

Bad smells released by waste waters

How to fight against bad smells released by waste waters?



Treatment, collection and storage of industrial or urban residual waters create smelly composites. The bad smells can really disturb the neighborhood.

An odor results from aromatic volatile composites present in the air. During the biological fermentation process, smelly composites are delivered from the waste waters full of organic load. As a result, bad odors appear.

Many elements from the fermentation of the organic composites can lead to an important olfactory issue:

- ammonia and amino
- mercaptans and sulfurs
- volatile fat acid (VFA)
- aldehydes

Smelly odors appear when the fermentation process begins into a pond (due to a lack of oxygen). The odors appear when the oxygen consumed by the microbial activity becomes superior to the natural oxygenation capacity of a pond (I.e the oxygen exchange between the surface of a pond and the atmosphere).

Three factors are responsible for the oxygen consumption, consumed by the microbial activity: the microorganism's concentration into water, the water temperature and the biodegradable organic load concentration in the pond.

The natural oxygenation capacity of a pond depends on the surface of the basin, water and air temperatures as well as the atmospheric pressure.

An answer to the odor issues

An artificial aeration (via surface aerators) completes the natural oxygenation of the pond by increasing the quantity of oxygen dissolved in the pond and so leads to favorable conditions for the microbial respiration. As a result, bad smells are avoided.

It is important to care about the number of aerators you need as well as their power to optimize the water oxygenation.

Thanks to its experience in waste water treatment, FAIVRE has developed a wide range of aerators. This French society is recognized worldwide and has innovating solutions to resolve aeration and oxygenation issues and to resolve odors issue.

Case study: Sugar refinery Saint Louis Sucre (14)

Background

Since 1950, Saint Louis Sucre produces sugar in Cagny, Calvados (Basse-Normandie). Harvested from September to December, the beetroots receive different treatments to extract their juice and sugar. An important quantity of water is necessary all along this process. The water is recycled during the sugar fabrication and at the end of the production (in January) this water full of organic load and rainwater is poured into two ponds (23 000m³) where waters stagnate until the next harvest in the following autumn. Since 2012, Saint Louis Sucre has received complaints from their neighborhood because of olfactory issues due to waste water. In order to fix this problematic, Saint Louis Sucre called Faivre Group.



First study: the appearance of olfactory issue around the sugar refinery

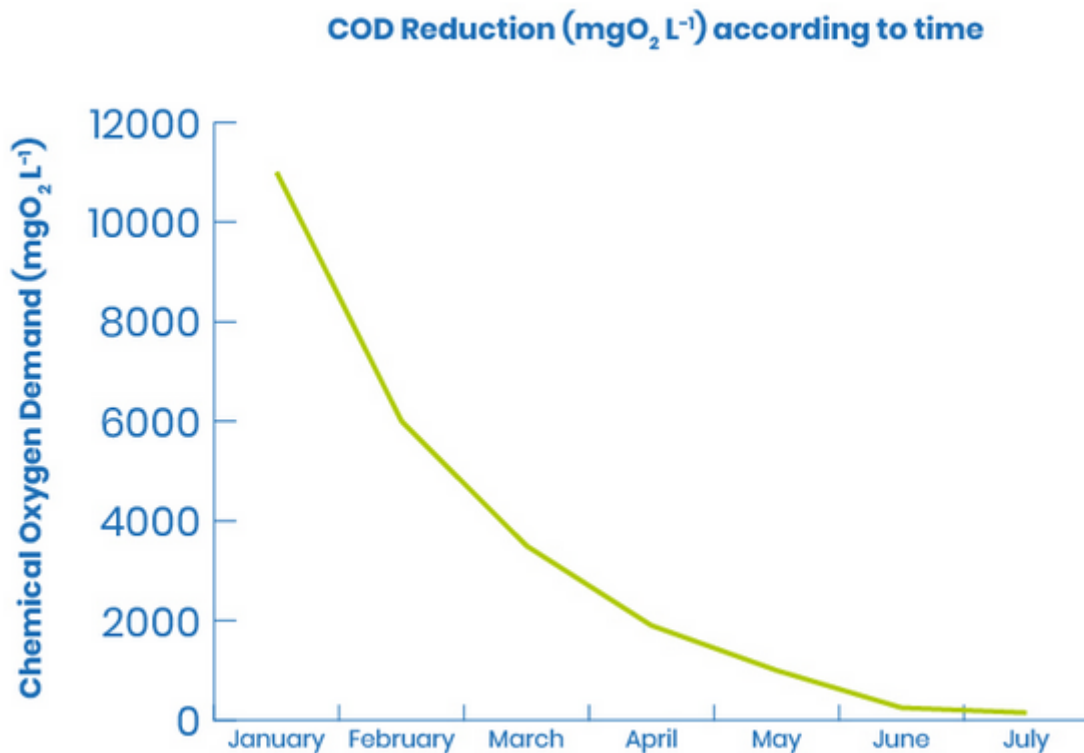
After the analysis of the sugar refinery context, FAIVRE made two assessments.

First, the complaints for bad smells resulted from the recent construction of a housing estate near the sugar refinery. The proximity between this new housing estate and Saint Louis Sucre exposed the inhabitants to most intense odors. Moreover, this phenomenon was emphasized by important winds coming from south/west-south. Those winds drove the smelly odors towards this part of the village.

Secondly, after a telephonic poll the society noticed that even if waters were stocked since January, bad smells were most present during summer. Two factors were responsible for this problematic:

- the heat which led to the organic load fermentation
- the augmentation of the inhabitants outside activities.

A temporal approach of the issue



A classic approach would have been to bring a higher oxygen supply when the odor issue appears in June. However, the high quantity of organic load of the ponds ($\text{DOC} = 10\text{g O}_2\text{L}^{-1}$) as well as the high temperatures of the air and water would need powerful aerators to bring the oxygen supply necessary.

The innovating approach developed by FAIVRE was to treat the issue before the apparition of bad smells by optimizing the degradation of the organic load as soon as the basins were fulfilled in January.

Indeed, an adapted aeration applied -when the basins are fulfilled- leads to the progressive decrease of the organic load during the first months of storage in cool period which then limits the oxygen supply when the outside temperatures increase in spring and especially in summer.

Considering the increase of the outside temperature and the increase of the organic load all along the storage period, FAIVRE estimated the oxygen supply into the basins.

- Without any treatment, the oxygen supply into the ponds double between January and April when the outside temperatures go from 5°C to 15°C .
- By settling powerful aerators in January, a reduction of 60% of the organic load in waters is waiting for April. It corresponds to the oxygen supply twice inferior to those

observed when there was an absence of treatment the same month. The aeration power is twice more feeble. This estimation of the oxygen supply in April is inferior to the oxygen supply in January.

These estimations show that a moderated oxygen supply, adapted to the oxygen supply in January might be enough to decrease the organic load all along the cool period even with a high initial load. When the temperatures become higher, the organic load might be low enough to let the oxygen supply inferior to those of January. Some aerators with moderated power might be sufficient to maintain a level of dissolved oxygen necessary to do not allow the fermentation process responsible for the olfactory problematic.

Solution

In addition to the surface aerators, FAIVRE Group also conceived every pond (surface, depth, etc) in order to estimate the length of electric cable necessary. Moreover, in its specifications, FAIVRE promised that the organic load would be reduced near 95% during summer period in order that the odors issue does not disturb the neighborhood.

FAIVRE also committed itself to deliver an operational installation for the next fulfillment of the basins to do not have olfactory issues the following summer.

FAIVRE found a quick and a ready for use solution.

Analysis after a year of exploitation

Thanks to the installation of the surface aerators in both ponds in Saint Louis Sucre, the organic load of the waste waters decreased from 98% the following summer. The reduction of the organic load was better than expected. Moreover, the neighborhood did not complain for olfactory issues anymore. The objectives fixed before the treatment have been reached. Finally, with this approach, the power necessary for the installation of the aerators are twice feeble than a classic approach because the treatment begins in cool period. FAIVRE's experience in aeration field leads to the resolution of the sugar refinery's olfactory issues.

Conclusion

Oxygenation via surface aerators is a solution adapted to odors problematic coming from the ponds or from residual waters full of organic load. Moreover, this method does not need chemical product and does not create negative impacts for the environment as well.

