Henkel Excellence is our Passion

Technical Article

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Henkel's Optal XP range performs better in tests than casein-containing adhesives

Scientific tests substantiate advantages of casein-free labeling adhesives in bottle cleaning process

Labeling adhesives have to satisfy multiple requirements. A new generation of casein-free adhesives now offers extended properties and a performance profile that ensures trouble-free production processes for beverage manufacturers while extending their options. Worries that these innovative adhesives could cause problems in bottle cleaning plants have proven to be groundless.

In the course of their life cycle, beverage bottles can encounter a whole range of conditions – in bottle cellars, in beverage retailing, during transport, in refrigerators or during cleaning. The same applies to their labels that position the brand and also inform the consumer about the beverage's composition and ingredients. The label is also exposed to a large variety of influences, e.g. fluctuating temperatures, changes of air, moisture and mechanical stress. The adhesives employed therefore have to do far more than just stick the label to the container. In fact, they have to feature a broad profile of processing and in-use properties. For instance, the label should not become detached from the bottle on exposure to condensation but still come off cleanly when the bottle is washed in preparation for re-use.

The properties of casein-based adhesives have been known for many decades and their use has become correspondingly established. Alternative adhesives have given rise to practical problems of varying complexity. Aside from the secure bonding of labels, attention has to be paid in particular to properties affecting the cleaning of returnable bottles, whereby both the labels and the adhesive have to be completely removed. Sometimes quite serious secondary problems can arise during bottle cleaning which ultimately exert a major influence on the type of adhesives used. Apart from the need for complete removability, important aspects include the formation of insoluble compounds in the cleaning solution, and foaming due to the occurance of dicomposed and saponified adhesive residues. Indeed, many businesses in the beverage industry fear that the use of casein-free adhesives in the returnable bottle segment will lead to a disruption of their cleaning plant due to the precipitation of insoluble components or excessive foaming. It is also essential that particles of adhesive can be completely rinsed out of the bottles as the cleaning operation proceeds.

Having instigated a comprehensive comparative test program, Henkel has now analyzed the performance of its casein-fee labeling adhesives of the Optal XP range versus that of casein-based labeling adhesives. The test methods and assessment criteria for this investigation were selected and compiled in close cooperation with Ecolab, a specialist for industrial cleaning and special bottle cleaning processes. The object of the exercise was to anticipate adverse influences on the bottle cleaning process and then eliminate these as far as possible, thus satisfying the imperative that the bottle cleaning operation be unimpaired by the labeling adhesives used.

No contamination of the washing solution by sedimentation

The sedimentation behavior of the various adhesive types was analyzed in a two-percent caustic soda solution with water. Caustic soda solutions with, in each case, two-percent casein-based and casein-free adhesive were then stored for 48 hours at 80 degrees Celsius. Directly after the preparation of the test solutions, the only observation was a degree of clouding without sedimentation. While sedimentation occurred in the casein-based adhesive after just six hours and remained visible for two days, the two casein-free Henkel adhesives Optal XP 300 and Optal XP 180 Plus exhibited no sedimentation at all. After storage at 80 degrees Celsius, the solutions were stored for a further five days at a temperature of 23 degrees Celsius, with the same results. And this was also the case when the same test series was performed with the addition of two-percent sodium carbonate (Na_2CO_3). These results show that the new casein-free adhesives do not lead to sedimentation problems.

Foaming behavior unproblematic

It was not only in sedimentation that the casein-free adhesives scored high. Also in terms of their foaming behavior, the two new-generation Henkel products performed better in the tests than their casein-based counterpart. Addition of an Ecolab defoamer (0.01 percent) resulted in significantly better foam suppression in the casein-free adhesives than was the case with the casein-containing adhesives. In practice, therefore, significantly lower defoamer dosages are possible.

No residue problems

In the test for adhesive residues left in the wash water following the bottle cleaning process, the two types of labeling adhesive performed equally well. After just two rinsing operations, the COD value (Chemical Oxygen Demand) was less than 15 milligrams per liter of wash water, representing good rinsability.

Laboratory tests and field results

In addition to performing well in the laboratory tests, the casein-free labeling adhesives of Henkel have also proven their worth in the field. Renowned breweries and beverage bottlers in Germany, France, Spain and the Eastern European countries are already using them and have reported no problems whatsoever with respect to sedimentation, foaming or deficiencies in bottle cleanliness.

This also applies to mixed operations whereby bottles labeled with casein-containing adhesives and bottles labeled with casein-free adhesives are cleaned in the same plant. Here again, customers have experienced no problems with respect to the wash solution.

While synthetic adhesives of the first generation may have shown weaknesses in the last ten years with respect to cleaning, foaming or solubility in the wash solution, these problems have now been eliminated through the use of new, tailored polymers developed by Henkel. With this second generation of casein-free adhesives, Henkel is now able to offer the beverage industry an attractive, field-proven alternative which, due to its reduced price volatility, should also bring long-term cost advantages.

The rising cost of renewable resources

Many companies have a traditional commitment to products based on renewable raw materials like casein and special starches. The beverage industry, for instance, often uses water-based casein adhesives to label glass containers.

These renewable raw materials are subject to strong price fluctuations, and manufacturers are often confronted with rising costs due to increasing demand coupled with supply volatility. For example, seasonal effects and climate changes can impact on the available quantities of the derived renewable raw materials. Markets also tend to respond in a volatile and speculative manner to fluctuations in the supply situation. The price of casein, for example, has soared in the last few years – and experts anticipate that this trend will continue. Constantly rising prices for casein – a raw material derived from cow's milk – have also driven up the cost of conventional labeling adhesives.

Always the right product for trouble-free production processes

For many years now, both beverage manufacturers, such as breweries and mineral water bottlers, and adhesives manufacturers have therefore been looking into alternative substances that are less susceptible to price fluctuations, whose performance features contribute to environmentally compatible processes and whose low complexity facilitates ease of processing.

Casein-free adhesives offer not only a longer shelf life and temperature stability, but also a number of further advantages over conventional labeling adhesives. These novel products based on robust polymers feature exceptionally good initial tack, for example. Similarly, they promote fast setting and drying, thus helping to reduce adhesive consumption rates. They represent an effective alternative to products based on traditional resources and make it possible to save up to 30 percent on adhesives. For the industry, this expansion of the range of adhesives means greater production and budgeting security. This becomes all the more important when one considers that natural polymers may become scarce and the market situation can quickly change. With this extended range of options in adhesives, bottlers can thus make choices that cut their costs and ensure trouble-free production processes.

Innovative and casein-free – performance without constraints

As the leading supplier of adhesives technologies, Henkel embarked on the development of casein-free adhesives with equivalent bonding and processing characteristics back in the late 1990s. With its newest generation of casein-free adhesives, the company now has a product series for glass bottle labeling that has a broader and more comprehensive performance spectrum and can be deservedly termed a pioneering, landmark innovation. In addition to their excellent wet tack, the adhesives exhibit good adhesion even to wet and chilled glass surfaces. The food and beverage industry can therefore turn to a powerful and efficient range of products that cover the entire spectrum of bottle labeling needs, including sophisticated adhesive solutions with high ice-water and condensation-water resistance.

Economic and ecological process benefits

Unlike their conventional counterparts, these adhesives are based on synthetic polymers and are hence independent of the dairy industry. The raw materials employed are thus subject to lower price volatility than casein. For bottling plants, greater price stability means improved cost estimation accuracy in their budgeting. The elimination of casein also yields further benefits, as this resource then becomes available for food production instead of being used for technical purposes.

In addition, these second-generation adhesives give no cause for concern during waste water treatment. The products also have FDA approval, are free of toxic ingredients and contain no alkylphenol ethoxylates, zinc or borax.

Ideal product design with added value

With their outstanding machine operation/automation properties and greater efficiency in production due to improved processes and reduced complexity, the adhesives contribute to environmentally compatible production and thus offer bottling plants an equivalent alternative adhesive that is not formulated with resources from the food sector.

The new generation of casein-free adhesives thus eliminates existing familiar drawbacks and presents an excellent alternative for many different applications. Whatever the requirement – high-speed machines or slow labeling processes, cold or hot, dry or wet conditions, heavy labels or thin aluminum foils, condensation-water resistance or extreme resistance to ice water – the Optal XP product series always includes a suitable adhesive. Renowned brewing customers are now employing these innovations for a huge range of labeling systems on returnable and disposable bottles.

For every labeling option, there is an Optal XP adhesive to match. The diversified property and performance profile of the new generation of adhesives helps to produce ideal bottle designs to make the brand stand out effectively at the point of sale and achieve market success, without putting any constraints on existing processes.

For further information, please go to www.optalxp.com

Photo material available for downloading at http://www.henkel.com/press

Henkel operates worldwide with leading brands and technologies in three business areas: Laundry & Home Care, Beauty Care and Adhesive Technologies. Founded in 1876, Henkel holds

globally leading market positions both in the consumer and industrial businesses with well-known brands such as Persil, Schwarzkopf and Loctite. Henkel employs about 47,000 people and reported sales of 16,510 million euros and adjusted operating profit of 2,335 million euros in fiscal 2012. Henkel's preferred shares are listed in the German stock index DAX.

Photo material is available at http://www.henkel.com/press

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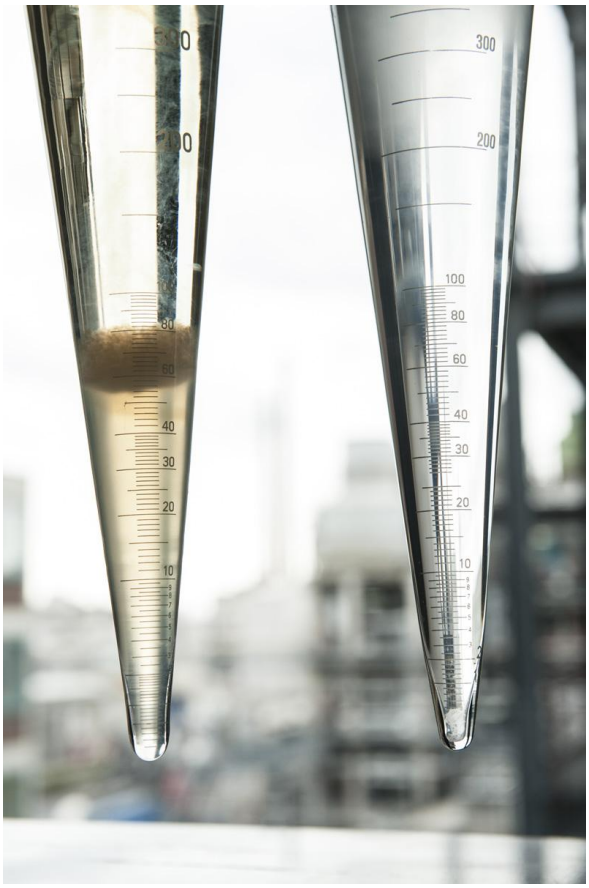

(Both photos) In tests, sedimentation was found to be significantly stronger in the caustic soda solution with the casein-based adhesive (left) than in the comparable solution with Optal XP from Henkel.

The caustic soda solution with the casein-free Henkel adhesive Optal XP (left) foams visibly less than the comparable solution with the casein-containing labeling adhesive.