

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

Sludge management - troubleshooting

GIZ FABRIC – ETP Operator Course



Contents

- Overview of sludge management issues
- Responding to operational issues in sludge thickening
- Responding to operational issues in mechanical sludge dewatering
- Responding to operational issues in sludge drying

Overview of sludge management issues

Overview of sludge management issues

Particular **challenging topic** in Bangladesh, focusing on

- Sludge thickening
- Sludge dewatering
- Sludge drying

Common issues

- Bad **odor**
- Incomplete **dewatering**
- Inadequate measures for avoiding **sludge generation**
 - Effecting treatment performance
 - Damaging ETP



Responding to operational issues in sludge thickening

Operational issues – Sludge thickening

Different systems in use

- Gravity thickener
- Flotation thickener
 - Higher level of operation control
 - More issues
- **Common challenges**
 - Controlling **sludge concentration in underflow**
 - Finding correct **dosage** of polyelectrolytes



Operational issues – Sludge thickening

Problem	Possible reasons	Common solutions
Bubbles in tank and turbid overflow	<ul style="list-style-type: none">• Heavy accumulation of sludge.• Insufficient withdrawal rate of thickened sludge• Skimmer mechanism not working	<ul style="list-style-type: none">• Check and repair skimmer mechanism• Increase withdrawal rate of thickened sludge.
Tripping of mechanism	<ul style="list-style-type: none">• Torque overload due to heavy sludge accumulation• Jammed scrapper mechanism or misalignment of scrapper	<ul style="list-style-type: none">• Increase sludge withdrawal• Check mechanism and remove any jamming• Re-align mechanism if necessary.• Check for and repair bridge sagging

Operational issues – Sludge thickening

Problem	Possible reasons	Common solutions
Bad odor and rising sludge	<ul style="list-style-type: none">Thickened sludge pumping rate too low.Too low feed rate to sludge thickener	<ul style="list-style-type: none">Increase feed flow rate.Increase withdrawal of thickened sludge
Thickened sludge not thick enough	<ul style="list-style-type: none">Inflow pumping rate too highOverflow or underflow rate too highShort circuiting in thickener	<ul style="list-style-type: none">Check and relevel overflow weirCheck and level feedwell drumReduce inflow and sludge withdrawal rate.
Oil leak in the drive	<ul style="list-style-type: none">Oil seal failure	<ul style="list-style-type: none">Replace seal

Operational issues – Sludge thickening

Problem	Possible reasons	Common solutions
Noise or excessive heating from drive	<ul style="list-style-type: none">• Lack of lubrication• Misalignment• Excessive wear	<ul style="list-style-type: none">• Lubricate as needed.• Check and correct alignment• Replace joint or bearing as needed.
Excessive slime growth on sides and weirs	<ul style="list-style-type: none">• Absence of periodical cleaning• Excessive organics/nutrients in the sludge.	<ul style="list-style-type: none">• Ensure complete emptying and cleaning of tank periodically.• Try chlorination if needed.
Loss of fine particles in overflow	<ul style="list-style-type: none">• Too much wasted activated sludge (WAS) in combined sludge.	<ul style="list-style-type: none">• Manage proportion of chemical and biological sludge in combined ETPs.• If sludge only WAS, try conditioning using polymers.

Operational issues – DAF thickener

Problem	Possible reasons	Common solutions
Floating sludge too thin	<ul style="list-style-type: none"> • Too much flight speed • Unit overload • Inadequate polymer dose. • Low dissolved air 	<ul style="list-style-type: none"> • Reduce flight speed. • Turn off sludge feed and allow unit to clear and purge with auxiliary recycle. • Optimize polymer dosage
Low dissolved air	<ul style="list-style-type: none"> • Re-aeration pump not working • Educator clogged • Air supply malfunction 	<ul style="list-style-type: none"> • Clean re-aeration pump and ensure its operation • Clean educator • Check and repair air supply line
Effluent solids too high	<ul style="list-style-type: none"> • Overloading of unit • Inadequate polymer dosage. • Skimmer speed too low. • Low air/solids ratio • Improper recycle flow. 	<ul style="list-style-type: none"> • Adjust and optimize the skimmer speed • Reduce feed. • Increase airflow • Optimize polymer dosage.

Operational issues – DAF thickener

Problem	Possible reasons	Common solutions
Skimmer blade leaking on beaching plate	<ul style="list-style-type: none">• Skimmer wiper not adjusted properly• Hold on tracks too high	<ul style="list-style-type: none">• Adjust skimmer wiper
High water level in retention tank	<ul style="list-style-type: none">• Air pressure supply low• Level control system bleeding continuously• Insufficient air injection	<ul style="list-style-type: none">• Increase air flow• Check and repair bleed system
Low water level in retention tank	<ul style="list-style-type: none">• Recirculation pump not working or clogged.• Level control system not working	<ul style="list-style-type: none">• Clean and check pump operation• Check and repair level control system
Low recirculation pump capacity	<ul style="list-style-type: none">• High retention tank pressure	<ul style="list-style-type: none">• Check and adjust pressure

Responding to operational issues in mechanical sludge dewatering

Operational issues – Sludge filter press

Filter press very sturdy and efficient option

Common issues

- Poor quality of equipment makes many a unit dysfunctional
 - Unwillingness to invest in good quality
- Lack of operator awareness and skills such as
 - Proper pressure setting
 - Need for variation in feed
 - Cleaning of cloths after filtration cycle



Operational issues – Sludge filter press

Problem	Possible reasons	Common solutions
Leaks between filter plates	<ul style="list-style-type: none"> • Improper alignment • Inadequate shimming 	<ul style="list-style-type: none"> • Realign filter plates. • Adjust shimming of stay bosses.
Too long filtration cycle time	<ul style="list-style-type: none"> • Feed sludge concentration too low • Improper conditioning of sludge. • Feed pressure inadequate 	<ul style="list-style-type: none"> • Improve sludge thickening to increase feed solids >4% • Apply chemical conditioning • Select the optimum pressure
Sludge sticking to plates and removal difficult	<ul style="list-style-type: none"> • Too many organics in feed sludge. • Inadequate conditioning 	<ul style="list-style-type: none"> • Reduce organics by digestion • Apply inorganic conditioning agents such as lime
Feed pressure too high (even at start)	<ul style="list-style-type: none"> • Pores of cloths clogged from previous operation. • Sludge too sticky 	<ul style="list-style-type: none"> • Ensure washing of cloths using water jets after each cycle of operation.

Operational issues – Sludge filter press

Problem	Possible reasons	Common solutions
Excessive moisture in filtered cakes	<ul style="list-style-type: none">• Filter cycle too short.• Lack of chemical conditioning	<ul style="list-style-type: none">• Complete cycles only when filtrate flow stops• Try chemical conditioning
Sludge leaks through the bottom	<ul style="list-style-type: none">• Obstruction in sludge forcing sludge between plates.• Improper alignment	<ul style="list-style-type: none">• Ensure sludge slurry smooth and without foreign particles• Re-align plates
Frequent media binding	<ul style="list-style-type: none">• Initial pumping rate too high• No pre-coat formation	<ul style="list-style-type: none">• Keep feed rate within designated levels

Operational issues – Sludge filter press

Problem	Possible reasons	Common solutions
Sludge cake dry outside and wet inside	<ul style="list-style-type: none">• Inadequate operation pressure.• Too many organics feed sludge• Pores of filter cloths clogged.	<ul style="list-style-type: none">• Adjust feed pressure• Apply digestion of sludge.• Use chemical conditioners such ferric chloride and lime.• Wash and clean filter cloths after each cycle.
Water dripping into dewatered sludge area or container	<ul style="list-style-type: none">• Absence of drip tray or improper closure of drip tray• Misalignment of plates	<ul style="list-style-type: none">• Ensure good and properly closing working drip tray• Re-align filter plates
Sludge cake wet in central part.	<ul style="list-style-type: none">• Lack of air/steam drying through central feed.• Sludge too slimy.	<ul style="list-style-type: none">• Use air passage after each cycle to dry central portion of sludge cake.• Apply chemical conditioning

Operational issues – Sludge centrifuge

Preferred option in large ETPs because of limited space requirement

- But high power consumption
- Low solids content in dewatered sludge

Common issues

- Tricky operation depending on quality of equipment and nature of sludge
 - damage of main rotator and conveyor.
 - frequent repairs in view of high operating speed



Operational issues – Sludge centrifuge

Problem	Possible reasons	Common solutions
Centrate clarity poor	<ul style="list-style-type: none">• Feed rate too high• Low pool depth• Conveyor screws worn out	<ul style="list-style-type: none">• Reduce sludge feed flow• Increase pool depth till getting clear centrate.• Repair or replace conveyor
Cake too wet	<ul style="list-style-type: none">• Feed rate too high• High pool depth• Speed too low• Excessive chemical feed	<ul style="list-style-type: none">• Reduce sludge feed rate• Decrease pool depth till getting good cake• Change pulley settings• Optimise chemical dosages
Centrifuge torque control trips frequently	<ul style="list-style-type: none">• Feed rate too high.• Feed solids too high.• Foreign material in machine.	<ul style="list-style-type: none">• Reduce flow• Dilute feed sludge• Remove conveyor and clean any foreign material

Operational issues – Sludge centrifuge

Problem	Possible reasons	Common solutions
Sudden increase in power consumption	<ul style="list-style-type: none">• Contact between bowl and accumulated solids inside case.• Effluent pipe plugged	<ul style="list-style-type: none">• Apply hard surfacing to areas with water• Check and clear effluent pipe
Gradual increase in power consumption	<ul style="list-style-type: none">• Conveyor screw wear	<ul style="list-style-type: none">• Re-surface screw
Uneven and surging solids discharge	<ul style="list-style-type: none">• Pool depth too low.• Conveyor screw rough.• Feed pipe too near to bowl beach	<ul style="list-style-type: none">• Increase pool depth• Rebuild conveyor screw• Move feed pipe to effluent end

Operational issues – Sludge centrifuge

Problem	Possible reasons	Common solutions
Centrifuge not start starting	<ul style="list-style-type: none">• Tripped circuit breaker or fuses.• Overload relay tripped• Torque control tripped• Vibration switch tripped	<ul style="list-style-type: none">• Correct problem and re-set• Flush machine, restarts relays.

Operational issues – Belt filter press

Effective unit requiring proper treatment control

Common issue

- Polyelectrolyte conditioning and proper dosing
- Proper alignment of clothes around rollers.
- Corrosion of press frame if made from low grade steel
- Cleaning practices of press area and cloths
- Control of cloth tension between rollers



Operational issues – Belt filter press

Problem	Possible reasons	Common solutions
Dewatered sludge too wet	<ul style="list-style-type: none"> • Sludge application rate too high. • Belt speed too high. • Incorrect polymer dosage. 	<ul style="list-style-type: none"> • Adjust influent sludge pumping rate • Adjust belt speed • Optimize polymer dosage through jar tests.
Excessive belt wear	<ul style="list-style-type: none"> • Improper alignment of rollers. • Sludge build-up on bottom of belt or on rollers. 	<ul style="list-style-type: none"> • Adjust alignment of rollers • Replace, repair or adjust faulty mechanism
Too much solids in filtrate	<ul style="list-style-type: none"> • Incorrect polymer dose • Solids running off the edge of filter belt 	<ul style="list-style-type: none"> • Optimize polymer dosage • Reduce sludge feed pumping rate. • Adjust belt rate of belt travel
Oil leak	<ul style="list-style-type: none"> • Oil seal failure 	<ul style="list-style-type: none"> • Replace oil seal.

Operational issues – Belt filter press

Problem	Possible reasons	Common solutions
Noisy or hot bearings	<ul style="list-style-type: none">• Excessive wear• Improper alignment• Lack of lubrications	<ul style="list-style-type: none">• Replace bearing• Lubricate the unit.• Align joint or bearing.
Too long filtration cycle time	<ul style="list-style-type: none">• Feed sludge concentration too low.• Improper conditioning of sludge• Feed pressure inadequate	<ul style="list-style-type: none">• Improve sludge thickening to increase feed solids >4%.• Apply chemical conditioning• Select optimum pressure
Filtration rate too slow	<ul style="list-style-type: none">• Improper operation of belt cleaning spray• Improper conditioning of sludge.	<ul style="list-style-type: none">• Clean nozzles of water spray for belt cleaning• Optimize and practice sludge conditioning

Responding to operational issues in sludge drying

Operational issues – Sludge drying

Use of **sludge drying beds** simplest and most common unit

- Simply but not maintenance free

Common issues

- Incorrect **operating practices**
- Improper **cleaning underflow pipes**
- **Improper removal** of all dried **sludge** before next round



Operational issues – Sludge drying beds

Problem	Possible reasons	Common solutions
Foul odor from sludge drying bed	<ul style="list-style-type: none"> • Too many organics in liquid sludge • Incomplete sludge digestion 	<ul style="list-style-type: none"> • Apply sludge digestion • Increase pH of sludge >8.0 before admitting to beds. • Add bleaching powder to drying sludge.
Excessive loss of sand	<ul style="list-style-type: none"> • Removal of sludge when still not dried completely. • Too much WAS in sludge. 	<ul style="list-style-type: none"> • Maintain proper drying cycle • Combine sludge from primary and secondary treatment
Sludge not dry even in good weather	<ul style="list-style-type: none"> • Sand media clogged • Drainage pipe blocked due to sludge. • Gravel bed past its life 	<ul style="list-style-type: none"> • Completely clean and rake surface of bed before applying next cycle • Check and repair drainage piping • Replace sand and gravel

Operational issues – Sludge drying beds

Problem	Possible reasons	Common solutions
Dried sludge dusty and crumbly	<ul style="list-style-type: none">• Too much drying• No following removal periodicity	<ul style="list-style-type: none">• Remove sludge once moisture content increases more than 50%.
Drying time too long.	<ul style="list-style-type: none">• Application depth too much• Blocked sand media• Clogged drainage lines	<ul style="list-style-type: none">• Adjust sludge admission depth, not more than 0.4 m• Wash and replace sand media• Check & clean the underflow pipes
Drying bed walls dirty	<ul style="list-style-type: none">• No splash pad• Sludge overflows above proper level	<ul style="list-style-type: none">• Use splash pad for admitting sludge into beds• Optimize sludge admission level within bed

Operational issues – Sludge drying beds

Problem	Possible reasons	Common solutions
Sludge drying capacity not adequate	<ul style="list-style-type: none"> • Too small area for sludge drying beds. • Incorrect operation practices 	<ul style="list-style-type: none"> • Construct adequate number of sludge drying beds • Optimize filtration cycle • Promptly remove any dried sludge
Semi-dried sludge getting wet again	<ul style="list-style-type: none"> • Admitting sludge into semi dried sludge. • Rains flooding beds 	<ul style="list-style-type: none"> • Never admit fresh sludge into semi dried sludge beds • Provide adequate number of beds considering rains. • Provide transparent covers or roofing against rainwater (to be removed after rains)
Removal of dried sludge difficult	<ul style="list-style-type: none"> • Too large drying beds • Absence of access to remove dried sludge 	<ul style="list-style-type: none"> • Construct beds in compartments with walkways • Use concrete/plywood planks for access.

To remember



- Sludge dewatering area needing care and attention in Bangladesh
- Sludge drying bed simplest and cheapest (except for high labor cost) but inefficient if improperly operated
- Be aware of pros and cons of different mechanical sludge dewatering methods
 - dryness of sludge
 - capital costs,
 - need for polymer
- Periodic maintenance and prompt repairs essential
- Paying attention to cleaning for good appearance of ETP

**Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH**

Registered offices
Bonn and Eschborn

GIZ Bangladesh
PO Box 6091, Gulshan 1
Dhaka 1212, Bangladesh
T +880 2 5506 8744-52, +880 9666 701 000
F +880 2 5506 8753
E giz-Bangladesh@giz.de
I www.giz.de/bangladesh