Lube-Tech

PUBLISHED BY LUBE: THE EUROPEAN LUBRICANTS INDUSTRY MAGAZINE

No.57 page 1

Skin and eye irritation tests for water-miscible metalworking fluids

Cimcool Industrial Products B.V.[1]
Evonik Stockhausen GmbH, Laboratory for Toxicology and Ecology[2]
TNO Quality of Life, Toxicology and Applied Pharmacology, Zeist, The Netherlands[3]

Bert Boomkamp [1], Eckhard Heisler [2], Menk Prinsen [3]

One of the aims of REACh (Registration, Evaluation, Authorisation restriction of Chemicals) is to improve the flow of Health, Safety and Environmental communications from the manufacturers of chemicals to the end users. The product safety data sheet (SDS) is a tool for achieving this. One aspect for consideration when producing an SDS is the skin and eye irritating properties of the product.

The information on the SDS for the skin/eye irritating properties of mixtures such as metalworking fluids are determined according to the EU's calculation procedure. However, synergetic or antagonistic effects between the product's ingredients are difficult to calculate. Animal tests are also used, but are less acceptable due to unnecessary animal suffering. Several new non-animal tests are now being officially accepted and consequently Cimcool has undertaken large scale skin and eye irritation tests using these. This fulfils the company's obligations to REACh, as well as the future GHS (global harmonised system) requirements.

The tests were performed on the products as supplied, in concentrated form. Metalworking fluids are typically diluted with water to concentrations between 5 and 10%. Skin contact occurs far more frequently with diluted products than with the concentrated form. Due to the frequent skin contact, skin irritation is a regularly occurring issue within the metalworking industry. Skin irritation prevention has always been an important objective for Cimcool and substantial tests have been conducted to exclude Cimcool metalworking fluids as a contributing irritant.

Cimcool's first tests started back in the 1960s. Over the years new skin irritation tests have become available, including TEWL (Transepidermal Water Loss) on human volunteers and BUS (Bovine Udder Skin) using cow's udders. These tests are usually performed using diluted products. With many years' of tribological experience, using tests that are state-of-the-art, Cimcool has developed metalworking fluids that are heading toward being completely skin compatible, thereby removing irritation issues.

Skin and Eye irritation according to European Union directive 1999/45/EC

Most water-miscible metalworking fluids are complex mixtures in order to give the product the required technical performance. A typical metalworking fluid may contain: Corrosion inhibitors such as alkanolamine borates, short chain carboxylic acid salts of alkanolamines, amides. Emulsifiers - such as fatty acid soaps of alkanolamines. Lubricants including mineral oil esters. And, biocides to retard fungal growth.

The European Union directive 1999/45/EC is referred to as the Dangerous Preparation Directive (DPD) in which, amongst others, skin and eye sensitivity is considered. For metalworking fluids skin contact is an important exposure route, eye contact should be minimised using safety goggles, but this may also occur accidentally.

The principle for establishing skin/eye irritation according to the EU DPD is straight forward, at first sight. It is based on the raw material information and the concentration.

If you consider two ingredients of a metalworking fluid: monoethanolamine (8%) and biocide (3%). Both can be considered as corrosive to the skin/eye (R34). Using the EU's calculation method this metalworking fluid would be classified as corrosive since the combined concentration is above 10%, the point above which the DPD states the product is corrosive. This calculation method, however, does not take neutralisation into account. The corrosive effects of the alkaline monoethanolamine are decreased with acidic materials such as boric acid and fatty acids.

In order to investigate the skin/eye irritation properties of metalworking fluid concentrates Cimcool performed independent irritation tests.