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ODA Overseas Economic Cooperation  
in FY2013

Summary Report

Viet Nam

Project Formulation Survey The Socialist  
Republic of Viet Nam

“ Project Formulation Survey on Leachate  
Treatment Technology in Viet Nam”

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Shiny Ball Holdings Co., Ltd., EJ Business Partners Co., Ltd.,  
Eight-Japan Engineering Consultants Inc. /Joint Venture

The content of this report is a summary of the project formulation survey, which was commissioned by the Ministry of Foreign Affairs of Japan in the FY 2013 and is carried out by the consortium of Shiny Ball Holdings Co., Ltd., EJ Business Partners Co., Ltd., Eight-Japan Engineering Consultants Inc. /Joint Venture. It does not represent the official view of the Ministry of Foreign Affairs.

## *Introduction*

### *I. Description of the current situation and development needs of the concerned development issues in the surveyed country(ies)*

Population of Socialist Republic of Viet Nam is projected as 95.3 million in 2019, 127.0 million in 2029 and 187.0 million in 2049 (General Statistics Office of Vietnam). According to this growth of population, municipal waste production is also increased. Ministry of National Resource and Environment (MONRE) simulation indicates below 30 million t/day in 2008, however, they projects acceleration as 40 million t/day in 2015, 70 million t/day in 2020 and 90 t/day in 2025.

Due to the continuing of population increasing and centralization to the urban area, municipal solid waste (MSW) problem in metropolitans like Ha Noi and Ho Chi Minh City is getting serious. The basic solution to address the MSW accession in Viet Nam is construction of landfill sites in each cities/municipalities.

The most common way to treat MSW in Viet Nam is landfilling. In some cities, they segregate organic waste, plastics and metals for recycling and composting however most of cities still landfill (or open dump) such MSW and industrial/medical waste without recovery of the recyclable materials.

In “Sanitary Landfill”, called in general, leachate is collected by liner sheets and pipes to be fed to treatment facility. However, most of landfills has leachate problems such as less capacity of treatment plant and leaking leachate, etc. because of rapid increasing of MSW and leachate quantity. There are some reports complaining odor and water environment pollution caused by leachate from neighboring residents, these are big concerns for health hazard to them.

The counter part of this study, Ho Chi Minh City, has 4 landfills including closed 2. Phuoc Hiep landfill site, where the experimental facility has been built in this study, has 2 leachate treatment facilities. However, capacity of these 2 facilities are not enough considering future landfill area expansion especially in rainy season. Further, the water treatment cost of these facilities is also affecting city’s budget, therefore, improvement and expansion of leachate treatment system is urgently needed.

This situation is same with other landfill sites (Dong Thanh, Go Cat, Da Phuoc) in HCMC, so, HCMC would like to have the proposals of leachate treatment plants which can meet with leachate effluent standards and lower treatment cost.

## II. Possible applicability of the SME's products and technologies, and prospects for future business development

The object technology in this study is wastewater treatment system named “MJT System” developed by Shiny-Ball Holdings Inc. with its headquarter located in Okinawa (the most East-Southern prefecture in Japan (hereinafter called as “SBH”). This MJT System is consisted by Solid-Liquid separation by specially designed coagulant as primary treatment and Shiny-Ball Cylinder and Z-Tank (high spec filtration) as the final treatment. All these components are completely developed by SBH.

Composition of the coagulant shall be specially designed considering the raw water (leachate) characterization in primary treatment. Shiny-Cylinder in Final treatment is the product which can degrade water molecule by ceramic ball (called as Shiny-ball) bumping/rubbing for the purpose to activate raw water so that Z-tank filtrate and absorb wide range of pollutants physically and chemically.

This system is absolute physical operating and doesn't use microorganism therefore it enables Easy operation, Small detention time, Small footprint and Small running cost.

SBH incorporated Shiny Vietnam Joint Stock Company (SVN) with Vietnamese partner in 2012 and has started water purification and wastewater treatment business utilizing abovementioned Shiny-Cylinder and Z-tank in Viet Nam. We have aimed to expand SBH business field into leachate water treatment (super highly organic polluted water) throughout the experiment plant to introduce, trial use of the MJT system in this study, and gotten a certain result and issues to be solved in future steps.

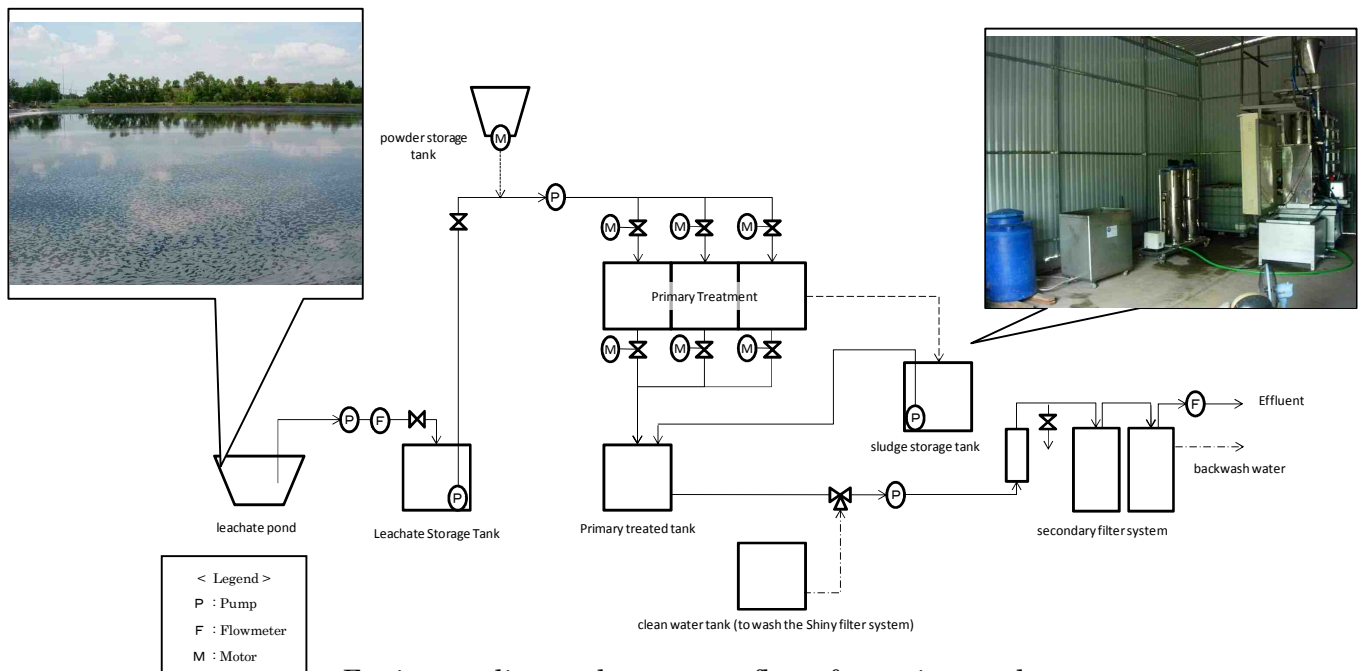
After this study, we plan to propose JICA's “Demonstration Project” in next fiscal year as an ODA project. To solve the issues we found, we will install demonstration plant which designed according to the raw leachate characteristics and operate approx. 1 year to optimize operation procedure, minimize running cost. The data we will obtain in this “Demonstration Project” must be used for the promotion and showcase of the MJT system and evaluation of the feasibility of BOO (Build, Own and Operate) system.

In the middle and/or long term, SBH aim to receive orders of leachate treatment facilities from HCMC and/or neighboring municipality using accomplishment of “Demonstration Project”. Generally speaking, water treatment project is usually ordered by BOO scheme therefore, SBH's target are (1) selling MJT facility to BOO proponent and (2) being BOO proponent of water treatment project.

### III. Verification of adaptability of the SME's products and technologies to the surveyed country(ies) (Demonstration and pilot survey)

To examine the applicability of “MJT system”, consisted by Shiny-ball cylinder, specially designed coagulant, Z-tanks (high efficiency filtrate tanks), etc., to leachate treatment of landfill site, we had a survey using module type experiment equipment in Phuoc Hiep waste complex in HCMC.

Equipment lists and treatment flow are shown below;



Equipment lists and treatment flow of experiment plant

Outsourced treated water analyses were done in total 10 times from 18th November 2013 until 12th February 2014. Due to the acquisition of installation permission time, the experiment duration was limited to only 1.5 months.

As the result of experiment operation with adjustments of operation method and equipment, it could be finally met with 28 items from 31 waste water standards on 12th Feb 2014 while it was only 22 items on November and December.

On the other hand, the reduction of these pollutant items often exceed the standard records high ratio around at maximum 90%. In these result, the advantages of MJT system (high solid-liquid separation efficiency by the coagulant and high absorption efficiency by filtration) could be exercised.

Following picture shows raw leachate water, primary treated water and final treated water.



Water treatment conditions (Left: Final treatment, Middle; Primary treatment, Right: Raw water)

On the basis of results of the study, it is needed to address found issues in this study throughout the construction of “demonstration plant.” We settled the designing specification of this “demonstration plant” in upcoming ODA as (1) Treatment capacity: 100-200m<sup>3</sup>/day, (2) Raw water quality: Maximum figures of the raw leachate water analysis results of Phuoc Hiep Landfill, (3) Effluent water quality: Below effluent standards. Using these specifications, we roughly designed the treatment flow and layout of the demonstration plant.

Additionally, the project feasibility analysis under the 20 years BOO (Build, Own and Operate) basis for 100 – 200 m<sup>3</sup>/day capacity was done. With the assumption of lower waste water treatment cost which presently HCMC is paying to the contractor, it is confirmed a certain visible result. In the future actual project size, this MJT system could be more viable because the initial and running cost can be reduced by scale-up and optimization of operation.

#### IV. Expected development impact and effect on business development of the proposing SME(s) in the surveyed country(ies) through proposed ODA projects

As the results of this study, some problems are identified. SBH will apply to private proposal-based dissemination and demonstration project and work to solve them through the installation and operation of the demonstration plant.

Development effect to be given to the target country in the future by this ODA projects are as follows:

##### 1) Improvement of water pollution

MJT system can respond to water pollution caused by rapid increase of MSW which is proportional to the increase and concentration of industry and population as a development issue of Vietnam now.

There is an effect on improvement of water pollution of rivers, canals and lakes in urban areas, the prevention of spread of infectious diseases caused by sewage flooding in the event of future flooding.

As an example, average BOD5 of raw water in Phuoc Hiep Landfill during the experiment was 1.586mg/l (maximum 2,863mg/l). The system can reduce this figure to be under the effluent standard, 50mg/l, therefore, it is deemed as 1,536mg/l (1,586-50) water contamination reduction advantage is contained in this system. Considering that one leachate treatment facility in Phuoc Hiep is ceased operation from October 2013, in case this reduction advantage applies to the capacity of this facility, 800m<sup>3</sup>/day, daily total 1,228,800,000 mg/day of organic contamination (BOD5) can be removed. To expand and introduce this system to Ho Chi Minh City and Vietnam nationwide, it could result good conservation of water quality.

##### 2) Reduction of leachate treatment commission fee

Using the MJT system of SBH, leachate treatment commission fee is expected to reduce VND 6,000 /m<sup>3</sup> from VND 96,000 /m<sup>3</sup> which is presently paid to contractor by DONRE (Department of Natural Resources and Environment Ho Chi Minh City).

In case if MJT system can be installed to all six landfills in HCMC, present total leachate treatment capacity is 3,500m<sup>3</sup>/day, expected total leachate treatment commission fee can be reduced about 7.6 billion VND per annum (equivalent to 38 million yen per annum).

Further, the effects on Business development of SBH by this ODA project are as follows;

##### 1) Achievement of record about leachate treatment and spread to HCMC, neighboring city/ municipality and nationwide

Once the demonstration plant in HCMC introduced by the ODA make a good result, this MJT system can be spread out to nationwide of Viet Nam and other countries in South East Asia. SBH and SVN will develop this leachate treatment project with BOO scheme considering budgetary shortage of target cities/municipalities for the initial investment.

## 2) Expanding Japanese waste related solution technologies

Japanese government has been supported to waste management sector of Vietnam in long term and Vietnamese government has high confidence to Japanese government and the technologies. Meanwhile, because Public and Private Partnership is now getting main stream of waste treatment (especially, low income municipalities wants to have BOT proposal.), Japanese companies face a difficulty to join these PPP scheme. One of the backgrounds causing this situation is that Japanese companies especially manufacturers have tend to prefer simple selling compare with being project implementer like PPP proponent.

The main reason of this tenor is that PPP scheme has non-negligible risks, and the governments of developing countries don't know the necessity of taking equal exposure of risk between Public side and Private side so much. This one of the risks with regard to PPP project in Viet Nam makes the private company not to proceed next step.

This ODA project aims a private company to join the waste treatment business in Viet Nam in the field of water treatment based on great relationship which Vietnamese Government and Japanese Government have been developed, therefore, we would like to introduce the necessity of equal responsibility between private and public throughout the project implementation.

## V. Proposals for formulating ODA projects

The most applicable ODA scheme we concluded in this study is “demonstration project” of JICA. In this project, the demonstration plant (treatment capacity of approx.100 ~ 200 m<sup>3</sup>/day) would be designed, installed and operated 1 year for the validation of treatment efficiency, operation expenses, etc. Followings shows the outline of “demonstration Project.”

### 1) Proposer

Shiny-Ball Holdings Inc., is the main proposer with his sister company, Shiny Vietnam Joint Stock Company who will act as local window. Demonstration project planning would be made by EJ Business Partners Co., Ltd. and Technical evaluation and monitoring instruction would be done by Eight-Japan Engineering Consultants Inc.

The counter party would be Ho Chi Minh City, in particular, Department of Natural Resources and Environment for the working partner.

### 2) Location of the Project

The site would be the landfill area in HCMC. The first priority is Phuoc Hiep Complex where the formulation study we carried out, however, we will discuss and select the best place for Demonstration project with DONRE.

### 3) Duration of Demonstration Project

Oct 2014	: Start designing, obtaining licensees,
Apr 2015	: Start Construction, Commissioning,
Oct 2015	: Start Operation (approx. 1 year)



#### 4) Targets of Demonstration Project

The targets of Demonstration Project are showing below;

No.	Targets to be achieved	Contents
1	Meeting all items of industrial effluent water standards	All items of industrial effluent water standard (QCVN40) shall be met in the Demonstration Project while the Experiment Plant couldn't achieve.
2	Verification of stability / continuity of the Plant	To verify the operation of the facility, the Demonstration facility shall continually meet with industrial effluent water standard 60 days in a row.
3	Expansion of plant capacity	To be the base for the expansion to the general size of leachate treatment facility in Viet Nam is 50 to 800 m <sup>3</sup> /day, in the Demonstration Project, the plant capacity shall be increased to 100 -200 m <sup>3</sup> /day.
4	Design and Construction of the total system	Although the experiment used a module type considering the limited time and space, in the Demonstration Project, it shall be needed to design and construct an order-made type system according to raw water quality.
5	Estimation of initial cost	Initial cost such as design, fabrication, delivery, construction and commissioning would be estimated in the actual plant size. To decrease this initial cost, SBH will use SVN for the local procurement for the material and mobilization.
6	Estimation of running cost	Running cost such as expenses for consumables, labors would be estimated in the actual operation in actual plant size. Plenty amount of consumables should be procured in local, therefore, SBH shall collaborate with SVN for the local portion.
7	Demonstration to the neighboring cities / Provinces	Introducing and promoting the "demonstration facility" and operation record and its quality to other customers in particular neighboring cities and provinces.

## Project Formulation Survey, The Socialist Republic of Viet Nam “ Project Formulation Survey on Leachate Treatment Technology in Viet Nam”

### SMEs and Counterpart Organization

- Name of Reseach Agency : Shiny Ball Holdings Co., Ltd.,
- Location of Reseach Agency : Okinawa Pref., Japan
- Survey Site: Phuoc Hiep Complex, HCMC ▪ Counterpart Organization : Dept. of Natural Resources and Env., HCMC

### Concerned Development Issues

- Increasing Municipal Solid Wastes (MSWs) in proportion to economic growth,
- Capacity expansion of landfills for big demand,
- Improvement and capacity expansion of leachate treatment plant is one of the most urgent issues,
- Water contamination in rivers, canals and ponds in urban area caused by rapid increase of MSW, and
- Spreading infection at the flooding season.

### Products and Technologies of SMEs

- Original waste water treatment system contains shiny wave reactor, flocculation coagulant, strainer, developed by Shiny Ball Holdings Co., Ltd.
- Segmentalizing water molecule (activation) to ease to separate impurities such as bacteria, etc.
- Not applying biological process enables shortening retention time, reducing settlement space, operation electricity, and easing O&M.

### Proposed ODA Projects and Expected Impact

- Design, install and operate a demonstration plant (capacity: considering 100 – 200m<sup>3</sup>/day) by JICA's Feasibility Survey and Pilot Project in 1 ~ 2 years to monitor leachagte water quality and validate expense for treatment,
- Addressing rapid increment of MSWs and relating water contamination at city,
- Enabling to propose cheaper water treatment fee to Municipalities and Water treatment bodies.

### Future Business Development of SMEs

- Spreading out the technology to landfills in HCMC and neighboring municipalities,
- Investing the leachate treatment business by SME as BOO (Build, Own and Operate) scheme.

