

Advisory Committee on Toxic Substances Paper		ACTS/06/2008	
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ADVISORY COMMITTEE ON TOXIC SUBSTANCES

THE USE OF TOXIC CHEMICALS IN THE SEMICONDUCTOR INDUSTRY AND APPROPRIATE CONTROLS

A Paper by Stewart McEwen – HSE Policy Group

Issue

1. Bud Hudspith of Unite has requested that a paper be put to ACTS setting out the position concerning the use of toxic chemicals in the semiconductor industry and appropriate controls.

Timing

2. Routine.

Recommendation

3. ACTS is requested to note the contents of the paper.

Background

4. There are a number of toxic, suspected carcinogenic and carcinogenic substances used in a variety of processes in the semiconductor manufacturing industry. For example:

Process	Substance(s)
doping/ion implantation	antimony trioxide, arsenic and arsenical compounds, arsine, boron trichloride, boron trifluoride, phosphine, phosphorous oxychloride
chemical vapour deposition	arsine, phosphine
bonding/encapsulation	antimony trioxide, beryllium oxide
stripping of developed photoresist	hydroxylamine, naphthalene, phenol, sulphuric acid mists
vapour phase epitaxy	arsenical compounds, gallium arsenide
wafer cleaning	sulphuric acid
etching	hydrofluoric acid

5. Following concerns raised about rates of cancers in current and former employees of National Semiconductors (UK) (NSUK) in Greenock, HSE concluded a study in 2001¹ which, in summary, found:

- for lung cancer in women, 2-3 times more cases were found than would have been expected;
- for stomach cancer in women, 4-5 times more cases were found than expected;
- for breast cancer in women, one third more cases were found. This was slightly above average and may have been partly attributable to factors such as shift work or non-work-related factors; and
- the number of brain cancers in men was 4 times higher than expected.

There was some evidence to suggest lifestyle may be a factor but that did not fully explain the findings. There was also the possibility that the cancer excesses observed were due to other factors, e.g. previous employment, genetic factors or were purely chance. The findings of the investigation, particularly those relating to lung cancer, reinforced concerns about cancer in the workforce. There was a possibility of a work-related cause for some of these cancers, but there was no definite proof that working at the plant has caused an increased risk of employees developing cancer.

6. As the findings of this 2001 report were inconclusive HSE decided to undertake a follow up study. Getting that study underway proved difficult, mainly due to confidentiality issues. The follow up study got underway early last year with the historical hygiene studies. After changes to the original aims due to a poor response from potential participants, the revised study protocol is soon to begin. This stage will consist of a case control study of breast cancer and case only studies of lung, stomach and brain cancers.

Argument

7. As a response to the findings of the 2001 NSUK cancer study, a programme of inspections of twenty five semiconductor manufacture sites was undertaken by HSE between February and May 2002, concentrating on the control of risks to health from exposure to carcinogens and suspected carcinogens. The overall conclusion drawn from these inspections was that in comparison with similar manufacturing activities and for manufacturing activities as a whole, the semiconductor manufacturers operate to similar standards with some very good practice and some area where improvements could, and sometimes should, be made. Those companies with high levels of compliance are characterised by effective systems to manage health and safety.
8. HSE is now developing a further inspection programme for the semiconductor industry, focusing on the control of known hazardous substances. These inspection visits will be undertaken during the 2009/10 planning year.
9. On 21 May, HSE published a number of COSHH Essentials sheets jointly developed by HSE and representatives of the microelectronics industry. This guidance covers both the use of hazardous substances and the processes in which they are used.

¹ <http://www.hse.gov.uk/statistics/nsukrept.pdf>

10. The issue of the use of hazardous substances together with a number of health and safety issues, not necessarily unique to the semiconductor industry are discussed and addressed at regular meetings of the Microelectronics Joint Working Group (MJWG), which includes representatives from the industry, Unite, and HSE. At its meeting on 21 May the MJWG discussed, among other things:

- progress on the NSUK follow up and other relevant studies, eg the Semiconductor Industry Association's (SIA) study currently underway in the United States;
- correspondence between Unite, the industry and Lord McKenzie of Luton on an industry-wide cancer study;
- progress on the implementation of the REACH regulation and its affect on the semiconductor industry and the Environment Agency's Emissions Scenario Document and its links with REACH;
- how the suite of industry-specific COSHH Essentials sheets could be developed to include other topics;
- the potential health and safety implications of the development in nanotechnologies, in terms of both the development of 'nano-sized' microelectronic products and nanotechnologies used in the industry's production processes.

Link to HSE Strategy

11. There is concern on the part of employee representative organisations that the use of toxic, suspected carcinogenic and carcinogenic substances used in a variety of processes in the semiconductor manufacturing industry is the cause of work-related ill health. However, industry representatives believe that there is adequate control of hazardous substances. Rising to the challenge of occupational health and focussing on core business and the right interventions where we are best placed to reduce workplace injury and ill health are particularly relevant when considering HSE's strategy.

Consultation

12. At the MJWG meeting on 21 May members were advised about the proposed HSE inspection programme for 2009/10 and were fully supportive. The continued interest of the MJWG together the Disease Reduction Programme's work on carcinogens in the workplace will ensure that adequate consideration of the issues in question is provided.

Action

13. Members are requested to note the information provided.

Contact

ACTS Secretariat