



" LUMILITE" Technology

Lumilite Japan Co. Ltd,

Ecological River Environment Technology Institute

http://lumilite.jp/



WATER ENVIRONMENTAL POLLUTION



The outflow of pollutant has been discharged over original capacity of purification











Pollution Load Flow & Deposition

- Living drainage
- Industrial Wastewater
- Agrochemical/Fertilizer
- •Sewage etc.



- Organic matter pollution
- Abnormal occurrence
 of algae
 Turbidity
 Death of aquatic life

Water quality is progressively worsening





Occurrence of stench







The Existing various water treatment technology



Most existing water technology is depended the result by natural environment conditions like type of contaminants, temperature, the difference between the PH concentration and etc.



Extremely high safety-friendly processing technology for environment and ecosystem



The breakthrough environmental cleanup technology improving sediment and water through accelerating natural purification capacity of rivers, lakes and so on

LUMILITE



Consists of 17 kinds of natural minerals with porous silicate







Lumilite Chip





Component	Name	Ratio by weight(wt.%)
SiO ₂	Silicon dioxide	74~76 %
AL ₂ O ₃	Aluminum oxide	12~15 %
K ₂ O	Potassium oxide	1.5 [~] 2.5 %
Na₂O	Sodium oxide	0.5~2.0 %
CaO	Calcium oxide	3.5~5.0 %
MgO	Magnesium oxide	1.0~1.5 %
Fe ₂ O ₃	Ferric oxide	1.0~2.0 %
CEC	Cation substitution capacity	200 [~] 300(meq/100g)



Extremely high safety-friendly environment and ecosystem processing technology

There is no need for equipment such as plant High improvement capability of water quality compared with Flocculants (PAC) "Field spraying method" Easy installation **Powerful** http://www.env.go.jp/policy/etv/ New technology registration 野号080-1803) by Ministry of Land, MINISTRY OF THE ENVIRONMENT Infrastructure. **JAPAN Environmental Technology Verification NETIS: QS-070011-A** 080-1802/1803 Safety Low Cost - To ensure a high-purity porous mine **Clear 26 Soil pollution standards** - Significant cost down compared with and 41 drinking water quality Zeolite (Reduction of usage) standards in JAPAN **NETIS(New Technology Information System)**

Ministry of Land, Infrastructure registered the environmental technologies that have been developed in the private sector after the verification of experts in each field. Actively system to be utilized in public works and private large-scale projects



Flow of basic installation for Lumilite



 Calculation of Lumilite by laboratory



② Determination of the spraying method according to the site survey



3 Preparation of the construction site



(5) Monitoring of water quality



④ Construction site (Spraying from boat) ④ Construction site (Spraying from land)



80

80

60

60

(mg/l)

Efficacy Comparison between LUMILITE and PAC (polyaluminum chloride)

LUMILITE



40

40

Lumilite

20

PAC (ml/l).

100% Reduction ratio of red tide (%) 80% 40mg/l Input : Red tide 45% Reduction 60% 80mg/I Input : Red Tide 68%~97% Reduction 40% 20% Almost no elution of aluminum and Less than 20 0% -20% reference value for drinking water -40% -60% -80% PAC(ml/l). Lumilite (mg/l) PAC 0.5 0.4 (3/6m) IV-C 0,3 Until 80mg/l input : no reaction for red tide 0.2 Aluminum: 0.29 0.29mg/l Detection 0.1 • From Input over 0.03ml/l : Elution numeric of 0.0 aluminum will start to increase

Kyushu Industrial Hygienists Association Center for Environmental Science (State certified water quality test agency) in 2007

Effects of "LUMILITE" Installation





Lumilite apply directly to the site with a variety of water quality deterioration

- The water quality improvement by aggregation and sedimentation of water pollutants
- After precipitated, Lumilite is coated on the bottom mud as a bed material,
- Surface charge of Lumilite absorbed the suspended material and become strong bonded state.
- Suppression the re-elution of suspended matter.
- To encourage the activity of bacteria in the bottom mud
- Decomposing the organic deposition in long-term

Suspension and control of Phosphorus

Recovery of self-purification capacity of the river in the reduction of pollution load by suppressing elution



"Aggregation" and "Sedimentation" of water pollutants

- Aggregation by Ionic substitution of Lumilite
- Sediment includes adsorbed suspended solids and oxygen
- Outstanding the bond effect of Lumilite

In the water







"Shield effect" Suppression the re-elution of suspended matter after sedimentation

- The adsorbed organic matter, nutrient salts and oxygen etc. in the mud by lumilite energize the decomposition bacteria.
- To suppress the bad odor for preventing ammonia and methane eluted from the mud of anaerobic conditions



"Lumilite is Shielding material"

The underwater is neutralized by Lumilite treatment

Required quantity of Lumilite for elution suppression from the bottom mud:

Clay and Silt

Cladding thickness: about 1mm

Sludge and Blue-green algae

Cladding thickness: about 2mm



"Decomposition Effect" Reduction of sludge (organic matter etc)

- The adsorbed organic matter is the nutrient of decomposition bacteria
- · Lumilite powder and chip is the nest of decomposition bacteria

Excellent environment as a breeding for bacteria



"Lumilite is Operating base for decomposition bacteria"

To maintain the aerobic state in bottom mud by the decomposition bacteria



3 weeks after spraying Lumilite Show the occurrence of plant microorganisms

Downstream river in IKISA dam After 6 months, organic Photo in January 17th 2008 matter was resolved Downstream river in IKISA dam Photo in August 9th 2008 After 6 months After 3 weeks



To actively improve the generated pollution by the living environment $\frac{\underline{\&}}{\underline{N}}$ <u>To be recovered the original nature purifying effect</u>

Lumilite technology is to execute the long-term water quality improvement by **Sediment improvement**



Lumilite technology is to formulated by the state of water quality and sediment

(Formulations in accordance with the purpose)



Long-term improvement of water quality and Sediment by using LUMILITE adapted for problem solving [Natural regeneration]

Powder Type

Making nano sized Lumilite depending on water quality

Chip type

Block Type



Immediate water quality improvement and Odor removal



Improvement at the reflux site



Water quality and sediment controlled by establishing microbial environment





1 Garden ponds, Park ponds, Bowl, Reservoirs, etc

- Shikinaen (World heritage in Okinawa)
- •Bowl of Imperial palace Chidorigafuchi (Tokyo)
- Bowl of Akashi Castle (Hyogo-ken)
- Fukshuen in Okinawa (Artificial park pond with purification equipment)
- Domestic wastewater and agricultural water ponds in IEJIMA
- Reservoir in Kurume Guangzhou

2 Lake, River, Dame

- ·IKISA Dam and downstream river (Saga-ken)
- -Banbon River -Living drainage confluence river (Soul in South Koria)
- Black soil & Oder –Living and industrial Drainage confluence river

(Guangzhou, China)

③ Turbid water treatment

-sedimentation pond turbid water treatment (South Koria)

(4) Industrial wastewater treatment

-kaolin raw material processing drainage pond (China)

- Penicillin factory and leather processing wastewater treatment
- **(5)** Aquaculture pond





<u>" 識名園 Shikinaen</u> " (World heritage in Okinawa)

Excited Date: Continuous maintenance from 2012

Okinawa Naha City

Scale: 5000tons



 Mass generation of algae (Spirogyra)
 Water Coloring
 Bad Odor
 Execution:
 Spraying Lumilite powder
 Long-term improvement for the bottom sediment







<u>" 識名園 Shikinaen</u> " (World heritage in Okinawa)





Appreciated lumilite quantity :

1st Year6tons2nd Year5tons3rd Year3.5tons

stop bad odor Stable water quality

Continuous improvement for the bottom sediment and control algae









<u>"Chidorigafuchi in Imperial Palace 皇居お濠</u>

Excited Date: July-October, 2018 Demonstration experiment Algal treatment in Tokyo Scale: 6500tons (Demonstration area) requested by Japan Ministry of Environment



Problem:

- Generation of algae (Blue-green algae)
- •Bad Odor

Execution: • Spraying Lumilite powder

Evaluation method :

Check whether the layer of the algae is suppressed in the target area by visual inspection and confirm that there is always no odor.







<u>"Chidorigafuchi in Imperial Palace 皇居お濠</u>

Excited Date: July-October, 2018 Demonstration experiment Algal treatment in Tokyo Scale: 6500tons (Demonstration area) requested by Japan Ministry of Environment

Appreciated lumilite quantity : 9 ton for demonstration experimental time Rapidly odor stop and disappear the layer of the algae











<u>明石城 Bowl of Akashi Castle</u>

(Hyogo-ken)

Excited Date: Continuous maintenance from 2017 Hyogo-ken Scale: 31,000 ton (Total 3 Bowl)



<u>明石城 Bowl of Akashi Castle</u>

Appreciated lumilite quantity: Total 25 ton (Powder) 80PPM / Covering about 1mm on sediment

- Rapidly odor stop and disappear the layer of the algae
- Start the improvement of sediment and maintain water quality by covering powder sediment

Result of Water quality

			After (1 st Treat) 2017-12-02	
рН	-	7.4	7.1	7
NTU	度	18.65	2.73	3.06
SS	mg/ł	9.54	1.82	1.89
DO	mg/ł	3.16	4.88	4.83
T-P	mg/ł	0.35	0.11	0.1
T-N	mg/ł	4.28	1.72	1.64
Chlorophyll a	mg/m ³	18.2	2.51	2.49

Result of Sediment Improve

(Decrease of organic matter and change of aerobic condition) [Ministry of the Environment]

			Before	After	After 6 month
		2018-03-12	2018-03-12	2018-09-20	
	pН	—	9.4	7.4	6.0
	T-N	mg/kg	12400	9730	11100
が析	T-P	mg/kg	1950	1860	2270
項 目	Redox Potential	mV	-141	-30	58
	Ignition weight loss	%	26.8	24.0	18.7

"福州園 Fukushuen" Okinawa)

Excited Date: Continuous maintenance from 2013 Okinawa Naha City Scale: 1000 tons Artificial park pond with purification equipment

Problem:

 Generation of algae (Blue-green algae) Water Coloring Bad Odor

+500 tons

Execution:

•Put into Lumilite Chip in the existing purification equipment instead of gravel Spraying Lumilite powder

Quantity of chip in the existing purification equipment : 3tons + 1ton

Appreciated lumilite quantity : powder1st Year1.5tonsstop bad odor2nd Year0.5tons

" Domestic Wastwater Ponds " (IEJIMA in Okinawa)

Excited Date: August 2014 Okinawa lejima Scale: 3000 tons The installed automatic spreader for spraying Lumilite Powder

Problem:

-Bad Odor

Execution:

- Put into Lumilite Chip in the purification area before discharging to ocean
- Spraying Lumilite powder by automatic spreader

" Domestic Wastwater Ponds " (IEJIMA in Okinawa)

Appreciated lumilite quantity :powder2 tons / Yearstop bad odorChip5 tonsPlaced in purification area

Before Treatment

Immediately after treatment

項目	処理前*	処理後**
Hq	7.1	7.3
濁度 (NTU)	119	1.86
SS (mg/ ℓ)	60	1.02
DO (mg/ ℓ)	0.21	5.57
T-P (mg/ ℓ)	5.53	0.95
T-N (mg/ ℓ)	57.2	8.7
COD	201	10.4
色度 (Color)	9	1
BOD	755	5.3
透明度 (cm)	20	200

"Agricultural Water Ponds " (IEJIMA in Okinawa)

Excited Date: August 2014 Okinawa lejima

Scale: 10,000 tons

Problem: • Generation of algae Clogging of sprinkler filter • Bad Odor Execution : • Spraying Lumilite powder • Lumilite chip circulation area with pump

Appreciated lumilite quantity :powder1 tons / once a yearChip4 tonsPlaced in circulation area with pump

"Washizuka Reservoir " (Fukuoka)

Excited Date: November 2008 Fukuoka Kurume city

Problem:

Scale: 5,200 tons

 Generation of algae (Blue-green algae)
 Bad Odor

Execution :

 Spraying Lumilite powder for 2days

"Washizuka Reservoir " (Fukuoka)

Before Treatment

After Treatment

Appreciated lumilite quantity : powder 1.8 tons (First day 1.2tons Second day 0.6tons

" Ikisa Dam & Downstream River " (Saga)

Excited Date: December 2007 Saga Scale: 90,000 m² 1,600,000 tons

Problem:

 Generation of algae
 Coloring water by Humic substance
 Bad Odor

Execution :

Spraying Lumilite powder

Demonstration experiment for 1 year by Ministry of Land, Infrastructure for NETIS registration

" Ikisa Dam & Downstream River " (Saga)

Excited Date: December 2007 Saga Scale: 90,000 m 1,600,000 tons

Before Treatment

After Treatment (after one month)

Appreciated lumilite quantity :powder66 tonscoated with 0.6mm to bottom mudIt became colorless and transparent after executionTransparency : Over 10m

Waterfall in the 300m downstream

Before Treatment

After Treatment (after one month)

The bottom of lake and Riverbed after treatment (One month after)

Dam Lake

Dam immediately downstream

The Riverbed after treatment (One month after)

300m downstream from Dam

2km downstream

The Riverbed after treatment (One month after)

2km downstream

The condition of riverbed

Long-term Effect (One Year after)

Dam Lake

Dam Lake

Long-term Effect (One Year after)

300m downstream

2km downstream

Water quality measurement result:

measurement place: Dam surface

Items	Pretreatment *	After Treatment**	After Treatment***
Turbidity	3.1	0.9	1.1
Chromaticity	10.6	4.7	3.9
T-N (mg/L)	0.40	0.27	0.33
T-P (mg/L)	0.022	0.006	0.010
COD (mg/L)	1.7	1.2	1.2
SS (mg/L)	3	<1	1

- Pretreatment: Monthly average from document in Saga prefecture
- ** 2008/1/30 (1 month after treatment)
- *** 2009/1/27 (13 months after treatment)

Sedimentation pond turbid water treatment

Excited Date: February, 2011 Korea

Korea 4 rivers project

Processing of turbid water that occurred in the dredging work **Problem:** Slow settling for from clay Reduce to under 50 NTU (Effluent standard) **Appreciated lumilite quantity :** 50~60PPM

Turbid water level before treatment : **300NTU** Turbid water level after treatment: **50NTU**

水質測定結果

項目	処理前*	処理後**
Hq	7.4	7.1
NTU(度)	318.00	28.00
SS (mg/l)	254.0	22.7
T-P (mg/l)	0.374	0.067
T-N (mg/l)	8.304	2.856
Mn (mg/l)	0.788	0.602
Fe (mg/l)	6.86	0.93

処理前*:2011年2月22日 処理後**:2011年2月23日 測定場所:沈澱池内表層

※濁水放流基準(韓国) 50 NTU以下 40 SS (mg/l) 以下

"Banbon River " (Soul in South Koria)

"Bad odor and black sediment for living drainage confluence river"

Excited Date: February 2018 ~

Problem:

Soul in South Koria

•Big bad Odor problem in city area

Execution:

- •Setting Lumilite Block
- Long-term improvement for the bottom sediment

and R	

Inspection	BOD(n	Reduciton rate	
Dute	Befor passing the Block	After Passing the Block	ide
Average	7.7	4.6	-48%
2018/8/23	4.0	3.8	
2018/9/20	10.4	5.5	
2018/10/25	11.4	4.2	

"Banbon River" (Soul in South Koria)

"Bad odor and black sediment for living drainage confluence river"

Long-term sediment (black soil) improvement and stop bad odor by lumilite Technology [Natural regeneration of rivers]

"Improvement of Rever in China

"Bad odor and black sediment for living drainage confluence river"

Long-term sediment (black soil) improvement and stop bad odor by lumilite Technology [Natural regeneration of rivers]

about 600,000 tons

Kaolin raw material Processing drainage Pond

Excited Date: October, 2012 Keishu city, China

Problem: Inflow the mineral wastewater of 600tons from factory everyday

- Turbid water level: 18,000NTU

Scale: about 20,000 m

- Bad odor occurrence

Appreciated lumilite quantity : 100PPM (Lumilite powder 60tons)

Turbid water level before treatment : 18.000NTU Turbid water level after treatment: 1.8NTU transparency: 8m

水質測定結果

項目	処理前*	処理後**]
рH	7.9	7.2	1
NTU(度)	18001.2	1.8	1
SS (mg/l)	1100	1	1
DO (mg/l)	0.9	8.8	1

処理前*:2012年10月28日
 処理後**:2012年11月10日
 測定場所:池内表層

Penicillin Factory Wastewater Treatment

Excited Date: February, 2012 Inner Mongolia, China Scale: about 20,000 tons

The processing amount: 3000~6000 tons / day **Appreciated lumilite quantity :** powder 400 tons Chip 60 tons

Water quality before treatment : COD 3,000~4,000ppm Ai minute 20,000mg/l Water quality before treatment : COD 300ppm Ai minute under2,000mg/l

水質測定結果

項目	処理前*	処理後**
Hq	7.91	6.71
SS (mg/l)	1014	52
DO (mg/l)	0.98	10.9
COD	2683	25.58
塩分 (mg/l)	20000	0.0
T-N	1409.07	10.02
T-P	645.0	2.0
透明度(cm)	0	200

処理前*:2012年2月22日 処理後**:2012年3月30日 測定場所:ペニシリン製造工場 CASS#5

Leather Factory processing Wastewater Treatment

Excited Date: May, 2014

China

The processing amount: 3000~6000 tons / day Appreciated lumilite quantity : 8~16tons/day

Water quality before treatment : NH3-N 300, Tor 250, COD 5000 Water quality before treatment : NH3-N 35, Tor 0.5, COD 70

Aquaculture pond

Appreciated lumilite quantity : Powder First execution-Spraying 150PPM After changing water 30~50PPM

Healthy fish with immunity grow by the rich minerals of Lumilite

項目	原水濃度(A)	処理水濃度	除去率((A-B)/
		(В)	A)
рН	8.3	8.1	
DO	3.4	6.3	
SS	22.9	6.3	0.84
COD	19.5	8.6	0.45
BOD	10.6	3.9	
T-N	22.47	10.55	0.48
T-P	0.85	0.02	0.95
Chlorop hyll a	48.5	3.6	0.97

Livestock wastewater Treatment