Proposal for reducing GHG emissions by controlling the airflow rate of an ammonia concentration meter in Aeration tank of STPs

Minto Matsunaga
Business Development Manager
HORIBA India Pvt. Ltd.

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Current situation – Wastewater

Infrastructure	Operation
Inadequate capacity(Approx. 30%) Old/poorly maintained facilities Missing sewer networks	High energy consumption (aeration) Lack of skilled operators Poor sludge management
Governance & Finance	**Environment & Health**
Weak compliance with discharge norms Limited cost recovery PPP model challenges	Poor effluent quality (N, P removal insufficient) GHG emissions (CH_4, N_2O) Water pollution & public health risks

NMCG(National Mission for Clean Ganga)

AMRUT Mission(The Atal Mission for Rejuvenation and Urban Transformation)

▶ Further **STP construction**, **increased processing capacity**, and **stricter regulations**

HORIBA's Proposal

Air volume control in the aeration process using a high-precision ammonia nitrogen meter

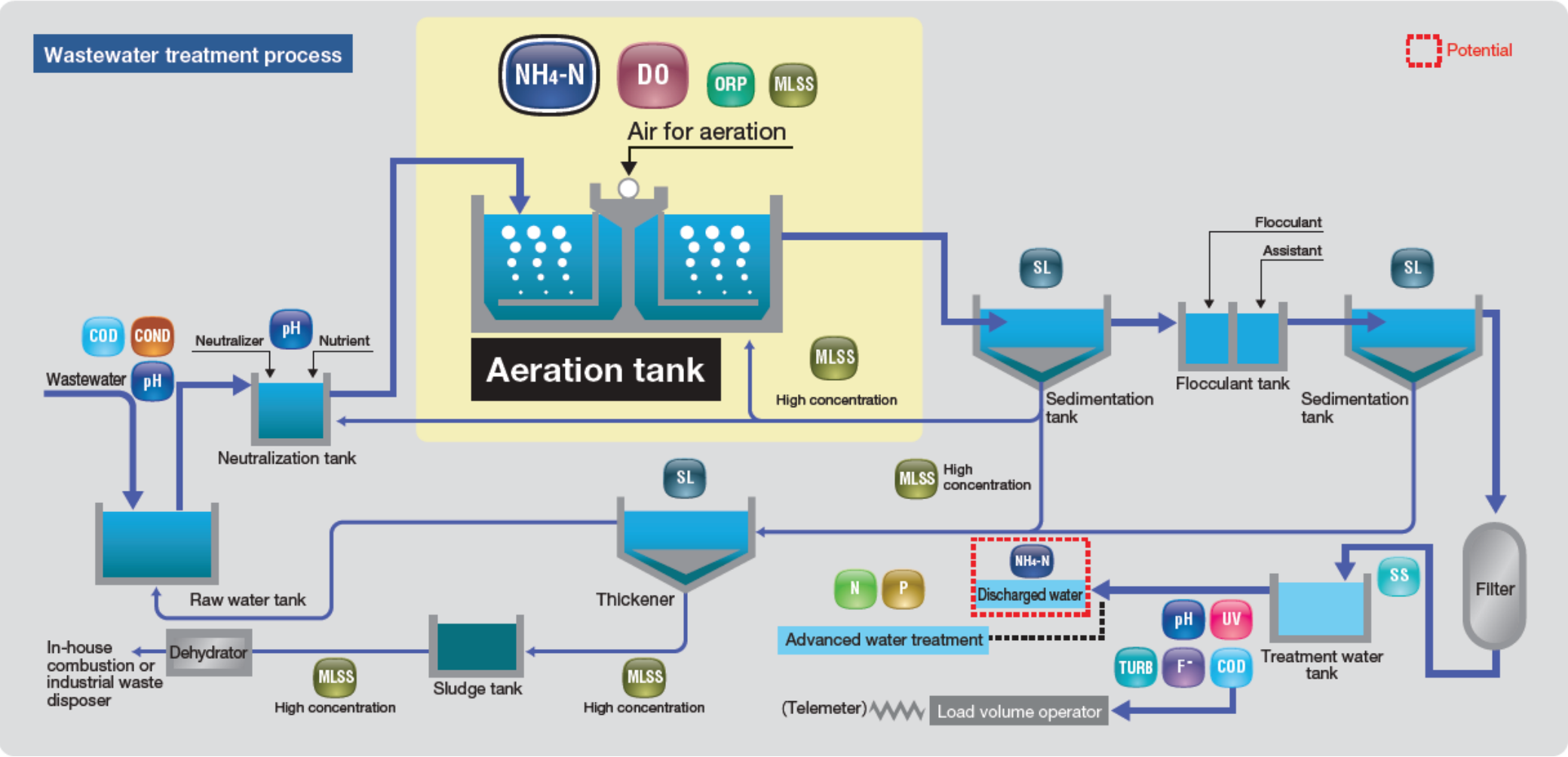
[Expected effects]
Improved efficiency of organic matter treatment, **reduction of GHG emissions** and **operational costs through energy savings**

*It may applicable "GHG Mitigation Activities" No.7 High end technology for energy efficiency

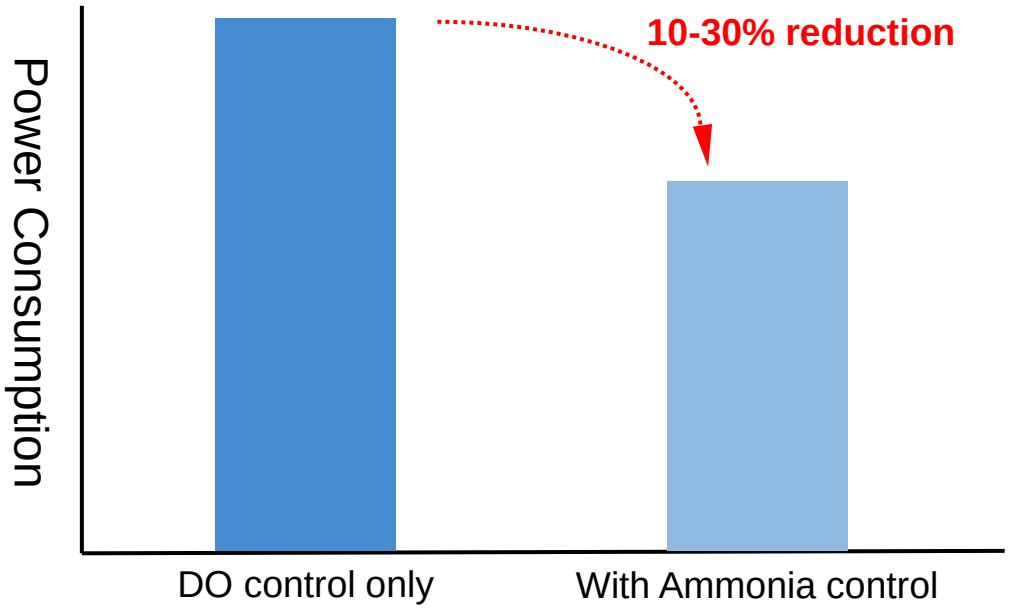
- Reduce CO_2 as GHG
- Reduce electricity cost
- Contribute serious power shortage

Application

HC-200NH is an ammonia nitrogen(NH_4-N) meter using ion electrode method which is designed for aeration control in wastewater treatment.



vs conventional control



DO-based control :

DO is indirect indicator of nutrient.
Requires maintaining a constant state of over-aeration, and it is difficult to respond to fluctuations in the inflowing wastewater in real time.

Ammonia-based control :

NH_4-N is direct indicator of nutrient.
The required air volume can be controlled according to the ammonia concentration in the aeration tank, minimizing over-aeration.

Japanese EPC has succussed average 16% power consumption reduction.
Air volume control using ammonia sensors is becoming a trend in the United States, China, Japan, South Korea, and Europe.

Reference - How much CO_2 it can reduce

[Premise]

1) **180kWh/day/MLD** in WWTP by Activated Sludge Process
2) Approx. **0.7kg CO_2e/kWh**

A wastewater treatment plant : 25MLD(Middle size)

180kWh x 25MLD x 0.7kg = 3,150kg CO2e/day
3,150kg x 365 days = 1,149,750kg/year

Assuming about 40% of the total

→ Amount of CO2 generated by using a blower : 459,900kg/year
→ If we can save energy by 20% by introducing an ammonia meter,

Reduction : 91,980kg CO_2e/kWh per year*

*Varies depending on sample and customer situation

Expected result

Reduce CO2 as GHG	Reduce electricity cost	Contribute serious power shortage
Appropriate blower air volume control optimizes over-aeration. This reduces the electricity used by the blower, indirectly contributing to CO2 reductions.	Optimal blower control reduces power consumption, reducing electricity costs at sewage treatment plants and improving running costs.	Reducing electricity consumption at the sewage treatment plant will increase the amount of electricity available to nearby residents.

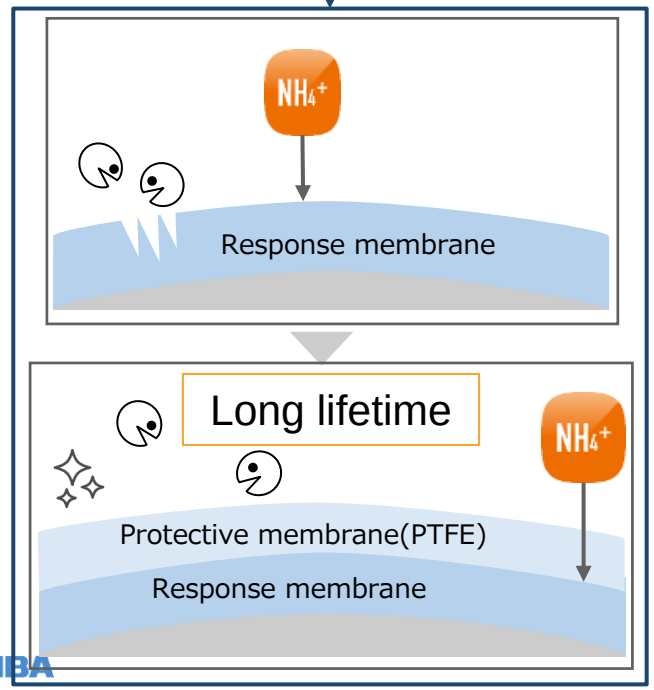
Overview – Ammonia nitrogen

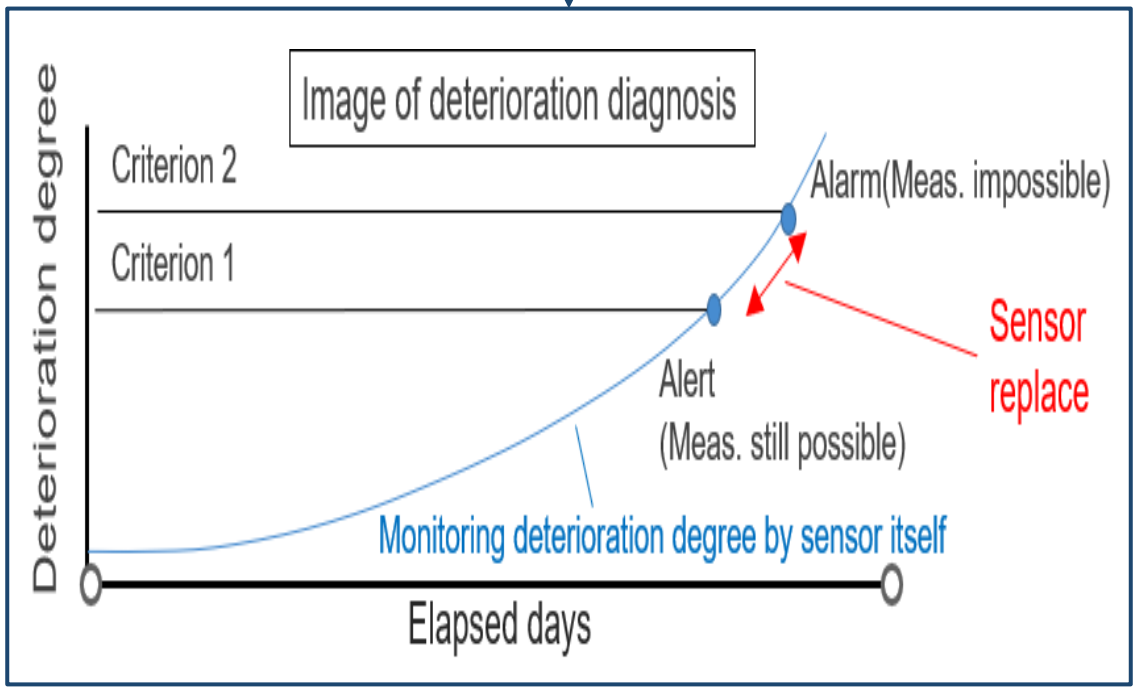
No reagents are used

Fast response

Protective film extends sensor life

Sensor deterioration diagnosis function



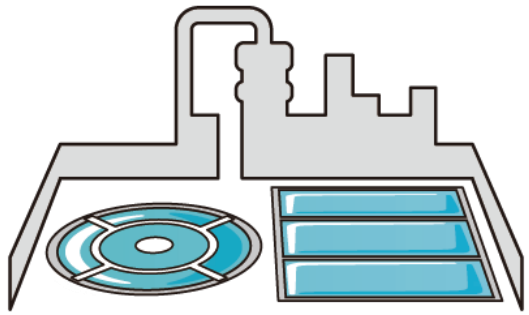


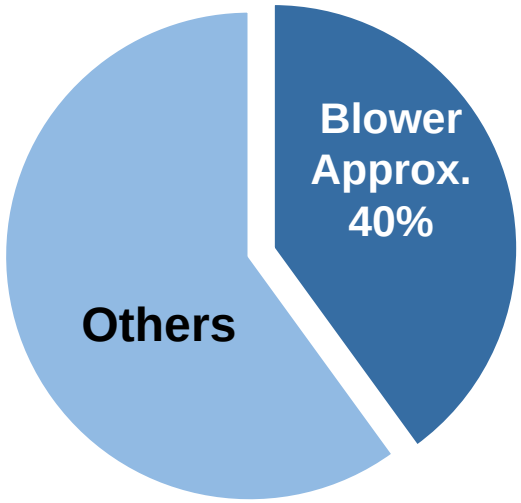
Ultrasonic cleaner (optional)

Without cleaner | With cleaner

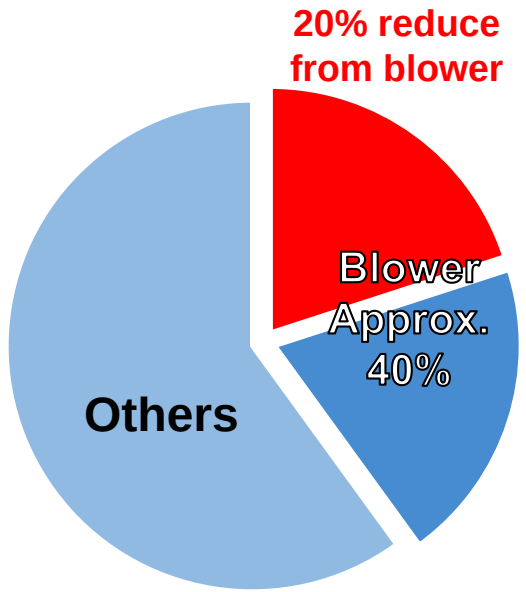
After 1 month

Case study – Aeration tank





I want to keep power consumption to a minimum.
But new energy-saving blowers are expensive, and installation requires extensive construction work.



■ Expected savings

	Regular size	Huge size
Processing power	25MLD	100MLD
Saving cost (Year)	**1M INR***	**4M INR***

***Depend on the customer.**

Contributing to energy conservation, CO2 reduction, and power shortages

For example – How much cost it can reduce

[Premise]

1) 8 INR per kilowatt (kWh) (← average electricity price)

2) 180kWh/day/MLD in WWTP by Activated Sludge Process

A wastewater treatment plant : 25MLD(Middle size)

180kWh x 25MLD x ₹8/kWh = ₹36,000/day

₹36,000 x 365 days = ₹13,140,000/year

Assuming about 40% of the total

→ **Blower electricity bill : ₹5,256,000/year**

→ **If we can save energy by 20% by introducing an ammonia meter,**

Reduction : ₹1,051,200 year*

*Varies depending on sample and customer situation

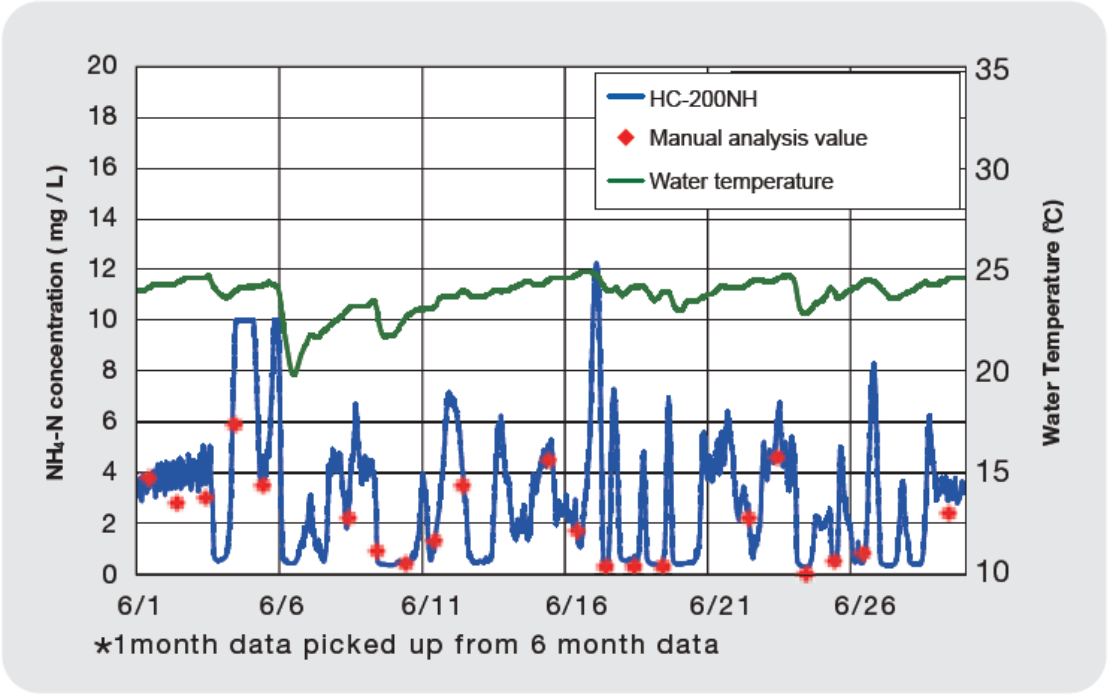
Competitors' sensors and analyzers

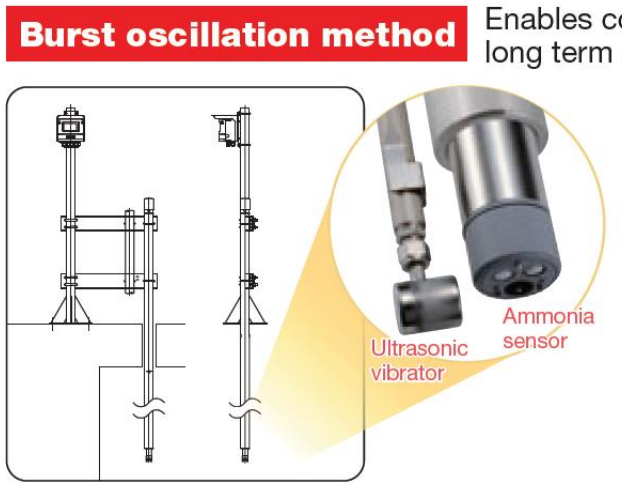
	Sensors	Analyzers
Measurement Method	ISE - Ion Selective Electrode (Immerse directly in the sample)	Wet chemistry using gas selective electrode (Draw sample, mixes chemical, then take measurement)
Advantage	Direct immersion(easy to measure and maintain)	Wide measurement range and more accurate
Disadvantage	Less accurate at low concentration and easy to drift (Other than Horiba)	Requires sampling preprocessing. more maintenance and cost.
Other information	Most of competitors do not recommend sensors to customers.	Customers are not very satisfied with analyzers due to cost, maintenance and response.

Comparison with sensors

	HORIBA	Others
Advantage	• Stable measurement even on the low range measurement • Anti fouling by ultrasonic cleaner • Deterioration diagnosis function	• Price less expensive • Low range measurement not recommended. • Drift and sudden error which cause frequent maintenance (According to customers comments)

■ Field test result





Expected result - additional

Reduce CO2 as GHG	Reduce electricity cost	Contribute serious power shortage
Appropriate blower air volume control optimizes over-aeration. This reduces the electricity used by the blower, indirectly contributing to CO2 reductions.	Optimal blower control reduces power consumption, reducing electricity costs at sewage treatment plants and improving running costs.	Reducing electricity consumption at the sewage treatment plant will increase the amount of electricity available to nearby residents.

Contribute to N2O reduction	Protect River and Sea quality
This may contribute to research on N2O generation suppression. *The global warming potential (GWP) of nitrous oxide (N_2O) is approximately 273 times that of carbon dioxide (CO_2) (evaluated over 100 years).	Because NH4 is measured directly, the treated water discharged will be below the regulated value.

Omoshiro-okashiku

Joy and Fun

Terima kasih

நன்றி

Gracias

谢谢

Danke

Σας ευχαριστώ πάρα πολύ

Tack ska du ha

धन्यवाद

THANK YOU

شُكْرًا

Grazie

ขอบคุณครับ

Obrigado

Большое спасибо

ありがとうございました

Cảm ơn

Merci

감사합니다

Dziękuję

HORIBA