REINVENTING THE ART OF DETERGENT POWDER FORMULATIONS

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IN my last paper "Discover The Magic Of Polymer In Soaps & Detergents" appeared in *'Soaps Detergents & Toiletries Review, Nov 14'* the general benefits of incorporation of polymer in detergent formulation were discussed. Now in this paper we are discussing polymer incorporation benefit in Detergent Powder formulations covering its effect to various commonly used ingredients STPP, Soda Ash, CMC, Optical whitening Agents etc along with cost benefits:

World over Polymers especially Acrylic Polymers are incorporated in Detergent Powder formulations by various multinational units. However in India, except few large units, awareness of application of use of polymer is very low especially among large no of unorganized small scale Detergent Units. These series of articles are being published for reinforcing & creating the awareness of polymers among such units.

We are now going to discuss the incorporation of Polymer and its effect to various builders used in Detergent Powder Manufacturing.

Reducing STPP Content

In India many Detergent Powder manufacturers are using STPP as main builder. But as discussed in our last paper, phosphate formulation can precipitate under several realistic usage conditions because of wide variation of hard water available .

A very little Polymer addition will not only help reducing STPP quantities but will also prevent precipitation of STPP salts on fabrics on account of two reasons.

Firstly, formation of insoluble complexes of STPP would be greatly reduced.

Secondly, if some amount of insoluble complex is formed, the polymer will keep this in suspended form & it will be easily rinsed away by water so that deposition of these insoluble salts on clothes will not take place.

Manufacturers are reducing STPP content in their formulations on account of very high prices of the product as well as on pollution & eutrophication grounds. So if little polymer is incorporated in the formulation, you can reduce STPP & thereby cost of the formulation without sacrificing performance benefits. US Patent No.: 5376300 & 4849125 describes much improved formulations by incorporating just 1%-2% of Polymers.

Encrustation Problem Of Soda Ash Is Reduced

Soda Ash is a major important builder of detergent formulations. However Soda Ash based detergents have serious encrustation problem as it reacts with hard water ions and form insoluble salts such as Calcium Carbonate & Magnesium Carbonate. These insoluble salts deposit on the fabric (i.e. encrustation) leading to yellowing & stiffening of clothes. Little polymer, if added, in soda ash based formulation eliminates encrustration. Further when we reduce STPP, we invariably use Soda Ash which is an economical and easily available substitute. Use of polymer with Sodium Carbonate can more than compensate for phosphate reduction. Formulation cost saving will be added advantage without compromising on cleanliness & whiteness maintenance.

In India large no. of Small Scale Detergent Powder making units use Acid Slurry (LABSA) , Soda Ash & water as main ingredients. Products of these units face major problem of hard water salt deposits on the clothes. This problem can easily be reduced or overcome by incorporating just 1 to 2% of lower molecular wt . Acrylic Polymers such as ACR 4500.

Increasing The Effectiveness Of Optical Whitening Agents

Optical Brighteners (OBs) are used to increase apparent whiteness/brightness of the fabrics in the detergent. These are undoubtedly the most expensive ingredient in the detergent formulation. They go in small dosage and hence their optimum use becomes all the more important.

Optical Brighteners work on the principle of absorbing UV light and remitting the light in the blue region of the visible light thereby making the fabric appear brighter/whiter.

For the brightener to be effective, it must dissolve or disperse in the washing solution and then become distributed on the fiber and throughout its surface. The effectiveness of Brighteners is therefore determined by their rates of dissolution in the washing solution and their distribution on the fibers. Majority of the Optical Brighteners used in the detergent formulations and the presence of hard water cationic ions neutralize the anionic charge of the OBs, leading to the loss of the important optical brightener properties of absorption of UV light and emission of visible light.

Polymer increases the efficiency of OBs by various routes a) Effective dispersion of OB in the wash solution resulting in effective monolayer distribution on the fabric b) Increasing the rate of dispersion c) Binding the cationic ions - which would otherwise coagulate the OB and rendering them ineffective.

Eliminating use of CMC

Soil removed by detergent/cleaner should not redeposit on the clothes. For this Carboxymethyl Cellulose (CMC) is incorporated in detergent formulations as an anti-redepositing agent. However if we incorporate polymer in detergents, we can totally eliminate CMC & can save entire cost relating to CMC addition.

Polymer keeps the dirt in suspension & does anti-redeposition in more effective way. One more important thing to be noted is that CMC does not effectively work with polyester fabrics. So for polyester fabric polymer is all the more important.

Readers are most welcome to discuss their queries and formulation issues. With due permission, replies related to such queries would be published in subsequent issues of SOAPS, DETERGENTS AND TOILETRIES REVIEW for the benefit of the entire Detergent Industry. Queries can be mailed to **vineetlohiya@rediffmail.com**

Removing the negative effects of Mineral Clay Fillers

Majority of the Indian Subcontinent detergent formulations incorporate very high levels of fillers like Dolomite, Calcite, China Clay etc. These are nothing but well defined particulate soils. Now, the irony is detergent powder formulations require removal of particulate soils but at the same time for lowering costs, these soils are incorporated in the formulations itself !. Since Polymers are the best dispersants (particularly low mol.wt), there incorporation becomes all the more important. These would disperse soils from the formulation which would get easily removed through the rinsed wash water. Acrylic Polymers also aid in increasing the overall rate of dissolution of the Powder in the wash water.

Reduction In Energy Cost In Spray Drying

Large detergent plants make detergent powder by first neutralizing the active matter & then making a slurry after incorporating various other builders. This slurry is pumped & sent to spray drying units for drying it to powder. If a little polymer is incorporated during the slurry making process than we can make pumpable & spray dryable slurry of higher solids.

Such slurries having less water will consume less energy & will result in lot of saving in energy bills.

To summarise, it is clear that, Polymers have become essential ingredients of laundry products. They perform multiple tasks of inhibiting growth of Calcium, Magnesium Carbonate Crystals, does Sequestration, Help Soil Removal, Prevent Re-deposition of Dirt, Dispersing the insoluble clays , Prevent Encrustration on Clothes. The Acrylic Polymers will make the detergent formulation stronger overall and more resistant to varying washing conditions and water hardness. Improved performance can be seen by observing the cleanliness/whiteness not only in one wash but wash after wash. In order to have long term sustainability Small Scale Detergent units should keep pace with technological developments and start incorporating Polymers in detergent formulations.

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