



**CONTAINMENT AS
THE SOLUTION TO
AVOID EXCEEDING
OCCUPATIONAL
EXPOSURE LIMITS
(OELs)**

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ABSTRACT

A key tool for assessing safe working conditions are occupational exposure limits (OELs), which refer to the airborne concentration of harmful chemical agents. The OEL indicates the maximum concentration of a substance a worker may be exposed to over a working lifetime, without suffering acute or chronic health effects¹.

Chemical and Pharma are common examples of industries that deal with substances affected by OELs which may be a part of daily business.

This white paper explores this critical topic, and aims to give the reader basic information about what OELs are, and how to understand the limits that may apply to substances that affect their industry and also about how containment is the perfect tool for minimizing this risk.

1. <https://www.knoell.com/sites/default/files/dokumente/CW70%20REACH-CLP%20hub.pdf>

DEFINITION & IMPORTANCE OF THE OELs

An OEL is an upper limit on the acceptable concentration of a hazardous substance in workplace air for a particular material or class of materials².

In general, it represents the maximum airborne concentration of a toxic substance to which a worker can be exposed over a period of time without suffering any harmful consequences. OELs are established based on the chemical properties of the substance, experimental studies, toxicological and epidemiological data³.

OELs are one tool or method for exposure identification and evaluation following the techniques of anticipation, identification, evaluation, and control. Their objective is the prevention of occupational diseases that arise as a consequence of exposure to hazards present in the workplace that can lead to diseases and illnesses that can manifest either immediately, or after a long period of time after the exposure has stopped⁴.

REGULATORY FRAMEWORK

Due to the fact that OELs are an important tool in risk assessment and in the management of activities involving the handling of dangerous substances, they are set by national authorities and are enforced by legislation in order to protect occupational safety and health⁵. There are many dangerous substances for which as yet there are no formal occupational exposure limits. In these cases, hazard banding or control banding strategies can be used to ensure safe handling⁶.

The OELs developed by the professional organizations are guidelines. Only the values adopted and prescribed by the legislation of every region are enforceable⁷. A summary of the legislation to be considered can be found below:

EUROPE

In Europe, there are two types of OELs for chemical agents: EU community exposure limits and national exposure limits, which may be different⁸.

The European Commission establishes two kinds of occupational exposure limit values or OELs (indicative OELs and binding OELs). The community limits are set by the European Agency for Safety and Health at Work (<https://osha.europa.eu>) and are specified in various directives that are updated regularly (<https://osha.europa.eu/en/legislation/directives/exposure-to-chemical-agents-and-chemical-safety>)^{9,10}.

2. <https://www.aiha.org/publications-and-resources/TopicsofInterest/Topics/Pages/Occupational-Exposure-Limits.aspx>

3. https://www.ccohs.ca/oshanswers/hsprograms/occ_hygiene/occ_exposure_limits.html

4. https://www.ccohs.ca/oshanswers/hsprograms/occ_hygiene/occ_exposure_limits.html

5. <https://www.aiha.org/publications-and-resources/TopicsofInterest/Topics/Pages/Occupational-Exposure-Limits.aspx>

6. <https://www.aiha.org/publications-and-resources/TopicsofInterest/Topics/Pages/Occupational-Exposure-Limits.aspx>

7. https://www.ccohs.ca/oshanswers/hsprograms/occ_hygiene/occ_exposure_limits.html

8. [https://www.chemsafetypro.com/Topics/EU/EU_Occupational_Exposure_Limits_\(OELs\).html](https://www.chemsafetypro.com/Topics/EU/EU_Occupational_Exposure_Limits_(OELs).html)

9. <https://www.dguv.de/ifa/fachinfos/occupational-exposure-limit-values/foreign-and-eu-limit-values/index.jsp>

10. [https://www.chemsafetypro.com/Topics/EU/EU_Occupational_Exposure_Limits_\(OELs\).html](https://www.chemsafetypro.com/Topics/EU/EU_Occupational_Exposure_Limits_(OELs).html)



Considering the Community values, the Member States are required to establish national occupational exposure limit values for listed chemical agents, which can be easily checked by using a free database called GESTIS (<http://limitvalue.ifa.dguv.de/>) that contains a collection of occupational limit values for hazardous substances gathered from various EU member states, Australia, Canada, Japan, New Zealand, Singapore, South Korea, Switzerland, China, and the United States¹¹.

USA

The National Institute for Occupational Safety and Health (NIOSH; <https://www.cdc.gov/niosh/index.htm>) is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness in the USA¹². NIOSH's "Recommended Exposure Limits" (RELs) can be found in the NIOSH Pocket Guide to Chemical Hazards (<https://www.cdc.gov/niosh/npg/>).

The Occupational Safety and Health Act of 1970 created both NIOSH and the Occupational Safety and Health Administration (OSHA; <https://www.osha.gov/>), in which "Permissible Exposure Limits" (PELs) are not recommended due to not being updated¹³. California OSHA has established an extensive list PELs that are enforced in workplaces under its jurisdiction (https://www.dir.ca.gov/title8/5155table_ac1.html#_blank). Although not enforceable in establishments outside of California, the PELs can provide information on acceptable levels of chemicals in the workplace¹⁴.

11. [https://www.chemsafetypro.com/Topics/EU/EU_Occupational_Exposure_Limits_\(OELs\).html](https://www.chemsafetypro.com/Topics/EU/EU_Occupational_Exposure_Limits_(OELs).html)

12. <https://www.dguv.de/ifa/gestis/gestis-internationale-grenzwerte-fuer-chemische-substanzen-limit-values-for-chemical-agents/limit-values-usa-niosh/index.jsp>

13. https://www.chemsafetypro.com/Topics/USA/OSHA_PELs_Permissible_Exposure_Limits.html

14. https://www.chemsafetypro.com/Topics/USA/California_OSHA_PELs_Permissible_Exposure_Limits.html

In addition, there are limits set out by many professional organizations, such as the American Conference of Governmental Industrial Hygienists (ACGIH; <https://www.acgih.org/>), which establishes the so-called “Threshold Limit Value” (TLV)¹⁵; and the American Industrial Hygiene Association (AIHA; <https://www.aiha.org/Pages/default.aspx>) Guideline Foundation Workplace Environmental Exposure Levels (WEELs), which provides guidance for protecting most workers from adverse health effects related to occupational chemical exposures¹⁶.

The OELs developed by the professional organizations are guidelines. Only the values adopted and prescribed by the legislation are enforceable¹⁷.

CANADA

In Canada, provinces, territories and the Labor Program (for federally regulated workplaces) list which occupational exposure limits are enforceable under their health and safety legislation¹⁸. A list of legislative references for Exposure Limits to Chemical and Biological Agents for Canadian jurisdictions is available at http://ccinfoweb2.ccohs.ca/legislation/documents/notes/oshleg/leg_tlv.htm.

There are OELs for over 725 substances (https://www.labour.gov.on.ca/english/hs/pubs/oel_table.php) under R.R.O. 1990, Regulation 833 (Control of Exposure to Biological or Chemical Agents) and Ontario Regulation 490/09 (Designated Substances) under Ontario's Occupational Health and Safety Act¹⁹.

The Ministry of Labor releases for public consultation proposals for new or revised OELs based on the annual recommendations of the American Conference of Governmental Industrial Hygienists (ACGIH; <https://www.acgih.org/>), with the proposed changes being published at <https://www.labour.gov.on.ca/english/about/consultations/oels/table.php>.

JAPAN

The Japan Society for Occupational Health (JSOH; <https://www.sanei.or.jp/>) recommends OELs as reference values for preventing adverse health effects on workers caused by occupational exposure to chemical substances, continuous or intermittent noise, impulsive or impact noise, heat stress, cold stress, whole-body vibration, hand-arm vibration and time-varying electric, magnetic and electromagnetic fields and ultraviolet and ionizing radiation²⁰.

The recommendations for OELs (2018–2019) according to the JSOH can be checked at <https://www.sanei.or.jp/images/contents/310/OEL.pdf>.

15. https://www.chemsafetypro.com/Topics/USA/ACGIH_TLVs_Threshold_Limit_Values.html

16. https://www.chemsafetypro.com/Topics/USA/AIHA_Workplace_Environmental_Exposure_Levels_WEELs.html

17. https://www.ccohs.ca/oshanswers/hsprograms/occ_hygiene/occ_exposure_limits.html

18. https://www.ccohs.ca/oshanswers/hsprograms/occ_hygiene/occ_exposure_limits.html

19. <https://www.labour.gov.on.ca/english/hs/topics/oels.php>

20. <https://www.sanei.or.jp/?mode=view&cid=310>



HOW THE RIGHT CONTAINMENT SYSTEM REDUCES AIRBORNE SUBSTANCES IN THE WORKPLACE

This white paper has defined the OELs, and has highlighted the importance of their control, but nothing has been said as yet about the most important factor: prevention. A legal limit or guideline (such as an OEL) should never be viewed as a line between “safe” and “unsafe”. The best approach is to always keep exposures or the risk of a hazard as low as possible²¹.

The formation of a sound barrier between the product within the manufacturing process and the people located in the operating environment is critical.

There is no lower risk than simply ensuring that the risk doesn’t happen in the first place, therefore the best way to ensure that harmful substances are below the OELs in industrial areas is to avoid them leaving the containers used for their storage and dispensing: **the right containment is the best tool for minimizing risk.**

If airborne risk cannot be minimized then this would result in the use of Personal Protective Equipment (PPE) by every worker, which may then result in a lack of comfort as well as a statistical increase of risk (an increase in the potential misuse of PPE and a lack of conscious mindfulness which results in human error).

21. https://www.ccohs.ca/oshanswers/hsprograms/occ_hygiene/occ_exposure_limits.html

In addition, reducing the airborne risk by using the right containment system has distinct advantages which not only protect the worker, but also the product. In many cases of incorrect containment, products have become contaminated and also have been wasted unnecessarily.

The opening and closing stages during the container operation are the most critical points, additionally a dust-free environment can be achieved during powder operations by ensuring that all moving valve systems, whether they are operated manually, semi-automatically or fully automatically, maintain a hermetically sealed transition between the container and the receiving unit²².

Since every substance and process has its own distinctive features, there is not one unique solution that fits them all without resulting in over-engineering. Knowing the substances that you have to work with will define the best containment system for every solution.

22. <https://thielmann.com/en/knowledge-base/white-papers/top-10-things-to-know-when-considering-a-powder-handling-system>



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