Too big to substitute?

Finding alternative chemicals or technologies for substances used in basic infrastructure can be a challenge

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Substitution is a central goal of REACH and EU biocide regulations. They aim to replace substances that cause an unacceptable risk to human health or to the environment with safer alternatives. However, it is a complicated process. The REACH Regulation requires that alternative substances and technologies are analysed, and the benefits from the continued use of the substance are compared with the costs of substitution. For a particular use, viable alternatives may simply not be available, or, in societal terms, they may be deemed too expensive.

New substances are being developed at a rapid pace in industrial research labs and universities around the world. The new substances will solve technical and safety problems, improve existing products and bring about completely new functionality. But before they are introduced to the market, they must pass strict regulatory checks. In the EU, according to the reversed burden of proof, new substances must first to be proved to be safe in order to gain access to the market. About 300 new substances are entering the EU chemicals market every year.

Existing substances, like newly developed ones, also undergo a uniform, step-wise risk evaluation process in the EU. The data gaps are being gradually addressed according to ECHA testing decisions, by substance evaluation programmes leading to dossier updates, and by updated classifications. In addition to these European processes, substances are undergoing risk assessment in various international and national programmes around the world. The trouble, however, is that there are no commonly agreed standards for this work to be sensibly divided between the various authorities. So, the same substance may have been risk assessed according to different criteria several times with various outcomes. EU member state authorities are now looking to revise down certain mandatory classifications. But once established, an EU mandatory classification (known as a harmonised classification and labelling decision), is likely to stick, due to the application of the precautionary principle.

The EU chemicals authorities have two main regulatory instruments at their disposal when faced with a possible substance of very high concern (SVHC). The use of the substance can be restricted, or it can be made subject to authorisation. Restriction is the blunter instrument of the two, as it does not involve any user-specific considerations. An authorisation can be granted to a user if it demonstrates that the risks of the substance are adequately controlled, or that the socio-economic benefits from continued use clearly outweigh the costs. Use specific restrictions can be implemented also under the EU biocide regulations.

In practice, regulating a substance gets more complicated the longer the substance has been on the market and the more uses it has. Substances exit the market all the time because they are substituted by less expensive and less hazardous substances. However, some substances have become so embedded in our way of life and infrastructure they are very difficult to ban completely. These substances seem too big to substitute.

For example, wood preservatives based on arsenic compounds were used until they were banned in the EU in 2006. These chemicals were widely substituted by one of the oldest wood preservatives, coal-tar creosote. However, as creosote also has a high hazard profile, regulators began considering a complete ban for the substance as a wood preservative under the EU biocide Directive, in addition to existing REACH restrictions. This would have forced European infrastructure managers to stop acquiring new creosote impregnated sleepers and poles into their networks after a four-year standard transition period.

However, an impact assessment conducted by the European Commission found that, in Sweden alone, the cost of gradually replacing creosote preserved railway sleepers would be around €3bn, and replacing the country's power supply poles and telephone poles, and other countrywide creosote oil impregnated wooden infrastructure, would have brought the bill to around €10bn. Due to this prohibitive replacement cost and the lack of viable alternatives, the continued use of creosote was accepted by the EU authorities, although some new restrictions were introduced. There are also studies that show that the release of persistent, bioaccumulative and toxic (PBT) substances release from creosote is significantly less than from other sources, such as traffic emissions. Nonetheless, the search for alternatives goes on, as substitution by concrete or steel sleepers and poles is possible, but not ideal, according to recent life cycle analyses.

In some cases, it is difficult to define the precise technical specifications of the perfect substitute substance. For example, a group of substances that biodegrade only very slowly and are used as flame retardants are being phased out. However, a replacement should not completely biodegrade either, otherwise ageing materials would catch fire easily. The right balance between having substances that have the desired effect, and at the same time are environmentally friendly, can be difficult to find.

As for creosote, the Swedish Chemicals Agency is starting a new round of investigations, and on 4 November announced a new call for information on substitutes.

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