

Maintenance of Effluent Treatment Plants

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The goal of a wastewater treatment system is to deliver a quality product, a reclaimed wastewater treatment that meet standards for reuse or stream discharge. Like any facility, a wastewater treatment plant requires continuous maintenance to function in a safe, efficient and reliable manner. If our component of a unit process fails, the entire system may break down. The result will be an inferior product.

Goals of a maintenance management system

Plant maintenance programs traditionally have been directed towards repair of broken equipment (i.e. emergency repair); planned maintenance programs were the exception. In today's context, however, a maintenance management program is an integrate system for Planning, organizing, staffing, directing and controlling maintenance work. The goal is to assure the required effluent quality from an existing wastewater facility at the lowest long-term cost. In cases where such systems have been implemented, saving of maintenance cost has been reported.

What type of maintenance management system is needed?

Any manager who oversees a maintenance management system seeks to strike a balance between optimum performances at low cost. This balance usually can be achieved through a compromise between a total, 'preventive' maintenance program and a total breakdown maintenance program. Periodic inspection of existing facilities can uncover conditions leading to potential breakdown o harmful depreciation. These conditions can then be corrected while they are still minor and are repairable, instead of after the faulty equipment or system has failed. In some cases, break down and subsequent replacement may be cost effective. But the cost of maintaining specific equipment has to be taken into consideration. The type of maintenance system implemented ultimately will depend on the facility's unique goals and needs.

A 'preventive maintenance' program is likely to be more convenient and less costly than a 'repair maintenance program'.

Preventive maintenance is the periodic inspection of facilities to discover defects or developing defects that could lead to break down or deterioration of equipment and the correction of such defects.

Breakdown of any one part of a plant can precipitate into a complete process failure. Even though some equipment redundancy is provided into the constitution of most wastewater treatment facilities to handle emergency situation, failure of individual machine can have serious repercussions on the total treatment process.

Preventive maintenance, when properly applied can reduce overall maintenance costs and increase efficiency and longevity of the equipment. A good preventive maintenance plan must be well though out, well organized and properly managed.

The necessity for maintenance program

The efficient operation and maintenance of a wastewater treatment facility is important for several reasons. It is first necessary to ensure that improper operation maintenance of one section does result in the failure of entire treatment process. Biological processes are particularly vulnerable to sudden shocks or changes in flows or loading quantities. These must be avoided. But one mistake cannot be allowed t foul the entire process. It is also very important to avoid expensive damage to machinery and equipment. The need to meet legal requirement is another priority.

Preventive maintenance starts from design and selection of effluent treatment plant. Easy maintenance and low breakdown should be the key parameter in selection of equipment. Also easy availability of service networks and spares should be considered while selecting the vendor. During designing various facilities for preventive maintenance such as flushing arrangement for lines are pone to choking are to be provided.

General scheme of effluent treatment plant can be classified into primary treatment, secondary treatment and/or tertiary treatment.

Primary treatment is physico- chemical process, i.e. treatment by means of physical separation using chemical properties. Thus it includes various chemical dosing systems, Clariflocculator, oil removal system, sludge removal and handling system (centrifuge/ filter press etc.)

Secondary treatment is basically a biological process, using aerators, secondary clarifiers.

Tertiary treatment is conditioning of this wastewater for reusing (recycle) the same. Various filtration equipment, disinfecting aids, ion-exchange/ reverse osmosis equipment and other membrane process like Ultra filtration & nanofiltration forms part of this.

Maintenance

Maintenance strategy can be broadly classified as Routine Maintenance, Breakdown Maintenance or Annual shutdown maintenance.

Routine maintenance is part of day-to-day operation. In case of effluent treatment plant, monitoring of inlet & outlet parameters of the waste & treated effluent respectively has a very vital role. Fluctuation of inlet effluent quality may even provide lead to problem in other plants of industry, and thus avoid major loss. However fluctuation in inlet parameters can also adversely effect performance of effluent treatment plant e.g. Collapse of biological treatment of biological treatment system due to death of bacterial culture- which can be due to increase level of hazardous chemical at the inlet of the plant. Lubrication and leak detection of rotary equipment is part of routine maintenance. In case of oil leakage any of these equipment can increase load on effluent treatment plant.

As wastewater can be of corrosive natures it is mandatory to take corrosion/rust prevention aids in this plant, e.g. piping used or equipment used should be rubber lined from internally and externally protected by anticorrosive paint.

The very important aspect of outline maintenance is to ensure that the plant is operating on optimum levels and not overloaded with respect to design conditions.

Mechanical maintenance is done to proactively analyze the problem and rectifying it immediately which if not attended can severely affect plant performance. Rotary equipment should be checked for physical health, vibration, alignment and leakage periodically. Other static equipment like dosing tank, vessels, pipes, valves etc. should be checked for physical health-corrosion, pitting, piling of rubber lining or painting, etc. All electrical drives including motor control center & control panel, should be fortnightly checked with regards to current ampere, load, temperature rise etc. As prescribed earlier, monitoring instruments are very vital for the smooth plant operation, hence periodic checking of accuracy of this instrument, re-calibration, cleaning of electrodes/sensors of this instrument is very important. Various interlocks in programmable logic control should also be checked periodically.

Breakdown maintenance is need based, due to unavoidable circumstances. The need of doing breakdown maintenance can arise due to failure of any critical equipment high fluctuation in inlet quality of effluent, collapse of secondary treatment system etc. During this the respective equipment to be immediately repaired by replacing faulty part (spares), analyzing the source due to which fluctuation of inlet parameter has occurred and rectifying the same. It is very much necessary to keep stock of spares handy to immediately rectify problem and bring plant back to normal.

Annual shutdown maintenance is planned annually along with other plants of industry for overhauling of the equipment. During annual shut down, maintenance period should be planned in such a way that all the equipment can be opened overhauled. In case of tertiary treatment plant involving ion exchanger resins, and/or membrane process, necessary chemical cleaning of resin or membrane should be carried out as recommended by manufacturer. Render specific maintenance for specific equipment as suggested by manufacturer.

It is always advisable to enter into annual maintenance contracts with control equipment manufacturer. This will avoid emergency shutdowns and ensure best performance of the equipment supplied by them.

Keep a crosscheck of throughput (total treated amount effluent) of effluent treatment plant v/s operating cost i.e. chemical consumption, power consumption etc. And ensure that it is well within the optimum limits as suggested by the supplier.