



Ultramarine in Detergents: The blue that makes whites whiter than white

Ultramarine blue is the synthetic form of a naturally occurring mineral called Lapis Lazuli. From the time of the Pharaohs, Lapis was widely used in jewellery and as the blue pigment in high quality decoration. It was the discovery of its beneficial effects in laundering applications - and the resulting increase in demand - that led, in 1828, to the development of a process for manufacturing the pigment on an industrial scale. The natural product was neither abundant nor cheap enough to justify its use as a laundry aid.

Ultramarine soon became widely accepted as the 'blue whitener'. When James Reckitt considered the options for expanding his successful laundry starch business by adding related products, he chose to set up an Ultramarine factory in Hull, England. That was in 1884 and it became the world's largest Ultramarine factory. It was still operational under the name Holliday Pigments Limited up until 2007 and the company - now based in Comines, Northern France - remains a world leading supplier of Ultramarine today.

From its roots in the laundry industry, Ultramarine expanded into plastics, cosmetics, paint, artists' colours and numerous other industries. But still a significant proportion of the thousands of tonnes of Ultramarine manufactured each year is used to improve the whiteness of laundered articles.

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Blue Undertones

As natural fibres age, they tend to become yellower in undertone. This is undesirable since in most societies, it is a bluer undertone white that suggests higher quality and cleanliness. The advantage of Ultramarine when used in the laundering process stems from its ability to absorb the unwanted yellowness in white articles and replace it with the much more desirable blue undertone. Its effectiveness is due to the particular reflectance characteristics of the pigment. Ultramarine has a red undertone, which means it reflects at both the blue and the red extremes of the spectrum and absorbs only the unwanted yellow component. Most other blues are of a green undertone. In addition to absorbing the yellow component they also absorb the red and cannot therefore give such a balanced correction as Ultramarine.

Ultramarine can be added at many stages of the laundry process. Usually it is included as part of the detergent powder, although it can be added separately at a later stage as a dry pigment or a predispersed liquid in the final rinse. Ultramarine is a pigment, not a dye. Pigments are insoluble and when added in the laundry process the Ultramarine will be present as tiny particles of pigment which are kept in suspension in the water due to the agitation of the laundering process. Inevitably some of the particles become trapped within the fibres of the laundered articles and it is these trapped particles that impart the desired blue undertone. On the next occasion that the article is laundered, some of these trapped particles will wash free but others will take their place. This results in almost a self regulation of addition. As the articles become older they become yellower and require more correction, but this is naturally achieved because the fibres will become more frayed and trap more pigment particles.

Balancing Act

The recommended addition level of Ultramarine is approximately 0.15% based on the detergent. Significantly exceeding this level may result in too high a concentration in the water and consequently too much entrapment of Ultramarine, giving a pale blue shade rather than a corrected white. If this happens it is important to remember that the pigment is only trapped in the fibres, it has not permanently coloured them. If the next wash is made with a lower Ultramarine content the blueness will be reduced. If a more rapid correction is required, rinsing with some vinegar or lemon juice will easily remove the excess blue colour.

Another important consideration is the particle size of the Ultramarine. It is the particle size of the pigment powder that determines the pigments' strength and undertone, the finer particles being stronger. However the finest particles are less than 1 micron and these can become so firmly trapped within the fibres of a laundered article that they do not wash out in the next wash. Inevitably some more particles will become trapped in subsequent washes, leading to a slow increase in blueness. To avoid this a particle size of 2 to 3 microns is recommended equating to a grade such as 08 in the Holliday Pigments' range.

Blue Rinse

The Ultramarine can be used to give a uniform pale blue colour to the detergent, or it can be concentrated on some of the granules which gives an attractive dark blue speckle effect in an otherwise white detergent. In either case the recommended addition level is around 0.15% based on the total detergent. The speckles suggest a special additive in the product which can be useful in marketing.

Ultramarine improves the undertone of white laundered articles giving improved whiteness, but cannot increase the reflectance to give improved brightness. This is only possible by using an optical brightener, which converts invisible ultraviolet light (UV) into visible light. Many blue pigments absorb UV light and would impair the efficiency of optical brighteners. Ultramarine does not absorb UV and combines well with optical brighteners, the one providing higher whiteness and the other higher brightness.

The efficiency of Ultramarine is illustrated in Figure 1 (page 3). White fabric was laundered with increasing additions of Ultramarine and optical brightener, both expressed as percent additions to the detergent. Regardless of the initial optical brightener content, addition of Ultramarine has a positive effect as expressed by the increase in whiteness index. More information can be found in the Holliday Pigments' publication "The Cost of Whiteness".



Environmental Considerations

As the world becomes ever more sensitive to environmental issues, the implications of discharging chemicals from laundry operations into watercourses are being taken more seriously. Optical brighteners are very persistent and it is possible that in the future their use will be restricted.

It is reassuring to know, however, that Ultramarine passes all of the environmental regulations including the German WGK (Verwaltungsvorschrift Wassergefährdende Stoffe of 17th May 1979, classification = 0) and to further minimise the effects of the synthetic Ultramarine manufacturing process on the environment - and specifically the quality of the water pumping into the nearby River Lys - Holliday Pigments has recently invested €2M in an effluent treatment plant at its main manufacturing site in Comines, Northern France. Based on a formula comprising ferric chloride, oxygenated water, a precipitant and coagulant, the resulting system is capable of treating up to 800m³ of water per day - more than double its previous processes - and is believed to be the most advanced solution for our industry.

Indeed, it is this commitment to the continuous improvement of its environmental credentials that will ensure Holliday Pigments' Ultramarine will always be available to improve whiteness.



The new water effluent treatment plant at Holliday Pigments' main manufacturing site in Comines, Northern France.

Benefits of Ultramarine for Laundry Applications

- Worldwide approval for use in skin contact applications
- Optimum whitening effect
- Does not permanently stain
- Synergy with optical brighteners
- Non-toxic

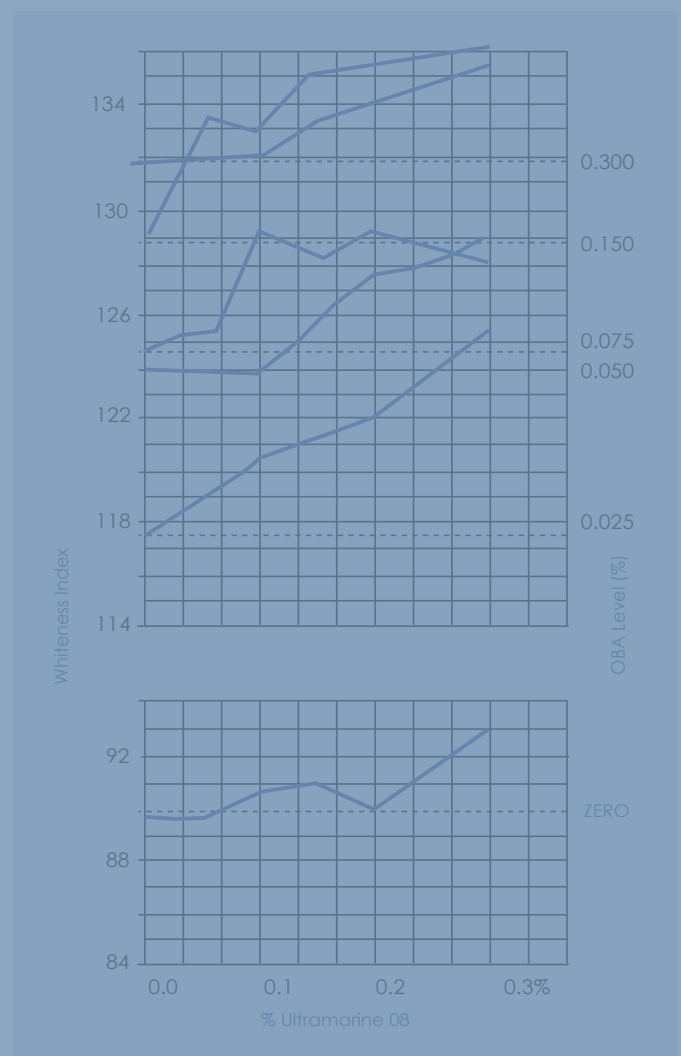


Figure 1:- The efficiency of Ultramarine is shown by the increase in whiteness index.



About Holliday Pigments

Holliday Pigments is a world leading supplier of Ultramarine pigments, which are used in a variety of applications including plastics, coatings, cosmetics, artists' colours and printing inks. Exporting to over 80 countries, Holliday Pigments has dedicated customer and technical service teams at its factory in France and its commercial office in Singapore.

Holliday Pigments has a proud 125-year history in the manufacture of technical quality Ultramarine and is the only Ultramarine manufacturer in the world to have invested in Flue Gas Desulphurisation technology, reducing sulphur dioxide emissions inherent in the manufacturing process by more than 99.5%.

In August 2008, Holliday Pigments joined Rockwood Holdings Inc., becoming an important addition to the Color Pigments and Services Division.

Rockwood's Color Pigments & Services Division is one of the largest worldwide suppliers of colored pigments for construction, coatings, plastics and specialty applications. The Division's manufacturing sites and customer service centers are located in the United States, United Kingdom, France, Italy, Germany, Australia and China with additional sales offices located in Singapore and Hong Kong. For more information on Rockwood, please visit www.rockwoodpigments.com.

The Rockwood Color Pigments & Services Division is a business unit of Rockwood Holdings Inc., Princeton, N.J., U.S.A. Rockwood Holdings, Inc. is a leading global specialty chemicals and advanced materials company. Rockwood has a worldwide employee base of more than 9,500 people and annual net sales of approximately \$3 billion. The company focuses on global niche segments of the specialty chemicals, pigments and additives and advanced materials markets.

For more information on Rockwood, please visit www.rocksp.com.

Further information on all Holliday Pigments' products is available from:

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