ENERGY AUDIT FOR A WASTE WATER TREATMENT PROCESS

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Abstract - *Wastewater treatment plant through various physical, biological and chemical methods all area of production has to save energy so that they are more aggressive and can follow recommendation about the environment. The auditing process and different factors moving the efficiency of any equipment and calculate the exact values from the electricity bills, we are use of energy for each day saving measures which energy auditors use. In Waste water treatment plant are now subject to optimization processes essential for reaching the regulation applied the discharge water. Additional have good energy saving potential but must be implement carefully to avoid increasing energy use other than decreeing it.*

Key Words: *Energy Audit, Waste Water Treatment Plant, costs;*

1. INTRODUCTION

When manipulative how much it costs to run and continue a Waste Water Treatment Process the main expenditure is energy, which is usually 38-40 % of the total cost. It is so necessary to save energy in the WWTP in order to increase profits, increase production and diminish toxic waste. Within latest years, both the public and private sector contain seen how energy, once an inconsequential factor in the cost structure, become an important matter. Due to the gradual augment in the cost of energy, companies have been grateful to meet the challenge of dropping its role in the in general costs or at least maintain present level. Accordingly it is necessary to be acquainted with with certainty the type and capacity of energy use in each process within diverse industrial operations, as well as to determine how to lower manufacture costs through energy use with no affecting quality or production. Energy Saving Programmer are regarding optimizing energy use inside energy management to be converted into more aggressive, expand the options of energy development and re-direct cost-effective resources to extra activities. Knowledge with putting these programmers into practice show that, separately from reducing energy cost an enhance in energy efficiency can also direct to higher productivity and less emission. Surrounded by a company, essential and implementing an Energy Saving process usually fall within the all-purpose brief of Energy Management because an suitable support is needed to identify also evaluate opportunity for saving energy in manufacturing. Wastewater treatment processes are multifaceted nonlinear systems by means of multiple inputs and outputs. The water treatment consists of numerous parts: preliminary treatment, primary treatment, secondary treatment, tertiary or advanced treatment and disinfection. Within the preliminary and primary management some solids, and particularly the crude solids are detached in order toward protect the devices used in the procedure (especially pumping equipment) and to put off blockage in pipes the investigate described in this paper concern the secondary treatment where the dissolve organic material is detached by biochemical oxidation. A mixed inhabitant of bacteria under specific conditions decomposes organic matter. In an airing tank the organic matter is improved to simple elements like carbon dioxide and water. If the manure is aerated, after a period (this can vary from three days to a few weeks) the new germs. In habitants form flocculent sludge. This sludge, named activate sludge, resolve be separated in the settle tanks and a division is recirculation to the ventilation tank. This returning process is an proficient one compared to an anaerobic progression. A model based on management mass and energy be developed inside. The purpose of the tertiary treatment is to advance water feature by removing unwanted elements such the same as detergents and balanced solids. Used for this, sand filters preserve be used. In the last part of the treatment, the disinfection, the bacteria are shattered.

2. ENERGY AUDIT

Energy Audit is a periodic examination of an energy system to make sure that energy is being used as capable as possible. Energy audit is a systematic study or survey to identify how energy is being used in a building or plant, and identify energy savings opportunity. With proper audit method and apparatus, an energy audit provides the energy executive with essential in sequence on how greatly, someplace and how energy is used surrounded by an organization.

3. ENERGY LOSS

Energy loss in any industrial process or plant is predictable; it's a prearranged conclusion. However its economic and environmental impact is not to be living taken lightly, therefore explaining the increasing need for industrial energy efficiency. Place simply; the rank of energy efficiency a plant or development be capable of achieve is inversely proportionate to the energy loss that occur; the higher the loss, the lower the efficiency.

4. ENERGY AUDIT APPROACH

The first step to a successful energy audit is to develop an approach an energy audit can be brokendown into phases.

(i) First an energy audit is division of an energy conservation program. Having an energy conservation program in consign will help with performance and monitoring of energy conservation measures (ECM).
(ii) The second phase is data collection. Assembly as much energy related information, processing that data, and observing unusual energy consumption provides a good opening point for the audit.

5. ENERGY CONSERVATION MEASURES (ECM)

Energy conservation measures are industrial using knowledge gain during data collection and the field inquiry. Evaluating whether or not an ECM should be implementing depends on the criteria renowned. One common criterion is return on investment. An energy conservation project must ideally pay for itself within a programmed time period. extra criteria used to evaluate ECMs could include availability of funding (including rebates or incentives), state of existing equipment, and the perception of customers who value environmentally friendly practices. The energy assessment preceding implementation of ECMs should provide an economic analysis.

6. OVERVIEW

Energy use can account for as much as 10 percent of a local government's annual operating budget. A significant amount of this municipal energy use occurs at water and wastewater treatment facilities. With pumps, motors, and other equipment operating 24 hours a day, seven days a week, water and wastewater facilities can be among the largest consumers of energy in a community and thus among the largest contributors to the community's total emissions. Nationally, the energy used by water and wastewater utilities accounts for 35 percent of typical municipal energy budgets. Electricity use accounts for 25–40 percent of the operating budgets for wastewater utilities and approximately 80 percent of drinking water processing and distribution costs. Drinking water and wastewater systems account for approximately 3–4 percent of energy use in the United States, resulting in the emissions of more than 45 million tons of annually.

7. WATER USE EFFICIENCY

Water and wastewater utilities be capable of also reduce energy use by promoting the capable use of water, which reduces the amount of energy desired to treat and share out water for example, urban water use accounts for 70% of the electricity associated with water supply and treatment. Water use efficiency can also help avoid the need to develop new water supplies and infrastructure. This guide provides some information on approaches to improve water use efficiency, but concentrates primarily on direct energy efficiency improvements in facilities. These economic and environmental costs can be reduced by improving the energy efficiency of water and wastewater facilities equipment and operations, by promoting the efficient use of water and by capturing the energy in wastewater to generate electricity and heat. Improvements in energy efficiency allow the same work to be done with less energy improvements in water use efficiency reduce demand for water, which in turn reduces the amount of energy required to treat and distribute water. Capturing the energy in wastewater by burning biogas from anaerobic digesters in a combined heat and power system allows wastewater facilities to produce some or all of their own electricity and space heating, turning them into "net zero" consumers of energy. Local governments can also reduce energy use at water and wastewater facilities through measures such as water conservation, water loss prevention, stormwater reduction, and sewer system repairs to prevent groundwater infiltration. Measures to reduce water consumption, water loss, and wastewater lead to reductions in energy use, and result in savings associated with recovering and treating lower quantities of wastewater and treating and delivering lower quantities of water. This guide focuses primarily on strategies for improving energy efficiency in water and wastewater facilities. Opportunities for improving energy efficiency in these facilities fall into three basic categories:

(i) paraphernalia upgrades,

(ii) organized modifications,

(iii) Modifications to capability buildings.

Equipment upgrades focus on replacing items such as pumps and blowers with more efficient models. Operational modifications involve reducing the amount of energy required to perform specific functions, such as wastewater treatment. Operational modifications typically result in greater savings than equipment upgrades, and may not require capital investments. Modifications to buildings, such as installing energy efficient lighting, windows, and heating and cooling equipment, reduce the amount of energy consumed by facility buildings themselves.

8. OBJECTIVES

The general aim of an Energy Audit is to identify technical and organizational measures that are feasible for saving energy right through the company. Before reaching this aim, several smaller steps have to be taken:

(i) Gather existing data about consumption, plus energy and production costs, to enhance understanding about the factors that lead to varying energy indexes within the plant.

(ii) Obtain an overall energy balance for the plant, as well as that of specific equipment or production lines so that these balances can be quantified.

(iii) Identify opportunities that could lead to saving energy.

(iv) Determine and evaluate in economic terms the achievable volume of savings and the technical measures for achieving it. Analyze the relationship between cost and profit of the various technical solutions proposed in order to priorities their implementation.

(v) Develop an action plan to carry out all the energy saving projects. These must include dates, goals and responsibilities; this plan will lend continuity to the company's Energy Saving Programmed.

a) DEVELOPMENT OF AUDIT

(i) Plan the audit.

(ii) Distribute the survey to the applicant.

(iii) Revise the data provided by the applicant and compile complementary information

(iv) Carry out field work and take measurements.

(v) Evaluate the data.

(vi) Produce a report and hand it into the company. The groundwork for the audit is usually done in the office of the energy consultant. His or her objective is to ensure that the team carrying out the work has a plan. The team Must be well trained and organized to optimize the time dedicated to this task is used. In order to develop this plan, revise all the background information and compile the available documents about the installation being studied. These could include.

(i) A copy of previous energy diagnostics, if these had been done.

(ii) General information about the installation such as plant size, types of work lines and products obtained, yearly energy consumption, fuel costs if relevant, applicable electricity rates, etc.

The contract, with the plant, to carry out the Energy Audit, and their requirements:

(i) The energy consultants (auditors) available and their experience.

(ii) The capacity and availability of the staff members who handle and control the installations under study.

Revising and evaluating all this information should pave the way to defining the action plan for the energy audit. This should determine its scope within the plant, the tasks to carry out and the experts responsible for each, as well as the time and budget needed for them. At the same time, the instrumentation that will likely be used to gather data during the audit and ensure they are in working order for when they are needed. Once the audit has been planned, it is time to ensure that the data for the essential calculations are at hand by sending a questionnaire to the client with the following data:

(i) Company details.

(ii) Plant production during the corresponding periods.

(iii) Energy consumption for the next 12 months of operation itemized by the different fuels used in the plant.

(iv) Properties and consumption of the raw materials used.

(v) The equipment that consumes the most energy.

(vi) Characteristics and capacities of the equipment that consumes energy, its location and role in the plant and or e installation in question. Below are samples of some of the headings included in these questionnaires.

This work has three parts- interviews, inspections and measurements which should be done in the following sequence: Check that all the measuring equipment is ready and in working order. Meet with the responsible person or people within the company or entity that requested the survey. Briefly describe the production process. Check the surveys to complete and/or modify data. Visit the plant to see the production process in situ. Take those measurements. Compile the data obtained before carrying out the measurements, a work schedule should be made, including the following;

(i) Calibrate and check the measuring devices.

(ii) Take the measurements.

As the parameters to measure with the most representative equipment within the plant, there should be at least:

(i) Analysis of exhaust gases precisely at the exhaust flue within the boiler block (combustion chamber)

(ii) Air flow, at the same point.

(iii) Exhaust gas temperature, at the point mentioned above.

(iv) Ambient temperature.

(v) Analysis of O2 at the exact point exhaust gases leave the residual heat exchanger (economizer, preheated).

(vi) Temperature of exhaust gases leaving heat exchanger. Air flow, at the same point.

b) WATER SALINITY

Conductivity of boiler and feeder water in these units, a thermal balance must be achieved with reference to the production unit. If the raw materials introduced in the furnace produce gases that are incorporated into the exhaust, their composition must be determined.

(i) Dryers For the dryers, the same measurements taken for the furnaces apply and the relative humidity and inward flow of effluent gas have to be determined.

(ii) Fluid systems whose temperatures differ from that of the atmosphere: Observe state of the heat resistance and air-tightness of the system

(iii) Examine lengths and diameters of uninsulated pipe sections, including valves, flanges, etc. to which an equivalent length will be given. Also, insulation type and thickness.

(iv) Determine quantity and nature of leaks

(v) Determine heat losses

(vi) Temperature along exterior surface of a section of insulated pipe. Temperature along exterior surface of a section of uninsulated pipe, near other section. Engines In those above 25 CV: Intensity; power factor and power Compressors. Exterior air inlet

Described in earlier steps should lead to energy-saving opportunities and measures. The former are identified according to the auditors' experience, past cases, references bibliographies, etc., and always after carefully analyzing equipment and systems within the installations being studied. Once opportunities are detected, it is necessary to identify measures to take advantage of them, checking cost over profits and expected savings. Savings measures can generally be classified into three categories:

(i) Cost-free or low-cost measures that have a brief recovery period (for instance, six months). These are usually operational changes or improved maintenance and procedures so that energy use is rationalized.

(ii) Mid-range investments, which often entail improving or changing equipment. Recovery is around six months to two years.

(iii) Measures with higher level investments, such as replacing major equipment or production lines. These can have a recovery period of 18 months given that, for such an amount, feasibility studies are required beforehand.

With the information gathered from the fieldwork, a report is produced. This will provide a systematic and coherent overview of the basic energy data for the plant. In this way, the energy parameters for the plant over successive periods can be studied. The aim is to involve the staffs who have helped do the study in making recommendations with the auditing team. Another aim is to confirm that all these recommendations can be applied within the conditions of the plant or installation being studied. It is therefore recommendable that staff revises the conclusions reached in the audit before a formal report is made. Preparing the report, with results and conclusions, is an important step within the audit. The report should have an action plan for the company and it's energy Saving Programmed. This plan must include a timeline for carrying out the recommendations and priorities them according to their profitability and the level of investment.

c) RECOMMENDATION FOR WATER & WASTEWATER

(i) Recycle water, particularly for uses with less-critical quality requirements.

(ii) Recycle water, especially if sewer costs are based on water consumption.

(iii) Test for underground water leaks.

(iv) Check water overflow pipes for proper operating level.

(v) Provide proper tools for wash down especially self-closing nozzles.

9. CONCLUSION

In this paper, the audit model future makes it possible to get to know a plant improved and take the appropriate steps to improve its performance in terms of energy. Additionally, the energy calculation done in this study absolutely supports the use of biogas. This model provides the managers at a WWTP with a explanation for investing in making the most of the residues. Another reason for backing this idea goes beyond the plant itself: saving energy in this way is of general benefit.

As a result it is necessary firstly to give confidence local authorities to develop the use of anaerobic digestion to produce energy in technical specifications. in addition, regulations should embrace the possibility of treating biodegradable residues within existing installation where size permits.

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