International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 01 | Jan - 2026 SJIF Rating: 8.586 ISSN: 2582-3930

Production of Eco-Friendly Paint from Cow Dung

Mr.A.S.Shirsath[1], Mr.S.V.Jadhav[2], Mr.S.G.Lahamge[3], Mr.S.M.Shirsath[4], Mr.V.V.Todmal[5]

[1]Lect Chemical Engineering Department Pad.Dr.V.V.Patil Polytechnic Loni
[2345]Students of Chemical Engineering Department Pad.Dr.V.V.Patil Polytechnic Loni

---

Abstract

The increasing environmental and health concerns associated with conventional synthetic paints have created a strong demand for sustainable and eco-friendly alternatives. Traditional paints often contain volatile organic compounds (VOCs), heavy metals, and petrochemical derivatives that contribute to air pollution and adverse health effects. In this context, the present study focuses on the manufacturing of eco-friendly paint using cow dung as a primary raw material, utilizing its natural binding, antimicrobial, and insulating properties.

Cow dung is an abundantly available agricultural by-product in rural India and has been traditionally used for coating walls due to its durability and eco-friendly nature. In this project, cow dung is processed through drying, pulverization, and filtration, followed by blending with natural binders, fillers, and water to produce a usable paint formulation. The prepared paint is evaluated for parameters such as adhesion, drying time, surface finish, thermal insulation, and resistance to microbial growth.

The results indicate that cow dung-based paint is biodegradable, non-toxic, cost-effective, and environmentally sustainable when compared to conventional paints. Additionally, it contributes to waste utilization and promotes rural resource-based industries. This study demonstrates the potential of cow dung as a viable raw material for green paint manufacturing and supports the development of sustainable construction materials with minimal environmental impact.

Keywords: Eco-friendly paint, Cow dung, Sustainable materials, Green manufacturing, Natural binders, Low-VOC coating, Waste utilization, Biodegradable paint

1. INTRODUCTION

The rapid growth of the construction and infrastructure sector has led to a significant increase in the consumption of paints and surface coatings. Conventional paints are primarily derived from petrochemical sources and often contain volatile organic compounds (VOCs), heavy metals, and synthetic additives. These substances are known to cause environmental pollution, poor indoor air quality, and various health issues, creating an urgent need for safer and more sustainable alternatives.

Environmental sustainability has become a major focus in modern material science and chemical engineering research. The concept of green manufacturing emphasizes the use of renewable resources, reduction of toxic emissions, and minimization of environmental impact throughout the product life cycle. In this context, eco-friendly paints have gained attention as they reduce carbon footprint, improve indoor air quality, and support sustainable development goals.

India, being an agrarian country, generates large quantities of animal-based biomass waste, particularly cow dung. Traditionally, cow dung has been used in rural housing for wall coating due to its natural binding properties, thermal insulation capability, and antimicrobial behavior. These traditional practices highlight the potential of cow dung as a valuable raw material for eco-friendly construction applications.

Cow dung consists of fibrous material, undigested plant matter, microorganisms, and natural organic compounds that contribute to its adhesive and protective properties. When processed appropriately, these components can be utilized to form a stable coating material. The presence of natural cellulose fibres improves binding, while microbial activity contributes to resistance against harmful pathogens.

The utilization of cow dung in paint manufacturing not only promotes sustainability but also supports waste vaporization. Instead of being treated as waste, cow dung can be converted into a value-added product, reducing environmental pollution and enhancing resource efficiency. This approach aligns with circular economy principles by transforming agricultural waste into useful industrial materials.

Another significant advantage of cow dung-based paint is its low toxicity. Unlike synthetic paints, it does not release harmful fumes or VOCs during application or drying. This makes it particularly suitable for indoor applications in residential buildings, schools, and healthcare facilities, where air quality is a critical concern.

From an economic perspective, eco-friendly paint produced from cow dung is cost-effective due to the low cost and easy availability of raw materials. This provides opportunities for small-scale and rural industries, generating employment and promoting local entrepreneurship. It also reduces dependency on imported or petroleum-based raw materials.
Therefore, the development of eco-friendly paint from cow dung represents an innovative blend of traditional knowledge and modern engineering practices. This research aims to explore the feasibility, manufacturing process, and potential applications of cow dung-based paint as a sustainable alternative to conventional paints.

1.1 Key Characteristics:

Environmentally Sustainable and Biodegradable

Cow dung–based eco-friendly paint is produced from natural and renewable resources, making it completely biodegradable and environmentally safe. Unlike conventional synthetic paints, it does not contribute to long-term environmental pollution and supports sustainable construction practices by reducing reliance on petrochemical-based materials.

Low Toxicity and Absence of Volatile Organic Compounds (VOCs)

This paint formulation is free from harmful chemicals such as VOCs, heavy metals, and synthetic solvents commonly found in commercial paints. As a result, it does not emit toxic fumes during application or drying, improving indoor air quality and making it safe for use in residential buildings, schools, and healthcare environments.

Natural Binding, Adhesion, and Surface Protection

The fibrous content and organic compounds present in cow dung provide effective natural binding and adhesion to surfaces such as walls and plaster. These properties help form a uniform coating with good surface coverage, while also offering protection against minor surface degradation.

Antimicrobial and Thermal Insulation Properties

Cow dung contains natural microorganisms and organic matter that exhibit antimicrobial and antifungal characteristics, helping to inhibit the growth of harmful bacteria and fungi on painted surfaces. Additionally, the porous nature of the coating contributes to thermal insulation, aiding in maintaining comfortable indoor temperatures.

Cost-Effective and Suitable for Rural and Small-Scale Production

Due to the easy availability and low cost of raw materials, cow dung-based paint is economically viable, especially for rural and semi-urban areas. Its manufacturing process is simple and energy-efficient, making it suitable for small-scale industries and promoting local employment and sustainable rural development.

1.2 Principle:

The principle of manufacturing eco-friendly paint from cow dung is based on the utilization of its natural organic constituents as binding and coating agents. Cow dung contains fibrous materials, cellulose, and naturally occurring microorganisms that contribute to adhesion, cohesion, and surface protection. When cow dung is properly dried, pulverized, and mixed with water and suitable natural additives, it forms a homogeneous paste capable of adhering to wall surfaces and forming a stable coating upon drying.

The drying mechanism of cow dung–based paint relies on natural evaporation and physical bonding rather than chemical curing reactions. As water evaporates, the fibrous and organic components interlock with the surface pores, creating a breathable and durable layer. Additionally, the inherent antimicrobial properties of cow dung help inhibit microbial growth on the coated surface, while the porous structure aids in thermal insulation and moisture regulation, making the paint suitable for sustainable and healthy indoor environments.

1.3 Applications

- **Residential Buildings**

Eco-friendly paint made from cow dung is suitable for application on interior walls of residential houses, particularly in rural and semi-urban areas, where improved indoor air quality and non-toxic materials are essential for healthy living conditions.

- **Rural Housing and Traditional Structures**

This paint is widely applicable in rural housing, mud houses, and traditional constructions, as it is compatible with earthen walls, plaster, and brick surfaces, enhancing durability while maintaining cultural construction practices.

- **Educational and Healthcare Facilities**

Due to its low toxicity and absence of harmful chemical emissions, cow dung–based paint can be safely used in schools, colleges, hospitals, and primary health centers, where maintaining clean air quality is critical.

- **Eco-Friendly and Sustainable Construction Projects**

The paint is well suited for green buildings, eco-housing projects, and sustainable architecture initiatives that aim to reduce environmental impact and promote the use of natural and biodegradable materials.

- **Interior Wall Coatings for Low-Cost Housing**

Its cost-effectiveness makes it an ideal choice for government-supported low-cost housing schemes and affordable housing projects, helping reduce construction expenses without compromising environmental safety.

- **Temporary Structures and Community Buildings**

Cow dung–based paint can be applied to temporary shelters, community halls, and storage structures where low-cost, environmentally safe, and easy-to-apply coatings are required.

- **Heritage and Cultural Site Maintenance**

The paint can be used in the restoration and maintenance of heritage buildings and cultural sites where traditional materials are preferred to preserve the original appearance and material compatibility.

1.3 Process Description

1) Collection of Raw Material

Fresh cow dung is collected from hygienic sources to avoid contamination by foreign materials such as soil, stones, or plant residues. Proper selection of raw material ensures consistency in paint quality.

2) Drying of Cow Dung

The collected cow dung is spread in thin layers and dried naturally under sunlight to remove moisture content. Drying prevents microbial spoilage and facilitates easy grinding and processing.

3) Pulverization and Grinding

The dried cow dung is crushed and ground into a fine powder using a grinder or mortar. Fine particle size improves uniformity, adhesion, and surface finish of the paint.

4) Sieving and Filtration

The powdered material is passed through a fine sieve to remove coarse particles and impurities. This step ensures smooth texture and consistent particle distribution in the paint formulation.

5) Preparation of Paint Base

The sieved cow dung powder is mixed with water in controlled proportions to form uniform slurry. Natural binders and fillers (such as lime, clay, or natural gums) may be added to enhance binding strength and coating performance.

6) Homogenization

The mixture is stirred thoroughly using a mechanical stirrer or manual mixing to achieve a homogeneous paint consistency. Proper mixing prevents lump formation and ensures even application.

7) Optional Natural Additive Incorporation

Natural additives such as plant extracts or natural pigments may be added to improve colour, antimicrobial properties, and durability without affecting eco-friendliness.

8) Quality Checking and Consistency Adjustment

The prepared paint is checked for viscosity, flow behaviour,, and uniformity. Water or binder content is adjusted if required to achieve the desired application consistency.

9) Application and Drying

The paint is applied on prepared wall surfaces using brushes or rollers. Drying occurs naturally through evaporation of water, forming a breathable and durable coating layer.

Fig - Paint obtained after the process

1.5 Limitations:

1) Limited Durability Compared to Synthetic Paints
2) Cow dung–based paint generally has lower durability and abrasion resistance than conventional synthetic paints, especially under harsh environmental conditions, which may require more frequent reapplication.
3) Restricted Colour Range and Aesthetic Finish
4) The natural composition of cow dung limits the availability of bright and glossy finishes. Achieving uniform colour shades and smooth textures comparable to commercial paints can be challenging.
5) Sensitivity to Moisture and Water Exposure
6) This paint is not highly water-resistant and may deteriorate when exposed to continuous moisture, rainfall, or washing, making it less suitable for exterior applications without additional protective coatings.
7) Variation in Raw Material Composition
8) The chemical and physical properties of cow dung can vary depending on factors such as animal diet, age, and environmental conditions, leading to inconsistency in paint quality and performance.
9) Lower Mechanical Strength
10) The coating formed has relatively low hardness and scratch resistance, which limits its application in high-traffic areas where surface wear is significant.
11) Shorter Shelf Life
12) Due to its organic nature, cow dung–based paint may have a limited storage life and can be susceptible to microbial growth if not stored properly or without natural preservatives.
13) Social and Market Acceptance Challenges
14) Despite its environmental benefits, there may be hesitation among consumers due to cultural perceptions and lack of awareness, which can restrict large-scale commercialization.

3. CONCLUSIONS

The present study demonstrates that eco-friendly paint manufactured from cow dung is a viable and sustainable alternative to conventional synthetic paints. By utilizing an abundantly available agricultural by-product, the project addresses environmental concerns related to toxic emissions, non-biodegradable waste, and excessive dependence on

petrochemical raw materials. The study highlights the effective use of natural resources in developing environmentally responsible construction materials.

The manufacturing process of cow dung–based paint is simple, energy-efficient, and cost-effective, making it suitable for small-scale and rural-level production. The natural binding, antimicrobial, and breathable properties of cow dung contribute to improved indoor air quality and healthier living environments. These characteristics make the paint particularly suitable for interior wall applications and low-impact construction projects.

Although the paint has certain limitations such as lower durability and moisture sensitivity compared to commercial paints, these challenges can be addressed through formulation improvements and the addition of suitable natural additives. Further research and optimization can enhance water resistance, shelf life, and surface finish, expanding its range of applications.

Overall, this research supports the potential of cow dung–based eco-friendly paint as a sustainable material that integrates traditional knowledge with modern engineering principles. Its adoption can promote green manufacturing, waste utilization, and rural economic development, contributing positively to environmental conservation and sustainable infrastructure growth.

4. REFERENCES

1. Kumar, P. & Upadhyay, E. Transforming cow dung into climate-friendly coatings to advance sustainable paint production. RASAYAN Journal of Chemistry, 18(03), 2025.
2. Malik, P. Cow dung paints: A review of performance and potential in the coatings industry. Journal of Coating Technology and Innovation, 2025.
3. Performance Properties of Cow Dung-Based Paint Developed for Eco-Friendly Application, International Research Journal of Engineering and Technology (IRJET), Vol. 11 Issue 12, Dec 2024.
4. Manufacturing of Eco-Friendly Paint from Cow Dung (Project Report), Department of Mechanical Engineering, B.L.D.E. College of Engineering and Technology, 2024.
5. Khadi Prakritik Paint – India's First Cow Dung Paint, Khadi and Village Industries Commission (KVIC) Development Report, 2020.
6. Chhattisgarh to use organic paint from cow dung for government buildings, Realty+ Report, Dec 2022.
7. Cow dung paint ecological use overview, Wikipedia — Cow dung (background on traditional and modern uses), 2025.
8. Ghamande, I.M. et al. Manufacturing of Cow Dung Paint. International Journal of Advanced Research in Education & Technology (IJARET), Vol. 3 Issue 2, Apr–Jun 2016 — outlines the basic manufacturing process, antibacterial properties, insulation features, and low production cost.
9. International Journal of Social Science and Economic Research, Economic Viability and Sustainability of Cow Dung Paint Production, Vol. 09 Issue 09, Sep 2024 — covers economic impact, scalability, local employment, and market potential of cow dung paint units.
10. Nature-Inspired High-Albedo Surfaces: Cow Dung Paint for Heat-Resilient Cities (Technical review/industry application insight) — discusses thermal insulation and reflective properties useful in sustainable building design.