EI Research report

Exposures to asbestos from work on removal of compressed asbestos fibre gaskets

energy institute

EI RESEARCH REPORT: EXPOSURES TO ASBESTOS FROM WORK ON REMOVAL OF COMPRESSED ASBESTOS FIBRE GASKETS

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It also offers its own Chartered Energy Engineer, Chartered Petroleum Engineer, and Chartered Energy Manager titles.

A registered charity, the EI serves society with independence, professionalism and a wealth of expertise in all energy matters.

This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

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EXECUTIVE SUMMARY

Introduction

The Energy Institute (EI) commissioned the Institute of Occupational Medicine (IOM) to undertake a study to assess concentrations that might arise from compliant and non-compliant methods of removal of compressed asbestos fibre (CAF) gaskets. The study comprised a literature review followed by a telephone survey of targeted contacts to gather information that would help assess the relevance of the published information to the oil and gas industry.

The literature review was undertaken first, and the telephone survey was undertaken with the benefit of insight gained from the literature review.

Standards of the time

Exposure limits for asbestos have changed greatly and progressively over the past 45 years. Therefore, procedures that were deemed compliant (i.e. producing low concentrations by comparison to exposure limits of the time) at the time some reports were published have become non-compliant as the limits became more stringent.

Review of workplace studies

There are only a limited number of published studies reporting concentrations during any sort of work with, or on, CAF gaskets in real workplaces, and all but two studies report only results for removal methods that would be non-compliant by today's standards. One of those two studies dealt mainly with non-compliant methods, and the other dealt solely with compliant methods. The most recent of those studies, dealing only with compliant methods, demonstrated that properly applied wet removal techniques produce low exposure concentrations. The study also showed that the standard phase contrast microscopy (PCM) techniques may not be suitable for accurately characterising how low those concentrations are, because evaluation of selected samples by transmission electron microscopy (TEM) showed that most of the fibres on air test samples were non-asbestos, and that concentrations during intense work throughout full shifts to remove CAF gaskets by wet methods resulted in asbestos fibre concentrations below 0,015 fibres/cc.

Review of simulation studies

There have been more simulation studies, but all dealt with the removal of CAF gaskets by methods that would be non-compliant by today's standards. The motivation for those simulation studies most likely was to provide data for assessing past exposures, probably for the purposes of civil litigation cases. As a consequence, some simulation studies placed great emphasis on following practices believed to be 'normal' for real industrial settings. One study which was criticised for not following that approach produced much higher concentrations; however, the interpretation of what would be normal industrial practice is subject to uncertainty. For example, the real workplace study (with compliant methods) described intense work on CAF gaskets throughout the full shift and therefore the work levels of the simulation study with high results should be considered valid.

Based on additional information obtained about the details in the study that produced high concentrations, it was considered that those higher concentrations would probably be attributable largely to low ventilation/dilution conditions in their simulation test rig. Those results indicate that high concentrations could arise from removal of CAF gaskets if the work is done in conditions with

very low ventilation/dilution. That particular study is also useful in that it provides data indicating how levels of concentrations would be affected by the type of tools used (hand tools to power tools) and by the size of the flanges/CAF gaskets.

Telephone survey and collection of information from within the oil and gas industry

The second phase of the project comprised telephone interviews with targeted contacts in the oil and gas industry.

The structured telephone interviews covered an agreed set of topics. This included seeking information on the applications where gaskets are present in the oil and gas industry, and what precautions/procedures are followed for removal and replacement if gaskets are believed to be non-asbestos. Any unpublished real workplace measurements that may be available were also requested.

Interviews with eight contacts produced descriptions of the current methods of work for removal of gaskets. These work methods involve precautions in line with published guidance from the UK Health and Safety Executive (HSE) being applied whenever gaskets are being removed. The physical methods of removing gaskets involve manual methods and wetting of gasket remnants with water.

CAF gaskets have been used in a wide range of applications. In some applications where the service life of gaskets is not more than 10 years, the cycle of replacement of CAF gaskets with non-asbestos gaskets is believed to have removed and replaced asbestos. However, there appear to be substantial numbers of applications still with CAF gaskets. Contractors generally work on the assumption that gaskets are likely to contain asbestos, based on the belief that labelling and records of which gaskets do or do not contain asbestos can be unreliable.

Four personal exposure measurements, dating from 2000, were supplied. These were measurements by the methods specified in Methods for the Determination of Hazardous Substances (MDHS) 39/4, i.e. by phase contrast optical microscopy (PCOM), and with 480 litre sample volumes giving quantification limits of 0,01 fibres/ml. Personal exposures during removal of gaskets, with gaskets being wetted where scraping of flange faces was required, ranged from less than 0,01 fibres/ml to 0,04 fibres/ml, as measured by the PCM method.

Six personal exposure measurements, dating from 2014, were also supplied. These were from removal of gasket from a compressor within an enclosure. However, no details of the work were described. Nevertheless, these personal exposures were all reported as less than a detection limit of 0,07 fibres/ml, and the detailed results indicate that concentrations were probably substantially less than that detection limit.

Conclusion from the combined phases of the study

The published data for removal of gaskets with wet methods (Cheng and McDermottt (1991); Spence and Rocchi, (1996)) combined with the previously unpublished data (received from interviewees) indicate that exposures during removal of CAF gaskets with application of control measures (wetting etc.) demonstrate concentrations substantially less than 0,1 fibres/ml, i.e. substantially less than the current UK Control Limit.

If CAF gaskets are removed with current levels of standard precautions, the likely exposure levels are very low and consequently the risk is very low.

– Workplace tests conducted specifically to assess concentrations during removal of CAF gaskets with different levels of precautions.
– Simulation studies, where CAF gaskets have been removed from flanges or surfaces that have been brought into a test facility where conditions are controlled.

Concentrations of airborne dust and fibre are dependent not only on the source of the dust, but also on the ventilation and dilution. The literature review was not expected to characterise the ventilation/dilution throughout the oil and gas industry. However, high levels of natural ventilation would be advantageous where flammable vapours might escape. In particular the offshore oil and gas industry operates in conditions where it is normal to have high levels of natural ventilation in many operational areas. By contrast, simulation studies can be, and have been, conducted in enclosed conditions to prevent spread of airborne dust where there will be much less dilution of any dust released. Therefore, it was also important to gather information about the typical operating conditions where work may take place involving gaskets in the oil and gas industry so that information from all available studies can be properly interpreted for their significance on likely concentrations in the relevant conditions. This was done in the second phase of the study.

1.3 PHASE 2 OF THE STUDY – TELEPHONE INTERVIEWS

1.3.1 Scope and purpose

The second phase of the study comprised telephone interviews with contacts within the oil and gas industry based on an agreed range of topics.

The interviews intended to seek information under the following headings:

– Where the (potential CAF) gaskets might be used in broad (sector of operation and product) and narrower premises, plant and process or processes terms.
– Approximate dates of when equipment or plant with CAF gaskets was first and later used in process and plant.
– Means of identifying if gaskets might contain (or not) asbestos.
– Types of asbestos-containing gaskets potentially still in service.
– The procedures and practices for removing gaskets 'containing' and 'not containing' asbestos.
– Control measures used during removal and replacement of gaskets 'containing' and 'not containing' asbestos.
– Relevant measurement data.

Interviewees were informed that the information collected during these series of interviews would be treated as confidential and would be anonymised before publication.