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

Restarting ETP operations

GIZ FABRIC – ETP Operator Course

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- Steps to take before restarting
- Steps for preliminary restart
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Restarting ETP - Challenges

Restarting ETP – Challenges

More difficult than starting new ETP

Common challenges

- No ready made protocol
  - Limited technical support from ETP supplier
  - Responsibility of ETP manager and staff
- Limited availability of funds
  - many parts worn-out and needing servicing
- Pressure from factory management
  - focus on re-starting production
  - less priority or support to ETP while not understanding ETP restart process

Restarting ETP – Challenges

Common challenges

- No spare time for re-starting or stabilization
- No lead time from management or environmental authority

After abrupt ETP shut-down

- Less attention to ETP cleanliness
- Increased safety risks

Restarting ETP – Challenges

Main issues to keep in mind

- **Safety** risks
  - Exposure to **Hydrogen Sulphide gas** while cleaning pits, manholes and tanks
  - Electric risk due to **insulation failures or damages**
  - **Corrosion** of mechanical units and weakened structures (e.g. railings, ladders, steps)
- Risk of **damage to ETP equipment**:
  - Diffuser breakages due to scaling
  - Drive damages due to dust and rust or poor/missing lubrication

Restarting ETP – Challenges

Main issues to keep in mind

- **Process failure**
  - System failure when restarting biological ETPs without proper re-commissioning procedure

- **Detailed checking of ETP** requires time but
  - **saving** much **money**
  - saving **lives**!

Restarting ETP – Challenges

Be aware of rapid corrosion in inoperative ETP

Steps to take before restarting

Steps to take before restarting

Cleaning of channels, pits and tanks

- Special attention to
  - confined space entry
  - protection against Hydrogen Sulphide gas
- **Refamiliarise** with and train on **safe work** and **emergency procedures**
  - See presentations 9.1 and 9.2
- Check availability and **conditions of safety** and **emergency equipment**

Steps to take before restarting

Checking electrical installations

- Check all electrical panels for loose wires, dirt and corrosion
- Tighten all terminations
- Check correctness of earthing on panels and motors
- Check working amperage of pumps/blowers for overloads (high amperage) or leaks in suction (low amperage)

Steps to take before restarting

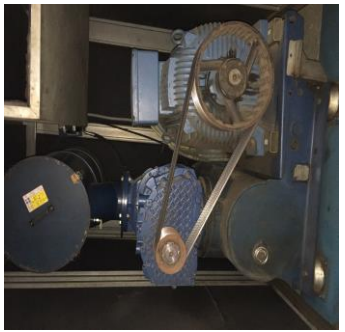
Checking mechanical installations

- Manually check all drives for any jams before starting
  - manually moving shafts and fans
- Check for noise or vibration during operation.
- Start and check submersible pumps only when proper water level reached
  - Damage during dry runs
- Check seal warnings before regular operation

Steps to take before restarting

Checking mechanical installations

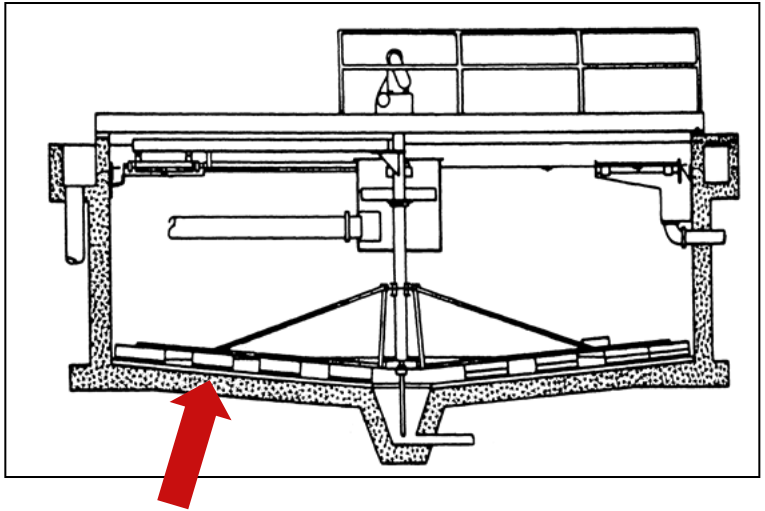
- Remove old sediments from all agitator tank to prevent drive breaking
- Clean blower lube using diesel.
- Change all belts in drives, if any one belt loose
- Ensure good lubrication
  - Replace old oil and top up with new
  - Grease bearings with proper grade before any start up
- Clean filter cloths by soaked in hypo and acid before re-start



Steps to take before restarting

Checking mechanical installations

- Check squeeges of clarifier rake arms
  - To evenly sweep floor
  - Replace if needed



Steps for preliminary restart

Steps for preliminary restart

Restarting screening operations

- Remove any dried screenings
- Manually remove fibers from bristles
- Check bars and spindle in manually cleaned screens
- Check proper lubrication of drives and gears on mechanical screens

Steps for preliminary restart

Restarting equalisation

- Empty equalization tank
- Clean diffusers (by removing and soaking in diluted HCl or formic acid
- Run blower with 0.5 m water level for checking of diffuser integrity
  - coarse bubbles: torn diffusers to be replaced
  - no bubbles: choked diffuser to cleaned again
- Start unit only after effluent reaching minimum level 50% of equalization tank.

Steps for preliminary restart

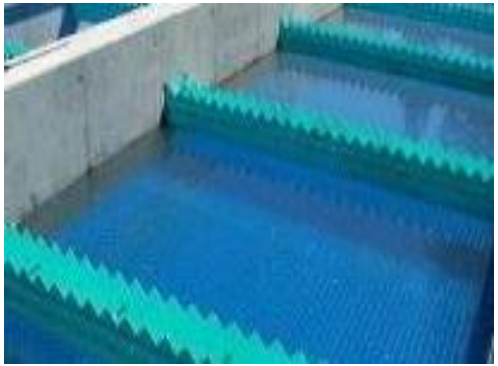
Restarting primary treatment operation

- Empty and clean flash mixer, flocculator and clarifier
- Remove any blockages in sludge underflow pipes prior to loading effluents
- Remove all dust from launder using a broom
- Adjust V notches of clarifier when tanks still dry

Steps for preliminary restart

Restarting primary treatment operation

- Check feed well drum alignment,
  - check for any bridge sagging
  - correct before loading tanks
- Wash reinstall tubes or plates in tube settler or lamella
- Ensure proper angle of tubes at 40 or 60 degrees
- Check and adjust overflow weir level to be even.
  - If not, replace box



Steps for preliminary restart

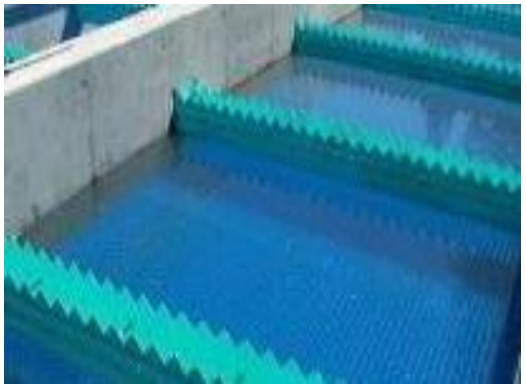
Restarting primary treatment operation

Selecting treatment chemicals

- **Ferrous salt** for reactive dyes
- **Alum and PAC** for other.
- **Polyelectrolytes** for build-up of flocs
  - Opt for branded chemicals and ask for safety data sheets

Setting dosage

- No fixed dosages but **do jar tests before re-starting**
  - Ferrous dosage ($FeSO_4$) till effluent turning pale green.
  - Excess $FeSO_4$ treated effluent turning red later.

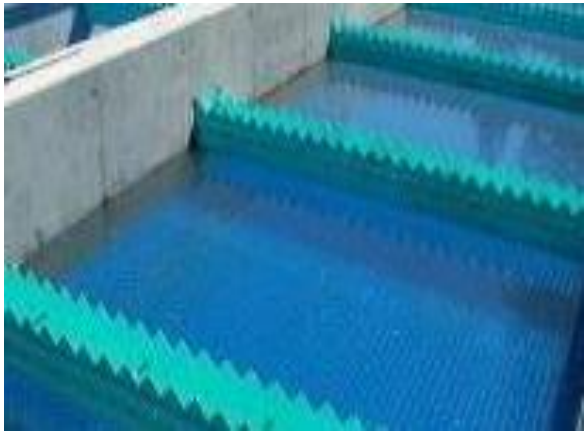


Steps for preliminary restart

Restarting primary treatment operation

Preparing and applying chemicals

- **Neutralizing** agent
  - **No Alum/FeSO4** as.
  - Use acid
- **Dosing Alum or FeSO4**
  - Too low dosage (<50 ppm) useless
  - Too high dosage waste of chemical & excess sludge
    - Lamella and tube settler requiring frequent sludge removal

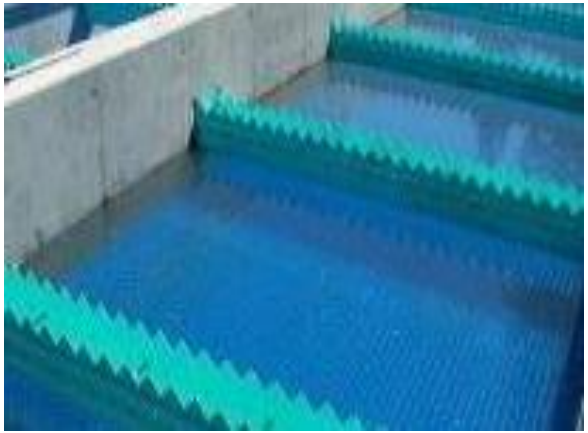


Steps for preliminary restart

Restarting primary treatment operation

Preparing and applying chemicals

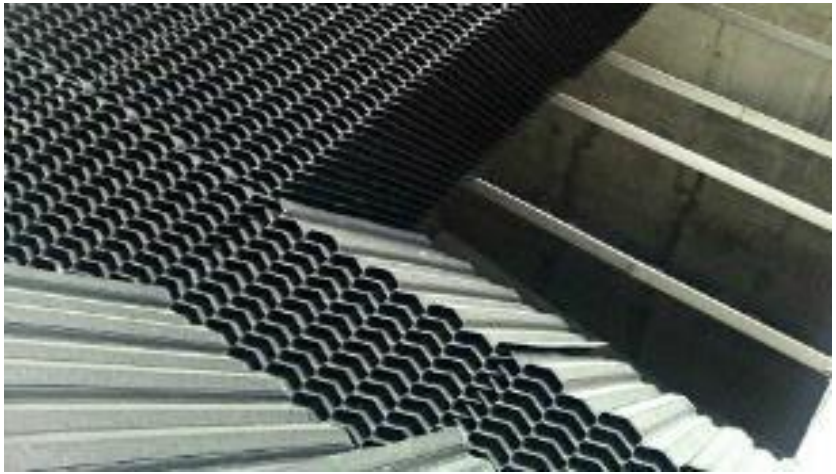
- Maintain **proper slurry concentration**
  - **alum/ferrous sulphate about 10-15%** and **lime 5-10%**
  - too high concentration = waste of chemicals.
  - too low concentration = waste of water.



Steps for preliminary restart

Restarting primary treatment operation

Re-adjust the baffles in tubes in lamella clarifier and complete jar tests before restarting



Steps for preliminary restart

Restarting primary treatment operation

For further consideration

- Dose **polyelectrolyte** (PE) in **low concentration** (e.g. 0.5%)
  - Higher concentration wastage
  - Use separate preparation and dosing tanks
- Dose PE only in **flocculation tank**, **not flash mixers**
- Use metering pumps for acid and PAC
- Use centrifugal pumps for lime

Steps for preliminary restart

Restarting primary treatment operation

For further consideration

- Use primary treatment to match F/M status in aeration
  - no chemical needed if flow is low
  - higher doses for full flow and high COD.
- Evaluate and select chemicals in totality, considering
  - cost of chemicals
  - impact on sludge generation
  - ready availability and supplies

Steps for preliminary restart

Restarting aerations systems

- Remove and **clean diffusers** with diluted acid.
  - If not retrievable, spray formic acid mist into air line.
- **Check diffusers** at 0.5 m water (similar to equalization)
- Do **system seeding**, if not mixed liquor suspended solids (MLSS)
  - Specialty microbes if no bio-sludge
  - Alternatively cow dung and molasses.

Steps for preliminary restart

Restarting aerations systems

To restart

- maintain lower feeding matching MLSS
  - higher F/M: 0.3 - 0.4.
  - higher nutrient addition (BOD:N:P @ 100:8:4)
  - higher dissolved oxygen (3 - 4 mg/l).
- If two aeration tanks available, commission one first
  - bio-sludge used for quickly second one.
- Start **sludge wasting** when **MLSS** level reaching **>1000 mg/l.**

Steps for preliminary restart

Restarting aerations systems

Testing aeration system

(1) Dissolved oxygen (DO)

(2) Mixed liquor suspended solids (MLSS) level

(3) Mixed Liquor Volatile Suspended Solids (MLVSS) level

(4) Sludge volume index (SVI)

(5) Nutrient addition

Steps for preliminary restart

Restarting aerations systems

Testing aeration system

(1) Check **DO** on **every shift**

- Portable DO meter good option
- Alternatively, Winkler's method

(2) Check **MLSS** level **every day**

(3) Check **MLVSS weekly**

- From MLSS, calculate F/M and maintain as suggested

Steps for preliminary restart

Restarting aerations systems

Testing aeration system

(4) Check **SVI every shift**

- By settling tank contents in jar
- Normal SVI 400 ml/litre in 30 mins

(5) Check **nutrient addition**

- **daily** in beginning (to compensate wash offs)
- every 2-3 days later
- once a week after commissioning.

Steps for preliminary restart

Restarting aerations systems

Manage common problems

- Heavy **white foaming** during start up.
  - Control with **water spray**.
  - Use **silicone based defoamers**.
- **Poor sludge settling** in clarifier.
  - Keep **return activated sludge level around 150%**
  - Keep at 100-125% once MLSS level >1000 mg/l

Steps for preliminary restart

Restarting aerations systems

Manage common problems

- **Sludge bulking** because of filamentous organisms
  - Adjust RAS levels
  - Dose PAC at clarifier inlet.
  - Dose 5 -15 ppm of chlorine in RAS line in sever cases.
  - Check dosage of polymer /color removal agent through jar testing
  - Better no specialty bacteria
    - permanent dosing since killing normal Pseudomonas

Steps for preliminary restart

Restarting aerations systems

Common problems

Heavy white foaming

Solid overflow

Preparing for future ETP shut-down

Preparing for future ETP shut-down

Applying good shut-down procedures for easier restarting

- Allow for **adequate time** to properly stop and shut-down ETP
- Keep all raw **effluent channels empty and clean**
- **Cover manholes** and drains tightly
- Remove and keep **costly controls in safe storage** areas
  - thefts common during shutdowns
  - protection against corrosion and rain

Preparing for future ETP shut-down

Applying good shut-down procedures for easier restarting

- **Empty tanks** (e.g. lift well, equalization, primary clarifier
  - Initially run only aeration tank and secondary clarifier
  - Empty secondary clarifier after fully removing bio-sludge
- During shut-down until re-starting
  - **Maintain minimum aeration** (mixing power >30 w/m3 of tank) in aeration tank.
    - Too much aeration quickly consuming all biomass
  - Carry out **routine maintenance** (e.g. oiling and greasing) and **periodical corrosion control** (painting, coating)

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