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Success Stories of CETPs/ETPs After the Implementation of Improvement Measures In Uttar Pradesh

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GOPA Infra

in consortium with

FICHTNER
WATER & TRANSPORTATION

Consulting Services on Rehabilitation Measures on behalf of the National Mission on Clean Ganga

"Support to Ganga Rejuvenation"
Phase II
Uttarakhand and Uttar Pradesh

India

Indo-German Development Cooperation
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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1 Background

GIZ's Support to Ganga Rejuvenation (SGR) Project is active in the State of Uttarakhand from 2015 and in Uttar Pradesh from 2018, providing technical assistance and **support to industries for improving ETP & ZLD operations, efficiency, debottlenecking and observe compliance w.r.t. environmental regulations**. Under this program, Experts from GOPA Infra visited industrial clusters and CETPs in state of Uttar Pradesh during the tenure of December 2019-March 2020 and offered their technical assistance to industries, CETP developers to improve ETP/CETP operations for various benefits - environmental, financial, regulatory compliance, resource conservation and reduced pollution. The assistance was given, among others, in form of suggestions for improvement measures that were discussed with the operators, and a process of handholding to support implementation of the measures and ensure trouble-shooting whenever necessary.

This report describes the success stories in the implementation of these suggested improvement measures for CETPs and the additional benefits that ensued to respective stakeholders. As a result of several field visits carried out by GOPA-infra team in 2019, a detailed list of improvement measures were suggested to developers & operators of the CETPs in Mathura, Rooma and Hapur Pilkhuwa. Reports detailing all improvement measures suggested are available with the GIZ project "Support to Ganga Rejuvenation". The operators reported to GOPA-Infra team that they had initiated implementation of selected measures already before the onset of the COVID-19 pandemic that hit India at the beginning of March 2020. However, it must be noted that GoI issued guidelines and restrictions in response to the Covid 19 crisis, which included cessation of all non-essential activities commercial and industrial activities and a stop to all local and international travel from March to July 2020. As a result, most textile industries were closed down for months and produced therefore no effluents; CETPs were closed as well. Even when operations started again around June/July 2020 (depending on the state), CETP sites could not be visited again by the GOPA-Infra Team due to travel restrictions in place till end of project. Therefore, the latest status of implementation of the suggested improvement measures could only be verified remotely through phone/web conversations.

2 Methodology

For the assessment of various aspects on improvements for CETPs, National & International Experts including team leader have visited CETPs during the tenure of SGR-2 Project. Necessary / available data and details were collected from CETP management. The details were appraised by the experts from GOPA team and assessment findings with suggested implementation measures. Improvements achieved were cross checked during follow up visits to CETPs. When travel restrictions were imposed to contain the Covid 19 crisis, GOPA-Infra team provided handholding support to CETP operators and follow-up to implementation of measures remotely through phone calls and web-based meetings.

SGR-2 GOPA team of Experts for improvement measures for CETPs is comprised of following experts, -

1. Ms Laura Sustersic – Team Leader
2. Mr John Thomas – Full Time Expert
3. Mr Trushit Desai – Wastewater Expert
4. Mr Martin Boehnke – International Expert
5. Mr Keith Burwell – International Expert
6. Ms Ruchi Yadav – Office Manager

Successfully Implemented Improvement Measures

3 Indirect Discharge Management of Wastewater at Pilkhuwa, Hapur CETP

3.1 Background

Hapur Pilkhuwa CETP having 2.1 MLD treatment capacity, is developed & operated by Hapur-Pilkhuwa Development Authority (HPDA) and mostly caters to Textiles Industries in the Pilkhuwa Industrial Cluster. Currently the plant is operated by a private contractor – M/s Amba Engineers through contract provisions. The current average effluent inflow is 1.8 MLD, but peak inflow often reaches and exceeds maximum capacity, i.e. 2.1 MLD. HPDA bears O&M expenses which is then reimbursed by the industrial units of industrial cluster. As to date, approximately 20% of the whole cluster area is developed and connected to the CETP. Development of additional industrial units within the cluster is ongoing and will need to be connected to the CETP once operational. Therefore, the CETP is expected to exceed the designed capacity very soon.

3.2 Situation Analysis

During visits of experts of GOPA-Infra, it was observed that the wastewater quantity often exceeded the maximum treatment capacity of CETP, sometimes leading to overflow of collection tanks. Further investigations were carried out by the experts through one-to-one meetings with major wastewater generating industries, CETP operators and developers, persons and establishments living and operating in the vicinity of CETP to assess the situation. Discussions with industries revealed that they were discharging the wastewater through pumping at uniform rate, hence there was no reason for sudden spikes in wastewater inflow at CETP.

Team of GOPA experts continued their investigation along with officials of HPDA, CETP operators and CETP member units to find out the cause for this problem. Upon thorough investigations at site in all directions of CETP, one pipeline carrying treated sewage from Hapur municipal area was found passing from the north side periphery of CETP. The pipeline ends near the east corner of CETP where the treated wastewater is usually discharged in natural drainage system. However, near the boundary wall of CETP, an unauthorized disposal point has been built, which allows disposal of municipal wastewater directly inside the CETP and thus increase in wastewater quantity receipt at CETP.

An additional problem observed was that industries sometimes dispose part or all their untreated wastewater in the storm water drains. Such wastewater ends up in the natural drainage system instead of CETP. During walk-through investigations, such disposal was observed from 2 industrial units just opposite to CETP.

3.3 Response to Situation & Suggested Improvement Measures

It was strongly suggested that treated sewage from Hapur Municipal Authorities to be stopped entering CETP premises on immediate basis. HPDA official have taken prompt actions to stop the sewage entering in CETP premises. Hapur Municipal Authorities were also alerted and informed of such actions. Additionally, the industrial units in Pilkhuwa Industrial Cluster were given strict notice for compliance of wastewater disposal into CETP drainage system only.

It was also suggested by the GOPA-Infra team to initiate routine & detailed monitoring of industrial wastewater disposal in storm water drains. As a result, HPDA officials established a team and started routine monitoring plan to monitor such activities.

In addition to these, a detailed list of improvements measures were also suggested to HPDA and CETP operator[1]. The operator and HPDA officials reported starting implementation of selected measures already before COVID-19 pandemic (March 2020). However, due to travel guidelines and restrictions, CETP site could not be visited after March 2020 and hence latest status of additional improvement measures could only be verified remotely and not on the field.

3.4 Results & Salient Benefits

The prompt and immediate actions by HPDA and CETP operators resulted in the initiation of an "Indirect Wastewater Discharge Management Plan', including a monitoring and compliance management system. This in turn resulted in;

1. Reduced volumes of wastewater treatment and disposal and of sludge production, leading to financial benefits (costs of input for treatment, cost of sludge disposal)
2. Elimination of shock peak-loads to CETP, improving compliance requirements
3. Elimination of unauthorized wastewater discharges into drains, leading to statutory compliance
4. Reduced wastewater discharge from CETP premises

Indirect Wastewater Discharge: Indirect wastewater discharge are popularly known as "Bye-Pass". These wastewater discharges are either unauthorized wastewater discharges in CETP Drainage Systems or Wastewater discharges into water bodies or land without appropriate permissions. Industrial wastewater discharges into Storm water Drainage Systems also classify as Indirect Wastewater Discharge. The Strategy and Action Plan to control and stop such discharges is defined as "Indirect Wastewater Discharge Management Plan."

[1] Detailed in reports submitted to GIZ project "Support to Ganga Rejuvenation"

3.5 Photographic Impression

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4 Multimodal-Multi Objective Oriented Integrated Optimization Measures for Physico-Chemical Treatment Process at Rooma CETP

4.1 Background

Rooma CETP having treatment capacity of 1.55 MLD industrial wastewater from Rooma Textiles park located near Kanpur was developed by UPSIDC. An assessment by CPCB reveals that the CETP can treat only 0.7 MLD textile effluent.

Rooma CETP falls under the purview of multiple cases of various courts including NGT, as Kanpur was once identified as most polluted industrial cluster. CPCB monitors the matter related to various directions and orders of Hon'ble NGT in this matter. CPCB have prepared a comprehensive Action cum Monitoring Plan for the state of Uttarakhand and Uttar Pradesh in compliance with the benchmark order of Hon'ble NGT named as **Ganga Matters** dated 02nd November 2015 in OA No. 297 of 2015, OA No. 132 of 2015, MA No. 385 of 2015, MA No. 769 of 2015 and OA No. 133 of 2015. CPCB regularly updates and submits compliance reports to Hon'ble NGT in these various cases.

During visits of GOPA experts, it was noted that the textile cluster has eight active units operating at 50% production capacity connected/ permitted, in compliance with Hon'ble NGT Orders. Current reported average effluent inflow: 0.6 MLD.

Preliminary proposals submitted to UPSIDC by the SPV for up-gradation and treatment capacity enhancement of CETP were assessed by GOPA experts and a preliminary review report was submitted to the operators of Rooma CETP as part of the support provided by the team.

4.2 Situation Analysis

During visits of Experts of GOPA Infra, it was observed that, in absence of availability systematic knowledge on wastewater treatment, a lot of inappropriate methods were adopted in the Physico-Chemical Treatment Section of CETP affecting multiple aspects of CETP operations.

Upon rapid assessment of various Standard Operating Procedures (SOPs) and operational practices, GOPA experts have proposed a comprehensive improvement plan[2] containing a set of improvement measures for optimization of Physico-Chemical Treatment section of CETP.

[2] Detailed in reports submitted to GIZ project "Support to Ganga Rejuvenation"

Largely following gaps/ discrepancies were observed and noted;

1. Improper methodology for preparation of chemical including coagulants
2. Improper methodology for dosing of chemicals
3. Improper design of equipment
4. Inadequate equipment capacities
5. Faulty and inappropriate electro-mechanical equipment
6. Absence of linkage of use of chemicals w.r.t. wastewater quality and quantity
7. Inadequate knowledge of CETP operation personnel
8. Inadequate knowledge of CETP analytical facilities
9. Absence of SOP for tracking unused chemicals in wastewater & sludge
10. Noncompliant Hazardous Waste Management Plan

4.3 Response to Situation & Suggested Improvement Measures

Suggested improvement measures suggested by GOPA experts were designed to obtain the following benefits:

1. Reduction in the use of chemicals
2. Increased efficiency of wastewater treatment process (Physico-Chemical Treatment Process)
3. Upgrading some of the equipment through available in-house resources
4. Improving knowledge base of CETP operators
5. Reducing Hazardous Waste (Chemical Sludge) Generation
6. Reducing operating costs
7. Reducing soil pollution
8. Facilitating enviro-regulatory compliance

Henceforth, the program of improvement measures suggested and supported by GOPA Experts under these inventions is called as “Multimodal-Multi Objective Oriented Integrated Optimization Measures for Physico-Chemical Treatment Process at Rooma CETP” as it has impacted on at least eight (8) aspects of Improvement Areas for CETPs.

In order to achieve desired outcome and results, GOPA team of experts intervened through following interventions;

1. Training to CETP operation personnel for, -
    - Need and use of chemicals in physico-chemical process of CETP
    - Training on laboratory analysis of wastewater
    - Training on jar test & treatability test
    - Training on chemical dosing calculations
    - Quality control tests for chemicals and reagents

- Desired specifications of electromechanical equipment, i.e. Reagent Mixers, Flash Mixers, Flocculator and Clarifiers
- Importance of Hazardous Waste Management
- Importance of compliance requirements and implications of non-compliance thereof

2. Explain the Standard Operating Procedures (SOP) for preparation of reagents
3. Explain the SOP for dosing of chemicals

CETP operators took this opportunity to test and try the improvement measures suggested by GOPA experts and have implemented aforementioned measures within short time span to understand benefits thereof.

In addition to these, a detailed list of improvements measures was also suggested to CETP operators at Rooma CETP. The operators reported putting into place selected suggestions before COVID-19 crisis in March 2020. However, due to travel guidelines and restrictions, CETP site could not be visited and hence latest status of additional improvement measures could only be verified remotely.

4.4 Results & Additional Salient Benefits

Implementation of improvement measures suggested by GOPA experts to Rooma CETP operators resulted in initiation of **"Multimodal-Multi Objective Oriented Integrated Optimization Measures for Physico-Chemical Treatment Process at Rooma CETP"**. The implementation of suggested measures had positive impacts on multiple aspects of CETP operations, mainly -

1. Reduced use of chemicals in wastewater treatment
2. Reduced release of chemicals including hazardous chemicals into land and waterbodies
3. Increased efficiency of wastewater treatment process (Physico-Chemical Treatment Process)
4. Upgradation of some of the equipment through available in-house resources (Reagent Mixers, Flash mixers and Flocculator)
5. Improvement of knowledge base of CETP operators (Personnel)
6. Reduction of hazardous waste (Chemical Sludge) generation & disposal thereof
7. Reduced operating costs
8. Reduced soil pollution

4.5 Photographic Impression

Lime milk & FeSO4 preparation Tanks (Before)

Segregated Lime & FeSO4 Dosing in Physico-Chemical Treatment Section of CETP

5 Hazardous Waste & Sludge Management at Rooma CETP

5.1 Situation Analysis

Additional to the observations and actions detailed above, GOPA experts observed significant problems in Rooma Hazardous Waste Management system, including:

1. Hazardous waste (chemical sludge) lying in storm water drains inside premises of CETP,
2. Hazardous waste was lying in open land exposed to leaching,
3. No dedicated and demarcated hazardous waste storage area/shed available,
4. Defunct sludge dewatering unit (centrifuge).

Upon rapid assessment of situation and technical details available from CETP Operators, GOPA experts have proposed a Hazardous Waste Management Plan in compliance with Hazardous Waste Management Rules, containing a set of improvement measures for compliance obligations as well as to reduce direct impact through pollution of soil and water bodies.

5.2 Response to Situation & Suggested Improvement Measures

Team of GOPA experts, National & International, paid several visits to CETP site and CETP operators and industries association of Rooma. The interventions were designed to bring the following benefits specifically targeting Hazardous Waste Management System in CETP:

1. To facilitate Compliance of Hazardous Waste Management Rules & Enviro-Regulatory Compliance
2. To eliminate water pollution
3. To eliminate soil pollution
4. To upgrade knowledge base of CETP operators

In order to achieve desired outcome and results, GOPA team of experts intervened through following interventions, -

1. Training to CETP operation personnel for Hazardous Waste Management
2. Cleaning of storm water drains of CETP and make them free from hazardous waste
3. Handling of hazardous waste including use of PPEs
4. Thematic design of sludge drying beds till sludge filtration unit is repaired / installed
5. Impervious Sludge Storage Pad till Hazardous Waste Storage Area is constructed in compliance with Hazardous Waste Management Rules

CETP operators promptly acted upon the improvement measures suggested by GOPA experts and have implemented aforementioned measures within short time span.

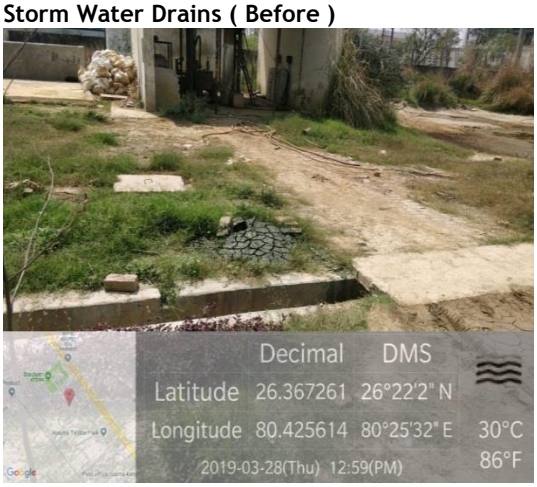
5.3 Results & Additional Salient Benefits

Implementation of improvement measures suggested by GOPA experts by CETP operators of Rooma CETP resulted in initiation of a "Hazardous Waste Management Plan and Practices at Rooma CETP". This in turn generated positive results on multiple aspects of CETP operations, mainly –

1. Enhanced knowledge of CETP operation personnel on Hazardous Waste Management & Handling thereof
2. Reduced water pollution
3. Reduced soil pollution
4. Improved compliance of Hazardous Waste Management Rules and Permit conditions
5. Better housekeeping and improved aesthetics

5.4 Photographic Impression

Storm Water Drains (Before)



Storm Water Drains (After)

Newly Constructed Sludge Drying Beds & Concrete Pads

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Annexes

Annex 1

Suggested Improvement Measures at Pilkhuwa, Hapur CETP

Following improvement measures have been submitted to the operator for implementation in phases as an outcome of assessment of data and details of Pilkhuwa CETP:

S. No.	Part, Process	Description	Identified Issues/Deficits	Improvement Measures	
1	Wastewater Drainage	Separated sewer systems for storm water and industrial water	Indirect Discharges	Detailed and routine monitoring program, wastewater analysis of natural drains in industrial cluster	
2	Screens	The screens are removing course solid materials from the wastewater	Screens must be frequently inspected and cleaned manually. The screens get flooded in case of peak flows	Installation of a screen system with automatic cleaning (screenings removal) The solid matters separated by the screen is removed with level-controlled rakes and disposed in a residue collecting basket	
3	Collection Pit	The collection pit is used as a pumping pit of the incoming wastewater	Feed pumps are manually operated according to the observed current flow rate	Installation of level-operated feed pumps and fill-level alarm. The power of pumps must be sufficient for hydraulic peak loads	
4	Oil and Grease Traps	Separation of oil and grease	Needs repairs	Upgradation of O&G Trap	
5	Equalization Tanks (EQT)	Mixing and buffering of incoming wastewater to avoid peaks for the hydraulic and pollutant loads	Homogenization of wastewater	It is recommended to install a mechanical mixer instead of a blower system (preferred by operator)	
				Blower system	Mechanical mixer
				Low homogenization degree	High homogenization degree
				Significant sedimentation of solids	Negligible sedimentation of solids
				Reduction of mixing performance due to ageing processes in diffusors and hence increasing energy consumption	Constant and reliable mixing performance over long periods of time
				High investment and operating costs (periodical exchange	Significantly lower investment and operating costs

S. No.	Part, Process	Description	Identified Issues/Deficits	Improvement Measures
				of diffusors, high energy costs)
6	Effluent Feed Pumps	Conveying wastewater from the EQT to further treatment steps	Current pumps are working but they are old and require regular maintenance. So at least one new pump should be added to avoid sudden work stopping. A level control system needs to be installed for an automatic operation of the feed pumps	New pumps needed along with auto start-stop control unit One pump should be installed for redundancy
7	Flash Mixer	The flash mixer is the first step of a chemical wastewater treatment by adding iron (or aluminium) salts to the wastewater at an alkaline pH value. The metal hydroxides are forming flocks with an electrical charge that can adsorb suspended 13particles from the wastewater	The current polyelectrolyte mixing system has rusted and needs to be replaced with a new one According to the operator's information, laboratory tests have been carried out for an optimization of the flocculation in order to use a maximum pollutant removal with a minimum of operational costs The currently operation of the flash mixer and flocculation is providing a sufficient flocculation	The flocculation should be always performed in the optimum pH range (according to laboratory tests) Hence, the dosing of flocculating agents should be controlled with a pH sensor to ensure the correct pH for the optimum flocculation results. The current Flash mixer is working but it would be better to have separate mixing of flocculating agents by providing a pH optimization tank prior to the flash mixer. This will lead to even better flocculation The mixer should be equipped with a paddle to achieve a better homogenization A new pH optimization tank and a new mixing system for polyelectrolyte is already planned
8	Flocculation	The forming of big hydroxide clusters for an efficient removal of suspended solids can be achieved by adding of polyelectrolytes		
9	Preparation of Flocculating Agents	The solutions of flocculating agents are prepared from solid basic materials (lime, ferrous sulphate, polyelectrolyte	The existing equipment is working	Since a new pH optimization tank is recommended it can be assumed that the piping of the chemical tanks must be modified as well. The piping sizes of the chemical preparation tank needs to be increased and more pressurized water is needed for an efficient preparation of the chemical solutions
10	Primary Clarifier	Separation of flocks (suspended solids) from the water	Existing sludge has operational issues	The existing sludge scraper needs to be replaced even the current treatment process meets the required limit values
11	Air Blower	Air blowers, together with diffuser units are providing	The existing aeration facility has three blowers based on twin lobe	It is recommended to get one new blower and to maintain/re-

S. No.	Part, Process	Description	Identified Issues/Deficits	Improvement Measures
		the required oxygen in the aeration tank for biodegradation and nitrification	technology	pair the existing two blowers that are currently working. In order to control the power of the blowers according to the oxygen demand of the aeration tank, a VFD needs to be provided. A VFD is required for an automatic control of the blowers provided by an oxygen sensor (DO Sensor)
12	Aeration Tank	Biological carbon degradation and nitrification of organically bound nitrogen and ammonia	The existing aeration tank is having sufficient volume capacity for 2.1 MLD	However, it is recommended to improve the design by installing a baffle in order to avoid short cut flows to the outlet. Depending on the future pollutant load an upgrade of the aeration capacity by implementing advance technologies such as MBBR or IFAS In case the C:N:P ratio in the aeration tank is out of range (100:5-10:1), an additional feed of the loss-making component is required for a proper biological wastewater treatment
13	Secondary Clarifier	Separation of activated sludge	The bottom scraper is rusted. It is working now but it will not work for long time due to increasing corrosions The sludge recirculation pumps are working but are old	The installation of a new bottom scraper should be conducted in due time An additional new sludge recirculation pump is recommended. An additional installation of a sludge thickener after the secondary clarifier could be an added advantage for an improved sludge dewatering process (centrifuge or screw press)
14	Sludge Dewatering	Dewatering of sludge	Requires major upgradation	It is recommended to carry out sludge dewatering with a sludge thickener in combination with a centrifuge or screw press to get better solid content in dewatered Sludge
15	Filter Feed Tank and Feed Pumps	Buffer tank for sand and activated carbon filter for a reliable operation of the filter units	Not installed	A buffer tank is recommended for even feeding of the filter systems Two new filter feed pumps are suggested (1 working+1 standby)
16	Sand Filter	Reducing suspended solids after the chemical-biological wastewater treatment	Not installed	Two sand filters with a backflush option are suggested (1 working+1 standby)
17	Activated Carbon Filter	Removal of non-biodegradable components	Not installed	Two activated carbon filters are suggested (1 working+1 standby)
18	Disinfection Unit	To disinfect treated wastewater	Not installed	A disinfection unit is required if the treated wastewater is planned to be recycled back to industries

S. No.	Part, Process	Description	Identified Issues/Deficits	Improvement Measures
19	Flow Monitoring	Monitoring of flow rate	The existing flowmeter for the inlet is working	An additional flowmeter at the final outlet from the new recommended carbon filter should be installed for a better controlling of the filter units The flowmeter at the outlet can be connected on a planned online monitoring system
20	Online Monitoring System	Monitoring of flow rate and pollutant parameters as specified by regulatory authorities	Currently only one flowmeter for the inlet	All monitored parameters must be comprehensible by calibration protocols and validated by a different analytical standard method (e.g. comparison of the value by photometric or titrimetric laboratory analysis) The calibration procedure is usually given by the manufacturer's manual. However, the COD can be easily controlled by applying a calibration solution that can be purchased ready to use from different suppliers or can be easily prepared in the laboratory
21	Drying Beds	The sludge from the chamber filter press is dried in provisional sludge drying beds	A Comprehensive sludge management plan is required	By utilizing drying beds, a gradual progression of the sludge dewatering must be considered. Means, depending on the lifetime in the drying bed, the upper layers will have much less water than the lower layers near to the bottom of the drying bed Particularly under consideration of the CETP-expansion a solar sludge drying, could be an alternative for the drying beds. Very efficiently could be a simple solar dryer with a combined sludge turning and transportation system. The reduction of the sludge volume by higher dewatering degrees safes significantly costs for the sludge disposal **For a holistic sludge management after a CETP-upgradation, the following measures can be summarized as follows:** 1. Optimization of flocculation by laboratory test and characterization of the sludge from the chemical treatment (% of dry substance). 2. Characterization (% of dry substance) of the biological sludge.
22	Sludge Disposal	Currently no plans. At the moment the sludge is kept in a sludge storage hall		

S. No.	Part, Process	Description	Identified Issues/Deficits	Improvement Measures
				3. Sludge amounts and sludge characteristics of both of the sludge qualities (chemical sludge from flocculation, sludge from aeration tank) can be figured out for the evaluation of a solar dewatering (are savings of a higher drying degree economically, enough space available for the required percentage of dry substance). This evaluation can be used to decide whether both of the sludge qualities can be treated together or separately. 4. Detailed sludge characterization and chemical analysis for the evaluation of disposal alternatives (such as AFR in Cement factories). 5. The volume of the sludge thickener must fit to the design of the CETP (flow rate, duration time, dry matter for dewatering). 6. For finding alternative sludge disposals (e.g. rotary kilns of cement industries) suitable sludge analysis (calorific value, dry substance content, ash residue, toxicity) are mandatory. For a thermal sludge utilization, the water content should be low, the caloric value should be high (low percentage of inorganic compounds) and the mass concentration of inorganic and organic halogen compounds (Cl, Br) must be low in order to avoid high toxic flue gas emissions during the incineration process (formation of polychlorinated dibenzodioxins and -furans).
23	Laboratory	A laboratory is mandatory for the operational self-monitoring of a CETP	Currently measured parameters: pH, TSS, COD, BOD_3	Relevant parameters for an operation of a CETP are COD, BOD, TKN, P-PO_4 together with TDS, TSS, MLSS and pH as well as the DS of sludge before and after dewatering that should be measured daily from representative samples For a proper technical control of the CETP it is a must that all records (including calibration records) of the online-monitoring station are available at the CETP as well. Ideally the laboratory at CETP is suggested to get NABL accreditation It also required that a computer is available for the preparation of required documentations (log-book for daily analysis

S. No.	Part, Process	Description	Identified Issues/Deficits	Improvement Measures
				and maintenance works, energy consumption, and other operational data) The evaluation of records from the online-monitoring unit (average values) should be combined with the result of daily analysis in the log-book Significant improvements are recommended for efficiently and reliable analyses of required basic parameters. Suggested are for example the equipment for manometric measurement of BOD (without chemicals) and the utilization of photometric standard methods for other parameters like COD or anions The implementation of a simple sampling and analysis based on Standard Operational Procedures (SOPs) is mandatory for achieving reliable results with a constant precision **SOPs should be prepared for:** 1. Sampling procedure for a combined sample obtained by 5 qualified single samples and 1.5 hours sample intervals. 2. Analysis procedures for all parameters analysed in the CETP laboratory according to an accepted standard method (preferable photometric methods) including the respective calibration procedures. 3. Evaluation and documentation of analytical results signed by the responsible person. 4. Calibrations/adjustments for all parameters of the Online-Monitoring-System, including the evaluation of obtained values. Intensive training measures for sampling, AQA and calibration of monitoring systems are urgently required.
24	SCADA System	An appropriate SCADA system is recommended for controlling all relevant parts of the CETP	Optional	The implementation of an appropriate SCADA system is recommended. The SCADA system can be implemented stepwise by setting priorities (e.g. aeration system, feed pumps, centrifuge) and can be expanded step by step. However, a stepwise implementation must consider sufficient free ports and a suitable control unit for further connections

S. No.	Part, Process	Description	Identified Issues/Deficits	Improvement Measures
25	Capacity Increase	In the longer term, the capacity of the CETP is not sufficient to treat the wastewaters of the expanding textile cluster. Therefore, an increase in CETP capacity must be planned and implemented in due time	The existing 2.1 MLD capacity sometimes becomes less to treat the incoming wastewaters from the industrial cluster. Furthermore looking forward to near future wastewater treatment demand, CETP Hydraulic Treatment capacity of 2.1 MLD will be far below the wastewater generation from the cluster	The capacity should be increased to 7 MLD considering future expansions On request, the operator of the CETP was explaining in details how the future expansion of the CETP will be designed. Thus, it could be summarized that the expansion of the CETP is intended to be designed according to BREF (comparable with standards of the German Association for Water, Wastewater and Waste, DWG) under consideration of the incoming hydraulic and pollutant loads (IDM) and with certain degree of recycle / reuse of treated wastewater within industries to reduce groundwater extraction and dependence thereupon.
26	Indirect Discharge Management	Uncontrolled and unauthorized treated sewage disposal into CETP, industrial wastewater discharge in storm water drains	Treatment and disposal liability of Sewage under EPA and Water Act	Detailed and routine monitoring and IDM program by HPDA

Annex 2

Suggested Improvement Measures at Rooma, Kanpur CETP

Following improvement measures have been agreed with the operator as an outcome of as-assessment of data and details of Rooma CETP:

S. No.	Improvement Measure Suggested	Expected Impact	Status as on 02 – Dec - 2019
1	SOP for Lime milk preparation	Reduction in Chemicals consumption, Reduction in Sludge Generation	Implemented
2	SOP for FeSO4 solution preparation	Better treatment efficiency, removal of colour from wastewater, better consistency of Chemical Sludge	Implemented
3	SOP for PE solution preparation	Better treatment efficiency, better consistency of Chemical Sludge	Partially implemented
4	Provision of Slow speed Gate type Flocculator mechanism instead of high speed stirred	Better treatment efficiency, better consistency of Chemical Sludge	Under planning
5	Provision of Flocculation Channel or Flocculation Tank	Better Sludge Floc formation, improved settling and separation of Chemical Sludge	Under planning
6	Replacement of present blowers with high efficiency blowers for aeration Tank	Better BOD/COD removal efficiency & Energy Savings	Under considerations
7	Training for Manpower – Chemist & Operators	Improved Operation of CETP	Under Planning
8	Replacement of Leaking / Torn our diffusers	Better treatment efficiency, savings in energy consumption and operating cost	Under consideration
9	Jar Test on weekly basis for chemical treatment and fixing dosages	Better treatment efficiency, savings in chemical cost, reduced sludge generation	Under consideration
10	Cleaning of storm water drains inside CETP filled with Chemical Sludge	Proper handling of Hazardous waste	Implemented
11	Cleaning of open area filled with Hazardous waste	Proper handling of Hazardous waste	Under implementation
12	Cleaning of Lagoon filled with wastewater and use it as Buffer for high flow conditions	Reduced impact of soil	Under implementation, in consultation with UPSIDC
13	Replacement of BOD incubator	BOD analysis	Under implementation
14	Training for Operators and Chemists	Better plant operation	Under considerations
15	Dosing of Polyelectrolyte in Decanters	Better sludge dewatering	Under implementation
16	Installation of Sludge Drying Beds	Drying of Sludge	Implemented, under commissioning
17	Replacement of Wastewater feed pump for equalization	Better consistency of wastewater feed to CETP	Under implementation
18	Change / Top up / Replacement of media in MGF	Better treatment efficiency	Under implementation
19	Periodic analysis of activated carbon in ACF for Iodine Value	Preventive Analysis	Under Consideration
20	Change / Top up / Replacement of media in ACF	Better treatment efficiency, Colour Removal, Residual COD Removal, Excessive Oxidant / Disinfectant (NaOCL) Removal	Under Consideration

S. No.	Improvement Measure Suggested	Expected Impact	Status as on 02 – Dec - 2019
21	SOP for analysis of NaOCL (Sodium Hypo Chloride) and dosing procedures	Better treatment efficiency, Better disinfection efficiency, reduced cost of chemicals and operation	Under consideration
22	Information board at the main gate as per the order of Hon'ble Supreme Court of India	Legal Compliance	Under implementation
23	Daily random / regular sampling of wastewater from member industries after PETP treatment	Operation of CETP, Predictive analysis	Partly implemented, under progress
24	Provision of Sludge Storage Area – Impervious Ground, leachate collection and transfer system, closed from three sides	Impact on Soil	Under Construction
25	Member level wastewater analysis on daily basis	Predictability of wastewater characteristics & improved performance of CETP	Under Consideration
26	Online Flow meter data at CETP & Integration with CETP Operations	Wastewater quantity measuring at CETP, Avoid flooding at CETP	Under Consideration
27	Cleaning residual water from Open Channel near Laboratory building and using it as a buffer during emergency purposes for storage of wastewater	Impact on Soil, CETP operation during abnormal conditions	Under Consideration
28	Monitoring of IDM on regular basis	Avoidance of shock loads to CETP, improved treatment efficiency	Partly implemented

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