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Car Wash Detergent Colorants - *Leaping the Hurdles of Proper Dye Selection – Reversing the Process*

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Introduction

Have you ever spent days or weeks trying to select the best detergent color to match your company logo, or your desired product identification shade, or the unique brilliant fluorescent eye-popping color? Much time is spent researching competitor's product colors, poring over countless PANTONE™ shades, and meeting with marketing experts to determine the best shade for your end-product, to find out in the end of this process, that the dyes or colorants selected do not work in your detergent formulation? How could that be? There are literally thousands of dyes and pigments to choose from, and they should all work, right?

This is not an atypical situation when formulating car wash detergents, or any colored chemical formulation for that matter. The best color-selection approach is to start by forgetting about the target shade at first, and begin with the detergent formulation's physical properties which inevitably dictate which colorants can be used. The term colorants is broad, which includes anything that imparts color - typically comprised of dyes, pigments, and fugitive "non-staining" tints. Pigments can be removed from this discussion as they are not typically used in car wash formulations due to their insolubility characteristics. The physical properties of a detergent formulation create a number of hurdles to overcome when it comes to colorant selection - which include technical, Safety, Health, & Environmental(SH&E), and economic considerations.

Technical Hurdles

There are innumerable types of detergent chemical formulations. With so many varied end-use applications and desired performance characteristics, a wide selection of chemicals must be used to meet all the needs. When formulating, technical questions arise such as: What should the pH be? Should it be non-staining to the material it is cleaning? Do we want it to fade in sunlight, or be stable to it? Will the chemical additives be compatible with each other? Once these and other questions are satisfied, the final colorant choice must also satisfy all of these technical parameters:

pH stability

With a wide pH range, typically from 2 to 13 in car wash detergents, the availability of colorants that are stable to the extremes of this range is quickly narrowed. Problems that could occur with improper pH-stable dye selection could be settling-out of dye, color-change, or total color disappearance. For some formulators, having a standard line of dyes that are stable in this whole pH range is their best option for the formulation of their product lines. They may not be able to achieve the exact shade they desire, but the peace-of-mind benefit of knowing the dyes



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will be pH-stable in all of their formulations, along with the logistical benefits that comes along with it, far outweigh the other benefits.

Chemical compatibility

Similar to pH, the colorant must be stable to the chemicals in the formulation. Car wash detergent formulation ingredients commonly include acids, alkalis, surfactants, phosphates, enzymes, silicones, solvents, polymers, and other additives, depending on application and desired effect. Each of these, individually or in combination, could have a negative effect on the colorant.

Solubility compatibility

Car wash owners usually desire a highly concentrated detergent in terms of both chemical activity and color intensity. This lowers cost and offers flexibility to the operator if the concentrate is used in secondary formulations. The colorant however, must be very soluble in order to maintain stability in these solutions.

Staining characteristics

Another concern in the selection of colorants is the potential staining characteristics of the dye. Dye classes that are typically used in car wash detergent formulations are acid dyes, basic dyes, and fugitive tints, each having different staining properties on materials such as leather, vinyl, and rubber. This is a very important consideration when formulating.

Basic dyes typically have a high degree of staining, Acid dyes medium-to-minimum, and Fugitive tints minimum-to-none. In all of these cases, the degree of staining is dependent on how high of a colorant concentration is used and the substrate the colorant is being applied onto.

UV Stability

A colorant's stability to sunlight or ultraviolet(UV) light is always a major concern. The last thing a manufacturer wants to see is their product fading on the store shelves. There typically exists a tradeoff with a bright fluorescent shade vs the length of time the detergent can be exposed to UV or sunlight before the color begins to fade. For some applications, such as a Triple-Foam product, the main goal is to see the vivid colors in the car wash foam for a short period of time during the actual car washing. In this case, the detergent can be kept in an opaque container to protect it from UV degradation while not in use. Actually, once the detergent is used, it is typically desirable for the colorant to fade quickly. So depending on your application and marketing approach, knowing the lightfastness ratings of colorants is an important factor to consider.



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Safety, Health, & Environmental Hurdles (SH&E)

When dealing with chemicals, it is very important that all SH&E rules and regulations are met. In today's world there are countless associations, programs, recommendations, rules, and regulations that exist to address these concerns with additional changes to legislation (both National and State) being submitted seemingly on an annual basis. Your Color Supplier should be knowledgeable about the regulations in your area.

Economic Hurdles

Once it is determined that all physical property requirements are satisfied, the physical form of the colorant, which typically affects the overall cost of the formulation, can be addressed. The cost of a colorant, or more accurately the *money-value*, is a function of how strong the colorant is. For example, when comparing a powder and liquid dye of the same Color Index number, the money-value is calculated based on the cost per pound relative to the strength of the dyes. If both liquid and powder dye costs \$10.00/lb. each, and the powder dye is five times stronger than the liquid dye, the powder dye then has a money-value cost of only \$2.00/lb. versus the liquid dye at \$10.00/lb.--meaning you only need to use 20% of the powder dye in a formulation as opposed to 100% of the liquid dye.

A liquid dye may offer a non-dusting, ease-of-use product, but cost is typically higher due to manufacturing costs, lower dye strength, and higher freight costs. Freezing conditions during shipping may also be a concern.

Powder dyes can be an attractive option as they can be highly concentrated whereas a small amount of dye will go a long way to achieve the desired shade. Handling may be a concern however, due to potential dustiness and difficulty dissolving into the detergent. Some powder dyes are available in "pellet" form, minimizing the airborne dust concern, but are typically more expensive.

When selecting colorants, it is recommended that the dye supplier be ISO-9001 certified in order to guarantee a cost-effective high-quality colorant. Any variation in dye strength, shade, solubility, color index name, or Chemical Abstract Service(CAS) number could adversely affect the final detergent formulation.

Finish Line – Final Colorant Selection to Meet All Requirements

Although there are thousands of colorants in existence, you can see how all of these physical property, chemical, environmental, and economic limitations can drastically reduce the number of suitable colorants that will satisfy all needs. Teaming up with an established and knowledgeable dye supplier that offers a broad selection of quality dyes, is the best first step in colorant selection. The next step is to identify all physical property and SH&E requirements of the detergent formulation with technical support from your colorant supplier, in order to determine available colorants that satisfy the requirements. And finally, always choose your color last!

For further information, please contact us at: info@organicdye.com