SOLUTIONS **thermoset**

Food contact compliance certification for cobalt-free curing of polyester storage tanks

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Nouryon Polymer Chemistry presents a cobalt-free curing system suitable to manufacture storage tanks for food and beverage by using unsaturated polyester resin. Polem (Lemmer, The Netherlands), the market leader in manufacturing storage tanks, successfully manufactured and delivered three storage tanks with certified food contact compliance to an international beer brewer.

Polem, together with Nouryon Polymer Chemistry, developed a cobalt-free curing system to manufacture storage tanks for uses in food contact application by using unsaturated polyester resin.
The storage tanks received food contact compliance certification from the Eurofins Certification Institute and three tanks were successfully manufactured and delivered to an international beer brewer.
Liquid storage tanks for the food contact segment are conventionally manufactured with steel. Food contact certified storage tanks from unsaturated polyester resin are traditionally manufactured with curing systems based on cobalt accelerators. Cobalt octoate, however, was recently reclassified to CMR Reprotoxic category 1B. Therefore, there is an increased desire to avoid the presence of cobalt in food processing equipment.
One of the reasons that cobalt is still being used is that there is no suitable alternative available in the market.
This changed several years ago when Nouryon, a leading supplier of curing systems for the polyester thermoset industry, introduced their Nouryact cobalt-free accelerator portfolio, which is based on copper, iron and manganese.

This new product range is now successfully used by Polem for certified manufacture of food contact equipment.
Polem, a leading manufacturer of composite storage tanks, has set the ambition to develop cobalt-free storage tanks to support their activities in the food processing industry.
They received food contact compliance certification for storage tanks manufactured with Nouryon's Nouryact CF40 iron-based accelerator and Butanox LPT-IN, a methyl ethyl ketone peroxide.
This is a breakthrough innovation for the polyester industry and was highlighted at JEC 2019 in Paris including a showcase at the JEC Innovation Planet.
The technology enables Polem to offer a lightweight polyester alternative for classic steel tanks in this particular segment.

Selecting the curing system

Polem contacted Nouryon in 2018 for a cobalt-free curing system in order to deliver food contact-certified storage tanks to an international beer brewer. The choice of curing system was open as long as the end product would pass the Eurofins certification process (migration tests).
Another requirement was that the curing system could not compromise on cycle time and mechanical properties.
As a market leader in curing systems, Nouryon was well versed in curing systems for the discontinuous filament winding process and evaluated their available materials. Lab tests were carried out and test laminates were manufactured to fine tune intake levels. An

Fig. 1: The three storage tanks as installed

evaluation was also completed from a regulatory perspective to check the ingredients present in the curing systems against the applicable European food contact regulations.

Nouryact CF40 as accelerator

The choice of the cobalt-free accelerator was key. The best-known alternatives are complexed formulations of vanadium, manganese, copper and iron, all however having their particular capabilities in terms of reactivity and regulatory status. The metal that is most promising from a sustainability point of view is iron, which is used in a complexed formulation in Nouryon's product, branded as Nouryact CF40. This accelerator is cobalt-free and CMR-free and has an excellent reactivity. The solvent used is hydroxyethyl methacrylate (HEMA), which co-polymerizes with the styrene in the resin, leaving no residual solvent at the end of the curing process.

Butanox LPT-IN

The choice of peroxide was made within the methyl ethyl ketone peroxide (MEKP) portfolio, which performed best with Nouryact CF40.
Standard MEKPs are formulated on dimethylphthalate (DMP), which, despite its favourable HSE classification, is often not positively listed for end products used for food contact applications. The DMP-free MEKP in this example is Butanox LPT-IN, which is based on diisononylphthalate. The reactivity of this formulation proved perfectly suitable in combination with Nouryact CF40 to fulfil Polem's requirements and to pass the migration tests successfully.

Food contact compliance certification

The curing system was fine-tuned using the above-mentioned ingredients and shared with Polem for evaluation in their lab facility that produces laminate panels. The curing process worked as expected, the panels were sent to Eurofins and passed the migration test successfully for the relevant media, as required by the end customer. This food contact certification was a breakthrough for manufacturing glass fibre-reinforced polyester end products and it allowed Polem to accept the project. In total, three tanks were manufactured (see Figure 1). The cooperation between Nouryon and Polem was a success for both parties and showed that breakthrough innovations are possible.
It gives Polem an extra competitive advantage and boosts their sustainability ranking.
This development is an excellent example of how innovation towards sustainable cure systems can be done in the composites industry. □

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