Sewage Management Plan

October 2022

Company info

Company Name:	Lafarge Industries South Africa (Pty) Ltd
Trading as:	Lafarge Industries South Africa (Pty) Ltd
Type of Entity:	Company
Company Registration Number:	2005/033309/07
Registered Address:	35 Westfield Road, Longmeadow Business Estate Ext. 11, 1609
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Company Website:	www.lafarge.com
Industry Type/Nature of Trade:	Cement Production
Name of the Landowner/s or Landlord/s:	Mr James Kirkpatrick
Name of Mortgage Bondholder/s (if any):	Lafarge
Deeds Office Registration Number of Mortgage Bond:	TOIP0000000000270061, TOIP0000000000270071 TOIP0026000010240000
Land Use Zoning as per Town Planning Scheme:	Industrial

Report details

Project Name	**Sewage Management Plan Lafarge Lichtenburg 2022**
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Contents

Introduction

This Sewage Management Plan addresses operation, maintenance and environmental and safety regulations for operation of the Lafarge Industries' Waste Water Treatment Works (WWTW).

The layout of this Plan is as follows:

1. Introduction
2. Plant Background
3. Operation and Maintenance
4. Process Control Testing
5. Environment and Safety

A datasheet that needs to be completed on a frequent basis is included as an Annexure. The sheet can be used as a control document to assist keeping record of the WWTW.

The operation checklist (**Annexure)** must be completed to ensure all the necessary operations are performed and to keep record of deviations observed at the WWTW.

Plant Background

The Lafarge Industries' WasteWater Treatment Works is a biological treatment system consisting of trickling filters. Typically, settled sewage flow enters at a high level and flows through the primary settlement tank. The supernatant from the tank flows into a dosing device, often a tipping bucket which delivers flow to the arms of the filter. The flush of water flows through the arms and exits through a series of holes pointing at an angle downwards. This propels the arms around distributing the liquid evenly over the surface of the filter media. Most are uncovered and are freely ventilated to the atmosphere.

Both absorption and adsorption of organic compounds and some inorganic species (such as nitrite and nitrate ions) by the layer of microbial biofilm. The filter media is typically chosen to provide a very high surface-to-volume ratio. Typical materials are often porous and have considerable internal surface area, in addition to the external surface of the medium. Passage of the wastewater over the media provides dissolved oxygen, which the biofilm layer requires for the biochemical oxidation of the organic compounds and releases carbon dioxide gas, water and other oxidized end products. As the biofilm layer thickens, it eventually sloughs off into the liquid flow and subsequently forms part of the secondary sludge. Typically, a trickling filter is followed by a clarifier or sedimentation tank for the separation and removal of the sloughed film.

The fundamental components of a complete trickling filter system are:

- a bed of filter medium upon which a layer of microbial slime is promoted and developed;
- an enclosure or a container which houses the bed of filter medium;
- a system for distributing the flow of wastewater over the filter medium; and
- a system for removing and disposing of any sludge from the treated effluent.

To ensure the high efficiency and performance of Lafarge Industries' WWTW, several visual inspections/indicators and lab tests must be used as an indication of the efficiency of the system. Therefore, it is very important to keep record of these test results in order to make necessary adjustments to obtain the optimum quality of effluent.

Lafarge Industries Waste Water Treatment Works

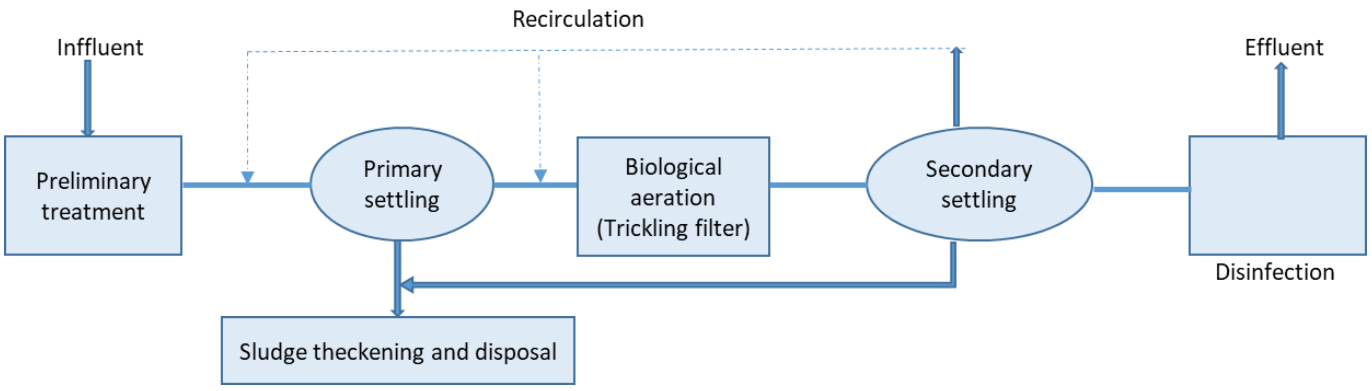

Figure 1: Waste Water Treatment Works schematic model

Primary settling tank

The primary settling tank removes large amounts of suspended and floatable materials before the wastewater enters the biological aeration phase. Removal of particles by sedimentation that rely on particle density, size etc. and retention time.

Primary settlement separates sludge and water that both go to secondary treatment.

- Sludge goes to anaerobic secondary treatment

- Water to aerobic/anaerobic treatment

Solids heavier than the water settle to the bottom of the tank and the material lighter than water floats to the top. These materials must be removed from the tank on a regular basis. Efficient operation of the primary settling tank is necessary to avoid organic overload of the biological treatment process following the primary treatment.

Trickling filter

A trickling filter is a type of wastewater treatment system consists of a fixed gravel bed media over which sewage or other wastewater flows downward and causes a layer of microbial slime to grow, covering the bed of media. Aerobic conditions are maintained by splashing, diffusion, and either by forced-air flowing through the bed or natural convection of air if the filter medium is porous.

Secondary aerobic treatment

The secondary settling tank is necessary to separate the biomass, which sloughs from the relatively clean wastewater. The permeable material allows for oxygen transfer, liquid flow and surface for microbial growth. Oxygen transfer is encouraged by differences in temperature between wastewater and air through draft tubes.

Plant operation and maintenance

Primary settling and Secondary settling tank

The floatable materials in the tank must be removed and disposed of on a frequent basis. Accumulations at the inlet and outlet of the tank must be removed on a frequent basis using a high pressure hose. Removal and disposal of the settled material in the tank must be performed once a year. The following observations described below must be executed on a frequent basis.

Observation frequency

The surface of the wastewater within the primary settling tank must be evaluated on frequent basis

Normal conditions

During normal and efficient operation of the primary settling tank, there may be large solids on the surface of the wastewater. No sludge is visible if the primary settling tank operates accurately.

Problems

Excessive accumulation of floatable materials can be caused due to overloading or insufficient cleaning frequencies. Floating sludge is a problem which may arise due to sludge becoming septic in the tank or excessive amounts of secondary sludge pumped back in the primary tank.

Corrective actions

If an excessive accumulation of solids is observed on the surface of the wastewater, it will be necessary to remove the floatable material more frequently. The frequency of sludge pumping must be reduced.

Settled material levels

Observation frequency

Observation of the sludge levels in the tank must be performed on a frequent basis.

Normal condition

The sludge blanket depth at the tank must be within desired levels (0-/+ 0.5m)

Problems

A very deep sludge blanket in the tank can cause undesired wastewater characteristics to be transported to the biological aeration.

Corrective actions

Reduce the secondary sludge return frequencies or increase the removal of the settled materials in the primary settling tank.

Flow distribution

Observation frequency

The flow distribution of the wastewater within the primary settling tank must be evaluated on a frequent basis.

Normal conditions

The flow in each of the different chambers must be equal and uniform in order to operate in normal conditions

Problems

Non-uniform flow throughout the entire tank will cause unsatisfactory operation of the tank . One of the reasons for non-uniform flow is sludge overload.

Corrective actions

More frequent removal of the floatable and settled material in the tank can solve this problem. A reduction in the sludge pumping frequency from the secondary tank can also assist in correcting the non-uniform flow.

Trickling filter

The design of a TF system for wastewater also includes a distribution system. Rotary hydraulic distribution is usually standard for this process, but fixed nozzle distributors are also being used in

square or rectangular reactors. Overall, fixed nozzle distributors are being limited to small facilities and package plants. Recently some distributors have been equipped with motorized units to control their speed. Distributors can be set up to be mechanically driven at all times or during stalled conditions.

Observation frequency

The rotation of the hydraulic distribution must be examined on a frequent basis.

Normal conditions

Smooth and uniform rotation of trickling filters indicates normal operation.

Corrective action

If abnormal conditions of the trickling filter are identified, the reason for the problem must be examined and corrective actions should be taken accordingly. If any mechanical problem is identified, it should be repaired as soon as possible.

Mechanical equipment

Observation frequency

The pump device must be examined on a frequent basis.

Normal conditions

Under normal operation conditions no extremely hard noises or excessive vibration will be noted

Problems

Abnormal operating conditions include unusual noise, vibration or pumping rate. This can be caused by clogging, mechanical failure or by improper maintenance.

Corrective actions

Examine the operation of the pump device, if clogging is observed, remove material that causes obstruction. If a mechanical failure is observed, repair or replace equipment as soon as possible.

Process control testing

Several tests must be performed to evaluate and control the Waste Water Treatment Works operation. All should be performed periodically to provide reference information for evaluation of performance. The following table summarises the routine sampling points and types of tests to perform to evaluate the operation of the WWTW.

Sampling point	Test
Influent	Dissolved oxygen, pH
	Total suspended Solids, Temperatures and Metals
Trickling filter (Biological aeration)	Speed of the rotation
Effluent	Dissolved oxygen, pH,
Process effluent	Dissolved oxygen, pH
	Total suspended Solids, Biochemical Oxygen Demand, Temperatures and Metals

Safety and Environment

The different processes within the wastewater treatment works can pose several hazards to the operators and the environment The wastewater treatment operators may be injured by falling on wet floors, falling into treatment tanks and by splashes of hazardous liquids. They are also exposed to hazardous chemical agents, these may cause acute poisoning, allergies, chronic diseases, etc.

Hazardous chemical agent spillages pose harm to the immediate receiving environments and leakages within the wastewater operation may cause environmental nuisance.

It is important for operators to adhere to all the safety measures put in place to associated to their duties and adhere to all the operating procedures to avoid safety and environmental incidents.