Verification Survey with the Private Sector for Disseminating Japanese Technologies for Automatic Regenerating Activated Carbon Wastewater Purification System

Summary Report

Indonesia

September 2016

Japan International Cooperation Agency (JICA)

Jtop Co., Ltd.

1. Background

1.1. Issues of industrial wastewater treatment in the Republic of Indonesia

In accordance with national industrial development between 2004 and 2008, reflecting an increase of approximately 29% in the number of factories and other development, the volume of wastewater in the Republic of Indonesia has rapidly increased. Among factories generating wastewater, about 47% of enterprises are food and beverage and 21% are textile-related and collectively, these food and textile industries requiring a substantial volume of wastewater, account for approximately 70% of all factories. The pollution load generated by agriculture and livestock has also become problematic nationwide.

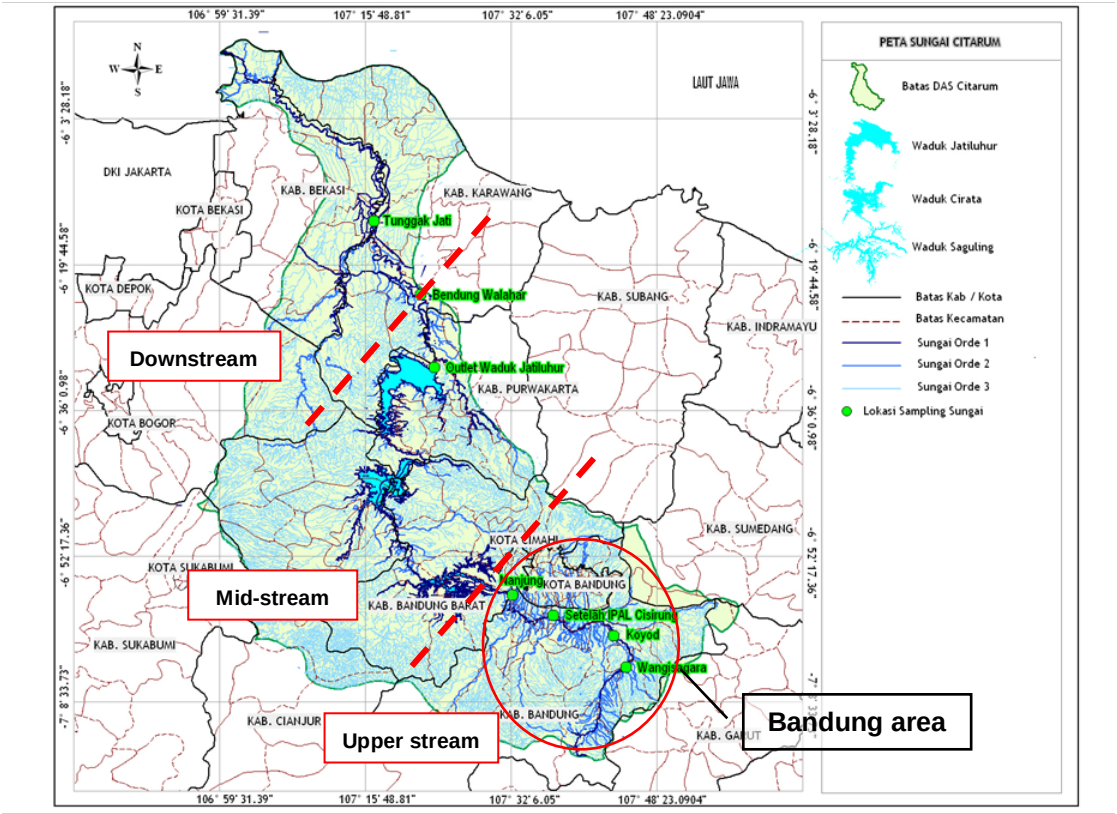
In 2007, around 13,000 medium- and large-sized enterprises were reported as potential pollutants of surface and ground water, an increase of 29% from 2004, hence the increasingly urgent need to establish a systematic environmental monitoring structure.

According to a hearing survey with local stakeholders conducted in 2013 during the field survey, including the Ministry of the Environment, the needs for water reuse have further intensified recently in Indonesia due to water shortages. Industries such as mining and industry, paper manufacturing, beverages and textile requiring particularly large volumes of water have increasingly focused on the potential of water reuse for industrial use. Although the Indonesian Ministry of the Environment has considered institutionalizing the promotion of water reuse ("Guidelines for Water Reuse: Dyeing and Printing Textile Industries" were drafted as part of a Ministerial Ordinance in 2010), expertise and knowledge of institutionalization in this sector remains insufficient and the guidelines have yet to come into force. Under the current system, enterprises should apply to the competent local government to use recycled water. However, given the lack of specific criteria or technical knowledge concerning the authorization process, the local governments concerned are struggling to handle such applications.

1.2. Issues of wastewater treatment in local governments (West Java Province, Bandung Regency and Bandung City)

The major environmental issues in West Java Province (including Bandung Regency and Bandung City) can be identified as follows: 1) worsening environmental pollution in the Chitarum River basin, 2) declining ground water level and spreading ground subsidence following excessive ground water intake and 3) insufficient environmental management capacity and a vulnerable management system.

With respect to 1) as above, pollution in the Chitarum River basin, which flows through the central part of the Province, has become an important issue.



(Source: West Java Province)

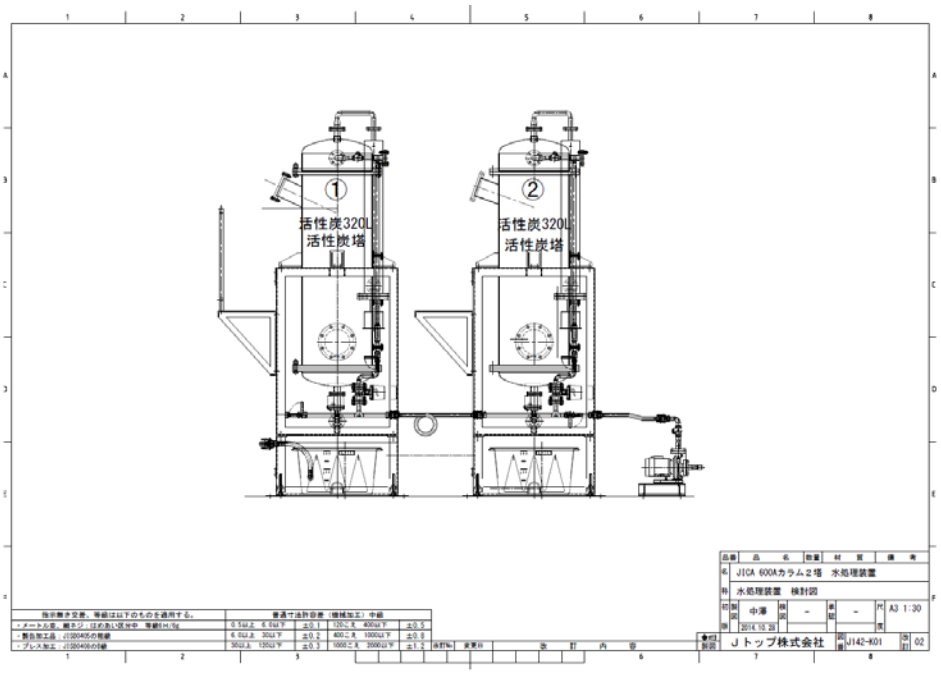
Chitarum River basin map

Figures for water quality (COD) in the Chitarum River regularly show over 100mg/L, reflecting deterioration compared to wastewater flowing into treatment plants in Japan. Indeed, since media and environmental NGOs have featured the Chitarum River as the most polluted in the world across the board, its pollution status has increasingly come under the spotlight.

1.3. Outline of product/technology to be disseminated and verified

Name	Automatic Regenerating Activated Carbon Wastewater Purification System (portable wastewater purification device)
Specifications	- Purification capacity of demonstration device: 30-40t/day (operating hours: 18-20h)
Characteristics	- Activated carbon need not be replaced or repurchased. - No sludge is generated. - Activated carbon is automatically regenerated on site. - Compact system allowing a space-saving installation (portable operation also available). - Energy-friendly. - Recyclable use of water. - Advanced purification and elimination of refractory substances available. - Honored with an Award of Excellence in the 25th Small and Medium Business Excellence in New Technology/New Product Awards in 2013.
Distinctive features compared to competitors' products	[Compared to conventional activated carbon technology] - Running costs can be greatly reduced since activated carbon for replacement need not be purchased. - Waste treatment cost eliminated. - User-friendly functional continuity and maintenance. - Despite 30-50% weight loss following conventional regeneration of activated carbon, the Jtop method features almost no loss. [Comparison with conventional advanced purification technology] - Power consumption cost is 2 to 10% of that under the ozone method. - Membrane technology, including MBR, requires a high-pressure pump, increasing the O&M cost, while O&M can be easily performed under the Jtop method.
Size	- Installation area for demonstration device: approx. 17.5 m^2 (W5m×D3.5m×H3.5m) ・Size of demonstration device: approx.4.5 m^2 (W3m×D1.5m×H3m)
Installation	・Indoor

Figure: Appearance drawing and specifications of the device body



Configuration of the demonstration device
- <u>Configuration of device: two units</u> Device size on installation: approx. W1150mm x D1050mm x H3500mm per unit - <u>Activated carbon tower: two towers</u> Tower size: diameter of approx. 600mm, length of main body approx. 1700mm - <u>Control panel</u> Independent type, semi-automatic method (three phases 220V, 50Hz specifications) - <u>Configuration of other devices</u> Boiler, heater, pump, filter, purification tank and pipes
Capacity demonstration device
- Amount of activated carbon Approx. 300L x 2 towers (recyclable specified activated carbon) - Wastewater purification capacity* Approx. 30 to 50t/day (fluctuates according to raw water content) * Here, organic substances are subject to purification

2. Survey Outline

2.1. Objectives

The Survey is to implement recycled water production and wastewater purification tests targeting wastewater from textile and other industries at multiple sites (factories, etc.) in the Bandung area and verify and improve technical and operating issues. It also supports water reuse and activities initiated by local governmental agencies to improve water quality management, such as guidelines formulated for the textile industry on how to reuse water by the Ministry of the Environment of Indonesia and a capacity development program for local governmental officers. At the same time, the Survey aims to improve the local environment and disseminate proposed recycled water treatment and wastewater purification system by promoting them through governmental measures and supervision.

2.2. Expected outcomes

The expected outcomes of the Survey are as follows:

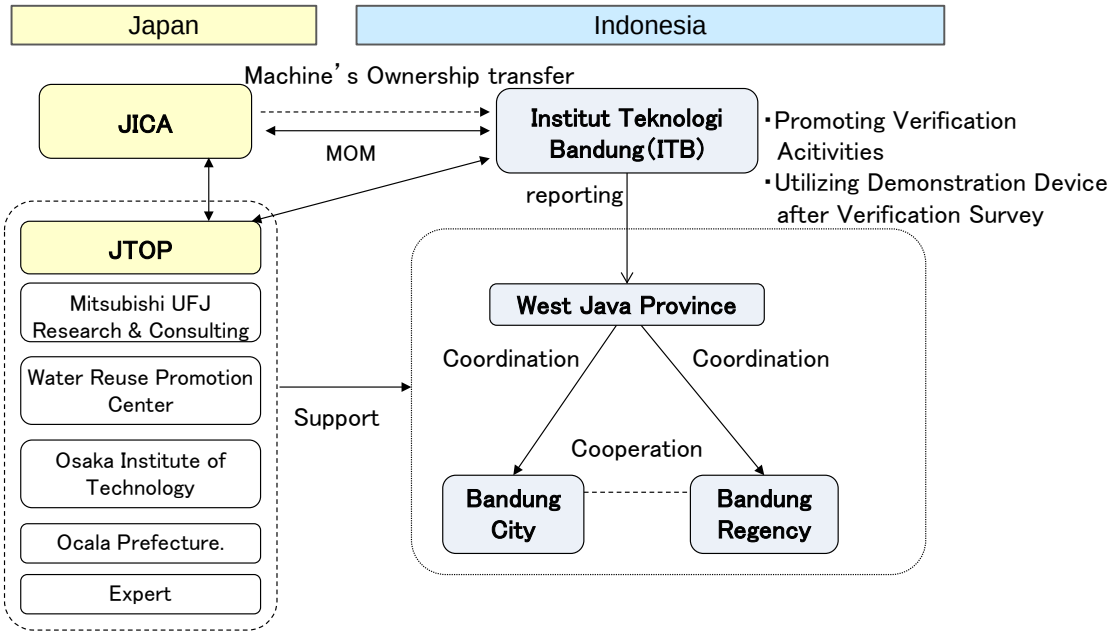
Outcome 1: To promote water reuse, the utility of recycled water production and wastewater purification system are recognized.

Outcome 2: Guidelines for Water Reuse: Dyeing and Printing Textile Industries (textile industry) of the Ministry of the Environment and Forest (draft) are prepared.

Outcome 3: The capacity of West Java Province, Bandung City and Bandung Regency for promoting water reuse and of wastewater regulatory administration for monitoring and supervision are improved.

2.3. Implementation system

The implementation system of the Survey is as follows. The minutes will be concluded by three entities: The Japan International Cooperation Agency, Institut Teknologi Bandung and Jtop. Jtop implements the Survey supported by external human resources.



Organizational Chart

3. Achievement the Survey

3.1. Verification

The Jtop equipment's wastewater purification performance was tested at three candidate enterprises: Sari Sandang, Grand Textile and Kahatex. While each enterprise treats a large volume of dye effluent, they are highly aware of improved water reuse and wastewater purification, as reflected in the increased water consumption cost during water shortages and suspension of operations in response to drought and other problems. In addition, given their large business scale, they require relatively high volumes of production and wastewater.

3.1.1. First test: Grand Textile

The first verification test assessed water quality by filtering wastewater produced by Grand Textile at the activated carbon tower. Under a flow rate of 40L/min (space velocity (SV) 8/h) in the activated carbon tower, purified water was collected at the purified water outlet and CODMn measured by a COD test kit. The test result was as follows:

Result of the wastewater test at Grand Textile

Bed Volume (BV)	COD pack test (mg/L)
Raw water	200 to 250
2	20
4	20
6	20
8	30
10	30
12	30
14	40
16	40
18	50
20	50
22	60
24	60
30	75
32	75
34	90
36	90

Compared to a simple test conducted on October 31 using a polyvinyl chloride column, while the values obtained by the COD pack test shifted by almost the same figures until 20 times the bed volume (BV), the value started to increase to over 20 BV. At around 35 BV, the value showed 50mg/L during the test on October 31 while the value during the November 25 test reached 90mg/L.

Based on the above result, it was verified that Grand Textile could maintain a wastewater purification capacity, even under a condition where activated carbon was regenerated to around 20 BV.

Grand Textile's raw water (left) and water purified by activated carbon (right)

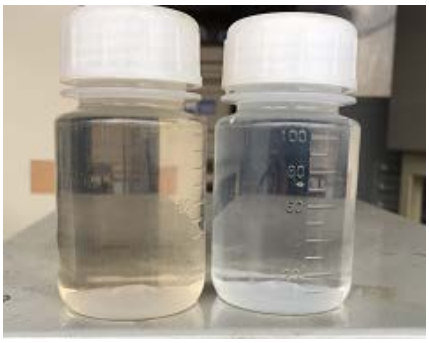
3.1.2. Second test: Sari Sandang

A verification test was conducted at Sari Sanadang to assess water quality by letting the wastewater run through the activated carbon tower. Under a flow rate of 40L/min (space velocity (SV) 8/h) in the activated carbon tower, purified water was collected at the purified water outlet and CODMn measured by a COD test kit. The test result was as follows:

Result of the wastewater test at Sandang

Bed Volume (BV)	CODMn (mg/L)
Raw water	50
8	5
16	8
20	9
24	10

While the raw water looked yellowish, the water purified by activated carbon was completely transparent. The effectiveness of the Jtop system in eliminating the color component of raw water and meeting the required water level of Sari Sandang was confirmed.



3.1.3. Third test: Kahatex

During the verification test at Kahatex, water quality with pack was assessed as necessary by filtering the final effluent produced by Kahatex at the activated carbon tower after regenerating activated carbon. Under a flow rate of 40L/min (space velocity (SV) 8/h) in the activated carbon tower, purified water was collected at the purified water outlet and CODMn measured by a COD test kit. The test result was as follows:

Result of the wastewater test at Kahatex

Bed Volume (BV)	CODMn (mg/L)
Raw water	Approx. 120
4	Approx.20
8	Approx. 20
16	Approx. 20

Kahatex's raw water (left) and purified water (right)

Similar to the status before regenerating activated carbon, a COD pack test confirmed that around 83% of COD had been eliminated. Similarly, while the raw water was deep brown in color, the water purified by activated carbon was almost transparent, which confirmed the elimination effect of the color component in raw water. This result verified that the improvement of final effluent, one of the objectives of Kahatex for introducing activated carbon purification system, met the demands of the company.

3.2. Dissemination

3.2.1. Company visit survey and supervision

The Survey team visited the following six enterprises: (1) Sari Sandang, (2) Sinar Majalaya Lestari, (3) Stanli Trijaya, (4) Hasan Sadikin Hospital, (5) Grand Textile and (6) Kimia Farma company.

An expert conducted a field survey to propose measures to improve water quality by changing the wastewater purification process based on the current wastewater condition and water reuse by introducing an activated carbon device. The expert also provided advice on how to monitor and supervise enterprises to the governmental officers in charge of regulation.

3.2.2. Preparation of Guidelines for Water Reuse: Dyeing and Printing Textile Industries (draft)

Supported by Professor Tjandra of the Institut Teknologi Bandung and the Water Reuse Promotion Center of Japan, "Guidelines for Water Reuse: Dyeing and Printing Textile Industries" were drafted. These guidelines were then translated into Indonesian and drafted under the supervision of Professor Tjandra. Subsequently, seminars on the water-reuse guidelines were organized for the public and private sectors concerned who will utilize them, to explain the guidelines to them and collect feedback. In parallel, the draft guidelines were finalized and submitted to the Ministry of Environment and Forest of Indonesia, who will promulgate said guidelines.

3.2.3. Technical cooperation to purify SMEs' wastewater

The significant volume of Batik wastewater having accumulated in West Java Province was discussed with the Ministry of the Environment and Forest and local governments (West Java Province, Bandung City and Bandung Regency) under the initiative of Professor Tjandra, Insittu Teknologi Bandung. Most Batik enterprises are unable to take wastewater treatment measures properly, meaning that small- and mid-sized enterprises are not subject to the scope of wastewater treatment regulations. While some enterprises taking simple environmental measures were introduced, their efforts are still considered insufficient. The need for a collaborative response between the General Directorate of Small- and Medium-sized Industries of the Ministry of Industry and the Ministry of the Environment and Forest to these situations was shared among stakeholders.

3.2.4. Seminar organization (twice)

Two seminars were organized. The first was held on Tuesday, November 24, 2015, at which drafted Guidelines for Water Reuse: Dyeing and Printing Textile Industries were introduced, mainly to private sectors, as part of the progress report of the verification survey and a site visit to Grand Textile was conducted to exchange opinions. 70 persons from 44 companies participated in this

seminar. Despite proactively raising questions, it was medium-sized or larger enterprises with relatively sound finances which showed a concrete interest, given the considerable initial cost.

The second seminar was held on Thursday, April 7, 2016 for private sectors and local governments, at which the draft Guidelines and Jtop system were introduced and a survey report was made. 16 persons from 11 companies participated. Since the participants agreed with the contents of the draft guidelines at this seminar, these guidelines were then submitted to the Ministry of the Environment and Forest, which promulgated them. In introducing Jtop system, more specific questions about introducing the machine were put forward from participants in response to information that overseas production of the system would reduce the initial cost to about 33%.

3.2.5. Participation in activities conducted in Japan

Three officers from West Java Province, Bandung City and Bandung Regency participated in the activities conducted in Japan, mainly within Osaka prefecture. Wastewater purification technologies of Jtop and other private companies were introduced and views were exchanged regarding the current status of wastewater treatment and previous experience in overcoming environmental pollution, etc. The activities were conducted from May 15-21, 2016.

4. Business development plan

Jtop has concluded a license agreement with Japanese trading companies and local EPC companies, which are business operators undertaking a series of work processes including engineering design, equipment and material procurement, production and construction work in a plant construction project. It also issues these companies with a set of licenses for production, sales and maintenance in Indonesia. Regarding production, Jtop proceeds to engage in discussion to establish an implementation system in those companies or outsource to local companies. However, given the lack of confirmed companies capable of handling production on site at the time of the survey, the production was handled in the Philippines as a temporary measure.

4.1. Policy and schedule of future business development in Indonesia

4.1.1. Market expansion according to enterprise size and capital

Indonesian markets can be roughly classified by Japanese and foreign enterprises, major local enterprises and medium- and small-sized enterprises. Jtop will employ different marketing strategies according to their enterprise size and capital. For Japanese and foreign enterprises, their sales results and channels in Japan can be utilized. For major local enterprises, conversely, business negotiation with individual companies is promoted while increasing awareness of Jtop system through a technical verification survey utilizing ODA schemes, introducing technology jointly with local governmental agencies, advanced research institutions and industry group and other initiatives. As for local medium and small-sized enterprises, the local governmental agencies responsible for providing legal support for wastewater measures will introduce Jtop system as a public business and reflect on implementation policy for the treatment business.

4.1.2. Areas urgently requiring water reuse

As part of market expansion, business will be developed by taking those areas urgently requiring water reuse into a market. In areas subject to water shortages, there is a strong incentive to avoid any loss of opportunity due to shutdown.

4.1.3. Consideration of industrial characteristics

Market expansion will be promoted taking unsuitable areas and specific requirements into consideration to introduce Jtop system aligned to the industrial characteristics of the corresponding enterprises. For example, when water is reused by a pharmaceutical company, the COD concentration must be zero, regardless of whether it is used for rinsing or toilets. For this reason, it was determined that the system introduction targeting water reuse would not be adjusted in such a case. Accordingly, the business will be promoted taking both industry and the characteristics of partner companies into consideration.

4.2. Lessons learned recommendations through the Survey

To ensure stable implementation of work, there is a need for detailed dialog with the government officers concerned in the partner country prior to survey implementation. The government officers in this respect refer not only to Indonesian local governments and research institutions as practical partners but also entities including higher authorities which sign the minutes. Since concluding minutes directly with local government is not institutionally allowed in Indonesia, the consent of higher authorities is required, which means prior consultation and discussion with higher authorities must get underway at the project formulation phase.

From the technical aspect, it was clarified that the Jtop system would not perform wastewater purification desirably if treatment water of a quality differing from the level originally expected or agreed entered the machine. This was often due to insufficient understanding on the part of wastewater operators. Accordingly, it is desirable to explain the minimum requirement to be followed to the field operators in advance and designate staff familiar with Jtop system to monitor the site situation for several days once operation commences. When an abnormal situation occurs or the operators' daily work is improved, proper supervision is also required.

Republic of Indonesia

Verification Survey with the Private Sector for Disseminating Japanese Technologies for Automatic Regenerating Activated Carbon Wastewater Purification System

JTop Co., Ltd. (Osaka)

Relevant development needs in Indonesia

- Water quality deterioration in the Chitarum River, which runs through West Java Province.
- Lack of affordable priced wastewater treatment system with easy O&M performance.
- Environmental load by dye effluent, including refractory substances discharged from the textile industry; one of the major national industries.

Survey activities implemented

- Technical verification of the automatic regenerating of the activated carbon wastewater purification system at textile factories and capacity building of local officers overseeing regulations by Japanese and Indonesian wastewater treatment experts (local university researchers, Japanese wastewater purification engineers and officers overseeing wastewater regulations in Japan).
- Supporting local governments' enterprise assessment, an incentive creation program, obligation to reuse water and prepare Guidelines for Water Reuse, etc.

Proposed Products/Technologies

Automatic Regenerating Activated Carbon Wastewater Purification System

Results of dye effluent purification by JTop product

Expected outcomes created in Indonesia

- Local governments will promote water reuse and improve their wastewater management system.
- An on-site regenerating activated carbon system will be established to slash the regenerating cost.
- Automatic regeneration will reduce the maintenance cost.

Expected outcomes created in Japan

Current status

- Help deepen and expand the economic exchange relationship between Kansai and Asia as a member of the Kansai-Asia Environmental and Energy Saving Business Promotion Forum (Team E-Kansai).
- Contribute to economic cooperation activities in Indonesia utilizing a system of collaboration between industry, academia and government. Building a network with related Indonesian organizations, major enterprises and the Institut Teknologi Bandung.

Future

- A system for exploring product sales from enterprises in the Kinki area will be developed.