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A REVIEW OF CALCIUM BASED STABILISER SYSTEMS FOR PIPES – 30 YEARS YOUNG – WHAT’S NEXT?

SHORT SUMMARY

A review of historical and present use of stabilisers replacing Lead for PVC in Europe will be given in the first part of the presentation, addressing triggers, timeline and implications. Various alternatives with their pros and cons will be discussed. Secondly, the paper will shed light on the situation with regard to different stabiliser systems for PVC pipes around the world with a specific view on APAC. The implications of regulatory and voluntary switches on the stabiliser use will be covered. The presentation will conclude with an outlook on expected developments in the near future.

KEYWORDS

- Pressure on Lead based PVC stabilisers in Europe
- Alternative stabiliser systems
- Operational challenges and solutions during the changeover period
- Current status of stabilisation of PVC pipes all around the globe
- Outlook on expected developments

INTRODUCTION

In the late 90’s of the last century the world of stabilisers for PVC pipes was divided in two parts – regions where Tin stabilisers were used (predominantly North and Central America as well as northern parts of South America) and regions where Lead based stabilisers were established. In the early 2000’s, NGO pressure on the PVC industry triggered a focus on Lead stabiliser systems in Europe leading to a voluntary commitment to phase out Lead by the European Stabiliser Producers Association (ESPA) and processing industry (EPPA). This voluntary commitment later became part

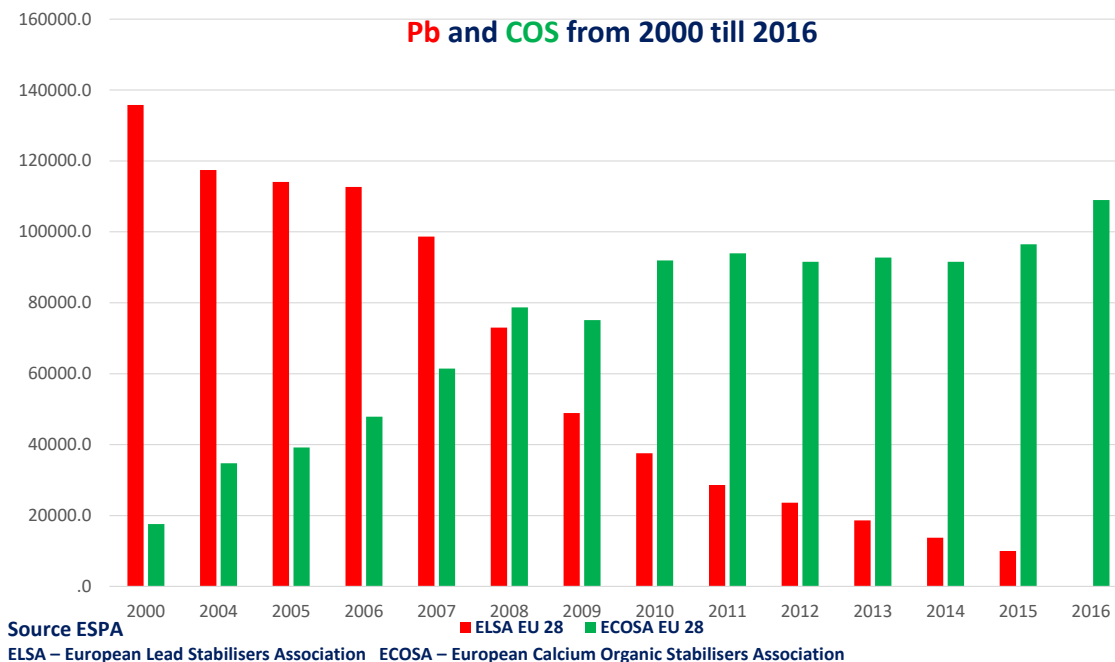
of the Vinyl 2010 voluntary commitment. In parallel pipe producers in Australia, South Africa and South America also started voluntarily to phase out Lead stabilisers.

DISCUSSION

Initially there was a discussion about alternative stabilisers for Lead based systems. Tin stabilisers were never really considered to be an alternative in Europe due to various reasons:

- Requirement for different dosing and processing equipment.
- Additional single lubricant dosage required, one-packs systems widely available from many sources who did not supply Tin stabilisers.
- Tin stabiliser suppliers had poor market intimacy and processing knowledge to provide technical support.
- Staining issues if Lead and Tin get mixed (especially with regard to recycling – a key part of the voluntary commitment)
- Odour in operational units.
- Lower VST due to liquid component.

So, Europe decided to replace Lead stabilisers by Ca-based stabiliser systems since this switch was considered smoother. Nonetheless the switch took its time.



In the changeover period all stakeholder had to go through a steep learning curve. Stabiliser producers needed to figure out how to translate chemistry into industrially applicable one-pack formulations. This required finding out about cross reactions, storability of formulations as well as the right specifications of raw materials.

Plate out, which had been around PVC processing forever but largely controlled, had a new friend. Converters had to learn that old “rules of thumb” and experience needed to be replaced by new knowledge. Finally, we arrived in a situation where converters are nowadays in a position to produce pipes with unchanged mechanical and optical properties which still fulfill all specifications and norms. Through the course of the years some equipment was optimized but predominantly no change in operational dry blending, compounding and finished product processing equipment was necessary. This changeover period was heavily supported by the Baerlocher technical service team. The joint effort of all stakeholders guaranteed that the voluntary switch away from lead has been completed until end of 2015.

The 2016 global view on stabilisers for PVC processing shows a quite fragmented picture with still more than 50% of processed PVC still using Lead stabilisers. About one quarter of PVC is stabilised with Ca-based stabilisers, whereas the rest uses Tin stabilisers and LMM (liquid mixed metals) widely used in plasticised PVC and plastisol applications. The regional split indicates that Europe is mainly using Ca-based systems, North America uses Tin and the two biggest regions, North East Asia and ‘the rest’ (Africa, Middle East, India and Australasia) are still dominated by the use of Lead stabilisers. Our prognosis for 2019 illustrates the huge switch to Ca-based stabilisers, mainly triggered by action in China. At the end of 2019, more the 50 % of PVC globally will be stabilised using Ca-based stabilisers. However, for the other main user of Lead stabilisers, the region comprising Middle East, Africa as well as India, we don’t expect a massive change of the situation immediately, albeit we see efforts to move away from Lead everywhere else.

The main triggers for a switch in China is a change in thinking about priorities towards a cleaner environment which also affects the use of heavy metals such as Lead and Tin and secondly a major PVC pipe converter (approx 1Mio tons) leading the switch from 2012-2016. These two drivers have forced the pipe industry largely away from using Lead stabilisers although till now, no regulatory ban has been imposed.

As a follow-up we observe a lot of voluntary actions as well as legislative regulation which will force a phase-out of Lead stabilisers also in South East Asia. In India regulation on Lead has been weak until recently and no significant change in this growing industry happened. By the end of 2018, still about 75 % of the PVC used there has been Lead stabilised but again growing NGO actions have paced the decision upon continued use in the hands of the tribunal appointed by the government tasked with decision making to allow for better environmental controls. It is anticipated that the outcome will be to develop a phase-out plan for Lead stabiliser which currently targets a replacement in most applications within the next 4 years.

The experience in different countries suggests that this target is quite ambitious and that a switch will not be an easy task for the various pipe sectors in an extremely competitive and fast growing environment, but it expected to be achieved.

As a result of all these actions a further big step away from Lead is expected until 2023 and finally a complete replacement of Lead stabilisers might even take already place in the next decade.

Besides this work around Lead stabilisers another trend is seen in stabilisation of PVC. Currently Europe isn't using much Tin based stabilisers (approx 8% of total stabiliser demand), nonetheless the more than 10 years old EU REACH regulations applies added pressure on already politically highlighted tin compounds by various member states of the EU. Namely Dioctyl- and Dimethyltin stabilisers are under scrutiny and it is expected that in the mid of the next decade these stabilisers will be effectively banned in Europe, excluding any pharmaceutical applications which are exempt from REACH scrutiny. Although this is a pure European topic for the time being, REACH style regulation is popping up rapidly across the globe by many countries seeking to take control of regulation of use of chemicals in their environments. There is therefore a real risk that these trends will be picked-up by other regions as well, as it has happened with the discussion surrounding Lead stabilisers.

CONCLUSIONS

Pressure to replace Lead stabilisation for PVC can be overcome by the use of commercially established Ca-based systems. In Europe such a changeover has been carried out, taking quite some time and effort as these systems and supply chains needed to be developed from scratch. The support by the stabiliser producers allowed pipe producers to achieve a situation where

nowadays pipes with the same specifications, the same technical properties and same costs can be made as formerly using Lead based stabilisers.

The experience gathered in Europe and now elsewhere as well, places stabiliser producers like Baerlocher in the position to support such a changeover in other regions where pressure forces a phase-out of Lead stabilisers. Such a global replacement of Lead stabilisers is expected to take place within the next 10 years. As pressure on Tin stabilisers, specifically in Europe increases, the replacement of Tin stabilisers is expected to be the next challenge for the PVC stabiliser and processing industry and already solutions to replace tin are being commercialized for pipe and fittings applications in various markets.