

Restarting ETPs after shutdown FAQ Part 1

The following list contains queries and answers

Question	Answer
1. It takes time to achieve desired result of ETP in commissioning/re-commissioning phase. Is there any acceptable time frame in any country's regulation for commissioning/re-commissioning phase run with unsatisfied result?	<p>The commissioning time of a biological treatment depends on the current condition. If it has any active MLSS left, the system can be commissioned within 10 days.</p> <p>If there is no MLSS and new seeding needs to be done, it might take about 3 - 4 weeks' time depending on the seed (sludge from a similar ETP, STP or traditional method of cow dung and molasses). The primary treatment can be commissioned almost immediately.</p>
2. In case of shut down of ETP, does the factory need to notify DOE?	In most countries in the world a shutdown (and subsequent restarting) of the ETP should be mandatorily informed to the regulatory agency.
3. Is there any way to easily neutralize Hydrogen Sulfide (H ₂ S) Gas?	<p>Generally, it is required to provide adequate ventilation (including forced air supply into the tank) to dissipate the gas. For an immediate control, one can spray oxidizing chemicals such as hydrogen peroxide to neutralize the H₂S.</p> <p>It is not advisable to use pure oxygen. Check the gas level again after half an hour. Also, it is possible to spray concentrated ferrous sulphate solution (ferrous sulphate is available in many textile ETPs).</p>

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<p>4. What is the nominal value of H₂S gas to continue the work in a tank?</p>	<p>Generally, less than 15 ppm of the gas does not create any problem. Concentrations up to 100 ppm for about 15 minutes may create issues such as headache, nausea, general weakness, pain in legs etc. Concentrations above 200 ppm, even for one-minute result in serious irritation of nose & throat, vertigo, blurring of vision, loss of consciousness lasting a few minutes. Concentrations between 500-900 ppm even for a minute results in profound coma, convulsions, disorientation even after recovery. Concentrations above 900 ppm for just a minute results in immediate death.</p> <p><u>Caution!</u></p> <p>The sense of smell is not the best detector for H₂S; when the H₂S concentration reaches approximately 15 ppm, the human nose becomes desensitized and the ability to smell H₂S declines, leading to the wrong assumption that H₂S may not be present. Rescuers who enter an area remove an accident victim succumbed to H₂S, need to protect themselves with a self-contained air supply unit. Rescuer need to be secured by safety line. Do not allow any rescuers to enter the area unprotected!</p>
<p>5. What would be next steps, if H₂S is detected in the tanks?</p>	<p>If H₂S is detected in a tank, the simplest solution is not to proceed with cleaning, provide adequate ventilation (including pumping air if possible) and use the system only after it is safe for work. For emergency situations, proceed as per answer above.</p> <p>For further reference, refer to the UNIDO pocket book on How to deal with H₂S¹ and safety video²</p>

¹

<https://open.unido.org/api/documents/4670868/download/How%20to%20deal%20with%20hydrogen%20sulphide%20gas%20in%20tanneries%20and%20effluent%20treatment%20plants>

² www.youtube.com/watch?v=xQkXMyetLfM&t=157s

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6. Is there any medicine for dealing with exposure (inhaling) H ₂ S?	Medical treatment methods for persons exposed to high concentrations of H ₂ S involve controlled administration of pure (medical) oxygen. Also medicines such as sodium nitrite are provided. However, these are to be administered only by trained medical personnel and in a hospital and never at the ETP premises. First aid measure involve removing accident victim to fresh air. Start providing CPR, if victim is not breathing. It is important to inform the medical personnel that the victim might have been exposed to H ₂ S.
7. How will we remove the stuck equalization waters after re-opening our factory when the restarting the ETP?	The simplest way is to mix and pump the contents to the primary treatment (if there is no primary treatment, the sludge in the tank should be taken only to the sludge tank). Regulate the feeding to aeration tank as per the commissioning procedure (admissible feeding has been explained in detail in the standard operating guidelines).
8. What spray can be used for cleaning diffusers?	Formic acid mist (sprayed into the air lines).
9. What will be % of spraying formic acid to air line?	The acid solution of about 20% can be used for the purpose.
10. In the presentation slide 10 it was mentioned that “Don't use alum/ FeSO ₄ as a neutraliser, use Acid.”. If we do so, does it increase the operation cost?	Use of alum or ferrous sulphate as neutralizer increases the treatment cost. Alum and ferrous sulphate are basically coagulants. They should not be used for neutralization because they are weak as acids. The consumption of acid to bring the pH down from say, 10 to 8 will be much less than that of alum or ferrous sulphate and cost will be much less with acid. Further, more usage of alum or ferrous sulphate increases the sludge generation, again adding to the cost.

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11. Regarding Filter Press Cleaning, is there any process to clean the cloths with chemicals rather than water only?	<p>During shutdowns and re-starting it is advisable to detach the filter cloth, remove any dried sludge physically and soak the clothes in dilute hydrochloric acid (4-6%) for 8 hours, rinse dry and re-install. Some type of filter cloths need soaking in hypo, though most of the cases acid will do. Sulphuric acid should not be used for cleaning at all due to the possibility of scaling due to calcium sulphate.</p> <p>During regular operation, after 4-5 cycles, cleaning with fresh water jet spray using a portable pump will remove particles clogging the filter cloths and keep it in good shape.</p>
12. Please let me understand about the SVI you mentioned 400. Would it be only SV instead of SVI? Please clarify it.	The settleability of sludge (SV-30) for a good operated ETP shall be 300-400 ml/litre. SVI for such a plant shall be around 110-120 ml/g.
13. How to ensure dose in coagulation and flocculation tank? What is the parameter to confirm the dose?	The dosage needs to be determined through jar tests. In most textile effluent treatment plants the objective of chemical treatment is to remove colour, TSS and COD. In effluents without much colour, about 90% removal of TSS and about 60% of COD reduction could be taken as a reasonably good target.
14. Should the chemical dosing during the startup will be same as in running operation?	Generally, yes. However, depending on the actual flow to the ETP, the feed to aeration tank need to be regulated by the chemical treatment. In case admissible COD (how to calculate the same has been described in detail in the standard operating guidelines attached) is lower than what you normally get in the outlet of primary treatment, the chemical dosage (or alternate chemicals itself) may need to be increased to get better efficiency from the primary treatment. If the flow is less and the likely COD load in equalized effluent is indeed within the admissible limit, dosing of any chemicals itself may be avoided (unless the inorganic TSS is extra ordinarily high. However, in most textile ETPs, the inorganic TSS level is low).
15. How can we clean any tank or diffuser as we cannot discharge untreated water directly?	If the tank is full and cannot be emptied the cleaning may be done using formic acid by spray misting it into the air line. Usually it does not lower the pH of the whole tank significantly and formic acid too get digested in the aeration tank over period of time.

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16. When feeding to biological tank shut down for long time or occasional close/leave, what quantity of Molasses, UREA & DAP are required per cubic meter of MLSS in biological tank/aeration tank while the level of MLSS maintain around 3,500 to 4,500 ppm?	If the MLSS is indeed 3500-4500 ppm, there is no need for dosing molasses (which is essentially a wastewater in itself). However, during the commissioning, dosage of molasses helps quick development of MLSS and a dosage 3000-5000 ppm (0.3-0.5% of the inflow) may be maintained.
17. For how long do the bacteria survive without aeration (air blower)? Sometimes dissolved oxygen level in aeration tank rises up to 8 to 10. After shut down the air blower that is delayed comedown to reach at desired DO level.	<p>It depends on many factors. However, it can be expected that active aerobic microbes shall get reduced to about 50% in there is no aeration for 8 hours and entire aerated microbes may die out without aeration in 1-1.5 days.</p> <p>If the DO is indeed going up to 8 mg/l, it indicates that there is very little MLSS in the tank (which can consume the DO supplied). Needless to say that aeration does not provide much organics reduction and is a waste of power. Once the MLSS picks up, the DO generally come down to 2-3 mg/l.</p>
18. In some ETPs we found red worms in aeration tank and green algae in post aeration tank. Are these bad or good?	<p>Different types of red worms are found to grow in aeration tanks, varying by the size. If the worms are microscopically small (say 0.5 mm-2 mm), they may be nematodes and flatworms naturally grown in activated sludge plants. Midge worms (larvae of midge flies, 5-6 mm in size) are very common in plants with high DO. They feed on the MLSS. These can be controlled using specialty biological larvicides such as Bacillus Thuringiensis (BT) sold commercially (e.g. AquabacXT). If the problem is too high and such controls are not available, the solution would be to waste the MLSS and recommission the plant. The third type of worms are the reddish sludge worms (Tubifex) with lengths of 25-30 mm which grown in tanks with old MLSS. These worms are generally harmless for humans, but do not add to any treatment value.</p> <p>Green algae in post aeration tank indicates that the nutrient levels, in particular Nitrogen, is high in the treated effluent. It is also possible that the retention time in the post aeration tank is too high. Algae may reduce some BOD and are therefore slightly beneficial.</p>

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19. When shutting down the feeding to biological tank, is it required to drive sludge recirculation pump?	Yes, when the aeration tank is being operated even after the shutdown, there will be some overflow from aeration tank to settling tank. The recirculation pump should be running continuously to prevent losing MLSS. Once the aeration tank level comes down due to evaporation (i.e., when there is enough free board), the outlet of aeration tank may be closed and whatever bio-sludge in the settling tank is pumped back into the aeration tank and then the secondary settling tank can also be emptied.
20. How to fix F:M ratio with MLSS. Please explain easily.	Refer to the detailed calculation of the same as given in the standard operating guidelines.
21. How to maintain food in Biological ETP for Bacterial survival during textile process off (I.e. factory closed)? Suppose that we want to keep MLSS 3g/L in aeration tank during Factory closed period, then what quantity of food has to be given for Bacterial survival?	<p>If the shutdown is for a long period (say more than two weeks) there may not be any need to maintain the MLSS level in aeration tank at 3 g/l. Even if the MLSS is maintained at 1 g/l, once the factory is restarted, it can quickly pick up to 3-3.5 g/l within 2-3 days.</p> <p>To maintain MLSS inside the tank, external feed like molasses (at 500-1000 mg/l dosage) and when it is closer to the re-opening, molasses dosage may be increased to (3000-5000 mg/l).</p>
22. Please mention name of some defoamers.	Defoamers can be based on silicon or non-silicon such as mineral oils, phosphate based or block co-polymers. There are several local companies selling imported chemicals under generic name 'defoaming agent' or 'antifoaming agent'. Before choosing a particular brand, the plant manager should compare the cost of these and confirm that these are bio-degradable.
23. What precautions need to taken for membrane based ETPs, for example membrane bio reactors (MBR)?	An MBR is an extension of activated sludge system where the separation of bio-sludge is done using a membrane filtration (microfilter/ultrafilter). Usually the MLSS levels are much higher than conventional aeration system and hence the chances of retaining some MLSS in the system is also higher. Shutting down the MBR is relatively easier. Once the inlet feeding is over, it is possible to just stop the withdrawal of treated effluent through the membrane and continue to maintain minimum aeration. A DO level of around 1 mg/l would be enough. Do not maintain too high aeration since this will quickly digest all bio-sludge.

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24. What is the optimum ratio of MLSS vs MLVSS in extended aeration process?	Generally, an MLSS level of 3500-4000 mg/l and MLVSS level of 2500-3000 mg/l should be a good level to maintain.
25. How is the level of bacteria measured for a standard biological process?	Even though there are bacteriological analyses to be done through microscope and colony counter, the simplest way to check an approximate ratio of MLVSS/MLVSS and if the same in the range of 0.6-0.75, it can be taken as an indication that the system has a reasonably microbial population.
26. What maintenance should be done before restart the filters (sand, activated carbon or MGF), belt press?	At the moment, this is not covered in the session. If an ETP specifically requests for it we can provide them.
27. What should be the CNP ratio in aeration tank?	Required CNP ratio during start up, as BOD: N:P is 100:8:4 and during regular operation it is 100:5:2.5
28. We have anaerobic basin please. What would be recommendations restarting the basin?	The scope of this session did not include anaerobic tanks. The basic requirement during the re-starting of anaerobic unit include maintaining pH in the range of 8-9, acidity: alkalinity in the ratio of 1:4 (if need be, dose some sodium carbonate) and seeding with bio-sludge from a well operated ETP/STP.
29. If the sustaining BOD is 50-70, what F:M ratio must maintain?	The F: M during re-starting phase can be 0.4-0.5. For further detailed information on how to maintain this value please refer to Standard Operating Guidelines.
30. As you know, the factories are opening slowly. They may start with 20% capacity and increase time to time. So, the volume of wastewater will increase slowly. Therefore, in case of big plant with about 250 m ³ /hr capacity, what precautions should be taken to secure the smooth ETP functionality?	It is actually good that the production and quantity of wastewater increases slowly instead of the complete production starting at a stretch. Detailed instructions of re-starting a large individual ETP are provided in the Standard Operating Guidelines attached.
31. What types of parameter should we check before/during restarting the ETP?	Detailed information on monitoring during restarting the ETP has been provided in the Standard Operating Guidelines attached.

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32. Please mentioned some reference book on ETP through which we can enrich our knowledge depth including basics.	<p>It is suggested to take some online course, plenty of which are available online.</p> <p>Reading reference books on:</p> <ul style="list-style-type: none">• Wastewater Engineering by Metcalf and Eddy,• Booklets such as Managing and Monitoring Effluent Treatment Plants by Stockholm Environment Institute and Bangladesh Centre for Advanced Studies.• The biological wastewater treatment series Marcos von Sperling is wonderfully detailed in seven separate volume:<ul style="list-style-type: none">- Volume 1: Wastewater Characteristics, Treatment and Disposal- Volume 2: Basic Principles of Wastewater Treatment- Volume 3: Waste Stabilization Ponds- Volume 4: Anaerobic Reactors- Volume 5: Activated Sludge and Aerobic Biofilm Reactors- Volume 6: Sludge Treatment and Disposal- Volume 7: Treatment Wetlands
33. How to remove sulfite and sulfide in 1) Physio chemical ETP and 2) Biological ETP?	<p>The sulfide may get removed in the primary treatment, especially if ferrous sulphate is used in the chemical treatment. The only issue is the complete blackening of sludge if sulphide level is high.</p> <p>The biological ETP, both sulfite and sulfide get completely oxidized to produce sulphates. Except for the slight increase in TDS it is quite effective and the tolerance limits are always achieved.</p>