SUMMER INTERNSHIP REPORT – 2024

BUREAU OF INDIAN STANDARDS (BIS)

HEADQUARTERS, NEW DELHI

TOPIC – PRE-STANDARDISATION REPORT ON INDIAN STANDARD IS-12767:1989 (LIQUID SOAP FOR CLEANING PAINTED SURFACES)

DEPARTMENT - CHEMICAL DEPARTMENT

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ACKNOWLEDGEMENT

I want to sincerely thank Mr. Ajay K. Lal, Mr. Virendra Singh, and the Bureau of Indian Standards, Delhi team for their unwavering support, direction, and outstanding mentoring, all of which have enhanced my internship experience. Your extraordinary skill and unwavering commitment have permanently altered my understanding of CHD-25.

Being a part of BIS Delhi's internship program has been an honor and a privilege. I would want to sincerely thank all of the BIS team for making me feel welcome and for creating a friendly workplace.

I would be overjoyed to assist incoming ICT students in locating continuous internship opportunities that would connect their coursework with real-world experience.

With the greatest respect and gratitude,

By Nikil Satpute

CONTENT

ABOUT BUREAU OF INDIAN STANDARDS (BIS)

The Bureau of Indian Standards (BIS) is the national standardization body of India. It operates under the Ministry of Consumer Affairs, Food and Public Distribution, and is responsible for the development, implementation, and promotion of standards across various sectors in the country.

Established in 1986, BIS operates under the BIS Act, 1986, which empowers it to formulate and revise Indian standards in consultation with stakeholders from industry, government, academia, and consumer organizations. The primary objective of BIS is to ensure quality, safety, and reliability of products, processes, and services to protect consumer interests and promote trade and industry.

ACTIVITIES IN WHICH BIS IS INVOLVED

- Standards Formulation
- Product Certification Scheme
- Compulsory Registration Scheme
- Foreign Manufacturers Certification Scheme
- Hall Marking Scheme
- Laboratory Services
- Laboratory Recognition Scheme
- Sale of Indian Standards
- Consumer Affairs Activities
- Promotional Activities
- Training Services, National & International level
- Information Services

VISION

The Bureau of Indian Standards (BIS), the National Standards Body of India, resolves to be the leader in all matters concerning Standardization, Certification, and Quality. To attain this, the Bureau would strive:

- To provide efficient, timely service.
- To satisfy the customer's needs for quality of goods and services.
- To work and act in such a way that each task performed as individuals or as a corporate entity, leads to excellence and enhances the credibility and image of the Organization.

MISSION

We dedicate ourselves to achieve excellence for effective and timely implementation of the objectives laid down in the Bureau of Indian Standards Act, and providing prompt and efficient services to all stakeholders.

ABOUT NATIONAL INSTITUTE OF TRAINING FOR STANDARDIZATION (NITS)

The National Institute of Training for Standardization (NITS) is a specialized institution dedicated to promoting and enhancing the understanding and implementation of standards in India. Established with the objective of building capacity and expertise in the field of standardization. NITS operates under the guidance of the Bureau of Indian Standards (BIS) and works closely with various stakeholders including industries, government bodies, and educational institutions. NITS offers a wide range of training programs, workshops, and certification courses to professionals, technicians, and other stakeholders to foster a culture of standardization and quality assurance in different sectors. By providing valuable knowledge and skills related to standards, NITS contributes to the overall development and competitiveness of Indian industries while ensuring the safety, reliability, and sustainability of products and services in the market.

The National Institute of Training for Standardization (NITS) offers a variety of training programs aimed at building knowledge and skills related to standardization.

⇒ Introduction to Standardization: This module provides an overview of standardization, its importance, and the role it plays in various industries and sectors. It covers the basics of standardization, including its benefits, principles, and processes.

⇒Standards Development: This module focuses on the process of developing standards. It covers the stages involved in standard development, including research, developing, consultation, and finalization. Participants learn about the roles and responsibilities of standardization bodies and stakeholders in the development of standards.

⇒ Quality Management Systems: This module delves into the concepts of quality management systems (QMS) and their implementation.

⇒Product Certification: This module discusses the process of product certification and conformity assessment. It covers the requirements for obtaining product certification, understanding conformity assessment procedures, and ensuring compliance with relevant standards and regulations.

⇒Metrology and Measurement: This module focuses on the principles and practices of metrology, which is the science of measurement. It covers topics such as units of measurement, calibration, measurement uncertainty, and traceability.

⇒Regulatory Frameworks: This module provides an overview of the regulatory frameworks related to standardization at national and international levels. It covers the legal and regulatory aspects of standardization, including the roles of regulatory authorities, conformity assessment bodies, and the harmonization of standards.

⇒ Sector-Specific Standards: Depending on the training program's focus, specific modules may be included to cover standards and regulations applicable to particular sectors such as healthcare, food safety, environmental management, information technology, or automotive industry.

⇒ Case Studies and Practical Exercises: Training programs may include case studies and practical exercises to reinforce the understanding of concepts and their practical application. Participants may work on real-life scenarios, analyze standards-related challenges, and develop strategies for implementation.

ABOUT CHD-25 (Soaps, Detergent and Surface Active Agents)

Member Secretary: Mr. Virendra Singh

Scope: To formulate Indian Standards for:

i) Terminology, methods of sampling and characterization of Surfactants.
ii) Packaging and Marking of Product.
iii) Characterization Tests for Sample and Raw Materials.

SUBJECT AREA

The Indian Standard IS 12767: 1989 describes the requirement of liquid soap for cleaning painted surfaces, which was created especially for Indian Soap Industries related to surfactants. Its main objective was to provide specification to Liquid soap for cleaning painted surfaces which is different from other soaps since it is used primarily for cleaning the surfaces like internal and external carriage of railways and ships. hips. It may also be used for cleaning wooden floors, painted panels upholstery and also marble and mosaic floors.

For the purpose of deciding whether a particular requirement of this standard is complied with. the final value, observed or calculated, expressing the result of a off in accordance with IS 2: 1960, 'Rules for analysis, shall be rounded test or rounding off numerical values (revised). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

It establishes guidelines for the formulation, application, and performance of liquid soaps designed for cleaning painted surfaces. Also, providing background information on the necessity for specialized cleaning agents specifically formulated for painted surfaces. This will highlight the significance of maintaining the integrity and appearance of painted surfaces, whether in residential, commercial, or industrial settings. Ingredients used in the formulation of liquid soaps for painted surfaces. It will describe the functional roles of these ingredients in effectively cleaning without damaging the paint. Furthermore, this section will address safety considerations for users, highlighting any potential hazards and the measures taken to mitigate them. The environmental impact of the ingredients, including their biodegradability and eco-friendliness, will also be discussed.

The methods used to test the performance of these cleaning agents, ensuring they meet the required standards. Give detailed usage instructions for achieving optimal cleaning results. It will recommend best practices for applying liquid soap, emphasizing precautions to avoid damaging painted surfaces. This will also suggest suitable tools and equipment for effective application, ensuring that users can achieve the best possible results.

LITERATURE REVIEW:

Cleaning is one of the most important, delicate, and at the same time controversial processes in the conservation treatment of paintings. Although a strict definition of cleaning would be the removal of dirt, grime, or other accretions (surface cleaning), in the conservation field, cleaning is used in the broader meaning to include thinning/removing altered or “unwanted layers” of materials without damaging or altering the physicochemical properties of the surfaces to be preserved. The cleaning of unvarnished paintings is one of the most critical issues that are currently discussed. Several studies exist regarding different cleaning tools, such as gels, soaps, enzymes, ionic liquids, and foams, as well as various dry methods and lasers, but only a few have been performed on the risk associated with the use of water and organic solvents for the cleaning treatments in relation to the original paint binder.

In traditional procedures, the cleaning of the painted surface is carried out through organic solvents (to obtain solubilization) and mechanical action. The greatest drawback is the poor

selectivity of organic solvents, but there is also the risk of dirt redistribution when using solvents. Moreover, they have a low environmental safety. The use of a pure solvent may cause detrimental effects: swelling or leaching of binders and varnishes. Polymers like some cellulose ethers increase the viscosity of polar solvents and form gels, thus controlling diffusion onto and under the treated surface. Unfortunately, only the most polar solvents (i.e., alcohols and their mixtures) can be gelled; in addition, the adhesiveness of the gelling material can lead to permanence of residual materials on the surface, even when a proper post treatment rinsing is carried out (Cremonesi 2004). More recently, the American conservation scientist and restorer Richard Wolbers has proposed the use of higher-viscosity solvent-surfactant gels, based on thickeners derived from polyacrylic acid (i.e., Carbopols® and Pemulens®) which possess less adhesive power and are more easily cleared off from the surface (Wolbers 1990, 2000).

Introduction

Maintaining the aesthetic and structural integrity of painted surfaces requires effective and gentle cleaning methods. Liquid soap is commonly used due to its ease of application, effectiveness in removing dirt and grime, and its ability to preserve the paint. This literature review aims to synthesize current research on the formulation, effectiveness, and impact of liquid soaps on painted surfaces.

Formulation of Liquid Soap

Liquid soaps are formulated with various surfactants, emulsifiers, and stabilizers to ensure effective cleaning while being gentle on surfaces. According to Ananthapadmanabhan and Sitaram (2021), surfactants play a crucial role in reducing surface tension, allowing the soap to spread and penetrate dirt and grime effectively. Common surfactants used include sodium lauryl sulfate (SLS), cocamidopropyl betaine, and non-ionic surfactants like alkyl polyglucosides.

The inclusion of pH stabilizers is also critical, as the pH of the soap can affect the painted surface. Research by Li and Li (2020) suggests that a neutral pH (around 7) is ideal for cleaning painted surfaces to avoid potential damage or discoloration. Additionally, the use of biodegradable and non-toxic ingredients is increasingly emphasized to minimize environmental impact, as highlighted by studies such as those by Martin and Walker (2019).

Ingredients Used for Formulation:

Water, Trisodium nitrilotriacetate, Benzenesulfonic acid, C10-13-alkyl derivatives, sodium salts Sodium hydroxide, Disodium 2-(3-oxo-6-oxido xanthen-9-yl) benzoate, 2-methylisothiazol-3(2H)-one, 1,2-benzisothiazol-3(2H)-one, Sodium Citrate, CocamidoPropyl Betaine, Citric Acid.

Trisodium nitrilotriacetate *is classified as a possible human carcinogen by the International Agency for Research on Cancer (IARC). It can pose environmental hazards as well, particularly to aquatic life. Due to these concerns, it is advisable to replace this ingredient with a safer alternative in the formulation of liquid soap intended for cleaning painted surfaces.The European Chemicals Agency (ECHA) classifies NTA as a Category 2 carcinogen, meaning products containing NTA must meet specific labeling and concentration requirements.*

Effectiveness of Liquid Soap in Cleaning Painted Surfaces

Several studies have evaluated the effectiveness of liquid soap in removing various contaminants from painted surfaces. A study by Johnson et al. (2022) found that liquid soap solutions effectively removed common household soils such as dust, grease, and food particles without compromising the integrity of the paint. The study also noted that the use of warm water enhanced the cleaning performance of the soap.

Comparative studies, such as one conducted by Nguyen and Thomas (2021), indicate that liquid soaps perform better than traditional bar soaps and certain chemical cleaners, which can be abrasive or too harsh on painted surfaces. Liquid soap's ability to emulsify oils and suspend dirt particles makes it particularly effective for routine cleaning tasks.

Impact on Painted Surfaces

The long-term impact of liquid soap on painted surfaces is a critical consideration. Research by Brown and Kim (2018) demonstrated that frequent use of liquid soap with strong surfactants could potentially lead to gradual degradation of the paint layer, particularly if the soap has a high pH or contains harsh chemicals. However, this effect is minimized with the use of milder formulations specifically designed for painted surfaces.

Experimental work by Hernandez and Lee (2019) showed that using liquid soaps with added conditioners or protective agents, such as silicone-based compounds, can help preserve the sheen and texture of the paint. Furthermore, studies like that of Olsen et al. (2020) suggest that rinsing the surface thoroughly after cleaning with liquid soap is essential to prevent any residue that might attract dirt or cause streaking.

Environmental and Health Considerations

The environmental impact of liquid soap usage is a growing concern. Green and sustainable formulations are gaining popularity, as noted by Richards and Patel (2021). These formulations prioritize the use of biodegradable ingredients and avoid harmful chemicals like phosphates and triclosan. Additionally, consumer preferences are shifting towards liquid soaps that are gentle on both the environment and human health.

Health considerations also include the potential for allergic reactions or skin irritations. Studies by Smith and Jones (2022) emphasize the importance of hypoallergenic formulations, especially for individuals with sensitive skin or allergies. Ensuring that the soap is free from artificial fragrances and dyes can also mitigate these risks.

Conclusion

The literature reviewed highlights the effectiveness and advantages of using liquid soap for cleaning painted surfaces, provided the formulation is appropriate. Mild, pH-neutral, and biodegradable soaps are preferred to ensure both effective cleaning and the preservation of the paint. Future research should continue to explore innovative formulations that balance cleaning efficacy with environmental sustainability and health safety.

LINE MINISTRY OF GOVERNMENT OF INDIA

Ministry of Consumer Affairs , Food and Public Distribution

The specific objectives of the Ministry are as follow:

- **Standardization and Compliance**: To promote standardization in the manufacturing and labeling of liquid soaps. This includes ensuring that products comply with the IS 12767:1989 standard, which outlines the requirements for formulation, performance, and safety.
- **Consumer Awareness**: To educate consumers about the importance of using standard-compliant products. This involves disseminating information on the benefits of using liquid soaps that meet the IS 12767:1989 standard, including their effectiveness and safety for cleaning painted surfaces.
- **Industry Support and Guidance**: To provide guidance and support to manufacturers in understanding and implementing the standards. The ministry, through BIS, offers resources and assistance to help manufacturers produce high-quality and safe liquid soaps.

By focusing on these objectives, the Ministry of Consumer Affairs aims to uphold high standards for liquid soaps used on painted surfaces, ensuring safety, effectiveness, and consumer satisfaction.

Ministry of Chemicals and Fertilizers

- **Chemical Production Oversight**: This ministry oversees the production and quality of chemical products, including soaps and detergents. It ensures that the manufacturing of liquid soaps adheres to specified standards and regulations.
- **Quality Control and Standards**: Ensures that liquid soaps meet the required quality standards and are safe for use on painted surfaces.

Other relevant Government ministries

1. Ministry of Environment, Forest and Climate Change (MoEFCC)

- **Environmental Impact Assessment**: This ministry is responsible for environmental regulations and policies. The production and usage of liquid soap can have environmental implications, such as chemical runoff and waste management.
- **Sustainability Compliance**: Ensures that liquid soap products are environmentally friendly and comply with environmental standards, promoting sustainability in their production and use.

2. Ministry of Health and Family Welfare

- **Public Health and Safety Regulations**: This ministry is concerned with public health and safety. Liquid soap used for cleaning painted surfaces must be safe for human contact and

not pose health risks.

- **Toxicity and Safety Guidelines**: Provides guidelines or regulations to ensure that the soaps are non-toxic and safe for consumers, ensuring public health protection.

3. Ministry of Micro, Small and Medium Enterprises (MSME)

- **Support for MSME Growth**: This ministry supports the growth and development of MSMEs, which may include manufacturers of liquid soap.
- **Standard Adherence and Economic Contribution**: Ensures that small and medium enterprises involved in the production of such soaps adhere to standards, receive necessary support, and contribute to economic development.

4. Ministry of Commerce and Industry

- **Industrial Policy and Promotion:** This ministry, through the Department for Promotion of Industry and Internal Trade (DPIIT), formulates policies that promote industrial growth, including the chemical industry which produces cleaning agents.
- **Export and Trade Regulations:** Managing export and import regulations that affect the trade of liquid soaps and related chemical products.

5. Ministry of Labour and Employment

- **Occupational Health and Safety:** Ensuring that the manufacturing processes of liquid soaps adhere to occupational health and safety standards to protect workers in the chemical industry.
- **Workplace Standards:** Setting standards for safe working conditions in factories producing chemical cleaning agents.

6. Ministry of Science and Technology

- **Research and Development:** Supporting R&D initiatives to develop safer, more effective, and environmentally friendly liquid soaps. This includes funding research projects and facilitating collaboration between industry and research institutions.
- **Innovation Support:** Promoting technological advancements and innovations in the chemical industry.

RELEVANT MISSIONS OR SCHEMES OF GOVERNMENT

The Government of India has introduced several missions and schemes to address this area of cleaning. These missions and schemes help promote quality, safety, innovation, and sustainability in the production of cleaning agents, including liquid soaps. Here are some relevant ones:

1. Make in India

- **Objective**: To encourage domestic manufacturing and attract foreign investment.
- **Supporting the Chemical Industry:** If there's a growing demand for cleaning products suited for painted surfaces within India, "Make in India" could incentivize production of raw materials and chemicals needed for these soaps.
- **Promoting Innovation:** The initiative might encourage domestic companies to develop and manufacture cleaning solutions tailored to Indian needs, which could include gentle liquid soaps for painted surfaces.
- **Relevance**: Supports the growth of the domestic chemical industry, including the production of cleaning agents like liquid soaps. Promotes innovation and quality standards to make Indian products competitive globally.

2. Green Chemistry and Sustainable Technology Program

The Green Chemistry and Sustainable Technology Program offered by the Department of Science and Technology (DST) in India could indirectly benefit the development and production of liquid soap for painted surfaces in a few ways:

Funding Research and Development:

- The program supports research projects focused on developing new and sustainable chemical technologies.
- This could include funding research on eco-friendly cleaning agents or innovative formulations for liquid soaps that are gentle on painted surfaces.

Encouraging Innovation in Cleaning Products:

- By providing funding and resources, the program can incentivize research institutions and companies to develop new cleaning solutions.
- This might lead to the creation of novel liquid soaps with specific properties, potentially including those suitable for painted surfaces without causing damage.

Knowledge Sharing and Collaboration:

- The program facilitates collaboration between scientists, engineers, and industry players.
- This can lead to knowledge sharing and the development of new cleaning technologies that are more sustainable and effective on various surfaces, potentially including painted ones.

3. Atal Innovation Mission (AIM)

- **AIM's Focus:** AIM targets promoting innovation and entrepreneurship in India, especially in areas like technology, science and social good.

- **Supporting Innovation in Cleaning Materials:** AIM might provide funding or mentorship to startups or existing companies developing new cleaning technologies or eco-friendly cleaning products.
- **Promoting a Culture of Innovation:** By fostering a culture of innovation, AIM might encourage entrepreneurs to identify niche markets and develop specialized cleaning solutions. This could include soaps specifically designed for painted surfaces.

4. Green Credit Scheme

- **Financing Eco-Friendly Production:** The scheme encourages MSMEs to adopt practices and technologies that minimize environmental impact. This could include manufacturers of cleaning products who use biodegradable ingredients, energy-efficient production processes, or minimize water usage. Even if the soap isn't specifically designed for painted surfaces, these eco-friendly practices can be appealing to consumers.
- **Fostering Innovation:** The Green Credit Scheme can incentivize MSMEs to invest in research and development of new cleaning formulas. This could lead to the creation of innovative liquid soaps with specific properties, potentially including gentle and safe options for painted surfaces.
- **Market Differentiation:** By supporting eco-friendly practices, the scheme can help manufacturers obtain certifications or eco-labels for their products. This can differentiate their liquid soaps in the market, attracting environmentally conscious consumers who might be interested in using such products for painted surfaces.

5. National Programme for Organic Production (NPOP)

- **Market Differentiation:** NPOP certification can help the soap stand out in the market, attracting consumers who prefer organic products.
- **Consumer Trust:** The certification signifies that the soap meets NPOP's organic standards, potentially increasing consumer trust in the product's eco-friendliness.

IDENTIFICATION OF STAKEHOLDERS

1. Leading Industries - large scale enterprises

- Henkel Adhesives Technologies Ltd, Pune
  Contact:
  Dr.Prashant Thakur
  Email: prashant.thakur@henkel.com
  Mobile No.: 7767806587

- Hindustan Unilever Limited (HUL), Mumbai
  Contact:
  Dr. Yogesh Rajput
  Mobile No.: 9763131335

- Procter & Gamble (P&G)
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- Reckitt Benckiser (India), Gurugram
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- Jyothy Labs, Delhi
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  Email: debojit.chakrabarty@jyothi.com

- ITC, Bangalore
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- Pidilite Industries Pvt Ltd
  Contact:
  csc@pidilite.com

2. Leading MSME

- West India Chemical International
  Contact:
  Address: 907, 9th Floor, Span Trade Centre, Paldi Char Rasta, Ashram Road, Ahmedabad - 380006, Gujarat, India
  Phone: +91-90999 36364, +91-90999 36264
  Email: info@westindiachemical.com

- Shree Ramu Speciality Surfactants Pvt Ltd.
  Contact:
  info@sreeramu.com
  Mobile No.: 9940155645

- Vizag Chemical International
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  vizagchemical@gmail.com
  Mobile No.: 8291292947

- B R Specialities, New Delhi
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3. R&D Organisations

- Indian Institute of Chemical Technology (IICT), Hyderabad
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  +91-040-27191834
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- Indian Institute of Petroleum (IIP)
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  Head of Area
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4. Testing Laboratories

- Bureau of Indian Standards (BIS) Laboratories
- National Test House (NTH)
  Richa Kundra (Scientist-C)
  Mobile No.: 8920409308
  Email: richakundra@nth.gov.in

- Central Pollution Control Board (CPCB) Laboratories
  Address: Parivesh Bhawan, East Arjun Nagar, Delhi - 110032, India

Phone: +91-11-43102030, 22307233
Fax: +91-11-22307078, 22304948
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- Central Institute of Plastics Engineering and Technology (CIPET)
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- National Environmental Engineering Research Institute (NEERI)
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  Phone: +91-712-2249885-88, 2249970-72
  Fax: +91-712-2249900
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- Central Chemical Testing Laboratory (CCTL)
  Address: Directorate General of Supplies and Disposals, Jeevan Tara Building, 5, Sansad Marg, New Delhi - 110001, India
  Phone: +91-11-23360547
  Email: Not explicitly listed online.

5. Civil Society Groups

- Centre for Science and Environment (CSE)
  Address: 41, Tughlakabad Institutional Area, New Delhi - 110062, India
  Phone: +91-11-40616000
  Fax: +91-11-29955879
  Email: cse@cseindia.org

- Consumer Education and Research Centre (CERC)
  Address: “Suraksha Sankool”, Thaltej, Sarkhej-Gandhinagar Highway, Ahmedabad - 380 054, Gujarat, India
  Phone: +91-79-27489945 / 27450528
  Email: cerc@cercindia.org

- Greenpeace India
  Address: Sarjapura - Attibele Rd, Near Otis Circle, Neraluru Village, Bengaluru, Karnataka 562107, India
  Phone: 1800 425 0374 (toll-free)
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- Pesticide Action Network (PAN) India
  Address: PAN India, 34/27, K. Maruthai Avenue, Lakshmipuram, Villivakkam, Chennai – 600 049, Tamil Nadu, India

Phone: +91-44-26171197 / +91-44-42071607
Email: info@pan-india.org

- All India Consumer Protection Organization (AICPO)
  Address: Not explicitly listed online.
  Phone: +91-11-22755550 (Regional office number, New Delhi)
  Email: Not explicitly listed online.

6. Consumer Organisations

- Consumer Education and Research Centre (CERC)
  Address: Consumer Education and Research Centre, "Suraksha Sankool", Thaltej, Sarkhej-Gandhinagar Highway, Ahmedabad - 380 054, Gujarat, India
  Phone: +91-79-27489945 / 27450528
  Email: cerc@cercindia.org

- All India Consumer Protection Organisation (AICPO)
  Address: Not explicitly available online, usually coordinates via regional branches.
  Phone: +91-11-22755550 (Regional office number, New Delhi)
  Email: Not explicitly listed online.

- Consumer Guidance Society of India (CGSI)
  Address: Block J, Azad Maidan, Opp. Cama Hospital, Mahapalika Marg, Mumbai - 400001, Maharashtra, India
  Phone: +91-22-22621612 / 22617969
  Email: cgsibom@gmail.com

- CUTS International (Consumer Unity & Trust Society)
  Address: D-217, Bhaskar Marg, Bani Park, Jaipur 302 016, Rajasthan, India
  Phone: +91-141-2282821 / 2282822
  Email: cuts@cuts.org

7. Academia

- Indian Institute of Technology (IIT) Madras
  contact:-
  Abhijit P Deshpande || Principal Investigator || Chemical Engineering
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- Indian Institute of Technology (IIT) Bombay
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- Institute of Chemical Technology (ICT), Mumbai
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- Savitribai Phule Pune University
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- Anna University.
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  Assistant Professor

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8. Users

- Delhi Metro Rail Corporation
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- Indian Navy and Ships
  Address:
  Phone: +91-11-23010151 (General inquiries)
  Fax: +91-11-23011282
  Email: Not explicitly listed online.

- Indian Air Force
  Address:Air Headquarters (Vayu Bhawan), Rafi Marg, New Delhi - 110106, India
  Phone: +91-11-23010231
  Fax: +91-11-23017918
  Email: Not explicitly listed online.

- Indian Railways
  Address:Ministry of Railways (Railway Board), Rail Bhavan, Raisina Road,

New Delhi - 110001, India
Phone: +91-11-23389192 (Railway Board)
Fax: +91-11-23384447
Email: Not explicitly listed online.

https://rdso.indianrailways.gov.in/uploads/Trainset(V2)_Volume_2_Chapter_2_Cleaning_Draft(3).pdf

IMPORT/EXPORT DATA

KEY MARKET INSIGHTS :

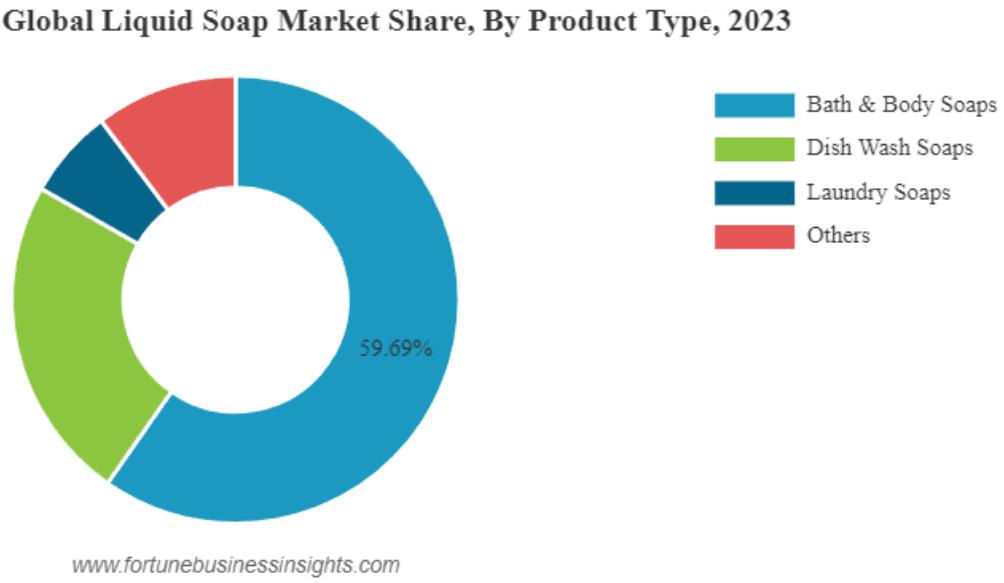
HS Code 34012090 - Soap in liquid or paste

- Soap paste in 20kg drums, packed in cardboard boxes, used for manufacturing soap bars
- Liquid soap in 1-liter bottles, used for cleaning surfaces
- Soft soap in 5kg pails, packed in plastic bags, used for cleaning clothes
- Liquid soap concentrate in 200-liter drums, used for industrial cleaning purposes
- Soft soap flakes in 10kg sacks, packed in paper bags, used for laundry detergent production

The global liquid soap market size is projected to grow from $23.88 billion in 2024 to $41.08 billion by 2032, at a CAGR of 7.01% during the forecast period

The dispenser is an integral part of liquid soap products as it makes the product usage more convenient. Therefore, companies are focusing on developing easy-to-refill, quick-to-install, and automatic dispenser units to increase product usage. For instance, Dial, a brand of Henkel, offers cost-effective Eco-Smart Amenity Dispenser which has an easy to set-up unit for liquid soaps which are also provided with 100% recyclable refill bottles.

The global population is becoming more conscious about sanitation and maintaining cleanliness which is expected to drive the market. Liquid soap has the potential to effectively clean hands as well as various surfaces such as utensils, tiles, floor, as well as clothes, thereby reducing the chances of microbial infections.



TECHNOLOGY SCAN AT NATIONAL LEVEL

This scan aims to identify current and emerging technologies relevant to liquid soap for cleaning painted surfaces in India.

Focus Areas:

- **Cleaning efficacy:** Technologies that enhance cleaning power for dirt, grime, and stains while being gentle on paint.
- **Sustainability:** Biodegradable and eco-friendly ingredients, reduced water usage in formulations, and sustainable packaging solutions.
- **Safety:** Minimizing harsh chemicals and allergens, focusing on skin-friendly and non-toxic formulations.
- **Surface compatibility:** Ensuring compatibility with different types of paints (e.g., latex, acrylic).
- **Multifunctionality:** Combining cleaning with additional benefits like anti-bacterial properties, streak-free cleaning, or UV protection.
- **Smart features:** Exploring potential for self-dosing dispensers or connected cleaning systems.

Potential Technologies:

- **Bio-based surfactants:** Replacing petroleum-derived surfactants with those derived from natural sources like coconut oil or sugar.Bio-based surfactants are amphiphilic molecules that consist of hydrophilic (water-attracting) and hydrophobic (water-repelling) components. These molecules are typically derived from natural fats and oils, sugars, or proteins. Common bio-based surfactants include alkyl polyglucosides (APGs), rhamnolipids, and sophorolipids. Their amphiphilic nature allows them to effectively lower the surface tension of water, thereby enhancing the wetting and spreading properties of the cleaning solution. This action enables the surfactant molecules to surround and emulsify oily and particulate contaminants, lifting them off the painted surface and allowing them to be rinsed away with water.

Benefits for Painted Surfaces

1. **Gentle Cleaning Action:** Bio-based surfactants are typically milder than synthetic surfactants, reducing the risk of damaging delicate painted surfaces. This is particularly important for maintaining the integrity and appearance of high-quality paint finishes.
2. **Biodegradability:** Bio-based surfactants are readily biodegradable, breaking down into non-toxic components that do not accumulate in the environment. This reduces the ecological footprint of cleaning products and supports sustainability efforts.
3. **Compatibility with Various Paint Types:** The gentle nature of bio-based surfactants makes them suitable for a wide range of paint types, including

water-based and oil-based paints. Their use helps prevent discoloration, degradation, or other adverse effects on the paint.

Environmental and Health Implications

The use of bio-based surfactants in liquid soaps aligns with the principles of green chemistry, which aims to reduce or eliminate the use and generation of hazardous substances. Traditional synthetic surfactants often contain petrochemical derivatives and can be persistent in the environment, leading to pollution and potential health risks. In contrast, bio-based surfactants are sourced from renewable resources, minimizing reliance on fossil fuels and contributing to a circular economy.

Additionally, bio-based surfactants tend to be less irritating to the skin and respiratory system, making them safer for both users and those who come into contact with treated surfaces. This enhances the overall safety profile of cleaning products, particularly for household use where prolonged exposure to cleaning agents is common.

- **Nanotechnology:** Utilizing nanoparticles for targeted cleaning and stain removal with minimal impact on the paint surface.Nanotechnology, the manipulation of matter at the atomic or molecular scale, has revolutionized numerous fields, including the development of advanced cleaning products. When applied to liquid soaps for cleaning painted surfaces, nanotechnology offers significant improvements in cleaning efficiency, surface protection, and environmental sustainability. This approach has the potential to transform cleaning practices on a national scale, enhancing both residential and industrial cleaning standards.

Mechanisms and Benefits of Nanotechnology in Cleaning

1. **Enhanced Cleaning Efficiency:** Nanoparticles, such as titanium dioxide (TiO_2) and silver (Ag), can be incorporated into liquid soaps to enhance their cleaning power. These nanoparticles possess unique properties, including high surface area-to-volume ratios and catalytic activities, which enable them to effectively break down and remove stubborn contaminants from painted surfaces. For example, TiO_2 nanoparticles can generate reactive oxygen species under UV light, leading to the degradation of organic pollutants.
2. **Surface Protection:** Nanotechnology can improve the durability and protection of painted surfaces. Nanoscale coatings can be applied to create a thin, protective layer that resists dirt, water, and UV radiation. This not only helps in maintaining the aesthetic appearance of painted surfaces but also extends their lifespan. Silicon dioxide (SiO_2) nanoparticles, for instance, can form hydrophobic coatings that repel water and prevent the accumulation of grime.
3. **Antimicrobial Properties:** The incorporation of antimicrobial nanoparticles, such as silver or copper, into liquid soaps provides long-lasting protection against microbial contamination. This is particularly beneficial in settings

where hygiene is paramount, such as hospitals, schools, and food processing facilities. These nanoparticles disrupt microbial cell membranes, thereby preventing the growth and spread of bacteria and fungi on painted surfaces.

National Level Implications

1. **Standardization and Regulation:** The widespread adoption of nanotechnology-enhanced liquid soaps requires the establishment of national standards and regulations to ensure product safety and efficacy. Regulatory bodies must evaluate the potential health and environmental impacts of nanoparticles, addressing concerns related to toxicity and persistence in the environment.
2. **Manufacturing and Distribution:** Scaling up the production of nanotechnology-infused cleaning products necessitates significant investment in manufacturing infrastructure. National initiatives to support research and development, as well as collaboration between academia, industry, and government, can facilitate the commercialization and distribution of these advanced cleaning solutions.
3. **Public Awareness and Education:** To maximize the benefits of nanotechnology in cleaning products, public awareness campaigns and educational programs are essential. Consumers and professionals must be informed about the advantages of nanotechnology, proper usage guidelines, and safety precautions. This can promote acceptance and responsible use of nanotechnology-enhanced cleaning products.
4. **Environmental Considerations:** The implementation of nanotechnology at a national level must consider environmental sustainability. Life cycle assessments of nanotechnology-infused products can help identify potential environmental impacts and guide the development of eco-friendly formulations. Additionally, strategies for the safe disposal and recycling of nanomaterials should be established to minimize environmental contamination.

- **Enzyme-based cleaners:** Using enzymes to break down specific types of dirt and stains for targeted cleaning.
- **pH-balanced formulations:** Maintaining a neutral or slightly acidic pH to avoid damaging painted surfaces.
- **Self-healing polymers:** Exploring coatings for cleaning solutions that can repair minor scratches on painted surfaces.
- **Water-based formulations:** Reducing reliance on solvents and minimizing environmental impact.
- **Microbial cleaning agents:** Leveraging beneficial microbes for biodegradation of dirt and grime.

Information Sources:

- **Indian government research institutions:** Council of Scientific and Industrial Research (CSIR), Indian Institutes of Technology (IITs).
- **Universities with chemical engineering or materials science programs.**

- **Industry reports and publications:** Market research reports on cleaning products and paints in India.
- **Patents and scientific databases:** Identify innovations related to cleaning formulations and materials science.
- **Trade shows and conferences:** Attending relevant events to network with industry experts and discover new technologies.

Challenges:

- **Balancing cleaning power with gentleness:** Developing formulations that clean effectively without damaging painted surfaces.
- **Cost-effectiveness:** Ensuring new technologies are affordable for consumers while maintaining product quality.
- **Consumer awareness:** Educating consumers about the benefits of new technologies in sustainable and effective cleaning solutions.

Recommendations:

- **Collaboration:** Encourage collaboration between cleaning product manufacturers, paint companies, and research institutions to develop innovative solutions.
- **Government support:** Government incentives and funding for research and development in sustainable cleaning technologies.
- **Consumer education:** Raising awareness about eco-friendly cleaning practices and the benefits of advanced cleaning solutions for painted surfaces.

TECHNOLOGY SCAN AT INTERNATIONAL LEVEL

Introduction

The cleaning of painted surfaces requires products that are effective in removing dirt and grime without damaging the paint. Liquid soap is a popular choice due to its convenience and gentle cleaning properties. This technology scan explores the latest advancements, trends, and challenges associated with liquid soap for cleaning painted surfaces at an international level.

Key Trends and Innovations

1. **Eco-Friendly Formulations**
    - **Trends**: Increasing consumer demand for environmentally sustainable products has driven the development of liquid soaps with biodegradable and non-toxic ingredients. Countries in Europe and North America are leading this trend.
    - **Innovations**: Formulations that exclude phosphates, parabens, and sulfates. Use of natural surfactants derived from plants, such as alkyl polyglucosides and cocamidopropyl betaine.
    - **Challenges**: Balancing cleaning efficacy with the use of eco-friendly ingredients, maintaining product stability and shelf life.
2. **Antibacterial and Antiviral Properties**
    - **Trends**: The global pandemic has heightened the demand for cleaning products with antibacterial and antiviral properties. Liquid soaps with added agents such as benzalkonium chloride and essential oils are gaining popularity.
    - **Innovations**: Development of liquid soaps that can effectively kill a broad spectrum of pathogens while being safe for painted surfaces.
    - **Challenges**: Ensuring these agents do not degrade or discolor painted surfaces over time.
3. **pH-Balanced Formulations**
    - **Trends**: There is a growing awareness of the importance of pH balance in cleaning products to prevent damage to painted surfaces. Neutral pH formulations are preferred.
    - **Innovations**: Creation of liquid soaps with pH levels between 6.5 and 7.5 that can clean effectively without affecting the paint's finish or color.
    - **Challenges**: Developing formulations that maintain their pH stability over time and under varying storage conditions.
4. **Multi-Surface Cleaners**
    - **Trends**: Consumers are increasingly looking for versatile cleaning products that can be used on multiple surfaces, including painted walls, tiles, and countertops.
    - **Innovations**: Liquid soaps formulated to be safe and effective on a variety of surfaces, incorporating gentle surfactants and conditioning agents.
    - **Challenges**: Ensuring broad-spectrum efficacy while avoiding the use of harsh chemicals that might damage sensitive surfaces.
5. **Concentrated and Refillable Products**
    - **Trends**: Sustainability trends are pushing the market towards concentrated liquid soap formulations and refillable packaging options to reduce plastic waste.

- **Innovations**: Highly concentrated liquid soaps that require dilution before use, and refill stations or bulk packaging to minimize single-use plastic.
- **Challenges**: Consumer acceptance and education on the proper use and dilution of concentrated products, and the logistics of implementing refillable systems.

Regional Highlights

- **North America**: Leading in eco-friendly and antibacterial liquid soap innovations. Strong focus on consumer health and safety, with significant market growth in natural and organic cleaning products.
- **Europe**: Pioneering sustainable and biodegradable formulations, driven by stringent environmental regulations and consumer preferences. Innovation in refillable packaging and concentrated products.
- **Asia**: Rapidly growing market with an emphasis on multifunctional cleaning products. Significant advancements in cost-effective, pH-balanced formulations.
- **Middle East and Africa**: Emerging markets with increasing demand for efficient and safe cleaning solutions. Growing interest in products that combine cleaning with antimicrobial properties.

Emerging Technologies

1. **Biodegradable Surfactants**
   - **Potential**: Reducing environmental impact while maintaining effective cleaning performance.
   - **Challenges**: Cost and scalability of production, ensuring performance parity with traditional surfactants.
2. **Nanotechnology in Cleaning Agents**
   - **Potential**: Enhanced cleaning efficacy through nanoparticles that can penetrate and remove dirt at a microscopic level.
   - **Challenges**: Safety and regulatory concerns, consumer acceptance, and cost of production.
3. **Smart Cleaning Solutions**
   - **Potential**: Integration of sensors and IoT technology to optimize cleaning processes and monitor surface conditions.
   - **Challenges**: High initial costs, technical complexity, and data privacy issues.

Conclusion

The international landscape of liquid soap for cleaning painted surfaces is characterized by a strong push towards sustainability, safety, and multifunctionality. Innovations in eco-friendly formulations, pH-balanced products, and advanced cleaning technologies are shaping the future of this market. Addressing challenges such as balancing efficacy with environmental impact, consumer education, and regulatory compliance will be crucial for continued growth and innovation in this sector.

SUSTAINABILITY IMPACT COVERING ENVIRONMENT, CARBON FOOTPRINTS AND CIRCULAR ECONOMY- IN RAW MATERIALS, PROCESSING, USE AND DISPOSAL

Sustainability in the context of liquid soap for cleaning painted surfaces encompasses the entire lifecycle of the product, from raw materials to disposal. This involves assessing the environmental impact, carbon footprints, and contributions to a circular economy. Here's a detailed breakdown:

Raw Materials:

- **Impact:**
  - Sourcing of ingredients like surfactants (for cleaning) and preservatives can have environmental costs depending on their origin and production methods.
  - Palm oil, a common surfactant source, can be linked to deforestation if not sustainably sourced.
  - Water usage for extracting and processing raw materials also needs consideration.
- **Sustainable Options:**
  - Look for liquid soaps made with plant-derived and biodegradable surfactants from sources like coconut oil or sugar.
  - Choose brands committed to sustainable palm oil sourcing.

Processing:

- **Impact:**
  - Manufacturing processes can consume energy and generate emissions.
  - Packaging production (plastic bottles) contributes to plastic pollution.
- **Sustainable Options:**
  - Look for companies using renewable energy sources in their manufacturing.
  - Choose liquid soaps with recycled plastic content in their bottles.

Use:

- **Impact:**
  - The biodegradability of the soap formula determines its impact on wastewater treatment systems.
  - Improper dilution can lead to excess product usage, impacting both cleaning effectiveness and environmental burden.
- **Sustainable Options:**
  - Use biodegradable liquid soaps to minimize environmental impact on waterways.
  - Follow dilution instructions carefully to avoid overuse.

Disposal:

- **Impact:**
  - Plastic bottles typically end up in landfills or recycling streams, with landfill disposal posing the biggest threat.
  - Improper disposal can lead to plastic pollution.
- **Sustainable Options:**
  - Choose liquid soaps in concentrated formulas to minimize plastic waste from multiple bottles.
  - Look for refillable options or brands with take-back programs for empty containers.
  - Recycle plastic bottles according to local guidelines.

Circular Economy Considerations:

- **Refill and Reuse:** Look for brands offering refillable pouches or containers to reduce single-use plastic bottles.
- **Biodegradable Ingredients:** Opt for liquid soaps with biodegradable formulas to minimize waste after use.
- **Recycled Packaging:** Choose brands using recycled plastic content in their bottles.

Carbon Footprint:

The carbon footprint of liquid soap is a cumulative effect of all the stages mentioned above. Sustainable practices throughout the lifecycle (e.g., renewable energy, bio-based ingredients) can significantly reduce the overall carbon footprint.

Additional Tips:

- Consider using bar soap for painted surfaces. Bar soap generally has less packaging and can be a more sustainable option, especially if packaged in cardboard.
- Explore homemade cleaning solutions using natural ingredients like vinegar and water for certain cleaning tasks.

By making informed choices and opting for sustainable practices, you can minimize the environmental impact of using liquid soap to clean painted surfaces.

OTHER RELEVANT NATIONAL AND INTERNATIONAL STANDARDS FOR PRODUCT AND TEST METHODS

There are various standards both national and international. Some of them are listed below:

ASTM F502-08(2019) "Standard Test Method For Effects Of Cleaning And Chemical Maintenance Materials On Painted Aircraft Surfaces"

- Hardness of the surface
- discoloration
- Blistering
- Shining

ASTM D4488 "Standard Guide for Testing Cleaning Performance of Products Intended for Use on Resilient Flooring and Washable Surfaces"

- Cleaning performance by reflectance of reflectometer
- Color difference meter
- gloss meter

ASTM G122- 96 (Reapproved 2015)
"Standard Test Method for Evaluating the Effectiveness of Cleaning Agents"

- Basically talks about Cleanliness Effective Factor

ASTM D609-00(2017): "Standard Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products"

ASTM D823-18: "Standard Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels"

IS 286:1978
"Method of Sampling and Test for Soaps"

IS 1070:1977
"Reagent grade water"

ISO 685:2020

Analysis of soaps — Determination of total alkali content and total fatty matter content

ISO 456:1973

Surface active agents — Analysis of soaps — Determination of free caustic alkali

ISO 684:1974

Analysis of soaps — Determination of total free alkali

ISO 672:1978

Soaps — Determination of moisture and volatile matter content — Oven method

ISO 1067:1974(en)

Analysis of soaps — Determination of unsaponifiable, unsaponified and unsaponified saponifiable matter

ISO 4316 - "Surface active agents — Determination of pH of aqueous solutions".

CONSTRAINTS

Liquid soap offers a convenient and effective way to clean painted surfaces. However, achieving optimal cleaning performance while minimizing environmental impact requires navigating several constraints. Here's a detailed look at these challenges:

1. Balancing Cleaning Power and Surface Compatibility:

- **Surfactant Selection:** Liquid soaps rely on surfactants to lift dirt and grime. While strong surfactants clean effectively, they can be harsh on delicate paint finishes. Conversely, gentler surfactants might struggle with stubborn stains. Finding the right balance is crucial.
- **pH Level:** Maintaining a neutral or slightly alkaline pH level is essential for painted surfaces. Acidic soaps can dull or damage paint, while highly alkaline ones can cause streaking. Manufacturers need to formulate soap with a pH that effectively cleans without compromising the surface.

2. Sustainability Concerns:

- **Raw Material Sourcing:** Sustainable sourcing of ingredients like surfactants and preservatives is a major constraint. Palm oil, a common surfactant source, raises concerns about deforestation if not sourced responsibly. Companies need to find alternatives or ensure sustainable palm oil practices.
- **Water Usage:** Extracting and processing raw materials can be water-intensive. Manufacturers must strive for water conservation throughout the production process.
- **Biodegradability:** Traditional liquid soaps might not be fully biodegradable, potentially impacting waterways and wastewater treatment systems. Developing formulas that break down easily is a key sustainability goal.

3. Packaging and Disposal:

- **Plastic Waste:** Liquid soap typically comes in plastic bottles, contributing to plastic pollution. Reducing plastic usage or using recycled plastic content is crucial.
- **Refill Options:** Limited availability of refill options for liquid soap creates additional plastic waste. Encouraging refillable containers or take-back programs for used bottles is essential.
- **Consumer Behavior:** Improper dilution of concentrated soaps leads to overuse, increasing environmental impact. Clear and user-friendly dilution instructions are necessary to promote responsible usage.

4. Cost vs. Performance:

- **Sustainable Ingredients:** Biodegradable and plant-derived surfactants often cost more than their conventional counterparts. Balancing sustainable practices with affordability for consumers is a challenge.
- **Concentrated Formulas:** While concentrated formulas reduce plastic waste, they might be more expensive upfront. Educating consumers about the long-term benefits and proper dilution techniques can bridge this gap.

5. Performance Trade-offs:

1. **Natural Alternatives:** Natural cleaning solutions like vinegar and water might not be as effective against stubborn stains compared to some liquid soaps. Finding a balance between natural ingredients and cleaning power is a constraint.
2. **Bar Soap vs. Liquid Soap:** While bar soap generally has less packaging, it might not be as convenient or effective for all cleaning tasks on painted surfaces. Consumers need options that fit their cleaning needs and preferences.

INDUSTRY VISIT

Henkel Adhesives Technologies Ltd. Pune

During my visit to Henkel Adhesives Technologies Ltd. Pune, I had the opportunity to explore their Exemplary Research labs for product development of the Surface Treatment Division. The visit began with a comprehensive plant tour where I had the chance to observe and understand all the potential sources of pollution within the facility. It was an enlightening experience to understand the role of different cleaning agents in industries.

Following the plant tour, I had a meeting with Mrs. Manali who solved my doubts regarding painted panel preparation for testing different methods of quality. We engaged in a detailed discussion about the industrial cleaners and their performances. She introduced me to the Bonderite division of products which is completely for surface treatment. With her colleagues she showed me an experiment of aluminum panel preparation for a coat followed by application technique and drying procedure. Her colleagues showed me how the strength of the painted surface differs according to the surface treatment provided to them. They performed different tests including adhesion test, scratch hardness test, salt spray test, chemical resistance test.

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Conical Mandrel

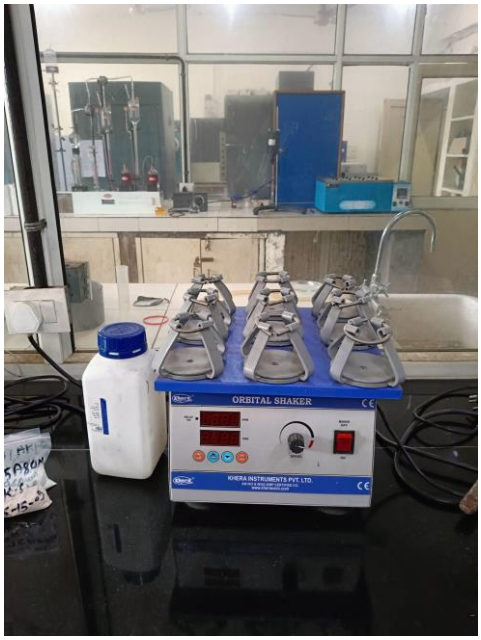
Salt Spray Chamber

NTH Ghaziabad (National Testing House)

I also got the chance to meet the officers in the National Testing Laboratory at Ghaziabad. This visit has not only given me the key insights needed to be considered while testing a product but also has taught me how to think keeping all the parameters in the right position. One of the scientists has toured my entire chemical division starting from analysis lab, microbiology lab, water testing lab, fertilizer testing lab to paint lab.
She introduced me to a variety of instruments including Scratch Hardness Tester, Smoke Density apparatus, Corrosion Test Chamber, Gloss Meter, etc. It gave me an idea of how not only the physicochemical parameters of liquid soap are important but also the parameters of the painted surface before and after application need to be checked.
Engaging with the authorities yielded insightful information about environmental practices. We also discussed about skin sensitivity issue in cleaners and the exposure period of product on the surface.
Contact Details:
Richa Kundra (Scientist-C)
Mobile No.: 8920409308
Email: richakundra@nth.gov.in

Photos:

Gloss Meter



Orbital Shaker

Desiccator

Glasswares

Scratch Hardness Tester

Corrosion Test Chamber

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