solar Power

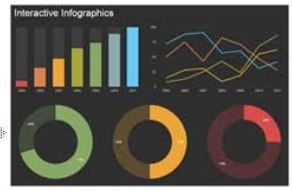
Batteries

EV Vhiecle

Waste (Biomass) –based Power Generator

Demand Control

Disaster Management



Dashboard
Monitoring & Control

Finetech
Going for Green

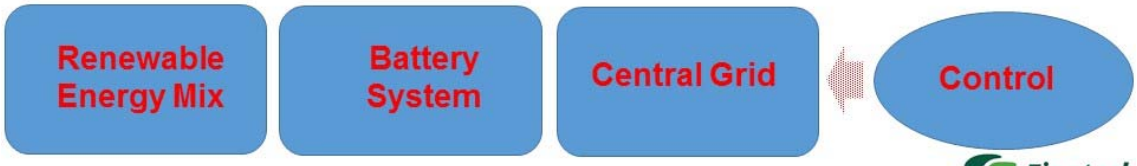
Smart Working Place Concept : PT DESA AIR CARGO

PT. DESA AIR CARGO BATAM

An Environmental Service Provider

Hybrid Power Generation System for Factory Operation:

- **Hybrid Power Generation System use a combination of Biomass-based Power Generator, PV Solar Power, Batteries and the Main Grid.**
- **The system highly impact on reducing total cost of energy with reduced fossil fuel usage in the factory operation.**
- **Hybrid Power Generation System controls to provide power, utilizing batteries, in accordance with price differential between day and night or weather condition or peak-shaving demand.**



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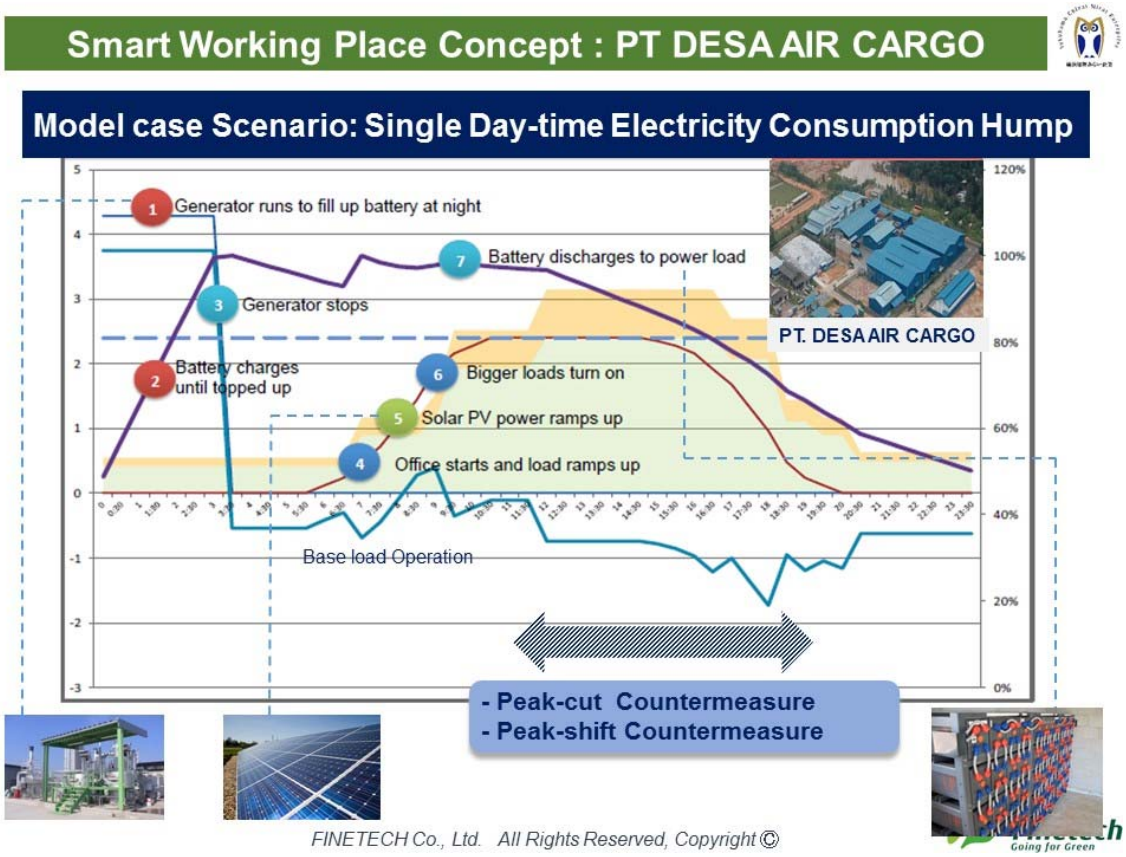
Smart Working Place Concept : PT DESA AIR CARGO
Model case Scenario: Single Day-time Electricity Consumption Hump
1 Generator runs to fill up battery at night
2 Battery charges until topped up
3 Generator stops
4 Office starts and load ramps up
5 Solar PV power ramps up
6 Bigger loads turn on
7 Battery discharges to power load
Base load Operation
PT. DESA AIR CARGO
- Peak-cut Countermeasure
- Peak-shift Countermeasure
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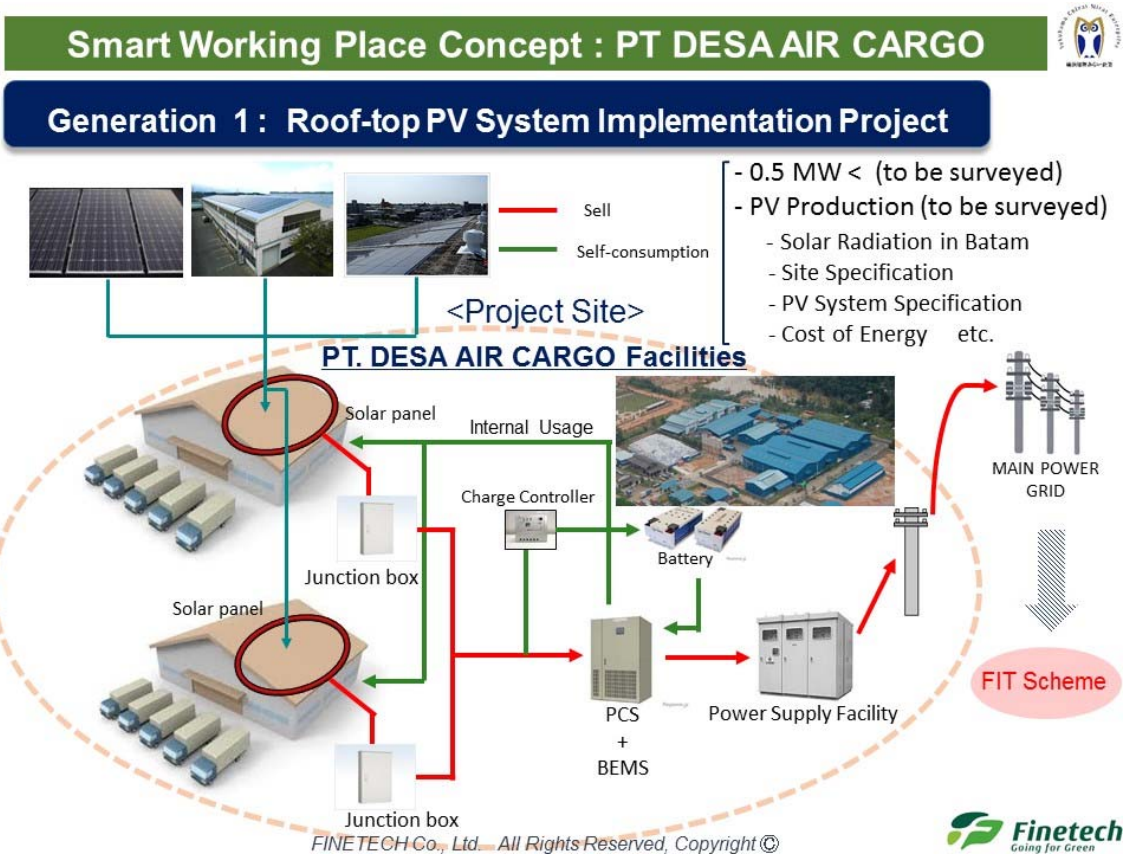
Smart Working Place Concept : PT DESA AIR CARGO
Generation 1 : Roof-top PV System Implementation Project
- 0.5 MW < (to be surveyed)
- PV Production (to be surveyed)
- Solar Radiation in Batam
- Site Specification
- PV System Specification
- Cost of Energy etc.
Sell
Self-consumption
<Project Site>
PT. DESA AIR CARGO Facilities
Solar panel
Internal Usage
Charge Controller
Battery
Junction box
Solar panel
PCS
+
BEMS
Power Supply Facility
MAIN POWER GRID
FIT Scheme
Junction box
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【Finetech Co.】

Smart Working Place Concept : PT DESA AIR CARGO

Formula for Calculation of Amount of CO2 reduced through the PV Solar Project

TBD

ERy = EGy × Efelec

(1,000kw x 24hrs x 365days) x 18% = approx. 1,576,800kwh

Amount of CO2 reduced per year through the Project = **Approx. 1,400 tCO2/year**
x 3 sites
= Approx. 4,200 tCO2/year

ERy : Amount of CO2 reduced per year（tCO2/year）

EGy : Amount of Electricity generated per year（MWh/year）

EFelec : Emission Factor of the Grid Electricity（0.839 tCO2/MWh）

Approx. CAPEX : JPY 1～3M per site

Final Steps to Project Inauguration: PT DESA AIR CARGO

➢ **Check List for Business Feasibility**

1. Final Quotation of CAPEX for installation of Hybrid Roof-top PV Solar System
2. Clarification of Boiler/Chiller/Equipment to be connected with PV Solar System
3. Clarification of Capacity for Battery to be connected with PV Solar System
4. Clarification of NEED of Feed-In-Tariff
5. Preparation for Due-diligence to apply for JCM Scheme

➢ **Check List for MRV Management**

1. Clarification of current monitoring system for electricity consumption at the factory (by each function level or by total factory level?)
2. Clarification of current business structure and capability for MRV Management (Need commitment for MRV Obligation)

【Finetech Co.】

FINETECH

(3) Waste/Wastewater Treatment Projects (October 21, 2015)

① Meeting with PT Desa Air Cargo (DAC) (9: 30 a.m. - 12: 00 pm, December 2, 2015)

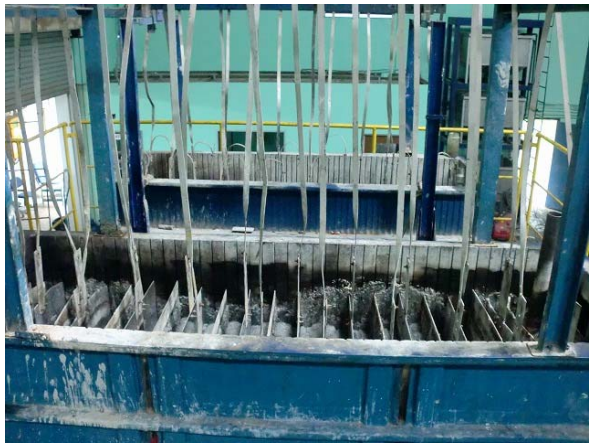
Summary

PT DAC (industrial waste treatment company, introduced by BIFZA) and AMCON Co. met to discuss topics including the potential to introduce high-efficiency sludge dewatering equipment, and the expected merits of doing so.

Under the current wastewater treatment process, with monthly labor costs at 250,000 yen (6 workers required) and electricity costs at 40,000 yen, the aim is to improve the overall treatment process by introducing microbubble equipment and high-efficiency sludge dewatering equipment.

To confirm the suitability of the microbubble equipment, small microbubble equipment (with transformer) was brought to the site, and a test conducted relating to the flocculation and separation effects for solids in industrial wastewater. A test of the separation effect was also conducted by injecting a coagulant (aluminum-type PAC).

Existing industrial wastewater treatment equipment



Existing industrial wastewater treatment equipment

Existing industrial wastewater treatment equipment (belt press)

Product suitability testing

Industrial wastewater

Test equipment brought from Japan

Testing in progress

Testing in progress

② Presentation materials 【AMCON Co.】

Company Profile

【AMCON Co.】

AMCON INC.

VOLUTE®

Company Profile

Address : 1926 Nippa-cho, Kohoku-ku, Yokohama, Kanagawa, 233-0057, JAPAN
Foundation : November 22, 1974
Capital Found : JPY 80,000,000
URL : http://en.amcon.co.jp/

Line of Business :
- **Development, manufacturing and sale of wastewater treatment systems, Chemicals**
- Water and Wastewater Analysis Department
- Maintenance of plumbing systems for residential and commercial buildings

Subsidiary: Czech Republic, China

AMCON provides;

AMenity &

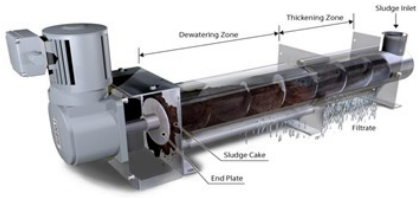
CONvenience

through our uniquely designed equipment
for applications of both municipal and industrial,
water and wastewater treatment.

AMCON
3

AMCON
VOLUTE®

Main Product -
Volute Dewatering Press



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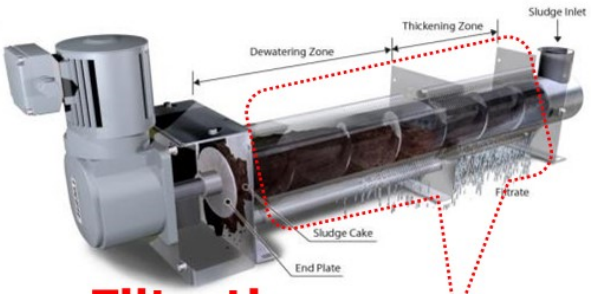
【AMCON Co.】

Volute Dewatering Press

VOLUTE®

Volute Technology Information.

Volute Dewatering Press is the so-called Multi-Disk-Plate Screw Press with unique "Volute" technology developed by AMCON, enabling stable SLUDGE dewatering with less operational cost. As of today, installation amounts to more than 2600 units in 62 countries worldwide, covering both municipal and industrial sector.



Advantages

Clog-Free System

Suitable for Oily Sludge

Energy Saving

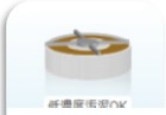
Water Saving

Filtration Body can Move

VOLUTE®

For Various Application

Easy Operation



Low Concentration Sludge

AMCON

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VOLUTE®

Location of Track Record in Indonesia

AMCON

6

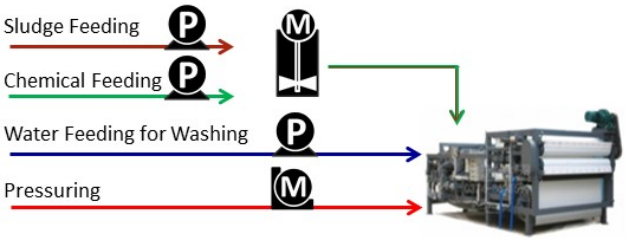
【AMCON Co.】

Case Study – Energy Saving Comparison with Belt Press

【AMCON Co.】

Comparison Energy Saving VOLUTE®

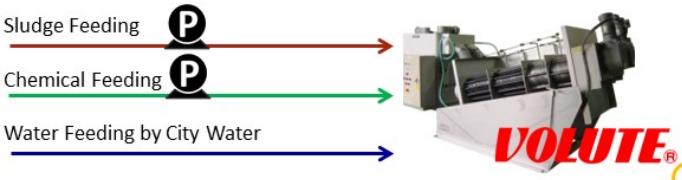
Belt Filter Press Sludge Treatment Flow Chart.



Power Consumption
Type: Belt 1 meter wide
Driving Motor: 1.5 kWh
Hydraulic Power Unit: 1.5 kWh
Water Feeding Pump: 10 kWh
Flocculation Tank Motor: 0.5 kWh
Total : 13.5 kWh

Annual Consumption
84,240 kW

AMCON VOLUTE Sludge Treatment Flow Chart.



Power Consumption
Type : ES-301 (ϕ300 x 1)
Driving Motor : 0.4 kWh
Hydraulic Power Unit : No-Use
Water Feeding Pump : No-Use
Flocculation Tank Motor : 0.4 kWh
Total : 0.8 kWh

Annual Consumption
4,992 kW

Inlet Sludge Volume is 3 m3/H@SS:1%.
Operation cycle od dewatering equipment used for the above calculation is 20 H/D, 6 D/W, 52 W/Y.

AMCON

VOLUTE®

JCM scheme
Proposal document
For PT. Desa Air Cargo Batam

AMCON

【AMCON Co.】

Summary

VOLUTE®

Existing process:

1. The Electrolytic Flocculation Tank (following EFT) replace the Microbubbler Equipment at the before stage of Dewatering equipment.

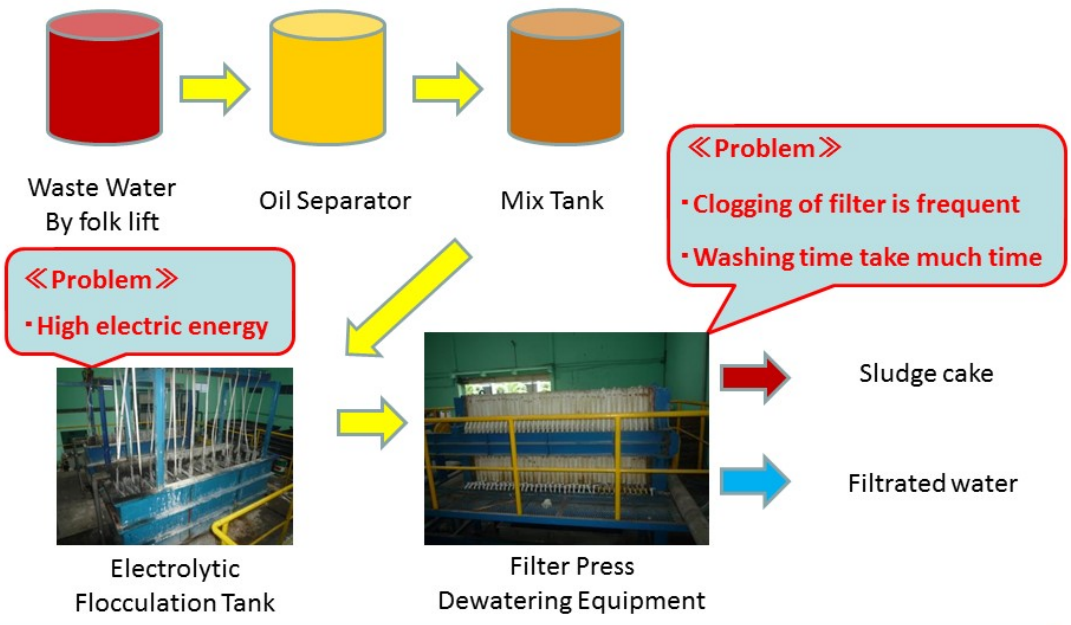
2. Existing filter press replace Volute Dewatering Press

We take FS investigation for the purpose above two contents.

AMCON

Existing Process Flow

VOLUTE®



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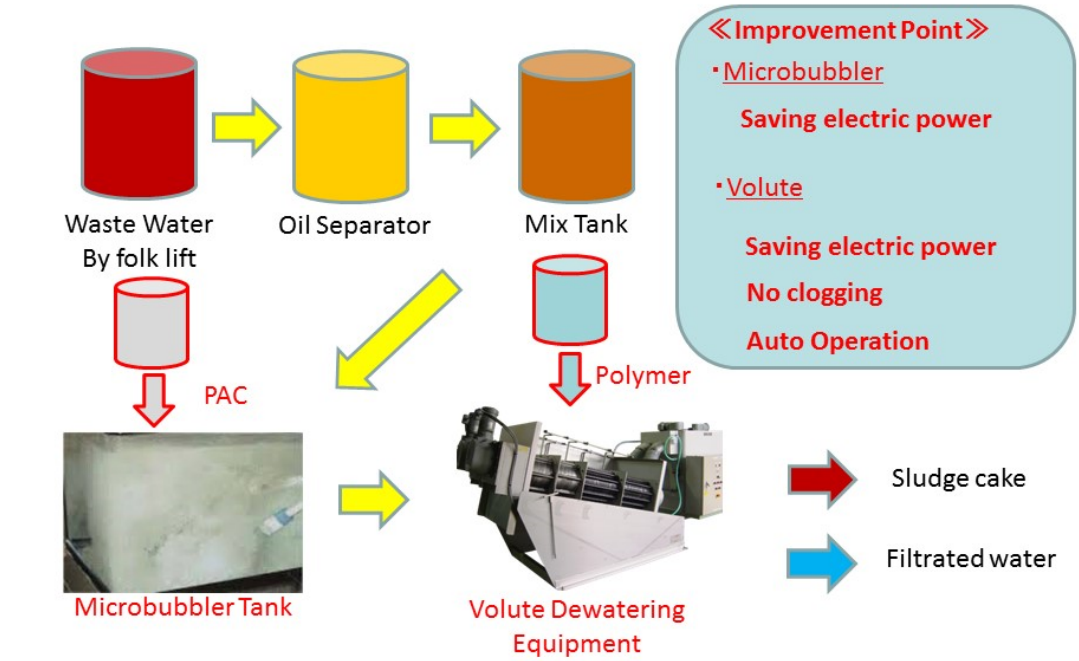
【AMCON Co.】

Proposal Flow



AMCON

Advantage Point

(From previous page)

- Microbubble equipment is a safe and save electric consumption, being compared with EFT
- By replacing Filter Press into Volute Dewatering Press results in achievement of easiness of operation and reduction of washing time

AMCON

【AMCON Co.】

Reduction

VOLUTE®

- Power Consumption reduction effect

  ⇒ 45,840 kWh/year

- Quantity of CO2 reduction effect

  ⇒ 40 t-CO2/year

VOLUTE®

Thank you for your kind attention

Terima kasih atas perhatian Anda

Squeeze Sludge Squeeze Cost!!

3.4 Final Report Meeting

A final reporting meeting with Japanese companies and local government and companies was jointly organized by the City of Batam, BIFZA, and the Y-PORT Center (Yokohama City, IGES).

The establishment of the task force team was announced, involving the City of Batam, BIFZA, City of Yokohama, and IGES, with the participation of three private sector companies from Japan, the JCM Secretariat from Indonesia, and BIFZA from the City of Batam. That was followed by information sharing, including a report on the results of this feasibility study, and then a common understanding was developed among the participants with regard to promotion of cooperation for project formation and realization of projects relating to JCM equipment subsidy projects.

Prior to the seminar, a courtesy call was made to Batam City Hall to the current mayor, and the current deputy mayor (to become the new mayor in March), to explain the overview of city-to-city collaboration and JCM project formation, etc.

(1) Agenda (9: 00 - 11: 50 a.m., January 20, 2016)

9: 00 AM-9: 15	**Opening Remarks** ● Ahmad Dahlan (City of Batam) ● Jon Arizal (BIFZA) ● Tetsuya Nakajima (City of Yokohama)
9: 15 AM-10: 00	**Background information** ・ Updates of the JCM in Indonesia ● Dicky Edwin Hindarto (Head of Indonesia JCM Secretariat) ・ Batam Towards Green and Resilient City ● Azril Apriansyhah (Head of BAPPEKO, City of Batam) ・ Batam Towards Smart City ● Imam Bachroni (BIFZA) Q & A
10: 00 AM-10: 15	**Outline of the programme** ・ Flagship projects and way forward toward smart and green island of Batam under city-to-city collaboration - Introduction of city-to-city collaboration between Batam and Yokohama - Introduction of the JCM and its financing program - Draft proposals from Yokohama side ● Yasuaki Nakamura (Yokohama) ● Kenji Asakawa (IGES) Q & A
10: 15 AM-10: 30	Coffee break
10: 30 AM-11: 30	Final report of the feasibility study ・ Energy-saving operation of A/C system at Hang Nadim Airport ● Erwin Avianto (iFORCOM) ・ High-efficiency treatment system for industrial waste-water ● Buntaro Shiono (AMCON) ・ Waste-to-Fuel plant for industrial waste ● Kevin Sagawa (Finetech) Q & A
11: 30 AM-11: 35	**Announcement of establishing "Task Force Team for the city-to-city collaboration between Batam and Yokohama"**
11: 35 AM-11: 45	**Closing Remarks** ● H. Muhammad Rudi, SE, MM (City of Batam) ● Jon Arizal (BIFZA) ● Tetsuya Nakajima (City of Yokohama)

(2) Participants from Japan (honorifics omitted)

(City of Yokohama) Tetsuya Nakajima, Kazuhito Taketo, Yasuaki Nakamura (IGES) Kenji Asakawa, Sudarmanto Budi Nugroho (FINTEC) Motoyuki Okada, Kikuo Sagawa (iFORCOM Tokyo) Ryosuke Itoh, Erwin Avianto (JUSTEC) Kotaro Doi (PCKK) Akifumi Nishihata

(3) Meeting Summary (honorifics omitted)

- At the start of the meeting, after acknowledgment of participants from the City of Batam and from Japan, and acknowledgment of the Secretariat, Director Nakajima from the City of Yokohama expressed appreciation to the City of Batam and BIZFA locally for their cooperation, which made it possible to have three concrete proposals (energy saving, water treatment, renewable energy) so soon after the signing of the Letter of Intent between the City of Batam and the City of Yokohama in May 2015.
- Dicky, Head of the Indonesia JCM Secretariat, said that it was significant that three JCM city-to-city collaboration projects (Batam and Yokohama, Bandung and Kawasaki, Surabaya and Kitakyushu) were underway in Indonesia, and that it was hoped that JCM projects would be registered.
- Next, Atika of the Indonesia JCM Secretariat, explained that the JCM Secretariat also had a role of introducing local companies to Japanese companies that were seeking Indonesian counterparts, that the Secretariat could facilitate consultation for companies that had issues about the development of JCM projects, and that it wanted to increase not only energy conservation but also renewable energy projects, etc.
- Imam of BIFZA said that for Batam, ideas for the realization of a smart city were very important, and that he looked forward to continued cooperation between Batam and the Y-PORT Center.
- Mr. Nakamura of the City of Yokohama and Mr. Asakawa of IGES said that the City of Batam was Y-PORT's first cooperation partner, and that they hoped to formulate JCM projects soon, as flagship projects of JCM city-to-city collaboration.
- Mr. Sasakawa of FINTEC explained that in the course of discussions about a waste to energy project and photovoltaic power generation project with an industrial waste treatment company (PT Desa Air Cargo), the CO2 emission reduction benefits were large, but for projects with high initial investment costs, use of the JCM equipment subsidy would be effective.
- During the question and answer session, BIFZA personnel asked about the expected numbers for energy efficiency in projects where air conditioning equipment energy efficient systems were installed in the Hang Nadim Airport terminal building. Mr. Itoh of iFORCOM Tokyo responded that there could be a variation of 10 to 20 percent for the target equipment, but for most equipment, actual measurements of energy efficiency after system installation exceed prior projections of energy efficiency.
- After announcing the establishment of the Task Force Team consisting of the City of Batam, BIFZA, City of Yokohama, and IGES, Dendi Purnomo (Head of Environment Management Authority) announced the conclusion of a successful meeting.

Courtesy call to Mayor Dahlan, City of Batam

Courtesy call to Deputy Mayor Rudi, City of Batam

Workshop (Opening Speech by Director Nakajima)

Workshop (Group Photo)

Workshop (Presentations by City of Yokohama and IGES)

Workshop (Announcement of Creation of Task Force)

Workshop (Presentations by Small and Medium-sized Enterprises from City of Yokohama)

Workshop (Q&A from the Floor)

4. Technical Considerations

4.1 ESCO, Energy Saving Projects

(1) Project Plans and Details

Because the City of Batam has been designated a Free Trade Zone (FTZ), an advanced transportation infrastructure has been developed here, and as a part of that, the Hang Nadim International Airport has a runway over 4,000 meters long, comparable with Jakarta and Bali.

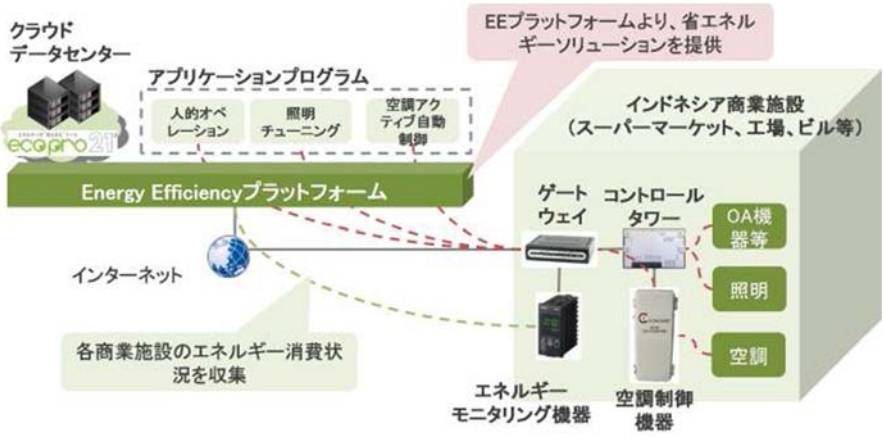
According to the Hang Nadim Airport Authority, which operates the airport (under the jurisdiction of BIFZA), high electricity costs are an issue of concern, and since the air conditioning systems account for a large share of total electricity consumption, there is a large need for energy conservation with those systems. In addition, the turbo chillers, which are at the core of the systems, were upgraded in recent years, so it is expected that they could be operated in a way that conserves energy.

Thus, there is to be a discussion about plans to introducing systems for energy-conservation operations for the Hang Nadim International Airport's air conditioning systems. If as a result electric consumption can be reduced, it will be possible to reduce greenhouse gas emissions from thermal power plants.

(2) Effectiveness and Efficiency of the Projects

All of the power plants belonging to PLN Batam, which supplies electricity in the City of Batam, uses fossil fuels as their source of electricity, including coal and natural gas. Thus, if demand for electricity can be reduced, the amount generated can also be reduced, which will reduced GHG emissions, and also reduce the emissions of air pollutants arising from coal and other fuels burned at the power plants.

iFORCOM's electricity cost reduction service is based on quantification and analysis of electricity usage (eco-kaizen21) and consulting to improve efficiency of electricity usage (eco-kaizen work), and it implements projects by installing electricity measuring devices and offer consulting. Because very little time is required from start until implementation, it is possible to generate credits quickly.



* General system design concept

(3) Suitability of Project/Technology, Feasibility, Innovativeness, Potential for Replication/Expansion

Nowadays, the need for energy conservation in emerging economies like Indonesia is rising for various reasons, including reductions in energy subsidies. However, due to a low willingness to invest in energy conservation, it is essential to offer solutions that involve only low initial investment costs, by minimizing the use of fully automatic, high performance, high cost hardware, and instead emphasize an energy-conserving style of operations that -- to the

extent possible -- improves the human operations of equipment. Also, in order to achieve an energy conservation effect, it is crucial to "localize" in a way that is compatible with local characteristics.

These proposals create a platform for the optimal approach to promotion of energy conservation in a way that response to user needs, conforming to local characteristics. More specifically, it is possible create and demonstrate a platform for the optimal approach to energy conservation in the target area, by making use of (1) Japanese-developed knowhow about how to develop "rules" (operating procedures) to improve energy efficiency (air conditioning, lighting, etc.) through human operations, and to comply with those rules, knowhow to design incentive schemes based on behavioral science, and (2) in the appropriate places, knowhow that applies automatic control (e.g., active automatic control of air conditioning) using information technologies and not depending on specific vendors.

iFORCOM has more successfully introduced this approach at over 2,000 facilities in Japan, and also at many facilities in Indonesia, including buildings of Indonesia's Energy and Resources Ministry, as well as shopping malls, factories, and office buildings. iFORCOM typically achieves 10-20% improvements in energy efficiency, and is confident in its ability to produce results.

This approach is innovative because it not only involves monitoring of electricity consumption, but also, through consulting services, establishes optimal rules (operating procedures) and conducts operational management by establishing schedules, all in pursuit of the best possible energy-conserving operations.

In the City of Batam, besides the airport terminals, numerous other facilities have centralized air conditioning systems, including ferry terminals, shopping malls, and hotels. Also, BIFZA is in a position to provide building guidance as it is involved in issuing construction permits for buildings, so for buildings to be constructed in the future, the current project(s) could be used as innovative case studies, and could play a role in the further deployment of energy-conserving approaches.

(4) Implementation of Study

Here we discuss a study of the state of electricity use at the Hang Nadim International Airport, estimate the possible reduction in electricity consumption (which translated into CO2 emission reductions), and consider the potential for project formation (i.e., the benefits of proceeding).

(Major Items Planned for Study)

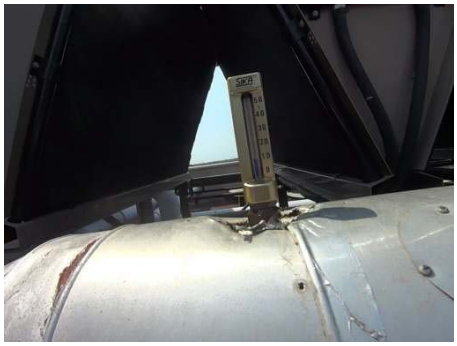
・Confirmation of location/placement of electrical measurements devices (power receiving equipment, etc.)

・Confirmation of status of air conditioning equipment and operations

・Confirmation of past electricity consumption

・Estimation of project benefits (reduced electricity consumption, investment performance, CO2 emission reduction)

(5) Study

Target equipment	Status of air conditioning equipment and operations
Chillers	・Installed units: 8 ・Compressors: 6 ・Installed environment: Rooftop, with adequate spacing ・Operating times: Daily 6: 00 - 21: 00 ・Temperature: Delivery 7℃, return 9℃ ・Inverters: Yes, 45 - 50 Hz Note: Reductions in electrical consumption can be expected by improving operating methods.  <View of chiller>  ＜Inverter＞  <Temperature of refrigerant>

Target equipment	Status of air conditioning equipment and operations
Chiller recirculation pumps	・Installed units: 24 3 units per chiller (of which 2 are operating) ・Pump capacity: 22 kW ・Installed environment: Rooftop, with adequate spacing ・Hours of operation: Coordinated with chillers ・Inverter: None Note: Reductions in electrical consumption can be expected by installing and controlling inverters.  <Chiller recirculation pumps>  <Pump manufacturer's information plate>  <Pump control panel>

Target equipment	Status of air conditioning equipment and operations
Air handing units (AHU)	・Installed units: 16 2 units per chiller ・Installed environment: Rooftop, with adequate spacing ・Hours of operation: Coordinated with chillers Temperature: Delivery 7℃, return not known (thermometer not functioning) ・Inverter: None Note: Reductions in electrical consumption can be expected by improving operating methods.  <Air handling unit>  <Temperature of refrigerant (not working)>  <AHU control panel>

Target equipment	Status of air conditioning equipment and operations
Outdoor-air processing units	・Installed units: 4 ・Operating times: Daily 6: 00 - 19: 00 ・Capacity: 45 PK ・Filter condition: 10 mm thickness of dust present ・SA takes air from ceiling area Note: Reductions in electrical consumption can be expected by improving operating methods.  <Appearance of outdoor-air processing unit>  <Ceiling area (insulation is present)>  <Filter (with dust)>

Target equipment	Status of air conditioning equipment and operations
Power receiving equipment	・Receiving capacity: 4.5 MkW ・2 power receiving units Note: Measuring devices need to be installed in order to ascertain and analyze electricity usage.  ＜Electrical room＞  ＜Power meter (1)＞  ＜Power meter (2)＞
Other	・Electricity usage data received: Electricity usage in past year: 12,032,240 kW

(7) Consideration of project feasibility

Solutions to be Consideration of	For adoption of the following solutions: It appears possible to achieve reductions in electricity ・Ascertain and analyze electricity usage ・Consulting services to improve operations in relation to in ・Inverter control of chiller recirculation pumps
by adoption of in electricity Estimated reduction	Electricity usage in past year: 12,032,240 kW Electricity usage for air conditioning: 3,040,062 kW → Reduction estimate: 3,040,062 kW x 13.6% ＝ 413,448 Electricity usage in offices, etc.: 7,283,394 kWh → Reduction estimate: 7,283,394 kW x 2.97% ＝ 216,316 Electricity usage in recirculation pumps: 1,708,784 kWh → Reduction estimate: 1,708,784 kW x 33% ＝ 568,374 Total reduction (sum): 1,198,138 kWh/year For annual electricity usage, a reduction of approximately 10% is expected. If electricity unit rate is 11.3 yen/kWh (based on historical data), a savings of approximately 13,538,959 yen/year is expected.

(8) Negotiations toward Project Development

The next steps would involve negotiations with the relevant authorities of Hang Nadim International Airport and BIFZA, the responsible agency, toward development of this project. The following schedule is proposed and in the process of being negotiated toward the realization of the project, based on the intention to utilize the JCM equipment subsidy program in fiscal 2016.

Adoption schedule (proposed)	
Feb. 2016	Repeat site studies in order to prepare official estimates
May 2016	JCM equipment subsidy program applications accepted
June 2016	JCM equipment subsidy program applications: Decision
June 2016	Official contract
July 2016	Begin adoption of solutions
Nov. 2016	Completion of adoption of solutions

4.2 Renewable Energy Projects

(1) Background and objectives

- In this context, the City of Batam government is looking to the City of Yokohama, which has advanced environmental and energy technologies, for cooperation relating to low-carbon technologies, and in 2015 signed a Letter of Intent relating to technical cooperation between the two cities. The City of Yokohama has established the Y-PORT Center to promote joint projects with partners including companies and international organizations in the city, in the context of the Y-PORT (Yokohama Partnership of Resources and Technology) Project as a core program of the city. Last year, the city also launched the Yokohama Urban Smart Solution Alliance (YUSSA) as an alliance of the city's mainly small- and medium-sized companies that participate in the Y-PORT Center. Based on the above, for developing countries that are engaged in city-to-city collaboration with the City of Yokohama, it is possible to have a comprehensive approach to assistance in the environmental and energy sectors, and one can anticipate progress in initiatives to develop projects that rely on a collaborative value chain of companies in the alliance in the supporting country.

- Finetech Co. has actively served as joint chair of the Y-PORT Center's YUSSA since it was established, and as for which of the company's environmental and energy technologies would be effective to introduce and in what way, Finetech has built a collaborative relationship with the City of Batam government and BIFZA, and has also engaged in this study with an emphasis on collaboration with the BIFZA Japan office, which has its own network.

FINETECH: Member Company of Y-PORT CENTER
Yokohama Urban Smart Solution Alliance

『第4回アジア・スマートシティ会議』（2015年10月横浜市 コンチネンタルホテル）

Smart Green Park 構想を発表

Yokohama Urban Smart Solution Alliance

Over 10 Leading Private SMEs in Yokohama, including **FINETECH**, form up an alliance under the roof of Y-PORT CENTER for cities in Asia and the world.
FINETECH plays an responsible role as Deputy Chair Company.

Y-PORT CENTER

Finetech

(2) Meetings with Batam Government, BIFZA, and Representatives of Batam Businesses

- The 4th Asia Smart City Conference, hosted in October 2015 by the City of Yokohama in the Minato Mirai district, was attended by government personnel from the City of Batam and BIFZA, as well as PT Desa Air Cargo (the City of Batam's sole intermediate treatment waste treatment contractor). Finetech also interviewed the persons in charge when it participated in the first study tour to Batam island in August 2015, explained its environmental energy technologies, and gained an understanding of the situation. Timed with participation in this meeting, and as a part of this study, based on a strong request from Batam government personnel, a schedule for a study tour was arranged for them on October 22, 2015, to see the Smart Green Park being developed by Finetech. Smart Green Park (for which the company has a registered trademark) is a community showcase site aimed at operating as much as possible in an off-grid environment by utilizing a variety of renewable energy and related technologies developed by Finetech, and managed/controlled by Finetech's core technologies in monitoring and control functions.

Bird's eye view of Smart Green Park, location of Finetech Co.'s North Kanto plant

- The renewable energy and biomass energy plant technologies being used at Finetech's Smart Green Park are able to maintain stable operation of facilities in the park, with a (1) mega-class solar farm (photovoltaic panel installation), (2) waste-to-energy electricity generation plant that

uses coffee grounds and other organic waste (biomass gasification power plant), and (3) semi-carbonization equipment (torrefaction: equipment produces fuel from unused biomass, including organic waste). In addition, electricity is also generated by floating solar power generation equipment, micro hydro, and small wind turbine. All of this electricity is monitored and controlled by "supervisory control and data acquisition" (SCADA) control technologies, and connected with grid electricity.

- During the discussion at the time of the Batam government personnel's study tour to the Park, some of the main comments they shared were that for Indonesia, as an archipelagic nation of many islands, (1) for energy infrastructure, it is crucial to create a decentralized electrical infrastructure that can be self-contained on each island, (2) ideas and technologies to recycle waste and re-use it effectively as energy would be very valuable, considering the need to use the finite land space effectively, and (3) if such initiatives can be initiated in Batam, it may be possible to use them as a model to deploy similar approaches on other islands of the archipelagic nation. In that context, it was indicated that Batam would like to receive a proposal portraying an overarching conceptual vision for Batam Island based on the model of Finetech's Smart Green Park, and within that framework, clusters of projects that could be part of JCM schemes. In addition, rather than ending with a one-off initiative with a project based on the overarching concept, it was requested that planning be done in a way in which successive initiatives have generational continuity as projects in the JCM scheme, starting with the priority placed on ideas that are easier to tackle, then moving on to the next phase, and subsequent phases, gradually expanding the level of completion.

Study tour to Finetech's Smart Green Park, by Batam government personnel, October 22, 2015

Members of visiting mission:

Mr. Dendi Purnomo, Head of EMA, City of Batam

Mr. Dendi Purnomo, Head of EMA, City of Batam

Mr. Binsar Tambunan, Head of Environmental Planning, BIFZA

Mr. Binsar Tambunan, Head of Environmental Planning, BIFZA

Mr. Memet E. Rachmat, Head of Wastewater Management, BIFZA

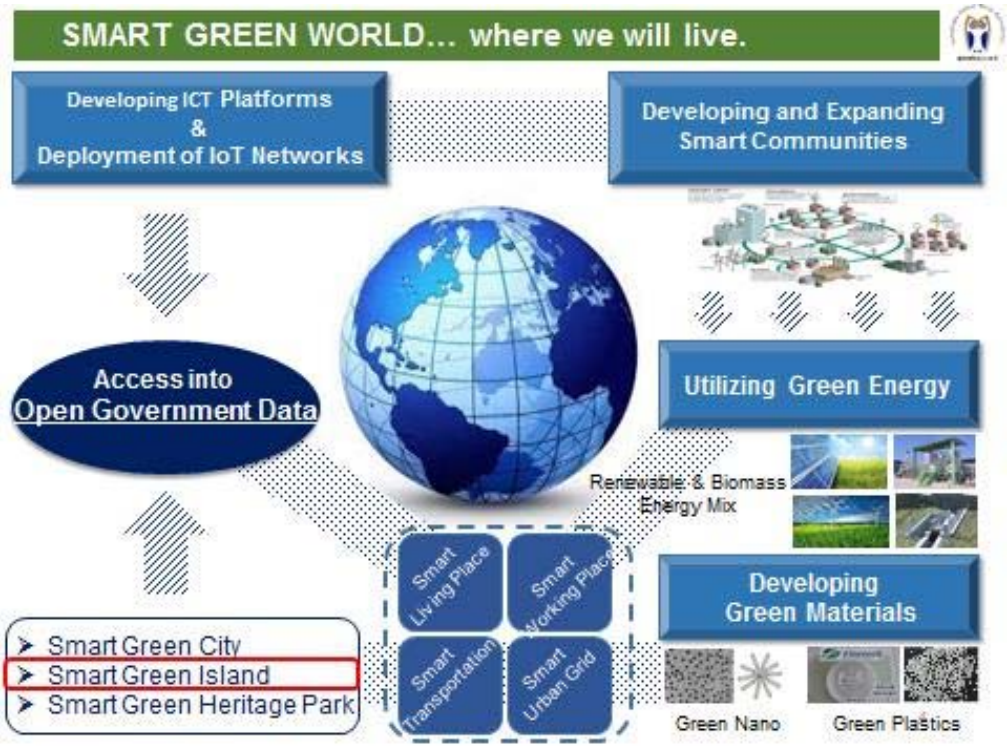
Mr. Memet E. Rachmat, Head of Wastewater Management, BIFZA

Mr. Kurniawan Chang, Head of PT Desa Air Cargo

Mr. Kurniawan Chang, Head of PT Desa Air Cargo

(3) Proposal from Finetech Co., Ltd., based on Batam Government Personnel Site Visit to Finetech's Smart Green Park

- After the study tour and visit, having received the indication that the Batam government personnel were interested in an overarching conceptual vision, Finetech proceeded to prepare the outline of a proposal. The company prepared the concept of a "Smart Green Island Park" focused on Batam, in the framework of a "Smart Green World" concept, which is an expanded version of the "Smart Green Park" (trademarked by Finetech Co., Ltd.) pivoting on the ASEAN region; and also began communications in collaboration with Batam government personnel. In addition, having learned that the Batam government was also considering a "Green City" concept, we received from City of Batam government personnel the idea of discussing integration of the ideas. (The vision proposal on the right was presented in detail by Finetech to the Batam government and BIFZA personnel during the December 2015 study tour and visit).



Overarching Concept of the "Smart Green World" Vision

a) Develop the Smart Community project on a platform of information and communication technologies (ICT)

b) As one corner of the Smart Community initiatives is the Smart Green Island Vision, which is an overarching concept focusing on Batam.

c) Two important pillars of the Smart Community project are the use of decentralized renewable energy and biomass energy, and the development of green materials with a focus on soft biomass.

d) In the above framework, develop a variety of project clusters (Smart Living Place, Smart Working Place, etc.)

e) As each project ends, effectively utilize the measured achievements and management/usage data that has been gathered, as Open Government Data (OGD).

"Smart Green Island Park" vision for Batam, based on the framework of the overall concept

- "BATAM Smart Green Island" vision, which serves as an overarching concept for undertaking JCM schemes, as presented by Finetech to the City of Batam government and BIFZA. This study's JCM project development cluster projects that Finetech would conduct would be under the "Smart Renewable Energy" and "Smart Working Place" categories, and an explanation of this overall vision and individual projects' development was presented accordingly during the plenary session with the City of Batam in December 2015, and at the final report meeting in January 2016.

(4) Potential for JCM Project Development by Finetech Co. based on the “BATAM Smart Green Island” vision.

- After the study tour to Finetech’s Smart Green Park by City of Batam government personnel on October 22, 2015, based on the “BATAM Smart Green Island” vision proposed by Finetech to the City of Batam and BIFZA government side, the City of Batam and BIFZA government side indicated an interest in a project development proposal specifically regarding Finetech’s environmental and energy technologies, and it was decided to put together project proposals from the perspective of a phased approach leading toward continued initiatives.

- Companies Visited by Finetech in Batam for Site Visits for Project Development

a) PT DESA AIR CARGO

Pt Desa Air Cargo is the contractor designated by the City of Batam government for intermediate water treatment, and is the only such contractor for the City of Batam. The company handles a large amount of waste from industrial parks and factories on the island, and its financial foundations are very solid. From this company, the highest priority request received by Finetech was to advance a way to install a hybrid-type photovoltaic power generation system on the roofs of company plants and find an alternative to grid electricity for the plants. Also, the company would like to supply photovoltaic electricity to supply part of what electricity needed at the neighboring PT Mega Green oil sludge recovery business, which the company’s head has invested in and manages. By doing so, the aim would be to reduce CO2 emissions in proportion to the reduction in electricity consumption from the central power grid, which uses coal and natural gas as its major fuels. (As for PT Mega Green, the firm’s boiler equipment is aging, so its replacement is an urgent task, and the firm is investigating project development as a JCM initiative.)

Also, based a site visit to Finetech’s Smart Green Park, Mr. Kurniawan, head of Pt Desa Air Cargo, indicated the desire to reuse his company’s waste materials and unused biomass as electrical energy, with a framework of Finetech’s waste-to-energy technologies. The company transports waste for treatment on the island of Java since it is not currently able to process some (e.g., waste from tobacco/cigarette processing plants, leftover construction wood, rubber, etc.), but aims to have waste treatment handled entirely on the island, in

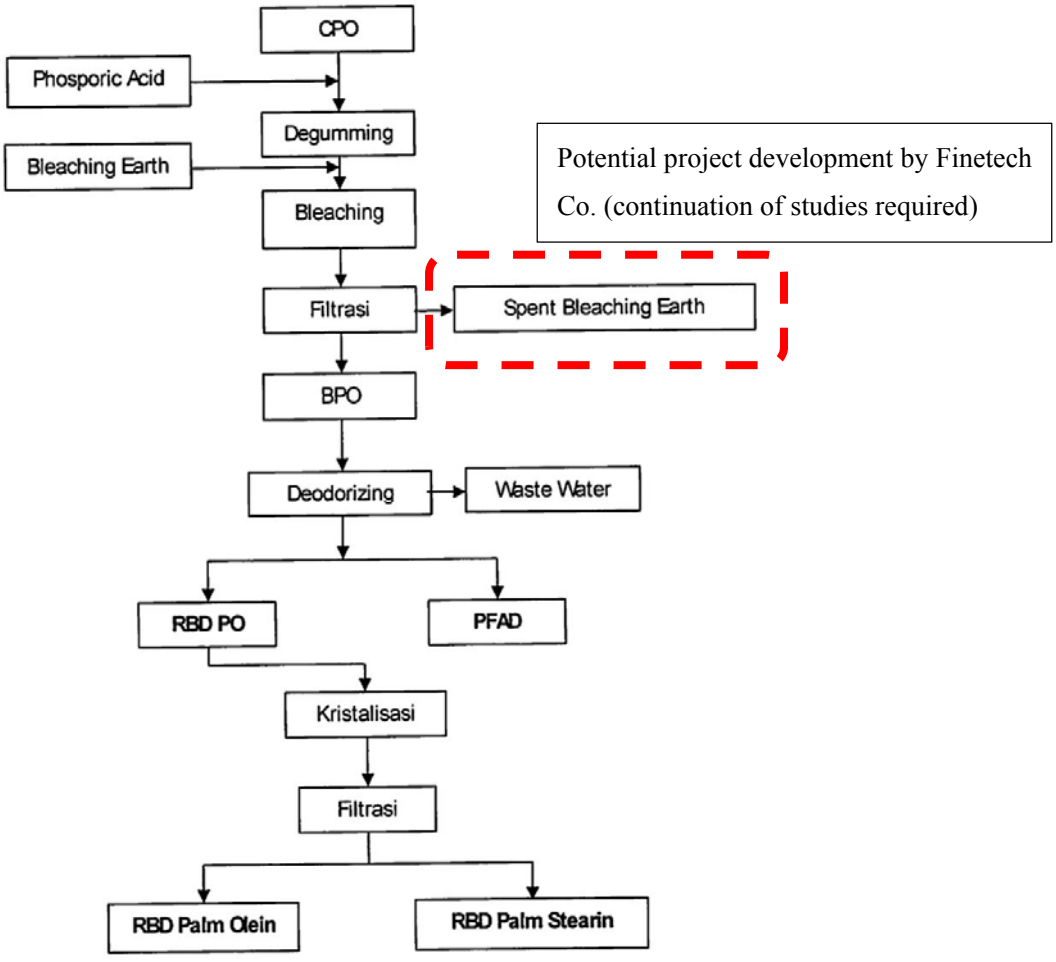
cooperation with the Batam government.

b) PT Musim Mus

Spent bleaching earth (residue)

In the process of bleaching palm oil, the PT Musim Mas palm oil refining plant located in Batam city generates approximately 1,500 tons per month of spent bleaching earth containing palm oil (the palm oil component of which could be used as a biomass fuel), which is disposed by a costly process that includes the use of drying and bacteria decomposing equipment on the factory grounds, followed by open dumping on the island. Meanwhile, the company is using diesel-powered electrical generators as a backup power source, as well as coal-fired boilers to generate steam needed for palm oil processing. In terms of project formation, Finetech's approach would be to use its technology to extract waste palm oil from the spent bleaching earth, to be able to use in mixed combustion in existing coal-fired boilers or diesel power generators, in order to reduce coal or diesel consumption, and thereby, reduce CO2 emissions.

Landfill disposal of spent bleaching earth residue disposed on southern part of the island after palm oil refining



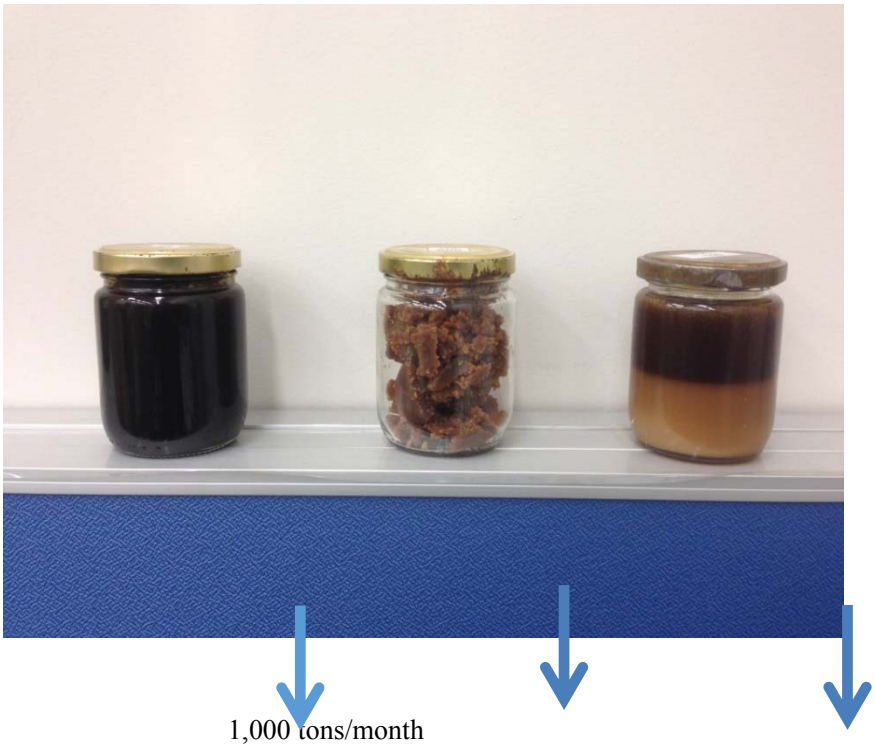
Flow Chart Proses Refinery & Fraksinasi

Processes used by PT Musim Mus for treatment of spent bleached earth

c) PT Ecogreen Oleochemicals

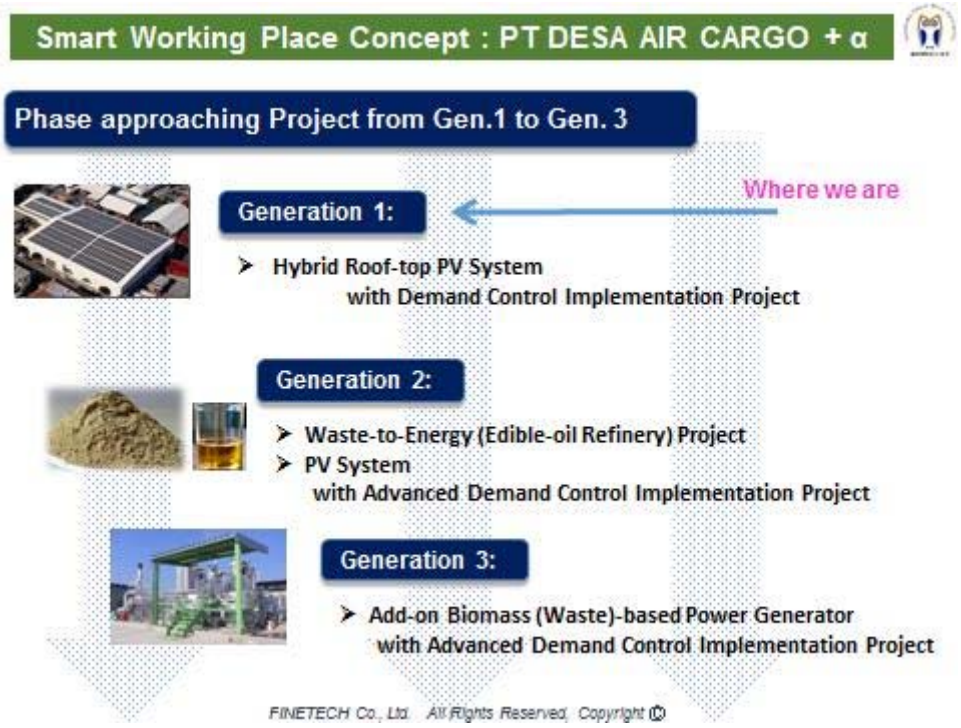
The company owns the Indonesian plants of the Ecogreen Group, a natural fatty alcohol manufacturing company headquartered in Singapore, with plants located mainly in Sumatra that refine and manufacture pressed palm oil, to produce saturated fatty acids, unsaturated fatty alcohols, oleic acid, and refined glycerin. In the company's waste management, the glycerin waste material is a major challenge, as it is treated as dangerous waste in the government's waste-related regulations, making it difficult to dispose in landfill as final disposal. The company is currently at the stage of looking at further treatment in order to reuse the extracted oil.

Glycerin waste emitted from production processes



- Phased Approach to Project Development

At the plenary meeting with City of Batam government personnel in December 2015, Finetech presented and explained a phased approach, with three project phases as steps for JCM project development. This approach was based on the views confirmed through site visits and discussions at Finetech's Smart Green Park by City of Batam government personnel on October 22, 2015, and by site visits and discussions with the possible project partners, under the under the framework of the BATAM Smart Green Island vision, as the overarching concept proposed by Finetech. Finetech's preference would be to continue working with PT Musim and PT Ecogreen Oleochemicals, which need more time for analysis and technology improvements, while proceeding first with initiatives for rooftop hybrid photovoltaic power generation systems with PT Desa Air Cargo, which has the greatest CO2 emission reduction potential, and for which there have been requests from the City of Batam and BIFZA administration.



Finetech's Approach/Proposal as Presented during Plenary Session in Batam on December 3, 2015

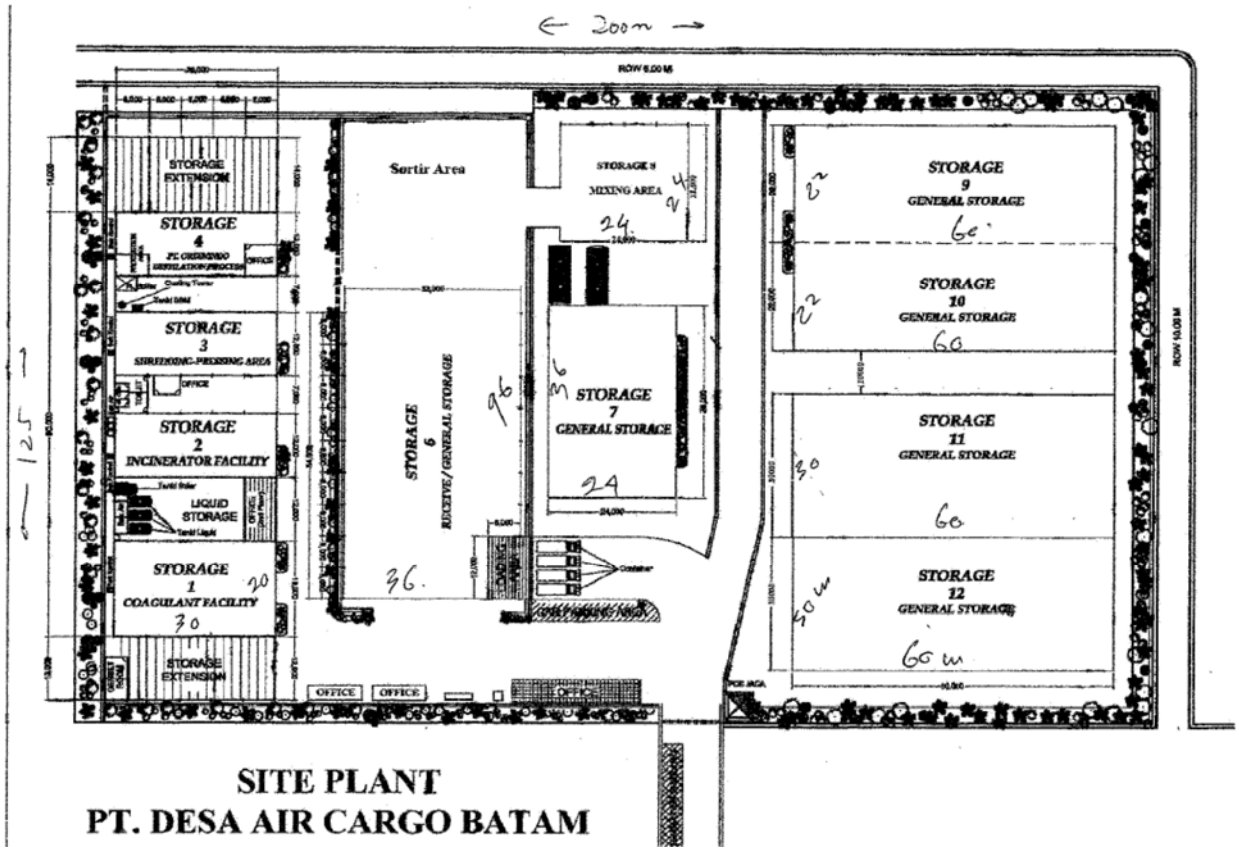
※ Phase 1: Development of rooftop hybrid photovoltaic power generation systems with PT Desa Air Cargo

Phase 2: Extraction/processing and re-use of oil content of spent bleaching earth

Phase 3: Decentralized power sources through effective use of combined (hybrid) photovoltaic and waste-to-energy (including re-use of oil content, mentioned above) electricity generation

(5) Rooftop Hybrid Photovoltaic Power Generation Systems with PT Desa Air Cargo

① Layout of photovoltaic panels for installation on rooftops of PT Desa Air Cargo plants



② Proposed model for installation, specifications, etc.

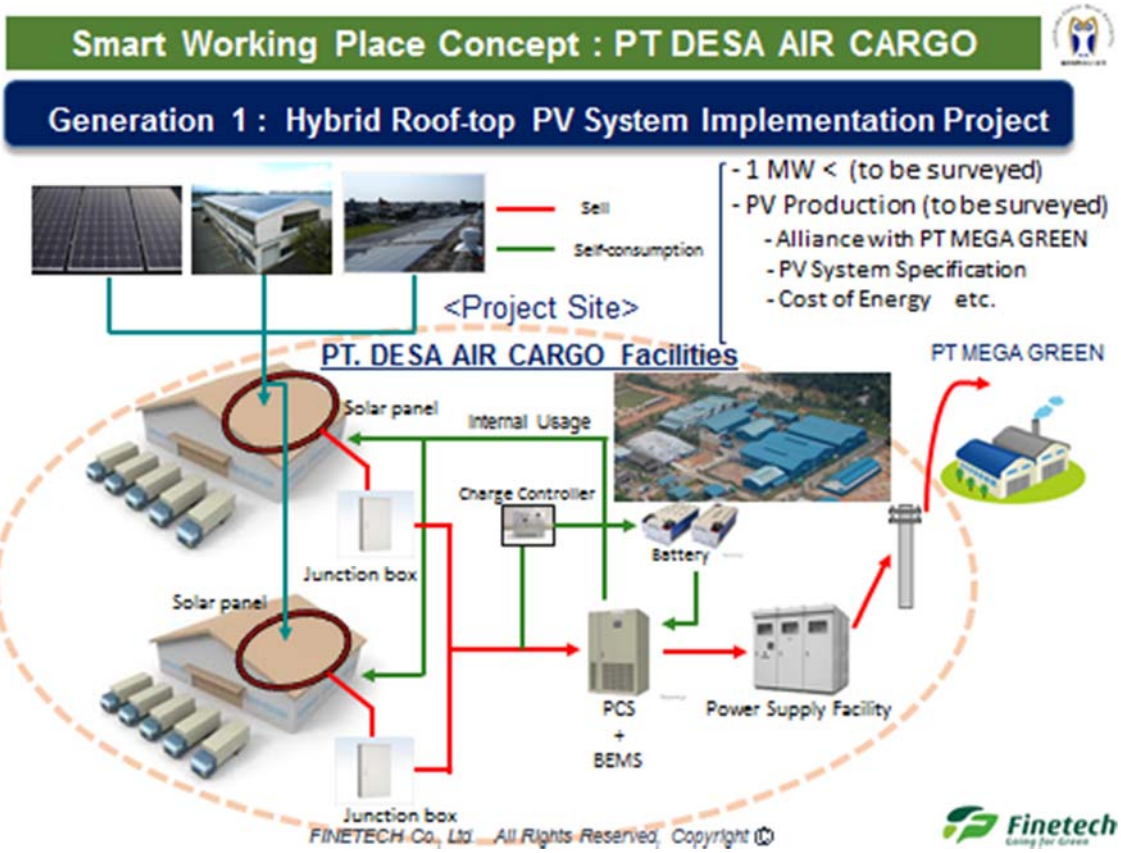
Note: Specifications, etc.

- Potential panel capacity: Max 1 MW
- Current electricity purchase price: Factory utility rates IDR 1,500/kW
- Electricity selling price (possible by FIT): IDR 1,800/kW to 2,000/kW
- Current monthly electricity charges: IDR 52 m/month
- Utilize electricity more efficiently, with advanced EMS management
- Utilize the system as local source of electricity in disasters

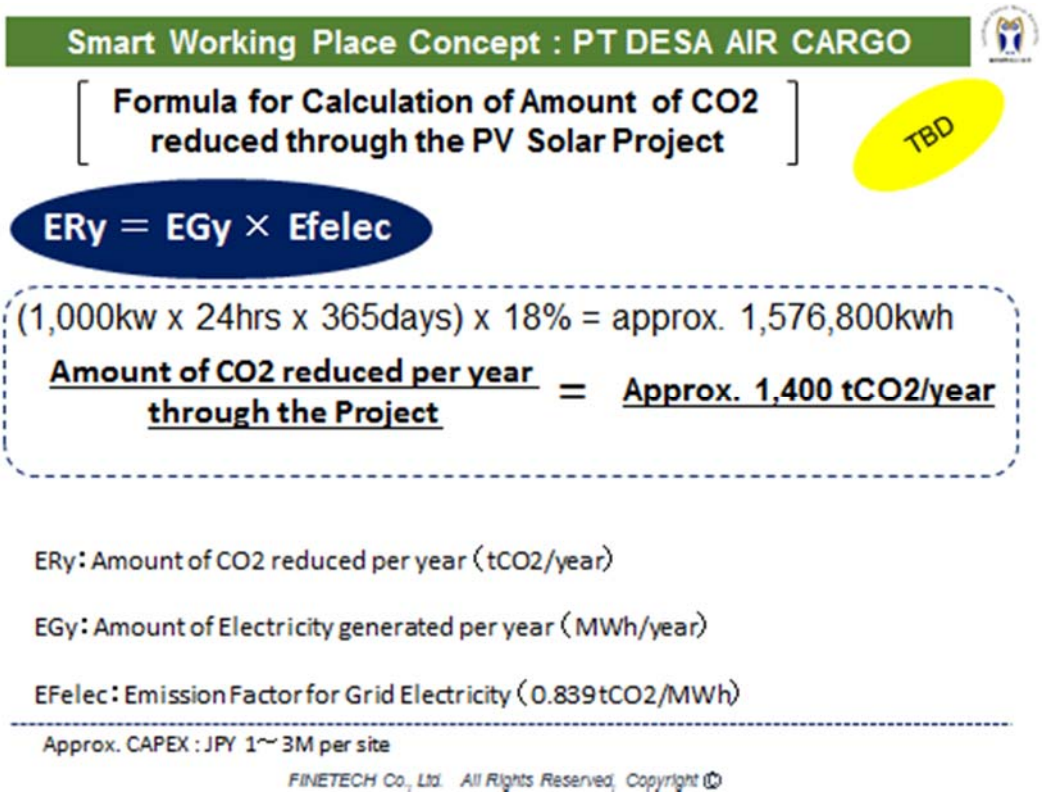
Note: Related potential

- Installation of photovoltaic panels on nearby PTMega Green plant.
  Consider the potential to share/trade electricity generated, by co-installation of PV panels with PT Desa Air Cargo

  .
- At the same time, consider replacing aging boilers at neighbouring PT Mega Green plant.



③ CO2 Emission Reduction Benefits, etc.



Note: As mentioned above, it is possible to boost the CO2 reduction effects by also considering installing photovoltaic panels on some rooftops of neighbouring PT Mega Green (a company that recovers oil sludge from tankers), which is invested in and jointly managed by PT Desa Air Cargo head Kurniawan Chang, to enable the exchange/trade of electricity to meet the demand of the plants. At the same time, the company is examining the possibility of a parallel initiative to replace aging boilers at the PT Mega Green plant.

(6) Future Actions for Making an Application to the JCM Scheme

① During a visit at the time of the final report to the Batam government in January 2016, it was confirmed with PT Desa Air Cargo's Head, Kurniawan, that there was basic consent relating to installation of this project's hybrid-type photovoltaic system installation, and to proceed with detailed discussions including coordination with relevant parties relating to formal procedures for an application under the JCM scheme.

② Regarding the composition of an International Consortium, at the time of the said site visit in January 2016, the basic details were explained to PT Desa Air Cargo's Head, Kurniawan, and agreement achieved regarding its composition. Note that this company is designated by the City of Batam government as an intermediate waste processing contractor, and is the only such contractor in the City of Batam. The company handles a large amount of waste from industrial parks and factories on the island, and its financial foundations are very solid.

③ Moving toward an application under the JCM scheme, PT Desa Air Cargo's Head, Kurniawan, is aware of the requirement to prepare a portion of local financing, and efforts are to be advanced to prepare and discuss the potential for this financing, including the potential for linkages with funding schemes from the Indonesian or Batam governments, or for low-interest loans from international financial institutions such as the Asian Development Bank. Concrete discussions are also to proceed in order to create the opportunity to meet with the GEC as soon as possible.

④ Regarding the installation of a hybrid rooftop photovoltaic system, because the expected life is over ten years, it has been explained to PT Desa Air Cargo's Head, Kurniawan, that in principle it will not be possible to rebuild the rooftop installation's building for that period of time, and he has indicated his understanding.

⑤ Understanding has also been achieved regarding establishing the systems to implement MRV, as well as responsibilities and obligations, and PT Desa Air Cargo is expected to make the institutional preparations for project implementation.

Fintech Co. has also reported regarding the directions for JCM project development by Finetech for PT Desa Air Cargo, on January 19, 2016, at the time of a report and visit to the Mayor of Batam, together with IGES and the City of Yokohama government.

4.3 Waste/Wastewater Treatment Projects

(1) Chronology

As a part of the Y-PORT Center project, as a result of an invitation for participants to do a site visit for Ministry of the Environment JCM project formation study, it was decided that AMCOM would participate in this FS study.

During the August 2015 FS study, in the context of discussions about the liquid waste treatment flow being used by PT Desa Air Cargo Batam (below, abbreviated as PT Desa) it was decided to propose a flow to shift away from the existing liquid waste treatment system. This was from the perspective of a suggestion to use high-efficiency treatment with AMCON's dewatering equipment, for industrial waste being collected and accumulated from all over Batam Island.

(2) Overview of Existing System, and Expected Issues

With the existing equipment, liquid waste is processed by an electrolytic flocculation treatment system (below referred to as electrolytic flocculation equipment), then dewatered by filter press dewatering equipment, and the filtrate separated from sludge by the dewatering equipment is filtered through a two-stage carbon filter, then discharged into a river.

With this flow, one can expect high electricity consumption by the electrolytic flocculation equipment, and much time required to clean the clogged filters of the filter press dewatering equipment, resulting in considerable labor and time required for the process.

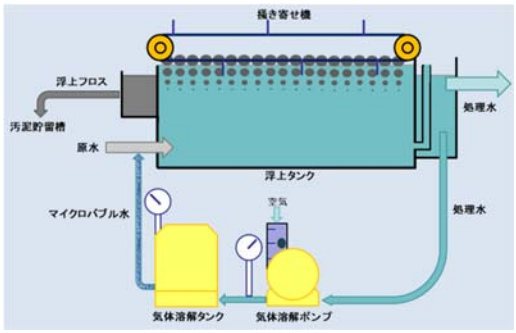
Raw water intake pit	Electrolytic flocculation equipment	Filter press dewatering equipment
		

(3) Proposal for system installation

In the context of (2) above, it was decided to develop a total proposal to reduce electrical consumption as well as the number of workers and their hours of labor by replacing the electrolytic flocculation equipment, which is expected to be problematic, with micro-bubble floating equipment that uses less electricity and is more efficient at treating liquid waste, and to replace the existing

filter press dewatering equipment with Volute dewatering equipment, which uses less electricity and does not clog.

In order to decide whether or not these proposals were possible, untreated liquid waste under the current status was brought back for analysis and to consider whether it would float with microbubble generators.

Microbubble equipment (concept flow)	Volute dewatering equipment
	

(4) Results of analysis of liquid waste

The results of analysis of liquid waste collected during the FS study in August 2015 are as follows:

≪Liquid waste Sample A (collected August 2015)≫

Parameter	Indicators	Photo of liquid waste
pH	7.3	
SS (mg/L)	230	
TS (%)	0.14	
BOD (mg/L)	1,200	
CODmn (mg/L)	730	
CODcr (mg/L)	3,100	
T-N (mg/L)	72.9	
T-P (mg/L)	52.7	
Cl^- (mg/L)	172	
n-hex (mg/L・mineral oil)	330	
n-hex (mg/L・animal and vegetable oil)	350	

For liquid waste Sample A above, a test was done using a jar test base to see the extent to which the effluent underwent floating separation when processed using micro-bubble equipment. In terms

of methodology, 1,200 ppm of PAC (an inorganic flocculant) was added to the liquid waste, and then pressurized water was injected into the liquid waste sample using a microbubble generator. The resulting turbid water and separated liquid were analyzed. The results are presented below.

≪Separated liquid A≫

Parameter	Indicators	Photo showing condition of separated liquid
BOD (mg/L)	350	
CODmn (mg/L)	200	
CODcr (mg/L)	740	
T-N (mg/L)	23.5	
T-P (mg/L)	11.9	
Cl^- (mg/L)	134	
n-hex（mg/L・mineral oil）	13	
n-hex（mg/L・animal and vegetable oil）	5	

It was determined that microbubbles could be proposed as a system, as we were able to confirm the separation in a beaker, and we confirmed that each of the analytical values decreased significantly. Also, at the time of the next FS, in order to focus on whether or not was possible to dewater concentrated turbid water, it was decided to bring a demonstration unit of the microbubble flotation equipment to the site, and take a sample of sludge for the dewatering equipment.

Also, because no samples were taken at the time of the August 2015 FS as sample of the filtrate from the on-site filter press dewatering equipment and filtrate from the carbon filter, it was decided to collect and compare samples of these during the December visit,

(5) Interview with PT Desa regarding Current Situation

In October 2015, the Head of PT Desa came to Japan and visited AMCON, and prior to the meeting, interviews were conducted regarding the current status of treatment and costs. The following information was obtained during the interview.

・Electricity costs paid for electrolytic flocculation equipment: Approx. 62,400,000 IDR (exchange rate 1 IDR=0.01 yen).
・Electrical and labor costs for electrolytic flocculation equipment and dewatering equipment: Approx. 250,000/month.
・The electricity costs for electrolytic flocculation equipment account for 75% - 80% of the total for the facility.
・Aluminum plates for the electrolytic flocculation equipment are replaced once every 2 - 3 months.
・About 6 operators work around the electrolytic flocculation equipment.
・Amount of liquid waste treated: Approx. 5 t/day.

Based on the results of the above interview, it was decided to develop a proposal for a system with a capacity to treat 5t per day.
In addition, because the equipment operating hours are not clear, estimates were done assuming the system could operate at approx. 1 t/h, and 5 h/day.

Also, since the electricity costs of the electrolytic flocculation equipment were approx. 624,000 yen/year, the estimates were done at approx. 52,000 yen/month,
and capacity at 5,200 kW/month. (Electricity unit cost: approx. 10 yen/kWh is assumed.)

In addition, to do a simple calculation of labor costs per person from the running costs of the 250,000 yen/month for the electrolytic flocculation equipment and dewatering equipment are calculated, we get
(250,000 yen－52,000 yen) ÷ 6 persons = 33,000 yen/person .

These estimates may be a stretch, but it was decided to include them here for consideration in the hopes that they will facilitate consideration of the budget dimension for PT Desa.

(6) Second FS Study

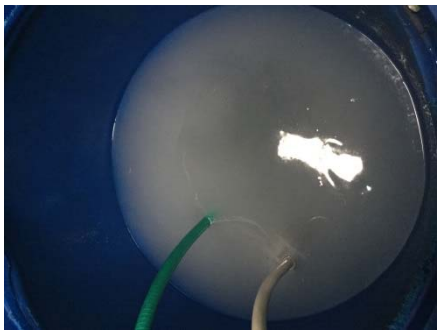
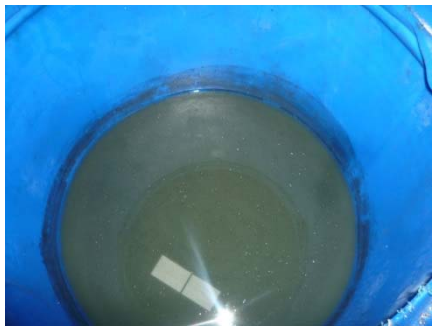
During the second FS study, in December 2015, as mentioned above a demonstration unit was brought to the site. PAC additives were added on-site to the liquid waste, and pressurized water injected, with the purpose of confirming the actual state of separation and to take samples.

Note that two types of liquid waste were prepared this time, but they were of completely different color and concentration compared to the August 2015 study, and it was not possible to interview to determine the source of the liquid waste.
This was an observation this time, but it was clear that the plant is required to process different types of liquid waste each time, depending on where it is transported from each day.

We confirmed that differences in the type of liquid waste will affect factors such as the amount of additive to add, the amount of pressurized water to inject, and the reaction time, which makes it difficult to ensure uniformity of processing. In addition, it was not possible to obtain satisfying results from the comparison of separation water in beakers; similar quantity ratios of additive and pressurized water added to about 20 liters of liquid waste produced different conditions for the separation water and flotation sludge.

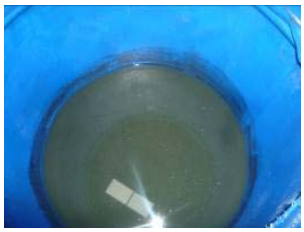
The results of analysis are provided below for the test conditions, raw water intake, filtrate, and separation water.

≪Photo of on-site demonstrations and equipment≫

Microbubble generator demonstration equipment -- full set	On-site configuration of demonstration units
	
Pressurized water	Effluent 1 (provisional name: green waste)
	
Effluent 2 (provisional name: cream waste)	Both effluents after injecting pressurized water
	
Microbubble separation water (left: cream, right: green)	Existing carbon filters (two units)

(7) Analytical Results of Effluent and Separation Water

① Analytical results of green waste



Sample type	Raw water (green)
Hydrogen ion concentration (pH)	5.3 (16.0 ℃)
Evaporation residue (TS)	1.29 %
Suspended solids (SS)	750 mg/L
Ignition loss (VTS)	20.9 %

② Analytical results of cream waste

Sample type	Raw water (cream)
Hydrogen ion concentration (pH)	5.4 (15.0 ℃)
Evaporation residue (TS)	2.45 %
Suspended solids (SS)	2300 mg/L
Ignition loss (VTS)	32.6 %

The results of raw water analysis are summarized above for the two types prepared.

Below are the results for turbid water and separation water from the microbubble generator equipment.

③ Analytical results of microbubble separation water

(Units: mg/L)

Parameter	**Green Waste separation water**	**Cream Waste separation water**
pH	3.9 (19.0℃)	4.2 (16.0℃)

SS	1200	240
TS (%)	0.57	1.02
BOD	3100	4500
CODmn	1100	1100
CODcr	3600	4700
T-N	59.0	256
T-P	165	83.9
Cl^-	4000	6000
n-hex (mineral oil)	16	20
n-hex (animal and plant oil)	24	58

④ Analytical results of existing filter press filtrate and carbon filter filtrate

(Units: mg/L)

Parameter	**Filtrated from filter press dewatering equipment**	**Carbon filter Filtrate ①**	**Carbon filter Filtrate ②**
pH	6.3 (16.0℃)	6.2 (16.0℃)	6.5 (16.0℃)
SS	40	43	48
TS (%)	1.08	0.76	0.43
BOD	9200	3200	1100
CODmn	1400	800	170
CODcr	5600	3000	580
T-N	145	81.7	28.8
T-P	15.5	4.5	11.8
Cl^-	5700	4100	3100
n-hex (mineral oil)	7	<1	<1
n-hex (animal and plant oil)	26	58	27

For the comparison in ③ and ④ above of microbubble filtrate and filter press/carbon filter filtrate relative to discharge standards, green shading is used to emphasize the crucial BOD and COD values.

Until the discharge effluent, even microbubble water is at a level that manages to clear the standards,

but compared with carbon filter effluent, the existing carbon filter produces a better result.

In terms of discussion, comments from personnel inside and outside the company suggest that even better separation results can be obtained not only by PAC coagulation but also by adding an anionic polymer flocculant. Thus, our intention is to switch to a proposal with an anionic polymer flocculant additive, and the use of carbon filters at the final process will be considered, as required.

(8) Test Results of Microbubble Flotation Flocculation Test

Next, a sample test was implemented including the potential to use polymer solution 1 as indicated at the outset, to determine if flocculant and effluent can also be obtained with the volute being the flotation sludge collected. The results are presented below.

① Green Waste: Flotation sludge from microbubble process

(i) Test results of sample properties

Sample type	Raw water
Hydrogen ion concentration (pH)	4.84 (17.7 ℃)
Evaporation residue (TS)	0.83 %
Suspended solids (SS)	5,120 mg/L
Ignition loss (VTS)	33.4 %
Salt concentration	0.23 %
Electrical conductivity	458 mS/m

(ii) Test results

Floc condition	Floccu-lation	Floc strength	Filtration properties	Additive ratio, quantity (vs TS)	Dewatered cake Moisture content	Suita-bility
	**Poss-ible**	**Poss-ible**	**Good**	*1 PAC: 30 % [1.3 mL] *2 Caustic soda: pH 7 *3: HB-1085 (anion) 1.2 % [6.0 mL]	**86.2 %**	**Good**

*1: For PAC the solution used is raw effluent diluted to 10%. *2: For caustic soda the solution used is raw effluent diluted to 5%.

*3: For polymers the solution used is raw effluent diluted to 40%.

The above results confirmed that for Green Waste flotation sludge, floc that can be coagulated and dewatered can be formed by adding a PAC additive, then pH conditioning with caustic soda, followed by adding an anionic polymer.

With just one solution of anionic coagulant, coagulation can be confirmed as described above, but the floc strength is weak and the floc breaks up during dewatering, so it was deemed to have poor

filtration properties, and as a result it was decided that the floc was not suitable for dewatering.

The scoring criteria are outlined below.

Suitability score	Description
Good	Use of the selected coagulant resulted in good dewatering performance.
Possible	Use of the selected coagulant resulted in dewatering but the performance was inferior.
Not possible	Dewatering is not possible with the selected coagulant.

② Cream Waste: Flotation sludge from microbubble process

(i) Test results of sample properties

Sample type	Raw water
Hydrogen ion concentration (pH)	5.20 (17.9 ℃)
Evaporation residue (TS)	2.33 %
Suspended solids (SS)	13,500 mg/L
Ignition loss (VTS)	46.7 %
Salt concentration	0.66 %
Electrical conductivity	1240 mS/m

(ii) Test results

Floc condition	**Flocculation**	**Flocstrength**	**Filtration properties**	**Additive ratio,** quantity (vs TS)	**Dewatered cake Moisture content**	**Suitability**
	**Good**	**Good**	**Best**	**PAC:** 30 % [3.0 mL] **Caustic soda** pH 7 HB-1085 (anion) 0.6 % [7.0 mL]	**81.1 %**	**Best**

Based on the above results, it was determined that flocculation and dewatering were possible with three solutions as additives with Green Waste, similarly to Cream Waste flotation sludge. Similarly, floc can be created with one polymer flocculant solution, but the floc strength and filtration properties were not good.

Accordingly, it was no longer possible to propose the plan with polymer 1 solution that was

explained with the proposed flow, and an additional proposal must be made with PAC and caustic soda.

Also, because the moisture content of the dewatered cake from the existing filter press dewatering equipment was 61.1%, it could be said that the moisture content comparison with the existing filter press and AMCON Volute did not produce a favorable result.

(9) CO2 Emission Reduction Effects

Current electricity consumption: Based on interview finding of 4,000 kWh/month, annual electricity consumption would be 48,000 kWh/year.

Microbubble generator estimated at approx. 8 kW

→8 kw×5 h/day × 30 days × 12 months = 14,400 kWh/year

Volute dewatering equipment: 0.2 kW (electricity for sludge pump and chemical pump counted separately)

→0.2 kw×5 h/day × 30 days × 12 months = 360 kWh/year

Therefore, the electricity consumption reduction benefit is estimated at 33,240 kWh/year, and reduction of electricity costs is estimated at 332,400 yen/year.

5. MRV proposals, PDD proposals

5.1 ESCO, Energy Saving Projects

（1）Proposed Projects

① Local counterpart

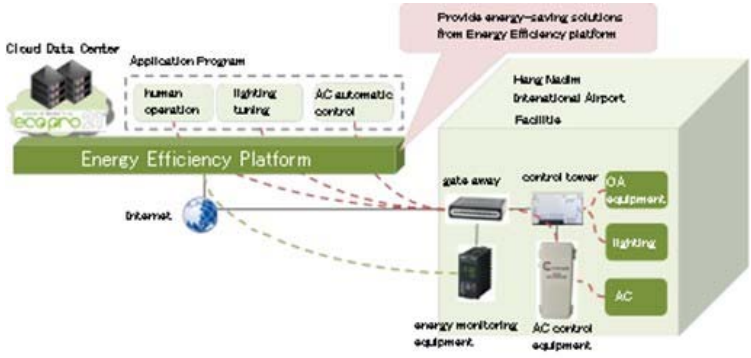
BIFZA (airport management)

② Subject site, subject equipment, etc.

Hang Nadim International Airport terminal air conditioning equipment (existing)

③ Technology to be introduced by the project to reduce CO2 emissions

Introduce software to conserve energy by visualizing electricity consumption of existing air conditioning equipment. Also, introduce devices for inverter control of chillers.



④ Project implementation period (rated years of lifetime of equipment, etc.)

Deemed to be 8 years.

（2）Formula to calculate CO2 emission reductions

$$ER_y = RE_y - PE_y$$

$$RE_y = EC_{PJ} \times EF_{elec} \times 1/(1-\lambda)$$

$$PE_y = EC_{PJ} \times EF_{elec}$$

ER_y: Annual CO2 emission reduction (tCO2/year)

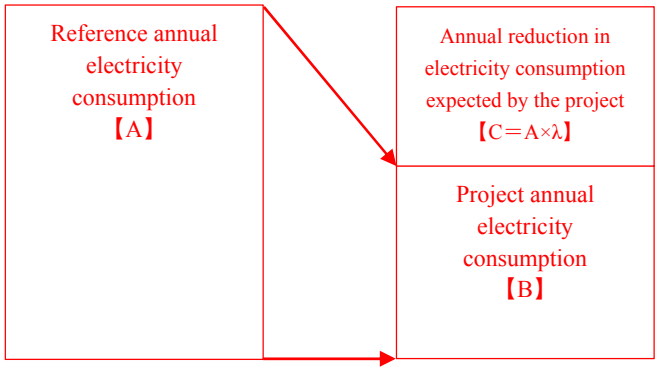
RE_y: Annual reference emissions (tCO2/year)

PE_y: Annual project emissions (tCO2/year)

EC_{PJ}: Annual electricity consumption of terminal building air conditioning equipment (after installing Eco-Pro 21, etc.) (MWh/year) (10,802,000 kWh/year)

λ: Energy conservation ratio (estimated at approx. **10%** based on other project achievements)

EF_{elec}: Emission factor for grid electricity (0.839 tCO2/MWh)



B＝A－C＝A－（A×λ）＝（1－λ）A　→　A＝1/(1-λ)B

（3）CO2 emission reduction effect:

The electricity consumption reduction effect is estimated at approx. **1,198,000 kWh/year**

The electricity cost reduction effect is estimated at **approx. 13.50 million yen/year** (electricity cost is assumed to be approx. 11 yen/kWh)

CO2 emission reductions are estimated at approx. 1,005 tCO2/year

（4）Project Feasibility

- Initial investment cost is estimated at approx. 40.0 million yen as the total for Eco Pro 21 (visualization system), energy conservation consulting, and inverter control devices.
- The investment period is assumed to be approx. 30 years without JCM subsidy.
  Investment payback period (without subsidy)＝40,000,000 yen ÷ 13,500,000 yen/year ＝**approx. 3.0** years
- If a subsidy ratio of 1/2 is expected, the period is significantly reduced (by approx. 1.5 years)
  Investment payback period (with subsidy)＝20,000,000 yen ÷ 13,500,000 yen/year ＝ **approx. 1.5** years

（5）Monitoring structure

Since this is a system that helps visualize electricity consumption of the target equipment, it is easy to conduct monitoring of electricity consumption in the project.

However, the capacity and commitment of the project partner toward MRV obligations is essential.

(6) Environmental and social considerations

Because these technologies are intended to reduce electricity consumption, in principle, no negative environmental impact is expected.

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form	

Form for submitting the proposed methodology

Host Country	Republic of Indonesia
Name of the methodology proponents submitting this form	iFORCOM Co., Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	3. Energy demand
Title of the proposed methodology, and version number	Installation of energy-efficient Air-Conditioning system with Energy Management System (EMS) at a building, Ver. 01.0
List of documents to be attached to this form (please check):	☒The attached draft JCM-PDD: ☐Additional information
Date of completion	05/02/2016

History of the proposed methodology

Version	Date	Contents revised
01.0	05/02/2016	First edition

A. Title of the methodology

Installation of energy-efficient air-conditioning system with Energy Management System (EMS) at a building, Ver.01.0

B. Terms and definitions

Terms	Definitions
Energy-efficient air-conditioning system	Energy-efficient air-conditioning system consists of indoor air-conditioning equipment and separately-placed centrifugal chiller, which has interconnection system and network connection with EMS. Centrifugal chiller contains inverter-driven compressor, an apparatus to control the speed of the compressor motor variably in order to maintain indoor temperature to preset temperature. Although the compressor motor in a non-inverter-type centrifugal chiller can only either operate in maximum capacity/constant speed or stop entirely, the compressor motor in an inverter-type centrifugal chiller can operate at adjustable speed.
Energy Management System (EMS)	EMS is a computer system designed to recognize the status of energy use within indoor environment in a building using; measuring/monitoring device; analysis/diagnosis device; and data storage device in an attempt to “control” optimum energy use of equipment and facilities within the system. Especially in this methodology, EMS has a function automatic control of motor speed of the inverter-driven compressor and evaporation temperature of the centrifugal chiller. EMS also has a function to monitor electricity consumption (so-called “visualization”) of not only air-conditioning system but also, if necessary, lighting equipment etc. in a building.

C. Summary of the methodology

Items	Summary

GHG emission reduction measures	This methodology applies to the project that aims to save energy /electricity consumption by introducing energy-efficient air-conditioning system with EMS at a building.
Calculation of reference emissions	Reference emissions are GHG emissions from the usage of the reference centrifugal chiller, calculated by multiplying electricity consumption of the project centrifugal chiller, ratio of electricity consumption between reference and project ($1/(1-\lambda_{EMS})$), and CO2 emission factor for consumed electricity.
Calculation of project emissions	Project emissions are GHG emissions from the usage of the project centrifugal chiller, calculated with electricity consumption of the project centrifugal chiller and CO2 emission factor for consumed electricity.
Monitoring parameters	Quantity of electricity consumed by the project centrifugal chiller is monitored by the electricity meter.

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	The project energy-efficient air-conditioning system is newly installed or installed to replace existing air-conditionings equipment and centrifugal chiller at a building.
Criterion 2	The compressor motor of the centrifugal chiller applied in the project air-conditioning system has automatic control technology of motor speed of the inverter-driven compressor and evaporation temperature of the centrifugal chiller which is controlled by EMS defined in the section B. In cases where the project replaces existing air-conditionings equipment and centrifugal chiller, the existing centrifugal chiller is non-inverter-type products without EMS.
Criterion 3	Periodical check at least once a month is planned. And the project system is continually monitored by the manufacturer on the internet.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Electricity consumption by the reference air-conditioning system	CO_2

Project emissions	
Emission sources	GHG types
Electricity consumption by the project air-conditioning system	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated by multiplying electricity consumption of the project centrifugal chiller, ratio of electricity consumption between reference and project ($1/(1-\lambda_{EMS})$), and CO_2 emission factor for consumed electricity. This methodology sets energy-saving ratio by EMS so that net emission reductions are achieved by applying the following conservative assumption.

There are two energy-saving effects by the installation of EMS. The main one is reduction of electricity consumption by automatic operation of motor speed of the inverter-driven refrigerating compressor and the other one is automatic control of evaporation temperature of the centrifugal chiller in tune with required refrigeration capacity for air-conditioning.

Although the automatic control of evaporation temperature of the centrifugal chiller certainly contributes to reduction of electricity consumption, the degree of energy saving effect by it depends on circumstances of each building such as adjustable range of preset evaporation temperature of the centrifugal chiller. And so the energy-saving ratio by EMS does not include the latter effect mentioned above. Hence this methodology considers only the former effect by EMS.

Because of this, the energy-saving ratio by EMS specified in this methodology is conservative.

F.2. Calculation of reference emissions

Reference emissions are calculated by the following equation.

RE_p =

RE_p	:	Reference emissions during the period *p* [tCO_2/p]
$EC_{PJ,p}$	:	Amount of electricity consumption of the project air-conditioning system during the period *p* [MWh/p]
λ_{EMS}	:	Energy-saving ratio by EMS [-]
EF_{elec}	:	CO_2 emission factor for consumed electricity [tCO_2/MWh]

G. Calculation of project emissions

Project emissions are calculated by the following equation.

PE_p =

PE_p	:	Project emissions during the period *p* [tCO_2/p]
$EC_{PJ,p}$	:	Amount of electricity consumption of the project air-conditioning system during the period *p* [MWh/p]
EF_{elec}	:	CO_2 emission factor for consumed electricity [tCO_2/MWh]

H. Calculation of emissions reductions

$ER_p = RE_p - PE_p$

$= RE_p$

ER_p	: Emission reductions during the period *p* [tCO_2/p]
RE_p	: Reference emissions during the period *p* [tCO_2/p]
PE_p	: Project emissions during the period *p* [tCO_2/p]

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
EF_{RE}	The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity), which is calculated based on the power generation efficiency using fossil fuel (coal, diesel fuel and so forth) as the power source. The default value for EF_{RE} is set to be 0.839 tCO_2/MWh.	The default value should be revised if necessary from survey result which is conducted by JC or project participants every three years.

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JCM Proposed Methodology Spreadsheet Form (input sheet) [Attachment to Proposed Methodology Form]

Table 1: Parameters to be monitored *ex post*

(a) Monitoring point No.	(b) Parameters	(c) Description of data	(d) Estimated Values	(e) Units	(f) Monitoring option	(g) Source of data	(h) Measurement methods and procedures	(i) Monitoring frequency	(j) Other comments
(1)	$EC_{PJ,p}$	Amount of electricity consumption of the project air-conditioning system during the period *p*		MWh/p	Option C	Monitored data	Data is measured by measuring equipment in the building. - Specification of measuring equipment: Electrical power meter connected up to EMS is applied for measurement of electrical power consumption of the project air-conditioning system. - Measuring and recording: Measured data is automatically sent to a server where data is recorded and stored. - Data collection and reporting: Inputting the recorded data to a spreadsheet electrically. - QA/QC: 1) Recorded data is checked its integrity once a month by responsible staff. 2) Calibration is conducted every year after the installation by manufacturer or a qualified entity.	Continuously	

Table 2: Project-specific parameters to be fixed *ex ante*

(a) Parameters	(b) Description of data	(c) Estimated Values	(d) Units	(e) Source of data	(f) Other comments
EF_{RE}	The reference CO_2 emission factor of grid and captive electricity	0.839	tCO_2/MWh	The default value should be revised if necessary from the survey result which is conducted by the JC or project participants every three years.	n/a

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
0	tCO_2/y

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

JCM_ID_F_PMS_ver01.0

JCM Proposed Methodology Spreadsheet Form (Calculation Process Sheet)

[Attachment to Proposed Methodology Form]

1. Calculations for emission reductions	**Fuel type**	**Value**	**Units**	**Parameter**
Emission reductions during the period of year y	n/a	0	tCO_2/p	ER_p
2. Selected default values, etc.				
The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity)	Electricity	0.839	tCO_2/MWh	EF_{RE}
3. Calculations for reference emissions				
Reference emissions during the period of year y	n/a	0	tCO_2/p	RE_p
Amount of electricity consumption of the project air-conditioning system during the period *p*	Electricity	0.000	MWh/p	$EC_{PJ,p}$
Energy saving ratio by EMS	Electricity	0.10	-	λ_{EMS}
The reference CO_2 emission factor of the grid and captive electricity	Electricity	0.839	tCO_2/MWh	EF_{RE}
4. Calculations of the project emissions				
Project emissions during the period of year y	n/a	0	tCO_2/p	PE_p
Amount of electricity consumption of the project air-conditioning system during the period *p*	Electricity	0.000	MWh/p	$EC_{PJ,p}$
The reference CO_2 emission factor of the grid and captive electricity	Electricity	0.839	tCO_2/MWh	EF_{RE}

[List of Default Values]

The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity)	0.839	tCO_2/MWh

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Energy Saving for Air-Conditioning System in the Building by Introducing High-efficiency Centrifugal Chiller with EMS

A.2. General description of project and applied technologies and/or measures

The proposed JCM project aims to improve energy saving for air-conditioning system in the Hang Nadim international airport terminal building by introducing high-efficiency air-conditioning system with EMS in Indonesia. The terminal building needs considerable electricity, and centrifugal chillers consume significant amount of energy compared with the other machines in the terminal building. The proposed project covers the terminal building of Hang Nadim international airport in Batam city, Riau province in Indonesia.

A.3. Location of project, including coordinates

Country	Republic of Indonesia
Region/State/Province etc.:	Riau province
City/Town/Community etc:	Batam city
Latitude, longitude	S: 6° 55’ 0”, E: 109° 44’ 53”

A.4. Name of project participants

The Republic of Indonesia	BIFZA
Japan	iFORCOM Co., Ltd. (Focal point)

A.5. Duration

Starting date of project operation	XX/XX/2016
Expected operational lifetime of project	8 years

A.6. Contribution from developed countries

The proposed project was partially supported by the Ministry of the Environment, Japan through the financing program for JCM model projects which provided financial supports up to 50% of initial investment for the projects in order to acquire JCM credits.

As for technology transfer, capacity building on operation and monitoring has been provided by iFORCOM Co., Ltd. in conjunction with a local engineering company.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	ID_AM00X
Version number	1.0
Selected approved methodology No.	N/A
Version number	N/A

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	The project energy-efficient air-conditioning system is newly installed or installed to replace existing air-conditionings equipment and centrifugal chiller at a building.	The project energy-efficient air-conditioning system is installed to improve existing air-conditioning equipment and centrifugal chiller at the terminal building.
Criterion 2	The compressor motor of the centrifugal chiller applied in the project air-conditioning system has automatic control technology of motor speed of the inverter-driven compressor and evaporation temperature of the centrifugal chiller which is controlled by EMS. In cases where the project replaces existing air-conditionings equipment and centrifugal chiller, the existing centrifugal chiller is non-inverter-type products without EMS.	The compressor motor of the centrifugal chiller applied in the project air-conditioning system has automatic control technology of motor speed of the inverter-driven compressor of the centrifugal chiller which is controlled by EMS.
Criterion 3	Periodical check at least once a month is planned. And the project system is continually monitored by the manufacturer on the internet.	Periodical check at least once a month is planned. And the project system is continually monitored by iFORCOM on the internet.

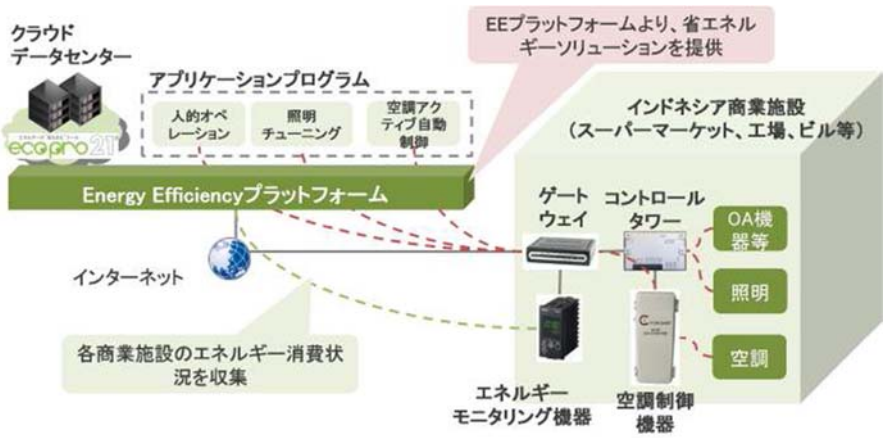
C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Electricity consumption by the reference air-conditioning system	CO_2

Project emissions	
Emission sources	GHG type
Electricity consumption by the project air-conditioning system	CO_2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016	10,095	9,090	1,005
2017	10,095	9,090	1,005
2018	10,095	9,090	1,005
2019	10,095	9,090	1,005
2020	10,095	9,090	1,005
Total (tCO_{2e})	50,475	45,450	5,025

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the proposed project	No

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The main stakeholders of the project are the power utility company (PLN Batam) and regulatory organization for the power sector (Department of Energy). In order to collect comments from the stakeholders, the project participants are planning to request face-to-face interviews.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
power utility company (PLN)	TBD	TBD
regulatory organization for the power sector (DOE)	TBD	TBD

F. References
TBD

Reference lists to support descriptions in the PDD, if any.

Annex
TBD

Revision history of PDD		
Version	Date	Contents revised
01.1	05/02/2016	First edition

5.2 Renewable Energy Projects

（1）Proposed Projects

① Local counterpart

PT Desa Air Cargo (industrial waste/wastewater treatment contractor) and PT Musim Mas (oil palm refining plant), etc.

② Subject site, subject equipment, etc.

Palm oil residue is extracted from bleaching earth waste and used as biomass fuel.

Photovoltaic electricity generation is also considered as a combination.

③ Technology to be introduced by the project to reduce CO2 emissions

④ Project implementation period (rated years of lifetime of equipment, etc.)

Deemed to be 15 years.

（2）Formula to calculate CO2 emission reductions

① Production and utilization of biomass fuel

$ER_y = SC_y \times NCV_{SC} \times EF_{fuel}$

ER_y: Annual CO2 emission reduction (tCO2/year)

SC_y: Biomass fuel production volume using bleaching earth waste as raw material (t)

NCV_{SC}: Net calorific value of biomass fuel (16GJ/t)

EF_{fuel}: Emission factor for substituted automotive diesel 0.0741 (tCO2/GJ) (IPCC Guidelines 2006)

However, subtract the applicable emissions if external electricity or fossil fuels are consumed during production of biomass fuel.

Meanwhile, the CO2 emission reduction calculation formula in the case of generation

of electricity using biomass fuel in principle has the same composition as the formula for photovoltaic power generation in ② below (activity volume is annual electric power generation, in MWH/year)

② Photovoltaic power generation

$ER_y = EG_y \times EF_{elec}$

ER_y: Annual CO2 emission reduction (tCO2/year)

EG_y: Annual electricity generated by photovoltaic power generation (MWh/year) (calculated from capacity of power generation facility x annual hours of operation x system output factor or annual amount of solar radiation x system output factor)

EF_{elec}: Emission factor for grid electricity (0.839 tCO2/MWh)

(3) CO2 emission reduction effect:

Annual electric power generation is estimated at approx. **1,577 MWh/year**

CO2 emission reductions are estimated at approx. **1,400 tCO2/year**

(4) Monitoring structure

Currently, electricity consumption is measured for the entire plant, and individual equipment does not currently have separate electricity meters, electrical meters are to be install on each machine of the subject equipment.

Also, the capacity and commitment of the project partner toward MRV obligations is essential.

(5) Environmental and social considerations

This technology is for bleaching earth waste, and will not increase consumption of course palm oil (CPO) procured from Sumatra, so in principle, no environmental impacts are expected.

Also, PT Ecogreen and PT Musim Mas are participating companies in RSPO.

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form	

Form for submitting the proposed methodology

Host Country	Republic of Indonesia
Name of the methodology proponents submitting this form	Finetech Co.,Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	1. Energy industries (renewable sources)
Title of the proposed methodology, and version number	Displacement of Grid or Captive Generator Electricity by a Solar PV System, Ver. 01.0
List of documents to be attached to this form (please check):	☒The attached draft JCM-PDD: ☐Additional information
Date of completion	05/02/2016

History of the proposed methodology

Version	Date	Contents revised
01.0	05/02/2016	First edition

A. Title of the methodology

Displacement of Grid or Captive Generator Electricity by a Solar PV System, Ver. 01.0

B. Terms and definitions

Terms	Definitions
Solar photovoltaic (PV) system	An electricity generation system which converts sunlight into electricity by the use of photovoltaic (PV) modules. The system also includes ancillary equipment such as inverters required to change the electrical current from direct current (DC) to alternating current (AC).

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Displacement of grid electricity and/or captive generator electricity using fossil fuel as power source by installation and operation of the solar PV system(s)
Calculation of reference emissions	Reference emissions are calculated on the basis of the AC output of the solar PV system(s) multiplied by the conservative emission factor of the grid and captive generator electricity.
Calculation of project emissions	Project emissions are the emissions from the solar PV system(s), which are assumed to be zero.
Monitoring parameters	The quantity of the electricity generated by the project solar PV system

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	The project installs solar PV system(s).
Criterion 2	The solar PV system is connected to the internal power grid of the project site and/or to the grid for displacing grid electricity and/or captive generator electricity at the project site.

Criterion 3	The PV modules have obtained a certification of design qualifications (IEC 61215, IEC 61646 or IEC 62108) and safety qualification (IEC 61730-1 and IEC 61730-2).
Criterion 4	The equipment to monitor output power of the solar PV system and irradiance is installed at the project site.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Consumption of grid electricity and/or captive generator electricity	CO_2
Project emissions	
Emission sources	GHG types
Generation of electricity from solar PV system(s)	N/A

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Considering that Batam grids use fossil fuel (coal, diesel fuel and so forth) as a power source, net emission reductions are ensured as follows.
It is assumed that solar PV systems installed in Batam will replace grid electricity (and/or captive generator electricity), which leads to the CO_2 emission factor of 0.839 tCO_2/MWh.

F.2. Calculation of reference emissions

$$RE_p = \sum_i EG_{i,p} \times EF_{RE}$$

RE_p : Reference emissions during the period *p* [tCO_2/p]

$EG_{i,p}$: The quantity of the electricity generated by the project solar PV system *i* during the period *p* [MWh/p]

EF_{RE} : The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity) [tCO_2/MWh]

G. Calculation of project emissions

$PE_p = 0$

PE_p : Project emissions during the period *p* [tCO_2/p]

H. Calculation of emissions reductions

$ER_p = RE_p - PE_p$

$= RE_p$

ER_p : Emission reductions during the period *p* [tCO_2/p]

RE_p : Reference emissions during the period *p* [tCO_2/p]

PE_p : Project emissions during the period *p* [tCO_2/p]

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
EF_{RE}	The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity), which is calculated based on the power generation efficiency using fossil fuel (coal, diesel fuel and so forth) as the power source. The default value for EF_{RE} is set to be 0.839 tCO_2/MWh.	The default value should be revised if necessary from survey result which is conducted by JC or project participants every three years.

JCM Proposed Methodology Spreadsheet Form (input sheet) [Attachment to Proposed Methodology Form]

Table 1: Parameters to be monitored *ex post*

(a) Monitoring point No.	(b) Parameters	(c) Description of data	(d) Estimated Values	(e) Units	(f) Monitoring option	(g) Source of data	(h) Measurement methods and procedures	(i) Monitoring frequency	(j) Other comments
(1)	$\Sigma EG_{i,p}$	The total quantity of the electricity generated in the project during the period *p*	0.00	MWh/p	Option C	Measured data	The AC output of the inverters is measured to determine the amount of net electricity generation by the solar PV system. The reading is taken from an electricity meter or the inverters. The reading is taken manually or electronically using a data logger. Electricity meter is calibrated in line with international/national standards or manufacturer's specification.	Monthly recording	n/a

Table 2: Project-specific parameters to be fixed *ex ante*

(a) Parameters	(b) Description of data	(c) Estimated Values	(d) Units	(e) Source of data	(f) Other comments
EF_{RE}	The reference CO_2 emission factor of grid and captive electricity	0.839	tCO_2/MWh	The default value should be revised if necessary from the survey result which is conducted by the JC or project participants every three years.	n/a

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
0	tCO_2/y

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

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JCM Proposed Methodology Spreadsheet Form (Calculation Process Sheet)

[Attachment to Proposed Methodology Form]

1. Calculations for emission reductions	Fuel type	Value	Units	Parameter
Emission reductions during the period of year y	n/a	0	tCO_2/p	ER_p
2. Selected default values, etc.				
The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity)	Electricity	0.839	tCO_2/MWh	EF_{RE}
3. Calculations for reference emissions				
Reference emissions during the period of year y	n/a	0	tCO_2/p	RE_p
The total quantity of the electricity generated in the project during the period *p*	Electricity	0.00	MWh/p	$\Sigma EG_{i,p}$
The reference CO_2 emission factor of the grid and captive electricity	Electricity	0.839	tCO_2/MWh	EF_{RE}
4. Calculations of the project emissions				
Project emissions during the period of year y	n/a	0	tCO_2/p	PE_p

[List of Default Values]

The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity)	0.839	tCO_2/MWh

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Rooftop solar power plants for an industrial waste treatment facility in the Batam island

A.2. General description of project and applied technologies and/or measures

The proposed JCM project aims to reduce CO_2 emissions by introducing a total of 1 MW grid-connected solar photovoltaic (PV) systems on rooftop of the warehouse buildings of an industrial waste treatment facility. The solar PV systems replace the grid electricity derived from fossil fuels such as coal, diesel fuel and so forth. The power generated by the solar PV system is basically self-consumed. When there is surplus power, it is exported to the gird. A remote monitoring system to monitor the performance of the system is also installed.

A.3. Location of project, including coordinates

Country	Republic of Indonesia
Region/State/Province etc.:	Riau province
City/Town/Community etc:	Batam city
Latitude, longitude	S: 6° 55’ 0”, E: 109° 44’ 53”

A.4. Name of project participants

The Republic of Indonesia	PT. Desa Air Cargo
Japan	Finetech Co., Ltd. (Focal point)

A.5. Duration

Starting date of project operation	XX/XX/2016
Expected operational lifetime of project	15 years

A.6. Contribution from developed countries

The proposed project was partially supported by the Ministry of the Environment, Japan through the financing program for JCM model projects which provided financial supports up to 50% of initial investment for the projects in order to acquire JCM credits.

As for technology transfer, capacity building on operation and monitoring has been provided by Finetech Co., Ltd. in conjunction with a local engineering company.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	ID_AM00X
Version number	1.0
Selected approved methodology No.	N/A
Version number	N/A

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	The project installs solar PV system(s).	The project installs a solar PV system. The solar PV module employed is Japanese manufacturer's products.
Criterion 2	The solar PV system is connected to the internal power grid of the project site and/or to the grid for displacing grid electricity and/or captive generator electricity at the project site.	The solar PV system of the project is connected to the internal power grid of the project site. The system of the project displaces grid electricity at the project site.
Criterion 3	The PV modules have obtained a certification of design qualifications (IEC 61215, IEC 61646 or IEC 62108) and safety qualification (IEC 61730-1 and IEC 61730-2).	The installed PV module (Japanese manufacturer's products) has obtained a certification of design qualifications (IEC 61215) and safety qualification (IEC 61730-1 and IEC 61730-2).
Criterion 4	The equipment to monitor output power of the solar PV system and irradiance is installed at the project site.	Installed inverters measure the output power of the solar PV system. And sunshine sensor boxes are installed at the project sites to measure irradiance. An electricity meter is installed for the project at the point where the solar PV power feeds into the internal grid of the project site to measure the quantity of the power.

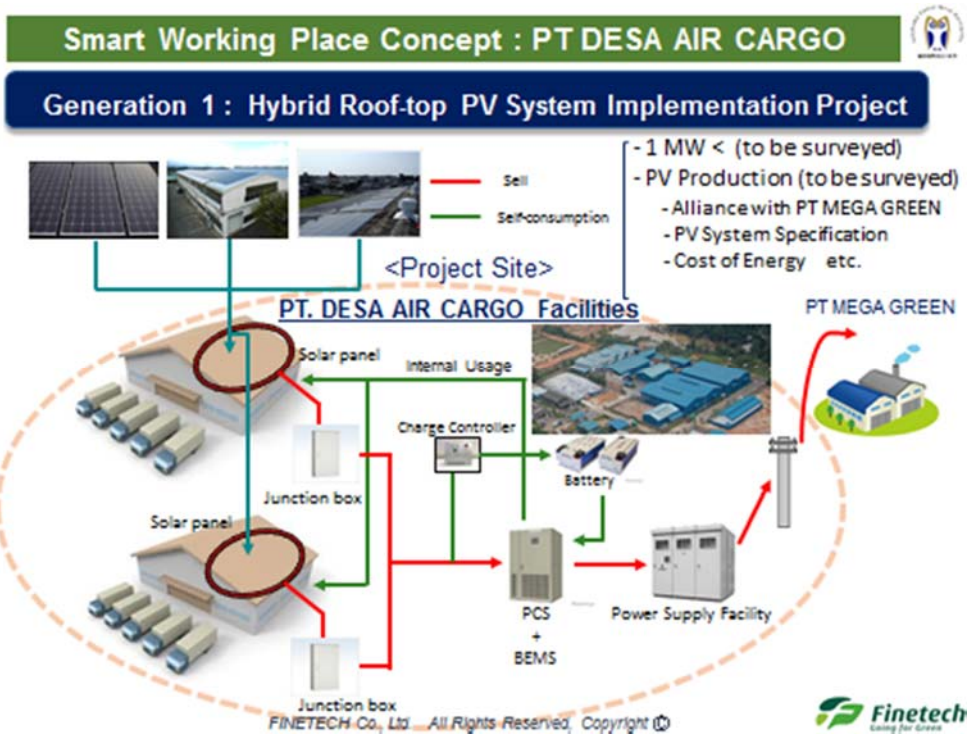
C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Consumption of grid electricity (and/or captive generator electricity)	CO_2

Project emissions	
Emission sources	GHG type
Generation of electricity from solar PV system(s)	N/A

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016	1,400	0	1,400
2017	1,400	0	1,400
2018	1,400	0	1,400
2019	1,400	0	1,400
2020	1,400	0	1,400
Total (tCO_{2e})	7,000	0	7,000

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the	No

proposed project	

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The main stakeholders of the project are the power utility company (PLN Batam) and regulatory organization for the power sector (Department of Energy).
In order to collect comments from the stakeholders, the project participants are planning to request face-to-face interviews.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
power utility company (PLN)	TBD	TBD
regulatory organization for the power sector (DOE)	TBD	TBD

F. References

TBD

Reference lists to support descriptions in the PDD, if any.

Annex

TBD

Revision history of PDD

Version	Date	Contents revised
01.1	05/02/2016	First edition

5.3 Waste/Wastewater Treatment Projects

（1）Proposed Projects

① Local counterpart

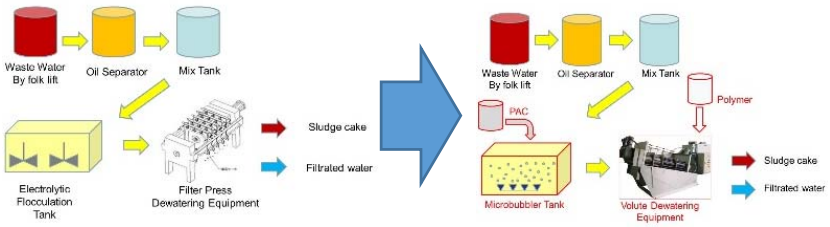
PT Desa Air Cargo (industrial waste/wastewater treatment contractor)

② Subject site, subject equipment, etc.

Treatment equipment (existing) for industrial wastewater (waste coolant, etc., from Shimano, Epson, Philips)

③ Technology to be introduced by the project to reduce CO2 emissions

The aim is to conserve energy by replacing the existing electrolytic flotation sludge separation tank and filter press-type sludge dewatering equipment with microbubble-type sludge separation tank and screw-type sludge dewatering equipment.



④ Project implementation period (rated years of lifetime of equipment, etc.)

Deemed to be 15 years.

（2）Formula to calculate CO2 emission reductions

$$ER_y = RE_y - PE_y$$

$$RE_y = EC_{PJ} \times EF_{elec} \times 1/(1-\lambda)$$

$$PE_y = EC_{PJ} \times EF_{elec}$$

ER_y: Annual CO2 emission reduction (tCO2/year)

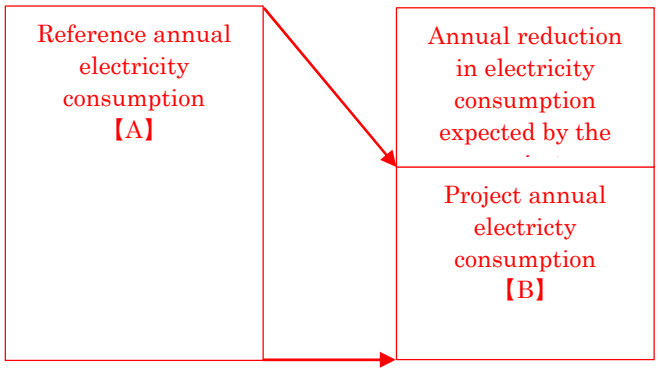
RE_y: Annual reference emissions (tCO2/year)

PE_y: Annual project emissions (tCO2/year)

EC_{PJ}: Annual electricity consumption (MWh/year) of the industrial wastewater sludge treatment equipment (after installing microbubble and Volute) (2,160 kWh/year)

λ: Energy conservation ratio (assumed to be approx. 96% based on other project achievements)

EF_{elec}: Emission factor for grid electricity (0.839 tCO2/MWh)



$B = A - C = A - (A \times \lambda) = (1 - \lambda)A \rightarrow A = 1/(1-\lambda)B$

（3）CO2 emission reduction effect:

The electricity consumption reduction effect is estimated at **approx. 47,640 kWh/year**

CO2 emission reductions are estimated at **approx. 40 tCO2/year**

（4）Project Feasibility

- Initial investment cost is estimated at approx. 14 million yen (microbubble 9 million yen, Volute 5 million yen)
- Investment payback period is estimated with consideration of the merits of reducing electricity costs, labor costs, parts replacement costs (aluminum electrodes in electrolytic separation tank, etc.)
- CO2emission reduction value = 14,000,000 yen ÷ (40 tCO2/year × 15 years) = **23,300yen/tCO2**

（5）Monitoring structure

Currently, electricity consumption is measured for the entire plant, and individual equipment does not currently have separate electricity meters, electrical meters are to be install on each machine of the subject equipment.

Also, the capacity and commitment of the project partner toward MRV obligations is essential.

(6) Environmental and social considerations

Because these technologies are intended to reduce electricity consumption, in principle, no negative environmental impact is expected.

However, it is desirable that the treated effluent when discharged meets water quality standards.

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form	

Form for submitting the proposed methodology

Host Country	Republic of Indonesia
Name of the methodology proponents submitting this form	AMCON INC.
Sectoral scope(s) to which the Proposed Methodology applies	3. Energy demand
Title of the proposed methodology, and version number	Installation of energy-efficient Wastewater treatment system with sludge flocculation and dewatering process, Ver. 01.0
List of documents to be attached to this form (please check):	☒The attached draft JCM-PDD: ☐Additional information
Date of completion	04/03/2016

History of the proposed methodology

Version	Date	Contents revised
01.0	04/03/2016	First edition

A. Title of the methodology

Installation of energy-efficient Wastewater treatment system with sludge flocculation and dewatering process, Ver. 01.0

B. Terms and definitions

Terms	Definitions
Energy-efficient wastewater treatment system	Energy-efficient wastewater treatment system consists of Energy-efficient sludge flocculation and dewatering equipment. Energy-efficient sludge flocculation equipment has advanced microbubble units. Energy-efficient sludge dewatering equipment has filter body consist of fixed ring and movable ring and screw in the filter body. This movable ring has function of cleaning the filter body itself, so clogging of filer body can be prevented, stable operation can be realized and cleaning water can be saved. Compared based on same processing capacity, Energy-efficient wastewater treatment system could reduce electricity consumption substantially.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	This methodology applies to the project that aims to save energy /electricity consumption by introducing energy-efficient wastewater treatment system with sludge flocculation and dewatering process.
Calculation of reference emissions	Reference emissions are GHG emissions from the usage of the reference conventional wastewater treatment equipment, calculated by multiplying electricity consumption of the project energy-efficient wastewater treatment system, ratio of electricity consumption between reference and project ($1/(1-\lambda_{EWT})$), and CO2

	emission factor for consumed electricity.
Calculation of project emissions	Project emissions are GHG emissions from the usage of the project energy-efficient wastewater treatment system, calculated with electricity consumption of the project system and CO2 emission factor for consumed electricity.
Monitoring parameters	Quantity of electricity consumed by the project energy-efficient wastewater treatment system is monitored by the electricity meter.

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	The project energy-efficient wastewater treatment system is newly installed or installed to replace existing conventional wastewater treatment equipment.
Criterion 2	Energy-efficient sludge dewatering equipment applied in the project wastewater treatment system has filter body consist of fixed ring, movable ring and screw in the filter body. This movable ring has function of cleaning the filter body itself, so clogging of filer body can be prevented, stable operation can be realized and cleaning water can be saved. In cases where the project sludge dewatering system replaces existing conventional equipment, the existing equipment should be filter or belt press.
Criterion 3	Periodical check at least once a month is planned. And electricity consumption of the project system is continually monitored by electricity meter.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Electricity consumption by the reference wastewater treatment system	CO_2
Project emissions	
Emission sources	GHG types
Electricity consumption by the project wastewater treatment system	CO_2

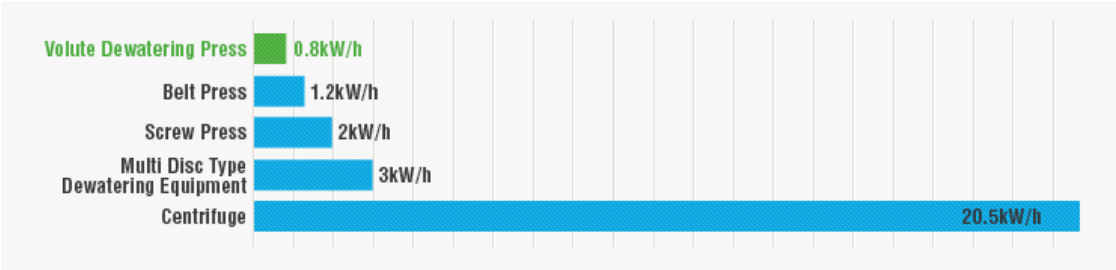
F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated by multiplying electricity consumption of the project wastewater treatment system, ratio of electricity consumption between reference and project ($1/(1-\lambda_{EWT})$), and CO_2 emission factor for consumed electricity. This methodology sets energy-saving ratio by energy-efficient wastewater treatment system so that net emission reductions are achieved by applying the following conservative assumption.

The screw which is the main component of energy-efficient sludge dewatering equipment rotates very slowly at a rate of 2 to 4 rpm, so that it consumes very low power and thus economical. When comparing energy-efficient equipment with centrifuge for 30 kg-DS/h throughput, the power consumption of Volute is 1/20th of centrifuge which requires rotation at high speed.

Comparison of power consumption among sludge dewatering equipment
(throughput 30 kg-DS/h)



Because of this, the energy-saving ratio by energy-efficient wastewater treatment system specified in this methodology is conservative.

F.2. Calculation of reference emissions

Reference emissions are calculated by the following equation.

$$RE_p = EC_{PJ,p} \times 1/(1 - \lambda_{EWT}) \times EF_{elec}$$

RE_p	:	Reference emissions during the period *p* [tCO_2/p]
$EC_{PJ,p}$	:	Amount of electricity consumption of the project wastewater treatment system during the period *p* [MWh/p]
λ_{EWT}	:	Energy-saving ratio by energy-efficient wastewater treatment system [-]
EF_{elec}	:	CO_2 emission factor for consumed electricity [tCO_2/MWh]

G. Calculation of project emissions

Project emissions are calculated by the following equation.

$$PE_p = EC_{PJ,p} \times EF_{elec}$$

PE_p	:	Project emissions during the period *p* [tCO_2/p]
$EC_{PJ,p}$	:	Amount of electricity consumption of the project wastewater treatment system during the period *p* [MWh/p]
EF_{elec}	:	CO_2 emission factor for consumed electricity [tCO_2/MWh]

H. Calculation of emissions reductions

$$ER_p = RE_p - PE_p$$
$$= RE_p$$

ER_p : Emission reductions during the period *p* [tCO_2/p]
RE_p : Reference emissions during the period *p* [tCO_2/p]
PE_p : Project emissions during the period *p* [tCO_2/p]

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
EF_{RE}	The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity), which is calculated based on the power generation efficiency using fossil fuel (coal, diesel fuel and so forth) as the power source. The default value for EF_{RE} is set to be 0.839 tCO_2/MWh.	The default value should be revised if necessary from survey result which is conducted by JC or project participants every three years.

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JCM Proposed Methodology Spreadsheet Form (input sheet) [Attachment to Proposed Methodology Form]

Table 1: Parameters to be monitored *ex post*

(a) Monitoring point No.	(b) Parameters	(c) Description of data	(d) Estimated Values	(e) Units	(f) Monitoring option	(g) Source of data	(h) Measurement methods and procedures	(i) Monitoring frequency	(j) Other comments
(1)	$EC_{PJ,p}$	Amount of electricity consumption of the project wastewater treatment system during the period p		MWh/p	Option C	Monitored data	Data is measured by measuring equipment in the building. - Specification of measuring equipment: Electrical power meter connected up to EMS is applied for measurement of electrical power consumption of the project wastewater treatment system. - Measuring and recording: Measured data is automatically sent to a server where data is recorded and stored. - Data collection and reporting: Inputting the recorded data to a spreadsheet electrically. - QA/QC: 1) Recorded data is checked its integrity once a month by responsible staff. 2) Calibration is conducted every year after the installation by manufacturer or a qualified entity.	Continuously	

Table 2: Project-specific parameters to be fixed *ex ante*

(a) Parameters	(b) Description of data	(c) Estimated Values	(d) Units	(e) Source of data	(f) Other comments
EF_{RE}	The reference CO_2 emission factor of grid and captive electricity	0.839	tCO_2/MWh	The default value should be revised if necessary from the survey result which is conducted by the JC or project participants every three years.	n/a

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
0	tCO_2/y

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

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JCM Proposed Methodology Spreadsheet Form (Calculation Process Sheet)

[Attachment to Proposed Methodology Form]

1. Calculations for emission reductions	Fuel type	Value	Units	Parameter
Emission reductions during the period of year y	n/a	0	tCO_2/p	ER_p
2. Selected default values, etc.				
The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity)	Electricity	0.839	tCO_2/MWh	EF_{RE}
3. Calculations for reference emissions				
Reference emissions during the period of year y	n/a	0	tCO_2/p	RE_p
Amount of electricity consumption of the project wastewater treatment system during the period p	Electricity	0.000	MWh/p	$EC_{PJ,p}$
Energy saving ratio by energy-efficient wastewater treatment system	Electricity	0.90	-	λ_{EWT}
The reference CO_2 emission factor of the grid and captive electricity	Electricity	0.839	tCO_2/MWh	EF_{RE}
4. Calculations of the project emissions				
Project emissions during the period of year y	n/a	0	tCO_2/p	PE_p
Amount of electricity consumption of the project wastewater treatment system during the period p	Electricity	0.000	MWh/p	$EC_{PJ,p}$
The reference CO_2 emission factor of the grid and captive electricity	Electricity	0.839	tCO_2/MWh	EF_{RE}

[List of Default Values]

The reference CO_2 emission factor of the grid electricity (and/or captive generator electricity)	0.839	tCO_2/MWh

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Energy Saving for the Industrial Wastewater Treatment Facility by Introducing High-efficiency Sludge Flocculation and Dewatering System

A.2. General description of project and applied technologies and/or measures

The proposed JCM project aims to improve energy saving for industrial wastewater treatment facility of the PT Desa Air Cargo by introducing high-efficiency sludge flocculation and dewatering system in Indonesia. The sludge flocculation and dewatering process needs considerable electricity and consumes significant amount of energy compared with the other process in the industrial wastewater treatment facility. The proposed project covers the industrial wastewater treatment facility of PT Desa Air Cargo in Batam city, Riau province in Indonesia.

A.3. Location of project, including coordinates

Country	Republic of Indonesia
Region/State/Province etc.:	Riau province
City/Town/Community etc:	Batam city
Latitude, longitude	S: 6° 55’ 0”, E: 109° 44’ 53”

A.4. Name of project participants

The Republic of Indonesia	PT DESA AIR CARGO
Japan	AMCON INC. (Focal point)

A.5. Duration

Starting date of project operation	XX/XX/2016
Expected operational lifetime of project	15 years

A.6. Contribution from developed countries

The proposed project was partially supported by the Ministry of the Environment, Japan through the financing program for JCM model projects which provided financial supports up to 50% of initial investment for the projects in order to acquire JCM credits. As for technology transfer, capacity building on operation and monitoring has been provided by

AMCON INC. in conjunction with a local engineering company.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	ID_AM00X
Version number	1.0
Selected approved methodology No.	N/A
Version number	N/A

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	The project energy-efficient wastewater treatment system is newly installed or installed to replace existing conventional wastewater treatment equipment.	The project energy-efficient wastewater treatment system is installed to replace existing conventional wastewater treatment equipment in an industrial wastewater treatment facility.
Criterion 2	Energy-efficient sludge dewatering equipment applied in the project wastewater treatment system has filter body consist of fixed ring, movable ring and screw in the filter body. This movable ring has function of cleaning the filter body itself, so clogging of filer body can be prevented, stable operation can be realized and cleaning water can be saved. In cases where the project sludge dewatering system replaces existing conventional equipment, the existing equipment should be filter or belt press.	Energy-efficient sludge dewatering equipment applied in the project wastewater treatment system has filter body consist of fixed ring, movable ring and screw in the filter body. The project sludge dewatering system replaces existing conventional equipment, and the existing equipment is filter press.
Criterion 3	Periodical check at least once a month is planned. And electricity consumption of the project system is continually monitored by electricity meter.	Periodical check at least once a month is planned. And electricity consumption of the project system is continually monitored by electricity meter.

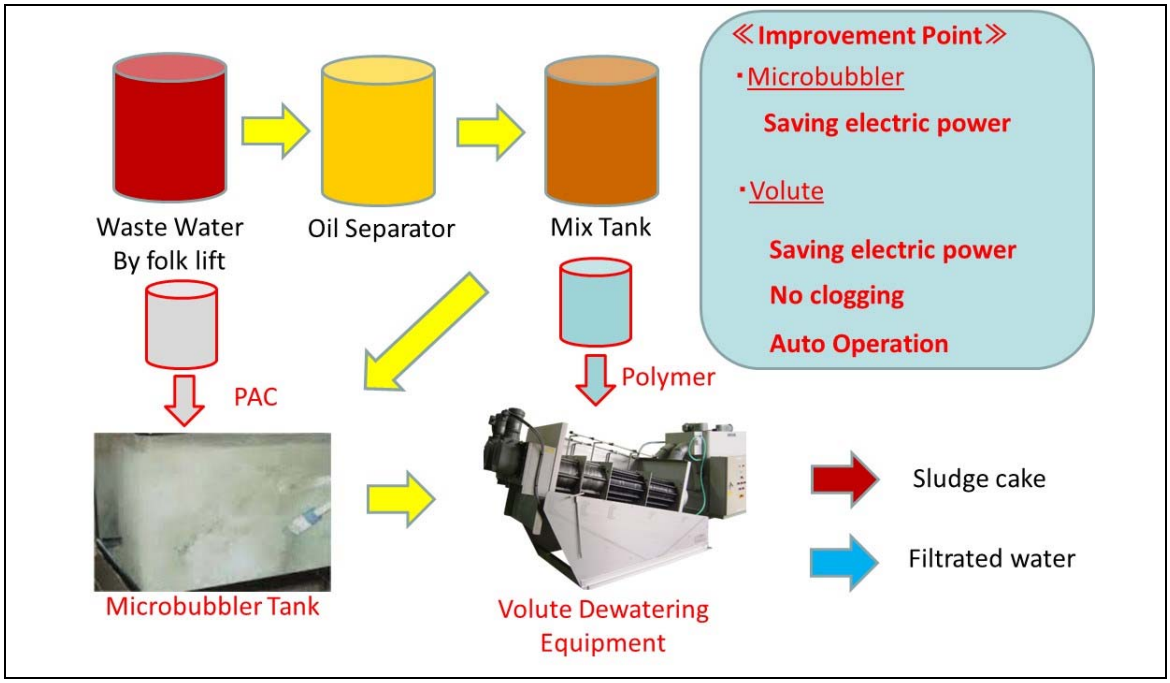
C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions

Emission sources	GHG type
Electricity consumption by the reference wastewater treatment system	CO_2
Project emissions	
Emission sources	GHG type
Electricity consumption by the project wastewater treatment system	CO_2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016	52	12	40
2017	52	12	40
2018	52	12	40
2019	52	12	40
2020	52	12	40
Total (tCO_{2e})	260	60	200

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the	No

proposed project	

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The main stakeholders of the project are the power utility company (PLN Batam) and regulatory organization for the power sector (Department of Energy).
In order to collect comments from the stakeholders, the project participants are planning to request face-to-face interviews.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
power utility company (PLN)	TBD	TBD
regulatory organization for the power sector (DOE)	TBD	TBD

F. References

TBD

Reference lists to support descriptions in the PDD, if any.

Annex

TBD

Revision history of PDD

Version	Date	Contents revised
01.1	04/03/2016	First edition