REACH obsolescence management in the European space sector

Paavo Heiskanen

2018-11-13

ESA-TECQE-HO-011587

Introduction

Main purpose is to

ensure a high level of protection of human health and the environment

in relation to the use of chemical substances. *

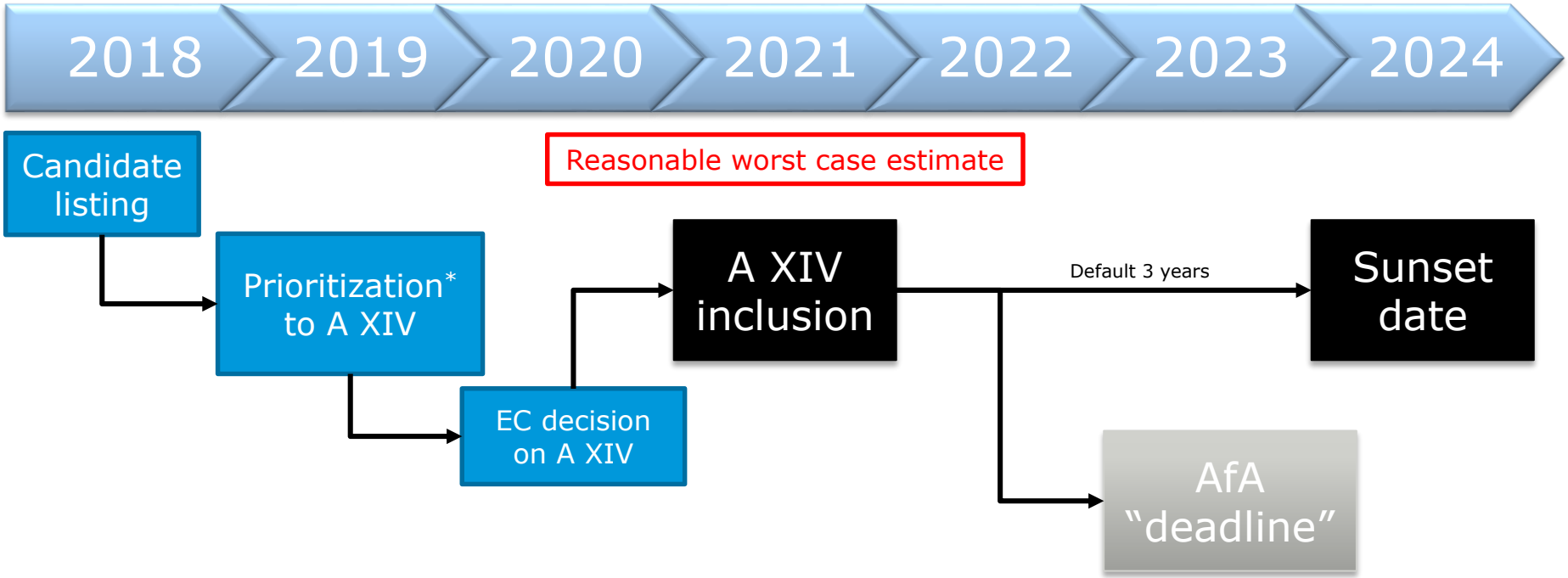
* EU Regulation 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the registration, evaluation, authorization and restriction of chemicals (REACH)

Very desirable and ambitious regulation to contribute to a safer and healthier environment

but

causes wide-reaching engineering and management challenges for the space sector which is by nature driven by performance and heritage design.

Example timeline of REACH authorisation (Pb)



*) Swift prioritization likely due to large volume / mass of use

Authorisation normally granted for 4-12 years.

OBSOLESCENCE RISK MANAGEMENT - THEORY

Risk Management

Risk Management (ECSS-M-ST-80C):

*"Risk management is a **systematic** and **iterative process** for **optimizing resources** … integrated through defined roles and responsibilities into the day–to–day activities in all project domains and **at all project levels**… It is performed in an **integrated, holistic way**, maximizing the overall benefits in areas such as:*

- *design, manufacturing, testing, operation, maintenance, and disposal, together with their interfaces;*
- *control over risk consequences;*
- *management, cost, and schedule."*

Obsolescence Management is Risk Management

Obsolesence Management (ECSS-Q-HB-70-23A):

*"Obsolescence management involves **implementing scheduled and coordinated actions** in order to secure the availability of a product during its entire life-cycle, through technical and economical means"*

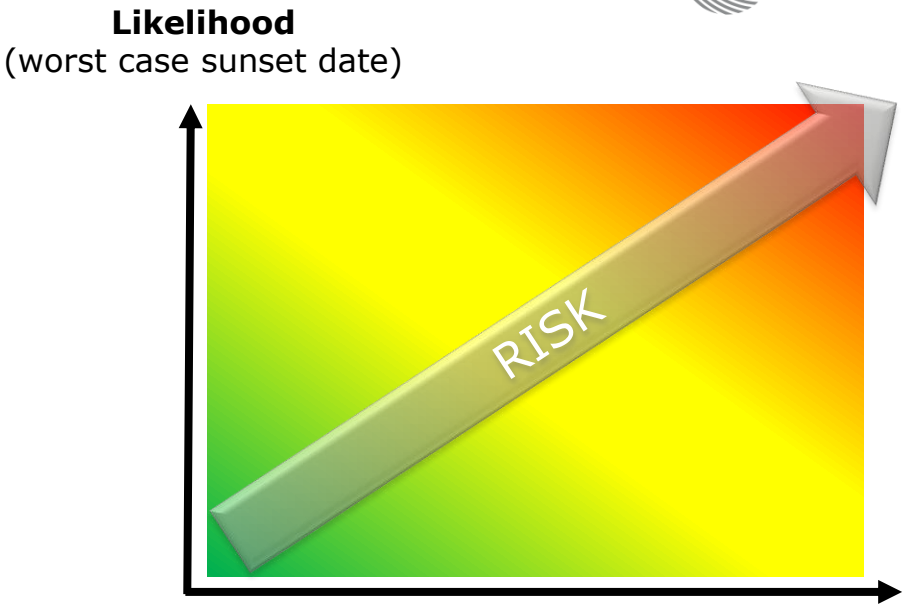
*"The proactive OM approach consists of tracking any potential cause of obsolescence … applied to **all stages of a product life-cycle**, starting from the design phase … "*

*"The first step of proactive obsolescence management is to establish for each MMPP (Material, Mechanical Part, Process) an **obsolescence risk analysis**."*

Systematic and iterative process for optimizing resources

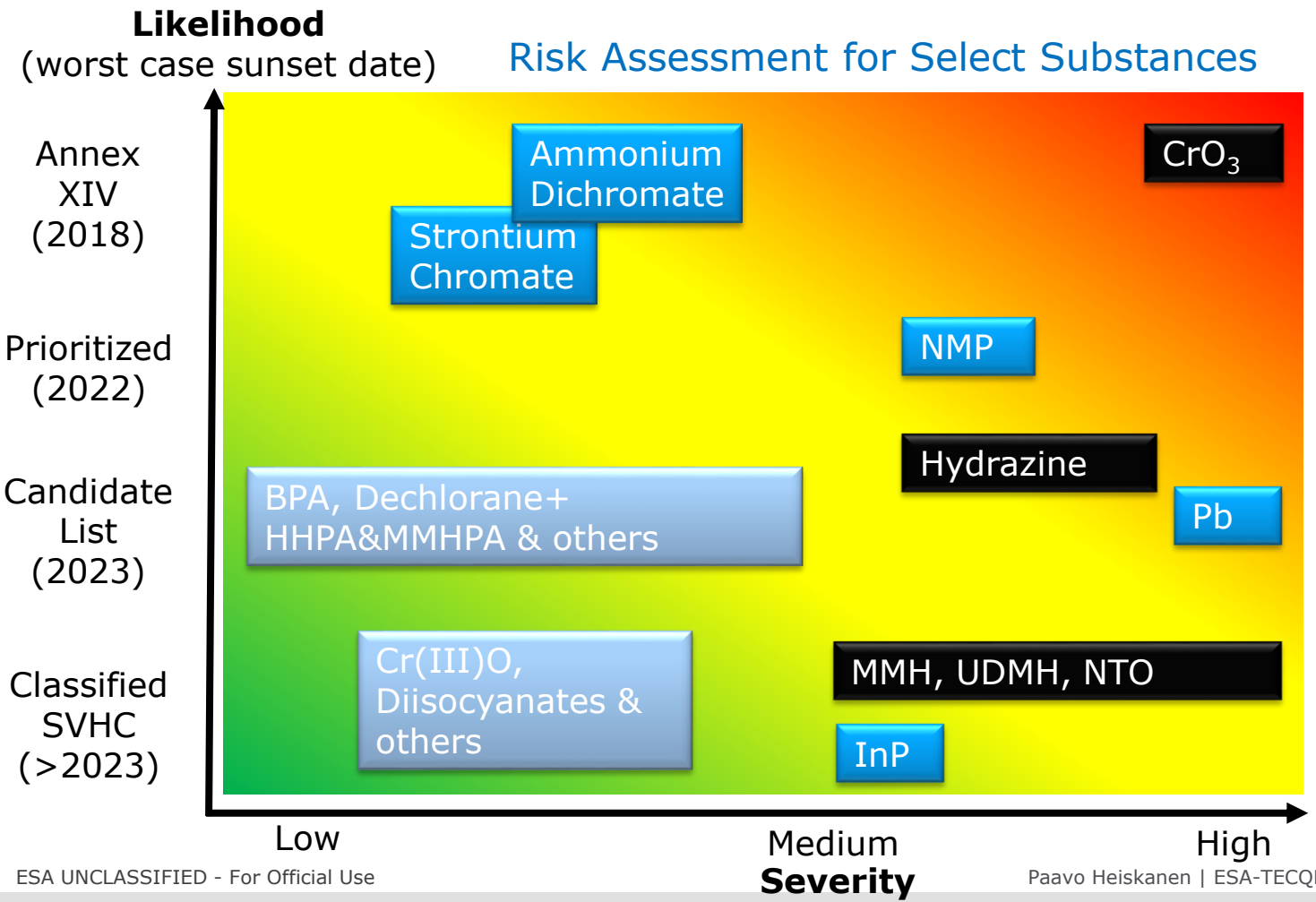
- How to define **Risk** in case of obsolescence management? A case study from ESA.*
- Risk [R] = Likelihood [L] * Severity [S] (standard definition)
- Likelihood is a function of time, represented by the status of a substance in REACH process (AXIV, Prioritized, Candidate list, SINlist, …)
- Severity has two components: Volume of Use [V] and Ease of Replacement [E]. [S] = [V] / [E]

*) This is an example, other calculation methods may be appropriate in different situations



Green – Tolerate, investigate
Yellow – Monitor, plan
Red – Mitigate, control

Risk Assessment for Select Substances

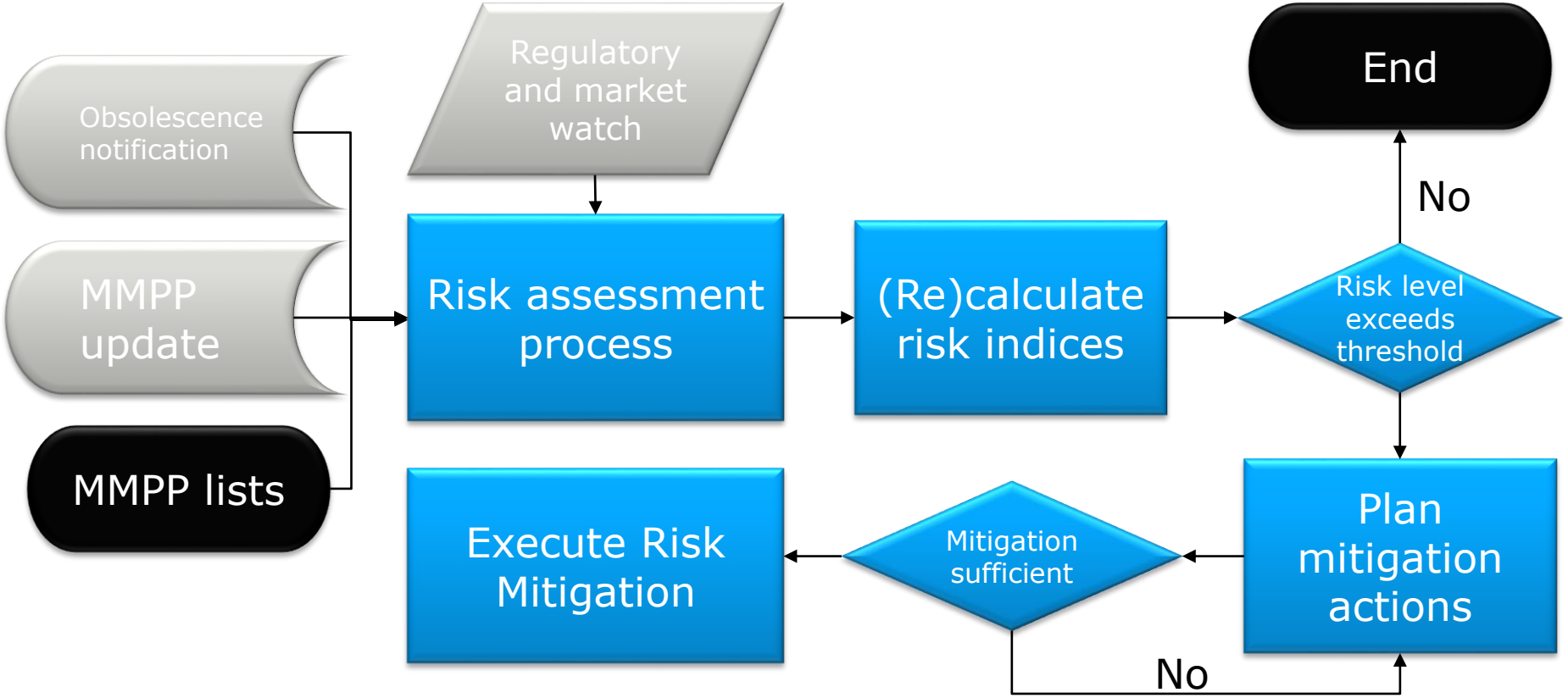


OBSOLESCENCE MANAGEMENT PROCESSES

Obsolescence Management Plan (ECSS-Q-HB-70-23A Annex A)

1. Identify and record **all** stakeholders within the organization and supply chain (Obsolescence manager, M&P Engineers, Sourcing managers, Project managers, PA Managers, Designers, SQAs, Manufacturing …)
2. Identify and record all sources of information for obsolescence
3. Define a risk threshold for actions and the responsible reporting chain
4. Include **contractual requirements** to subcontractors and supply chain for OM
5. Detail an update schedule and triggers for revisiting the OMP
6. Create Obsolescence Risk Assessment and Obsolescence Risk Mitigation plan
7. Make sure the actions are followed

“Iterative process at all project levels”



PRACTICAL OBSOLESCENCE RISK MANAGEMENT

Impacts of REACH on a Space Supply chain

1. Directly affects the entire industrial sector through obsolescence of materials, processes, and technologies at unprecedented scale
2. REACH needs to be taken into consideration already in the design phase (Obsolescence risk management and planning)
3. REACH will affect the project even after manufacturing (fueling, pyrotechnics, repairs, recurrent models, …)
4. Project duration also increases uncertainty and risk (one-off satellite payload versus multi-decade launcher program)
5. Not only a compliance matter, but risk management in a niche market.

Cross-sectorial management within space community required

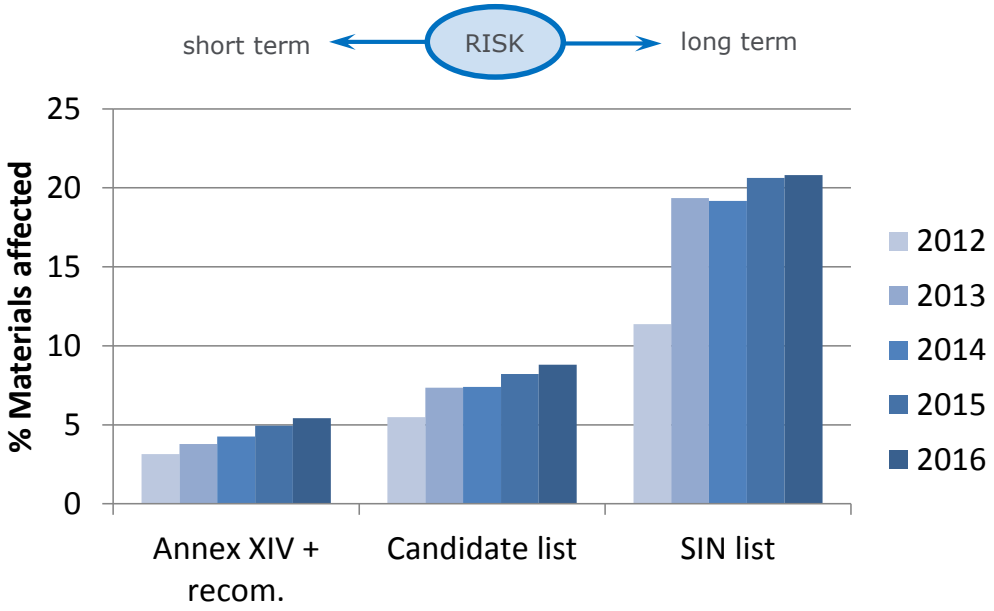
European-wide coordination through MPTB

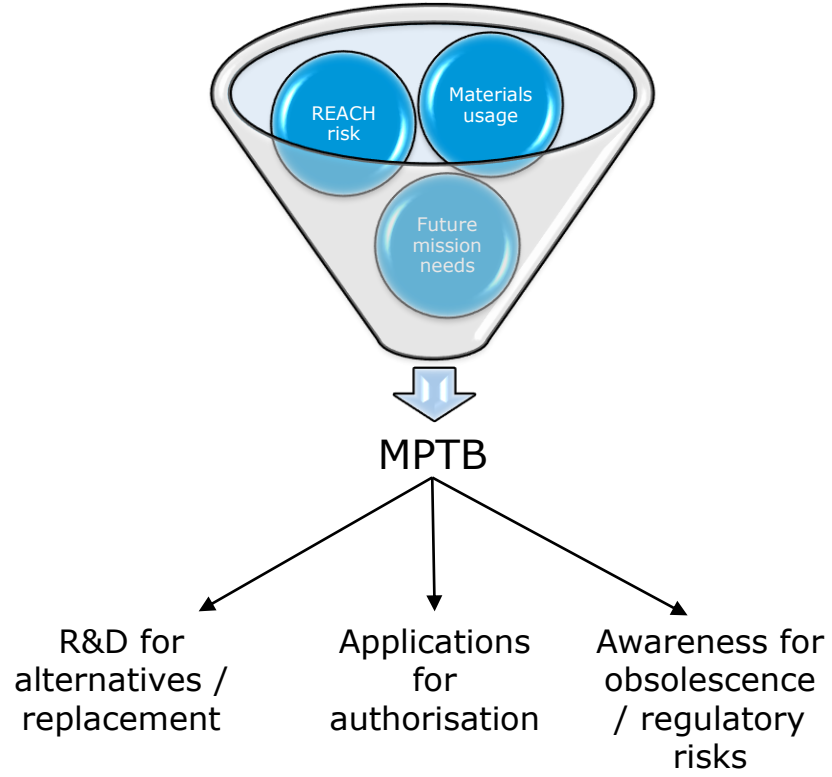
REACH is affecting European space industry as a whole. Coordination and information exchange of risk analysis and mitigation is to the benefit of the entire community.

The **Materials & Process Technology Board** is a European platform that includes the major industrial partners and space agencies. Tasks include:

- Legislation: Intelligence of legislative processes (e.g. REACH, RoHS) and coordination of actions.
- Obsolescence risk management: Identify in advance critical materials and processes.
  Propose action plans to mitigate obsolescence risk of Materials & Processes.
  Reduce programmatic risks and costs by early replacement.
- Data exchange: Share materials test data and avoid test duplication.
- R&D activities: Coordination of R&D activities, monitoring of alerts, analysis of in-orbit anomalies, *etc.*
- Communication & information exchange: Coordination of information via symposia, WGs, training. Development of synergies with other industrial sectors.
- Splinter activities: Chromate space task force, hydrazine task force, European Space Materials Database (ESMDB) steering board
- Standardisation: Provide inputs to European Space Standards (ECSS) – for example new obsolescence management handbook (ECSS-Q-HB-70-23A)

Trend of REACH obsolescence risk





Example of a an obsolescence mitigation action

Supplier actions caused a need to substitute a chemical

Affected members of the MPTB organize a working group

The working group decides to evaluate substitutes

Substitution alternatives are mapped:

	Product A	Product B	Product C	Product D
Company A	X	X		
Company B			X	
Company C				X

Working group agrees on the test standards. Agencies provide lab. support

Results are shared within the WG

	Test A	Test B	Test C
Product A	55 %	80 %	95 %
Product B	80 %	80 %	80 %
Product C	60 %	70 %	90 %
Product D	65 %	55 %	85 %

Each participant proceeds to their individual qualifications

Examples of substitution efforts in ESA

1. Ammonium Dichromate (pyrotechnic powder)

- Replacement studied under Cleanspace funding (TRP, target TRL4)
- Qualification on pyro-valve level left to industry

2. Chromium Trioxide

- To be presented in detail by Lucia Pigliaru

3. Strontium Chromate

- Replacement assessment ongoing at laboratory testing level

CONCLUSIONS

Conclusions

- **In mid-term ~8% materials may be affected, in long-term possibly 20%.** Obsolescence management is a business continuity enabler.
- Space related uses of hazardous substances may have high potential for successful REACH authorisation, however, there remains a significant **commercial obsolescence risk** due to the small market share.
- **Project management** needs to take current legislation into account, and realize that even future legislation can affect current projects.
- **Significant future investments are needed** by industry and agencies for product replacements and maintenance of production capabilities.
- Early replacement of materials/processes containing SVHCs may position European space industry on the **forefront of green technologies**, and provide it with a commercial advantage after successful qualification.
    - Early substitution gives a competitive advantage in the future.
- Stakeholder **communication** (supply chain, authorities, associations, etc.) is pivotal for success of sustainable supply.
- **Coordination of obsolescence issues with all stakeholders very challenging** but necessary for pro-active obsolescence risk management.

Future events and reference material

Materials and Processes Technology Board Stakeholder Day

11 June 2019, ESTEC, The Netherlands - https://indico.esa.int/event/264/

- ECHA Annex XIV authorisation list
- ECHA Candidate list for authorisation
- ECSS-Q-HB-70-23A – Materials, mechanical parts and processes obsolescence management handbook (20 November 2017)

Thank You!

Paavo.Heiskanen@esa.int
Reach.Officer@esa.int