Technical Rule for Hazardous Substances 460

„Recommended course of action for determining the state of the art“

examples of the approach

Example 5

Hard chrome plating of metal parts of varying sizes (subcontracted electroplating)

Procedures A and B (hard chrome plating with rim extraction or with rim extraction and wetting agent respectively) are generally accepted rules of technology.

The meaningful combination of further additional, precautionary measures like covering of the process container (highest efficacy of precautionary measures), general exhaust ventilation, and exhausted transport vehicle leads to state of the art procedures (procedures G and H). In contrast to the generally accepted rules (procedures A and B: hard chrome plating with rim extraction (A) and wetting agent (B) they represent procedures that have proven to be feasible in practice.

The topic “Retrofitting” was discussed intensively and in part controversially. The existence of the state of the art does not (automatically) imply that it can be achieved in all cases. Not every old industrial plant can be upgraded to the state of the art; new industrial plants can achieve by definition the state of the art although this might in part be associated with large efforts.
ACTIVITY: Hard chrome plating of metal parts of varying sizes (subcontracted electroplating)

PROCESSES

PROCEDURE A
Short title: Hard chrome plating with rim extraction

- Electropolishing process container with a volume of several m³ and rim extraction and wetting agent
- Electropolishing process container with a volume of several m³ and rim extraction and wetting agent
- Electropolishing process container with a volume of several m³ and rim extraction and wetting agent

PROCEDURE B
- General exhaust ventilation system

PROCEDURE C
- Hard chrome plating, electroplating
- Hard chrome plating, electroplating
- Hard chrome plating, electroplating

PROCEDURE D
- Short title: Hard chrome plating with rim extraction and covering
- Short title: Hard chrome plating with rim extraction and covering
- Short title: Hard chrome plating with rim extraction and covering

PROCEDURE E
- Covering of the process container
- Covering of the process container
- Covering of the process container

DESCRIPTION OF THE WORK SYSTEM

- Characteristics (activity, department)
  - Hard chrome plating, electroplating
  - Hard chrome plating, electroplating
  - Hard chrome plating, electroplating

- Specifications of the WORK SYSTEM
  - Equipment, work environment, ventilation technology, qualification of the operators

- Specifications of the MATERIAL FLOW
  - (e.g. raw materials, other desirable changes, properties of the materials)

SYSTEM OPERATION

- Source/Quality of the DATA
  - DGUV-I 213-716
  - ETEM and DGUV-I 213-716 (E)GU BGI 790-

- NORMAL OPERATION
  - Exposure data
    - Exposure peaks up to 24 µg Chromium(VI)/m³ (10% percent)
    - Exposure peaks up to 84 µg Chromium(VI)/m³
    - Exposure peaks up to 36 µg Chromium(VI)/m³

- MAINTENANCE procedures
  - Exposure data
    - Exposure peaks cannot be expected during cleaning, maintenance and repair activities.
    - Exposure data is currently not available.

- POSSIBLE OPERATING DISRUPTIONS
  - Exposure data
    - Exposure peaks cannot be expected during cleaning, maintenance and repair activities.
    - Exposure data is currently not available.

- ASSESSMENT OF ASPECTS of regulations on hazardous substances

- EXPOSURE-risk relevant materials
  - Exposure to substances applicable FPF during maintenance
  - Exposure to substances applicable FPF during maintenance
  - Exposure to substances applicable FPF during maintenance

- RELIABILITY of the available protective measures
  - Main protective measure technically mandatory
  - Main protective measure technically mandatory
  - Main protective measure technically mandatory

- TYPE and extent of the measurement scale
  - Assessment of the risk by inhalation
  - Measurement of electroplating and control systems general ventilation system incorrect use of venting agent

- ASSESSMENT OF THE RISK BY INHALATION
  - Chromium: Not classifiable as carcinogenic to humans (IARC 1)
  - Exposure to chromium compounds (1 µg/m³)
  - Chromium: Complying with the assessment scale
  - Assessment of the risk by inhalation
  - Exposure to chromium compounds (1 µg/m³)

- ASSESSMENT OF THE RISK BY CONTACT
  - Sulphuric acid: Complying with the AGW for sulphuric acid (0.1 mg/m³ E)
  - Chlorine: Not classifiable as carcinogenic to humans (IARC 1)
  - Sulphuric acid: Complying with the AGW
| 40 | **Assessment of dermal risk** | High dermal risk in the case of manual positioning in the device | High dermal risk in the case of manual positioning in the device | High dermal risk in the case of manual positioning in the device | High dermal risk in the case of manual positioning in the device | High dermal risk in the case of manual positioning in the device | Low, due to the high degree of automation during maintenance work, when required | Low, due to the high degree of automation during maintenance work, when required |
| 41 | **Assessment of the physical and chemical endangerment** | Formation of hydrogen through electrolysis; satisfactorily removed with forced ventilation; cooling effect of chromium trioxide | Formation of hydrogen through electrolysis; satisfactorily removed with forced ventilation; cooling effect of chromium trioxide | Formation of hydrogen through electrolysis; satisfactorily removed with forced ventilation; cooling effect of chromium trioxide | Formation of hydrogen through electrolysis; satisfactorily removed with forced ventilation; cooling effect of chromium trioxide | Formation of hydrogen through electrolysis; satisfactorily removed with forced ventilation; cooling effect of chromium trioxide | Formation of hydrogen through electrolysis; satisfactorily removed with forced ventilation; cooling effect of chromium trioxide |

**OTHER ASSESSMENT ASPECTS**

| 43 | Concurrent assessment scales arising from industrial safety and protection of health (e.g. protective objectives) | | | | | | |
| 44 | | | | | | | |
| 45 | Other statutory or standardized specifications of objectives (Consequences, Limitation of the process) | From 22.09.2017 onwards, an approval according to REACH is required for the use of chromium trioxide. | From 22.09.2017 onwards, an approval according to REACH is required for the use of chromium trioxide. | From 22.09.2017 onwards, an approval according to REACH is required for the use of chromium trioxide. | From 22.09.2017 onwards, an approval according to REACH is required for the use of chromium trioxide. | From 22.09.2017 onwards, an approval according to REACH is required for the use of chromium trioxide. | From 22.09.2017 onwards, an approval according to REACH is required for the use of chromium trioxide. |
| 46 | Existing protection by a patent or standardized specifications of objectives (Consequences, Limitation of the process) | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable |
| 47 | Assessment aspects from other sectors of protection (e.g. occupational protection, environment, resource protection) | Compliance with German Clean Air Act due to the extraction. | Compliance with German Clean Air Act due to the extraction. | Compliance with German Clean Air Act due to the extraction. | Compliance with German Clean Air Act due to the extraction. | Compliance with German Clean Air Act due to the extraction. | Compliance with German Clean Air Act due to the extraction. |
| 48 | Socio-economic and commercial assessment aspects (see also TRG 06/88) | – | – | General ventilation system leads to an increase in energy consumption | – | – | General ventilation system leads to an increase in energy consumption |

**BIBLIOGRAPHY/REFERENCES**

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**JUSTIFICATION OF THE ASSESSMENT**

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**RESULT OF THE ASSESSMENT**

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**INSTRUCTIONS FOR USE, if necessary**

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