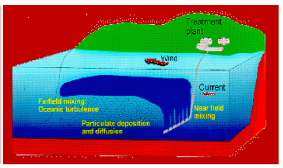
Series: IGN/Environment/1 – July, 2016

Establishment and Management of Common/ Combined Effluent Treatment Plants







1. What is common and combined effluent treatment ?

Common effluent treatment plant (CETP) concept is evolved to facilitate collective treatment of effluents from various industries at a centralized facility, to avail benefit of scale of operation. Till 1990, CETP at Jeedimetla, Hyderabad is the only plant in India. Whereas in 1991, the Ministry of Environment & Forests (MoEF), Government of India initiated a financial support scheme for establishing CETPs to facilitate small and medium entrepreneurs (SMEs). While this scheme is for initial 10 years, subsequently, many other schemes further facilitated their growth and now there are more than 130 CETPs in India, primarily serving chemical, textile and tannery clusters.

Over the years of operation of CETPs, it has been realized that co-treatment of sewage and natural storm water along with industrial wastewaters often enhance treatability, particularly in case of CETPs serving chemical industries. Such plants are referred as combined effluent treatment plants.

2. What are the benefits of collective treatment?

Collective treatment facilitates:

- Cost-effectiveness due to scale of operation
- No space requirement within manufacturing sites for complete wastewater treatment
- Opportunity for homogenization of industrial wastewaters/ segregated categories of waste streams
- Increased hydraulic stability for the treatment plants,
- Professional management of treatment
- Elimination of multiple discharges and corresponding real time monitoring requirement
- Better organization of treated effluents and proper disposal of sludge *etc.*

3. What are major challenges in operation of CETPs?

- The flow and characteristics changes substantially with time
- Lack of adequate common resources and corpus for taking immediate interventions
- No segregation and separate treatment facilities for predominantly toxic and inorganic streams from major share of biologically treatable effluents.
- CETPs serving synthetic organic chemical industries will have varying quality of effluents due to batch operations and different reaction times, therefore complex in respect of treatment, demands expertise in stabilization and operation of CETPs consistently with compliance *etc.*

4.What are the factors which influence proper planning and operation of CETPs?

- **Categories of effluent generating member industries** - type of industries, homogeneous, heterogeneous, scale of operation etc.
- **Qualitative/ quantitative fluctuations of effluent** - physical, chemical and biological characteristics; and variations in flow and future projections.
- **Pre-treatment requirements** - compatibility with conveyance system from industry to CETP, inlet quality standards set for different streams at CETP; and equalization/ homogenization requirements for different treatment technologies at CETP, immediately upon receipt of effluent from member industries.
- **Segregation of effluent streams at individual member industry** - Each treatment technology has certain parameter-specific removal efficiencies, therefore, often a combination of technologies are required to deal with heterogeneous wastewaters. Whereas, incompatibility of technologies to specific pollutants, makes it essential to separate respective wastewaters into few groups at individual industries, such as High COD, bio-degradable, recalcitrant, metal bearing etc. corresponding to existing/proposed combination of treatment scheme at CETP, for better overall efficiency of treatment.
- **Collection/conveyance system; and monitoring mechanism** - there are many modes of collection i.e. open channels, pipes (underground/ over ground) and tankers *etc.*, each mode has its own merits and limitations for a given situation. Ensuring only acceptable quality of effluent is discharged by member industries is an essential pre-requisite. Besides, monitoring requirement depends on mode of conveyance i.e. each tanker quality may be checked before accepting; and in case of piping network, continuous monitoring instruments, besides frequency of monitoring corresponding to effluent quality variations etc. are essential. Often lack of proper collection system with monitoring is a major constraint.

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- **Treatability, choice of technology, bio-degradability and interferences** – Before finalisation of any treatment scheme, treatability studies are essential, however, challenge remains, as the inlet quality of effluent changes with time scale, particularly when serving heterogeneous synthetic organic chemical industries. Therefore, modular development in respect of size and choice of technologies are important for facilitating enough flexibility for CETP operators, corresponding to changes in flow and quality. Often combination of technologies are required considering treatability and economics for ex. biological treatment is cheaper among others, whereas it can not treat toxic and non-easily biodegradable matters etc. Whereas, thermal treatment is expensive, but may be a requirement to deal with both high organic and in organics bearing wastewaters.
- **Mode of disposal; and respective standards** – After treatment, wastewater can be discharged into sea, freshwater bodies, on land, sewers, as permitted by respective SPCB. Each mode of disposal has corresponding standards for treated wastewaters for ex. deep sea discharge is better off than others, considering dilution/insignificant impacts. Therefore, depending on proximity and assimilative capacity of receiving body, cost-effective choice may be selected.
- **Charging system** – The costs can be classified into capital, operating and administrative expenses. The Central Government scheme provides part funding support, if state government commits their respective share for establishment of CETPs, these conditions varies. Often industrial development corporations are taking responsibility to establish CETPs by availing grants.

For proper operation and corresponding administrative costs, initial membership charges are collected for creation of corpus, and regular charges considering various models are in practice, which often considers flow & critical pollutant concentrations, for proportionately charging, including collection, treatment, disposal, administrative, depreciation costs etc.

5. What are possible hazards in effluent treatment facilities?

Hazards of effluent treatment operations include

- Natural hazards – Floods, earthquakes, lightening
- Accidental hazards – enclosed CETPs, fire & explosion hazards, electricity, slips, trips and falls at work
- Chemical
- Biological hazards
- Ergonomic and psychological hazards
- Exposure to mercury
- Endotoxins
- Hazardous Air pollutants

For further details, please refer "Guidelines for Health and Safety of Workers in Wastewater Treatment Facilities", published by Central Pollution Control Board (CPCB), 2001.

7. What are key factors for better operation of CETPs ?

- Segregation of critical pollutant(s) bearing effluents at individual member industries, for separate conveyance and treatment either at individual industry premises or at CETP.
- Each CETP-specific concentration limits for critical pollutants may be set for segregation from predominant biologically degradable effluents. Setting this inlet quality acceptance criteria may consider treatability of existing treatment units, and immediate new facilities under consideration.
- Therefore, toxic effluents, low volume & high COD effluents needs segregation, besides predominantly inorganic effluents and metals bearing effluents.
- Recognition of total dissolved solids (TDS-inorganic) as a critical parameter for control. Significance further enhances, if not marine disposal. For managing TDS, either concentration, or dilution with sewage are choices, if not recoverable/ reusable. Each case-specific appropriate strategy needs to be decided with due consideration to long-term sustenance of recipient water bodies.
- Most CETPs having only biological treatment unit are finding it difficult to comply with standards for critical pollutants. Therefore, there is a need to augment efficiency of biological treatment by allowing co-treatment of sewage for regular input of microorganisms. Besides, specific treatment for segregated toxic, inorganic and metal bearing effluents, as the case may be, need to be considered.
- Qualitative and quantitative variations are largely due to product/production variations in the member industries. Therefore, CETPs shall have modular capacity structures for operational ease.
- CETP shall have qualified environmental engineers/ scientists, and they shall undertake water audits in member industries and guide cost-effective preliminary treatment to meet acceptable criteria set for effluents at CETP.
- Adequacy of equalization tanks to be ensured, not only for equalization of flow but also for homogenization of quality, to facilitate consistent feed quality to subsequent secondary treatment units.
- Charging system may consider all plant-specific critical parameters (for ex. flow, SS, pH, COD, TDS, Ammonical nitrogen, heavy metals *etc.*) for achieving consistency in compliance, by generating respective required resources.
- Back-up power facilities are required, to avoid non-compliance, if relevant.
- Member industries shall pay dues to CETPs timely, for smooth functioning.
- Local regulatory bodies may help CETPs to achieve required hydraulic load, through other sources of effluents and permitting treatment of surrounding sewage, at a price.
- Proper organizational structure with ownership of anchor/major industries facilitates better operational control, as CETP compliance is essential for member industries, from the pollution control point of view.
- CETPs are an economic solution provided, effective scientific, technical and managerial strengths are pooled-in, with due regard to receiving environment.

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