



SoleBox mould cleaning system. CREDIT: STS SRL

FROM BAKING TO MOULDING

At the recent Polyurethanes 2008 Technical Conference, industry experts affirmed how rising energy prices, evolving regulations and the increased general awareness of global climate change are creating ever greater demands for green products. Richard Engler of the US EPA Green Chemistry Program stated: "Aside from the obvious benefits to health and the environment, green chemistry makes sense. It can reduce costs, capital investment, and time to market, encourage investors, minimise unknown future liability and enable new functionality. And, it allows you to do things you couldn't do before."

All manner of materials are being explored in the quest for sustainable natural sources of raw stock for industry to the extent that soya bean extract is now used to enhance the foam used in bed mattresses. An example has appeared in our own industry in the unlikely form of baking soda or, to use its correct terminology, sodium bicarbonate.

Sodium bicarbonate, or sodium hydrogen carbonate, is a white crystalline solid with a slight alkaline taste resembling that of washing soda (sodium carbonate) and is a component of the mineral natron. It is frequently found in mineral springs and in its natural mineral form, known as nahcolite. The ancient Egyptians discovered this was a good cleaning agent and used it much as we use soap. In 1791, a French chemist found a way to produce sodium bicarbonate as we know it today and in 1846 two New York bakers, John Dwight and Austin Church, developed the process of making baking soda from sodium carbonate and carbon dioxide. They later joined forces to form Church & Dwight, still a major world producer today.

NaHCO_3 —to give it its chemical formula—can be produced by creating a reaction between calcium carbonate, sodium chloride, ammonia and carbon dioxide in water or by the reaction of carbon dioxide with an aqueous solution of sodium hydroxide and a further addition of carbon dioxide. Sodium bicarbonate is perhaps best known for its use in baking where it reacts with other components to release carbon dioxide and that helps dough to 'rise' when making bread. It is also used in a process for cleaning paint called sodablasting and it was only a short step from there to the footwear industry.

The majority of shoes today use pre-moulded sole units in a variety of compounds. Whilst thermoplastics such as PVC, TPR, TPU and POE do not produce any appreciable mould fouling, EVA and, more especially, PU do. In the case of the latter, the release agent used to assist removal of the moulded sole reacts with the PU itself resulting in a relatively rapid build-up of deposit on the mould surface that soon masks finer design details. It is, therefore, necessary to clean moulds frequently in order to maintain consistent quality.

DMF (d-methyl formamide) was originally used to clean metal moulds but although highly effective was replaced by NMP (n-methylpyrrolidone) due to health and environmental concerns. NMP is soluble in water and can be used on more delicate metal-filled epoxy moulds. It also works well but is labour intensive and uses a large amount of expensive chemical.

Light shot blasting assisted by air or water was then tried but the problem was finding an environmentally friendly abrasive agent that would clean all types of mould without damaging surface detail. What about a solution of sodium

“...and it should be noted...”

REACH is a European Community regulation on chemicals and their safe use. It deals with the registration, evaluation, authorisation and restriction of chemical substances. It came into force on June 1 2007. Its aim is to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances and, at the same time, enhance the innovative capability and competitiveness of the EU chemicals industry.

It requires greater responsibility on the part of industry to manage risks from chemicals and to

provide safety information on them. Manufacturers and importers must gather information regarding their chemical substances and register it in a central database run by the European Chemicals Agency (ECHA). The agency manages the resultant database, co-ordinates in-depth evaluation of suspicious chemicals and runs a public database containing hazard information.

It also calls for the progressive substitution of the most dangerous chemicals when suitable alternatives have been identified.

bicarbonate—if it could strip paint, could it also clean moulds? It in fact proved highly efficient and cost effective. It was given a further boost with the introduction of the European REACH legislation on June 1 2007.

BAKING TO MOULD CLEANING

The Italian company STS Srl specialises in surface washing systems for a wide range of industries. It also has a very effective system for cleaning sole moulds based on sodium bicarbonate. Called the SoleBox, it is specifically designed for the soft cleaning of moulds and will remove residue from PU, EVA and rubber moulding operations on aluminium, steel or metal-filled epoxy moulds. STS says it is also completely free of any REACH restrictions, which removes a further headache for the unit sole moulder.

The softness and friability of sodium bicarbonate causes it to disintegrate on impact so that the mould surface will retain its brightness and surface finish for a long time. The sodium bicarbonate can obviously only be used once and it does leave a considerable amount of residual dust. To overcome this, a special filter and pre-separator unit is included to ensure good visibility inside the cabinet and long term, problem-free operation.

The STS system, in fact, combines all the requirements for mould cleaning in a single unit. The cabinet itself contains all the blast equipment, has an easy-access door and a large window with an ‘inlet air-knife’ for good visibility. A delivery unit supplies a constant and precise quantity of cleaning agent, while a high-efficiency cyclone removes 93% of all residual material via hoppers into plastic bags for disposal. A cartridge filter unit with automatic reverse air pulse cleaning ensures only clean air is emitted. The efficiency of the process can be seen in the two images showing PU and EVA moulds before and after cleaning.

SEEKING ALTERNATIVES

Whatever your opinion regarding the ever increasing amount of regulation and restriction that is being forced

upon industry in general from all sides, the movement towards a greener future is now irreversible. The global economy of the 20th century was built upon oil; the 21st will be built on renewables. The clever use of a cheap, simple and safe material such as sodium carbonate to replace expensive and potentially harmful chemical cleaners is a good example. An old dictum says simple solutions are usually the best. Who in the footwear industry will come up with the next one? 🍷



PU and EVA moulds before and after cleaning. CREDIT: STS SRL