THE CHROMATE EXPERTS
OCCUPATIONAL SAFETY | DECONTAMINATION | SUBSTITUTION | DISPOSAL

Chromium (VI) risk due to the use of high-temperature textile insulation systems containing alkali and/or alkaline earth metals (coll. calcium) in combined heat and power plants (CHP plants)

Introduction and Problem Statement

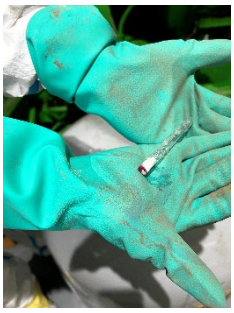
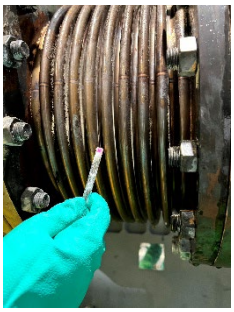
- **Problem:**
  High-temperature textile insulation containing alkali and alkaline earth metals (especially calcium) can **lead** to the formation of carcinogenic, skin-absorbing and environmentally harmful chromium (VI) compounds **(especially calcium chromate) on chromium-containing metal parts** at temperatures between 350-750°C. **This applies in particular to engines and exhaust components in combined heat and power (CHP) plants**.

- **Underestimated danger:**
  The risks posed by the often visible yellowish dusts are often underestimated. **However, visibility and swirling potential indicate large-scale contamination of the entire engine compartment**, which **endangers humans** (inhalation, dermal) and **the environment** (carryover).

- **Immediate measures necessary:**
  The **contamination requires immediate safety measures** such as **spatial separation, access bans**, disinstallation, **decontamination** and, **above all, substitution of the problematic insulation materials**.

- **Risk assessment obligation:**
  Operators are legally obliged to carry out a risk assessment (in accordance with 89/391/EWG) in order to assess risks and determine protective measures. This documentation serves as a decision-making aid for this.

- **S-T-O-P – Principle (2004/37/EU; COSHH2002 UK):**
  The hierarchy applies to protective measures: substitution before technical, organizational and personal protective measures. Substitution has the highest priority.

Risk details and legal obligations

Health and environmental hazards from chromates

- **Hazardous substances:**
  Calcium chromate ($CaCrO_4$) and sodium chromate (Na_2CrO_4) are primarily produced thermochemically when today's insulation materials are used. These are classified as **carcinogenic** (H350), **skin-sensitizing** (H317), **skin-resorptive** ("H" marking) and **very toxic to aquatic organisms with long-term effects** (H410).

- **Routes of Exposure & Risks:**

  - **Inhalation: Fine dusts can be inhaled**. Measurements showed concentrations up to 6.99 µg/m3, far above the tolerance concentration of 1 µg/m3 (D/F/NL). Even small amounts (example "knife tip"; approx. 100 mg) can mathematically massively exceed the limit values and pose a **high risk** .

  - **Dermal: Skin contact can lead to sensitization and ulcers**. **The dust is distributed over a large area of the entire work area**.
    Here, too, there is a **high risk**.

  - **Environment: Chromates are highly hazardous to water** (D: WGK 3). The aforementioned pinch of chromate can mathematically contaminate 333,333 liters of drinking water (German GBU recommendation).
    Carry-over and improper disposal pose significant environmental risks (**high risk**).

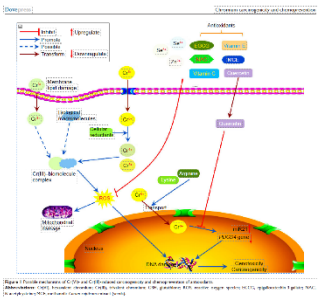
- **Affected persons:**

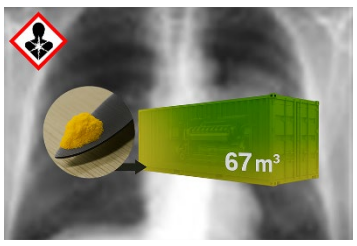
  Not only insulators, but also service staff, caretakers, cleaners and visitors are at risk.

Risk details and legal obligations

Legal Regulations (D/EU)

- **D: GefStoffV; NL: Arbobesluit; F: Code du travail; UK: COSHH**
  Immediate risk assessment, substitution obligation, exposure, the pan-European minimisation requirement according to 2004/37/EU applies.
- **The employer has the duty to determine and assess the type, extent and duration of the dermal hazard as part of its risk assessment and to determine the necessary protective measures to prevent or minimise the risk of skin contact.**
  The employer must assess the determined exposure with regard to a risk to employees and the effectiveness of the protective measures, **whereby the wearing of personal protective equipment may not be taken into account.**
- **Substitution obligation for carcinogenic substances, minimisation requirement**, acceptance (0.1 µg/m3; D, NL, F) and tolerance concentrations (1 µg/m3: D, NL, F) for chromium (VI) compounds. **Even exceeding the acceptance concentration requires an action plan.**
  There is no European threshold value for chromium (VI) compounds
- **REACH:**
  Chromium (VI) compounds are partly listed as SVHC, substitution mandatory.
- **Occupational diseases:**
  Lung/skin cancer. Occupational health care is mandatory.





Solutions and protective measures

Substitution as a core solution and transitional measures

- **Substitution (S):**

  The priority and most sustainable solution is to replace the alkali/alkaline earth containing insulation materials with available "calcium-free" alternatives according to the principle: **"No calcium – no calcium chromate".**

  These materials are market-tested, prevent chromate formation and meet the minimization requirement. They are technically and economically feasible.

- **Technical measures (T):**

  Until substitution, technical measures are mandatory, but often have limited effectiveness and do not replace substitution:

  - Enclosure/separation of the work area, negative pressure maintenance (HEPA filters).
    Point extraction during dusty activities (deinstallation, decontamination).
    Industrial vacuum cleaner (dust class H).
    Professional decontamination of contaminated areas by specialist companies.

- **Organizational measures (O):**

  - **Access restrictions, marking of the danger area**.
    Preparation of operating instructions, hazardous substance instructions.
    Minimization of exposure duration.
    Decontamination procedures for personnel and tools.
  - **Important:** So-called **"neutralizations"** (e.g. with ascorbic acid) **do not replace professional decontamination**, can **generate dangerous by-products** (*chromium (III) compounds are not harmless either*) and may only **be carried out as part of an overall concept by trained personnel under the highest protective precautions**. **They do not constitute a technical protective measure**.

Solutions and protective measures

- **Personal protective equipment (P):**

  As a last measure, there must **be no permanent solution** :

  - **Respiratory protection: At least FFP3 mask** (fan-assisted if necessary).
  - **Body Protection: Protective suit type 5/6**.
  - **Chemical protection gloves**.
  - **Skin protection plans, strict hygiene, separate storage of work/private clothes**.

- **Environmental protection/disposal:**

  Contaminated materials (insulation materials, PPE, cleaning cloths, etc.) must be disposed of as hazardous waste. Runoff-free work must be ensured.

Call to action and corrections

Why Act Now and Common Myths

- **Urgency:**

  Action is required now for reasons of:

  - **Health:** Protection of employees from irreversible damage (cancer).
  - **Legal certainty:** Compliance with the national and European regulations, avoidance of fines, official orders up to plant decommissioning.
  - **Costs:** Long-term savings through substitution versus recurring costs for PPE, time-consuming decontamination, disposal and possible consequential costs of illnesses.
  - **Image:** Maintaining sustainability status ("green" energy) and avoiding environmental liability risks.

Refutation of misunderstandings/narratives

- "*Only air measurements are relevant*": **False**. Visible contamination, material analysis and skin contact are also crucial. A high hazard can also be determined without air measurement.
- "*Neutralization is a simple solution*": **False**. It is unreliable, generates by-products and does not replace decontamination.
- "*Only insulators are affected*": **False**. Many occupational groups can be exposed.
- "*That little bit of powder is harmless*": **Wrong**. Even the smallest amounts can exceed acceptance and tolerance concentrations; there is no safe threshold for chromium (VI) compounds.
- "*Chromium (VI) formation is material-independent*": **Scientifically incorrect**. Alkali/alkaline earth metals (especially calcium oxide) from insulation materials are crucial catalysts.
- "*There are no regulations*": **False**. Strict rules apply (country-specific and EU-wide).
- "*The formation of chromium (VI) is unclear*": **False**. The mechanisms are known.
- "*There are no calcium-free insulating materials*": **False**. They are available and already market-tested.

Recommended next steps for operators:

- **Right away:**

  Identify danger, integrate safety officer, carry out/update risk assessment, initiate immediate measures (PPE, access restriction, training).

- **Soon:**

  Carry out substitution testing, plan decontamination and substitution concept (with experts/specialist companies).

- **Implementation:**

  Professional decontamination and installation of the substitution solution commissioned and carried out by trained external specialist companies. Effectiveness control (measurements) after measures.

- **Support:**

  The information network **"The Chromate Experts"** has investigated the **formation of chromate by alkaline and/or alkaline earth metal insulation materials and systems in detail** and regularly exchanges scientific and practice-oriented information.

  Companies specializing in chromate control and prevention offer support in analysis, planning, decontamination, substitution and measurement technology.

Brochure presented by (contact):

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Available on www.chromatexperten.de/en/kompendium:

The decision-making aid for risk assessment for alkaline and/or alkaline earth metal (calcium-containing) insulation systems (54 pages, D/EN)

DIE CHROMATEXPERTEN
ARBEITSSCHUTZ | DEKONTAMINATION | SUBSTITUTION | ENTSORGUNG

Decision-making aid for risk assessment of alkaline and/or alkaline earth metal (calcium-containing) insulation systems: Avoiding chromium(VI) risks in CHP plants (according to TRGS 400)

Facts, protective measures and substitution obligation for operators

Engine manufacturers and producers of textile insulating materials report the formation of carcinogenic, skin-absorbing and chronically environmentally harmful chromium (VI) compounds, especially calcium chromate, through the use of high-temperature textile insulation containing alkali and alkaline earth.

The dangers posed by the visible yellowish dusts are often underestimated and trivialized, even though they pose a serious safety problem.

The visibility and the potential for stirring up alone indicate large-scale hazards to humans (inhalation and dermal) **and the environment contaminating the entire engine compartment and require immediate safety measures** (spatial separation, entry bans, deinstallation, decontamination and substitution to comply with European regulations on protection against carcinogenic substances).

Even before further measures are initiated, a risk assessment must be carried out, the preparation of which is to be facilitated by this documentation, also in order to avoid official plant shutdowns.