

## Shampoo

Washing of the hair and scalp has become a near universal practice. Shampoos are the mostly used hair-care products.

A shampoo is a cleaning formulation of chemicals called surfactants in a suitable form - solid, liquid or powder that has ability to surround oily material on surfaces and allow them to be rinsed away by water from the hair scalp. While there are numerous types of shampoos, the majority are low viscosity solution formulas delivered from a plastic bottle. Often they are marketed towards different types or condition of hair.

Function of shampoo: A good shampoo should "cleanse hair and scalp thoroughly without stinging or irritation and should not remove too much of the natural oil from the scalp". A good shampoo should be able to perform the following functions:

- 1) It should remove the secretion of sebaceous glands (Sebum) and atmospherically-acquired oil.
- 2) It should remove the residues of hair setting lotions/dressings from the hair scalp.

- 3) It should produce sufficient level of foam (lather) to satisfy user.
- 4) After shampooing, it should leave the hair soft, lustrous and easy to comb before and after drying.
- 5) It should impart a pleasant fragrance during use to mask the odor of wet hair.

A Shampoo formulation may also be compounded to emphasize some specialized capability like minimizing eye sting, controlling dandruff, or impart appealing fragrance to gain a more favourable acceptance from the population. Removal of dirt on hair is achieved by detergents, which act by a number of physical phenomenon viz., wetting, foaming, emulsification and peptization. Removal of dirt involves following processes:

- 1) The detergent must wet both dirt as well as the hair i.e. it should lower surface tension.
- 2) The interfacial tension must be reduced so that dirt or oil particles are displaced by detergent solution.
- 3) The dirt particles must be kept dispersed so that these are washed away.

## Raw Materials for Shampoo:-

A Shampoo basically a solution of a detergent modified by additives to render it easier to apply and to safeguard against deterioration of the hair condition after the Shampoo has been rinsed away. The main ingredients for Shampoo include:

- 1) Detergents / Surfactants
- 2) Foam boosters and stabilizers
- 3) Conditioning agents
- 4) Viscosity modifiers, including hydro colloids and electrolytes
- 5) Opacifiers or clarifying agents
- 6) Sequestering agents
- 7) Preservatives
- 8) Fragrances and Colors
- 9) Special additives, including antidandruff agents.

### Water

A primary ingredients in all Shampoos, it makes about 70 to 80 percent of entire formula. It helps to dilute the detergents & make the formulation easier to spread and reduce irritation. It also keeps formula inexpensive. The Surfactant and water are mixed with gentle stirring to minimize frothing. The foam booster (N alkyl betaine) and other functional ingredients are mixed by propeller stirring. The pH adjuster (citric acid) and thickeners are added with vigorous stirring. The preservatives and perfume are added in last step.

2) Surfactants: They are classified as non-ionic, cationic, anionic and amphoteric according to way in which they ionize. The non-ionic detergents have sufficient cleansing power but only few have foaming property. Therefore, they are not used as <sup>principal</sup> foaming agents. They are mild and non-irritating to skin and are used as foam boosters and stabilizers. Cationic detergents produce foam well and have sufficient cleansing power, leave hair lustrous and free of electrostatic charge. But they possess two serious drawbacks. Firstly, they have tendency to weigh down hair and secondly, they are injurious to corneal eye tissue. Anionic surfactants, due to their superior foaming property and low cost, are most widely used surfactants. Ampholytes are used for their hair conditioning properties.

Examples of anionic detergents used in Shampoo include alkyl benzene sulfonates, alkyl sulfates, ayl peptides, sulfosuccinates, ayl lactylates, alkyl polyethylene glycol sulphates etc. Non-ionic surfactants include fatty acid alkanolamides (eg monoalkanolamides), polyalkoxylated derivatives and amine oxides etc. Amphoteric Surfactants Comprise of N-alkyl amino acids (eg  $\beta$ -aminoacid derivatives) and betaine etc.

### 3) Foam boosters and stabilizers:

Foam stabilizers or foam builders when added to formulation increase the quantity, volume and stability of lather. Often, they also increase viscosity and impart slight conditioned effect to the hair. The principal foam boosters are the fatty acid alkanolamides (such as lauryl diethanolamide, coconut monoethanolamide), fatty alcohols (in low concentration and to a small extent), phosphate. Sodium benzene Sulphonate is considered to be a good foaming surfactant when used alone. The addition of lauryl monoethanolamide not only increases the initial foam volume but also enhances the stability of the foam.

### 4) Conditioning agents:

Some materials are added to shampoo to offset the harsh effect of surfactants. Typical conditioning agents include polymers, silicones, fatty materials like lanolin and its derivatives, esters such as isopropyl myristate and butyl palmitate, glycerol, propylene glycol, mineral oil, natural products like polypeptides, egg derivatives, herbal extracts and synthetic products i.e. surfactants, resins etc. Conditioning agents are intended to improve manageability, feel and luster of the hair. These ingredients are left on the hair surface rinsing and they modify the characteristics such as feel, softness, compatibility and static charge.

shampoo which specifically feature conditioning as a benefit are called 2-in-1 shampoos because they clean and condition hair in the same step. Examples of conditioning agents include Guar hydroxypropyltrimonium chloride which is a polymer, Dimethicone which is a silicone and Quaternium 80, a quaternary agents

4) Viscosity modifiers: These are used for thickening of shampoo. In general natural gums such as gum Karaya, tragacanth, gum acacia have been replaced by synthetic gums such as hydroxymethyl cellulose, methylcellulose, carboxy methyl cellulose and carboxy vinyl polymers but care must be taken since they have tendency to form films on the hair. Simply adding salt can also increase the thickness of shampoo. Inorganic salts and electrolytes such as sodium and potassium chloride can be used in limited amounts. However, the danger of film formation is avoided by using other thickening agents such as alkanolamides and glycol or glycol stearates.

6) Opacifiers & clarifying agents: Since clear form shampoo remain the most popular. In general Coupling and solubilizing agents help to maintain shampoo clarity over a wide temperature range. Care must be taken in selection of compounds of this type for possible eye irritation and toxicity. Transparency may be improved by solubilizing alcohols, phosphates or non-ionic solubilizers.

Opacifying agents include alkanolamides of higher fatty acids, glycol monostearate and distearate, propylene glycol and glycerol monostearate, fatty alcohol (i.e. cetyl alcohol, steryl alcohol), milky emulsions of vinyl polymers and latexes, insoluble salts (i.e. Magnesium, Calcium or Zinc salt of stearic acid), finely dispersed Zinc oxide or titanium dioxide and magnesium aluminium silicates, etc.

Clarifying agents include solubilizing alcohol like ethanol, isopropanol, propylene glycol, hexylene glycol, etc. Phosphates and non-ionic solubilizers like polyethoxylated alcohol and esters also belongs to this category.

7) Sequestering agent:- They are used to prevent deposition of Calcium and magnesium salts of soaps on to the hair, when the shampooed hair is rinsed with hard water. The addition of sequestering agents such as citric acid and salts of EDTA, prevents lime soap formation in the lathering process provided that proportions of up to 1% should be used. Non-ionics in low concentrations (such as the Tweens) have shown to improve the cleansing action of soaps and their lime soap dispersion. Polyphosphates such as tetrasodium pyrophosphate and tripolyphosphate possess good clarifying action. These salts decrease solubility of soap and detergents.

g) Preservatives : Bacterial growth in shampoo can lead to breakdown of leading to discolouration of the product. Surfactants in shampoo tend to interfere with the bactericidal activity of the antibacterials. Therefore, higher concentration of preservatives is necessary in shampoos. The test includes formaldehyde, ethanol, methyl, propyl and butyl hydroxybenzoate, phenylmuriatic acetate, the alkyl anisole etc. Formaldehyde, remains unaffected by surfactants and is used in concentration of 0.1 - 0.15%. It is not compatible with protein hydrolysate ingredients in some shampoos.

Two most common preservatives used in shampoos are

- 1) DMDM hydantoin (dimethyloldimethylhydantoin) releases formaldehyde and is compatible with most of surfactants;
- 2) Methylparaben.

9) Fragrances and Colors :- All shampoos have perfume and dyes in them to ensure their cosmetic acceptability. Perfumes are compounded from a number of essential oils, extenders and fixatives. Consideration should be taken that the fragrances used should be soluble and compatible with other ingredients used and should not effect the viscosity and stability of the shampoo.

10) Special additives : Traditional antidandruff compounds included sulfur, salicylic acid, hexachlorophene, resorcinol and tar. Most recent additives include selenium sulphide, zinc pyrithione (ZPT), pyroctone olamine (PO) the iodine-containing hydroxy quinolines and some quaternary ammonium compounds.

Sometimes it also necessary to protect the shampoo by adding stabilizers like antioxidants, sunscreens, suspending agents and pH control agents. Reducing agents protect the product from discoloration and bad odor. odor due to oxidation. Sunscreens such as benzophenone or benzotriazole derivatives absorb harmful ultraviolet radiation and thus reduce product damage from sunlight exposure. Suspending agents like xanthum and bentonites, stabilize shampoo where solid particles are suspended in a liquid. Various pH control agents viz. buffers, protect the product from changing color odor or any irritation due to a change in pH.

#### Types of shampoos:

Shampoo can be of various types

Powder shampoo, Lotion shampoo, liquid shampoo, cream shampoo, Aerosol shampoo, baby shampoo, Conditioning shampoos, Anti-dandruff shampoo, Specialised Shampoo

#### Powder shampoo:

The formulation of dry shampoos is a powder blending process, which usually starts with grinding the ingredients to provide a uniform particle size. After careful blending, the mixture may be subject to sieving to better homogenize them and again provide a uniform particle size.

### Formula 1

S.No	Ingredients	% (W/W)
1.	Henna Powder	5.0
2.	Soap Powder	50.0
3.	Sodium Carbonate	22.5
4.	Potassium Carbonate	7.5
5.	Borax	15.0
6.	Perfume	Q.S

### Formula 2

S.No	Ingredients	% (W/W)
1.	Sodium lauryl Sulphate	20.0
2.	Sacroside	5.0
3.	Sodium carbonate	10.0
4.	Sodium sulfate	15.0
5.	Perfume	Q.S

### Clear liquid Shampoo:-

Clear liquid shampoos can be prepared with detergents having lower cloud point. These can also be made with detergents and alkanomides.

### Formula 3

S.No	Ingredients	
1.	Triethanolamine lauryl Sulphate	50.0
2.	Lauric isopropanolamide	2.0
3.	Water to make	100
4.	Perfume/Colour/Preservatives	Q.S

### Formula 5

S.No	Ingredients	% (W/W)
1.	Coconut oil.	14.0
2.	Olive oil	3.6
3.	Castor oil	3.0
4.	KOH	5.0
5.	Glycol	2.0
6.	Ethyl. Alcohol	4.0
7.	Sodium hexametaphosphate	1.0
8.	Perfume	0.3
9.	Water	68.0

## Aerosol based shampoo

They are prepared by two components concentrate 88% and 12% propellant to expel the Shampoo from the container

### Formula-6

S.No	ingredients	%(W/W)
1.	Ammonium salt of monoglyceride sulfate coconut oil	35.0
2.	Perfume oil	0.7
3.	Lanolin	0.8
4.	ethyl alcohol	6.0
5.	Isopropylal	17.0
6.	Water deionized	37.0
7.	Aluminum Sulfate	3.5

## Dry Shampoo

This product is to be used in totally dry way. It is applied to the hair and brushed through, cleansing by absorbing the excess sebum and taking the atmospheric soil with it. No water is used at any stage.

S.NO	Ingredients	%(W/W)
1.	Corn starch	10.0
2.	Talc	45.0
3.	Tripolite	45.0