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# **OBSOLESCENCE MANAGEMENT OF SPACE MATERIALS AT CNES**

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ESA 4th REACh Workshop

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## OBSOLESCENCE FOR SPACE PROJECTS

### Risks of obsolescence of qualified space materials, processes and technologies

#### Disappearance of substances/materials of the European market

- Production stop, manufacturers bankruptcies
  - Regulation evolution:
    - For European market, REACH is a major obsolescence risk.
    - Difficulties of monitoring non-European regulations
  - Geopolitical issues: sudden stop of access to essential materials:
    - Global pandemic (COVID)
    - Wars
    - Strategic materials (rare earth materials)
    - ITAR (International Traffic Arms Regulation)
- Timeline for alternative finding is short and endanger projects' agendas

## OBSOLESCENCE FOR SPACE PROJECTS

### Performances decrease (quality risk)

- Evolution in material's suppliers:
  - Materials' composition change with an impact on properties
  - Materials' source
  - Rationalization of references of materials
- Manufacturing processes change: location change (change of plant)
- Change in stakeholders of suppliers, which can be non-European in the end
- Small space market: raise of use of commercial products (electronic components, glues ..), that have to be used in a specific environment
- Duration of and level of qualification process on space systems (several years)

→ Will NEW SPACE projects change the stakes/challenges?

## CNES ACTIVITES IN OBSOLESCENCE MANAGEMENT

- CNES as MPTB Member (MPTB = ESA + European Space Agencies + EDA + Industrials) is taking part to:
  - Working groups on substances and strategic materials for the space activities (ex: Hydrazine, Chromates)
  - Follow-up evolutions of the REACh regulation through interactions with ministries and other industries (Aerospace, army)
  - Follow-up other regulations such as RoHS, CLP (REACh LAW)
  - Obsolescence risks working group (OSG)
  - Alternatives identification and testing:
    - Eg Working group on RF Absorbers (lead by Industrials with CNES and ESA support)

## FOCUS on OSG

- REACh monitoring, obsolescence risks anticipation
- Impacted materials prioritization
- Sharing of information
- Evaluation of alternatives, tests in common
- Tools for capitalization (REAChTool, MATREX)

### Impacted space materials prioritization

Is it always used?

For which application / process?

Which importance and what quantity used?

Is there an alternative for every application?

If not, is an alternative technically accessible?

Investigation into the uses  
within the OSG WG

Investigation into the CNES  
uses

Investigation into the  
subcontractors / partners /  
labs uses

Studies results on  
alternatives

Actions, Road Map,  
R&T studies,  
Cross tests campaigns

## FOCUS ABSORBERS

Eccosorb manufacturing transferred by Laird from Belgium to USA with consequences on Europeans users

- New export constraints
- Long term sustainability of products
- Difficulty to have delivery schedules

1- Needs of industrial partners

2- Identification of European suppliers and products

3- Tests on materials: agreement on common tests and repartition between participants

- Definition of samples sizes, geometries, quantities
  - Materials procurement
- Common tests: outgassing, DSC, CTE measurements, DMA, TGA and TMA for complementary characterization, electrical measurements,

### Results

*Best candidates identified, additional material qualification tests to be performed by each entity*



## CNES MULTI-APPROACH STRATEGY

- At CNES level, obsolescence risks anticipation and management:
  - Information capitalization and establishment of materials list with REACh risks using REAChTool and MATREX
    - Ex of REACh regulation and impact on CNES projects
  - Build a communication network
    - Between space actors: with suppliers, partners, contractors
    - Internally (CNES technical experts)
  - Specific actions for SME and labs
    - Awareness-raising on obsolescence and associated topics (COMET workshop)
    - Supporting activities (REACh regulation)

## CNES ACTIVITES IN OBSOLESCENCE MANAGEMENT

- Ex of REACh regulation and impact on CNES projects: Integration of REACh at different levels
  - Technical specifications and commercial contracts upgrade
  - Projects:
    - Product Assurance and project people awareness-raising: Article 33 process
    - Materials review for space projects

	<i>Risk</i>	<i>Propositions</i>
Ongoing projects and materials manufactured	- Problems for changes / repairs	- Low risk - Hazard studies are to be carried out if necessary
Ongoing projects and materials not manufactured	- Planning & cost risk - Loss of performance	- Alternative search and re-qualification if necessary - Back to designer
New project	- Project stop if it is a strategic material (no material= no function)	- Take into account from the conception - Alternative search - New materials choice - New designs choice - How to requalify

## CNES ACTIVITES IN OBSOLESCENCE MANAGEMENT

- Proactive approach
  - Developing a common methodology (incl tests definition) for assessing new M&P to save time and money
    - Need to change our approach on how to manage our materials/processes and how to qualify them
  - R&T activities
    - On impacted materials alternatives
    - On specific topics: European sources focus: CNES and industrials

## FOCUS European sources

1- Identification of problematic materials

2- European manufacturer's identification

3- Common methodology for testing materials:

tests matrix: type of tests, samples number, w/or wo thermal cycling

4- Choice of Materials and procurement

5- Materials evaluation (32 materials)

- Samples manufacturing (based on technical datasheet)
- Samples testing (outgassing, material thermal characterization, mechanical testing reference and after thermal cycling, thermal and electrical samples)

### Results

*Bulk and generic properties validation*

*Additional material qualification tests to be performed by each entity*

*New manufacturers and suppliers identification (for CNES projects)*

## INNOVATION

### R&T studies: partnership between CNES and Industrials

- Launch by anticipation in order to find real alternatives or new processes/technologies
- To get around future or new constraints

### Development of new materials REACh compliant

In 2015, R&T study on development and qualification of new thermal control coatings > aqueous versions  
A real partnership with MAP > AQ PU1 and AQ PUK

### Surface treatments

In 2009, 2012, 2013, multiple studies on:

- New surface treatments without CR IV > in the end, led to the use of SURTEC
- Replacement of old surfaces preparation processes targeted by REACh with new technologies instead of chemicals

Metallic surfaces preparation by laser or dry surface treatments

## INNOVATION

### What now ?

These are old studies that led to the discovery of new technologies and processes.

- Need of making an overview of what works today, what is really used, and what still need to be upgraded or improved:
  - ❑ Several solutions to assure each function
    - Surface treatment:
      - multi-materials for aluminum alloy protection,
      - new processes without chemicals = laser surface preparation
  - ❑ Manufacturing processes changes
    - Additive layers manufacturing to avoid chemicals
    - no toxic solvents inside paints => water based paints (AQ PU1)
- Re-evaluate potential solutions left aside because of low TRL
- Common works with shared and cross-tests campaigns

## CONCLUSIONS

- Chemical substances landscape evolution → important works to make on materials, processes and technologies
- Anticipation and follow-up evolutions are essential for the space actors:  
it is important to sustain some innovation spirit through all researches and projects
- Supply chain management
- Communication and information sharing to optimize and limit the costs induced by M&P substitution / requalification studies

## PERSPECTIVES

- Work together, propose common studies
- Contact EU space agencies (ESA/CNES) for any changes or evolutions in materials/processes
- “We want you” for Obsolescence WG





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