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RESEARCHES ON TREATMENT STATION AND THE SEWAGE NETWORK IN THE VILLAGE GHIDIGENI, GALATI

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ABSTRACT

The population of the village is entitled to use the water supply, either through direct connections to the system, with drinking fountains in the yards or through network drinking fountains located in the street.

The commune has its water supply, water source through deep drilling and storage tanks. Household wastewater through its contents is not dangerous and their flow is 5 l/s. The activity will have a positive impact in that they will collect household wastewater from households, while preventing groundwater pollution.

Sewage network will be made of PVC pipes ready for SN2 main collectors having DN 315/400 mm. Sewage pipes will be buried on a bed of sand, about 10 cm thick. Pipes and fittings that make up the network of sewers are resistant to most chemicals present in aqueous solutions.

For wastewater treatment there are disagreements regarding the large installation. This is valid even in the case of legal amendments or conditions caused by exploitation, technical concepts and procedures that will ensure the greatest possible flexibility of the sewage treatment plant.

KEYWORDS: wastewater, groundwater, sewage network, broadband, wastewater treatment

1. Introduction

The main objective of the wastewater treatment is the removal of suspended substances, colloidal and in solution, toxic substances, microorganisms, etc. of the wastewater, in order to protect the environment (air, soil, emissary, etc.).

Discharges of unused or improperly treated wastewater may harm public health. In this line of ideas STAS 1481 provides for the wastewater to be discharged downstream of the points of use.

Wastewater treatment plants are the set of constructions and installations where sewage is subject to technological purification processes that alter its qualities so as to meet the prescribed conditions for receiving and dispatching substances retained in these waters.

Nowadays, treatment plants can be classified into two groups: urban and industrial.

Industrial wastewater treatment plants treat only industrial wastewater, while municipal wastewater treatment plants receive, in varying proportions, domestic sewage, meteoric, drainage and surface water treatment plants [1, 2].

Municipal wastewater treatment with industrial wastewater is sometimes advantageous. The existence of a single wastewater treatment plant, where both industrial and urban waters are treated, can reduce the cost of water treatment production and more efficient cooperation between industry and the populated center for wastewater treatment.

In view of the treatment of wastewater and the reduction of the cost of treatment, besides the measures taken by pre-treatment of waste water, the following must be taken into account: irrigation of urban or industrial wastewater, purification process leading to crop growth; recirculation of treated wastewater, resulting in reduced investment in water treatment and treatment plants; retention and reuse of valuable substances, driven by wastewater (wood fibers, petroleum products, etc.) or resulting in water treatment (sludge, gas, etc.), the replacement of some degradable substances, which are part of the technological process of some industries, with others, more easily degraded, to simplify the treatment process and reduce cleaning costs; the use of self-cleaning capacity for emissions, to reduce sewerage facilities, etc.

Advanced sewage treatment is defined by the set of additional operations following secondary conventional scrubbing with the purpose of removing suspended and dissolved substances left in the water after passing the classical steps. Advanced treatment includes processes and technologies designed to provide high purification rates that cannot be achieved by classical methods and/or to remove pollutants in the physical and biological stages [3-6].

Advanced sewage treatment is mandatory, being required by the need to maintain ecological balance.

The impact of wastewater on the environment must be analyzed both in terms of the consequences of carbon dioxide spillage and the changes that may occur in the emissary as a result of nitrogen and phosphorus compounds. At the same time, the effect of other compounds, such as those toxic, which are accidentally discharged or conducted into natural waters, should also be analyzed.

Advanced sewage treatment is introduced into the treatment technology when it is necessary to obtain high quality water, which cannot be achieved through biological processes, to protect the environment, to avoid eutrophication downstream of the discharge point the purpose of using reused water or when the emissary is used as a source of supply to some localities [7, 8].

For the choice of processes and technology as a whole, it is necessary to consider: the self-purification capacity of the natural course in which effluent discharge takes place; water treatment costs for the purpose of potable water treatment in the case of catchments downstream of the effluent discharge point; the costs of constructions and installations related to the proposed technology, the costs of exploiting and controlling the quality of the effluent discharged; energy requirements for the operation of facilities and equipment related to the proposed technology [9].

2. Experimental procedure

The organic matter retained in the mechanical separators and the primary decanter together with a part of the secondary decant deposition are passed to the plant called tank and subjected to an anaerobic fermentation process.

Unpalatable odorous volatile substances resulting from enzymatic hydrolysis of organic substances and lipids and counterparts are converted into methane gas and carbon dioxide. The residue obtained in the methane, the sludge is dehydrated from the drying layers, resulting in a largely mineralized and generally inactive product.

Most sewage treatment plants have a close-fitting schematic diagram, the difference being made by the dimensions and technologies used.

In the composition of a treatment plant, we distinguish the following steps: a primary, mechanical; a secondary, biological, and a tertiary, biological, mechanical or chemical stage at some stations (Figure 1).

The characteristics of wastewater can be: physical, chemical and biological. (Fig. 2). The physical characteristics are: the urban wastewater temperature is usually 2 to 3 °C higher than that of the supply water and this is a decisive factor in the wastewater treatment.

Turbidity of wastewater and emissivity only indicates the content of suspended matter because there is no well-defined relationship between turbidity and suspension content. Turbidity is measured in degrees on the silica scales and is determined primarily for the emissive water and only occasionally for wastewater.

The scent of fresh wastewater is almost inexistent. The waters under fermentation have more or less pronounced odor of swollen eggs, depending on the fermentation stage in which they are found.

The color of fresh sewage is light gray; by fermenting organic matter from water, the color of the wastewater becomes darker.

With respect to chemical characteristics we can mention: dissolved oxygen (O_2) which is found in small quantities in wastewater (1-2 mgf/dm^3), but only when fresh and after biological treatment. Depending on the degree of pollution, surface waters contain higher or lower amounts of oxygen. If water contains the amounts of oxygen shown in Table 1, that water is considered to be saturated; above these values the water is over-saturated, and below these values, sub-saturated.

Biomedical Oxygen (CBO) consumption of wastewater or emissary is the amount of oxygen consumed for biochemical decomposition under aerobic conditions of total organic solids at standard temperature and time - 20 °C and 5 days respectively; In this case, the value is marked with CBO5 - biochemical oxygen demand at 5 days.

Oxygen deficiency is the amount of oxygen missing from water to reach the saturation value. To determine the degree of soiling of surface water, it is of great importance to know its oxygen content.

Chemical oxygen consumption (CCO) measures the carbon content of all organic matter categories by determining the oxygen consumed by potassium bicarbonate in acidic solution.

Biological characteristics are all the organisms present in the wastewater.

Table 1. *Oxygen depending on the water temperature*

Parameter	Value						
Temperature [°C]	0	5	10	12	14	16	18
O_2 in water [mgf/dm^3]	14.23	12.80	11.33	10.83	10.37	9.95	9.64
Temperature [°C]	20	22	24	26	28	30	
O_2 in water [mgf/dm^3]	9.17	8.83	8.53	8.22	7.92	7.63	

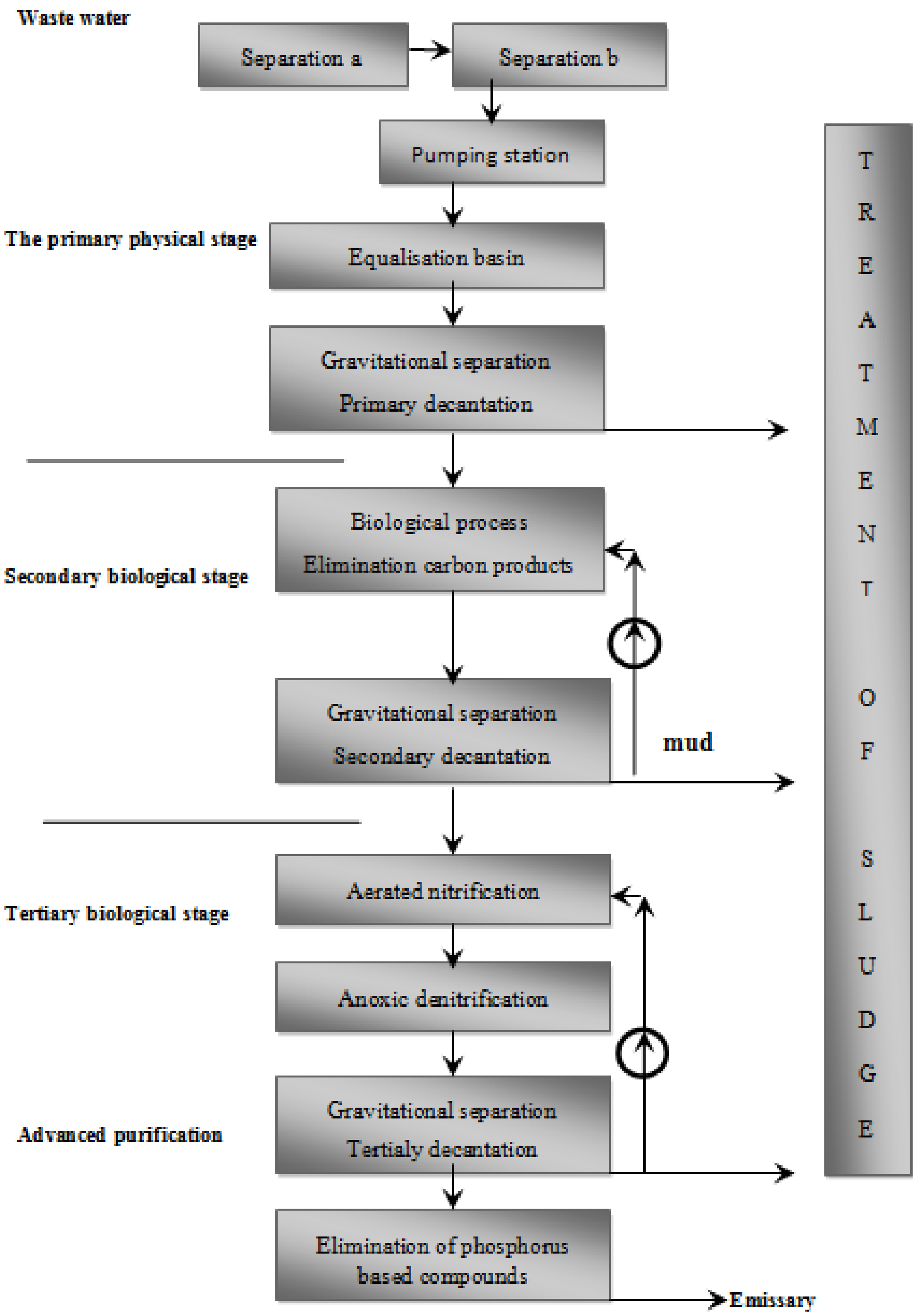

Fig. 1. *The general scheme of a treatment plant*

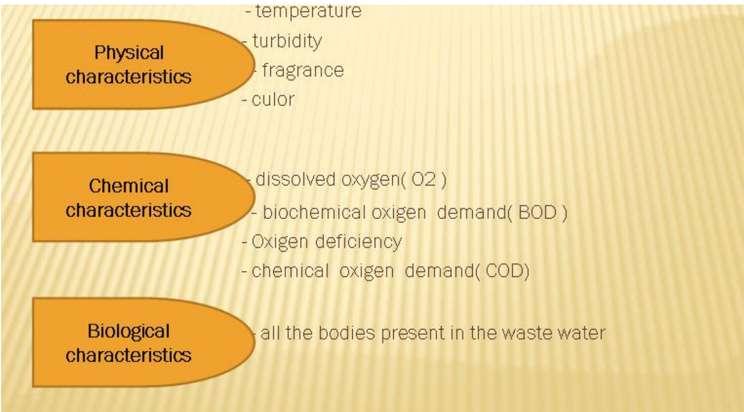

Fig. 2. *Characteristics of waste water*

Active sludge is the basic structural unit of the process. The term *activated sludge*, introduced by Arden and Locket, considers the cause and effect of self-purification of polluted, sufficiently aerated and agitated water in the presence of microorganisms. At a concentration of biomass in the aeration basin of 1000-8000 mg/l, in a properly conducted process, a biomass concentration in the sludge at the 6-15 g/l decanting outlet will result. The secondary decant in the scheme retains the active sludge with an efficiency of 25-80%; he cannot retain isolated microorganisms. The recycled sludge percentage is 25-200% of the treated flow rate. Active sludge contains species that in their common activity can metabolize the organic matter to carbon dioxide and water. Looking at the microscope, a flacon has a complicated structure characterized by a gelatinous mass secreted by microorganisms in which many bacteria and inert substances are contained; among the flocks live protozoa and some metazores.

There are two categories of sludge that interfere with the operation of activated sludge basins: recirculating sludge and excess sludge [Figure 3].

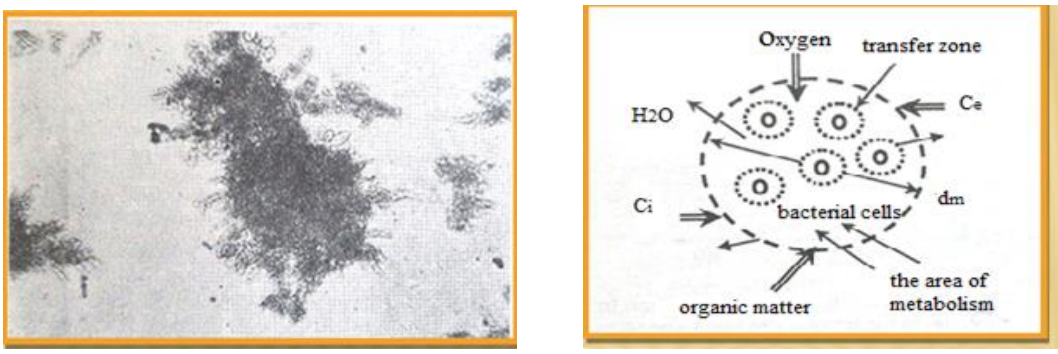

Fig. 3. a) Microscopic aspect of activated sludge b) Bottle with active sludge

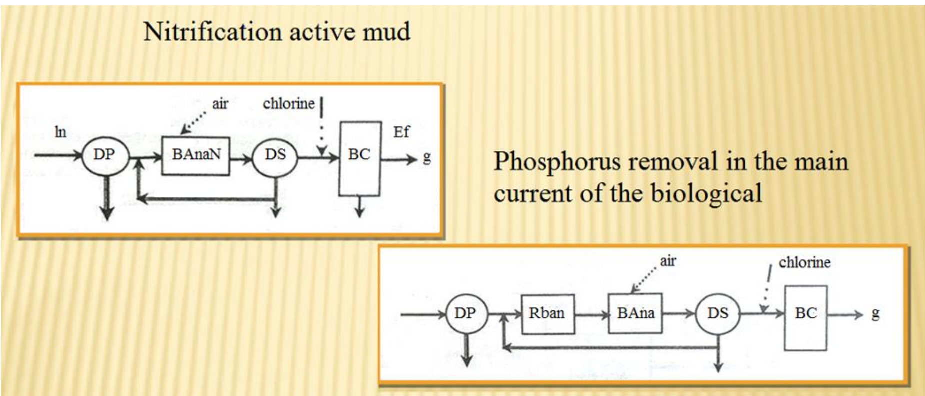

Fig. 4. *Technological schemes for advanced waste water treatment*

In activated sludge treatment plants, a balance must be struck between rapid mineralization of organic substances which requires rapid development of microorganisms and formation of flocs by concentrating live cells from the aqueous system at low cell growth rates. This balance is achieved by recycling the sludge retained in the secondary decanter.

Advanced sewage treatment is defined by a set of additional operations aimed at eliminating the suspended and dissolved substances remaining in the water after passing the classical steps. Technological schemes for advanced wastewater treatment are presented below (Figure 4).

Wastewater contains phosphorus compounds, an essential element of the plant's and animal's nutrients. Wastewater contains about 10-12 mg/l of phosphorus.

Phosphorus removal can be accomplished by chemical or biochemical reactions.

Osmosis can occur when there is a semipermeable membrane such as cell membrane. When a cell is submerged in water, water molecules cross the cell membrane from the low solvate zone to a high solvated zone. This process is called osmosis.

Osmosis is important in biological systems where many biological membranes are permeable. There are two types of osmosis: reverse osmosis and direct osmosis.

Reverse Osmosis produces clean, even "clean" (demineralized) water, and can be used for sewage treatment, potable water preparation (Figure 5).

The principle of operation of the process is a semi-permeable membrane through which water passes very easily from other substances less or not due to the size of the molecule.

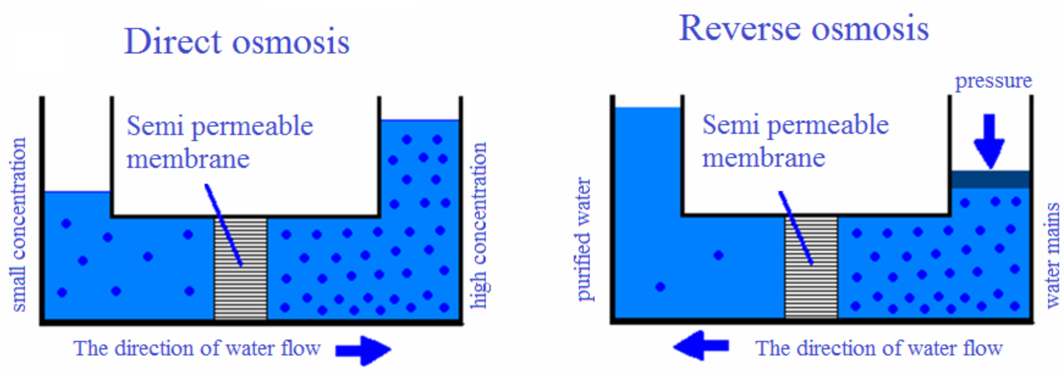

Fig. 5. *Osmosis*

3. Sewage treatment plant and sewerage network in the commune of Ghidigeni, Galati

Ghidigeni Commune is located in the north of Galati County, about 25 km north of Tecuci. The access to the locality is through a branch of the national road Tecuci - Bârlad - DN24 (www.proiect-galati.ro).

Existing water supply system has a water source with depth drilling and existing storage tanks 300 and 1 x R500, can ensure the flow in future distribution network expansions for the entire population of the commune.

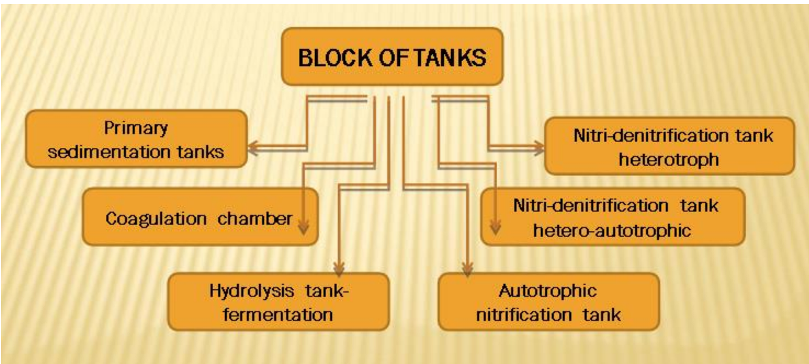

Fig. 6. *Biological treatment stage*

Domestic wastewater is pumped into the pressure and quench chamber and then into the switching house. From this, the wastewater gets gravitationally into the manure grate's home for retaining coarse solid matter and further gravitationally to the grease separator / separator. After the sand and fats are retained in the grease separator, the wastewater gets gravitationally into the equalizing, homogenizing and pumping basin. From here the water is pumped through the radiator shaft and the electromagnetic flowmeter into the mechanical grate attached to the RESETILOVS N3-CA1S-160-931 compact container type treatment N + P, and from here, in the biological and chemical treatment tanks block where organic, biodegradable substances and nitrogen and phosphorus compounds are removed.

The biological treatment step consists of a biological treatment module with two parallel treatment lines, type RESETILOVS N3-CA1S-160-931. N + P. This plant performs a very efficient mechanical and biological treatment, the process being automated and permanently controlled (Figure 6).

The sewerage network will be made of PVC pipe fittings SN2 for main collectors with DN 315/400 mm. The sewer pipes will be buried on a sand bed about 10 cm thick. The pipes and fittings that make up the sewer system have chemical resistance to most aqueous solutions.

In order to achieve the required degree of purification, it is proposed that the electro-pumps in the endowment of the technological objects be FLYGT type due to the reliability, the high energy efficiency, and the long service life.

The provision of advanced machinery and equipment is mandatory in order to achieve the desired cleaning efficiencies. The proposed technological solution includes state-of-the-art, low-energy, simple operation operations by applying a process-specific automation.

4. Conclusions

The wastewater treatment plant from the village of Ghidigeni, Galati county, is characterized by a simple but modern technology and high efficiency.

The village has its water supply system, a water source through deep drilling and storage tanks.

Domestic wastewaters are not hazardous and their flow rate is 5 l/s.

The sewerage network will be made of PVC pipe fittings SN2 for main collectors with DN 315/400 mm.

The sewer pipes will be buried on a sand bed about 10 cm thick. The pipes and fittings that make up the sewer system have chemical resistance to most aqueous solutions.

The introduction of the biological treatment step was made due to the very high content of organic matter present in the wastewater.

Implementing the three principles, i.e. recycling, recovery, non-degradation of quality, has a beneficial effect both on the environment and on the economic and productive aspect.

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