Review Article

Treatment and technology of domestic sewage for improvement of rural environment in China-Jiangsu: A research

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Submission Date: 20/05/2021 Acceptance Date: 25/07/2021 Published Date: 20/10/2021

ABSTRACT

One of the highest populated country is China where population of rural is 67% of the total population. The main issue that causing the rural environment of China-Jiangsu is treatment of domestic sewage waste-water. Basically, these arrives due to the untreated waste water from households and are directly flowing to water bodies that are nearby to their respective areas. More than 60% of people in China are affected by this physically causing huge health problems and spread of disease and also directly affecting living beings under water bodies. By this, sewage treatment plants were built by China 5-6 years ago but still the problem exists as the treatment wastewater hasn’t improved. So, in this paper we give a research area of how to improve household sewage wastewater treatment in better way and also give a futuristic way of the latest technologies in changing the wastewater treatment into an improved level. This study shows that we described the basic research framework for sewage wastewater treatment by improving with latest technologies.

Keywords: Domestic Sewage, Rural, Sewage wastewater, Sewage Treatment, Technologies

INTRODUCTION

With the constant improvement of rural life level and industry, quantity of waste water increased rapidly. Discharging of wastewater directly into rivers and lakes without treating will inevitably lead to water pollution, and the development of the reckless does not conform to the trend of today’s development. Therefore, it is essential in our modern county to recognize that strengthen the rural sewage treatment has become an important content of socialist new rural construction. Under the condition of Chinese huge land area, social organization structure, economic development status and living habits are various as the distribution of villages and towns is extremely scattered. All these factors not only resulted in the complex characteristics of village waste-water, such as wide surface, dispersal, but also the complexity of choice of treatment process, construction, investment, operation and management. The development of rural areas in China is relatively deficient because of the shortage of funds and resources. By the end of 2014, administrative villages, whose domestic sewage was treated before discharge,
made up only 13% in China. The characteristics of rural domestic sewage are very different from that of the city, but its technical system and management system are not perfect. The environmental burden of domestic sewage in rural areas has exceeded the cities. [1]

In the formulation and implementation of the 13th five-year plan, sewage treatment in rural areas has become an important issue in China's water environment governance. [1] Therefore, how to control and manage rural sewage problem, still need to be constantly practiced and discussed. The source of rural sewage was various, containing domestic sewage, farmland storm runoff, livestock sewage and so on. So, it has the characteristics of wide varieties of sources, intermittent discharge, diversity of water quality, high organic concentration, small pollution load of unit area, etc. [2] Practical technology with less cost, low energy consumption, stable operation, should be adopted combined with the actual situation.

The methods of rural sewage collection and treatment are divided into three types according to the degree of centralized treatment: urban sewage treatment, collected and processed of village units through small pipe networks (village group for short), and in-situ wastewater treatment. The key point to reduce the cost of sewage treatment in rural areas is to choose the suitable sewage collection and treatment methods. The model of "classification in household, collection system in village, transporting and processing in town" is generally adopted in areas around town and places of sensitive environment. However, in villages with scattered layout, underdeveloped economy and inconvenient transportation, the mode of "classification in household, collection system and processing in village" is preferred. [3-5] Figure 1 depict the traditional sewage wastewater treatment and table 1 depict the characteristics of domestic sewage of 3 main rural areas of China.

![Figure 1. Traditional sewage wastewater treatment procedure](image)

### Table 1. Characterization of domestic sewage

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Jiangsu</th>
<th>Shengcun Village</th>
<th>Niujie Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>ToC (mg/L)</td>
<td>24.5–29</td>
<td>24.5–28.0</td>
<td>24.5–27.5</td>
</tr>
<tr>
<td>pH</td>
<td>6.8–7.3</td>
<td>6.8–7.5</td>
<td>6.5–7.4</td>
</tr>
<tr>
<td>TSS (mg/L)</td>
<td>119.8–232.0</td>
<td>120.3–228.0</td>
<td>119.3–223.5</td>
</tr>
<tr>
<td>BOD (mg/L)</td>
<td>208.0–310.5</td>
<td>204.2–319.8</td>
<td>201.0–318.0</td>
</tr>
<tr>
<td>COD (mg/L)</td>
<td>353.6–541.8</td>
<td>347.1–543.7</td>
<td>341.7–540.6</td>
</tr>
<tr>
<td>Ammonia-N (mg/L)</td>
<td>13.6–18.2</td>
<td>13.8–17.7</td>
<td>13.8–18.3</td>
</tr>
<tr>
<td>Nitrate-N (mg/L)</td>
<td>0.4–1.6</td>
<td>0.0–1.0</td>
<td>0.0–0.75</td>
</tr>
<tr>
<td>Phosphate-P (mg/L)</td>
<td>3.5–13.8</td>
<td>16.5–21.4</td>
<td>19.8–25.6</td>
</tr>
<tr>
<td>Detergents (ABS base) (mg/L)</td>
<td>19.2–23.6</td>
<td>16.5–21.4</td>
<td>19.8–25.6</td>
</tr>
<tr>
<td>Total coliform/100 mL sample</td>
<td>$(94.0–4.8) \times 10^7$</td>
<td>$(4.3–4.7) \times 10^7$</td>
<td>$(4.9–5.2) \times 10^7$</td>
</tr>
</tbody>
</table>

**Citation:** Li Z, Treatment and technology of domestic sewage for improvement of rural environment in China-Jiangsu: A research, SPR, 2021, Volume 1, issue 4, Page No.: 305 - 314. DOI: [https://doi.org/10.52152/spr/2021.146](https://doi.org/10.52152/spr/2021.146)
1.1 Wastewater treatment in rural areas of China-Jiangsu

The generation and treatment of wastewater needs to be viewed as part of the urban water cycle, where large masses of water are introduced to sustain life and industrial production needs. With the largest population in the world and recent rapid economic development, China’s water consumption was expected to increase in the past decade. However, the water usage did not grow linearly with the urbanization progress, as shown in the water usage and urbanization ratio in Figure 2. The water usage and urbanization ratio are shown in Figure 2. This is likely due to development in water conservation policies. The country’s urbanization rate increased from 41.8% in 2004 to 59.6% in 2018 (Figure 2), while the total water usage increased from 554.8 billion tons in 2004 and peaked at 618.3 billion tons in 2013, it decreased in the years that followed. The total water consumption gradually decreased to 601.6 billion tons in 2018. The decrease in national water consumption coincided with the implementation of statewide water-saving policies. [6-8]

China Water Conservation Technology Policy Outline was released by the government in 2005, which stipulated water-saving policies in agricultural, industrial and municipal water consumption. Following that, dramatic decreases in water consumption were reported in the agricultural sector, which accounted for more than 60% of total water usage. While agricultural water usage increased from 358.6 \( \times 10^9 \) m\(^3\) in 2004 to 392.2 \( \times 10^9 \) m\(^3\) in 2013, it decreased to 369.3 \( \times 10^9 \) m\(^3\) in 2018. The industrial water usage, which came second after agricultural water usage, showed a similar trend. Industrial water usage increased from 122.9 \( \times 10^9 \) m\(^3\) in 2004 to 146.2 \( \times 10^9 \) m\(^3\) in 2011 and decreased to 126.2 \( \times 10^9 \) m\(^3\) in 2018. The other sectors, namely municipal and ecological water usage, increased from 65.1 \( \times 10^9 \) m\(^3\) and 8.2 \( \times 10^9 \) m\(^3\) in 2004 to 86.0 \( \times 10^9 \) m\(^3\) and 20.1 \( \times 10^9 \) m\(^3\) in 2018, respectively. These types of water consumption might have been mainly affected by urbanization, and present opportunities for future water conservation efforts.

As part of the urban water cycle, most of the water used in municipal areas is collected and treated in municipal WWTPs. [10] Besides, rainwater and part of the treated industrial wastewater is also collected by the urban drainage pipeline grid, which is also treated in municipal WWTPs. The wastewater discharge volume in recent years is shown in Figure 3. In general, total wastewater discharge volume gradually increased from 41.5 \( \times 10^8 \) m\(^3\) in 2000 to 73.5 \( \times 10^8 \) m\(^3\) in 2015. After 2015, the total waste-water discharge volume slightly decreased to 70.0 \( \times 10^9 \) m\(^3\) in 2017. The industrial wastewater discharge volume gradually increased from 19.4 \( \times 10^9 \) m\(^3\) in 2000 to 24.7 \( \times 10^9 \) m\(^3\) in 2007 and decreased to 20.0 \( \times 10^9 \) m\(^3\) in 2015. Meanwhile, municipal wastewater discharge volume increased from 22.1 \( \times 10^9 \) m\(^3\) in 2000 to 53.5 \( \times 10^9 \) m\(^3\) in 2015. Respectively for other years like 2020.[11-16]

![Figure 2. Water usage of different areas](image)

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1.2 Water pollution in rural areas of China

Rural wastewater treatment rates are far behind urban wastewater due to policies, investment and awareness. Therefore, rural environmental pollution also is a social concern problem. The results showed 50% of complaint letters and 70% petitions about pollution were from rural areas (Wen, 2009). China has 2.79 million villages and 768.8 million villagers represent 57.36% of the Chinese population (Chen, 2012). The rural area plays an important role in the Chinese economy and these diffuse sources of pollution will eventually impact on productivity. Water pollution has a serious impact on Chinese industry, agriculture, water supply and people’s heath.

More than 80% of rural wells in China's northeast contain water unsafe for drinking, water ministry officials say. But they insisted that the water being supplied to urban areas across the country was still safe. The figures come amid rising concerns for the environment affecting water and air quality, with the government seeking to cut down on pollution. Much of that focus is targeted on the industrial north, which is one of the country's most heavily polluted areas. The water ministry last week released a report (in Chinese) showing most of the samples drawn from over 2,000 shallow underground wells in the north and east in 2015 were of poor quality: More than 30% were of Grade IV quality, which is suitable only for industrial and agricultural use. Nearly 50% were Grade V, which is water unfit for human consumption of any type. Figure 4 shows the contributors of water pollution and Figure 5 shows the no. of WWTP vs Year.

Figure 4. Contributors for water pollution, Figure 5 No. of WWTP’s vs Year

The rate of water supply has gradually increased and 74.6% of the Chinese rural population had access to piped supply water in 2012 (NHFPC, 2013). This has had a major influence on wastewater amounts because the rural population can more easily consume water and more wastewater will be produced; for example the amount of water consumption could reach 200 Ld-1 per person in some affluent villagers. In 2010, the total annual water consumption of China has reached 1.7 billion m³ in towns and 1.2 billion m³ in villages (MOHURD, 2010). The amount of rural...
wastewater is around 4% of the total in China and the trend of rural sewage amount could increase in the future due to increased use of wash machines and flush toilets. Chinese rural wastewater discharge amount and characteristics of different regions were summarized (Table 2). Majority of rural areas’ water consumption was lower than urban region, but large variation (3.0-5.0) in discharge amount was observed. Generally, all the quality parameters of rural sewage contained less pollutants, but in a greater range. Wang et al. [21] and Liao et al. [22] suggested that this was due to socio-factors and sewage characteristics were different and affected by local industries. Table 2 depict the characteristics of domestic sewage in different rural areas of China along with demand of water. Table 3 depict the standard discharge of pollutants from sewage waste-water of China and EU.

### Table 2. Characteristics and demand of water of rural regions of China

<table>
<thead>
<tr>
<th>Provinces</th>
<th>Concentrations (mg/L)</th>
<th>Water demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pH</td>
<td>SS</td>
</tr>
<tr>
<td>Sichuan</td>
<td>6 - 9</td>
<td>100-500</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>6.4-8.9</td>
<td>10-507</td>
</tr>
<tr>
<td>Hubei</td>
<td>43</td>
<td>91</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>6 - 9</td>
<td>250</td>
</tr>
<tr>
<td>Beijing</td>
<td>458-2250</td>
<td>135-628</td>
</tr>
<tr>
<td>Yunnah</td>
<td>6.7-8.3</td>
<td>251-969</td>
</tr>
<tr>
<td>Fujian</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

### Table 3. Sewage waste-water standard values of China on pollutants

<table>
<thead>
<tr>
<th>Parameters (mg/L)</th>
<th>First Class</th>
<th>Second Class</th>
<th>Third Class</th>
<th>EU standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade A</td>
<td>Grade B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COD</td>
<td>50</td>
<td>60</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td>BOD3</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>SS</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>TN</td>
<td>15</td>
<td>20</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TP</td>
<td>0.5</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>NH3-N</td>
<td>8</td>
<td>5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>30</td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>pH</td>
<td>--</td>
<td>--</td>
<td>6-9</td>
<td>--</td>
</tr>
<tr>
<td>No. of fecal coliforms</td>
<td>1000</td>
<td>10000</td>
<td>10000</td>
<td>--</td>
</tr>
</tbody>
</table>

1.3 Key Highlights

This paper focus on depicting treatment of domestic sewage wastewater in which following are key objectives;

a. Bringing and overview of wastewater in-sight in rural areas of China

b. Proposing a research scheme of effective wastewater treatment plant

c. Depicting the usage of latest technologies for wastewater treatment

d. Much useful for sewage plant analyzer for understanding the usage of latest technologies for advance development of sewage from preventing environmental and living being’s cause.

Organization of paper: As we already come across the wastewater and its pollution statistics in rural areas of China in Section 1, rest of the paper is as follows; Section 2 depict some of the research method put forwarded by various researchers, Section 3 depict the research scheme for better sewage treatment, Section 4 depict usage of latest technologies for sewage treatment in rural areas and finally ends with conclusion in Section 5.

2. Literature Review

Chang et al. [24] used a non-radial slacked-based data envelopment analysis model combined with cluster analysis to construct an index system covering multiple aspects, including three inputs and four outputs to assess 681 facilities. These samples selected from the biggest demonstration area are the most representative for and exceed 2/5 of the running facilities all over the country. The average efficiency score of samples was 0.496 meaning the improvement potential was about 50.4%. Only 27
samples were relatively effective, scoring 1. The remaining 654 facilities had different levels of input excesses or output shortfalls, which should be the key objects to improve overall performance. In addition, there was evidence that output indicators had more room for improvement than input indicators.

Yu et al. [25] electrical conductivity (EC) of the influents and effluents of rural domestic sewage treatment facilities from eight counties in Jiaxing City were investigated through correlation with pollutants, such as chemical oxygen demand (COD), total nitrogen (TN), ammonium nitrogen (NH₄⁺-N), total phosphorus (TP) and suspended solids (SS). EC exhibited good correlations with the concentrations of TN ($R^2 = 0.7068$, $p < 0.01$), NH₄⁺-N ($R^2 = 0.6718$, $p < 0.01$) and TP ($R^2 = 0.5944$, $p < 0.01$), suggesting that EC could be used to indicate TN, NH₄⁺-N and TP concentrations in rural domestic sewage, and thus, dynamically adjust the treatment load of rural domestic sewage treatment facilities. A higher level of pollutants in rural domestic sewage resulted in higher correlations between TN/NH₄⁺-N/TP and EC.

Chen et al. [26] analyzed two deep subsurface wastewater infiltration systems (SWISs) were constructed and fed with domestic sewage (control system, S1) and mixed wastewater consisting of old landfill leachate and domestic sewage (experimental system, S2). S1 and S2 exhibited favorable removal efficiencies, with TP (98.8%, 98.7%), COD (87.6%, 86.9%), NH₄⁺-N (99.8%, 99.9%) and TN (99.2%, 98.9%). Even when increasing the pollutant load in S2 by adding old landfill leachate, the almost complete removal performance could be maintained in terms of low effluent concentrations and even increased in terms of load removal capabilities, which included COD (19.4, 25.9 g·m⁻²·d⁻¹), NH₄⁺-N (8.2, 19.9 g·m⁻²·d⁻¹), TN (8.9, 20.6 g·m⁻²·d⁻¹).

Singh et al. [27] analyze performance of a newly designed four-chamber septic tank were investigated in current study. A three-layer orifice plate was fitted in the first compartment in an upward direction, and a baffle was arranged in the second compartment of the septic tank. The filter placed in the third and fourth compartment was used to collect water for field irrigation or connect subsequent devices for further processing. Flow field distribution in the first chamber was numerically simulated by Fluent software, and simulation results were verified by residence time distribution tracer experiment. The improved treatment effects of the modified septic tank with optimal parameters of 20 mm (diameter), 60 mm (gap) and 180 mm (distance) were validated by simulation experiments.

3. Research framework

The degree of treatment can be determined by comparing the influent wastewater characteristics to the required effluent wastewater characteristics after reviewing the treatment objectives and applicable regulations. The contaminants in wastewater are removed by physical, chemical and biological means.

The individual methods usually are classified as physical unit operations, chemical unit processes and biological unit processes. Although these operations and processes occur in a variety of combinations in treatment systems, it has been found advantageous to study their scientific basis separately because the principals involved do not change. [29]

**Physical operations:** Treatment methods in which the application of physical forces predominates are known as physical unit operations. Screening, mixing, flocculation, sedimentation, floatation, filtration and gas transfer are examples of physical unit operations. [30]

**Chemical operations:** Treatment methods in which the removal or conversion of contaminants is brought about by the addition of chemicals or by other chemical reactions are known as chemical unit processes. Precipitation and adsorption are the most common examples used in wastewater treatment. [31] In chemical precipitation, treatment is accomplished by producing a chemical precipitate that will settle. In most cases, the settled precipitate will contain both the constituents that may have reacted with the added chemicals and the constituents that were swept out of the wastewater as the precipitate settled. Adsorption involves the removal of specific compounds from the wastewater on solid surfaces using the forces of attraction between bodies. [32]

**Biological operations:** Treatment methods in which the removal of contaminants is brought about by biological activity are known as biological unit processes. Biological treatment is used primarily to remove the biodegradable organic substances (colloidal or dissolved) in wastewater. [33] Basically, these substances are converted into gases that can escape to the atmosphere and into biological cell tissue that can be removed by settling. Biological treatment is also used to remove nutrients (nitrogen and phosphorus) in wastewater.

The unit operations and unit processes mentioned above are grouped together to provide various levels of treatment described below –

**Preliminary treatment:** Preliminary wastewater treatment is the removal of such wastewater constituents that may cause maintenance or operational problems in the treatment operations.
processes, and ancillary systems. It consists solely of separating the floating materials (like dead animals, tree branches, papers, pieces of rags, wood etc.) and the heavy settle able inorganic solids. It also helps in removing the oils and greases, etc. from the sewage. This treatment reduces the BOD of the wastewater, by about 15 to 30%. Examples of preliminary operations are:

- Screening and combination for the removal of debris and rags.
- Grit removal for the elimination of coarse suspended matter that may cause wear or clogging of equipment and
- Floatation / skimming for the removal of oil and grease.

**Primary treatment:** In primary treatment, a portion of the suspended solids and organic matter is removed from the wastewater. This removal is usually accomplished by physical operations such as sedimentation in Settling Basins. The liquid effluent from primary treatment, often contains a large amount of suspended organic materials, and has a high BOD (about 60% of original). Sometimes, the preliminary as well as primary treatments are classified together, under primary treatment. The organic solids, which are separated out in the sedimentation tanks (in primary treatment), are often stabilized by anaerobic decomposition in a digestion tank or are incinerated. The residue is used for landfills or as a soil conditioner. The principal function of primary treatment is to act as a precursor to secondary treatment.

**Secondary treatment:** Secondary treatment involves further treatment of the effluent, coming from the primary sedimentation tank and is directed principally towards the removal of biodegradable organics and suspended solids through biological decomposition of organic matter, either under aerobic or anaerobic conditions. In these biological units, bacteria will decompose the fine organic matter, to produce a clearer effluent. The treatment reactors, in which the organic matter is decomposed (oxidized) by aerobic bacteria are known as Aerobic biological units; and may consist of:

- Filters (intermittent sand filters as well as trickling filters),
- Aeration tanks, with the feed of recycled activated sludge (i.e. the sludge, which is settled in secondary sedimentation tank, receiving effluents from the aeration tank), and
- Oxidation ponds and aerated lagoons.

Since all these aerobic units, generally make use of primary settled sewage; they are easily classified as secondary units. The treatment reactors, in which the organic matter is destroyed and stabilized by anaerobic bacteria, are known as anaerobic biological units and may consist of:

- Anaerobic lagoons, Septic tanks, Inhofe tanks, etc.

Out of these units, only anaerobic lagoons make use of primary settled sewage, and hence, only they can be classified under secondary biological units. Septic tanks and Inhofe tanks, which use raw sewage, are not classified as secondary units. The effluent from the secondary biological treatment will usually contain a little BOD (5 to 10% of the original), and may even contain several mg/L of DO. The organic solids/ sludge separated out in the primary as well as in the secondary settling tanks are disposed of by stabilizing under anaerobic conditions in a Sludge digestion tank.

**Tertiary/advanced treatment:** Advanced wastewater treatment, also called tertiary treatment is defined as the level of treatment required beyond conventional secondary treatment to remove constituents of concern including nutrients, toxic com-pounds, and increased amounts of organic material and suspended solids and particularly to kill the pathogenic bacteria. In addition to the nutrient removal processes, unit operations or processes frequently employed in advanced wastewater treatment are chemical coagulation, flocculation, and sedimentation followed by filtration and chlorination. Less used processes include ion exchange and reverse osmosis for specific ion removal or for the reduction in dissolved solids. Tertiary treatment is generally not carried out for disposal of sewage in water, but it is carried out, while using the river stream for collecting water for re-use or for water supplies for purposes like industrial cooling and groundwater recharge.

**Nutrient’s removal or control:** The removal or control of nutrients in wastewater treatment is important for several reasons -

- Wastewater discharges to confined bodies of water cause or accelerate the process of eutrophication,
- Wastewater discharges to flowing streams tax oxygen resources for the removal of nitrogenous BOD thereby depleting the aquatic life, and
- Wastewater discharges when used for groundwater recharging that may be used indirectly for public water supplies could cause health problems like blue baby diseases in children.

The nutrients of principal concern are nitrogen and phosphorus and they can be removed by biological, chemical, or a combination of processes.

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In many cases, the nutrient removal processes are coupled with secondary treatment, for example, metal salts may be added to the aeration tank, mixed liquor for the precipitation of phosphorus in the final sedimentation tanks, or biological denitrification may follow an activated sludge process that produces a nitrified effluent. [40]

4. Usage of latest technologies for domestic sewage wastewater

Wastewater treatment involves reduction in pollutants in process from wastewater and proper operation and maintenance of the plant to obtain the desired performance. Wastewater treatment technologies are crucial for urban water systems. Some of the new technologies being used and introduced for wastewater treatment globally to reclaim the resources. [41-50]

Membrane filtration: Membrane filtration is essential to the development of advanced water reclamation systems and the development of new and improved systems is expected to continue. Micro and ultrafiltration membranes provide excellent pretreatment to remove a wide range of dissolved contaminants. Membrane bioreactor filtration technology is being extensively used for advanced treatment to produce water for reuse by the industries.

Nanotechnology: The emergence of nanotechnology and the incorporation of living microorganisms in bio microelectronic devices has revolutionized the treatment process. The best part of nanotechnology is that it can easily merge with other technologies and modify, endorse and clarify any existing concept. It offers innovative approach to develop and exploit these processes in completely new ways. Nanotechnology concepts are being investigated for higher performing membranes with fewer fouling characteristics and improved hydraulic conductivity. A number of new researches are being conducted for producing fabrication of membranes from nano materials for decomposition of toxic compounds during the treatment. It will also provide effective segregation of metals, bimetallic nano particles, mixed oxides, zeolites and carbon compounds etc. from the wastewater resources. With improved membranes and configurations, more efficient pumping and energy recovery systems will be possible.

Automatic Variable Filtration Technology: Automated Variable Filtration (AVF) technology is a state-of-the-art technology used for wastewater treatment in which upward flow of influent is cleaned by downward flow of filter media. During the treatment process itself, the filter media is cleaned by the filtered influent thus there is no requirement for any additional filter media cleaning or fresh water. The AVF process comprises two sets of media filters that can be operated in series or in parallel. The two stage series configuration is used to produce very high quality filtrate. This mode is ideal for refining secondary wastewater for reuse. The AVF process is equipped with actuated valves, sensors and programmable logic controllers to automatically switch from serial mode to parallel mode during wet weather conditions or other preset operating conditions. The key benefits of the system are:

- Higher solids capacity
- Continuously cleaned media beds
- Elimination of ancillary equipment
- Even flow distribution
- Cost effective to install and low operating and maintenance costs
- Average reject of 5-15%
- Extremely low power consumption
- Ease of Operation & Maintenance

Microbial Fuel Cells: Microbial fuel cells is a breakthrough technology where electrical energy could be extracted directly from organic matter present in the waste stream by using electron transfer to capture the energy produced by microorganisms. Micro-organisms are grown as a biofilm on an electrode; the electron donor is separated from the electron acceptor by a proton exchange membrane, which establishes an electrical current. This technology is still in its development stage and significant advances in process efficiency and economics will be necessary before it could be used widely to produce electrical energy directly from organic matter present in the waste-water.

CONCLUSION

Domestic sewage treatment in rural areas is not easy due to the difficulties in normal operation of treatment facilities, to a certain extent. Also, there is a need of preventing the flow of untreated wastewater to water bodies from huge cause. Thereby this paper brings an overview of domestic sewage treatment in rural area of China-Jiangsu in which we get an overview of the wastewater treatment and possible pollution statistics from the area. Then various research frameworks proposed by researchers are depicted and then we described the basic research framework for sewage wastewater treatment by improving with latest technologies.

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Acknowledgement

The authors are thankful to the higher authorities for the facilities provided.

Authors’ contribution

This study was done by the authors named in this article, and the authors accept all liabilities resulting from claims which relate to this article and its contents.

Conflicts of interest

There are no conflicts of interest.

Funding

Financial assistance has not been received from any agency or institution for this study.

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Citation: Li Z, Treatment and technology of domestic sewage for improvement of rural environment in China-Jiangsu: A research, SPR, 2021, Volume 1, issue 4, Page No.: 305 - 314. DOI: https://doi.org/10.52152/spr/2021.146

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