TRAINING PROGRAMME FOR ETP OPERATORS IN TEXTILE INDUSTRY

Promotion of Sustainability in the Textile and Garment Industry in Asia - FABRIC

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

FABRIC Asia

Optimization of ETP operations

GIZ FABRIC – ETP Operator Course

Contents

- Basic approaches and starting points
- Specific optimizing options

Basic concept and starting points

Optimization of ETP operations

Aspects with potentials for optimization

- Energy consumption and use
- Selection, use and dosing of chemicals
- Air/oxygen supply treatment units
- Maintenance procedures and practices
- Waste and sludge treatment

Keep in mind possible interconnections and cross-cutting effects!

Optimization of ETP operations

Basic concept and benefits

- Optimization =
  - not meaning best performance;
  - but getting best from ‘available’ equipment.
- Optimization of ETP = key duty of ETP operator

Optimization of ETP operations

Basic concept and benefits

- Important issues to consider
  - Need for validation and feedback.
  - Consideration of investments versus outputs
  - Integration into "plant controlling" with technical and financial aspects.
  - Range of simple to complex measures (e.g. Keeping machinery in good condition, proper preventive maintenance)

Specific optimizing strategies and approaches

Specific ETP optimizing strategies

(1) Management of treatment chemicals

- Streamlining dosing of treatment chemicals
- Applying good chemical handling practices
- Calculating and monitoring daily chemical use

Specific ETP optimizing strategies

(1) Management of treatment chemicals

- **Streamlining dosing of treatment chemicals**
- Applying good chemical handling practices
- Calculating and monitoring daily chemical use

- Plan selection of your treatment chemicals
- Properly calculate and operate daily chemical consumption on basis COD-load of your outlet equalization tank)
- Prevent destruction of flakes by using high speed mixer.
- Reconfirm your lime and ferrous sulphate/alum dosing, also for synthetic flocculent (doubled experiments)
- Select best flocculent for your operation.
- Keep your dosing equipment clean

Specific ETP optimizing strategies

(1) Management of treatment chemicals

- Streamlining dosing of treatment chemicals
- **Applying good chemical handling practices**
- Calculating and monitoring daily chemical use

- Protect insolubility of Alum and Lime by using ASTM standard quality.
- Take ineffective substances of your chemicals (e.g. sand, soil, water) into consideration (e.g. include higher dosage).
- Maintain pH value around 8.5 for good precipitation of heavy metals and settable solids.
- Ensure good condition synthetic flocculent (e.g. storage control in water-free areas).
- Store in dry and clean room

Specific ETP optimizing strategies

(1) Management of treatment chemicals

- Streamlining dosing of treatment chemicals
- Applying good chemical handling practices
- **Calculating and monitoring daily chemical use**

  - Prevent overdosing after weekend
  - Ensure supply of Lime and Alum of same quality
  - Carry out entrance control
  - Change supplier if delivering insufficient or poor chemicals
  - Double-check settling condition latest every two weeks in correlation of COD of your inlet
  - Ensure chemist testing settling twice a day (minimum)

Specific ETP optimizing strategies

(2) Management of Chemical treatment

- Preventing floc destruction
- Reconfirming lime and alum/ferrous sulphate dosing
- Selecting best flocculent for your operation
- Keeping dosing equipment clean and functioning

Specific ETP optimizing strategies

(2) Management of Chemical treatment

- **Preventing floc destruction**
- Reconfirming lime and alum/ferrous sulphate dosing
- Selecting best flocculent for your operation
- Keeping dosing equipment clean and functioning

- Set flash mixer to medium speed (e.g. 100 rpm)
- Use slow speed mixer for flocculator unit.
- Adapt flocculation channel (if available) to stability of precipitated sludge
- Limit hydraulic flow into clariflocculator or clarifier to surface loading (about 1 - 1.5 m3/m2/h).
- Prevent accumulations of solids by removing sludge regularly.
- Clean over flow channels of sedimentation basins regularly.
- Monitor pH levels regularly

Specific ETP optimizing strategies

(2) Management of Chemical treatment

- Preventing floc destruction
- **Reconfirming lime and alum/ferrous sulphate dosing**
- Selecting best flocculent for your operation
- Keeping dosing equipment clean and functioning

- Make jar tests using measuring cylinder every two days (settable solids per litre) with Lime and Alum
- Verify dosing and control tests twice daily
- Take care no flocs going over wires (V-notches) of the clariflocculator or primary clarifiers
- Ensure proper mixing in equalization tank to prevent under dosing due to shock loadings
- Check conditions of screens to prevent poor mixing and sticking

Specific ETP optimizing strategies

(2) Management of Chemical treatment

- Preventing floc destruction
- Reconfirming lime and alum/ferrous sulphate dosing
- **Selecting best flocculent for your operation**
- Keeping dosing equipment clean and functioning

- Cheapest flocculent not necessarily the best
- Order samples from different suppliers to test their efficiency before selection
- Consult suppliers about optimized dosing of their product
- Cross-check results with independent sources (e.g. other operators)
- Compare daily dosing of lime, alum and flocculates for different suppliers
- Ensure getting stable products for dry storage

Specific ETP optimizing strategies

(2) Management of Chemical treatment

- Preventing floc destruction
- Reconfirming lime and alum/ferrous sulphate dosing
- Selecting best flocculent for your operation
- **Keeping dosing equipment clean and functioning**

- Prevent settling in baffle channel
- Control velocity of your flow to achieve sufficient flocculation
- Control condition of mixers and weirs
- Check pipes every week.
- Use chemicals without much of sand content.
- Do not run unit with thick sludge, especially during re-starting.

Specific ETP optimizing strategies

(3) Management of oxygen supply

- Adjusting oxygen supply
- Reducing inlet load by primary treatment
- Checking COD and BOD in every stage
- Checking DO-levels
- Alternating use of blowers

Specific ETP optimizing strategies

(3) Management of oxygen supply

- **Adjusting oxygen supply**
- Reducing inlet load by optimizing primary treatment
- Checking COD and BOD in every stage
- Checking DO-levels
- Alternating use of blowers

- Reduce your inlet load by optimizing primary treatment
- Check COD and BOD in every stage
- Check DO-level in pre-aeration tank and in aerobic biological treatment with DO-meter.
- Use catalyst for oxidizing your H_2S in case of long term H_2S stability
- Ensure that aerators can be used alternately.
- Switch on/off aerators based on DO values in aeration system (manual or automatic)

Specific ETP optimizing strategies

(3) Management of oxygen supply

- Adjusting oxygen supply
- **Reducing inlet load by optimizing primary treatment**
- Checking COD and BOD in every stage
- Checking DO-levels
- Alternating use of blowers

- Balance your plant efficiency
- Use lime and alum for precipitation
- Keep wastewater fresh to avoid increase of H_2S from settling sludge
- Use pre-settler to balance load if unit available
- Equalize effluent and avoid simply using equalization tank as “pre-storage” tank for inlet effluents
- Organize meetings with different plant-managers of your nearby ETPs to reduce heavy metals in the effluent.

Specific ETP optimizing strategies

(3) Management of oxygen supply

- Adjusting oxygen supply
- Reducing inlet load by optimizing primary treatment
- **Checking COD and BOD in every stage**
- Checking DO-levels
- Alternating use of blowers

- Balance your efficiency based on BOD/COD in treated effluent.
- Make sampling and analysis part of your routine operation.
- Base BOD/COD analysis on composite samples.
- Apply good laboratory practice for reliable results
- Compare your results with results of other institutes
- Prepare and review monthly testing reports, also to forecast future load situations in your ETP

Specific ETP optimizing strategies

(3) Management of oxygen supply

- Adjusting oxygen supply
- Reducing inlet load by optimizing primary treatment
- Checking COD and BOD in every stage
- **Checking DO-levels**
- Alternating use of blowers

- Avoid wasting energy by keeping oxygen intake below 2,5 mg/l
- Increase aeration if DO below < 1,0 mg/l
- Cross-check DO levels from meter reading with Winkler's method in laboratory.
- Calculate inlet load and present oxygen supply
- Avoid nitrification and poor settling of bio-sludge from too much oxygen.
- Consider post aeration to meet the DoE values.

Specific ETP optimizing strategies

(3) Management of oxygen supply

- Adjusting oxygen supply
- Reducing inlet load by optimizing primary treatment
- Checking COD and BOD in every stage
- Checking DO-levels
- **Alternating use of blowers**

- Use DO-measurement to decide (i) how to run and determine correct operational conditions
- Blowers/aerators provided with variable frequency drive (VFD) to be used for DO control
- Prefer ETP operation with self-monitoring using adequate DO measuring instruments
- Remember to regularly calibrate instruments such as DO meters.
- Investment in such instruments (about 1 - 1.5 lakhs taka or USD 1100 – 1700 per unit) usually recovered within one year from energy savings.

To remember

- Well designed and constructed ETPs pre-requisite for good functioning but inputs and unit operations to be further optimized
- Consider optimizing existing system before initiating expensive ETP modifications, additions/ and improvements
- Optimization efforts resulting in…
  - reduced treatment costs
  - consistent and treatment performance and reduced risk of non-compliances and consequences e.g. fines
  - improved image of factory with buyers/brands, authorities and general public.
- ETP operators key contributors to making optimization happen

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