Site Visit and 1st Feasibility Assessment Report of TADOX® Treatment of Gaunchi Drain along Faridabad Region

Submitted to

The Member Secretary,
Haryana State Pollution Control Board (HSPCB) &
The Director General-cum-Secretary to Government of Haryana, Environment & Climate Change Department, Panchkula, Haryana.

By

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27th June 2022

To
The Member Secretary, Haryana State Pollution Control Board &
The Director General-cum-Secretary to Government of Haryana, Environment & Climate Change Department,
Panchkula, Haryana.

Subject: Submission of report of Site Visit and 1st Feasibility assessment of treating Gaunchi Drain wastewater samples using TERI's TADOX® Technology

Dear Shri. S. Narayanan, IFS

I am pleased to present to you the Site Visit and 1st Feasibility Assessment Report of treating Gaunchi Drain wastewater samples using TERI's TADOX® Technology. This contains the site visits on 4th June 2022 at the two sites of Sarurpur Industrial Area, Sector 53, Faridabad and Gaunchi Drain site at Ballabgarh Sona Road, Parvatiya Colony, Faridabad region and the observations.

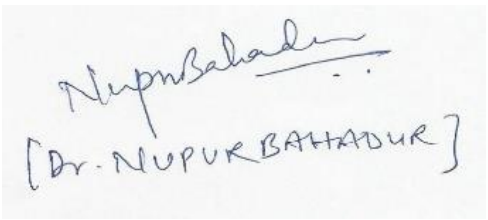
The wastewater samples collected from the Gaunchi Drain site were treated at TERI Gurugram campus using TERI's TADOX® Technology and the results are encouraging enough to ascertain the feasibility of this technology, to be applied for onsite treatment. I have provided the detailed results and discussion along with NABL Test certificates, key inference, recommendations, and the way forward.

Also, I have provided some **additional successful case studies from Haryana**, where TADOX® Technology was found suitable in wastewater treatment, e.g. (A) Petrochemical wastewater from an Industry in Panipat, (B) Textile wastewater from Barhi Industrial Area of Sonipat, (C) Open Drain in Gurugram and (D) Direct Sewage treatment in STP in Gurugram.

Based on the work so far, I have also proposed some of the **collaboration opportunities between HSPCB and TERI**, which if taken ahead with the use of Advanced Oxidation Nanotechnology like TADOX® in treatment of highly polluted Gaunchi drain and other industrial and municipal wastewater streams, will be 1st of its kind in the World. This would be a great opportunity to undertake as this might give HSPCB, the 1st mover advantage with the credit of pioneering and promoting an indigenously developed Technology under DST-Water Mission, Ministry of Science & Technology, Govt. of India.

I look forward to your valuable feedback and suggestions in moving ahead.

Thanking you with high regards,



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Site visit to Gaunchi Drain, Faridabad Region

1. Background

The Hon'ble Chairman, Haryana State Pollution Control Board (HSPCB), Shri. P. Raghavendra Rao, IAS (Retd.) visited TERI Gurugram campus on Friday, May 27, 2022 along with other esteemed members of HSPCB. During his visit, he was briefed about TERI's Advanced Oxidation Technology (TADOX®) for wastewater treatment and reuse. He visited the running 10 KLD TADOX® Wastewater Treatment Plant (WWTP). That day, effluent from a petrochemical industry in Panipat was being treated and the results were highly encouraging. This led to initiation of a collaboration between TERI and HSPCB to address some key environmental and pollution challenges in the state using TERI's TADOX technology. In this context, the first opportunity offered by HSPCB is treatment of Gaunchi Drain, along Ballabgarh stretch in Faridabad Region. It was therefore required to visit the site, collect samples for feasibility assessment for TADOX Treatment. On Friday, 4th June 2022, such a visit was planned through regional office, Ballabgarh.

2. Objectives of site visit

- To assess the drain site along the Ballabgarh stretch.
- To collect the water samples from the drain and assess feasibility of TADOX treatment.
- To explore possibility of onsite treatment

3. Site visit

3.1Selected Site

Plot No. 14B, Gali No. 1, Sarurpur Industrial Area, Sector 53, Faridabad

3.2 HSPCB, NGT and TERI Members meeting on-site

Following members were present for the site visit:

S. No.	Name	Designation
1	Sh. S. Narayanan, IFS	Director General-cum-Secretary to Government of Haryana, Environment & Climate Change Department, Haryana and Member Secretary, Haryana State Pollution Control Board
2	Dr PKMK Das	Member HYMC Haryana
3	Sh. Y K Garg	Member HYMC Haryana
4	Dr. Nupur Bahadur	Senior Fellow & Head, NMCG-TERI CoE on Water Reuse, Water Resources Division, TERI
5	Sh Dinesh Kumar	Regional Officer, Ballabgarh Region
6	Sh. Vijay Choudhary	Regional Officer, Palwal and Mewat Region

7	Sh. Abhijeet Singh Tanwar	AEE, Ballabgarh Region
8	Sh. Manish Yadav	AEE, Mewat Region

3.3 Site photographs


IndianOil

3.4. Observations

Sarurpur Industrial Area, Sector 53, Faridabad

(i) This area has unauthorized industrial sector together with residential area.

(ii) There is neither a proper drainage facility, nor an onsite treatment facility for wastewater, as the result wastewater from surrounding industrial areas is being discharged into the drain.

(iii) It was observed that a tanker was discharging industrial wastewater into the drain; however, HSPCB Officials present on site took swift action against the tanker driver and the owner.

(iv) The area had unpleasant aesthetics, heaps of garbage and odour around.

(v) Drain passing through this area was clogged and had a lean flow

(vi) The drain barely has freshwater inflow; instead, majorly had wastewater from nearby industrial and municipal discharge.

(vii) Specially during monsoon season and otherwise as well, the complete area is under severe occupational, environment and health hazard.

4. Visit to Gaunchi Drain at Parvatiya Colony, Faridabad and sample collection:

The team together visited the Gaunchi Drain site at Ballabgarh Sona Road, Parvatiya Colony, Faridabad region. This area is surrounded by various Industrial clusters, having no CETP and a non-functional STP. As the result this drain along with storm water, majorly contains effluent discharge from the nearby industrial clusters and inadequately treated wastewater from STP, making aesthetics highly unpleasant.

50-60 l sample was collected from this section of the Gaunchi Drain in sanitized bottles and containers of 20 l capacity and taken to TERI Gurugram campus and treated as soon as received. Also the pre and post treated samples were sent to accredited NABL Lab in Rohini, Delhi for testing and analysis on the next day.

5. Methodology of Treatment and testing of physicochemical parameters

I. The samples were analysed as obtained from the site after mixing the container well in order to obtain a homogenous sample.
II. This untreated sample was termed as a raw sample.
III. All Raw samples were sent to the laboratory for characterization of basic physicochemical and organic pollutant analysis for pH, TSS, TDS, Conductivity,

Turbidity, COD etc. at the same time, primary treatment for the samples was optimized with use of different coagulants and flocculants.

IV. The optimized dose was estimated based on reduction in colour, turbidity and transparency of the sample (based on UV Visible spectra and analysis) and the sludge generation ratio.

V. After optimization of the primary treatment the samples were subjected to TADOX treatment at batch scale reactor, during which samples from each stage were taken in order to optimize the treatment time.

VI. Finally, after the initial run and optimization, the experiment was run finally, and samples (in duplicates) were taken from each stage. The samples from each stage were characterized in the NABL laboratory and the key results are discussed in the next section.

6. Analysis of Wastewater quality parameters

All sample analysis were carried out at NABL accredited facility and standard methods were followed. The internationally acceptable methods and traceable certified reference materials were used for the analytical work as given in 'Standard methods for analysis of water and wastewater' by American Public Health Association (APHA) 2017.

7. Results and Discussion

The 50 l sample was run in the batch scale as described in the methodology section above. Overall 4 hour TADOX treatment was undertaken, which led to the change in UV Visible spectra and physical appearance significantly, as shown in Figures 1 and 2, respectively and water quality parameter data of pre and post treated samples is provided in Table 1 below.

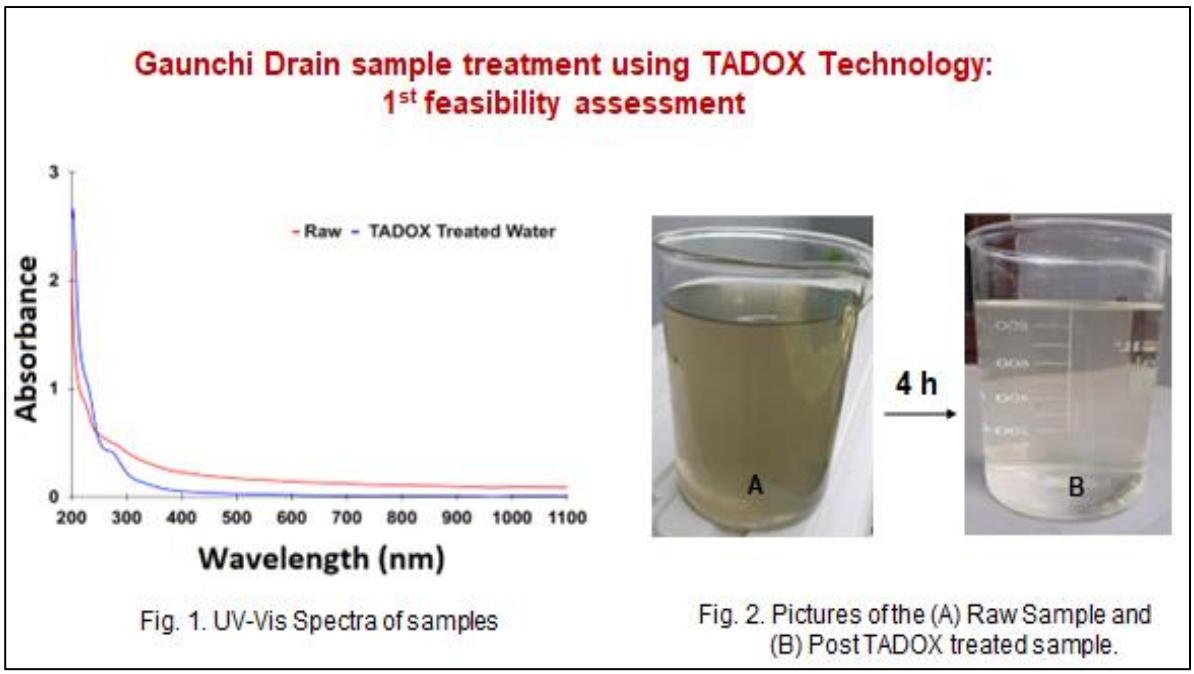


Figure 1: UV- Vis Spectra showing absorbance for the untreated sample i.e. Raw (shown in red) and treated sample i.e. Post TADOX (shown in Blue).
Figure 2: Images of the two respective samples

Table 1: Comparison of various parameters for the untreated (raw) and treated effluent samples

S.No.	Parameters	Unit	Pre-TADOX (Raw sample)	Post TADOX (Treated sample)	% *Removal*
1	pH Value	-	7.33	8.91	-
2	Turbidity	NTU	46.00	4.92	89.30
3	EC	µmho/cm	2160.00	1238.00	42.68
4	TDS	mg/L	1079.00	620.00	42.53
5	Colour	Hazen	405.18	68.17	83.17
6	PO4	mg/L	3.80	0.20	94.73
7	NH4-N	mg/L	2.33	1.22	47.63
8	TSS	mg/L	280.00	156.00	44.28
9	COD	mg/L	320	160	50
10	BOD	mg/L	64	8	87.5

Discussion

As evident from Figures 1 and 2, there is substantial reduction in absorbance between 250 - 300 nm, which indicates removal of COD and Total Organic Carbon (TOC). The same is also evident from the physical appearance of the samples, where the sample is decolorized by 83%. Also the notable features include 95% Phosphate removal and 87% BOD reduction without involving any kind of biological treatment, which is attributed to the UV disinfection taking place within TADOX treatment, which involves UV-TiO2 Photocatalytic action in treatment of mixed effluents from industrial and municipal wastewater.

8. Key Inference

(1) TADOX treatment made the sample aesthetically pleasant, which is evident from substantial reduction in turbidity, colour, phosphates, ammonia, suspended solids and COD.

(2) The BOD < 10 mg/L indicates high improvement in treated water quality.

(3) **Key Benefits of TADOX Treatment**: (i) drain having industrial and municipal wastewater could be treated together, (ii) no stream segregation of any kind required, (iii) no biological treatment or disinfection of any kind required before or after TADOX treatment, (iv) treatment within few hours, (v) small footprint could serve as advanced Decentralized Treatment systems, (vi) less use of chemicals and less sludge also addresses secondary problems and (vii) Use of Advanced Oxidation Nanotechnology like TADOX®, in treatment of highly polluted Gaunchi drain and other industrial and municipal wastewater streams, will be 1st of its kind in the World. This would be a challenge as well as a great opportunity to undertake as this might give HSPCB, the 1st mover advantage with the credit of pioneering and promoting an indigenously developed Technology like TADOX®, under DST-Water Mission, Ministry of Science & Technology, Govt. of India.

9. Recommendations & Way Forward

(1) It was the 1st attempt made to treat the samples from a highly polluted Gaunchi Drain using TERI's TADOX Technology. Further detailed study and analysis of biological parameters and heavy metal presence etc. could be studied as part of future work. Also possibility of further improvement in water quality with increasing treatment/retention time could be explored.

(2) TADOX could serve as a Decentralized Treatment Technology for open drains like Gaunchi, where drain could be diverted and brought to the onsite TADOX

treatment plant, to be set up near the drain and the treated water could be supplied to downstream of the drain.

(3) Based on the 1st feasibility analysis, we propose to go ahead for Stage-2 trials at 10 KLD TADOX plant at TERI Gurugram campus, where, 5 KL Drain sample (to be sent in tankers) will be run in continuous manner for almost 10 days, as good as a running plant and the data generated from this study will help us in providing the complete techno-economic feasibility assessment for going ahead with an onsite pilot or a full scale plant on-site.

(4) Once techno-economic feasibility is assessed at 10 KLD scale, then on-site Decentralized Wastewater Treatment Plants of required capacities based on TADOX Technology could be installed in each of the Industrial areas (CETP) and the existing STPs could be made functional and augmented to higher capacities and adequate treatment would be possible within existing infrastructure.

(5) Also another possibility could be explored where certain stretches of the drain could be identified and on-site wastewater treatment plants (WWTPs) of specific capacities could be put across these stretches.

10. About TERI

The Energy and Resources Institute (TERI) is an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation. TERI is an innovator and agent of change in the energy, environment, climate change and sustainability space, having pioneered conversations and action in these areas for over four decades.
https://www.teriin.org/

11. About TADOX® Technology Centre for Water Reuse

TADOX® Technology Centre for Water Reuse is an area in the Water Resources Division of TERI, which deals with commercialization of the TADOX® technology.

https://www.teriin.org/water

12. About the PI

Dr Nupur Bahadur is Senior Fellow and Heads NMCG-TERI Centre of Excellence on Water Reuse and also she is the Area Convenor, TADOX® Technology Centre for Water Reuse in the Water Resources Division, TERI. She obtained Ph.D. in Chemistry from IIT Roorkee in 2005 working in the area of Photochemistry and Photocatalysis for pollution abatement. She

is the Inventor of TERI's Advanced Oxidation Technology (TADOX®) technology. Her 22 years of Professional experience involves, teaching, research, technology development & demonstration, patents & trademark, policy intervention, consultancy, capacity building and Technopreneur roles.
LinkedIn Profile: https://www.linkedin.com/in/dr-nupur-bahadur-40909771/

13. About TERI's TADOX® Technology

The Energy and Resources Institute (TERI), New Delhi has developed a novel technology called TERI Advanced Oxidation Technology (TADOX®), which provides treatment of wastewater stream containing high color, COD, BOD, TOC, dissolved organics, micropollutants, non-biodegradable and persistent organic pollutants (POPs) in effluents from grossly polluted industries and municipal wastewater. TADOX® is under TERI's Patent (grant awaited) and also under various categories of Trademark with the Trademark Office, Govt. of India. TADOX® involves UV-Photocatalysis as an Advanced Oxidation Process (AOP), leading to oxidative degradation and mineralization of targeted pollutants. Also it involves, novel approaches which make very less use of chemicals in the overall treatment leading to much reduced quantum of sludge, preventing secondary pollution.

YouTube Link of the 5 min video of TADOX® Technology: https://youtu.be/fgpBa1_Atyc
This technology has been developed under **DST Water Mission, Water Technology Initiative (WTI) Program of Ministry of Science & Technology, Govt. of India** during July 2017-July 2020 and the outcomes have been announced through its Press Release on 25th Aug 2021: https://pib.gov.in/PressReleasePage.aspx?PRID=1748888
Department of Science & Technology, Govt. of India published the successful outcome on its website at
https://dst.gov.in/new-advanced-oxidation-technology-can-enhance-waste-water-reuse-lower-cost

This technology has received following Awards at various forms: (i) **'Design and Manufacturing Technologies for 'Make in India'** by Dr. Harsh Vardhan, Union Cabinet Minister, Ministry of Science and Technology, Govt. of India during IISF; (ii) **STE Water Award 2019** for **Technological Innovation in Wastewater Treatment**; (iii) **Aqua Excellence Award 2019** for '**Development of Technology**' by Mr. Gajendra Singh Shekhawat, Union Cabinet Minister, Ministry of Jal Shakti, Govt. of India in World Aqua Congress.

In Oct 2020, **National Mission for Clean Ganga (NMCG),** Ministry of Jal Shakti and TERI signed an MoU to explore possibilities of TADOX® implementation in point source pollution abatement across ETPs/STPs under Namami Gange Programme. In Jan 2022, National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti, Govt. of India and TERI came

forward to establish 1st of its kind Centre of Excellence called **NMCG-TERI CoE on Water Reuse** (https://lnkd.in/dnZiniWR).

A. TADOX® Technology for Industrial Wastewater Treatment

The TADOX® treated colorless and high-quality water going to subsequent tertiary system involving RO may prevent bio-fouling of membranes, enhance life span and efficiency of RO systems and reduce overall load on subsequent evaporators like MEE and MVR etc. **enabling sustainable and affordable ZLD compliance with 85-90% enhanced water reusability**. Further, **having small footprint, few hours treatment time and together with resource & energy efficiency, the overall treatment is expected to bring down OPEX by 30-40% than current values**. Further, TADOX® could be **integrated and retrofittable** in existing treatment systems depending on the nature and constitution of the matrix; e.g. for streams having high COD, it could be integrated at pre-biological stage to enhance biodegradability; for streams having high BOD, at post-biological or polishing stage to remove recalcitrant and dissolved organics.

B. TADOX® Technology in Sewage and Municipal Wastewater Treatment

In case of Sewage and Municipal wastewater treatment, TADOX® having Advanced Oxidation is sufficient for **direct treatment, without any kind of biological treatment** or disinfection technology, **not even requiring any kind of grey and black water stream segregation**. With total treatment time of 4-5 h, together with high grade treated water quality (in many cases Class A Grade water quality, as per CPCB, Govt. of India Norms) makes it an excellent choice in improving current efficiencies in wastewater treatment together **offering augmentation of capacity within existing infrastructure**. Also it could serve as **Decentralized Wastewater Treatment system and micro-STP** in upcoming and existing infrastructural projects, townships, commercial complexes, Green Buildings, AMRUT and Smart Cities Project. Also under SBM 2.0, where the requirement is to enhance treated water reuse, this technology could be used at the polishing stage of the current STPs.

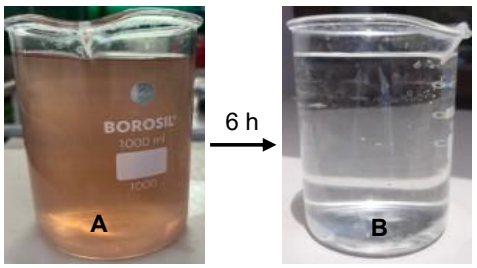
C. Technology Readiness Level (TRL)

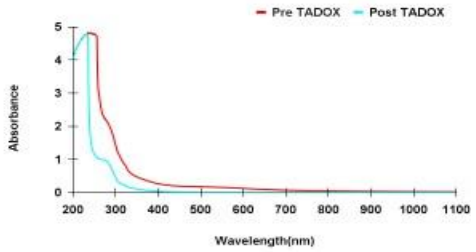
Currently technology is at TRL 7, with first 10 KLD TADOX® WWT Plant operational since Aug 2020 in TERI Gurugram campus. This plant is treating wastewater coming from a collection sump, having wastewater from toilets, research laboratories, hostel, canteens, laundry etc. No stream segregation of any kind is required. The technology is ready for commercialization. Various wastewater treatment companies have come forward to seek license and implement TADOX Technology.

14. Successful Case Studies from Haryana

(A) Petrochemical Industry wastewater from Panipat

Haryana Case study B: Petrochemical Industry Wastewater treatment in Panipat





KEY RESULT: TADOX® treatment led to removal of colour, COD and BOD, making sample aesthetically pleasant and improved treatability for downstream tertiary treatment, enabling sustainable and affordable ZLD compliance and enhanced water reuse.

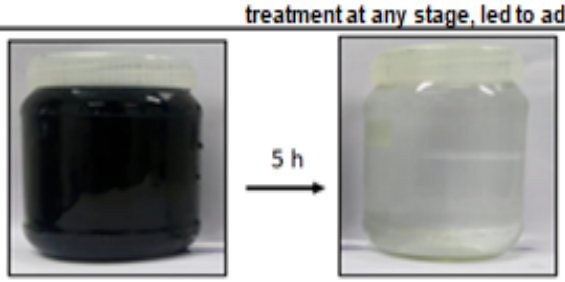
S. No	Parameters	Unit	Pre-TADOX (A) (Raw sample)	Post TADOX (B) (Treated sample)	% Removal
1	pH Value	-	7.84	9.69	-
2	Turbidity	NTU	76	5	93
3	Colour	Hazen	711	18	97
4	COD	mg/L	400	160	60
5	BOD	mg/L	43	2	96
6	Total Dissolved Solids (TDS)	mg/L	4005	3680	8

(B) Textile Industry wastewater from Sonipat

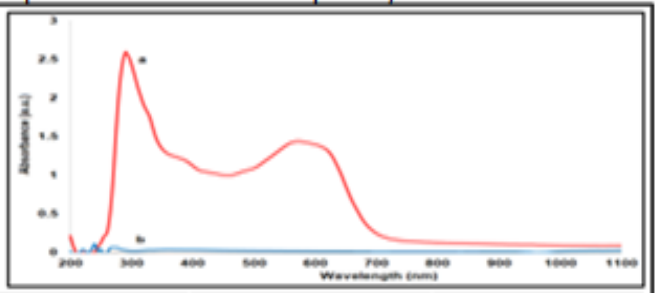
Haryana Case study A: Textile Wastewater treatment in Sonipat

ETP, Textile Unit, Barhi Industrial Area, Sonipat

(KEY RESULT: End-to-end TADOX Treatment of effluent from equalization tank, without any kind of biological treatment at any stage, led to adequate treatment and ZLD compliance)



a. Pre Treated b. Post Treated



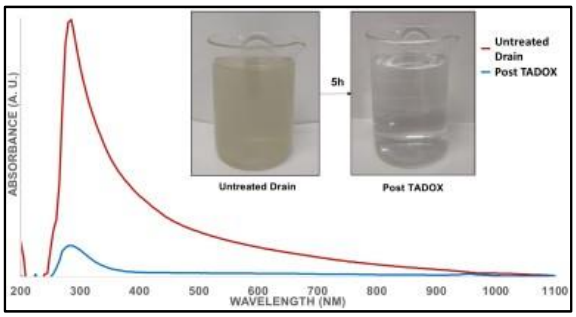
S. No.	*Parameter (mg/l)*	Pre Treated	Post Treated	% change
1	pH	10.3	9.1	-
2	Conductivity (µmho/cm)	5144	198	96%
4	TSS	1800	172	90.5%
5	TDS	2566	146	94%
6	Chloride	720	12.5	98%
7	Hardness	115	25	78%
8	BOD_5	24	10	ZLD
9	COD	304	44	

(C) Open Drain in Gurugram

8

Haryana Case Study D: Mandi Village Drain in Gurugram

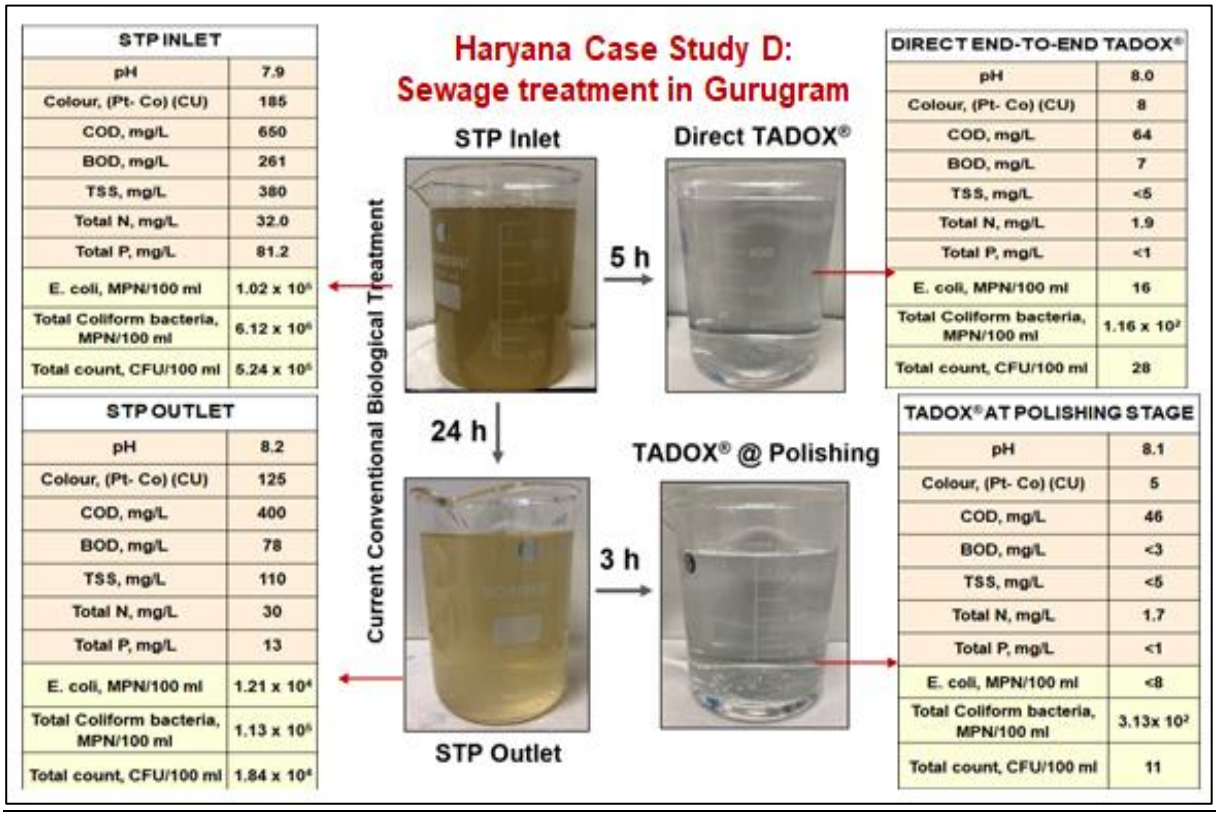
(passing through TERI Campus)



Parameter, Unit	Untreated Drain	TADOX Treated
E. coli, MPN/100ml	30.1x 10^3	16
Total coliform bacter MPN/100ml	28 x 10^4	30
Total count, CFU x 105/100ml	106	0.004

Parameter, Unit	Untreated Open Drain	TADOX Treated
pH Value	7.29	8.4
Conductivity, µmho/cm	1276	271.3
Total Dissolved Solids mg/l	637	135.6
COD, mg/l	96	35
BOD, mg/l	27	< 1
DO, mg/l	3.2	6.3
Nitrate Nitroge,mg/l	45.1	31.8
Nitrite Nitrogen, mg/l	1.4	5.2
Total Kjeldahl Nitroge mg/l	9.33	3.65
Phosphate, mg/l	2.65	0.1

(D) Direct Sewage Treatment in STP in TERI Campus in Gurugram



STP INLET	
pH	7.9
Colour, (Pt- Co) (CU)	185
COD, mg/L	650
BOD, mg/L	261
TSS, mg/L	380
Total N, mg/L	32.0
Total P, mg/L	81.2
E. coli, MPN/100 ml	1.02 x 10^5
Total Coliform bacteria, MPN/100 ml	6.12 x 10^5
Total count, CFU/100 ml	5.24 x 10^5

STP OUTLET	
pH	8.2
Colour, (Pt- Co) (CU)	125
COD, mg/L	400
BOD, mg/L	78
TSS, mg/L	110
Total N, mg/L	30
Total P, mg/L	13
E. coli, MPN/100 ml	1.21 x 10^4
Total Coliform bacteria, MPN/100 ml	1.13 x 10^5
Total count, CFU/100 ml	1.84 x 10^4

DIRECT END-TO-END TADOX®	
pH	8.0
Colour, (Pt- Co) (CU)	8
COD, mg/L	64
BOD, mg/L	7
TSS, mg/L	<5
Total N, mg/L	1.9
Total P, mg/L	<1
E. coli, MPN/100 ml	16
Total Coliform bacteria, MPN/100 ml	1.16 x 10^2
Total count, CFU/100 ml	28

TADOX® AT POLISHING STAGE	
pH	8.1
Colour, (Pt- Co) (CU)	5
COD, mg/L	46
BOD, mg/L	<3
TSS, mg/L	<5
Total N, mg/L	1.7
Total P, mg/L	<1
E. coli, MPN/100 ml	<8
Total Coliform bacteria, MPN/100 ml	3.13x 10^2
Total count, CFU/100 ml	11

15. Collaboration Opportunities between HSPCB-TERI

HSPCB and TERI could explore the following areas of collaboration with funding support:

A: Wastewater Treatment Projects

1. Making Habitats Sustainable across TERI Campus and Mandi Village, where combined wastewater across TERI campus could be treated and supplied to Mandi Village for non-potable high-end reuse.
2. Industrial Wastewater in particular Textile Wastewater treatment in Panipat and Sonipat CETP Clusters and CETP in Faridabad and Ballabgarh regions.
3. Landfill leachates
4. Municipal Wastewater treatment as a Decentralized Treatment Technology
5. Construction & Hospitality sector as Decentralized Treatment Technology
6. Hospital Wastewater treatment
7. Open Drains like Gaunchi drain in Ballabgarh stretch etc.

B: Training and Capacity Building Programs

Training and capacity building for HSPCB Professionals (entry & mid-career/ ETP & STP Operators etc.) for Wastewater Treatment & Management/ Water Reuse/ SBM 2.0/ AMRUT 2.0

C: Creation of a Committee on Wastewater Management & Water Reuse Plan for Haryana

Where we may assess current gaps and challenges, review status of existing CETPs/STPS/Drains etc.; review of existing policies, reports, secondary data on the subject; corroborating the data with our scientific findings and proposing point source pollution abatement strategies, augmentation and upgradation plans within existing infrastructure, etc.

16. NABL Testing & Analysis Report (Annexure 1)

PERFACT RESEARCHERS PVT LTD

TC-6993

Issue Date : 21/06/2022

TEST REPORT

Surface Water Analysis

ULR No. : TC699322000032348F **Test Report No. :** PRPL/WS/040622-001

Name of the Customer	:	The Energy and Resources Institute (TERI)
Name & Address of the project		TERI Gram, Gwal pahari, Gurugram- Faridabad Road, Gurugram, Haryana
Location of Sampling & GPS detail	:	Gaunchi Drain, Faridabad
Sampling Plan & Procedure	:	PRPL/WP/WS/058
Date of Monitoring/ Date of collection	:	04/06/2022
Date of Receipt of Sample at lab	:	04/06/2022
Sample Description	:	Drain Raw
Sample Quantity	:	2 Ltr.
Sample Collected by	:	Abhimanyu
Tests started on	:	04/06/2022
Tests Completed on	:	10/06/2022

RESULTS

S.No.	PARAMETER	Unit	Test Method	Results	Minimum Detection Limit
1	Colour	Hazen	APHA 2120 B 23rd edition 2017	405.18	1
2	Turbidity	NTU	APHA 2130 B 23rd edition 2017	46	1
3	pH at 25°C	--	APHA 4500-H+ B 23rd Edition 2017	7.33	2
4	Conductivity	µmhos/cm	APHA 2510 B 23rd edition 2017	2160	1
5	Total Dissolve Solids	mg/L	APHA 2540 C 23rd edition 2017	1079	1
6	Phosphorous	mg/L	APHA 4500-P D 23rd edition 2017	3.8	0.01
7	Nitrate Nitrogen	mg/L	APHA 4500- NO3 B 23rd edition 2017	12.2	0.1
8	Biochemical Oxygen Demand (BOD @ 20°C for 5 days)	mg/L	APHA 5210 B 23rd edition 2017	320	1
9	Chemical oxygen demand	mg/L	APHA 5220 B&C,23rd edition 2017	64	5
10	Ammonical Nitrogen	mg/L	APHA 4500 NH3 C 23rd edition 2017	2.33	1
11	Nitrite Nitrogen	mg/L	APHA 4500-NO2 23rd edition 2017	0.3	0.2
12	Total Suspended solids	mg/L	APHA 2540-D 23rd edition 2017	280	1

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TC-6993

Issue Date : 21/06/2022

ULR No. : TC699322000032348F **Test Report No. :** PRPL/WS/040622-001

Remarks:

1. The results mentioned above relate only to the Sample received and Tested by us.
2. The test report shall not be reproduced either in full or part without the written approval of the Laboratory.
3. Samples received shall be disposed off after one month from the date of issue of Test Report unless specified otherwise.
4. Samples for BOD and DO, Colour shall be disposed off after 7 days from the date of issue of test report.

End of Report

Analyst

Authorized Signatory

Authorized Signatory
Chandra Shekhar Jha

506, 5th Floor, NN Mall, Sector 2

PERFACT RESEARCHERS PVT LTD

TC-6993

Issue Date : 21/06/2022

TEST REPORT

Surface Water Analysis

ULR No. : TC699322000032349F

Test Report No. : PRPL/WS/040622-002

Name of the Customer	:	The Energy and Resources Institute (TERI)
Name & Address of the project		TERI Gram, Gwal pahari, Gurugram- Faridabad Road, Gurugram, Haryana
Location of Sampling & GPS detail	:	Gaunchi Drain, Faridabad
Sampling Plan & Procedure	:	PRPL/WP/WS/058
Date of Monitoring/ Date of collection	:	04/06/2022
Date of Receipt of Sample at lab	:	04/06/2022
Sample Description	:	Drain Treated
Sample Quantity	:	2 Ltr.
Sample Collected by	:	Abhimanyu
Tests started on	:	04/06/2022
Tests Completed on	:	10/06/2022

RESULTS

S.No.	PARAMETER	Unit	Test Method	Results	Minimum Detection Limit
1	Colour	Hazen	APHA 2120 B 23rd edition 2017	68.17	1
2	Turbidity	NTU	APHA 2130 B 23rd edition 2017	4.92	1
3	pH at 25°C	--	APHA 4500-H+ B 23rd Edition 2017	8.91	2
4	Conductivity	µmhos/cm	APHA 2510 B 23rd edition 2017	1238	1
5	Total Dissolve Solids	mg/L	APHA 2540 C 23rd edition 2017	620	1
6	Phosphorous	mg/L	APHA 4500-P D 23rd edition 2017	0.2	0.01
7	Nitrate Nitrogen	mg/L	APHA 4500- NO3 B 23rd edition 2017	19.2	0.1
8	Biochemical Oxygen Demand (BOD @ 20°C for 5 days)	mg/L	APHA 5210 B 23rd edition 2017	160	1
9	Chemical oxygen demand	mg/L	APHA 5220 B&C,23rd edition 2017	8	5
10	Ammonical Nitrogen	mg/L	APHA 4500 NH3 C 23rd edition 2017	1.22	1
11	Nitrite Nitrogen	mg/L	APHA 4500-NO2 23rd edition 2017	0.5	0.2
12	Total Suspended solids	mg/L	APHA 2540-D 23rd edition 2017	156	1

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TC-6993

Issue Date : 21/06/2022

ULR No. : TC699322000032349F **Test Report No. :** PRPL/WS/040622-002

Remarks:

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End of Report

Analyst

Authorized Signatory

Authorized Signatory
Chandra Shekhar Jha

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