WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A Review on Disposal & Recovery Methods of Sludge from Chemical and Natural Coagulants

Keerthi S[1], Dr. D. Bhuvaneshwari[2], Dr. A. Kumar[3], Mr. P. Vignesh[4]

[1]M.E., Environmental Engineering, RVS Technical Campus, Coimbatore, India
[2]Assistant Professor, Department of Civil Engineering, RVS Technical Campus, Coimbatore, India
[3]Head of the Department, Department of Civil Engineering, RVS Technical Campus, Coimbatore, India
[4]Assistant Professor, Department of Civil Engineering, RVS Technical Campus, Coimbatore, India
Email: **samykeerthi81@gmail.com**

ABSTRACT

Sludge from water treatment is a major challenge. Its properties depend on the type of coagulant used. Chemical coagulants like alum and PAC produce sludge that is heavy in metals and hard to biodegrade, while natural coagulants like plant-based materials produce organic sludge that is easier to treat. This review explains the characteristics of both types of sludge, their disposal methods, and ways to recover useful products. Chemical sludge is best for thermal treatment and coagulant recovery, while natural sludge works well for composting and biogas production.

Introduction

Water treatment plants use coagulants to remove impurities, but this creates sludge that must be managed safely. If not handled properly, sludge can pollute soil and water. The type of coagulant—chemical or natural—decides how the sludge can be treated. This review compares disposal and recovery methods for both types to find sustainable solutions.

Characteristics of Sludge

Chemical Coagulant Sludge

- Contains metals like aluminum and iron.
- Low biodegradability.
- Good settling properties, but heavy and dense.
- Can be burned for energy because of its high heating value.

Natural Coagulant Sludge

- Mostly organic matter.
- High biodegradability.
- Rich in nutrients like nitrogen and phosphorus.
- Safer for composting and land application.

Disposal Methods

Chemical Sludge

- **Landfilling:** Needs stabilization to prevent leaching.
- **Incineration:** Burns sludge to reduce volume and recover energy; ash can be used in bricks or cement.
- **Solidification:** Mixing with lime or cement for safe disposal.

Natural Sludge

- **Composting:** Converts sludge into organic fertilizer; can be done in windrows or closed vessels.
- **Anaerobic Digestion:** Produces biogas and nutrient-rich digestate.
- **Land Application:** Safe if tested for pathogens and metals.

Reuse & Recovery

Chemical Sludge

- **Coagulant Recovery:** Acid treatment of alum sludge produces reusable coagulant (SRP).
- **Material Reuse:** Ash from incineration can be used in construction.
- **Phosphorus Recovery:** Extracted from ash for fertilizer.

Natural Sludge

- **Compost:** Improves soil fertility.
- **Biogas:** Renewable energy from anaerobic digestion.
- **Digestate:** Used as biofertilizer.

Conclusion

Chemical sludge is best treated by thermal methods and coagulant recovery, while natural sludge is ideal for composting and biogas production. Choosing the right method reduces environmental risks and turns waste into useful resources. Future work should focus on cost-effective technologies and combining chemical and natural coagulants for better sludge management.

References

1. Jai Prakash Kushwaha, Vimal Chandra Srivastava, Indra Deo Mall (2010). *Treatment of dairy wastewater by inorganic coagulants: Parametric and disposal studies.* **Water Research**, 44: 5867–5874.
2. Tarique Ahmad, Kafeel Ahmad, Abdul Ahad, Mehtab Alam (2016). *Characterization of water treatment sludge and its reuse as coagulant*. **Journal of Environmental Management**, 182: 606–611.
3. Astha Kumari, Nityanand Singh Maurya, Abhishek Kumar, Rajanee Kant Yadav, Amit Kumar (2023). *Options for the Disposal and Reuse of Wastewater Sludge, Associated Benefit, and Environmental Risk.* IntechOpen Chapter.
4. P. Santhosh (2013). *A Pilot-Scale Study on In-Vessel Composting of Organic Waste Using Mechanical Forced Aeration.* **Journal of Chemical, Biological and Physical Sciences**, 3(4): 2885–2894.
5. K. Rasappan, A. Kumar, P. Santhosh (2015). *Studies on Sugarcane Pressmud and Distillery Waste as a Biofertilizer through Composting.* **International Journal of Chemical Sciences**, 13(3): 1333–1344.
6. A. Kumar, K. Rasappan, P. Santhosh (2016). *Synthesis of Biogas as a Renewable Energy from Organic Waste Mixture by Anaerobic Fermentation.* **Nature Environment and Pollution Technology**, 15(2): 437–442.