Occupational exposures to gasoline vapour

Additional data collected and analysed

The risk assessment methodology requires data on exposure in order to make comparisons between so-called 'no-effect-levels', arising from health effect studies, and exposure cases as they occur during normal handling and use of the substance.

Exposure information may to some degree be estimated using modelling approaches or analogies, but in general it is preferable to make use of actual measured data. CONCAWE therefore initiated several years ago, a programme to prepare an inventory of exposure levels to gasoline in anticipation of the planned risk assessment for that substance. The first phase of this activity consisted of the collation of existing data from member companies' monitoring programmes. The resulting overview was published in report 2/00. This overview indicated that for several occupational scenarios the exposure information was either out of date or absent. Consequently, a measurement campaign was organised in CONCAWE member company operations to address these shortfalls. The results were recently published in report 9/02. In support of this campaign, the recommended method of obtaining detailed exposure information, speciated by chemical constituent, was also revised and re-issued (report 8/02).

Some of the main findings of this work are discussed in this article.

The impact of vapour recovery systems

Concerns about ground-level ozone formation led to the introduction of vapour recovery systems in the 1990s.

In distribution operations vapour recovery (VR) is being introduced stepwise in accordance to the requirements of directive 94/63/EC, a process that is due for completion in 2004. In many cases these systems also resulted in reduced worker exposure levels. From the data collected, it appears that vapour recovery combined with bottom loading reduced the exposure of road tanker drivers and rail car loading operators by a factor of three when filling up at depots and terminals.

In attended service stations, where occupational exposure is already low, vapour recovery further reduces occupational exposure by half.

When comparing the average data from the present surveys with the work published in 1987 (CONCAWE report 4/87) and with data published in the open scientific literature, it becomes apparent that, in the oil refinery work environment, exposure to gasoline vapour has been reduced by a factor of five. This is a reflection of the introduction of vapour recovery systems, as well as increased production automation and improved design and engineering practices.

Benzene exposure

The implementation of the Road Fuels Directive (98/70/EC) has led to a reduction of benzene levels in gasoline, and consequently in gasoline vapour, by a factor of three since early 2000.

Almost all of the detected exposures in the post-2000 surveys comply with the exposure limit in force as of mid-2003 as defined in Directive 97/42/EC. The remaining elevated exposure levels that were recorded mainly relate to old technology scheduled to be replaced (e.g. railcar loading without vapour recovery).

Consequences for gasoline risk assessment

Feeding this up-to-date exposure information into the gasoline risk assessment process is essential in order to reach conclusions which take into account environmental controls already implemented.