WASTEWATER SMELL ABATEMENT

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1. INTRODUCTION

In glazed tile manufacturing processes, the most efficient way to reduce water consumption and minimise, or even suppress wastewater emissions, is by reusing the wastewater in the raw materials preparation stage for the tile body in wet milling processes.

However, when there is excess wastewater in relation to the water used as a raw material in body preparation, wastewater emissions can be avoided by reusing the water in cleaning operations or as a cooling agent. The most important constraint with regard to such wastewater reuse is usually the appearance of smells, a problem that is aggravated when recycling occurs in batch operations and when ambient temperature rises.

In view of this problem, it was decided to undertake a study on an industrial and laboratory scale to determine the main wastewater variables that affect smell production

and to establish the effectiveness of certain techniques for resolving this type of problem.

2. EXPERIMENTAL WORK

2.1. INDUSTRIAL-SCALE STUDY

In the first stage, the evolution with time was studied of various critical recycled wastewater parameters at different points in the company facilities, which were considered a problem in as far as the appearance of bad smells was concerned. The following locations were involved:

- Company wastewater treatment facility outside the production plant. A continuous measuring system (multiparametric probe) was installed for this purpose in one of the wastewater treatment facility tanks. The following parameters were determined continuously: temperature, dissolved oxygen, pH, conductivity and redox potential, while COD and sulphates were intermittently determined. Other parameters were also taken into account such as ambient temperature, visual appearance of the water (presence of algae, colour, etc.), with a view to determining their effect on the appearance of smells.

- Point inside the production plant where treated wastewater was used. The listel cutter was chosen, at which recycled water was used as a cooling agent. The study was performed by inserting the measuring element in the piping before the water outlet, and continuously determining temperature, dissolved oxygen, pH, conductivity and redox potential, while intermittently determining COD and sulphates.

After performing this industrial-scale study and analysing the data, it was decided to implement a series of actions in the production process and wastewater treatment to reduce the problem of smells. These actions were divided into three groups:

Actions in the production process: optimisation of water consumption in the cleaning stage, appropriate sizing of water collection tanks, minimising the quantity of water to be treated if the water could be directly reused in the same process, thus avoiding having large volumes of treated water in the wastewater treatment facility area, etc.

Low-cost treatment techniques: introduction of waterfall aeration systems, biological treatment with bacteria, use of plants for wastewater oxygenation, use of fish as biological indicators, etc.

Chemical treatment techniques: the effect was studied of using different disinfecting and oxidising chemical additives for treating wastewater smells (ozone, potassium permanganate, sodium hypochlorite, hydrogen peroxide, etc.).

2.2. LABORATORY-SCALE STUDY

The efficiency was assessed of different reagents used for treating industrial wastewater prior to the appearance of smells. The reagents involved were both typical

reagents employed in wastewater treatment in the ceramic industry (hydrogen peroxide and sodium hypochlorite) and reagents which, though less common, are also used in wastewater treatment (ozone and potassium permanganate).

Three types of water samples were used in the laboratory tests: distilled water (reference samples), samples of wastewater from the wastewater treatment facility, and samples of industrial water (a 50/50 mixture of treated water and well water). Each of these samples was treated with the reagents mentioned, determining the efficiency of the treatment by measuring dissolved oxygen, redox potential and performing olfactometric tests.

3. RESULTS AND CONCLUSIONS

- The determination of dissolved oxygen was found to be one of the most significant parameters in determining wastewater quality with regard to smell production.
- The joint application of preventive measures and low-cost treatment techniques was shown to be highly effective in wastewater smell abatement, without requiring an important capital outlay or sophisticated treatments.
- Continuous measurements inside one of the pipes through which the recycled wastewater was circulated indicated that when treated wastewater was allowed to stand (at weekend stoppages, etc.), the water rapidly degraded, lowering the dissolved oxygen to a few hours. To minimise smell production, treated wastewater should therefore not be allowed to stand, and oxidation should take place as close as possible to the points of use.
- Potassium permanganate, in the proportions and test conditions used, was the most efficient studied reagent, as the samples treated with this reagent exhibited fewer problems with regard to smell production and held dissolved oxygen levels in the water for a longer time after treatment.

4. REFERENCES

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