



Hexavalent chromium (Cr(VI)) is a dangerous and carcinogenic substance that can unexpectedly form within insulation materials used around high-temperature equipment. Specifically, when stainless steel or chromium-containing alloys come into contact with insulation containing alkaline substances (such as calcium, magnesium, or sodium), leading to the formation of water-soluble and highly toxic Cr(VI) compounds. A recent study by Van Leeuwen (2024) demonstrated how chromium vapors generated at high temperatures can reactively condense onto insulating materials containing alkali and alkaline earth metals, forming hazardous Cr(VI) deposits. Major industry players, including Caterpillar, Siemens, Rolls-Royce, and Rockwool, have acknowledged this issue through safety bulletins, highlighting the presence of Cr(VI) as a critical occupational health concern.

Standard analytical methods for Cr(VI) typically exhibit very low recovery rates for Cr(VI) in these complex insulation matrices, rendering them unreliable and inadequate for accurate risk assessment. Quick tests, such as swab tests or those designed primarily for water-soluble Cr(VI) detection, often provide misleading or false-negative results due to interferences from metals (such as zinc and aluminum) and other reducing agents in insulation dust. These limitations necessitate the adoption of advanced analysis methods capable of accurately detecting and quantifying Cr(VI), ensuring proper health and safety measures are implemented.

The issue of hexavalent chromium formation predominantly impacts industries operating high-temperature equipment, such as power generation plants, gas and steam turbines, aerospace engines, marine propulsion systems, petrochemical plants, and automotive industries.

The formation process

The formation of hexavalent chromium (Cr(VI)) is a chemical process that occurs when the following five elements are simultaneously present:



Chromium containing alloy

Materials such as stainless steel or low-alloy steel contain chromium that can convert into Cr(VI).



Temperatures from 250 °C

At this temperature and above, chromium compounds oxidize into the hexavalent form.



Alkali and alkaline earth metals

Elements like calcium (found in insulation materials) act as catalysts in the formation of Cr(VI).



Oxygen

Present in ambient air, oxygen facilitates the oxidation of chromium to Cr(VI).

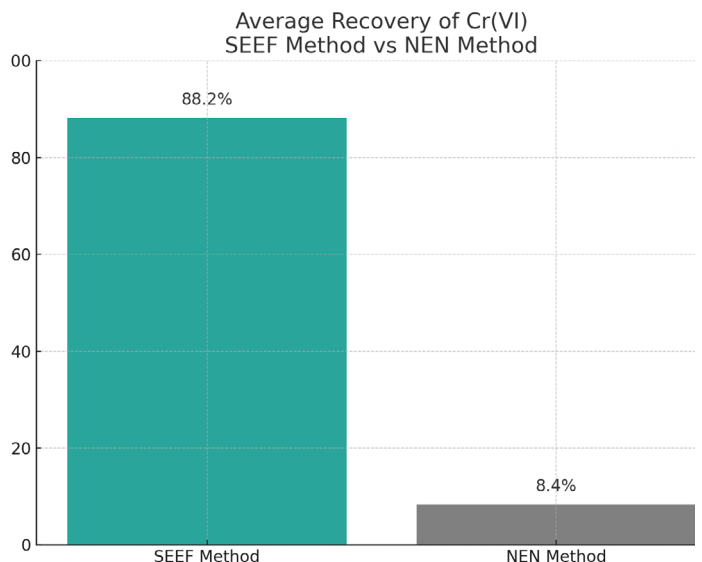


Moisture

From ambient air promotes conversion of chromium compounds into soluble and toxic Cr(VI) compounds.

Why traditional methods fail

Traditional analysis methods have significant limitations, especially in complex insulation matrices. Due to the presence of reducing agents and interferences such as metal particles, these methods typically yield very low recovery rates for Cr(VI). This results in false-negative or misleading results, leaving hazardous Cr(VI) undetected and underreported.



Introducing the SEEF Cr(VI) analysis method

The SEEF Cr(VI) analysis method provides an innovative analytical solution tailored specifically for the challenging conditions found in high-temperature insulation systems. Unlike traditional methods, SEEF utilizes a unique stabilization approach that effectively maintains the integrity of Cr(VI) compounds throughout the analytical process. This advanced stabilization strategy significantly enhances recovery rates, offering reliable detection even in complex sample matrices. The SEEF method thus ensures accurate and reproducible results, crucial for informed decision-making and comprehensive risk management in affected industries.



“ 1/150th of a grain of sugar of this yellow dust is enough to reach the Dutch, German and French limit value for Cr(VI) in 1m³ of air!

How we became a market leader

Our journey began in 2019 in a modest garage, driven by the ambition to solve the persistent analytical challenges posed by reducing elements encountered in traditional Cr(VI) detection methods. Through dedicated innovation and continuous improvement, we developed an analytical method that overcame these limitations, providing unprecedented accuracy and reliability. Today, SEEF has evolved into a professional organization conducting approximately 1500 Cr(VI) analyses per month. Our ambition does not stop here: we are committed to further growth and automation, aiming to provide global access to the most reliable Cr(VI) detection technology available.



1500 Tests

on Cr(VI) per month in our laboratory in Ulvenhout, in The Netherlands



Check our website www.seefbv.com for more information



42%

of the analyses we do test positive for the presence of Cr(VI) compounds. This shows how important a reliable analysis is.



We provide clear advise on all your Cr(VI) questions.

Solution

Effective risk management starts with accurate detection! SEEF offers both on-site analytical services and convenient testing products for independent assessments.

Once risks are clearly identified, safe removal of Cr(VI) compounds becomes essential, an area where SEEF can also provide expert guidance.

Finally, substitution is key. Opt for insulation systems that are free from calcium and other alkali and alkaline earth metals to mitigate future Cr(VI) risks. Contact SEEF today to take control of your Cr(VI) management strategy and ensure workplace safety and environmental compliance.