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# A **Green** and Economic Approach Towards Aluminum Sludge Handling

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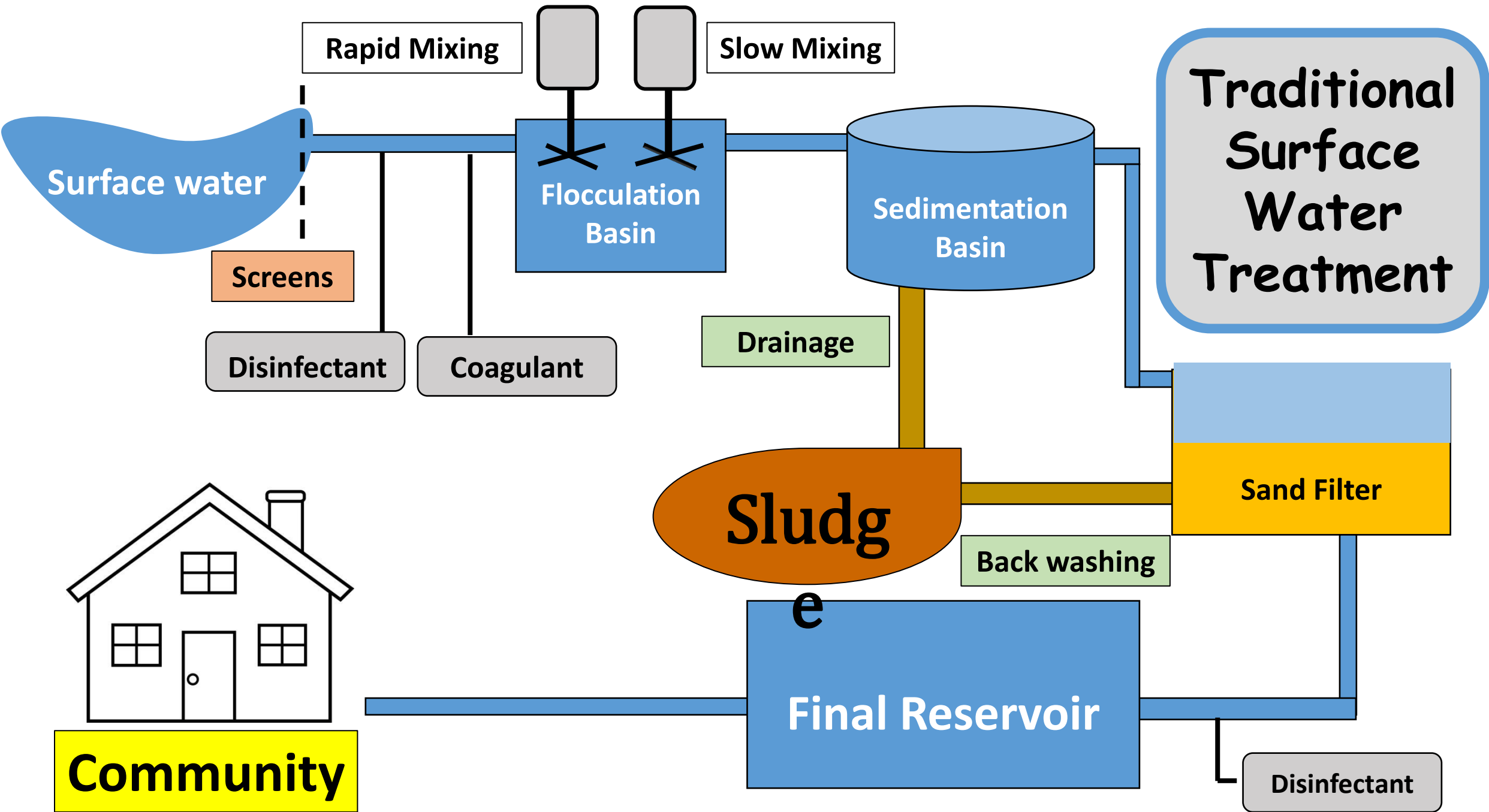
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# INTRODUCTION

- Aluminum Sludge is the common waste for drinking water production from surface water.
- In developing countries, the main sludge handling pathway is through disposal into waterways.
- No one can ignore the bad influence of aluminum sludge on the aquatic environment.
- Traditional sludge handling (thickening - drying - landfilling) shows an additional cost.



# INTRODUCTION

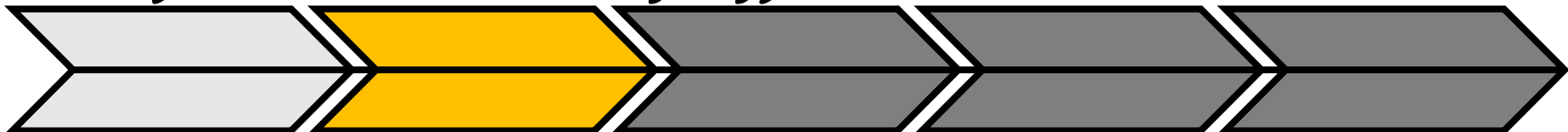
- Water treatment operators in low income lands show more attention to water production rather than environmental protection.
- Therefore, an innovative solution for sludge handling with an increase in water production and cost reduction will be a good trick to motivate decision makers indirectly to protect the environment.



# COAGULANTS RECOVERY FROM ALUMINUM SLUDGE

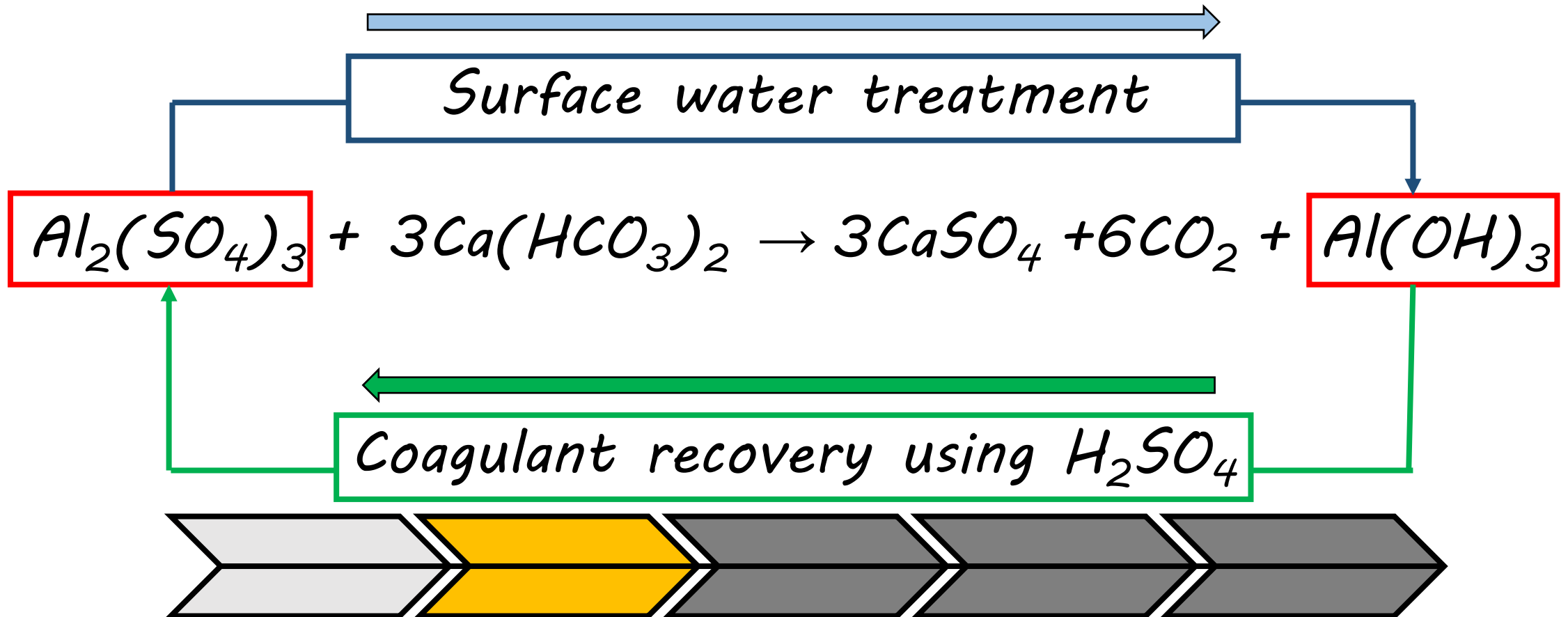
## Background

- Coagulants recovery was first introduced in 1960s as a good way for sludge handling and cost reduction.
- Recovery afterwards became a good media for research and studies to explore its different aspects.
- Many methods were proposed for coagulants recovery including (Acidification, basification, Donnan dialysis, ion exchanging)

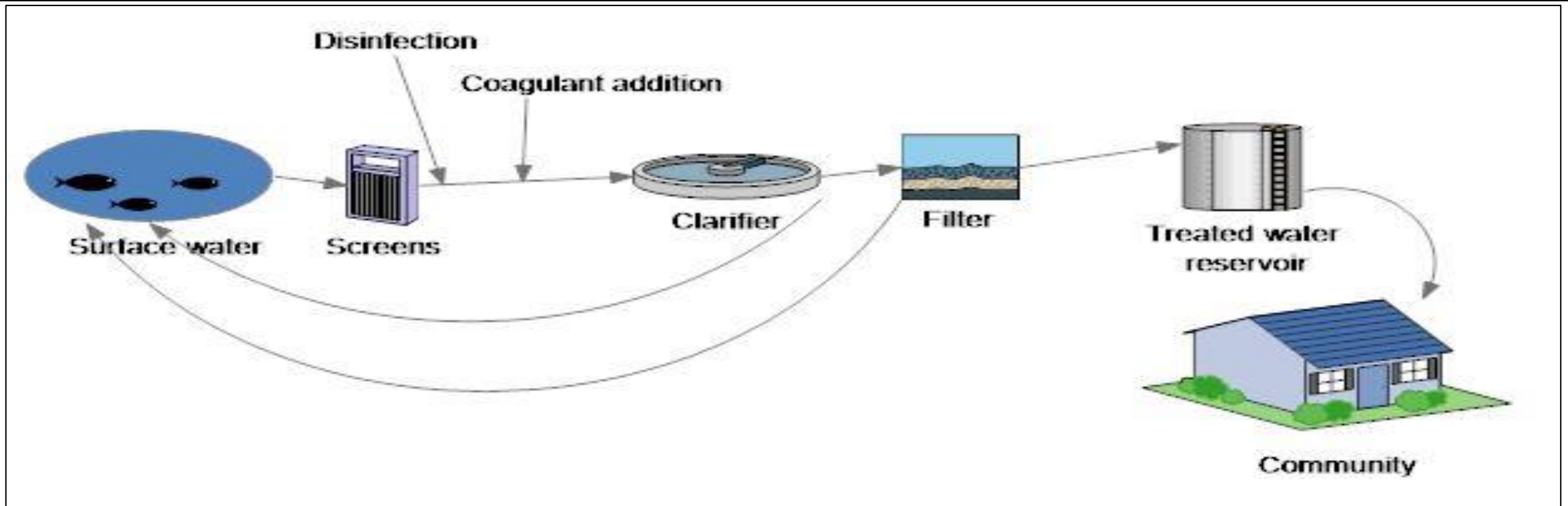


# COAGULANTS RECOVERY FROM ALUMINUM SLUDGE

## Basic Concept



# COAGULANTS RECOVERY FROM ALUMINUM SLUDGE

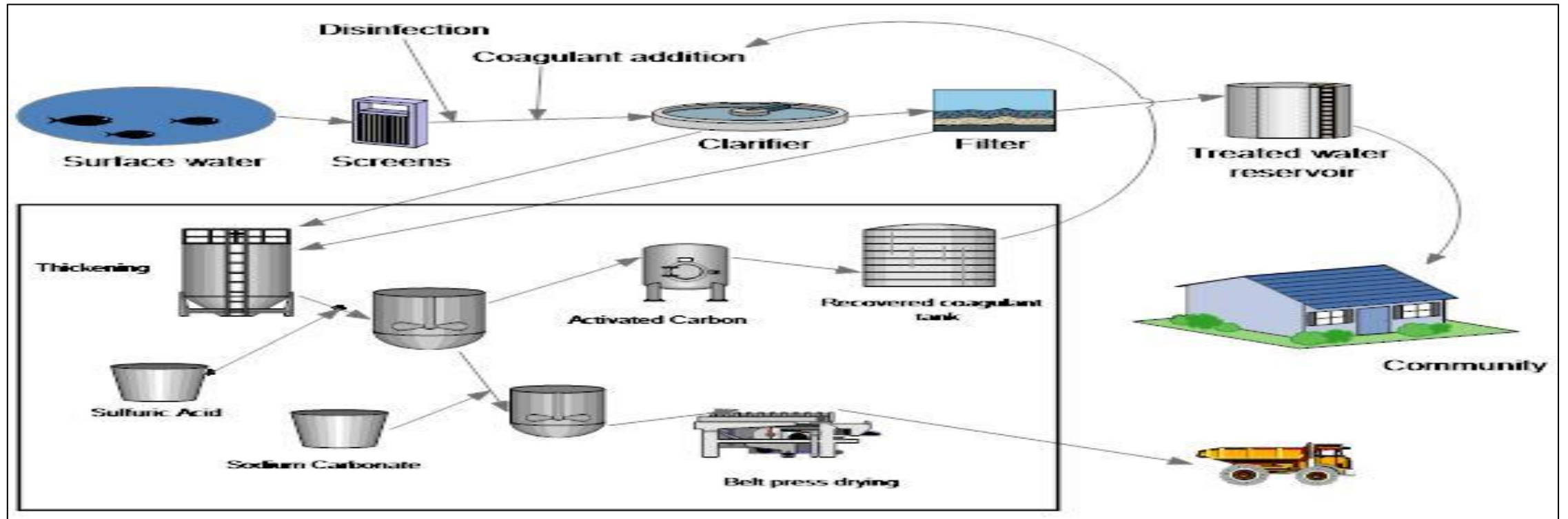


*Common sludge handling pathway*





# COAGULANTS RECOVERY FROM ALUMINUM SLUDGE



*Coagulants recovery in surface water treatment*



# COAGULANTS RECOVERY FROM ALUMINUM SLUDGE

## Cost

- Cost estimation for the recovery process is specific for each case.
- However, recent publications have reported the recovered coagulant to be cheaper than the virgin one.
- Our cost analysis in Egypt revealed that one cubic meter of recovered aluminum sulfate with 7% ( $Al_2O_3$ ) cost = 75 EGP Vs 104 EGP for the same percent of the commercially available alum.



# RECENT RESEARCH EFFORTS

- Recovery using acidification was reported as the most popular option as it shows the highest efficiency and the cheapest pathway for coagulants recovery from sludge.
- Recovery using acidification was reported to be a feasible option but with limited sequential recovery cycles.
- A purification step should be applied to the produced coagulant solution to assure sustainable and continuous recovery process.



# RECENT RESEARCH EFFORTS

- The coagulants recovery process is specific for each case depending on the raw water quality, sludge characteristics and the recovery conditions.
- A fresh coagulant could be advised to be used to refresh and enrich the quality of the recovered coagulants depending on the operating conditions.
- A strong quality monitoring program should be conducted to assure good recovery and optimum treatment for different pollutants.



# APPLICATION OBSTACLES

- Accumulation of different pollutants especially organic matter.
- The recovery process in some cases could be more expensive than using the commercially available coagulant.
- Extra load (training, cost, raw materials, electricity, management, etc...)
- Upper management and decision-makers support.



# CONCLUSIONS AND RECOMMENDATIONS

- Coagulants recovery and using in water treatment is considered a good choice for sludge handling and cost reduction.
- A purification step should be applied for the recovered coagulant solution especially if sequential recovery and usage is planned.
- A detailed feasibility study should be carried out for each case.



# CONCLUSIONS AND RECOMMENDATIONS

- A tight quality monitoring and control program should be designed and applied to assure good performance and quality.
- Recovered coagulant costs = fresh coagulant price + sludge handling and minimization.
- Good marketing and communication plan should be conducted and applied to increase the awareness about coagulants recovery.






# INVITATION FOR READING AND CITATION

- Fouad, M. M., El-Gendy, A. S., & Razek, T. M. (2017). Evaluation of leached metals in recovered aluminum coagulants from water treatment slurry. *Water Science and Technology*, 75(4), 998-1006.
- Fouad, M. M., Razek, T., & Elgendy, A. S. (2017). Utilization of Drinking Water Treatment Slurry to Produce Aluminum Sulfate Coagulant. *Water Environment Research*, 89(2), 186-191.
- Fouad, M. M., El-Gendy, A. S., & Razek, T. M. (2017). Evaluation of sludge handling using acidification and sequential aluminum coagulant recovery: case study of El-Sheikh Zayed WTP. *Journal of Water Supply: Research and Technology-Aqua*, jws2017039.



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*Thank You*