IAQ QUALITY SUSTAINABILITY AWARD - ONE-PAGE SUMMARY

The One-Page Summary should be in English and submitted as Appendix 1 to your Application. It will also be published on the IAQ Quality Sustainability Award Homepage; http://iaqaward.com. The length of this document must not exceed 1 page.

Project and contact details

The name of the quality sustainability project
Reduction of liquid wastes generated in copper transformation process

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Organization(s), country, where the project-members are working, including Web-page links
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Project description

Essence of the project: A method for treating liquid waste generated during the copper transformation process has been implemented using quality tools. This method reduces the volume of liquid waste and recovers water for reuse in the plant's processes. (Project start: 02/11/2021 and project end: 12/31/2022).

Problem statement: Tecnofil is a world-class Peruvian company with over 45 years of experience, specialized in transforming copper and its alloys, and carries out its activities with quality standards, social and environmental responsibility. In recent years, the company has added more production lines and encountered challenges in handling the growing volume of liquid waste generation. In 2018, 108.2 m^3 of liquid waste were generated, whereas in 2022, this figure increased to 287.6 m^3. Internally, 63.6% of these liquid wastes were treated using the coagulation-flocculation method, which involved the use of hazardous chemicals such as sodium hydroxide (NaOH) and ferric chloride ($FeCl_3$), while the remaining 36.4% was disposed of as hazardous liquid waste. This situation has had various consequences, including an increase in water consumption, an uptick in the use of hazardous chemical reagents, and prolonged exposure of workers to high-risk work environments.

Analysis performed: A root cause analysis of the problem was carried out, in which eight possible causes of the increase in liquid waste generation were identified. These causes were evaluated and it was concluded that "inadequate waste treatment method" is the main cause of the problem. Based on this information, a research was conducted on different methods of liquid waste treatment. The research revealed six potential treatment methods, out of which two were chosen for further evaluation because they met the criteria we were looking for: shorter treatment time, low cost, low complexity, and low operational risk. Subsequently, both methods underwent laboratory tests using various types of liquid waste generated at the plant. The test results demonstrated that the evaporation method could treat all liquid wastes. Furthermore, it had the capacity to recover water equivalent to 70% of the volume of the treated liquid waste, with the necessary quality for reuse in the plant's processes. After confirming the effectiveness of the evaporation method, the conceptual engineering of the project was developed and presented to the senior management, who approved it and allocated the necessary resources for its execution. Subsequently, the project was implemented. Following that, tests were conducted to ensure the best operating conditions. An operational instruction was also prepared, personnel received training, and operation records were established to ensure its functionality.

Methodology used: The Plan-Do-Check-Act (PDCA) methodology was used in the development of the project. To ensure systematic progress, the stages of this methodology were divided into seven steps. During the implementation, the planning stage required extensive analysis as there was insufficient information available about methods that could treat our liquid waste formed in lubricant and refrigerant emulsions. Consequently, laboratory tests were conducted to assess the feasibility of the methods.

Results achieved and in what way do they support the UN Sustainable Development Goals: 1. Reduction of liquid waste generation from 36.4% to 23.6% 2. Recovery and reuse of 448.4 m^3/year of water, 3. Reduction in the use of hazardous chemical reagents, 419.6 kg/year of NaOH and 2000 kg/year of $FeCl_3$ were no longer consumed, and 4. Improvement of working conditions in the area of liquid waste treatment, the worker currently does not need to handle or be exposed to hazardous chemical reagents, since the new treatment process is automatic. All these results align with three Sustainable Development Goals. Goal 6: Clean Water and Sanitation, Goal 8: Decent Work and Economic Growth, and Goal 12: Responsible Consumption and Production.

Quality methods used: The methods and tools used were: brainstorming, process flow diagram, nominal group technique matrix, decision matrix, Ishikawa diagram, Gantt chart, linear regression, and design of experiment using 3 factors.

Project leverage potential

The project can be implemented in other companies where the nature of their liquid waste consists of lubricant and refrigerant emulsions. Examples of these companies are the iron and steel and metalworking industries.

It is important to note that the application of this project depends mainly on the nature of the liquid waste. Consequently, before undertaking this type of project, it is necessary to carry out laboratory tests to verify whether the liquid waste generated by the industry can be treated using the evaporation method.

Picture/Image describing the project