2008

Sewage Treatment and **Huwa-San**.

Application Manual

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1. Introduction:

Nuisance odors associated with sewage reticulation systems and associated treatment plants, has always been an area of concern for municipal authorities.
A combination of encroachment of residential housing near wastewater treatment plants and pumping stations, together with increasing public expectations of an unpolluted environment, has resulted in authorities having to look very seriously at sewage systems odor control. Sewage odors are of course, not a new problem and many control techniques have been evaluated or utilized to date.

2. Sewage treatment background:

Sewage treatment, or **domestic wastewater treatment**, is the process of removing **contaminants** from wastewater. It includes physical, chemical and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (or treated effluent) and a solid waste or sludge suitable for discharge or reuse back into the environment. This material is often inadvertently contaminated with many toxic organic and inorganic compounds.
Sewage is created by residences, institutions, hospitals and commercial and industrial establishments. It can be treated close to where it is created, or collected and transported via a network of pipes and pump stations to a municipal treatment plant, Industrial sources of wastewater often require specialized treatment processes.
The sewage treatment involves three stages, called primary, secondary and tertiary treatment. First, the solids are separated from the wastewater stream. Then dissolved biological matter is progressively converted into a solid mass. The biological solids are neutralized then disposed of or re-used, and the treated water may be disinfected chemically or physically (for example by lagoons and micro-filtration). The final effluent can be discharged into a stream, river, lagoon or it can be used for the irrigation of a golf course, green way or park. If it is sufficiently clean, it can also be used for groundwater recharge.

2.1 Description

Raw influent (sewage) includes **household waste** liquid from **toilets, baths, showers, kitchens, sinks,** is disposed In sewerage pipe line gray water system also liquid waste from industry and commerce. A lot of sewage also includes some surface water from roofs or hard-standing areas As rainfall runs over the surface of roofs and the ground, it may pick up various contaminants including **soil** particles and other **sediment, heavy metals, organic compounds**, animal waste, and **oil** and **grease**. The site where the raw wastewater is processed before it is discharged back to the environment is called a wastewater treatment plant (WWTP). The order and types of mechanical, chemical and biological systems that comprise the wastewater treatment plant are typically the same for most developed countries:

Mechanical treatment:

Influx (Influent)
Removal of large objects
Removal of sand and grit
Pre-precipitation

Biological treatment:

Oxidation bed (oxidizing bed) or aeration system
Post precipitation

Chemical treatment:

(this step is usually combined with settling and other processes to remove solids, as physical chemical treatment.

2.2 Primary treatment :

Removes the materials that can be easily collected from the raw wastewater and disposed of. In primary treatment, the influent sewage water is strained to remove all large objects that are deposited in the sewer system, such as rags, sticks, tampons, cans, fruit, etc. This is most commonly done with a manual or automated mechanically raked bar screen. The bar screen is used because large solids can damage or clog the equipment used later in the sewage treatment plant. The solids are collected in a dumpster and later disposed in a landfill.

Primary treatment also typically includes a sand or grit channel or chamber where the velocity of the incoming wastewater is carefully controlled to allow sand grit and stones to settle, while keeping the majority of the suspended organic material in the water column. This equipment is called a **degritter** or sand catcher. Sand, grit, and stones need to be removed early in the process to avoid damage to pumps and other equipment in the remaining treatment stages.

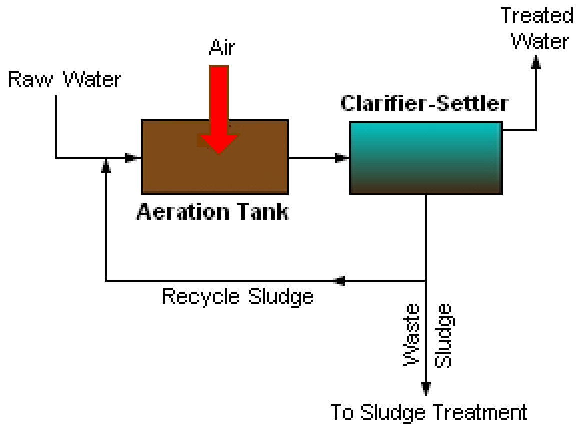
Primary sedimentation tank.

2.3 Sedimentation

Many plants have a sedimentation stage where the sewage is allowed to pass slowly through large tanks, commonly called "primary clarifiers" or "primary sedimentation tanks" or “primary settling tank”. The tanks are large enough that sludge can settle and floating material such as grease and oils can rise to the surface and be skimmed off. The main purpose of the primary clarification stage is to produce both a generally homogeneous liquid capable of being treated biologically and a sludge that can be separately treated or processed. Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank from where it can be pumped to further sludge treatment stages.

2.4 Secondary treatment

Secondary treatment is designed to substantially degrade the biological content of the sewage such as are derived from human waste, food waste, soaps and detergent. The majority of municipal and plants treat the **settled sewage using aerobic biological processes**. For this to be effective, the biota requires both **oxygen** and a **substrate on which to live**. the bacteria and protozoa consume biodegradable soluble organic contaminants (e.g. sugars, fats, organic short-chain carbon molecules, etc.) and bind much of the less soluble fractions into flock.
On larger installations, air is forced through the media using blowers. The resultant wastewater is usually within the normal range for conventional treatment processes.

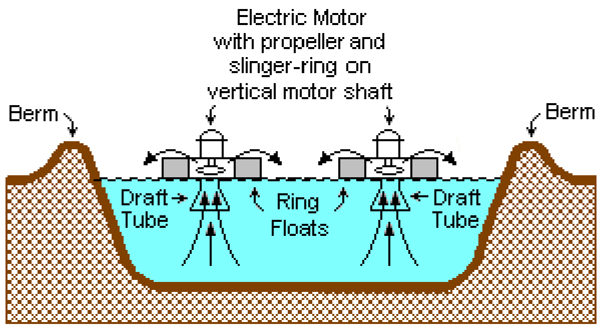


A generalized, schematic diagram of an activated sludge process.

2.5 Activated sludge

In general, activated sludge plants encompass a variety of mechanisms and processes that **use dissolved oxygen to promote the growth of biological flock that substantially removes organic material.**
The process traps particulate material and can, under ideal conditions, convert ammonia to nitrite and nitrate and ultimately to nitrogen gas.

Surface-aerated basins



A TYPICAL SURFACE – AERATED BASIN

Note: The ring floats are tethered to posts on the berms.

A Typical Surface-Aerated Basin (using motor-driven floating aerators).
Most biological oxidation processes for treating industrial wastewaters have in common the use of oxygen (or air) and microbial action. Surface-aerated basins achieve 80 to 90% removal of Biochemical Oxygen Demand with retention times of 1 to 10 days.
In an aerated basin system, the aerators provide two functions: they transfer air into the basins required by the biological oxidation reactions, and they provide the mixing required for dispersing the air and for contacting the reactants (that is, oxygen, wastewater and microbes).
Typically, the floating surface aerators are rated to deliver the amount of air equivalent to 1.8 to 2.7 kg
Biological oxidation processes are sensitive to temperature and, between 0 °C and 40 °C, the rate of biological reactions increase with temperature. Most surface aerated vessels operate at between 4 °C and 32 °C.

2.6 Secondary sedimentation

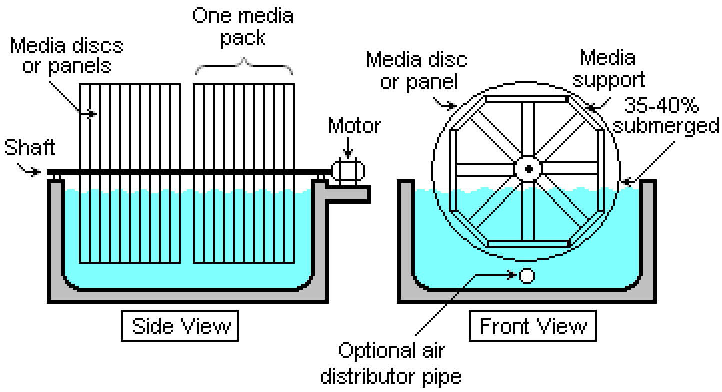
The final step in the secondary treatment stage is to settle out the biological floc or filter material and produce sewage water containing very low levels of organic material and suspended matter.

Secondary Sedimentation tank

2.7 Biological aerated filters

Biological Aerated (or Anoxic) Filter (BAF) or Biofilters combine filtration with biological carbon reduction, nitrification or denitrification. BAF usually includes a reactor filled with a filter media. The media is either in suspension or supported by a gravel layer at the foot of the filter. The dual purpose of this media is to support highly active biomass that is attached to it and to filter suspended solids**. Carbon reduction and ammonia conversion occurs in aerobic mode** and sometime achieved in a single reactor while nitrate conversion occurs in anoxic mode. BAF is operated either in upflow or downflow configuration depending on design specified by manufacturer.

Rotating biological contactors



2.8 Tertiary treatment

The purpose of tertiary treatment is to provide a final treatment stage to raise the effluent quality before it is discharged to the receiving environment (sea, river, lake, ground, etc.). More than one tertiary treatment process may be used at any treatment plant. If disinfection is practiced, it is always the final process. It is also called "effluent polishing".

2.9 Filtration

Sand filtration removes much of the residual suspended matter. Filtration over activated carbon removes residual toxins.

2.10 Lagooning

Lagooning provides settlement and further biological improvement through storage in large man-made ponds or lagoons. These lagoons are highly aerobic and colonization by native reeds, Small filter feeding greatly assist in treatment by removing fine particulates.
Wastewater may contain high levels of the nutrients nitrogen and phosphorus. Excessive release to the environment can lead to a buildup of nutrients, called eutrophication, which can in turn encourage the overgrowth of weeds, algae, and cyanobacteria (blue-green algae). This may cause an algal bloom, a rapid growth in the population of algae. The algae numbers are unsustainable and eventually most of them die. The decomposition of the algae by bacteria uses up so much of oxygen in the water that most or all of the animals die, which creates more organic matter for the bacteria to decompose. In addition to causing deoxygenation, some algal species produce toxins that contaminate drinking water supplies. Different treatment processes are required to remove nitrogen and phosphorus.

2.11 Nitrogen removal

The removal of nitrogen is effected through the biological oxidation of nitrogen from ammonia (nitrification) to nitrate, followed by denitrification, the reduction of nitrate to nitrogen gas. Nitrogen gas is released to the atmosphere and thus removed from the water.
Nitrification itself is a two-step aerobic process, each step facilitated by a different type of bacteria. The oxidation of ammonia (NH_3) to nitrite (NO_2^-) is most often facilitated by *Nitrosomonas* spp. (nitroso referring to the formation of a nitroso functional group). Nitrite oxidation to nitrate (NO_3^-), though traditionally believed to be facilitated by *Nitrobacter* spp. (nitro referring the formation of a nitro functional group), is now known to be facilitated in the environment almost exclusively by *Nitrospira* spp.

2.12 Phosphorus removal

Phosphorus can be removed biologically in a process called enhanced biological phosphorus removal. In this process, specific bacteria, called polyphosphate accumulating organisms (PAOs), are selectively enriched and accumulate large quantities of phosphorus within their cells (up to 20% of their mass). When the biomass enriched in these bacteria is separated from the treated water, these Huwa-San have a high fertilizer value.

2.13 Disinfection

The purpose of disinfection in the treatment of wastewater is to substantially reduce the number of microorganisms in the water to be discharged back into the environment. The effectiveness of disinfection depends on the quality of the water being treated (e.g., cloudiness, pH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time).
Chlorination remains the most common form of wastewater disinfection in due to its low cost. The disadvantage is that chlorination of residual organic material can generate chlorinated-organic compounds that may be carcinogenic or harmful to the environment. Residual chlorine or chloramines may also be capable of chlorinating organic material in the natural aquatic environment. Further, because residual chlorine is toxic to aquatic species, the treated effluent must also be chemically dechlorinated, adding to the complexity and cost of treatment.

2.14 Sludge treatment and disposal

The sludge accumulated in a wastewater treatment process must be treated and disposed of in a safe and effective manner. The purpose of **digestion** is to ***reduce the amount of organic matter and the number of disease-causing microorganisms present in the solids.*** The most common treatment options include **anaerobic digestion**, aerobic digestion, and composting.
The choice of a wastewater solid treatment method depends on the amount of solids generated and other site-specific conditions. However, in general, composting is most often applied to smaller-scale applications followed by aerobic digestion and then lastly anaerobic digestion for the larger-scale municipal applications.

2.15 Digestion:

Anaerobic digestion

Anaerobic digestion is a ***bacterial process that is carried out in the absence of oxygen***. The process can either be *thermophilic* digestion, in which ***sludge is fermented in tanks at a temperature of 55°C***, or *mesophilic*, at a temperature of around 36°C. Though allowing shorter retention time (and thus smaller tanks), thermophilic digestion is more expensive in terms of energy consumption for heating the sludge.
One major feature of anaerobic digestion is the production of **biogas**, which can be used in generators for electricity production and/or in boilers for heating purposes.

Aerobic digestion

Aerobic digestion is a bacterial process occurring in the presence of oxygen. ***Under aerobic conditions, bacteria rapidly consume organic matter and convert it into carbon dioxide***. The operating costs are characteristically much greater for aerobic digestion because of the energy costs needed to add oxygen to the process.

Composting

Composting is also an aerobic process that involves mixing the sludge with sources of carbon such as sawdust, straw or wood chips. In the presence of oxygen, bacteria digest both the wastewater solids and the added carbon source and, in doing so, produce a large amount of heat.

2.16 Sludge disposal

When a liquid sludge is produced, further treatment may be required to make it suitable for final disposal. Typically, sludges are thickened (dewatered) to reduce the volumes transported off-site for disposal. There is no process which completely eliminates the need to dispose of biosolids. There is, however, an additional step some cities are taking to superheat the wastewater sludge and convert it into small pelletized granules that are high in nitrogen and other organic materials. for example, several sewage treatment plants have dewatering facilities that use large **centrifuges** along with the addition of chemicals such as **polymer** to further remove liquid from the sludge. The removed fluid is called **centrate** is typically reintroduced into the wastewater process. The product which is left is called **cake** and that is picked up by companies which turn it into **fertilizer pellets**. This product is then sold to local farmers and turf farms as a soil amendment or fertilizer, reducing the amount of space required to dispose of sludge in landfills.

Centrifuge dumping area

3. Problems assignment in sewage treatment plan (STP):

Lack of oxygen causes many problems in waste water treatment. It can result in inadequate purification or even in anaerobic decomposition, subjecting the facility and its vicinity to highly offensive odors. This could be the worst case scenario, where collapse of the aerobic process with anaerobic process taking up the critical chemical indicators (i.e. DO, BOD, COD, H_2S, TSS, and etc)over the acceptable limit.
Sulphide is produced in sewage systems as a result of decomposition of organic matter but is primarily the result of bacterial reduction of sulphate.
Hydrogen sulphide (H_2S) escaping into the air from sulphide containing wastewater is the primary cause of nuisance odors. The threshold odor concentration of H_2S is between 0.025 and 0.25 ppb. H_2S is very toxic and becomes undetectable after exposure to high concentrations. It has therefore claimed the lives of numerous workers in sewage systems. It attacks metals directly, and indirectly, and causes serious corrosions to concrete sewers because it is oxidised biologically to sulphuric acid on the pipe walls. Where sewage is retained in the reticulation system, for sufficient time to deplete all dissolved oxygen, the resultant anaerobic conditions promote the growth of sulphate reducing bacteria, which in turn oxidises sulphate to sulphide.

4. Introduction of new technology Huwa-San:

Huwa-San is a strong oxidizer effective in controlling sulfide and organic related odors in wastewater collection and treatment systems. It is typically applied to a wastewater system most frequently where there is a retention time of less than five hours and at least 10 minutes prior to the point where the Huwa-San is released. Huwa-San will oxidize the hydrogen sulfide present and in addition promote bio-oxidation of organic odors. Huwa-San decomposes to oxygen and water adding dissolved oxygen to the system thereby reducing Biological Oxygen Demand (BOD) ,Chemical Oxygen Demand (COD), Total suspended Solids (TSS).

5. Technology Background

What is Huwa-San?

A new German disinfection technology developed in mid 1980's, It uses a special formulation of **stabilized hydrogen peroxide by a minute amount of nano-size particles of colloidal silver**. Hydrogen peroxide becomes stable with the positively charged silver (Ag++) and other stabilizer. In addition, it becomes very effective since the synergy power between the H2O2 and silver multiplies at least 20 times then used each disinfectant alone. Further, it is very efficient since the product releasing the Oxygen slowly in sewage treatment which increases the dissolved Oxygen to the desirable limit.

6. Huwa-San Application In sewage Treatment:

6.1 Primary Settling Tank – Huwa-San Treatment

Huwa-San can be used before Primary Settling Tank (PST) in quantity of **30 to 50 ppm**, ***OR*** by injecting Huwa-San in Supernatant water (the return water from sludge dewatering system ,, centrifuge.) in Quantity of **400 to 600 ppm.(TR50.)**
Huwa-San will slowly decomposes to oxygen and water adding continuous dissolved oxygen to the system thereby reducing the BOD, COD, TSS and increasing the DO level in the water needed by the aerobic bio-digester and for the di-nitrification process.
By using Huwa-San before PST you will get the following benefits:

- Increased the dissolved oxygen up to 800% .
- Decreased the BOD level more than 50 %.
- Decreased the TSS level more than 80 %.
- Decreased the H_2S more than 75%.

At the above low percentage of Huwa-San, will not have any effect on the microbial load in PST This is because the microbial and organic level is very high.

6.2 Sludge Treatment by Huwa-San:

The efficiency of Huwa-San to control the odor issue at the different type of sludge can be achieved by following up the below instruction:

Raw Sludge (PST Sludge): using Huwa-San before the consolidation Tank (C.T) at **50 ppm** and after the consolidation tanks at **350 ppm**.(TR1.)

Activated Sludge (SST Sludge): using Huwa-San before the consolidation Tank (C.T) at **25 ppm** and after the consolidation tanks at **350 ppm.** (TR1.)

Digested Sludge: using Huwa-San before and after the consolidation Tank (C.T) at **300 ppm.(TR1).**

By Using Huwa-San in sludge treatment process will improve the following:

- **Decreased** the unacceptable odor/smell to an acceptable level (80-90% reduction).
- **Decreased** the H_2S level by more than 70%.
- **Increased** significantly the dissolved oxygen. This will help the aerobic digestion process.
- **Decreased** the sludge viscosity to make the water separation process in the centrifuge area faster and more robust/consistent (easier to more dry sludge in the cake area).

P.S for the above treatment we should first conduct lab. test to verify the exact quantity of Huwa-San injection as the sewage plan condition could be different from place to place according to temperature , Humidity, Type of sewage, etc…

7. TREATMENT COMPARISONS

Several treatments have been used for the control of sulphide production in sewage systems; however, most are quite expensive and not applicable for large sewage flow rates.

Alternative treatments for sulphide control in sewage systems include;

- Huwa-San.
- Oxygen Injection.
- Air Injection.
- Chlorine.
- Chlorine Dioxide.
- Bacterial Cultures.

The following information will detail some of the advantages and disadvantages of each of these treatment systems.

7.1 Huwa-San:

Huwa-San has been extensively used for sulphide control in sewage. It is used in various forms world-wide as the oxidant of choice due to the ease of application and its environmental acceptability,

- **ADVANTAGES**

Huwa-San is simple to dose.
The reduction of Huwa-San adds oxygen to the sewage the peroxide component of Huwa-San liberates oxygen which assists in reducing anaerobic conditions.
Huwa-San is very effective for oxidizing sulphides.
There are NO detrimental or hazardous by-products.

Oxidant	Oxidation Potential, V
Fluorine	3.0
Hydroxyl radical	2.8
Ozone	2.1
Hydrogen peroxide	1.8
Potassium permanganate	1.7
Chlorine dioxide	1.5
Chlorine	1.4

- **DISADVANTAGES**

Huwa-San in its high concentrated form is a hazardous chemical to handle.

7.2 OXYGEN INJECTION:

With this system, oxygen is injected into the raw sewage in an effort to prevent anaerobic conditions occurring or persisting. This treatment method is generally only partially effective as total prevention of anaerobic conditions is difficult along the full length of the sewage pipelines. Oxygen Injection is quite widely used and has been shown to be effective in reducing the sulphide production in sewage systems, although not eliminating the problem.

- **ADVANTAGES**

O2 Injection is a simple process, requiring very little operator input.
O2 is effective at reducing anaerobic conditions and therefore sulphide production.
O2 injection is one of the more economical treatments for large sewage systems.

- **DISADVANTAGES**

Liquid oxygen storage tanks and dosing systems require significant space and associated costs.
O2 Injection Systems are only partially effective.
The capital equipment outlay and subsequent operating cost are very high when utilized on small to medium treatment systems.

7.3 AIR INJECTION:

To reduce the costs associated with oxygen injection, compressed air has been utilized, however, this method of sulphide control is not extensively used, as the oxygen transfer to the sewage is very poor, and the volumes of air required causes venting problems within the sewage reticulation system. The same basic advantages and disadvantage are applicable for air injection as with oxygen injection.

7.4 CHLORINE:

Chlorine has been used for direct injection into sewage for many years; however, the results are generally not very satisfactory, due to chlorine's reaction with ammonia compounds.

- **ADVANTAGES**

Chlorine is partially effective for oxidation of sulphide.
Chlorination equipment is generally quite simple and easy to operate.

- **DISADVANTAGES**

The chlorine dose required to oxidize all sulphides is very high, as sulphide oxidation generally requires break point chlorination. Although simple to dose, sodium hypochlorite is an expensive treatment for oxidation of sulphides in sewage.
Chlorine not effective in high temperature countries (35 to 40 C).
High maintenance costs due to excessive corrosion problems.
Many remote pump stations in treatment areas cannot accommodate gaseous chlorine.

7.5 CHLORINE DIOXIDE:

- **ADVANTAGES**

CIO2 is a selective oxidant and will not react with nitrogenous based compounds such as ammonia.
CIO2 is a very rapid oxidizer whereby the oxidation of sulphides is virtually instantaneous.
CIO2 is effective in sewage irrespective of pH.

- **DISADVANTAGES**

Chlorine Dioxide requires a chemical generation process, requiring chemical handling facilities and a small room to house the generation equipment. It is difficult to control accurately and expensive to generate.
CIO2 will react with various organic matters in the sewage, making it an expensive treatment, although comparable with chlorine due to chlorine reaction with ammonia.
High maintenance costs due to excessive corrosion problems.
Chlorine Dioxide is very dangerous toxic gas that irritates the respiratory system.

7.6 BACTERIAL CULTURES:

The utilization of specifically mutated bacterial cultures has been extensively evaluated for the control of sulphides in sewage. Generally speaking the bacterial cultures which are effective in degrading sulphur based compounds are aerobic organisms, and therefore do not work effectively under normal sewage conditions. As a result these types of cultures have only had limited success in control of odors associated with sewage systems. Another system which inhibits / enhances bacterial growth through the use of a growth stimulant is a product derived from kelp, stimulating growth at low levels and at high level inhibiting growth. This has the effect of reducing the production of sulphide in rising mains by inhibiting the bacteria responsible.

8. DISINFECTION OF TERTIARY TREATED SEWAGE (Effluent Water.)

INTRODUCTION

The discharge of treated sewage to the environment has recently become an important topic worldwide, due to pollution of our beaches, rivers and general waterways. Although not all primary, secondary and tertiary treated sewage is disinfected prior to discharge to the environment, this situation will surely change in the near future.
There are serious concerns about the ***long-term fate and transmission of toxic chemicals and pathogens from recycled municipal wastewater to irrigated land*** and crops and thus to human food and to groundwater.
Using present technologies, ***municipal wastewater treatment may not completely disinfect recycled irrigation waters, allowing pathogenic microbial populations to re-grow in water storage and transmission systems.*** As a result, recycled water used for agricultural and municipal irrigation can contain enough pathogenic organisms to threaten human health once released into the environment. Moreover, the long-term environmental fate of synthetic organic compounds, including pharmaceutically active chemicals and disinfection byproducts, contained in recycled wastewater is largely unknown. Overall, the environmental and public health impacts of irrigation with reclaimed sewage effluent and the potential degradation of underlying groundwater are largely unknown.

Chlorine has long been favored as a disinfectant for both water and wastewater treatment, due to its bacterial effectiveness, initial low cost, convenience, and relative long lived residual. However, chlorination, as normally practiced in wastewater treatment, results in the formation of ***trihalomethanes*** and other ***chlorinated organics*** that are undesirable from a water pollution point of view. A further undesirable effect is the ***corrosion damage chlorine causes*** on the treatment equipment and plant.

An alternative treatment to chlorine should be cost effective, provide a measurable residual, be easy and safe to handle, and produce little or no undesirable by products.

Huwa-San is the obvious choice for an alternative oxidant to chlorine, as it provides several desirable characteristics, which include;

Huwa-San is a strong oxidant which is effective over a broad pH range.
Huwa-San provides an easily measurable residual.
Huwa-San does not react with organic matter to form toxic by-products.
Huwa-San does not require long contact times.
Huwa-San decompose to water and Oxygen increasing the D.O in water which give more benefit for irrigation.

Although Huwa-San suffers a certain cost disadvantage when compared to ***chlorine as a disinfectant on a weight for weight basis.***
However, the unique properties of Huwa-San under certain conditions such as with sewage disinfection, has prompted many researchers to investigate its cost effectiveness relative to chlorine, taking into account the ***hidden costs of chlorine disinfection such as corrosion damage as well as the serious damage to the environment.***

Water is a valuable commodity, particularly inland where a reliable source is not always available for such applications as; irrigation, spray systems, golf course watering etc.

Huwa-San Advantages & Disadvantages

- **ADVANTAGES**

Huwa-San can be dosed via a simple dosing tank and pump
Huwa-San breaks down to oxygen and water leaving no toxic by-products
Huwa-San oxygenates wastewater decreasing BOD and re-growth of anaerobes
Huwa-San is UV stable allowing for safe relative long lasting residual, and preventing re-growth
Huwa-San is effective against all microbiological growth including, spores viruses etc.

- **DISADVANTAGES**

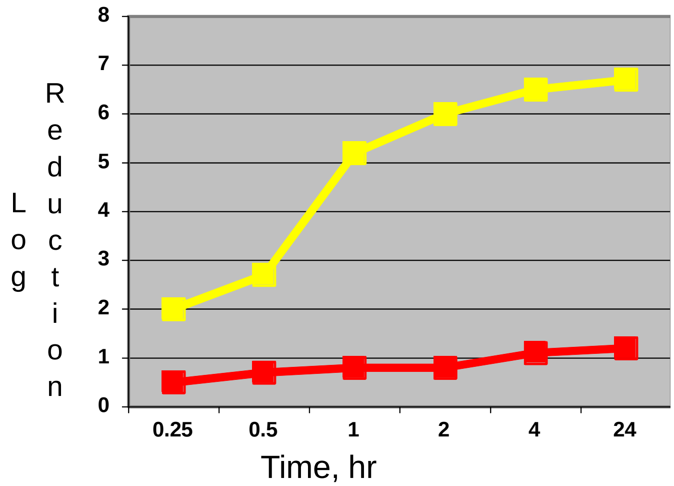
Huwa-San is a strong bio-penetrate so biomass may be dislodged initially.

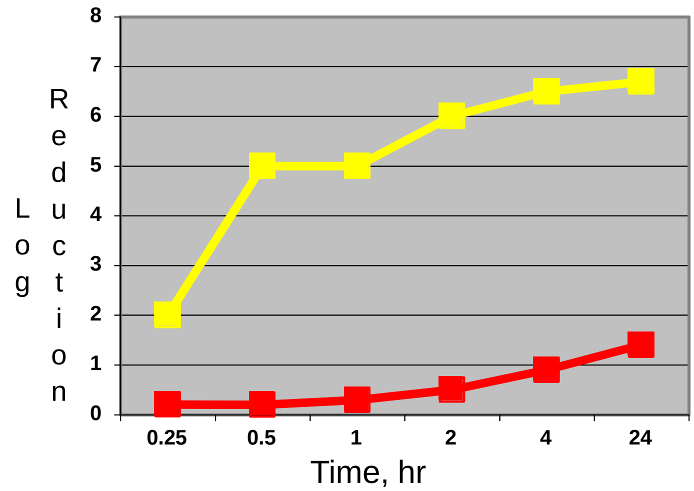
9. Huwa-San versus Hydrogen Peroxide:

Huwa-San has more power than hydrogen peroxide (20 to 1000 time more power.)
The following is Study done by Prof. Dr. Dirk Vanden Berghe Univ. of Antwerpen, 2005.
Comparing the killing power between H2O2 and Huwa-San:

Staph aureaus ATCC 6538
H_2O_2 Vs Huwa-San

Salmonella typhirum ATCC 13311
H_2O_2 Vs Huwa-San





Hydrogen Peroxide advantage and disadvantage:

- **Advantage**

H2O2 environmentally friendly decomposes to water and oxygen.
H2O2 good oxidizer for hydrogen sulfide.
H2O2 Increase the Dissolved Oxygen in water.

- **Disadvantage**

H2O2 is not stable in storage.
H2O2 fast decompose in water the effectiveness against H2S more less than BioShield.
H2O2 Can't Treat the smell in sludge cause of his fast decomposes.
H2O2 Less effective in sewage treatment comparing with Huwa-San even if we use 7 time more quantity of H2O2.
H2O2 doesn't provide the same quantity of D.O same like Huwa-San.
H2O2 is 20 time less power than Huwa-San.

As a result we can say that by using H2O2 in sewage treatment plan we need to inject bigger quantity (7 time more than Huwa-San.) and the result only 20% comparing with Huwa-San. So If we compare Price to price we can say by using H2O2 7 time more Than Huwa-San The Huwa-San we be little bit cheaper. But if we compare the efficiency the Huwa-San 80 time better than H2O2 to solve bad smell problem and to increase the D.O in Sewage treatment.

10. Case Study & Cost Analysis:

In Al Aweer Sewage treatment Plan, they were using H2O2 (Hydrogen Peroxide.) to treat the sludge before centrifuge as following:

1- Capacity of the centrifuge is 24 m3/hr.
2- Injection of H2O2 1.5 ton/day. Which equal 2600 ppm.
3- The smell problem doesn't solve and the operator can't stay near the area of centrifuge more than 10 min cause of very bad smell, beside the complain from the residential near the station.

We start to use Huwa-San as following:

1- Injection of 200 kg/day. Which equal 350 ppm.
2- The smell problem was solve.
3- We sign a yearly contract with them as they found that by same cost of H2O2 they use less quantity of Huwa-San and they solve the smell problem which is not solved by H2O2.

11. Questions and Answers:

1. What Huwa-San can help in sewage treatment process?

Our product can help treat the sewage water in many different areas. It can be used to:

- *Significantly **reduce the organic matters and suspended solids** in the first phase of the STP (50-80%) - The STP can handle double of the flow capacity for sewage treatment.*
- *Increase the **dissolved oxygen** needed for the bio-mass reactor (DO = 3 ppm)- Confirm the DO is at the needed level & decrease the electrical bill for the deareator.*
- ***Disinfect the effluent water** - Eco friendly disinfectant and much safer than chlorine to handle and store.*
- ***Eliminate bad odor from the effluent treated water**- Water can be used for irrigation without odor complaint or contamination of agro products*
- ***Eliminate bad odor from the sludge**- No odor complaint*
- *Many other benefits*

2. What is the normal recommended dosage of this disinfectant for the secondary treated sewage to achieve Fecal coliform < 200 per 100 ml and Viable Helminth Ova < 1 per liter at 25Deg C.

It should be anywhere from 25 ppm to a max of 100ppm Huwa-San depending on many factors (initial bacterial load, water quality, Temperature, etc)

3. Is there any field data of the above dosages verified and certified by an accredited agency / Laboratory

Yes, many field data (i.e. Dubai Municipality Waste water treatment plant) and international micro lab.

4. What dosage is required to achieve reduction of organic and suspended solids between 50 to 80% in STP and at what point, the product needs to be dosed?

The dose was best at 50 ppm and it was dosed at the first settling tank.

5. Could you please explain us the mechanism of increasing the DO in the Biomass reactor?

It is simple, when the Huwa-San oxidize the organic materials it produces plenty on nano size oxygen bubbles which will dissolved in the water and it will increase the DO.
Increase the dissolved oxygen needed for the bio-mass reactor (DO = 3 ppm) then Confirm the DO is at the needed level & decrease the electrical bill for the deareator.

6. Is there any residual effect available to prevent contamination during the Transit of effluent water? & what is the concentration required to produce the residual effect?

Yes you will have some residual depending on many factors but we recommend 25-100 ppm of Huwa-San dosing rate. The product will also remove the biofilm and eliminate odor.

7. What is the shelf life of Huwa-San and what are the precautions required for safe storage facilities?

The shelf life is more than 5 years at cool room Temperature (23 C) and 2 years outside in the shade (45 C)

8. What is the concentration / percentage strength of the product?

45.0-49.5%

9. What is the strength/dilution of the solution required for Dosing?

Depends on the application and location you can provide this as per lab test.

10. What is the residence time required to disinfect a secondary treated sewage to achieve a good quality?

20-30minutes

11. What is the pH to be maintained to achive best results ?

Ph 6.5 is best but also Huwa-San works well in wide ranges pH 4-8

12. Is there any change in the alkalinity levels of treated sewage after dosage of the product?

No

13. Is there any mixing equipment required for dispersion of the product to be dosed or the product is readily soluble in the liquid mass to be disinfected?

Only liquid storage tank and dosing control pump

14. What is the cost / Kg of the product?

This depends on the volume and type of contract. However, the Dubai Municipality waste water treatment plant conducted a cost assessment between Hydrogen Peroxide and our product. Their findings are it is cheaper and most importantly will solve many of the problems that they have (i.e. odor control).

15. Is it not that the product when dosed in Bio Reactor to increase the DO, while Oxidizing the Organic Matter will also destabilize the active MLVSS ?
Is there is any info. achieved in similar plants with Dosages applied.?

Great, this is a question everyone asks us. Dubai Municipality was afraid the effect of our product on the activated sludge. We have proved to them that there will be no effect and we have the data to share with you. The reason that it will not have any effect, is because the location and the amount that we need to dose. If we dose the product in the Inlet of first settling tank, the product will react with the heavy amount of organic and by the time it reaches the Bio Reactor all the residual will be gone. Hence no effect on the Bio Reactor. However, the DO will be high in the water needed by the Bio Reactor. Hope this makes sense to you, we also conducted many tests and we have proof/results of that.

16. Will the above dosage of effluent water from STP will ensure also silver levels < 0.01 mg/L as required by effluent discharge limits ?

Again this is great, this the second most asked question. Yes, the silver amount discharged will be very small, and way below the effluent discharge limit.