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MANUFACTURING OF FRAGRANCED CREAM

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ABSTRACT
The development of a robust manufacturing process for creams, focusing on formulation optimization, process scalability, and quality assurance. It involves extensive research to identify the best cream formulation, followed by process optimization, evaluating various manufacturing techniques, and considering equipment selection and design. Quality control and assurance are crucial, with strict testing protocols for purity, stability, and sensory attributes. Sustainability and environmental impact are also considered, with efforts to minimize waste, optimize energy consumption, and use eco-friendly packaging materials.

INTRODUCTION
The term "cosmetic" is derived from the Greek word "kosmesticos," which means "to adorn." Cosmetics are any materials used to beautify or promote appearance since that time. Nowadays, makeup is important for both men and women. Cosmetics have grown in popularity as more people want to look young and attractive. Creams, lipstick, perfumes, eye shadows, nail polishes, hair sprays, and other cosmetics are widely available today. After applying the base cream, other cosmetics such as face powder give the skin a glow. Then there are lipsticks, which are worn by women of all ages. They are made with the appropriate amount of wax and cocoa butter.
An important balance between the water content of the stratum corneum and skin surface lipids maintains the appearance and function of the skin. Because the skin is the body's most superficial layer, it is constantly exposed to various environmental stimuli. Exposure to both external and endogenous factors may disrupt this balance. Furthermore, soaps, detergents, and topical irritants such as alcohol and hot water can remove skin surface lipids. The disruption of the skin barrier resulted in a variety of skin problems, the most common of which is a loss of water content, which causes skin dryness and symptoms such as roughness, scaling, cracks, redness, and an uncomfortable feeling of tightness, sometimes accompanied by itching and stinging.
Fragrance is an integral part of cosmetic products and is often regarded as an overriding factor in the selection of cosmetics among consumers. Fragrances also play a considerable role in masking undesirable smells arising from fatty acids, oils and surfactants that are commonly used in cosmetic formulations. Essential oils are vital assets in the cosmetic industry, as along with imparting pleasant aromas in different products, they are able to act as preservatives and active agents and, simultaneously, offer various benefits to the skin. Moreover, the stimulating demand for natural ingredients has contributed massively to a renewed interest in cosmetic and wellness industries in plant derivatives, especially essential oils. This has led popular cosmetic companies to endorse natural fragrances and opt for minimally processed natural ingredients, given the potentially adverse health risks associated with artificial fragrance chemicals, which are major elements of cosmetics. Among the high- valued essential oils used as fragrances are citrus, lavender, eucalyptus, tea tree and other floral oils, among others, while linalool, geraniol, limonene, citronellol, and citral are much-appreciated fragrance components used in different cosmetics.
Fragrances play a particularly important role in increasing the attractiveness of cosmetics.
Pleasant smells influence the comfortability and the effect of the products and also impact significantly on the overall evaluation of cosmetics. Therefore, along with the shape and design of the container, the smell is also one of the characteristics of cosmetics that the consumer experiences and look forward

to in the selection of those items. Among natural fragrances, essential oils, which are complex mixtures of terpenes and other aromatic or aliphatic compounds, produced as secondary metabolites in specialized secretory tissues of aromatic plants, are the most popular. In nature, essential oils play very important roles in plant defences and signalling processes.
Indeed, the volatile nature of essential oils makes them likely to be useful as fragrances but does not preclude other functions for them in cosmetics. In fact, their intended use has been for a long time principally industrial, whereby standardization of fragrance requiring the blending of essential oils from different plants with the aim of obtaining a specific scent has been a common practice. It has been reported that 300 essential oils out of about 3000 plant species are commercially available in the flavors and fragrances market. The essential oils produced predominantly for industrial purposes are those from orange, corn mint, citronella, eucalyptus, peppermint, and lemon. Essential oils are widely incorporated into modern skincare products because of their complexity of active compounds, strongly fragrant properties and natural marketing image. Moreover, over the years, they have shown several scientifically proven cosmetic properties.
Several thousands of plants distributed throughout the world contain a group of odiferous, fragrance, oily products that are highly volatile organic substances collectively known as essential oils. Essential does not mean most necessary but rather the concentrated characteristics or quintessence of a natural flavour or fragrance raw material (Coulson et al, 2 2003). Therefore, perfume may be from essential oils of vegetables or plant origin. It is a complex mixture of aldehydes, ketones, hydrocarbons, alcoholic acid and short chain esters.
The existence of perfume on certain plants has been known for thousands of years. They can be found in leaves, flowers, stems, barks, and roots. Ancient Egyptians extracted essential oils from plants tissues by steam distillation (Ogbu, 2005). Other methods of isolating essential oils includes solvent extraction, expression, cold plate or effleurage. Some of these methods have been adopted by essential oil extracting industries.
Plants have long been used in perfumery as a source of essential oils and aroma compounds. Orange leaves, blossoms, and fruit zest are the respective sources of petitgrain neroli, and orange oils. Bark, flowers, blossoms fruits leaves, twigs, resins, roots, seeds woods commonly used. Animal sources such as Ambergris, Castoreum, Civet Hyraceum, Honeycomb, Deer musk can be used.

OIL MANUFACTURING PROCESS
The production of oil through the solvent extraction process, particularly using the Solcelet method, offers a highly efficient and versatile approach to extract oil from various raw materials, including seeds, nuts, and fruits. This paper provides a detailed examination of the Solcelet process for oil manufacturing, encompassing its principles, methodology, equipment requirements, and key considerations.
The Solcelet process is a solvent extraction technique that utilizes polar solvents such as ethanol or methanol to selectively extract oil from solid or semi-solid matrices. This method relies on the differential solubility of oil components in polar solvents, allowing for the efficient separation of oil from the feedstock.
Key considerations in the Solcelet process include solvent selection, process parameters (such as temperature, pressure, and extraction time), safety protocols, and environmental impact mitigation. Careful optimization of these factors is essential to maximize oil yield, quality, and process efficiency while minimizing solvent consumption and environmental footprint.
Moreover, the Solcelet process offers advantages such as versatility, scalability, and the ability to handle a wide range of raw materials, making it suitable for both small- scale and large-scale oil manufacturing operations. However, challenges such as solvent recovery efficiency, solvent handling, and regulatory compliance must be addressed to ensure safe and sustainable operation.

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Essential oils are natural fragrances extracted from virtually every parts of a plant. Essential oils are volatile and liquid aroma compounds from natural sources usually plants, they are not oils in a strict sense, but often share with oils poor solubility on water.

Essential oils are desired from various types and parts of plant. Some of them include: Grass Oils, Jasmine, Violet, Lavender, Rosemary. Lemongrass oil of East Indian lemongrass has antifungal activity. The volatile oils may also have some pesticide and mutagenic activities Cymbopogon nardus is a source of citronella oil. Cymbopogon martinii is reportedly toxic to fungi. (Moore, Michael 2006). Extracting oil from lemongrass typically involves methods that are suited to extracting essential oils from plant material. Here are some common extraction methods for lemongrass oil: *Steam Distillation, Hydro distillation, Solvent Extraction, Supercritical Fluid Extraction, Cold Press Extraction*

SOXHLET EXTRATION PROCESS:

The extraction of lemongrass oil was performed with Soxhlet extractor apparatus using ethanol as Solvents. The extraction will carry out with lemongrass sample with particle size 200 µm, 300 µm, 350 µm and the respective oil yields were noted.

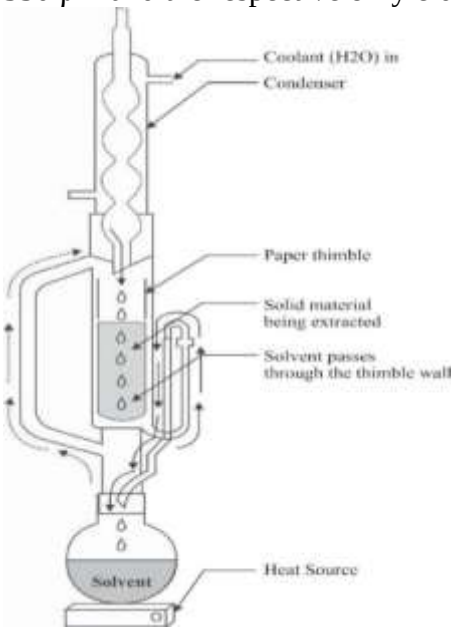

Fig. 5: Soxhlet Extraction Process

Apparatus - weighing balance, two necked round bottom flask, heating mantle, thermometer, healer 500 ml, measuring cylinder, screening apparatus, Ethanol.

EXPERINEMTAL PROCEDURE **:**

First assembled the setup for Soxhlet extractor. Then next weight 40 gm. Lemongrass on weighing balance. Make thimble from filter paper add the lemongrass into the Thimble. Place the thimble in the Soxhlet chamber. Add 150 ml ethanol into the bottom flask. Place the flask in the heating mantle. Set the temperature at 90 degree Celsius. Adjust the temperature of the heating mantle. Set the time of process for 1 hour then 1.20 min then 1.40 min. and take the runs according to the parameters.

FORMULATION OF PRFUME FROM SSENTIAL OIL

Take 10ml of lemongrass essential oil extracted. For making alcohol free perfume 5ml of aqua silk solvent is used in the place of methanol. 5ml of the Fixatives were added to the mixture (to improve the longevity of the perfume). The solution were shaken and poured into a 50ml bottle.

CREAM MANUFACTURE PROCESS

The process of selection of raw materials is as follows: Selecting the right raw materials for cosmetic creams involves a combination of factors to ensure product safety, efficacy, stability, and market appeal. Here's a step-by-step guide to the process: Define Product Requirements, Research and Screening: Conduct thorough, Safety Assessment, Efficacy Evaluation, Stability Testing, Supplier

Qualification, Regulatory Compliance, Sustainability and Ethics, Trial Formulations and Testing, Final Ingredient Selection:

TYPES OF SKIN CREAMS

They are divided into two types:

- *Oil-in-Water (O/W) creams* which are composed of small droplets of oil dispersed in a continuous phase, and an emulsion in which the oil is dispersed as droplets throughout the aqueous phase is termed an oil-in-water (O/W) emulsion.
- *Water-in-Oil (W/O) creams* which are composed of small droplets of water dispersed in a continuous oily phase. When water is the dispersed phase and an oil the dispersion medium, the emulsion is of the water-in-oil (W/O) type.

Types of creams according to function, characteristic properties and type of emulsion: Make-up cream, Vanishing creams, Foundation creams, Cleansing creams, Winter creams, Night cream or massage creams, Skin protective creams, Hand and body creams

GENERAL INGREDIENTS USED IN SKIN CREAMS

The raw materials which are used in a manufacturing of skin creams include:

Water: This is the most important and widely used raw material in any cream formulation. These are the cheapest and easily available. In skin creams, water is used as solvent to dissolve other ingredients of creams. Water, which is free of any toxins, pollutants, microbes, etc. is used in preparation of creams. Water can also form emulsions, it depends upon how much quantity of water is used in the formulation and sometimes referred to as oil-in-water emulsions and sometimes water-in-oil emulsions depending upon the quantities of oil phase and water phase used.

Oil, fats and waxes: Oil, fats and waxes and derivatives there form comprise an essential portion of creams. Waxes act as an emulsifier, fats act as a thickener and oil act as a perfuming agent, preservative, etc. according to its function .Oil may be two types' mineral and glyceride.

Mineral oil: Mineral oil consists of hydrocarbons derived from petroleum oil .Mineral oil is clear, odourless, and heavily refined oil and it is widely used in cosmetics. Mineral oil rarely causes allergic reactions and it cannot become solid and clog pores of the skin. It is light weight and inexpensive, it helps to reduce water loss from the body and keeps body moisturized. A number of mineral oils are used in cream formulation.

Examples:

- Light liquid paraffin
- Heavy liquid paraffin
- Liquid petroleum

Glyceride oil: Glyceride oil is mostly vegetable oils. Examples of glyceride oils are almond oil, arachis oil, castor oil, coconut oil, olive oil etc.

Vegetable oil: Form a barrier on the surface of the skin and slow down the loss of water, helping to maintain plumpness of skin. Vegetable oils may also be used to increase the thickness of the lipid or oil portion of cream or personal care products. E.g. Almond oil, germ oil, avocado oil, sunflower oil etc. Waxes: Which are used in preparation of cream includes beeswax, carnauba wax, ceresin, spermaceti, etc. Waxes are used in cosmetics because it helps to keep an emulsion from separation of oil and liquid components. These waxes also increase the thickness of the lipid portion and sticks on the surface of the skin.

Fats: Different types of fats are used in the preparation of creams. These materials can be obtained from animals, plants or mineral origin. Glyceride oils and fats may be of animals or vegetable origin. They consist of combinations of higher fatty acids and glycerin. When saponified they form soap, or fatty acid and glycerin, depending upon process used. The most common of these fatty acids are lauric, margaric, plamitic, stearic, saturated group. Oleic acid is liquid and most popular unsaturated fatty acid. More specially the oil most commonly used in other cosmetics are olive oil, almond oil, seasame

oil, peanut oil, coca butter fat, mutton tallow, lard and beef stearine.
Lanolin: It is derived from wool fat of a sheep. Lanolin are of two types- the hydrous lanolin contains between 25%- 30% water. Anhydrous lanolin has point of 38°C42°C and has a slight odour. These ingredients act as a lubricant on the skin surface, which gives the skin soft and smooth appearance. Lanolin helps to form emulsion and blends well with other substances used in cosmetic and personal care products.
Colours: Before the development of the modern technology, colours primarily came from substances found in nature such as turmeric, saffron, indigo, etc. After the 19th century, colours were made in the laboratory and were found to be much more stable with greater colouring intensity. They also could be produced without using plants harvested in the wild.
Emollients: Emollients, also commonly referred to as moisturizers, are products that help to soften skin or to treat skin that has become dry. Most emollients are forms of oil or grease, such as mineral oil, squalene, and lanolin. They work by increasing the ability of the skin to hold water, providing the skin with a layer of oil to prevent water loss, and lubricating the skin.
Humectants: These are important multi-functional ingredients found in most skin care formulations. Humectants are hydroscopic organic compounds. These are the materials that can absorb or retain moisture. These has many benefits such as moisturization, exfoliation, etc. Examples of humectant are glycerin, Hydroxyethyl urea, betaine, sodium PCA, Sodium- LLactate, etc.
Perfumes: Perfume is a substance that imparts a scent or order, including a sweet and pleasant smell. Examples of natural perfumes used in creams are-

- White Blossoms:
- Rosy Dreams
- Orange Blossom

Vitamins: Vitamins plays an important role in maintaining the physiological function of whole body and the skin. Vitamin A, B, C, E etc. are generally used in formulation of the creams.
Preservatives: The use of preservatives in cosmetics is essential to prevent alteration caused by microorganism and contamination during formulation, shipment, storage and consumer use. Antioxidants can also be used to protect alteration caused by exposure to oxygen. Synthetic preservatives when used in low concentration effectively preserve the products.

CHARACTERIZATION
Determination of pH:
At room temperature, the pH of the cream can be determined using a standard digital pH meter by diluting an appropriate quantity of the formulation with a suitable solvent in a beaker. However, it is advisable to calibrate the pH meter before use with a standard buffer solution at pH 4 and pH 7. Meanwhile, according to Maha et al. (2018), the pH of a topical preparation should be between 4.5 to 6.5, which corresponds to the pH of the skin. The pH should not be too acidic, as this can irritate the skin, nor should it be too alkaline.
Organoleptic Properties/Physical Appearance: Involves grading of its texture and colour. To be more precise, the clarity, smell, texture, and foreign particles present were evaluated. The grittiness and stickiness were determined by rubbing them between two fingers. Esoje et al. (2016) suggested that this test was to be conducted randomly, at different temperatures and storage duration *to observe for any changes.*
Centrifugation Test: It is conducted to assess the chemical and physical stability of the formulation under the influence of centrifugal force. Five to ten grams of sample were centrifuged at 3000 rpm for 30 min at room temperature. The formulation was examined for phase separation after the centrifugation process, which is an indicator of formulation instability. Meanwhile, Fernandez et al. (2018) evaluated both organoleptic (look, color, feel, thickness) and physical (phase separation and creaming) properties. Phase separation is denoted by the presence of caking, coalescence, and flocculation.

Mechanical Vibration Test: This test assesses the formulation's stability when subjected to mechanical vibration, which can result in phase separation and indicate instability. Five grams of sample were vibrated for 10 s on a vortex shaker (Haidalph).

Spreadability: It is a term used to describe the area a topical application spreads after being applied to the skin of the affected areas, with shorter intervals indicating better Spreadability. Between two glass slides, the formula was applied and pressed to achieve a uniform film thickness. Following that, a weight of 10 g was added to the pan, and the top plate was pulled using a string attached to a hook. The time it takes for the upper glass slide to travel 10 cm over the lower plate is recorded, and the Spreadability (S) is calculated using the formula.

STEPS FOR MANUFACTURINF MOISTURING CREAMS

- Weighing and dispensing of all ingredient
- Preparation of aqueous phase
- Preparation of oil phase
- Transfer of purified water to water vessel
- Transfer of oil material to wax vessel
- Temperature control
- Maintain temperature 100 C
- Maintain 120 C temp & keep it for 60 min
- Transfer the water phase in main vessel
- Transfer the oil phase in main vessel
- Mixing of oil phase and water phase to main vessel with homogenizer.
- Tube Filling & Sealing by Automatic Tube Filling & Sealing machine.
- Packaging
- Transfer to Quarantine
- Transfer to finished product store.

The equipments used in the manufacture of creams are mixer, emulsifier, homogenizer, kettle, storage vessel, *Mixer, Emulsifier, Homogenizer, SS Kettle,Storage Vessel, Filling and packaging*

QUALITY CONTROL MEASURES

Quality control in cosmetics encompasses several key activities:

- Validation of raw materials
- Adherence to good manufacturing practices (GMP)
- Meticulous process control
- Product testing both in-house and in third-party laboratories.

Key components of effective quality control in cosmetics

- *Raw material inspection:* Every component that goes into a cosmetic product must be rigorously tested. This starts with thorough supplier vetting and includes in- house or third-party laboratory testing for every batch of raw material received.
- *Formulation and mixing*: Precision is critical in the formulation and mixing process. The batch-to-batch consistency is a hallmark of quality. It's achieved through exact measurements, strict adherence to processing times and conditions, and robust documentation for traceability.
- *Production process monitoring:* This involves a suite of activities including calibration of equipment, validation of cleaning processes, and inline controls to check for quality at different stages of manufacturing.
- *Packing and labeling:* The integrity of cosmetic products can be compromised by incorrect packaging and labeling. It's crucial to ensure the packaging is functional and keeps the product safe throughout its shelf life, while also conveying accurate usage instructions and ingredient information. Tests like measuring the accuracy of filling equipment (maybe even adhering to the e-symbol) would be typical tests at this stage.

- *Final product testing:* Once the product has been manufactured, it is subjected to several final tests.

Quality testing Flow:

These range from sensory evaluation to ensure the product's aesthetic attributes are consistent, to physical tests checking the weight, volume, and sealing, to lab tests confirming chemical composition and microbiological safety.

- *Microbial testing:* To ensure the product is free from harmful bacteria, yeast, and mold, microbial tests are conducted. These are vital for products that come in contact with the skin, especially those used in sensitive areas such as eyes and lips.
- *Stability testing***:** This examines how a product retains its integrity over time with respect to physical, chemical, and microbiological attributes. It simulates various environmental conditions like temperature fluctuations and humidity to ensure the product remains stable.
- *Preservative efficacy testing:* Cosmetics need preservatives to prevent microbial growth. These preservatives must be tested for efficacy to ensure they perform as intended without causing undue harm to the consumer.
- *Compatibility testing***:** Packaging is an often overlooked aspect of product quality. This testing ensures that the product formula does not react negatively with the packaging material, which could affect product integrity and consumer safety.
- *Performance testing:* Beyond safety, cosmetics must deliver on their promises. Performance testing assesses the functionality of the product—does a moisturizer hydrate, does a foundation provide the right coverage, and does a shampoo clean and nourish the hair as advertised.

TESTING METHODS:

Physical and chemical testing

- *Spectroscopy*: Utilized to determine the concentration of active ingredients, preservatives, and potential contaminants. Techniques like infrared (IR) and ultraviolet-visible (UV-Vis) spectroscopy are commonly used.
- *Chromatography:* High-performance liquid chromatography (HPLC) and gas chromatography (GC) are instrumental in separating and analyzing the components of complex formulations.
- *Rheology:* The study of flow and deformation of the product. Products like lotions and creams must ensure they have the right texture and spreadability.

Microbiological testing

- *Culture techniques:* These are the "gold standard" for detecting and quantifying microbial content. Manufacturers culture samples to detect the presence of bacteria, yeast, or mold.
- *Rapid microbiology methods (RMM):* Techniques such as PCR (polymerase chain reaction) are used for rapid detection of microbial contamination.
- Microbiological challenge testing: to test the efficacy of the preservation system of a product formulation.

1. ISO TESTS

These are standardized tests under ISO and various pharmacopeia but can be adapted and expanded based on the specifics of the formulation and the factory

Safety testing

- *In vitro toxicology:* To determine the potential toxicity of ingredients and the final product, in vitro methods may be used, such as cellular assays that can predict irritation or harmful effects without animal testing.
- *Human repeat insult patch test (HRIPT):* Although in vivo testing is becoming less common due to ethical considerations, HRIPT is a method to assess the potential for dermal irritation or allergic reactions in a controlled manner with human volunteers. It's less ethical because with HRIPT there is a chance to sensitize people, making them allergic to substances. Other in vivo methods such as skin irritation are also used, although they are rapidly replaced by ex vivo and in vitro alternatives.

Performance testing

- *Clinical trials:* Human volunteer panels are used to test product efficacy and claim substantiation. This can include tests for hydration, anti-wrinkle effects, sun protection factor (SPF), and more.
- *Instrumental evaluation:* Devices like corneometers, which measure skin hydration, or visiometers, which can document wrinkle reduction, are used to provide quantitative data on product performance.

Stability testing

- *Accelerated stability studies:* These studies subject the product to elevated temperatures and humidity to predict its shelf life and help identify potential stability issues.
- *Real-time stability studies:* Observing the product under normal conditions over time provides data on the long-term stability of the formulation.

Packaging testing

- *Compatibility testing:* Ensuring the product formula does not interact negatively with packaging materials and compromise quality.
- *Functionality Testing:* Simulating transportation and usage to ensure the packaging performs under stress and preserves product integrity.

Sensory analysis

- *Expert panels:* Trained individuals who evaluate the product's color, texture, odor, and other sensory attributes.
- *Consumer sensory panels:* Untrained consumers who provide feedback on the product's sensory characteristics and usage experience

COST ANALYSIS

1. RAW MATERIALS

TABLE I: RAW MATERIAL COST

RAW MATERIALS	**COSTING**
DEMINIRALIZED WATER	Rs 7/KG
EMULSIFYING WAX	Rs 399/KG
LANOLIN	Rs 650/KG
STEARIC ACID	Rs 299/KG
CHEA BUTTER	Rs 600/KG
METHANOL	Rs 28/L
OIL AND PRESERVATIVES	-

2. MACHINERY

3. AREA AND POWER REQUIREMENT

- *The approximate total area required for complete industrial setup is 2000 to 2500Sqft.*
- *Power Requirement:* The power consumption required to run all the machinery could be approximated as 20hp
- *Approvals & Registration Requirement:*
- *GST Registration*
- *Udyog Aadhar Registration (Optional)*
- *Choice of a Brand Name of the product and secure the name with Trademark if require.*
- *License from cosmetic and drug control board.*

CONCLUSION

The research project will help us understand the human psychology and their reason to choose one product or a brand from the other. It also helps us understand how the different marketing strategies help the consumer choose the best product

Fairness creams constitute a consistent proportion of income for the FMCG companies in India. As most of the Indians are very much bothered about their complexion the fairness creams enjoyvery good market growth rate when compared with other related product categories. As Fair & Lovely's USP has done wonders, other players in the market can also follow their philosophy of 'fairness'. It is not sufficient if a company has the right product with right quality. It has to be communicated properly to the target audience. Hence, TVCs which were widely remembered and recognized by Indian consumers for fairness creams can be made use for creating the awareness for various brands of fairness creams.

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