“Project Formulation Survey”
Under Governmental Commission for Overseas Economic Cooperation, Official Development Assistance (ODA) FY2012

Summary Report

Cebu City, Republic of Philippines

Feasibility Study on Establishing a Resource Recycling Enterprise

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Mansei Recycle Systems Co., Ltd. /
Carbon Free Consulting Corporation Joint Venture

Summary

This feasibility study was proposed from Mansei Recycle Systems Co., Ltd. (hereinafter, Mansei Recycle Systems), for the purpose of solving the waste disposal problems in Republic of the Philippines, Cebu City (hereafter, Cebu City) and implementing assistance to developing countries through ODA. In particular, the focus is on extracting plastic waste from general waste at an intermediate processing facility, processing the plastic waste into fuel and raw material for production of electricity, and selling the fuel to end users. This study has been conducted as a preliminary investigation with the view to commencing ODA project formulation / cooperation preparation surveys following the completion of this study.

In Chapter 1, we review the current status and the needs arising from the relevant development issues in the target area.

Since President Aquino was appointed as the president of the Republic of Philippines in June 2010, key policies such as the eradication of corruption, strengthening of security, and promotion of peace in Mindanao have been adopted backed by strong national support, and the country has enjoyed a stable regime so far. However, the country continues to face many issues in order to achieve sustainable economic growth. These issues include infrastructure development, job creation, strengthening tax collection and fiscal consolidation, enhancing education, improving the business environment, introducing foreign currency, improving agricultural policy, and protecting overseas migrant workers. Rapid population growth has resulted in the manifestation of waste management problems not only in the capital city of Manila, but also in the project target area, Cebu City.

As the economy grew in Cebu City, the amount of waste generated by the city also rapidly increased, and the challenges faced by the final waste disposal site became obvious. In 1982, the amount of waste generated was 212 ton/day, but in 2010 it had increased to 420 ton/day, meaning waste generation had doubled over the past 30years. The Inayawan Sanitary Landfill (constructed with the support of JICA and the only landfill in the city) was closed in December 2012 upon having been filled with 2 million cubic meters of waste, double the amount originally planned. Currently, 50% of the waste from Cebu city is dumped at a landfill privately operated in Consolacion, a city located in the northern Cebu province. The remaining 50% is handled by a privately operated MRF (Material Recovery Facility) in the Inayawan region. (1/3 is biodegradable waste used for composting, and plastic waste is segregated manually from the remaining 2/3 of non-biodegradable waste. The plastic waste is machine shredded and then sold to a cement company as fuel).

Analysis of the plastic waste in terms of material composition and fuel value has confirmed that the plastic waste is a viable source for recycled fuel production, possessing high calorific power equivalent to coal (anthracite).The privately operated MRF, mentioned above, is providing 50ton of fuel /day to the cement company, but upon our inquiry the cement company confirmed that although waste-derived fuel currently accounts for around 10% of their total fuel consumption, they are looking to increase this ratio to 70%. From this we were able to confirm the positive ongoing demand for plastic waste-derived fuel.

In Chapter 2, we review the possible application of Mansei Recycle Systems' technology and the prospects for future business development

Mansei Recycle Systems has attained many achievements and possesses unique knowledge and expertise in plastic recycling technology within Japan.

The first achievement is the waste plastic to fuel technology developed by Mansei Recycle Systems. Compared to conventional RPF fuel, CPF (Cube Plastic Fuel), a type of fluff fuel, can be produced with a lower initial capital cost, and consumes less electricity during the manufacturing process. The company operates a production line with a production capacity of 144ton/day, making it one of the top-class production lines in Japan.

The second achievement is the modal shift measures that the company has introduced to the Kyushu, Tomakomai, and Kii Peninsula regions. By making full use of freight vessels and other transportation means, a highly efficient transportation system has been established.

The following provides an overview of Mansei Recycle Systems' processing technology.

Typically within waste, a large amount of soil, sand and other fine matter unsuitable for recycling is mixed in. Mansei Recycle Systems possesses the technology to sort and extract plastic waste suitable for recycling from these mixed wastes, through the use of vibration and wind sifting in conjunction with fine sorting by hand, followed by the removal of metal using magnetic separator machines, and finally the production of fluff fuel through shredding and compacting. Waste Plastic based fuel (fluff fuel) produced through this process is used as boiler fuel by cement companies and paper companies, providing an alternative to traditional fuel such as coal and heavy oil.

The following describes the proposed intermediate processing facility which will take advantage of the above technology.

The intermediate processing facility will be designed to be capable of producing 5ton of fluff fuel per day assuming an 8hour/day operating cycle. However, under the assumption that the facility will be processing the existing waste at the Inayawan sanitary landfill whereby the plastic component of this waste is 11%, the design will take into account the required yield and allow for a total input weight of around 50 ton/day. The fluff fuel is to be distributed to cement companies and paper companies as boiler fuel. The expected sales revenue is around 20 million yen per year (equivalent to 1,125tons of finished product).

The business development plan over the medium to long term, subsequent to the completion of this feasibility study, will mainly be to (1) Conduct a detailed design study of the candidate site (detailed design study of the equipment installation for the intermediate processing facility, as well as investigation on licensing, registration, and other requirements) (2) Implement a pilot testing project (medium term working demonstration) (3) Prepare for commencement of trading as a business enterprise (4) Commence business operations with one production line (5) Potentially increase operational capacity by employing multiple production lines.

In addition, a management system will be implemented whereby the focus is on business cooperation with relevant local institutions and with customers such as cement companies and paper companies

In this regard, maintaining sound relationships with local partners will be vital. An ongoing effort is being made to further enhance the mutual trust that has been built with Cebu City, the

Center for Advanced Philippines Studies, Inc. (CAPS), and Cebu Solid Waste Management Inc, who are the planned partners for this project.

The risks involved in pursuing this business include the risks related to the living environment of the local waste scavengers, potential conflicts with existing local businesses, and consideration for the local community. However, these risks can be adequately mitigated through obtaining ongoing advice from CAPS, with whom a solid relationship has already been built.

In Chapter 3, we review the development impact on the target country and Mansei Recycle Systems' business development impact through the implementation as an ODA project.

Regarding the issues related to the consistency of the proposed products and technology with the development needs of the target country, it is possible to set forth the following four points.

(1) Cebu City is trying to secure a site for a new landfill, but progress is lacking due to conflicts of opinion with local residents.

(2) The MRF Plant adjacent to Inayawan Sanitary Landfill operated by Cebu Solid Waste Management Inc, is producing plastic fluff fuel by recovering waste plastic from commercial waste. However, the MRF plant does not intend to accept household waste, which has lower plastic content compared to commercial waste

(3) Biodegradable waste that is generated from Carbon market as well as restaurants are being recycled through composting. However, household waste has plastic and other materials mixed in which must be segregated and removed for composting, making the process inefficient.

(4) There is a large volume of recyclable plastic included in the existing waste at Inayawan Sanitary Landfill that is currently not being utilized.

Upon comprehensive consideration of the above issues, the following proposal based on the technology of Mansei Recycle Systems can be put forth.

An intermediate processing facility will be built within the grounds of Inayawan Sanitary Landfill. Plastic waste, which comes second after biodegradable waste in terms of volume composition of total waste, will be processed and recycled as fuel. Specifically, household and commercial waste collected at Barangay level will be further segregated at the intermediate processing facility into plastic waste, other valuables, and other wastes. The plastic waste obtained through segregation will be processed and sold as fuel or raw material for power generation. However, since household waste is currently being handled by the privately owned landfill in Consolacion and commercial waste is mainly collected and recycled by local recycling contractors, the facility will initially place priority on recycling and producing fluff fuel from the plastic waste included in the existing waste at Inayawan Sanitary Landfill in order to avoid direct competition with existing local businesses. This will contribute towards Inayawan Sanitary Landfill regaining available capacity as a landfill. Furthermore, if there is a need to alleviate the pressures arising due to the lack of capacity of the landfill operators and recycling contractors, the facility will accept and process household and commercial waste collected at Barangay level as well.

The following describes Mansei Recycle Systems' business development impact through the implementation as an ODA project.

●As the first step toward commencing operation as a business enterprise, an on-site pilot test will be performed to assess the quality of the plastic waste derived fuel. By implementing this pilot test as an ODA project, benefits such as reduction in financial burden, strengthening of relationships with relevant local institutions, and facilitation of smooth negotiations can be expected. Furthermore, if the waste derived fuel production line is continuously maintained and operated even after validation of the pilot test, it will provide a clear demonstration on the effectiveness of the proposed waste derived fuel enterprise in the medium to long term.

● Waste management is a common problem throughout the Philippines as well as in urban areas in all developing countries, creating potential for further expansion of this project in the future.

● Employment opportunities will be created for local scavengers who are currently working and living in harsh environments

● In addition to the positive impacts for Cebu City, further impacts within Japan can also be expected, such as the increased employment opportunities at Mansei Recycle Systems stemming from its business expansion, the transfer of technical expertise to workers of Cebu City through training sessions held in Japan and the potential effect on the waste management industry in Japan in which more than 100,000 companies operate

In Chapter 4, we present detailed steps for ODA project implementation.

As described in chapters 2 and 3, Mansei Recycle Systems' ODA project proposal is to: (1) Carry out a pilot test project related to waste derived fuel production and conduct a medium term demonstration (2) Identify other potential project sites within Cebu City and other neighboring cities, gain a detailed understanding of market size, provide proposals to and conduct awareness-raising activities for local partners (Cebu City Department of Public Services ("DPS"), private sector businesses, NGOs and foundations such as RAFI involved in local human resources and education, and barangays), and secure end-user customers for the establishment of an independent waste management and recycling business enterprise.

Furthermore, although the basic assumption for the subsequent stage of commencing business operations is to obtain funding support from various government budgets, if there is a match between the aid policies of the Japanese Government and local development needs, we would like to consider utilizing ODA funds to (3) reduce the initial financial burden of acquiring capital equipment and providing on-site training in Japan as well as local training and education, focusing on the capacity development of DPS to enhance its capabilities and promote self support.

In accordance with the ODA project strategy described above, and upon taking into account the local needs and circumstances of the site identified through the field survey, the information gained from consultation with relevant local institutions, the desired timeframe in which Mansei Recycle Systems hopes to commence operations, and the scale and concepts of existing government funding schemes, we propose a ODA project implementation process based on the following stages: (1) Carry out a pilot test project related to waste derived fuel production and conduct a medium term demonstration, (2) Secure end-user customers for the establishment of

an independent waste management and recycling business enterprise (3) Commence business operations with ODA support to reduce the financial burden of initial investments

The following describes the specific ODA funding schemes assumed for each stage:

For (1) , utilize ① "Grassroots Aid" to carry out a pilot test for waste derived fuel production at Inayawan and ② "Private Sector Partnership Volunteer System" to assign Mansei Recycle Systems staff to Cebu Solid Waste Management Board ("SWMB") for a period of 1 to 2 years in order to support the development, operation and maintenance of local waste management systems.

For (2), utilize ③ "Projects for Business Dissemination to Governments of Developing Countries" and ④ "Private Sector Proposal Based Technological Cooperation Projects for Small and Medium Sized Enterprises as well as ⑤ "Dissemination/Expansion Type", the new framework planned for future rollout.

For (3), utilize ⑥ "ODA Grant Aid"

In all cases, DPS and SWMB will be the main local counterpart.

Through consultations conducted as part of this field survey, we have explained to relevant parties the technical support that will be provided during the initial stage of the ODA project process through the planned "Grassroots Aid" scheme. We have also explained the medium to long term business development scenario for Mansei Recycle Systems' operations in Cebu including ODA project implementation and have received acknowledgement of ongoing cooperation from these relevant parties. Furthermore, we have achieved a consensus with the Cebu City mayor and DPS regarding the candidate site for the project, and they have confirmed their intention to provide full cooperation on future efforts to collect additional information and to perform the required processes and procedures. Overall, we believe we have successfully built a cooperative relationship with local parties to prepare and proceed with the project and a foundation for establishing a "Waste Derived Fuel Production Joint Venture" (tentative name) with DPS as the core member.

Attachment: Outline of the survey