ANZAIKANTETSU CO,LTD

mcs section

Project to Eliminate Blue-Green Algae at the Outer Moat of the Imperial Palace Hibiya, Tokyo

Project Overview

Translator's Note

The Algae problem of the Imperial Palace Moat, Tokyo, has been reported on many occasions in the Japanese media, especially the Hibiya Outer Moat, which is the main focus of this project. Located at the water gate output point, it has a problem not only with Algae layers, but also odour in the main entrance of the Royal Palace. The Japanese Government investigated many solutions, but finally decided that Anzai Kantetsu Co. Ltd., should be involved in this project, using its patented Nanobubble technology.

Normally, a direct government commission is only granted to large scale companies with capital of US$10 million or more. However, due to the forthcoming Tokyo Olympics 2020, a quick and sustainable solution for the future was crucial. Therefore for Anzai Kantetsu to be invited to participate is a very rare and exceptional case as this is one of the most prestigious commissions in Japan.

The original report consists of 40 pages. I've summarized the main part into the 6 pages below.

Regards,
Aki Takagi
October, 2018

ProjecttoEliminateBlue-GreenAlgaeat theOuterMoat of the Imperial Palace HibiyaMoat(Extracts taken from longer report).

Commissioner:Government of Japan
TechnologySupplier:Ansai KantetsuCo.,Ltd, Yokohama
Place:The Imperial PalaceHibiyaMoat

1.Project Aims:

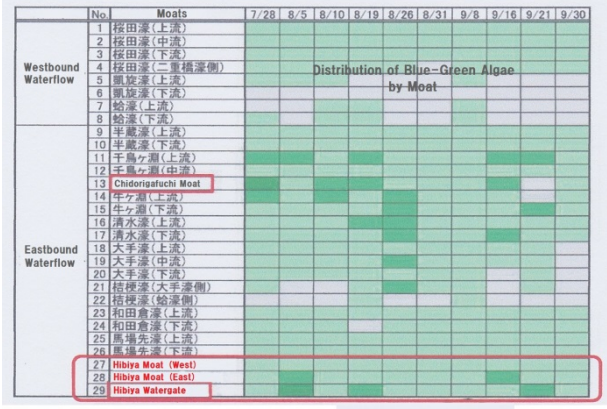
Improvement of the water environment of the Imperial PalaceHibiya Moat towards the Tokyo Olympic Games2020. RemovalofBlue-GreenAlgaeand ongoingsustainable measures.DiffusionPreventionof suspendedmatter andAlgaein the downstream of theothermoatareas.

2.Background:

HibiyaMoat, which isthe objectto this project, is located at the point where the westboundwaterstreamaround the Imperial Palaceand the eastboundwater stream join together, and the numerical value ofChlorophyllis extremelyhigh.The numerical value of Chlorophyllin HibiyaMoat was910 µg / litre,whichwasmore than 12times comparedwith 14 µg / litreof theGaisenMoat,the west side waterway and 78 µg/ litreof theBabasakimonMoat,the eastern waterway,andurgentunsustainable measureswererequiredfor the upcoming Tokyo Olympicsin 2020.

Fig.1 Imperial PalaceOuter Moat

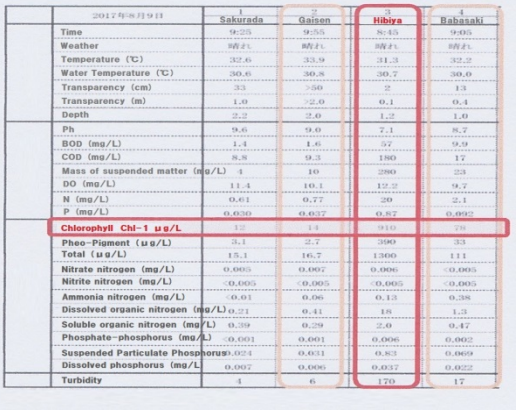
Fig.2 Project Site–Hibiya Outer Moat



Distribution of Blue-Green Algae by Moat

	No.	Moats	7/28	8/5	8/10	8/19	8/26	8/31	9/8	9/16	9/21	9/30
Westbound Waterflow	1	桜田濠（上流）										
	2	桜田濠（中流）										
	3	桜田濠（下流）										
	4	桜田濠（二重橋濠側）										
	5	凱旋濠（上流）										
	6	凱旋濠（下流）										
	7	蛤濠（上流）										
	8	蛤濠（下流）										
Eastbound Waterflow	9	半蔵濠（上流）										
	10	半蔵濠（下流）										
	11	千鳥ヶ淵（上流）										
	12	千鳥ヶ淵（中流）										
	13	Chidorigafuchi Moat										
	14	牛ヶ淵（上流）										
	15	牛ヶ淵（下流）										
	16	清水濠（上流）										
	17	清水濠（下流）										
	18	大手濠（上流）										
	19	大手濠（中流）										
	20	大手濠（下流）										
	21	桔梗濠（大手濠側）										
	22	桔梗濠（蛤濠側）										
	23	和田倉濠（上流）										
	24	和田倉濠（下流）										
	25	馬場先濠（上流）										
	26	馬場先濠（下流）										
	27	Hibiya Moat (West)										
	28	Hibiya Moat (East)										
	29	Hibiya Watergate										

Table 1 Distribution of Blue-GreenAlgaeby Moat



2017年8月9日	1 Sakurada	2 Gaisen	3 Hibiya	4 Babasaki
Time	9:25	9:55	8:45	9:05
Weather	晴れ	晴れ	晴れ	晴れ
Temperature (℃)	32.6	33.9	31.3	32.2
Water Temperature (℃)	30.6	30.8	30.7	30.0
Transparency (cm)	33	>50	2	13
Transparency (m)	1.0	>2.0	0.1	0.4
Depth	2.2	2.0	1.2	1.0
Ph	9.6	9.0	7.1	8.7
BOD (mg/L)	1.4	1.6	57	9.9
COD (mg/L)	8.8	9.3	180	17
Mass of suspended matter (mg/L)	4	10	280	23
DO (mg/L)	11.4	10.1	12.2	9.7
N (mg/L)	0.61	0.77	20	2.1
P (mg/L)	0.030	0.037	0.87	0.092
Chlorophyll Chl-1 μg/L	12	14	910	78
Pheo-Pigment (μg/L)	3.1	2.7	390	33
Total (μg/L)	15.1	16.7	1300	111
Nitrate nitrogen (mg/L)	0.005	0.007	0.006	<0.005
Nitrite nitrogen (mg/L)	<0.005	<0.005	<0.005	<0.005
Ammonia nitrogen (mg/L)	<0.01	0.06	0.13	0.38
Dissolved organic nitrogen (mg/L)	0.21	0.41	18	1.3
Soluble organic nitrogen (mg/L)	0.39	0.29	2.0	0.47
Phosphate-phosphorus (mg/L)	<0.001	0.001	0.006	0.002
Suspended Particulate Phosphorus	0.024	0.031	0.83	0.069
Dissolved phosphorus (mg/L)	0.007	0.006	0.037	0.022
Turbidity	4	6	170	17

Table 2 Data-Hibiya Molt

3.Water ImprovementConditions:

Transparency1mmin.
ChlorophyllValueChl-a 25μg/litre.
T-P0.05mg/ litre.max.
tobesatisfied.

4.TechnicalPrinciple andthePurification System:

Byusingin combinationwith anARagitator,toagitatethe sediment(organicsludge)at the bottom of themoatand efficiently support the decompositionreduction causedby the dissolved oxygen risewhich is createdby the AnzaiKantetsuNanobubble GeneratorAF 50 A/L.

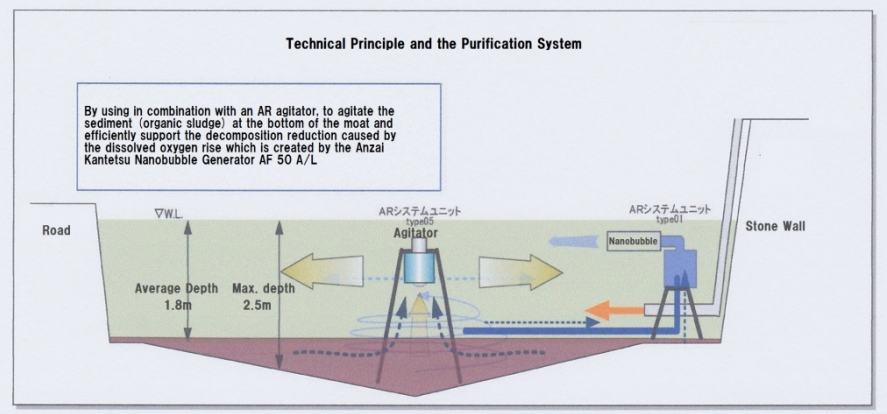


Fig.3Purification System

PowerSource: 100V single phase or 200V three phase power supply required.

ElectricityConsumption ofEquipment: 48 KW/ Daily

Monitoring:By monitoringcamerasandhaving astableInternet connectionrequired for cameraoperation.

EquipmentNoise:There is almost no sound accompanyingequipmentoperation.

5. Site Schematic:

HibiyaMoatArea: 35,884m2

Deepestpart: 4 m

Averagedepth: 1.4-2.5 m

WaterVolumeof HibiyaMoat:72,000m3

In-flowwatervolume:3,000-14,000 m3 (dailymax.)

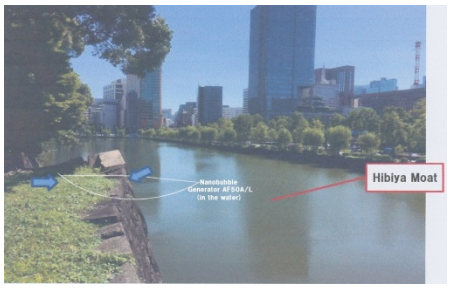


Fig.4&5Target Polluted Area

6.ProjectPeriod:

August,2018-September, 2018

7.The ResultsEvaluationMethod

In addition to theChlorophyllValue (Chl-a)ofBlue-GreenAlgae, the evaluation was alsomade visuallyby the specialistbasedon the following criteria.
EvaluationLevels:

Level1 Transparencyrisesandlight green natural water coloris back
Level2Lacks transparency,butBlue-GreenAlgaehave beeneliminated
Level3Blue-GreenAlgaeremainingandstilllackoftransparency.
Level4 Blue-GreenAlgaeblown by the wind overlap to form a layer, and it has a strong odor.

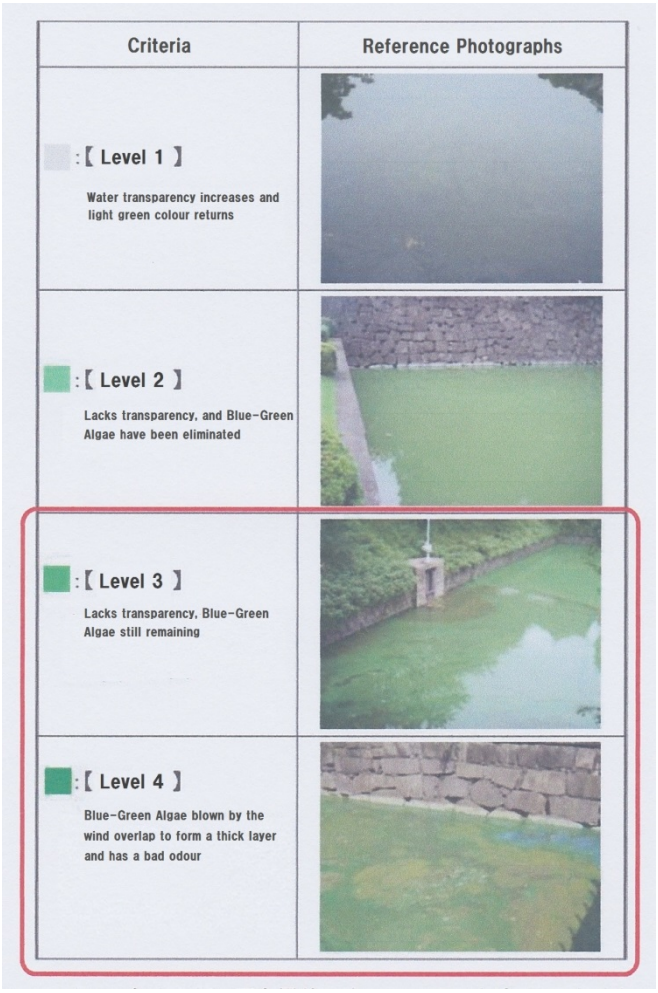


Fig.6Visual evaluation

Monitoring camerasto be introduced for observingthelevelofBlue-GreenAlgae.

8. Results

RegardingtheHibiya Moat project,water samplingforevaluation wasconductedin the following threelocations:

		Starting Data A		Final Data B	1-(B/A)
	Sample Test	2018年8月9日	2018年8月9日	2018年9月28日	Improvement
Watergate	Chlorophyll a(μg/L)	910	42	200	78% Down
Boat House		–	–	64	

		Starting Data A		Final Data B	1-(B/A)
	Sample Test	2017年8月9日	2018年9月12日	2018年9月28日	Improvement
Watergate	T－P(mg/L)	0.87	0.061	0.064	93% Down
	Transparency		12.4	32.5	
	C O D(mg/L)	180	11	8	96% Down
	S S(mg/L)	280	13	8	97% Down
Boat House	T－P(mg/L)	–	0.055	0.025	
	Transparency		15.8	50	
	C O D(mg/L)		10	7.1	
	S S(mg/L)		11	4	

Table.3The result

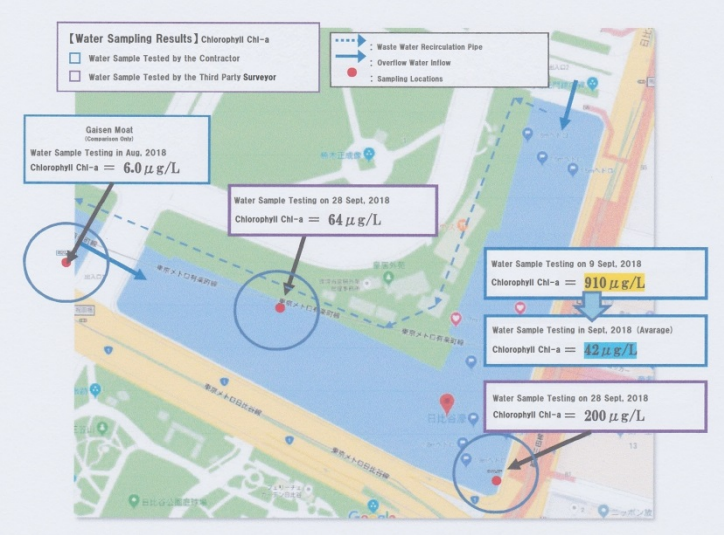


Fig.7The result

Results Summary

a.ChlorophyllValue-Chl-a(μg/litre)fell to 200fromthe initial 910 and improved by 78%.

b. T-P (mg/litre)decreased to 0.064fromthe initial 0.87, achievingan improvement rate of 93%.(<0.05 mg)

c. COD(mg/litre)decreased to 8fromthe original 180, achieving96%improvement.

d.SS(mg/litre)decreased to 8 fromtheinitial 280, achievingan improvement of 97%.

e. Transparencyachieved1mormoreasinitiallytargeted.

Certificates& DataissuedbytheTokyo Metropolitan WaterAuthority attached.
(See attached PDF)

Therefore, it is believed that theNanobubbles will exert similar effects in purifying water quality throughout the entire moat of the Imperial Palace,and also prove that adoption over the whole water environmentalimprovementprojectstoward Tokyo Olympicswiththeappropriate technology.

October, 2018

Imperial Palace
Government of Japan

Mr Anzai reviewing the water

Quality ofwater after treatment