Checklist for the possible occurrence of Cr(VI)

	yes	no
1. does the company generate electricity using turbines and/or diesel engines?		
Which? (Double answer possible.) Turbines		
Diesel engines		
2. has a risk assessment been prepared for the operation?		
3. is there a risk assessment for maintenance work?		
4. does this include the possible occurrence of Cr(VI) compounds?		
5. do you carry out such work yourself in the company?		
6. if no: to whom will this work be contracted?		
7. are there any operating instructions?		
8. date of the last instruction?		
9. have yellow deposits become visible during such work?		
10. are these removed with low dust prior to maintenance work?		
11. is personal protective equipment available?		
Respiratory protection (FFP2 or		
better) Eye protection and flushing		
capability Disposable suit		
Cut resistant nitrile gloves		
12. have you checked the substitution of the installed insulation or maintenance materials used?		
Result?		

If one or more of the questions 7 - 12 were answered with "no" is answered, the corresponding protective measures still have to be implemented.

Legal basis

The company's occupational health and safety system is based on risk assessment. Section 5 of the Occupational Safety and Health Act regulates the employer's duty to identify and assess hazards and possible causes of hazards for each workplace.

In order to ensure the safety and health protection of employees when using work equipment (machinery), the employer must assess the hazards that occur in accordance with § 3 of the Industrial Safety Regulation.

In order to be able to assess the health hazards posed by chromium(VI) compounds, it is absolutely necessary to determine the exact causes of exposure.
The employer's obligation to specify the extent, type and duration
of an exposure is to be determined and assessed in § 7 of the Hazardous Substances Ordinance.

The Thuringian Occupational Safety Authority will randomly check the fulfillment of the duty to investigate and check the effectiveness of the protective measures implemented for the employees on the basis of the results determined on site. In addition, personal protective equipment and the documentation of occupational safety instructions will be checked.

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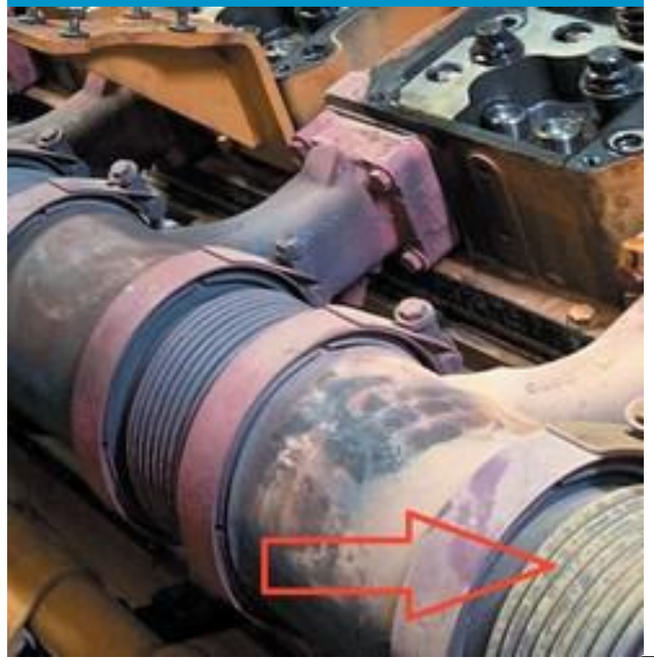
Cover graphic: www.harmfuldust.com
Internet: verbraucherschutz.thueringen.de
Photos: www.kavarmat.com/caofree
Status: May 2022

Freistaat Thüringen
Landesamt für Verbraucherschutz

Chromium (VI) exposure during maintenance and repair of turbines and engines

Information on proper handling



Oxidation of chromium to chromate in the presence of calcium oxide

The background to this priority action (SPA) by the Occupational Safety and Health Administration is an open letter sent to top state agencies in the summer of 2020, referring to the possibility that the

Insulation of the power generation operated engines (and their exhaust systems) and turbines may be contaminated with the carcinogenic chromium(VI) compound calcium chromate ($CaCrO_4$).

2 Cr + 2 CaO + 3 O2 → 2 CaCrO4

or

2 Cr2O3 + 4 CaO + 3 O2 → 4 CaCrO4

Four conditions must occur simultaneously for calcium chromate to form:

1. Chrome steel
2. Temperatures > 400 °C
3. Oxygen presence
4. Calcium based products

(Siemens Energy, 52nd Power Plant Colloquium in Dresden, October 2020)

This focus action is intended to provide answers to three questions:

- Have operators identified these potential hazards and documented them in their risk assessment?
- Have external employees of service companies been informed or instructed?
- What measures have been taken or are planned?

Examples of the occurrence of chromium(VI) in energy production

1. Where are these conditions present?

Turbines (gas, coal turbines, combined heat and power plants)

The chromium present in the metal alloys of the turbines thus reacts with calcium oxide contained in the insulating materials to form carcinogenic chromium(VI) compounds due to the temperatures generated during turbine operation.

(www.harmfuldust.com)

Engines

On exhaust manifolds or heat shields, for example, components containing chromium react with maintenance materials containing calcium (pastes, greases, etc.) to form chromium(VI) compounds.

(www.eneria.fr/en/hexavalent-chromium-or-chromium-6-cr-6-on-engines)

2. How can these reactions be detected?

Yellow dust deposits
in areas of particularly high heat are a clear indication of the presence of chromium(VI).

Used insulation elements may be contaminated if they were exposed to temperatures from approx. 350 °C as insulation of bodies containing stainless steel.

Chromate = Chromium(VI)

The chromate ion (Cr6+) occurs in various bonding forms. The best known are the chromium trioxide CrO3, the chromate CrO_4^{2-} and the dichromate $Cr_2O_7^{2-}$.

All Cr(VI) compounds (with the exception of the water-insoluble barium chromate) are highly toxic, hazardous to water and carcinogenic.

H314

Causes burns to the skin and severe eye damage.

H330
Danger to life if inhaled.

H340
May cause genetic defects.

H350
May cause cancer.

H372
Causes damage to organs through prolonged or repeated exposure.

Important!
The main route of absorption is inhalation, only a small part is absorbed through the skin.

Protective measures

There are no known cases of chromates being released into the breathing zone of employees through the operation of turbines and motors.

Due to the release of dust deposits and Skin contact exposure is possible during maintenance, cleaning or repair work.

The following protective measures are

recommended. Ingestion by inhalation or skin

contact
can be prevented by:

- no release of inhalable dust (e.g. do not blow off dust!)
- Disposable respiratory protection (FFP2 or FFP3 mask)
- waterproof eye protection (goggles or face shield)
- cut resistant nitrile gloves
- Disposable suit

All waste generated during the repair process (including cleaning cloths and used personal protective equipment) must be collected and stored in a suitable, sealed, labeled container until disposal as hazardous waste.

Before starting work, perform a Cr(VI) quick test and remove the yellow deposits carefully and properly. For example, a washing liquid consisting of 10% citric acid, 10% ascorbic acid and 80% distilled water is recommended. This not only removes or binds the dust, but also reduces the chromate to the less dangerous Cr(III).
Cleaning with WD-40 and cloth rags is also possible. In this case, the cleaning process must be carried out until the Cr(VI) test is negative.

(www.eneria.fr/en/hexavalent-chromium-or-chromium-6-cr-6-on-enginesHexavalent chromium Safety Bulletin S)