Investigating and possibility of advance application of IDEA process in urban sewage treatment

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Abstract: Today different ways application of sewage treatment are depend on cultural, social, environment and economical features of every region and implemented base of available knowledge and technology of every special process. Fortunately environmental technology has significant grow in sewage section. And in this case page attention to this issue and have environment new perspective has significant role in society IDEA system has more advantage other than active sludge active modified system. Indeed this system in advance kind of SBR system. And its most advantage is current continues in system. And it has low cost relative to other similar system and even SBR process. On the other hand system conduct is simpler than similar systems. Other advantage of this system is remove nitrogen and phosphorous. Now SBR process application in Tehran studies as one common consortium of one internal and external company. We have modern and new process with this mechanism after IDEA process and we can point to IECA, AAT, IDEA, ICEAS and last technology of SBR.

Keywords: Sewage treatment, Environment, Carbon organic matter, IDEA process.

Introduction

Government pay more attention to useful and cost effective ways for recovery process, Water filtering and urban and industrial earth and is the most complicated material. Energy was the most important invest of countries during 2 decade ago but now water will be the most valuable invest of countries. So industry, nation and government pay more attention to water

Kinds of treatment

Foreign treatment: All methods for removing problems due to impurity before inter water to industrial unit called foreign treatment and include methods such as in exchange resin and filtration.

Internal treatment: it is possible that water treatment cost to foreign methods is high if water treatment costs to foreign methods are high if water Debi is less. So for complete removing impurities they should add chemical national to industrial unit.

History of ion change resins

Ion exchange resins are solid particles that can substitute similar electrical ion. One British geologist found in 1850 that ammonium sulfate solution passed in soil layers and change ammonium with calcium as one ion substitute ion. The name of mineral resin is zeolit and it is able to deleted calcium and magnesium ions of water and instead produce sodium ion. So they are called sodium zeolit. But sodium zeotil cannot water silis treatment. So scientists try to make zeolits in Netherlands that has active hydrogen. Today produce pour and strong cationic resins and also poor and strong resins. And resins pour on to special pillar of steel and pure water pour on above on it then exit bottom of pillar. Resin recovery: After we use resin a long time, treatment period of it is less and we should apply recovery act on it and include below steps. Reverse washing water following of resin bed to top and their purpose is resin grain suspending.

Recovery chemical material injection (when they use salt).

Slow cleaning: This process is for distributing chemical material in resin bed and as result better contact of chemical material to resin gains.

Electrodialize: Electrodialize state as one industrial way less than 1/3 century. Electrodialize is like resins mettod but instead use disk membranes with high mechanical resistance. This membrane has 2 kinds of cation and anion. And anionic membrances has positive electrical charge and only cations can passed them .Cationic membrance has negative electrical change and only cations can passed them reverse osmoz: it is physical process and we can use semi-pure solution by semi-peruse membranes. In this process we can deleted 99% mineral and 97% organic mated and water colloid and water push to this membrance by pump, because only pour water can pass membrance.

Common ways for sewage treatment

Filter way

Sludge recovery way

In every 2 ways at first polluted water passed on grid metal disk or metal and plastic net until pig particles in sewage remain on it then sewage enter to get fat pool and this sewage after 2 steps enter to deposit pools. Number of these pools is different and sometime is 6 numbers. Sewage of first pool enter to second pool after aerobic sedimentary process and then and every time much material of its surpassing sediment and they fixed. This material gathered in necessity interval and then conducted to sludge digestion set. Anaerobic microorganism start to activity for lack of oxygen then metabolized so hydrolyze some of insoluble solid material so we obtained some of metal and hydrogen sulfur gases and unsustainable organic material converted to sustainable biochemical material and decrease their volume.

Filters and water treatment systems

The most important issues in drip Irrigation systems are blocking emitters. Emitter holes in very small in comparison with spray nozzles and danger for blocking them by water suspension and even Bactria's in water are very much. Emitter blocking lead to water doesn't reach to plant and plants have much damage to products. The material that blocks emitters divided to 3 main groups:

1- Physical material suspense

2- Chemical material

3- Biologic material like Alga and bacteria

Table shows different material (physical, chemical and biologic material in emitters blocking.

We can easily recognize some material in water like clay and suspend sand and we should certainly filter water. But recognizing chemical material is not simple work. Researcher offer different scales about water. This scales help to designer engineers to recognize water proportion degree and apply treatment way.

Possibility and application of IDEA advance application in urban sewage treatment.

We use different process in urban and industrial sewage treatment systems one of the most popular ways is active sludge and use in worldwide.

BOD loading and ammonium concentration in input flow determine (MLSS). Biomass in pool. Usually use F:W ratio to determine biomass mass for BOD leading.

F.M ratio is in F:M process design. Sludge volume index (SUI) apply for determine occupied volume by mass. SVI value in IDEA process design is in 121-5 Ib. BOD/Ib. MLSS/d certain value of sludge remove in every cycle. And lead to IDEA process determined by 2 factors.

1- Hydraulic process determined by 2 factors.

2- Organic leading and F:M ration.

We can determine input pool volume relative to time in one 4 time cycle. Usually they calculated pool length and width that maintain L:W ration = 1:3. This pattern make on piston flow pattern in IDEA pool. We can easily calculate daily oxygen by aerobic time and sewage pollution degree and determined diffusers.

Case study

Unit's aspects and volumes in one IDEA systems as below at first input treatment pass filters and then enter to pomp age station then conducted to 2 pump. These tanks selected with 66 meter long, 2 meter width. And polaced fixed diffusers with small bubbles in every tanks.

After passing current of these pools, this current enter to distributing channel and use them big bubble diffusers. Sewage enters to 4 active sludge tanks by this channel. Every tank has 68 meter long, 27 meter width and 4/6 meter depth. Application normal depth of every unit is 1/3 to 3/8 4 hours cycle process includes 2 hours ventilation and again cycle start.

Separating mechanism includes one order of arm pipes and placed in tank exit. Output current control by one siphon system. Since this current act in 3/8 height of siphon system. Since this current act in 3/8 height of siphon and current exit it and treat by cationic polymers.

F:M ratio is best design tools for determine MLSS value. One of distinctive point of this system is low activity of F:W ratio. But one of it's main distinctive points are active cells percentage. This ratio is 50% and in reactor is 10%. Accepted F:W ration for IDEA system is 4% (Lkg MLSS/day 5kg Bod). Design MLSS concentration*/n is 400 mg/I. MLSS concentration is in 2000 to 5000 mg/I and depend on sludge loading and sludge sedimentation properties.

Cell residue time

Sludge age is better parameter for F:W ratio for design. For example selected sludge age should be less than biomass grow rate. And if we considered grow nitrate bacteria in system, sludge ago should be more than 10 days. On the other hand we should have better experience for high residual time for substrate suspend in system. Relationship between consumpted and study ago for domestic sewage with BOD reaction content rate is 5 time or equal to 1% ≠ 8 ^ d and state as below : (Sa=BODW=10^{-1}#8^713;10

Sa=Oxygen equal to consumption carbon substreh (kg/d)

BODU=BOD = final carbon

BOD=BODt = consumpted carbon in (T) kg/d time

Only 70% substrate carbon can conswmpted in active sudage process during 5 days residual.

FBVSS for unalayzible VSS accumulation of input ss and for high time cell. Residual in IDEA process in low. 5 BOD can state by Rc as below:

Rn oxygen

Rn calculated by below formula:

NT(PPNP N902- (NT) $PN_{6.4}$ Rn=)

Rn=Needed pure oxygen

NT=AU available input nitrogen

PN=Oxidation input oxygen ratio

PDN=Denized nitrate ratio

We should calculated nitrogen exit of residual sludge and sewage. And this value is 30%

3-2-5) needed oxygen in process

RT=Rc+Rn

Period peak needed oxygen

Aerate system capacity should be such respond to one-circle needed oxygen and leading of periodic peak substreh in one small unit is 3 times of mean leading. In this system selected capacity inhibit this swings peak to moderate ratio: 1:25 select for determining oxygen level in IDEA process.

Advantage and disadvantages of IDEA process

Advantage

1- It is improved process and improved standard SBR system by approach cost and use biologic advantages.

2- Continues input flow: This process facillated balanced loading possibility for all pools and process control. In this case there is possibility for single-pool we since impair e and low-flow situation.

3- It implement control system base on time rather than flow and has fixed relationship between aerated, settlement and discharge process.

4- Sewage has 5 BOD and TSS.

5- Non-trite delete result is below mg/I+N ammonium, Mg/I-P phosphors and Mg/I nitrogen.

6- Volume of produced sludge is low and fixed.

7- It provides continues use and flow shortcut.

8- It is not necessity to add chemical or filtration.

9- It is proper for urban and industrial sewage.

10- Tolerance for hydraulic and organic peeks.

11- Simple and stable installation

12- Less volume of primary investment, concrete placement, less drilling, and low earth surface.

13- Low use cost

Disadvantages

1. Energy consumption is high during use process
2. Produced sludge settlement is very difficult.
3. It is like SBR process does not proper for big cities.

Optimization microorganism activity in water and sewage treatment. Sewage or oil refinery has much oil and fat as suspended particle heavy and light hydrocarbons, pherol and soluble organic material and they are dangerous if they discharge in space without treatment. At first they use one separated setion for oil and then one bidogic treatment process for completed removed residual organic matter and has 2 sections:

Aerotae reservoir: In this reservoir input sewage with air and aerotated microorganism is contact during 4 hours to 24 hours aerated action implement by grid milling for providing oxygen needed microbic activity.

Settlement reservoir: It separated active sludge solid particle and fluid.

Inhibitive factors

Every factors that is poison for microorganism and block their performance called ((Inhibitive factor)). Bacteria's poison is dele to following factors: Be organic matter like phenol, Forforal, Hydrocarbons, H_2S and atomic material heavy metals like lead, Nickle and korm ions.

High concentration of soluble material

Some of material have accelerating features on active sludge performance and increase it's output, and sewage treatment speed, then decrease sewage residual time in aerotate pool.

Material and methods

At first experiments conducted for study phenol inhibitive factor:

At first they pour 100 mm active sludge in 6 erlens and then 150 ml of input sewage ndded to biologic system of that refinery then they added 200, 100, 50, 20, 10, 0 ppn pherol and earotate action done by shaker during 6/5 hours. In 18 20-℃ . Then sewage is in inertia state for 19 hours. Finally COD level of sewage with fenol concentration comparison before and after treatment in section 2. Glycerin effect test as on accelerating material and added 0 to 400 ppm glycerin for every erlen. At first they added 100 ml of active sludge and 150 ml of input sewage in 6 erlens and then 0 to 400 ppm glycerin added to every erlen. And aerated action did by shaker for 48 hours in 18-20℃. And settlement completed after 2 hours and value measures after treatment. So figures obtained and before treatment evaluated.

In 3 set of experiments evaluated accelerated factor effect (Maltoz) on active sludge system.

This experiment is consistent with glycerin and phenol. And applied different concentration of matloz between 0 to 400 ppm. This situations 18 to 20 ℃ and earotate time 48 hours and 225 circle shaker and settlement time 2 hours. Finally COD value and darkness measured after treatment and comparison with COD value of primary sewage.

Chorm oxide relieved poisoning

Simple nettralized VI by alkaline material is not enough. Since composite alkaline chromate is soluble in water and has poison property and are very dangerous. So it is nessacity to earlier property and are very dangerous. So it nessacity to earlier convert chrom oxid (VI) to chrom oxide (III) and then neutralized it. Then they use dioxide brimstone, sulfite sodium, Bi sulfite sodium, sultat iron (II) and clorid iron (II) for converting chrom (VI) to chrom (III). End of Acid sulfur reaction recognized by change colour of solution of oxid chrom (VI) of yellow colour to red colour. If this reaction complete by sulfat iron, this color is recognized Gy one cover of sulfate iron yellow colour.

Neutralize heavy methods

On the other hand neutralization regulate PH for biologic phenomenon's and on the other poison heavy metal make in solution to alkaline salts or hydroxides with low soluble capacity. Earlier we assumed all metals settled without residual in PH = 7 while then they found all metals settled in PH special region. Copper and lead settled in PH= 5/8 and nickel, cadmium, lead and silver in PH>1.

Generally they don't allowed in PH situation for delete this solution sewage neutralize and heavy metal settlement done by aitratesood and ahak extraction Neutralization reaction conducted is immediately. But metal hydroxides separations is time – consuming.

Sludge treatment

Metal ions that was in solution converted to hydroxide sludge after sewage treatment and neutralization. Separating this sludge is forcible to government rules.

Sodiomantaion: Water containing stand sludge enter to one bat reserve heavy for this process heavy hydroxide reserve in reserve bottom and obtain of light water. Sometimes small particle of sludge gathered in special reserves by pumping. So this water has 1-2% solid materials and 99-98% wero water.

Suspension: Sludge treatment is technical by passing time press filter is very certain method and we can directly treatment sewage. This sludge has 50-80% water and is soluble Ion exchangers.

Polluted ions accumulate in exchangers have infinit capacity and this reaction is slow at end of reaction. They immerse cationic exchanger immerse them on strong acids. And then metal ions enter to acids and hydrogen replaced them. They wash with salt and anions gather in them.

Result and discussion

Since increase phenol concentration of at 100 ppm, COD value removes increase. This increase is 40% to 50% but then COD remove is decrease. And it is 46% in 200 ppm. This issue shows percentage delete by microorganism increase by increase phenol concentration to 100 ppm. This result shows sewage contain phenol to 100 ppm don't change biologic treatment trend.

Treatment sewage darkness increase by increase phenol concentration to 20 ppm, Since increase phenol concentration inhibit particle suspend in air and this particle exit with treatment sewage and increase darkness.

Darkness effect is relatively constant of 50 ppm concentration. Output sewage darkness decrease of 0 to 400 ppm concentration and in ppm 200 is 32% NTU and decrease 5%. It is interesting at same time piping water darkness in NTV 6%. So adding glycerin to sewage deleting suspend particle material.

COD delete percentage increase to 200 ppm concentration with increase maltoz concentration, but treated sewage COD is constant value to ppm 200 concentration and generally decrease significantly to 200 ppm darkness. So we considered 0 to 400 ppm and specialy 200 ppm as ((optimization concentration)).

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