

TRAINING PROGRAMME FOR ETP OPERATORS IN TEXTILE INDUSTRY

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

Sampling of Wastewater

GIZ FABRIC – ETP Operator Course



Contents

- Basic aspects of sampling
- Sampling procedures and methods
- Good practices in handling samples

Basic aspects of sampling

Basic aspects of sampling

Important!

- ETP only functioning if correctly **monitored and controlled**

Necessary precautionary measures

- a) Ensure **representativeness** of sample
- b) Prevent **sample contamination**
- c) Properly **preserve, transport and store** samples
- d) Take **safety precautions** while taking samples



Basic aspects of sampling

Role and responsibilities

- Monitoring generally job of ETP manager and lab chemist
- Crucial role of **correct data collection & monitoring** belongs to **operator**
 - correct sampling of wastewater as per set procedure!
 - Without correct and representative sample wrong data and misguided control of ETP operation



Basic aspects of sampling

Main common requirements for all sampling

- **Quantity**

- Sample to be sufficient to perform all required analytical testing

- **Quality**

- Strictly as per sampling and handling procedures
- Integrity of sample by avoiding sample deterioration or contamination

- **Relativity**

- Sample to be truly representation of source



Basic aspects of sampling

Importance of ensuring occupational health & safety during sampling

- Right **safety equipment needed and provided**
- Preventive measures implemented
- Being prepared for emergency and capable of providing assistance
- Appropriate type of **personal protective equipment (PPE)** used as per requirements



Basic aspects of sampling

Six pre-requisites for quality data

1. Collecting representative samples
2. Formulating objectives and plan of sampling program
3. Proper handling and preservation of samples
4. Ensuring proper chain-of-custody and sample ID procedures
5. Application of field quality assurance
6. Timely and proper analysis



Basic aspects of sampling

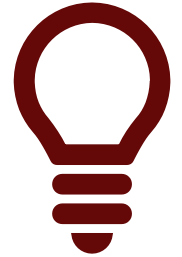
To remember



Sample according to set procedures to **reduce error margin** and **increase accuracy** of sample results

Collect representative samples via **flow measurements**:

- Recording of flow rates with
 - online
 - in pipe measurement facility or
 - portable flow meters



Sampling procedures and methods

Sampling procedures and methods

Sampling procedures and methods

Different sample collection **devices and methods**:

- **Automatic samplers**

- Collecting samples by periodically pumping a sample into sample bottle/s.
- Triggered to sample by a set time or amount of liquid passing by flow-measuring device.

- **Using sample dip-poles**

- Expandable plastic or aluminum rods (upto 20ft) with special device securely holding sample botte at end

- Dipping sample bottles for **manual sampling**



Sampling procedures and methods

Grab composite sample

Useful for parameters like total oil and grease released to sewer system in 24-hours period

Step 1:

- Grab individual samples in field and composite on site or in laboratory

Step 2:

- Record flow level at time of each sampling (for flow-proportional grab composite)

Step 3:

- Make composite sample with portions of each grab sample according to each flow level at time of sampling



Sampling procedures and methods

Volatile organic compounds grab

Step 1:

- Collect samples in clean glass beaker

Step 2:

- Transfer samples to 40-milli liter vials (usually with HCl acid for preservation) and cap with flexible septum

Special attention to

- ✓ preventing air bubbles in vial (with no air space under cap)
- ✓ filling vial filled until liquid crowning.
- ✓ tightly screwing cap until bulging septum

Sampling procedures and methods

To remember when sampling organics

1. Tendency of **organics to absorb to plastic** (polyethylene, polypropylene and polycarbonate)
 - Stainless steel buckets, sampling rods, and glass containers recommended
2. **Holding times critical** element for organic analysis
 - Some only holding times of 24 hours (e.g. BOD)



Sampling procedures and methods

Discrete sampling

- Used when looking at specific characteristics of wastewater flow
 - At **certain times** of day
 - For **certain parameters** (e.g. high or low pH; high or low flow events)
 - For **flow composites** (if flow rate recorded at time of sampling)
- **Recommended procedure:**
 - samples are taken in individual bottles at the time of the event and each sample is analyzed

Sampling procedures and methods

To remember when sampling for heavy metals

- Be aware of **contamination** during sampling
- **Avoid metal** (including stainless steel) **sampling equipment**
 - Use plastic sampling equipment wherever possible
- Prevent effects from **trace metals**
 - Possible trace metals such as mercury in distilled water!
 - Use of deionized instead of distilled water for decontamination

Sampling procedures and methods

To remember when sampling microbiological analytes

- Large sample volumes required being easily contaminated by bacteria present on most surfaces and in air
- Maintain **short holding times** (preferably less than 6 hours)
- **Special attention** to
 - **washing and disinfecting hands** with alcohol based hand disinfectant (e.g. 70% ethanol or hexifoam) prior to and between sample collection
 - **Wearing and changing latex gloves** between samples to avoid contamination of samples during collection
 - **Directly collecting samples** into sample container whenever possible

Sampling procedures and methods

Automatic sampling types

- **Time-controlled water and wastewater sampling**
 - Enter desired time interval and sample volume in menu and allow sampler to operate
 - Some water samplers equipped with cooling of composite samples
- **Flow-proportional water and wastewater sampling**
 - Equipped with a transmitter that is able to receive external signals (e.g. from a flowmeter)
 - Sampling can be adapted to the flow rate



Moveable samplers
(model RS Hydro)

Sampling procedures and methods

Automatic sampling types

- **Event-triggered water and wastewater sampling**
 - Able to detect high loads of wastewater and trigger sampling automatically with analytical sensors
 - Providing reliable evidence about peak loads in effluent flow and making representative sample
 - Mostly used in inlet of wastewater treatment plants with irregular wastewater flows



Stationary samplers
(model Endress & Hauser)

Sampling procedures and methods

Automatic sampling – Pros & Cons

Advantages	Disadvantages
<ul style="list-style-type: none">▪ Convenient (no need for work during night/weekends)▪ Safe (no need to stay at unsafe locations for long time)▪ Able to record and analyze data from off-site locations▪ Automatically recording of data on sampling like time, quality of samples	<ul style="list-style-type: none">▪ High equipment costs▪ Prone to failure (need of care to maintain and to charge batteries)▪ High protection of equipment and good maintenance needed

Sampling procedures and methods

Manual sampling – Procedure

- Precautionary measures
 - **Wear** new clean, **non-powdered, disposable gloves** for each sample
 - Change gloves any time during sample collection if coming in contact with sampled effluent
- **Avoid contacting media** being sampled.
- Proceed with sampling from least to most suspected contaminated area

Sampling procedures and methods

Manual sampling – Procedure

- Samples from highly contaminated media to be placed in ice chest
- Sample as a team (of at least two persons)
 - one collecting samples
 - one taking notes, photographs and fill out tags

Sampling procedures and methods

Collecting time composite manual sampling

- Discrete sample aliquots of equal volume collected at constant time intervals in container
 - Example: 100 ml sample every hour to form 800 ml sample for an 8 hour shift.
- **Options for collection:**
 - Collection of **constant sample volume at varying time** intervals proportional to wastewater flow
 - Collection by **varying volume** of each aliquot **proportional to flow** while maintaining **constant time** interval between the samples.

Good practices in handling samples

Good practices in handling samples

Good practices in handling samples

Good practices in selecting sampling locations

▪ Raw effluent samples

- Take sampling at **inlet of screens**
- Avoid scraping bottom and stirring up sediments with sampling cup

▪ Equalized effluent samples

- Take sample at **outlet of equalization tank transfer pump**
 - effluent falling into flash mixer/neutralization chamber)
- Better to take and mix **4 - 6 samples** from **different points from inside of tank**

Good practices in handling samples

Good practices in selecting sampling locations

- **Primary, tertiary and final treated effluent**
 - Take sample at **overflow** from respective **settling tank**
 - Avoid taking samples from overflow launder
- **MLSS**
 - Take **samples at inlet of secondary clarifier** or **overflow weir of aeration tank**

Good practices in handling samples

Good sample storage practices

- **Avoid contact** of collecting device contact **with sample containers** when transferring samples
- Place samples into **appropriately labeled containers**
- **Store samples** for volatile organic compounds and BOD analysis **without any headspace**
- Immediately **place samples on ice**
 - Samples requiring reduced temperature storage



Good practices in handling samples

Good practice in sample preservation

- Preserve samples as soon as practically possible
 - ideally immediately at time of sampling
- Sample with pH adjustment to be checked using pH strips
 - Pour small volume of sample over pH strip
 - Do not put pH strip into sample



Good practices in handling samples

Labelling of samples

- Clear **sample identification at all times** essential
 - Recommended contents of label
 - To recorded in **Field Record Sheet**
 - Retained as **permanent record**
- Date of sampling
 - Time of sampling
 - Location and name of sampling site (GPS coordinates)
 - Job or project number
 - Name of sampler
 - Container pre-treatment and preservations added
 - Other observations affecting method or results of analysis

Good practices in handling samples

Sample chain of custody

To **demonstrate sample control** giving confidence about sample integrity

- Imperative if samples
 - to be **used in legal proceedings**; or
 - any suspicion of tampering samples at any stage of process.
- Records for **tracing sample possession and handling** from collection, analysis, reporting to disposal
- Use for **protection of sample couriers** assume responsibility for container and not content
 - sample to be secured with adhesive tape to prevent tampering by courier.

Good practices in handling samples

Sample transport and storage

To maintain **quality and reliability of analysis** results

- Pack properly to **avoid breakage** and cross-contamination
- Appropriate **preservation to reduce sample degradation**
 - **Not to exceed holding** time between sampling and analysis
 - Sample **containers sealed**, carefully packed with suitable packing material
 - **Sample chilled or frozen** (as required) and transported in appropriate cooler or fridge

Good practices in handling samples

Legal sampling for use in penal action and legal cases

- Taken by authorized persons from enforcement agency (e.g. DOE)
 - Person taking sample to serve **notice to factory management**.
 - Sample to be taken in **presence of authorised person and factory representative** and divided into **two sample parts**
 - Both samples to be **marked and sealed with signatures** of factory and enforcement agency representatives
 - One sample to be sent to authorised laboratory for analysis (cost paid by factory) by factory, sealed by enforcement agency.
 - Second sample to be kept for analysis by department laboratory (e.g. DoE)

To remember

- Follow **adequate sampling** for obtaining **proper analysis results**
- **Sampling procedure** depending **on location** and **parameters** to be analyzed
- **Grab** and **composite sampling** common modes of sampling
 - **Composite sampling** preferably through **automatic sampler** using time based or flow based sampling
- Ensure **all samples** to be properly **labelled**
- Apply good practices in sample **preservation and sealing of samples** as well as **transport and storage**

**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