

Controlling worker exposure to chemicals during adhesive manufacturing

1 General information

Country: Finland.

Available language: Finnish.

The **sector covered** in this case study is the manufacturing sector.

Task covered: production of adhesives.

Worker groups covered (vulnerable groups): mainly Finnish-speaking employees (both female and male), very few English-speaking employees (from other European countries).

The **purpose of this example of good practice** was to reduce the exposure of employees to dangerous chemicals in the manufacturing and testing departments using technical and organisational methods.

The **target groups** are employers, managers, health and safety managers of industrial companies.

2 Initiator/organisations involved

Jyrki Tiihonen, Kiilto Oy, Tampere, Finland.

3 Description of the case

3.1 Introduction/background

Kiilto OY was established in October 1919 as a small hair tonic and shoe polish factory in the Pispala district of Tampere. In the 1910s, chemists were in need of hair tonics and mouthwashes to sell, shoe factories had run out of paints, polishes, waxes and adhesives, and furniture factories needed spirit lacquers and polishes — Kiilto OY started to fulfil those needs. The breakthrough of adhesive floor coverings in the 1930s kicked off the production of construction adhesives (Kiilto OY, 2017).

As the materials and methods developed, the needs and applications expanded in the construction sector and various other fields of industry. Today, Kiilto develops and manufactures adhesives and related products and systems for all kinds of construction, renovation and industrial purposes from top to bottom (Kiilto OY, 2017). Its product portfolio consists, for example, of:

- floor adhesives;
- wall adhesives and pastes;
- wall and ready-mixed plasters;
- waterproofing membranes and accessories;
- cementitious adhesives, grouts and silicones;
- parquet adhesives, lacquers and oils;
- adhesive sealants and universal adhesives.



In addition, Kiilto Clean produces cleaning chemicals (detergents and disinfectants).

In Finland, Kiilto OY employs around 200 workers and about half of these workers are exposed to chemicals. These employees work mainly in the manufacturing department (everyday exposure) as well as in the research and development department (limited exposure). All age groups are represented. Usually, employees have long working careers at Kiilto (some employees have worked for Kiilto for 40 years).

For manufacturing, Kiilto uses many different raw materials (approximately 200 of these are classified as hazardous). The company assesses the risks associated with chemicals continuously and has highlighted the most dangerous ones:

- one carcinogen (N-(hydroxymethyl)acrylamide), which is used only in a closed system;
- some isocyanates (the purpose of which is to produce polyurethane-based adhesives), which are not used entirely in a closed system; the main concern is their sensitising health effect;
- some mutagenic and reproductive chemicals (Cat. 2), which are used in accordance with strict safety rules.

Kiilto has made serious efforts to substitute the carcinogen N-(hydroxymethyl)acrylamide, which it uses in the manufacturing process, for a less harmful alternative, but, so far, no other chemical has been found that could successfully substitute for this carcinogen. N-(hydroxymethyl)acrylamide is — and, for several years, has been — used in a closed system, and, so far, it has not posed any problems for workers' health, as direct exposure is prevented.

Hazard — physical state: liquids, aerosols, solids.

Hazard — health effect: sensitising effect, mutagenic effect (however, the carcinogenic substance is used in a closed system and no serious health impacts have been detected among workers in recent years).

Exposure route: skin, inhalation.



3.2 Aims

Through a complex system of carefully selected safety measures, Kiilto protects workers from exposure to hazardous chemicals during the manufacturing process. The system of controlling exposure to chemicals involves:

- the elimination of hazardous chemicals from the manufacturing process (stopping the production of solvent-based adhesives);
- technical measures (such as using the carcinogen N-(hydroxymethyl)acrylamide in a closed system, using ventilation systems and exposure scenarios);
- organisational measures (such as a specific process of selecting new chemicals, extensive training for workers with the requirement that all workers must possess a Finnish Occupational Safety Card);
- the provision of personal protective equipment (PPE) (with clear recommendations).

3.3 What was done and how?

Kiilto has adopted several strategies to control the exposure of employees to chemicals in the workplace:

- 1) Kiilto uses a process called 'Management of Change' to select new chemicals, which includes the consideration of several aspects of human health. Safety data sheets (SDSs) are examined very carefully and exposure scenarios are used to determine whether or not the exposure of workers to a potential new chemical would be acceptable. Kiilto has emphasised, however, that one of the challenges in terms of using this process is the lack of exposure scenarios attached to SDSs — the safety manager of Kiilto estimated that only 10% of the SDSs for the raw materials that Kiilto could potentially use have scenarios that the company

could benefit from.

- 2) Kiilto uses local exhaust ventilation in all areas in which there is a risk of chemicals being present in the air. As a result of this exhaust ventilation, PPE is almost never necessary, as exposure levels are already as low as possible. Two types of ventilation system are used: (a) a permanent system installed at workplaces and (b) a mobile ventilation system used during short-term work or in work areas that are not typically used for handling chemicals. In research laboratories, fume hoods are used (when chemicals need to be tested).
- 3) Where possible, Kiilto stores raw materials in relatively large containers (bulk containers) and the chemical is kept in a rather closed system. This way, no smaller containers or intermediate bulk containers (IBCs) are opened as often.
- 4) Kiilto provides clear recommendations for PPE for workers (clothing, gloves and safety goggles); PPE is used mainly for spills and accidents (as, in 'normal situations', the aim is to keep exposure levels so low that no PPE is necessary).
- 5) There is an obligation for all employees to possess a Finnish Occupational Safety Card (Työturvallisuuskortti). According to the Centre for Occupational Safety, a personal Occupational Safety Card is valid for 5 years and is granted to persons who successfully complete the training. Occupational Safety Card training provides basic information about the dangers of a working environment and occupational health and safety in shared workplaces. Initially, the training was designed first and foremost for the shared workplaces of the manufacturing industry, but it is equally applicable to the building industry, the public sector, the shipbuilding sector and other sectors (the implementation of such training is voluntary). The training takes 1 day and after 5 years, 4 hours of additional training is required to renew the card.
- 6) Kiilto provides basic training for every new employee. Chemical hazards and the importance of safe routines are always emphasised during basic training for manufacturing employees.
- 7) Every year, a safety day is organised. In addition, workers receive first-aid training, accident training, firefighting training and process safety training. The company ensures that every manufacturing worker receives several days of training per year to remind all employees that safety comes first, including chemical safety.
- 8) For English-speaking employees, the training sessions are provided in English. Material SDSs are always in Finnish as well as in English.
- 9) Exposure measurements are conducted regularly. Depending on the chemicals and processes, the measurements are conducted every 2 or 3 years to make sure that conditions have not changed.



In recent years, the company has aimed to reduce the number of solvent-based adhesives produced and produce only water-based adhesives. Gradually, the company has come to a decision to stop the production of solvent-based adhesives completely. In 2018, no solvent-based adhesives will be produced. The solvent-based adhesives that clients still demand are now purchased from other producers. One main reason for this decision was to protect employees' health. The other reason was economical. In the 1990s approximately 50% of adhesives were solvent based; nowadays, Kiilto estimates that only 1% of their clients demand solvent-based adhesives.

3.4 What was achieved?

A well-managed system of controlling exposure to chemical hazards, through the systematic implementation of several safety measures, is now in place. The main emphasis is on technical measures as well as on training workers, and on reducing the use of hazardous substances in manufacturing processes (e.g. the decision to stop producing solvent-based adhesives). Through different safety measures, very low exposure levels have been achieved and, in most working areas, no PPE is therefore needed.

3.5 Problems faced

The main problems faced during the implementation of the current management process for chemical safety at Kiilto are as follows:

- Exposure scenarios: the lack of exposure scenarios or the complexity of exposure scenarios (difficult to implement). It is also sometimes difficult to find a suitable exposure scenario among all the scenarios provided by a SDS, and, when the producer is foreign, the Finnish translation of the SDS may not always be of sufficient quality.
- Combined exposure: in manufacturing processes, workers are often exposed to a combination of multiple chemicals. Kiilto still faces challenges in terms of assessing exposure and health risks adequately in such cases.

3.6 Success factors and challenges

For Kiilto, chemical safety has always been a priority. The current system for ensuring chemical safety has been developed throughout the years and is considered a good example for many other Finnish manufacturing companies. Through a multifaceted approach, Kiilto has successfully minimised the exposure of workers to the dangerous chemicals that are used in the process of manufacturing adhesives. The only carcinogenic substance used at Kiilto has been used in a closed system for years and the exposure of workers to this substance is therefore prevented.

3.7 Transferability

The approach used by Kiilto has the potential to be transferable to other countries. Moreover, in addition to the manufacturing of adhesives, the approach may also apply to other similar types of manufacturing processes. Kiilto is a member of the Chemical Industry Federation and, each month, the company has several visitors who become acquainted with the safety measures and chemical processes and learn how to use chemicals safely by following the example of Kiilto; the company has always been willing to share its good practices. There is also regular cooperation between Kiilto and the Chemical Industry Federation and upper high schools — school children visit Kiilto and the company demonstrates the hazards of chemicals and how to use chemicals safely.

3.8 Costs and/or economic impacts

The company has not calculated the costs or economic impacts. The company has a yearly budget for safety measures and for developing the chemical safety system, but the exact costs of reducing chemical exposure levels have not been specifically calculated.

3.9 Evaluation

The case study:

- comes from a credible source;
- is easy to understand for the user;
- is transferable to other companies/countries;
- represents a realistic work situation;
- has a focus on preventing risks at source;
- is targeted at solving a specific problem.

3.10 Further information

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About Kiilto: <http://www.kiilto.com/fi/>

4 References and resources

Kiilto OY, 2017. Available at: <http://www.kiilto.com/en/products/> (accessed 25 January 2018).

Centre for Occupational Safety. Occupational Safety Card. Available at: <https://www.tyoturvalisuuskortti.fi/en> (accessed 25 January 2018).