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20 November 2017

Space product assurance

Materials, mechanical parts and processes obsolescence management handbook

ECSS Secretariat
ESA-ESTEC
Requirements and Standards Division
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Foreword

This Handbook is one document of the series of ECSS Documents intended to be used as supporting material for ECSS Standards in space projects and applications. ECSS is a cooperative effort of the European Space Agency, national space agencies and European industry associations for the purpose of developing and maintaining common standards.

The material in this Handbook is defined in terms of description and recommendation how to organize and perform activities dealing with human dependability.

This handbook has been prepared by the ECSS-Q-HB-70-23A Working Group, reviewed by the ECSS Executive Secretariat and approved by the ECSS Technical Authority.

Disclaimer

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Table of contents

Figures

Tables

1 Scope

This Handbook provides guidelines to manage obsolescence of Materials, Mechanical Parts and Processes (in-house and sub-contracted).

It is useful for any actor of the European Space sector.

It covers Materials, Mechanical Parts and Processes (MMPP) used in flight hardware as well as ground support equipment (including test systems) and materials or tools used during process (not in the final product) and skills (know-how).

It is not within the scope of this Handbook to address EEE components and software.

This document describes the general causes of obsolescences and introduces the concepts of proactive and reactive obsolescence management, depending of the programme phase.

2 References

ECSS-S-ST-00-01	ECSS system – Glossary of terms
ECSS-Q-ST-70	Space product assurance – Materials, mechanical parts and processes
ECSS-Q-ST-70-71	Space product assurance – Material, processes and their data selection
ECSS-M-ST-10	Space project management – Project planning and implementation
ECSS-M-ST-80	Space project management – Risk management
EN 62402:2007	Obsolescence management - Application guide
T. Rohr et al., ISMSE-12 ESTEC Noordwijk, The Netherlands, 2012	Impact of REACH Legislation on European Space Programs
M. Chevalier et al., ISMSE-13 Pau, France, 2015	A method to customize qualification of substitutes in case of material or process obsolescence

3
Terms, definitions and abbreviated terms

3.1 Terms from other standards

a. For the purpose of this document, the terms and definitions from ECSS-S-ST-00-01 apply, in particular the following terms:

1. design
2. development
3. life cycle
4. lifetime
5. material

b. For the purpose of this document, the terms and definitions from ECSS-Q-ST-70 apply, in particular the following term:

1. mechanical part
2. process

3.2 Terms specific to the present handbook

3.2.1 bill of MMPP

list of materials, processes or mechanical parts that are needed to manufacture or repair an end product

NOTE This is reported in Declared Materials List (DML), Declared Processes List (DPL) and Declared Mechanical Parts List (DMPL).

3.2.2 criticality

<CONTEXT: Material obsolescence>

measure of severity of the consequences of MMPP obsolescence with regard to its use

3.2.3 obsolescence

transition from availability to unavailability of a material, mechanical part or process from the manufacturer or supplier

NOTE The unavailability can be permanent or temporary.

3.2.4 obsolescence management network

network of persons in charge of collecting, transmitting and recording all the information concerning obsolescence issues and responsible to implement risk mitigation actions and obsolescence treatment actions

NOTE Members of the obsolescence network can represent different functions (e.g. procurement, quality, production, and design office)

3.2.5 obsolescence manager

person in charge of coordinating and supervising obsolescence management at company level and following up obsolescence treatment projects progress

3.2.6 obsolescence risk analysis

assessment of the probability and severity of the risk of obsolescence and prioritization of the obsolescence risk

3.2.7 proactive obsolescence management

actions to anticipate obsolescence and to mitigate the risks linked to obsolescence issues

3.2.8 reactive obsolescence management

reactive strategy consists in reacting only when the obsolescence is proven

NOTE 1 Obsolescence is considered as proven when a discontinuance date is known.

NOTE 2 The discontinuance date can be transmitted through a formal document by the supplier or related to date of ban determined by a regulation.

3.3 Abbreviated terms

For the purpose of this document, the following abbreviated terms apply:

Abbreviation	Meaning
AfA	application for authorization
AIT	assembly, integration and test
ASD	Aerospace and Defense Industries Association of Europe
BOM	bill of material
CAS Number	Chemical Abstract Service Number
C&L	classification and labelling
CLP	classification, labelling and packaging
CMR	carcinogenic, mutagenic, reprotoxic
CoRAP	community rolling action plan
COTS	commercial off-the-shelf
DML	declared materials list
DMPL	declared mechanical parts list

Abbreviation	Meaning
DPL	declared processes list
EAR	Export Administration Regulations
ECHA	European Chemical Agency
EC Number	European Community number
EEA	European Economic Area
EEE	electrical, electronic and electromechanical
EHS	environment, health and safety
EU	European Union
GIFAS	Groupement des industries françaises aéronautiques et spatiales *(French Aerospace Industries Association)*
HB	handbook
HCL	harmonised classification and labelling
ITAR	International Traffic in Arms Regulations
MMPP	materials, mechanical parts and processes
M&P	materials and processes
MPCB	Materials, Mechanical Parts and Processes Control Board
MPTB	Materials and Processes Technology Board
MS	member state
ODS	ozone depleting substance
OM	obsolescence management
OMP	obsolescence management plan
PACT	Public Activities Coordination Tool
PBT	persistent, bioaccumulative and toxic
POP	persistent organic pollutants
R&D	research and development
REACH	Registration, Evaluation and Authorization of Chemicals (European regulation)
RMOA	risk management option analysis
RoHS	restriction of hazardous substances
SDS	safety data sheet
SIN List	substitute it now list
SVHC	substance of very high concern
TRL	technology readiness level
vPvB	very persistent and very bioaccumulative

4
Causes of obsolescence and purpose of obsolescence management

4.1 Introduction

Obsolescence can affect all space products throughout their lifecycle. Through obsolescence management appropriate actions are put in place to minimise detrimental impact and costs throughout the product life.

4.2 Causes

The main causes of obsolescence are:

a. Regulations and their evolution: Environmental regulations such as REACH, health and safety.

b. Import – export constraints: export control (e.g. ITAR), export licence, embargo.

c. Changes from suppliers such as

   1. product evolution (formulation, raw material supply chain, packaging, product properties, deviation from original specification),
   2. manufacturing processes and means, streamlining of product ranges, manufacturing stop, change of manufacturing location,
   3. product designation, industrial re-organization.

d. Supplier force major circumstances: bankruptcies, industrial accidents (e.g. fire, explosion), loss of know-how, natural disasters (e.g. flooding, storm, earthquake).

e. Market competitiveness such as too low volume of production, outdated technology, indirect impact of environmental regulations.

   NOTE Indirect impact of environmental regulations means that even if the space sector is out of the scope (e.g. RoHS), the market availability is driven by much larger actors that need to comply and drive alternative product development.

f. Loss of employee specific skills and company know-how.

4.3 Purpose

The increasing number of obsolescence issues affects the space sector particularly due to the specific characteristics of space programmes:

a. Long life cycles (especially for space transportation).

b. Low purchase volumes.

c. Long MMPP qualification time (e.g. high performance requirements, high safety standards, complex interactions between systems, and multinational programmes).

d. Low production volumes.

e. Use of proven technologies (heritage).

f. Complex contractual supply chain.

Obsolescence management of MMPP is an added-value to limit impacts of obsolescence to:

a. Ensure undisrupted manufacturing and maintenance of the space hardware during the whole programme life time.

b. Avoid redesign during a later stage of the space programme.

c. Minimise cost and planning time.

d. Meet customer requirements related to obsolescence management.

e. Guarantee quality and sustainability of the supply chain.

f. Avoid use a non-qualified MMPP.

5 Overview of obsolescence management process

5.1 Obsolescence management team

The establishment of an obsolescence management team is key of success of obsolescence management (OM), including the identification of a person devoted to centralize information. This person is responsible for the control of information as follows:

a. Set up actions to get the information as soon as possible

b. Information analysis

c. Communication of the information within internal network

This person can rely on the obsolescence management-dedicated network. This network can be composed of different representatives that include the following functions:

a. Programme and project management

b. Procurement

c. M&P support

d. Quality control

e. Production

f. Design

g. Environment, health and safety

h. Product stewardship (product management and regulation specialist)

i. Legal support (REACH, export control …)

It is important that within companies a reciprocal communication line between OM management team and other company members is established.

The OM team manages the implementation and the follow-up of actions, e.g. preventing obsolescence, mitigating risk, treating obsolescence. It is responsible for the communication of the obsolescence information to other members of the company.

It is essential that the OM team members are clearly identified inside the company. By that, any member of the company becoming aware of obsolescence issues, informs the obsolescence management team in timely manner.

5.2 Obsolescence management approach

5.2.1 Proactive approach

The proactive OM approach consists of tracking any potential cause of obsolescence in order to anticipate future obsolescence cases. It also aims at:

a. anticipating strategies in order to have a mitigation solution once obsolescence occurs.

b. not selecting obsolete or limited-life MMPP as alternative solution or as baseline in new developments

The proactive approach is implemented at each step of the life of space products to meet product lifetime requirements. It is important that the proactive approach is applied to all stages of a product life-cycle, starting from the design phase.

This approach includes continuous monitoring for MMPP availability that allows identifying or predicting their obsolescence date. This monitoring also allows assessing the risk of obsolescence occurrence and its criticality for space hardware.

5.2.2 Reactive approach

Following the reactive strategy, actions are taken only when the obsolescence is confirmed, e.g. identification of alternative solutions, stock-piling, no action.

5.2.3 Obsolescence management in space programmes

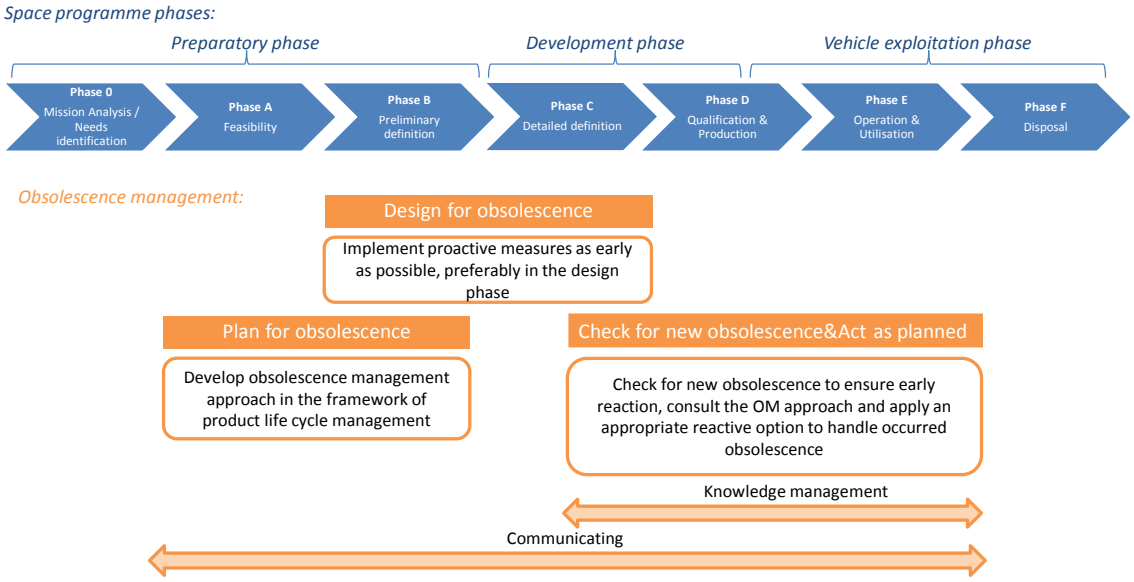
Obsolescence management involves implementing scheduled and coordinated actions in order to secure the availability of a product during its entire life-cycle, through technical and economical means (e.g. replacement, stockpiling). It can be implemented, as early as possible for better anticipation, during all phases of a space programme such as design definition, development, production, use, maintenance, spares and repairs.

Whenever possible, priority can be given to the proactive over reactive approach. A general scheme describing the interaction between OM and space programme phases is shown in Figure 5-1. Obsolescence management starts with the implementation of an obsolescence management plan. It can start as early as the feasibility phase of space programmes by setting up an approach for obsolescence management.

Implementation of proactive measures can start as soon as possible, for example from preliminary definition, before bills of MMPP are available. A preliminary item list can be assessed in order to identify obsolete or potential obsolete items. Also the manufacturer or supplier can be required to inform the customer about the MMPP obsolescence status.

A detailed process to verify obsolescence issues can be typically implemented after PDR during the detailed definition phase (phase C). During this stage, appropriate actions can be carried out in accordance to the defined OM approach. A periodical review of obsolescence risks for products and technologies can be managed at least at each design review throughout the whole programme.

It is important to perform communication between the OM team and other members of the company in a continuous way, and is prerequisite for successful obsolescence management. It is also important to collect, analyze, store and distribute information (knowledge management) to improve the company OM process.



[Based on ECSS-M-ST-10 and EN 62402:2007]

Figure 5-1: Obsolescence management versus space programme phases

5.2.4 Obsolescence management plan

Implementing an obsolescence management plan can be an effective way to mitigate obsolescence risk especially for long-term space programmes. An example of the content of an obsolescence management plan is provided in the Annex C. This plan is part of the proactive approach and can complement the project risk management process.

5.3 Obsolescence management database

To anticipate and treat obsolescence, it is important to gather all the information in an obsolescence management database independent of the considered OM approach (proactive or reactive). An example of the content for an OM database is given in Annex B.

6 Relevant practices for obsolescence management

6.1 Proactive approach

6.1.1 Overview

Proactive best practices are summarized in Figure 6-1. The steps coloured in orange are explained in the present section 6.1.

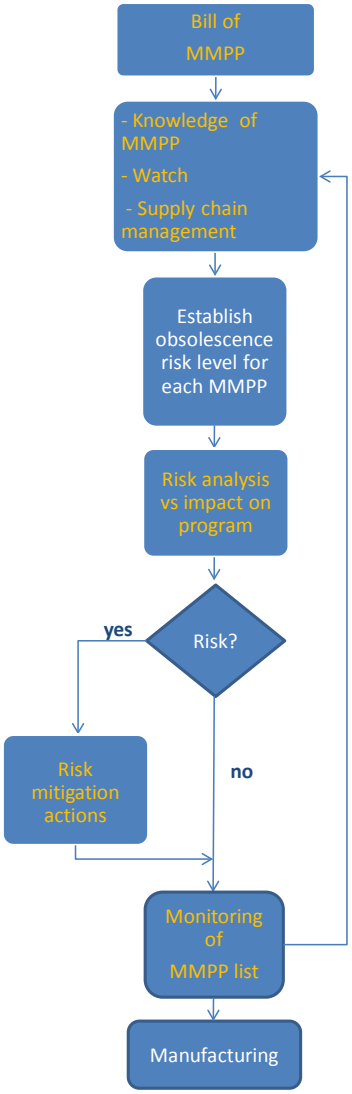


Figure 6-1: Proactive approach best practices scheme

6.1.2 Establishment of an obsolescence-awareness culture

Establishing an obsolescence-awareness culture inside a company can constitute a change of mindset in programme management, through communication and participation of all company employees. It allows to anticipate obsolescence issues as integral part of project management. Obsolescence management training can be an appropriate way to raise obsolescence awareness. It is important to involve all members of the company, especially newcomers in such a training.

6.1.3 Knowledge of the MMPP

Prerequisite of obsolescence management is the knowledge of MMPP, this means to have the most complete information about the composition of selected materials, mechanical parts and formulations used during manufacturing processes. The detailed knowledge about MMPP allows the identification of MMPP changes, including the identification of substances that are part of MMPP and face obsolescence risks due to regulatory impact. The relevant information can be collected from suppliers or sub-contractors or obtained in-house and be included in the obsolescence management database.

The following information can be collected:

a. Information from suppliers

   1. Safety data sheets (SDS) analysis: The information relevant to be analyzed in SDSs are CAS or EC numbers, changes to be checked and verified with supplier (change of CAS or EC numbers, change of substance percentages, addition or removal of substances). It is important to ask the supplier on a regular basis for an update of SDSs, especially for products less frequently procured
   2. Interviews of suppliers: Information about precursor or auxiliary substances, intermediates, information about the supplier's obsolescence risk management process
   3. Request for procurement specification changes
   4. Certificates of performance and associated test data
   5. Supplier's declarations, incl. REACH article 33 declarations

b. Information obtained in-house

   Any change in performance and possibly composition can be tracked through incoming inspections tests or monitoring of drift of process control parameters.

c. Information obtained from subcontractors

   Information can be gathered through basic contractual documentation to be delivered to customers, such as DML, DMPL and DPL. It is the responsibility of each customer in the supply chain to ask its subcontractors to provide their obsolescence analysis. Such request can be done e.g. during materials process control boards (MPCB), or even earlier during a preliminary review milestone.

   NOTE 1 The MMPP lists do not provide the entire design information.

   NOTE 2 Performing MPCBs even for recurrent equipment, can be recommended to track obsolescence issues.

d. Any other information

   Information can also be found in literature, patents, and through networking. All the gathered information can be systematically included in a dedicated tool for MMPP knowledge management. It is important to maintain it up-to-date in order to facilitate subsequent risk analysis.

6.1.4 Supply chain management

6.1.4.1 Overview

It is important to involve actively downstream supply chain actors in obsolescence management. It can be done by specifying contractual obsolescence management requirements, through suppliers and subcontractors monitoring, or by dedicated procurement specifications with suppliers.

6.1.4.2 Contractual obsolescence management requirements to supply chain

Contractual clauses for obsolescence management can include:

a. notification modes, process how obsolescence is communicated, and schedules

b. possible consequences in case the notification deadline was not respected

c. stock constitution modes if relevant (minimum quantity)

The supplier or subcontractor can be asked to demonstrate how he continuously monitors the availability of MMPP used in the design or manufacturing of the equipment. This can include but is not be limited to:

a. having an obsolescence management system in place to identify early and to react to an occurrence of MMPP obsolescence

b. making agreements with suppliers and subcontractors to provide early warning of supply disruption or MMPP obsolescence

6.1.4.3 Supplier and subcontractor monitoring

To gain better knowledge of supplier products in addition to product changes (section 6.1.3), the customer can perform supplier or subcontractor monitoring for obsolescence issues to track the following changes:

a. Plans for production shut down

b. Change of production location or capacity

c. Change of minimum order volume

d. Company re-organization

e. Risk of bankruptcy

f. Design change

g. Loss of know-how

h. Technology development road map

i. Change of manufacturing means

The monitoring process can be performed through:

a. Audits

b. Regular exchanges (meetings, visits) whatever the frequency of orders.

c. Asking for notification letters

d. Financial analysis

e. Networking (outside the direct supply chain)

6.1.4.4 Procurement specification with the supplier

A procurement specification can be agreed with the supplier which can include:

a. A requirement to inform its customer of any change of its product or process used to manufacture it at defined number of months before the implementation of change (early warning of supply obsolescence or disruption)

NOTE It is important that the deadline for early warning covers the time to ensure maintenance of the production capability of the hardware

b. Capacity to procure the MMPP in quantity necessary before switching to an alternative solution. Stockpiling needs to cover the qualification period for new products or to allow finalization of the production.

c. Detailed description of a product including composition and processes used.

6.1.5 Watch

Continuous survey of regulatory and market developments is necessary to gather obsolescence-related information. This monitoring can involve all company employees as everybody can get information and contribute to obsolescence anticipation. For efficient information exchange, a dedicated network can be established (see section 5.1). The monitoring perimeter needs to be defined, monitoring can be more or less active depending on the criticality of the products. More attention can be paid to products that are more critical and less frequently ordered. The following aspects of monitoring can be considered:

a. Regulation watch

1. Environmental regulations including RoHS, REACH, radiation protection regulation (Directive 2003/122/Euratom), environmental national regulations, ODS, POP.
2. Export control including ITAR, EAR, and embargos.
3. Anticipation of environmental regulation developments including SIN list, REACH CoRAP, REACH PACT.

NOTE For more details regarding the REACH regulation, the reader can refer to the Annex D.

b. Market watch for products and market trends, existing and future technologies, alternative technologies, information about supply-demand

1. Public information from the internet
2. Trade shows
3. Technology publications
4. Manufacturers and suppliers visits

c. Strategic materials watch

1. British Geological Survey (www.bgs.ac.uk)
2. Conflict materials (www.conflictfreesourcing.org)

d. Networking

Gathering and sharing experience with obsolescence issues with other organizations (external communication) is a recommended approach. Information can be shared amongst organizations in order to implement joint actions (consortium, professional groups). Examples of such groups for space sector are the MPTB, ASD-Eurospace and other national associations (e.g. GIFAS in France).

6.1.6 Obsolescence risk analysis for MMPP, programme risk analysis and risk mitigation actions

The first step of proactive obsolescence management is to establish for each MMPP an obsolescence risk analysis. For this, some obsolescence risk indicators are presented in the Table 6-1. It is up to each company to determine the relative weight of each obsolescence risk. Information about risk management in space projects can be found in ECSS-M-ST-80.

Based on the output of this obsolescence risk analysis, higher risk rated MMPP are assessed regarding their use and criticality in the programme. The result can be included in the programme risk matrix and in the critical items list.

An action plan is triggered when the risk is higher than a certain level to be determined by each company. According to the results of the risk analysis, following actions can be implemented to decrease the programmatic risk (see Table 6-1).

Table 6-1: Examples of risk mitigation actions to be implemented as a function of obsolescence risk type

Category	Obsolescence Risk Factor	Risk mitigation actions
Procurement	Single source	• identify and possibly evaluate and qualify a second source • improve contractual relationship with the supplier
	Legislative impact (incl. environmental regulation impact, for instance from REACH or RoHS, and export control) and geopolitics constraints.	• REACH authorization • Analysis of alternative • Clarify with supplier its position • Exemption • Check the impact of restriction on the market • Identify non-Export Control sources • Stockpiles (life time of MMPP to be considered) • Lobbying
	Scarce (shortage such as for carbon fibres, strategic materials such rare-earth-based materials, embargo, risk of counterfeit…)	• Stockpiles • Lobbying • Having information about supply-demand
	Long time for delivery (in case of non-conformity of a lot)	• improve contractual relationship with the supplier • search for another supplier • Buffer stockpile (periodical restocking?) • Implement some intermediate tests to ensure that the lot will be compliant
	Low consumption level (risk of rationalization if Space sector is the only user)	• Find synergies with other companies o Lobbying • Stockpile
	Specific requirements (properties difficult to obtain on the market) for non-COTS	Technical survey to adapt the specification to the market
	Lack of knowledge of the supply chain	• Technical audit • Contact directly the manufacturer • Avoid as far as possible intermediates in (brokers) procurement
	Recurrent quality problems with the supplier or subcontractor	• Technical audits • Improve procurement specification if necessary • Look for another supplier
	No procurement agreement with the supplier or manufacturer	Improve contractual(or not) relationship with the supplier
	Bad financial situation of the supplier	Identify another supplier
	Very small company	Identify another supplier

Category	Obsolescence Risk Factor	Risk mitigation actions
Design	Design driver (change in one MMPP would induce a change in the whole design (for instance impact on mass), such as for beryllium case)	Improve design robustness to allow the substitutions of MMPP
	Technology driver (for example, in the case of the hydrazine and gallium arsenide, MMPP too application-specific)	• Strong R&D capability • Strong relationship with scientific laboratories
Application - Manufacturing and AIT (assembly integration & test)	Common MMPP, multiple company usages	Exhaustive mapping of all materials usages
	Scarce skills involved	• Maintain skills through training • Avoid single point failure • Anticipate retirement
	Used in end product that has a long operational life (maintenance) and long life cycle (recurrent manufacturing, long space programme from design to manufacturing)	• Buffer stockpile • Start obsolescence management at design phase • Select up-to-date technologies • Anticipate manufacturing of spare parts
	Use of technology or process outdated (for example, machine maintenance more and more difficult to ensure)	• Anticipate procurement of spare parts for maintenance of machines • Develop close relationship with the manufacturer of the machine • Use second hand market for spare parts of machines • Evaluate an up-to-date technology
	MMPP not used according to the application for which this MMPP has been developed by the supplier	• Inform supplier of the targeted application • Identify an alternative solution whose function determined by supplier corresponds to the application • Improve design review process
Availability of alternatives and technology readiness level	No viable alternative identified or evaluated	• Design change • R&D
	High cost of alternative	• Design change • R&D
	High cost and duration of qualification compared to available budget and schedule	• Stockpile • Take decision of procurement at an intermediate milestone of the qualification
	Collateral effects on higher level assemblies (for example, the replacement of a primer can induce requalification of paints, adhesive bonding used subsequently)	Exhaustive mapping of all higher level impacted MMPP

Note 1: In case of stockpile, it can be useful to assess possibility to extent lifetime of the MMPP.

Note 2: Periodical restocking can be preferred to long term storage to maintain a certain monitoring on the product, when it is possible.

6.2 Reactive approach

6.2.1 Overview

Reactive best practices are summarized in Figure 6-2. The steps coloured in orange are explained in more detail in the present section 6.2.

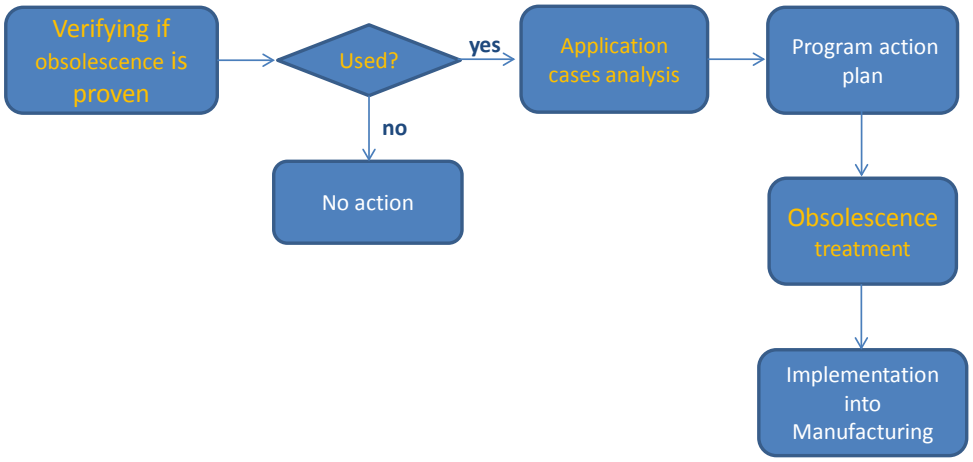


Figure 6-2: Reactive approach best practices scheme

6.2.2 Verify obsolescence information

The first step for the reactive approach is to verify that the obsolescence is proven. As an example, it can be determined through an official statement from the supplier or through regulatory decisions. Gathering obsolescence information is necessary to adopt mitigation measures. The required information can include (non-exhaustive list):

a. Definition of the obsolescence type: REACH, manufacturing stop, change of manufacturing site, change of manufacturing process, export control regulations, reformulation of material or mechanical part.

b. Date of the effectiveness of the obsolescence.

c. Possibility of last-buy order including quantity and date.

d. Proposal of alternative solution in the obsolescence notification (if available) and date of availability of this alternative.

NOTE This information can be gathered in a template to ensure efficiency, completeness and consistency of information (see Annex A).

In addition to an official statement, for understanding the consequences of obsolescence as well as performance of proposed alternatives, other technical information can be collected. This can be done by communication with product suppliers or manufacturers, through working groups, partners, and sub-contractors. It is important to collect obsolescence related information from a wide range of information sources to verify the use of the MMPP (in-house, at supplier or sub-contractor level).

6.2.3 Communication

It is important to disseminate obsolescence related information inside the company and flag this information in dedicated tools to ensure that designers, procurement and product assurance are aware of the obsolescence issue. It is also important to share the obsolescence information outside the company with defined actors such as sub-contractors, customers, and other organizations (e.g. MPTB).

6.2.4 Application case analysis

To enable a consolidated MMPP application case (impact) analysis, it is important to collect at least information about the MMPP uses, their applications, and programmes that are impacted. When an obsolescence issue occurs, the following non-exhaustive list can be verified:

a. Analyze the time required to treat the obsolescence in line with the programme schedule

b. Check the possibility of stockpiling

c. Investigate availability of MMPP alternative

d. Verify the duration of the alternative MMPP qualification

e. Validate if the alternative MMPP is compliant with regulation or import-export constraints

f. Evaluate the possibility of change of technical specifications to accommodate the new performance of alternative MMPP or to change the design

g. Assess the possibility to ensure regulation compliance (e.g. REACH authorization or exemption)

With this application case analysis a programme action plan for obsolescence mitigation can be implemented.

6.2.5 Obsolescence treatment

Several mitigation actions can be implemented (non-exhaustive list):

a. Prepare a stockpile of MMPP, where the feasibility depends on:
    1. product availability from suppliers
    2. last buy order
    3. shelf life of the product
    4. status of the product with regard to regulations
    5. storage costs

b. Anticipate the production life-cycle and volume to manufacture stockpiles.

c. Evaluate and qualify an alternative MMPP solution such as:
    1. new material or process
    2. new supplier
    3. new sub-contractor
    4. new solution proposed by the supplier

d. Modify the design.

e. Change or prepare deviation of requirements (in early programme phase).

f. Take no actions, e.g. in case when the programme ends before the obsolescence date or for very minor MMPP changes not imposing any tests. It is important to justify and record this decision.

NOTE 1 Several of these actions can be managed in combination.

NOTE 2 Several of these actions can be considered as a transitory solution, giving time to qualify a permanent solution.

NOTE 3 An example of methodology of obsolescence treatment can be found in "A method to customize qualification of substitutes in case of material or process obsolescence" written by M. Chevalier et al.

NOTE 4 It is strongly recommended to exploit synergies between different space programmes.

7 Obsolescence data management

7.1 In-house data management

The objective of this section is to propose a set of suitable data for obsolescence knowledge management inside companies. The choice of the management tool is subject to company decision and not within the scope of this handbook. For example in-house data management can be handled in a dedicated database and companies can use tools for the management of MMPP knowledge and for the management of obsolescence alerts and treatment. The objective of setting up a database is to:

a. Make obsolescence-related information available to company members

b. Compile and save information about obsolescence cases, return of experience and know-how on obsolescence management

c. Cross-check information between MMPP list, regulation impact and criticality analysis

It is necessary to keep the database up-to-date to ensure efficient and effective obsolescence management. Database records can include:

a. The name of MMPP: commercial name, chemical name, synonyms

b. List of substances involved to produce material or mechanical part or involved during a process (at a minimum, information excerpted from SDSs) and associated concentration and CAS/EC numbers

c. Description of the processes, equipment, products

d. Internal reference of MMPP (e.g. part number)

e. Name of supplier and manufacturer

f. Manufacturing location of MMPP

g. Production need, stock status, shelf-life

h. Uses, applications, and programmes

i. Obsolescence risk indicators(see Table 6-1)

j. Information about proven obsolescence issues (date, cause)

k. Risk level (e.g. low, medium, high)

l. Risk mitigation or obsolescence treatment actions and related status

7.2 Network communication

At the European level, the ESCC MPTB is the platform for the space community to gather and share obsolescence-related information (http://escies.org). Some obsolescence information is also reported in the European Space Materials Database (see ECSS-Q-ST-70-71 Annex A).

NOTE For easier data transfer between databases, the space community agreed on general naming rules for materials which are published in the European Space Materials Database.

Annex A
Obsolescence information template

This example of template can be used for communication of information related to an obsolescence case to the obsolescence network.

Commercial identification of MMPP (*):

……

MMPP identification (ex: chemical nature or type of alloy) (*):

……

MMPP function (*):

……

Name of manufacturer and/or supplier (*):

……

Type of obsolescence cause (*):

☐Environment

☐Supplier failure

☐Manufacturing stop

☐Import-Export Constraint

☐Manufacturing location

☐Product/process Evolution

☐Others: …….

Description of the obsolescence (*):

……

Date of the effectiveness of the obsolescence (*):

……

Information source (*):

☐Official letter

☐Exchange with supplier

☐Network

☐Others: …….

Internal reference (such as part number) :

……

Alternative solution proposed by the supplier (attach technical datasheet if available):

……

Other calendar information (date of alternative solution availability, last-buy order date etc.):

……

Other information:

……

(*) Minimum information to provide

Annex B
Example of content of obsolescence management database

MMPP Name	
Process description	
Internal Reference	
Use location (site, building…)	*For managing country or different site-specific Health, Safety and Environmental constraints…*
Uses (applications, programmes...)	
Manufacturer Name	
Manufacturer location	
Supplier/sub-contractor Name	
Supplier/sub-contractor location	
SDS Date	
REACH/CLP compliance of MSDS	*Evaluation of the compliance of SDS with regard to CLP and REACH regulation: SDS in language of country where the product is supplied, format of SDS with 16 sections, substance classification in accordance with harmonized classification….*
Substance Name	
N° CAS	
N° EC	
Concentration (%)	*In most cases, it corresponds to the concentrations of substances contained in the procured product*
CLP Classification	*Including CLP codes and phrases*
CMR? **PBT/vPvB?** **ED?**	*CMR: Carcinogenic, mutagenic, toxic for reproduction* *PBT: Persistent, Bioaccumulative, Toxic* *vPvB: very Persistent, very Bioaccumulative* *ED: endocrine disruptor*
REACH Candidate List	*For instance, the date of inclusion of the substance in the Candidate List can be mentioned*
REACH Annexe XIV	*For instance, the date of the Sunset Date has to be mentioned*
Import/Export Constraints	*For instance ITAR, Export Control …*
Other regulations (POP, ODS, RoHS…)	
Other obsolescence risk indicators (single source? Scarce?….)	
Risk mitigation actions	
Information about proven obsolescence issues	
Obsolescence treatment actions	
Result of risk analysis	

Annex C
Example of obsolescence management plan

The purpose of the obsolescence management plan (OMP) is to describe the proactive approach that can be taken to manage, mitigate, and resolve obsolescence issues of materials mechanical parts and processes throughout the life cycle of the project or programme. The content of the document can include:

<1> Introduction

a. Description of the purpose, objective, content and the reason prompting its preparation.

<2> Applicable and reference documents

a. Applicable and reference documents to support the generation of the document.

<3> Terms, definitions and abbreviated terms

a. Any additional terms, definitions or abbreviated terms used.

<4> Programmatic context

a. Description of the project or programme, its life-cycle and the time-frame for which the OMP is applicable.

<5> Obsolescence management organisation

a. Description of organisation and people responsible for obsolescence management as well as interfaces towards sub-contractors to flow down obsolescence management requirements.
b. Reporting lines and of individuals responsible for obsolescence management.

<6> Regulatory and market watch

a. Describe the process to maintain intelligence on possible regulatory and market obsolescence risks for MMPP.
b. Specify the key information sources.

<7> Supply chain management

a. Specify contractual OM requirements.
b. Describe the process for monitoring subcontractors and suppliers.

<8> Risk assessment and risk mitigation

a. Description of the process to be followed for MMPP obsolescence and programmatic risk assessment and definition of relevant indicators for quantification of risk.
b. Risk threshold that triggers an action.
c. Results of the risk assessment.
d. Definition of an action plan. It can be provided in an independent document or as part of the existing risk management process.
e. Definition of the periodicity for revision of risk assessment and associated action plan. Determination of a process to monitor the implementation of the action plan.

Annex D
Information about the REACH regulation

D.1 Background

D.1.1 Overview

The REACH regulation (Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)) came into force in 2007.

It applies to all substances imported to or manufactured in the European Economic Area (EEA), unless specific exemptions are foreseen. It shifts the responsibility for demonstration of safe use of chemicals from authorities to industry. The manufacturing, placing on the market and use of substances in Europe is regulated by processes through registration, authorization, and restriction.

Registration: The regulation does not allows that substances on their own, in mixtures or in articles to be manufactured in the EEA or placed on the market unless they have been registered with the European Chemicals Agency (ECHA). Substances require registration only if they are manufactured or imported in volumes of 1 tonne or more per year.

Authorization: Substances that are identified as Substance of very High Concern (SVHC) can enter the authorization procedure. The aim is to assure that the risks from the SVHCs are properly controlled and that they are progressively replaced by suitable alternative substances or technologies where these are economically and technically viable. During the authorization process, SVHCs are gradually included in the Annex XIV of the REACH regulation. Once included in that Annex, the regulation does not permit to place them on the market or used after a date to be set (the so-called 'sunset' date) unless an authorization is granted. All uses not authorised are to be phased out unless specific exemptions are foreseen. Authorizations are subject to a time-limited review period, whose length is determined on a case-by-case basis and specified in the authorization decision. The candidate list is the baseline tool to identify substances as SVHC.

Restriction: General or use-specific restrictions for substances presenting an unacceptable risk to human health or the environment arising from their manufacture, use or placing on the market can be implemented under REACH; these restrictions are listed in the Annex XVII of the REACH regulation. If a restriction applies, the actors concerned need to comply. An authorization for continued use within the scope of a restriction cannot be sought.

D.1.2 Definition of terms

The REACH regulation defines substances, mixtures and articles in a different way compared to what is usually understood as materials and process formulations.

Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which can be separated without affecting the stability of the substance or changing its composition (for example, it can be a solvent, or a fuel).

Mixture: means a mixture or solution composed of two or more substances (for example, it can be an adhesive, paint, or an alloy).

Article: means an object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition (for example, it can be a polymer film, a prepeg, or a screw).

D.1.3 Relationship between substances, mixtures, and articles

The relationship between substances, mixtures, and articles for typical space applications is depicted in Figure D-1.

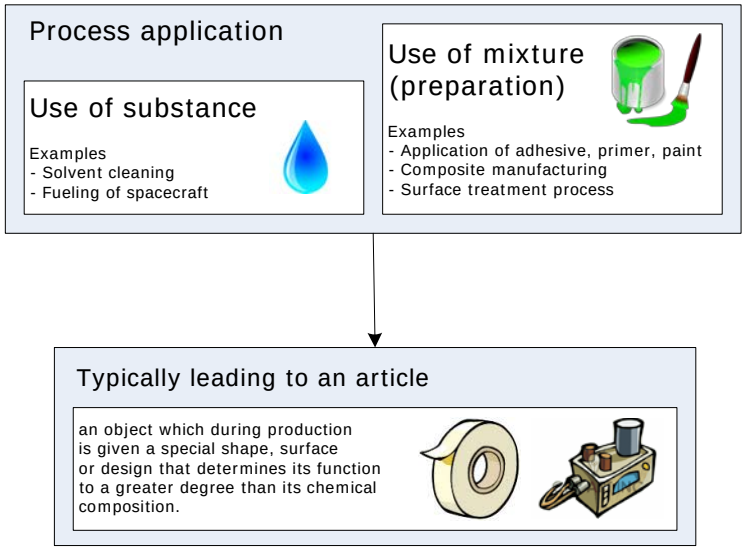


Figure D-1: Typical relation between substances, mixtures, and articles

In case a substance is classified a Substance of Very High Concern (SVHC) or a mixture contains a SVHC the following REACH obligations apply if a defined concentration limit is reached (minimum 0,1 %):

- Provide safety data sheets at least for all substances and mixtures that are classified as hazardous.
- A substance is on authorisation list is subject to authorisation for uses after the sunset date.

In case an article contains a SVHC on the candidate list > 0,1 % the following obligations apply:

- Suppliers provide sufficient information to allow safe use of the article to recipients (article 33).
- Information of ECHA in case substance exceeds quantities totalling 1 t/year (article 7(2)), unless specific exemptions are applied.

It is important that the use of articles containing a SVHC are not subject to authorisation.

D.2 Technical consequences of REACH

The potentially large number of substances requiring authorization, as well as the strict rules and high costs involved to seek authorization, but also other regulatory risk management options such as restrictions, will consequently lead to disappearance of substances from the market. It is estimated that industry can be forced to phase out substances within 4,5 to 6 years once a proposal for SVHC identification has been initiated. The most imminent risk is the possible future obsolescence of qualified materials, processes or technologies. Additional information can be found in the proceeding "Impact of REACH Legislation on European Space Programs" written by T. Rohr.

This can happen through changes of materials compositions, alterations of manufacturing processes, or removal of materials or substances from the European market. Even unanticipated risks can be considered, e.g. manufacturers can miss relevant deadlines under REACH, and lose – at least temporarily – their legal market access.

The main objective of proactive risk management is the reduction of programmatic risks and costs by early replacement, including use of alternatives, re-qualification or possibly new developments. The analysis is performed based on a consolidated MMPP inventory. The risk analysis required all materials to be split down into composition based on safety data sheets (SDS). The individual constituents are then matched with reference REACH lists. The REACH substances regulatory risk management process to be monitored for this risk analysis is outlined in a simplified way in Figure D-2.

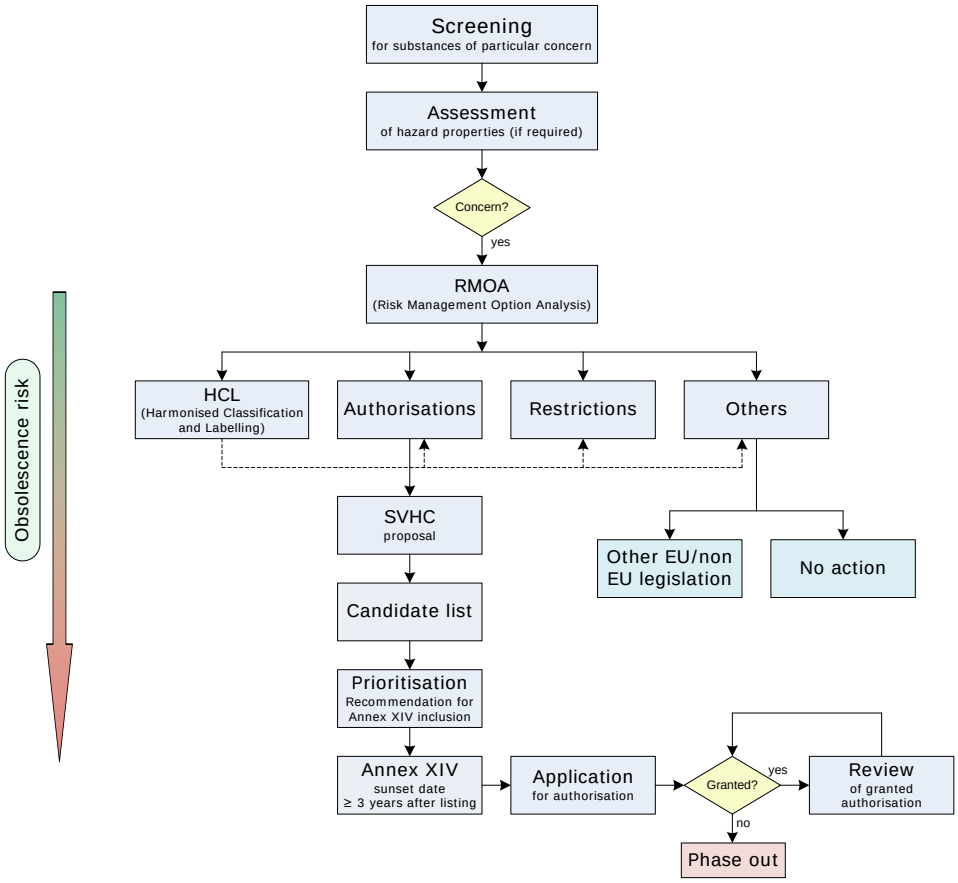


Figure D-2: Simplified REACH substances regulatory risk management process

The further a substance is advanced in the authorization process of REACH, the higher is the estimated future risk of obsolescence.

Most imminent risks are evident for substances that appear in Annex XIV or are recommended for Annex XIV inclusion. Mid-term risks can be considered for substances that have entered the candidate

list (SVHCs) or have been proposed as SVHC (SVHC dossiers). For the establishment of long-term risks several sources provide relevant information. HCL (Harmonised Classification and Labelling), part of the CLP regulation, is a process that is used for certain very hazardous substances (e.g. CMR Cat. 1A, 1B or 2) to establish a legally binding hazard classification on EU/EEA level. This flags relevant substances and consequently potential SVHCs at an earlier stage.

In addition, to improve predictability of future SVHCs, the EC has introduced a SVHC Roadmap to 2020. Without numerical goal it is intended to include all relevant currently known SVHCs in the candidate list by 2020. The information is provided by the so-called Public Activities Coordination Tool (PACT). For the listed substances risk management options (authorization, restriction, no action) are being considered as part of a so-called Risk Management Option Analysis (RMOA). PACT also lists substances for which a hazard assessment is carried out in a first step. The RMOA aims to identify whether or not further regulatory risk management activities are needed for a substance and if so, to identify the most appropriate instrument to address the concern.

Another important risk assessment tools is CoRAP (the Community Rolling Action Plan). This is part of the overall substance regulatory risk management process to identify substances for which there is a suspicion that their manufacture and/or use could pose risks to human health or the environment. Substances that are part of the CoRAP can be monitored, as the result of this evaluation process will provide insight into their risk potential.

Whereas above lists and tools can be used to support an obsolescence risk management process, it is difficult to anticipate the likelihood of and time until real obsolescence can occur. Table D-1 to Table D-3 provide additional clarifications and guidelines in case the substance, contained in the MMPP is flagged for different likelihood and time-scale of risk of obsolescence.

Table D-1: Summary of legal obligations of industry, possible associated actions, schedules as a function of regulatory step - Possibly long-term

List name	Purpose	Update of list (current practice)	Legal obligations of industry	Possible actions by the user of the M&P	Minimum time until sunset date[1]	Next regulatory step	Other relevant notes
CoRAP list	Establish a list of substances registered under REACH, for which risks can be further clarified by EU Member States	Once per year	For REACH registrants: provide additional information if requested, to clarify substance risk to health or environment	Monitor evaluation outcome for substance(s) of interest	n/a	Depending on evaluation outcome: • harmonized C&L • RMOA (PACT) • No action	-
Public Activities Coordination Tool (PACT) list	Give advance notice of the substances that are on an authority's radar for exploring the potential need for regulatory risk management.	Monthly	None	Provide relevant info to ECHA/MS in charge of RMOA (e.g. on alternatives and socio-economic data, depending on the authority's information needs) or hazard assessment for PBT/vPvB or endocrine disruptor properties under REACH Monitor outcome and suggested follow-up	6,5 years	Depending on outcome: harmonized C&L Identification as SVHC (authorization) REACH restriction Other EU-wide regulatory measures Need for action other than EU regulatory action No action needed at this time	An RMOA conclusion is not legally binding in terms of the proposed regulatory follow-up. It can be revised in the future, e.g. in light of new information or further assessment.

[1] The sunset date is the date(s) foreseen in REACH Annex XIV (Authorisation list) from which the placing on the market and the use of the substance is prohibited unless an authorisation is granted or an exemption from authorisation applies. For example, the sunset date for chromium trioxide is 21 September 2017.

Table D-2: Summary of legal obligations of industry, possible associated actions, schedules as a function of regulatory step - Possibly mid-term

List name	Purpose	Update of list (current practice)	Legal obligations of industry	Possible actions by the user of the M&P	Minimum time until sunset date[1]	Next regulatory step	Other relevant notes
Registry of SVHC intentions	Make interested parties aware of the substances for which a SVHC dossier is intended to be submitted	Every 6 months prior to candidate list proposal	None	Participate in subsequent public consultation for candidate list inclusion (with hazard-related information)	6 years	Candidate list inclusion	The Registry of Intentions also comprises proposals for restrictions and Harmonized Classification and Labelling (HCL)
Candidate List of substances of very high concern for Authorization	Identification as SVHC by listing it first step of the authorization procedure	Every 6 months, normally in June and December	For article producers and importers, notify ECHA - Article 7(2) in case of more than 1 ton/y and > 0,1% of substance presence For substance mixture suppliers, provide SDS (Article 31(1)(c)) For article suppliers, duty to communication information on substances >0,1% in articles - Article 33	Clarify position of chemicals supplier Launch R&D for replacement Analyse and document use exemptions (e.g. intermediate[2], scientific research and development[3])	5 years	Prioritization by ECHA for Annex XIV	Listing is not a ban Listing does not in all cases lead to Annex XIV or Annex XVII listing Listing can be the end of the regulatory activity Un-listing not currently foreseen in REACH

1 The sunset date is the date(s) foreseen in REACH Annex XIV (Authorisation list) from which the placing on the market and the use of the substance is prohibited unless an authorisation is granted or an exemption from authorisation applies. For example, the sunset date for chromium trioxide is 21 September 2017.

2 Intermediate means a substance that is manufactured for and consumed in or used for chemical processing in order to be transformed into another substance (synthesis).

3 Scientific R&D means any scientific experimentation, analysis or chemical research carried out under controlled conditions in a volume less than one ton per year.

Table D-3: Summary of legal obligations of industry, possible associated actions, schedules as a function of regulatory step - Imminent

List name	Purpose	Update of list (current practice)	Legal obligations of industry	Possible actions by the user of the M&P	Minimum time until sunset date[1]	Next regulatory step	Other relevant notes
ECHA recommendations for inclusion in the Authorization List (Prioritization)	Short list of substances from the candidate list that are in ECHA's opinion to be next included in the Authorization list as a priority.	once per year (REACH requirement: At least every second year)	None	Investigate alternatives Determine authorization strategy (own/supplier AfA[2] or exemption route) Support own use in public consultation on ECHA draft recommendation under REACH Article 58(4)	4 years	EC decision on Annex XIV inclusion	
Authorization List	List of SVHC subject to REACH authorization, to assure that the risks from those SVHC are properly controlled and that these SVHC are progressively replaced by suitable alternative substances or technologies where these are economically and technically viable.	Once per year	Apply for authorization - Article 62/63; or Rely on upstream AfA & notify ECHA (Art. 66); or Document use exemption from authorization (if any) - Article 36; or Stop use starting from the sunset date	Pursue qualification and validation of alternatives Prepare & submit own AfA / support supplier AfA (and notify ECHA under Art. 66)	3 years	Granting of authorization (in case of AfA submission)	No restriction under Annex XVII can be added to uses subject to authorization (Art. 58(5)). Use of substance in already existing articles can be restricted (Art. 58 (6)) in addition to authorization

[1] The sunset date is the date(s) foreseen in REACH Annex XIV (Authorisation List) from which the placing on the market and the use of the substance is prohibited unless an authorisation is granted or an exemption from authorisation applies. For example, the sunset date for chromium trioxide is 21 September 2017.

[2] AfA = Application for Authorisation under REACH Title VII.

D.3 Additional information

For more information, links to ECHA lists are provided below (the links are valid at the time of publication of this document):

Annex XIV	https://echa.europa.eu/authorisation-list
List of recommendations for Annex XIV	https://echa.europa.eu/previous-recommendations
Candidate List	https://echa.europa.eu/candidate-list-table
Annex XVII	https://echa.europa.eu/substances-restricted-under-reach
PACT List	https://echa.europa.eu/pact
CoRAP List	https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table