Committee for Risk Assessment (RAC)

Committee for Socio-economic Analysis (SEAC)

Opinion

on an Annex XV dossier proposing restrictions

Version: 18 September 2019

Committee for Risk Assessment (RAC)

Committee for Socio-economic Analysis (SEAC)

Opinion

on an Annex XV dossier proposing restrictions on

N,N-Dimethylformamide

ECHA/RAC/[Opinion N°(same as opinion number)]

ECHA/SEAC/[Opinion N°(same as opinion number)]

Compiled version prepared by the ECHA Secretariat of RAC's opinion (adopted [xx Month 20xx]) and SEAC's opinion (adopted [xx Month 20xx])

Draft date: [xx Month 20xx]

[Date]

[RAC opinion number]

[Date]

[SEAC opinion number]

Opinion of the Committee for Risk Assessment

and

Opinion of the Committee for Socio-economic Analysis

on an Annex XV dossier proposing restrictions of the manufacture, placing on the market or use of a substance within the EU

Having regard to Regulation (EC) No 1907/2006 of the European Parliament and of the Council 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (the REACH Regulation), and in particular the definition of a restriction in Article 3(31) and Title VIII thereof, the Committee for Risk Assessment (RAC) has adopted an opinion in accordance with Article 70 of the REACH Regulation and the Committee for Socio-economic Analysis (SEAC) has adopted an opinion in accordance with Article 71 of the REACH Regulation on the proposal for restriction of

Chemical name(s):	**N,N-Dimethylformamide**
EC No.:	**200-679-5**
CAS No.:	**68-12-2**

This document presents the opinions adopted by RAC and SEAC and the Committee's justification for their opinions. The Background Document, as a supportive document to both RAC and SEAC opinions and their justification, gives the details of the Dossier Submitters proposal amended for further information obtained during the public consultation and other relevant information resulting from the opinion making process.

PROCESS FOR ADOPTION OF THE OPINIONS

Italy has submitted a proposal for a restriction together with the justification and background information documented in an Annex XV dossier. The Annex XV report conforming to the requirements of Annex XV of the REACH Regulation was made publicly available at https://echa.europa.eu/restrictions-under-consideration/-/substance-rev/21804/term on **19/12/2018**. Interested parties were invited to submit comments and contributions by **19/06/2019**.

ADOPTION OF THE OPINION

ADOPTION OF THE OPINION OF RAC:

Rapporteur, appointed by RAC: Sonja KAPELARI

Co-rapporteur, appointed by RAC: Bert-Ove LUND

The opinion of RAC as to whether the suggested restrictions are appropriate in reducing the risk to human health and/or the environment was adopted in accordance with Article 70 of the REACH Regulation on **[date of adoption of the opinion]**.

[The opinion takes into account the comments of interested parties provided in accordance with Article 69(6) of the REACH Regulation.**] [**No comments were received from interested parties during the public consultation in accordance with Article 69(6)).**]**[1]

The opinion of RAC was adopted **by [consensus.][a simple majority]** of all members having the right to vote. [The minority position(s) including their grounds are made available in a separate document which has been published at the same time as the opinion.**]**[4]

ADOPTION OF THE OPINION OF SEAC

Rapporteur, appointed by SEAC: Lars FOCK

The draft opinion of SEAC

The draft opinion of SEAC on the proposed restriction and on its related socio-economic impact has been agreed in accordance with Article 71(1) of the REACH Regulation on **20/09/2019.**

The draft opinion takes into account the comments from the interested parties provided in accordance with Article 69(6)(a) of the REACH Regulation.

[The draft opinion takes into account the socio-economic analysis, or information which can contribute to one, received from the interested parties provided in accordance with Article 69(6)(b) of the REACH Regulation.**] [**No socio-economic analysis, or the information which can contribute to one, were received from interested parties during the public consultation in accordance with Article 69(6)(b).**]**[4].

The draft opinion was published at http://echa.europa.eu/yyyy on **dte_2nd_public_consult_start**. Interested parties were invited to submit comments on the draft opinion by **dte_2nd_public_consult_deadline**.

The opinion of SEAC

The opinion of SEAC on the proposed restriction and on its related socio-economic impact was adopted in accordance with Article 71(1) and (2) of the REACH Regulation on **[date of adoption of the opinion]**. **[**The deadline for the opinion of SEAC was in accordance with Article 71(3) of the REACH Regulation extended by **[number of days]** by the ECHA decision **[number and date]]**[2].

[The opinion takes into account the comments of interested parties provided in accordance with Article[s 69(6) and][5] 71(1) of the REACH Regulation.**] [**No comments were received from interested parties during the public consultation in accordance with Article[s 69(6) and][3] 71(1)**]**[6].

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1 Delete the unnecessary part(s)

2 Delete the unnecessary part(s)

The opinion of SEAC was adopted **by [consensus.][a simple majority]** of all members having the right to vote. [The minority position[s], including their grounds, are made available in a separate document which has been published at the same time as the opinion**.]**[6].

[For substantial opinions, use the following style for table of contents.]

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OPINION OF RAC AND SEAC

The restriction proposed by the Dossier Submitter is:

Substance Identity (or group identity)	Conditions of the restriction
– N,N-dimethylformamide, – EC No 200-679-5 – CAS No 68-12-2	• Manufacturers, importers and downstream users of the substance on its own or in mixtures in a concentration equal or greater than 0.3% shall use in their chemical safety assessment and safety data sheets by [xx.yy.zzzz] a worker based harmonised Derived No Effect Level (DNEL) value for long-term inhalation exposure of 3.2 mg/m^3 and a worker based harmonised DNEL for long-term DNEL dermal exposure of 0.79 mg/kg bw/day.

The Dossier Submitter proposes 2 years transitional period.

THE OPINION OF RAC

See RAC opinion

THE OPINION OF SEAC

SEAC has formulated its opinion on the proposed restriction based on an evaluation of the information related to socio-economic impacts documented in the Annex XV report and submitted by interested parties as well as other available information as recorded in the Background Document. SEAC considers that the proposed restriction on **N,N-Dimethylformamide**[6] is the most appropriate Union wide measure to address the identified risks, as concluded by RAC, taking into account the proportionality of its socio-economic benefits to its socio-economic costs provided that the scope or conditions are modified, as proposed by RAC or SEAC, as demonstrated in the justification supporting this opinion.

The conditions of the restriction proposed by SEAC are:

Substance Identity (or group identity)	Conditions of the restriction

– N,N-Dimethylformamide, – 68-12-2 – 200-679-5	Manufacturers, importers and downstream users of the substance on its own (regardless of whether DMF is a (main) constituent, an impurity or a stabiliser) or in mixtures in a concentration equal or greater than 0.3 % shall use in their chemical safety assessment and safety data sheets by [xx.yy.zzzz] a worker based harmonised Derived No Effect Level (DNEL) value for long-term inhalation exposure of 6 mg/m^3 and a worker based harmonised DNEL for long-term DNEL dermal exposure of 1.1 mg/kg bw/day.

JUSTIFICATION FOR THE OPINION OF RAC AND SEAC

IDENTIFIED HAZARD, EXPOSURE/EMISSIONS AND RISK

Justification for the opinion of RAC

Description of and justification for targeting of the information on hazard(s) and exposure/emissions) (scope)

Summary of proposal:

N,N-Dimethylformamide (DMF) is an aprotic medium polar organic solvent classified as toxic for reproduction 1B, acute tox. 4 (inhalation and dermal route) and as eye irritant 2. It is a high production volume substance which has been registered with a total tonnage band of 10 000 – 100 000 t/a. It is used in a number of industrial applications and by professional workers. Therefore occupational exposure to DMF is to be expected. Secondary exposure via the environment can be excluded since the substance is readily biodegradable and no potential for bioaccumulation exists. Thus, the proposal is targeted at occupational exposure to DMF.

RAC conclusion(s):

RAC supports targeting the restriction proposal on occupational settings.

Description of the risk(s) addressed by the proposed restriction

Information on hazard(s)

Summary of proposal:

RAC conclusion(s):

A dermal DNEL of 1.1 mg/kg/day (100/90) is thus suggested by RAC to be used for the dermal exposure. This DNEL is slightly higher than the dermal DNEL suggested by the DS (0.79 mg/kg/day).

In conclusion, RAC proposes to use a DNEL of 6 mg/m^3 based on the NOAEC of 6.2 mg/m^3 in the Kilo *et al.* study for hepatic effects in humans (2016) and the DNEL of 6 mg/m^3 based on a NOAEC of 150 mg/m^3 for malformations in a rabbit developmental toxicity study (Hellwig *et al.*, 1991).

Key elements underpinning the RAC conclusion(s):

Information on emissions and exposures

Summary of proposal:

Add summary of Dossier Submitter's proposal from the Problem identified section (hazard, exposure/emissions, risk) of the Annex XV restriction report.

RAC conclusion(s):

Key elements underpinning the RAC conclusion(s):

Characterisation of risk(s)

Summary of proposal:

RAC conclusion(s):

Key elements underpinning the RAC conclusion(s):

Uncertainties in the risk characterisation

Evidence if the risk management measures and operational conditions implemented and recommended by the manufactures and/or importers are not sufficient to control the risk

Summary of proposal:

Add summary of Dossier Submitter proposal from the Problem identified section (hazard, exposure/emissions, risk) of the Annex XV restriction report.

RAC conclusion(s):

Key elements underpinning the RAC conclusion(s):

Evidence if the existing regulatory risk management instruments are not sufficient

Summary of proposal:

Add summary of Dossier Submitter proposal from the Problem identified section (hazard, exposure/emissions, risk) of the Annex XV restriction report.

RAC conclusion(s):

Key elements underpinning the RAC conclusion(s):

JUSTIFICATION IF ACTION IS REQUIRED ON AN UNION WIDE BASIS

Justification for the opinion of SEAC and RAC

Summary of proposal:

DMF is a high production volume substance registered with a total tonnage band of 10 000-100 000 t/a used in many industrial settings. It is produced in - and imported into - the EU. No direct exports have been reported. Based on the exposure analysis, risks on a Community-wide level are found to be present and need to be controlled. Secondly, according to the EU Treaties, the free movement of goods needs to be guaranteed in order not to distort the internal market. Acting on a Community-wide basis ensures equal treatment of both - EU producers and importers. Furthermore, it gives a clear signal to non-Community suppliers, provides a “level playing field” by preventing competition distortion and allows equal protection of human health across the EU.

SEAC and RAC conclusion(s):

Based on the key principles of ensuring a consistent level of protection across the Union and of maintaining the free movement of goods within the Union, SEAC and RAC support the view that any necessary action to address risks associated with DMF should be implemented in all MS. DMF is marketed and used throughout the EU and risks for workers have been identified. Therefore, action is required and it should be taken on a Union wide basis.

Key elements underpinning the SEAC and RAC conclusion(s):

As also confirmed in the public consultation, there is strong evidence that DMF is used in a large number of EU Member States. Therefore, the protection of human health from the adverse effects of DMF (e.g. reprotoxic effects) is needed on a Union-wide basis.

RAC concludes that for several uses the exposure might not be sufficiently controlled in workplaces. The proposed restriction addresses manufacturing and use of the substance and would therefore prevent a possible trade and competition distortion and establish a level playing field for manufacturers and users.

The proposal follows the general principles for managing chemicals under REACH, except for the fact that the DNEL, derived on a regulatory science basis, is defined in the restriction rather than by registrants.

JUSTIFICATION WHETHER THE SUGGESTED RESTRICTION IS THE MOST APPROPRIATE EU WIDE MEASURE

Justification for the opinion of SEAC and RAC

Scope including derogations

Justification for the opinion of RAC

Summary of proposal:

Add summary of Dossier Submitter proposal and suggested derogations from the Impact Assessment section of the Annex XV restriction report.

RAC conclusion(s):

Key elements underpinning the RAC conclusion(s):

Justification for the opinion of SEAC

Summary of proposal:

The Dossier Submitter has evaluated two Restriction Options: RO1 and RO2. RO1 is a total ban for placing on the market and use of DMF for all applications in the EEA. Such a total ban would eliminate any industrial/professional exposure towards DMF.

The proposed restriction (RO2) is a combination of a harmonised DNEL for inhalation and a harmonised DNEL for dermal exposure of 0.79 mg/kg bw/day. The inhalation DNEL implies that DMF shall not be manufactured and used by professional or industrial workers, unless the 8-hour TWA exposure[3] will remain below 3.2 mg/m^3.

[3] The "8-hour TWA" specifies what was meant by "long-term inhalation time" in the original proposal

The Dossier Submitter underlines that RO1 and RO2 are considered to have substantially the same human health impact as, applying the proposed DNELs and the adherent risk reduction measures, the risk will be under the same level of control.

Due to the absence of suitable alternatives for a large number of uses, the total ban of DMF would have severe economic impacts. The Dossier Submitter also rejected an option to list the substance on Annex XIV to REACH and thereby only allow authorised uses, as no feasible alternatives exist for a large number of uses.

The Dossier Submitter proposes a transitional period of 2 years. The Dossier Submitter concludes that, except for two sectors, the proposed restriction can be implemented without major costs. However, all the relevant sectors involved in the production of man-made fibres and 50 % of those involved in the production of PU coating and membranes, are expected to close down. The Dossier Submitter states that the estimated health benefits will outweigh the costs.

The Dossier Submitter has not proposed any derogation.

SEAC conclusion(s):

SEAC focusses its assessment on the restriction options, RO1 and RO2. SEAC has not evaluated the authorisation route (RMO3) in depth. However, SEAC can confirm that for a number of uses, no safer economic and technically feasible alternatives are available according to the information available to SEAC.

SEAC agrees with the conclusion of the Dossier Submitter that due to the manifested lack of feasible alternatives for a number of uses and considering that the risks can be sufficiently controlled by the proposed restriction, a complete ban (RO1) would be a less cost-effective restriction option than the proposed restriction.

SEAC does not find it necessary to consider whether other EU-wide measures could be more appropriate, as the proposal will ensure that all risks are controlled and it follows the general principles for managing chemicals under REACH, except for the fact that the DNEL is defined in a restriction under REACH rather than by registrants.

SEAC notes that RAC has proposed higher DNEL values, which will reduce industry costs to implement measures to ensure that exposure does not exceed a level which imposes a risk to workers. Thereby, these higher DNEL values (further) improve the cost effectiveness of the restriction.

During the public consultation the PU-coating sector requested transition time of 10 years from the time of the agreement of the restriction. Furthermore, the man-made fibre sector asked for gender specific DNEL values, as the liver effects is relevant for both men and women, while developmental effects are not relevant for women. If the DNEL value for liver effects are higher than the DNEL value for developmental effects, higher exposure levels could be accepted for others than women in the childbearing age. SEAC notes RAC conclusion that a ‘true’ inhalation DNEL for the liver effect could possibly be higher than the DNEL of 6.2 mg/m^3 which is based on Kilo et al. (2016).

SEAC concludes in line with the RAC conclusions above that the above described requests

from the two sectors are not sufficiently justified. SEAC notes that the measured exposure currently is about twice the DNEL level derived by RAC and that RAC concludes that according to the information provided during the PC, the man-made fibre industry as well as the PU-coatings and membranes industry are able to comply with the proposed DNELs by using effective PPE and by implementing job rotation. This is further dealt with in the cost section below.

With regard to the length of the transitional period, RAC and SEAC agree with the DS proposal of a two-year transition period from the entering into force of the restriction understanding that the period also includes the implementation of the recommended and/or identified risk reduction measures. SEAC notes that Chemical Safety Reports, Safety Data Sheets, and information communicated down the supply chain shall be updated without delay as soon as new information potentially affecting the risk management measures becomes available or when a new restriction is imposed[4] (REACH Article 31 and 32).

Key elements underpinning the SEAC conclusion(s):

The proposal covers all professional and industrial uses of DMF. SEAC notes RAC's conclusion that the proposed restriction in combination with the cut-off value for reprotoxic substances of 0.3 % according to the CLP Regulation (EC) No. 1272/2008 (amending the Directive 1999/45/EC) will address all risk related to use of DMF.[5]

SEAC acknowledges the general principle in REACH, where in the case that a supplier cannot identify relevant risk reduction measures to ensure that exposure will remain below the proposed DNEL values, the supplier has to advise against the use. However, REACH allows a downstream user to continue the use if the user can demonstrate safe use through a Downstream User Chemical Safety Assessment using the relevant DNELs. This might be possible since the user would have more specific information on further risk reduction possibilities. SEAC agrees that the proposed restriction conforms with the above mentioned general principle.

With regard to RO1 (the ban) SEAC notes that RAC confirms that DMF is a threshold substance. Therefore, the risk is adequately controlled under the proposed restriction if the subsequent RCR is below 1. For a number of uses, it will still be possible to use DMF with an exposure below the proposed (safe) limits. Hence, SEAC agrees that the proposed restriction would be a more appropriate option than a complete ban.

[4] SEAC notes that the Commission in the restriction on 1-methyl-2-pyrrolidone (NMP) (Annex XVII, entry 71) included a second paragraph to address the implementation of risk reduction measures. REACH Article 37(5) also covers the obligation for the down-stream user to apply the appropriate RMM and OC to adequately control the risks identified.

[5] According to REACH, Annex XVII, entry 30 DMF should not be placed on the market or used for supply to the general public when the individual concentration is equal or above 0.3 % (weight/weight) as substance, as constituent of other substance or in a mixture

Effectiveness in reducing the identified risks

Justification for the opinion of RAC

Summary of proposal:

Add summary of Dossier Submitter proposal from the Impact Assessment section of the Annex XV restriction report.

RAC conclusion(s):

Key elements underpinning the RAC conclusion(s):

Socio-economic impact

Justification for the opinion of SEAC

Costs

Summary of proposal:

The Dossier Submitter has calculated the cost impacts in a partly quantitative and partly qualitative manner for two restriction options: RO1 and RO2. The costs of these options were derived by comparing the costs of the baseline scenario with the cost impacts of the restriction options. A quantitative assessment of the costs has not been found possible for all the sectors where workers can be exposed.

Currently, the main use of DMF (ca. 80 %) is as a solvent in chemical synthesis of pharmaceuticals, agrochemicals and fine chemicals, and in addition, in electronic industry and as a solvent in the synthesis of artificial fibres or artificial leather. The pharmaceutical industry also uses DMF to sterilise powders and ampules and in various quality control applications. The 20 % remaining applications are assumed to be used as intermediate, as laboratory chemical, as cleaning solvent and in formulations. The substance is potentially used in all Member States. The baseline presented by the Dossier Submitter describes the current situation adjusted by expected growth in the use.

Based on the registration dossier and through consultation the Dossier Submitter has estimated the total production within the EU to be 20 000-30 000 tons. The following uses covering about half of the produced tonnage have been identified:

Identified uses	Tonnage in t/a
Production of fine chemicals	2 000-3 000
Production of pharmaceuticals	500-1 500
Production of polymers	5 000-7 500
Production of textiles, leather and fur	2 000-3 000
Manufacture of non-metallic mineral products	500-1 500
Manufacture of perfumes / fragrances	10-30

Note: DS indicates that the actual tonnages are expected to be higher than indicated in the table.

Through consultations with industry, the Dossier Submitter has gained information on the additional costs expected on certain industry sectors that the proposed restriction would impact (Figure E10 in the Annex E of the proposal):

1. Industrial gas industry: No significant impacts (below €5 M) are to be expected, as European producers are currently using DMF under conditions which comply with the proposed restriction;

2. Man-made fibre industry: Estimated impacts would over a 15 year period be € 500-800 M. All costs are related to an indication in the questionnaire survey which states that the whole industry will close down the production of the man-made fibre production in the EEA;

3. Polyurethane (PU) coating and membranes industry: Estimated impacts would over a 15 year period be €380 - 710 M; 85% of the costs is related to an indication in the questionnaire survey that 50% of the production will close down the production in the EEA.

Where an industry sector has not made specific cost information available, it is assumed that the costs are moderate.

Total economic costs are estimated to be € 880-1 515 M over a 15 year period. The costs are claimed to be reduced by €190-360M for the PU-coating and membranes sector if sufficient time (~10 y) is given for them to adjust to the restriction.

The Dossier Submitter has in principle considered the impacts on the different levels of the supply chain for the specific sectors: DMF producers, direct users in the sectors and down-stream users. However, the Dossier Submitter has identified costs for DMF producers in case of shut-down of production.

The Dossier Submitter has not calculated costs for the enforcement of the restriction.

SEAC conclusion(s):

SEAC finds the overall cost estimate developed by the Dossier Submitter to have shortcomings, to be very uncertain and to severely overestimate the costs. The overestimation is even more significant when applying the RAC derived DNELs, as the higher DNELs are expected to be less costly to conform with. SEAC acknowledges several uncertainties in the analysis.

Most importantly, SEAC does not find it likely that 50 % of the PU-coating and membranes sector as well as the complete man-made fibre industry would close down due to the restriction. As this element represents about 90-95 % of the Dossier Submitter's cost estimate, this affects the cost estimate significantly.

SEAC has in the background document discussed the methodology for the way the Dossier Submitter has estimated societal loss due to close or relocation of the production. This is not included in the draft opinion as SEAC does not find that the proposed restriction will result in major close down or relocation of the production.

Concerning the PU-coating and membranes sector SEAC notes that a number of companies may be able to find substitutes for some of their uses, however, there will be no substitute for all uses. Investments planned in the industry may already decrease the exposure close to DNEL values agreed by RAC, however, some further measures seems to be needed. SEAC and RAC find that in the short run the companies may reach the RAC agreed DNELs by additional use of RPE and organisational measures (e.g. job rotation). This in turn gives more adjustment time for the companies to adopt needed technical measures, and it is expected to result in lower costs overall as companies can use the measures most suitable for them. Furthermore, BREFs would cause industry to face some of the similar measures in 4-5 years anyway. The extra costs due to the proposed restriction for these measures would then be in form of interests for the invested capital in the interim period. As there will be a transition period also with the restriction, this interim period will only be a couple of years. SEAC notes a request by some industries for an extended transition period (up to 10 years), however, referring to the possibility to use PPEs etc., SEAC does not find this request justified.

SEAC notes representative public consultation comments by the man-made fibre industry. Based on those comments, the average exposure could be reduced close to or at the level of DNELs agreed by RAC by implementing different kind of risk reduction measures. This itself suggests, that the costs may be moderate and the costs reported in the original dossier are clearly overestimated. Industry has not convincingly demonstrated that the risks could not largely be adequately controlled by the use of personal protection equipment (PPE) and administrative measures, like job rotation in cases where technical measures are not sufficient or feasible.

There is no overall estimation of costs for upgrading production facilities to be able to comply with the RAC agreed DNEL values. SEAC notes that a preference for the principle of hierarchy of control[6] makes it difficult to estimate the overall least costs of reducing exposure, as it will be a case by case evaluation for each industrial user. The comments submitted by the man-made fibre industry in the public consultation focus mainly on the costs of technical measures and consider the costs to be excessive. SEAC has a view that the additional use and the subsequent costs of personal protection equipment (PPE) and administrative measures could be a less expensive option, however, those measures are not fully discussed in the public consultation comments.

During the public consultation the pharmaceuticals sector and industrial gas sector (Petrochemicals) have indicated (Comments # 1976 and 1987 respectively) that they support the proposed restriction. According to the two sectors, the exposure is already at the level required in the original restriction proposal. For pharmaceuticals as well as other industries using DMF (Production of fine chemicals, polymers, fine chemicals, phenolic resins, medical devices, sport equipment, chemical and pigment-dyes) no information on the need for further risk reduction measures and accompanying costs was provided.

SEAC agrees that the restriction will not impose further enforcement obligations and associated costs. This is further described in the section on practicalities below.

In the following sections, the situation is described for the PU-coating and membranes sector, the man-made fibre sectors and for other sectors using DMF.

Key elements underpinning the SEAC conclusion(s):

Based on the information available, SEAC agrees with the Dossier Submitter that safer alternatives are not available for all uses. As a polar aprotic solvent, DMF has specific properties as a solvent.

Specific evaluation for the PU-coating and membranes sector

The Dossier Submitter analysed PU-coating and membranes industry for their ability to substitute DMF in their activities. Based on the information that 30 firms represent the total turnover in the sector, the sectoral coverage of the analysis was very high (80-100 % reported by the Dossier Submitter).

Based on the analysis, the Dossier Submitter concludes that it is not clear whether DMF can be completely substituted in the PU-coating sector. The use of DMF for the different types of coatings strongly depends on the polymer used for coating, the material to be coated and the properties to be achieved. In some applications DMF as coating solvent may be substituted by water or organic substances. However, some specific coatings will still require DMF. SEAC notes that this result has been confirmed by industry in the public consultation (PC #1986).

Also for membranes, e.g. for osmosis or ultrafiltration, the choice of solvent is very important for the quality and a number of examples are presented for which DMF is not replaceable. SEAC notes that this has also been confirmed in the public consultation (#1975).

[6] Council Directive 89/391/EEC of 12 June 1989 'on the introduction of measures to encourage improvements in the safety and health of workers at work' establishes basic rules on protecting the health and safety of workers. The employer shall implement the measures on the basis of a number of general principles of prevention, among which: avoiding risks, combating the risks at source, replacing the dangerous substances by the non-dangerous or the less dangerous ones, and giving collective protective measures priority over individual protective measures. These principles have been further elaborated into a preferred hierarchy of control measures in article 6.2 of the Chemical Agents Directive: a) substitution, b) process design and engineering controls that prevent release of substances at source, c) collective protective measures at source, such as ventilation and organisational measures, and d) individual measures, such as personal protective equipment. The Carcinogens and Mutagens Directive defines requirements for carcinogenic or mutagenic substances. These substances should be replaced as far as technically possible, regardless of economic considerations (art. 4.1). If that is not possible, the company should use closed systems (art. 5.2), and if that is not possible as well, the employer should ensure that exposure is reduced to a level as low as technically possible by means of a combination of measures, including the limitation of the quantities of substances present and the number of workers exposed (art. 3 & 5). See https://oshwiki.eu/wiki/Hierarchy_of_prevention_and_control_measures

With regard to the costs of substitution, only limited information for the PU coating and membranes sector is available. Due to a lack of information on possible alternatives, the cost estimate only covers equipment required when substituting to alternatives and is listed as a one-time cost in the range of €60-100 million, as identified in the DS-questionnaire survey. It is SEACs view that this information does not give a reliable picture of the possible costs, as no details on the equipment requirements neither estimates of the running costs are presented.

Based on information from the PU-coating and membranes Industry, the Dossier Submitter indicates that the proposed restriction would imply that companies representing 50% of the turnover in the part of the industry using DMF will substitute DMF with another substance. However, only very limited cost information for substitution is submitted. Companies were asked for information on costs for equipment, R&D, testing and variable costs, but no concrete alternative substances were identified and Dossier Submitter summarised the cost estimate to be a total amount of € 50-110 M. Hence, SEAC considers the basis for the estimation to be non-transparent and therefore the estimate to be very uncertain. However SEAC notes that according to the information submitted in the public consultation several of producers without giving further details indicated that they have concrete plans for substitution DMF with alternatives within a couple of years. This is also driven by consumer demands for articles without DMF residuals.

SEAC further notes that a survey[7] submitted in the public consultation indicates that with the on-going or planned investments, the inhalation exposure can meet an exposure level around halfway between the current OEL (15 mg/m^3) and the proposed DNEL (3.2 mg/m^3), which is quite close to the value agreed by RAC (6.0 mg/m^3). SEAC notes a public consultation comment by Fedustria (PC #2327) informing that the increase of the DNEL values as agreed by RAC will not fundamentally change the business case for the PU-coating companies as the investments industries have to make will be more or less the same whether they have to meet a DNEL for inhalation of 3.2 mg/m^3 or 6 mg/m^3. SEAC understands that sometimes lumpy investments may cause such an outcome, however, underlines that generally the tighter limits tend to be progressively costlier, especially as any remaining need for risk reduction can be addressed by use of PPE and organisational measures

The Dossier Submitter has presented company level cost estimates for individual exposure reduction activities for reaching the required exposure level. The reduction activities range from minor interventions to more extensive investments and the subsequent costs reach several million Euros. The interventions cover activities like redesign of ventilation system, retrofitting coating line and automation, however, no aggregate cost estimate is presented. A specific analysis carried out for and reported by Fedustria[8] provides specific information on costs for different actions, however, no quantification for the sector has been performed.

SEAC acknowledges the hierarchy of control principle, which is generally to be followed in the exposure control/risk management. The hierarchy of control principle makes it difficult to estimate the aggregated cost for risk reduction, as the decision on how to address the risks has to be done on a case by case basis. For instance, in some cases PPEs and administrative risk reduction measures, like job rotation can be implemented if higher level reduction

[7] Comment 1986. Fedustria is a Belgian federation of the textile, wood and furniture industry. The survey is based on individual discussions and meetings with 10 European companies using DMF (dimethylformamide) as a solvent for polyurethane (PU) for textile coating and film and membrane production

[8] Information in note of 5 March 2018 on SEA on the PU coatings and Membranes sector (confidential)

measures, like substitution and further automation are too costly. SEAC notes that for tasks where the present exposure is above the safe level, at least personal protection equipment and possible extension of the staff to enable job rotation would incur additional costs. Therefore, the preferred activities may vary by individual company and as a result a mechanistic estimation of the aggregated cost for exposure reduction activities is not available.

In the public consultation several companies claimed that due to needs for quick interventions in the production process and frequent changes in production it would not be possible for many of them to comply with the proposed limit. However, this appear to be based on the assumption that use of personal protection equipment shall not to be taken into account when estimating the exposure for inhalation. Fedustria (#1986) mentions that the use of RPE would theoretically be sufficient to decrease the calculated risk with regard to the proposed DNEL of 3.2 mg/m^3. However, Fedustria does not consider this practical nor comfortable since RPE should be worn continuously during eight-hour shifts, and mentions PPEs in many cases are not allowed to be worn for many hours. SEAC has a view that PPE and e.g. job rotations may be used during adjustment periods when a company is adapting to new regulation and e.g. substitution or technical adjustments appear prohibitively costly in the short run.

Fedustria also notes that the release of a revised BREF on Surface Treatment using Organic Solvents (STS), which is expected in 2019/2020, will impose a further reduction of the allowed diffuse emissions of DMF. A new mandatory emission level for diffuse emissions of DMF will be a factor of 4 lower than the present OEL of 15 mg/m^3 (i.e. below the RAC agreed DNEL). The companies will be obliged to comply with this new mandatary emission level at the latest 4 years after the publication of the revised BREF STS in the Official Journal i.e. potentially 2023-2024. SEAC takes this as an evidence that potential additional costs due to the proposed regulation may not be overly large as BREF is causing the industry to move to the same direction within a few years.

SEAC further notes that it might be possible to use administrative measures in case there are practical issues hindering use of PPEs or other risk reduction measures.

SEAC notes that the PU-coating and membranes industry has indicated to the Dossier Submitter that “sufficient transition time” will decrease the socio-economic costs for this sector by 50 % (p. 434 in the XV *Annexes*). Furthermore, in the public consultation (#1986, #2284, #2276 and #2282 and #2323) industries from the PU-sector requested a 10 years transitional period. This is generally reasoned by the time needed to identify and implement substitutes and possible risk reduction measures. SEAC does not see such a long transition period necessary as PPEs and administrative measures can be implemented within a short notice.

Impacts on the man-made fibre industry

DMF is used as a solvent in the production of polymeric (man-made) fibres. None[9] of the industry players has identified alternative solvents that are technically and economically feasible (e.g. DMAC (having similar hazards as DMF), Sodium thiocyanate, GBL, DPMrA and DMSO were reviewed). DMSO is discussed as the most promising potential alternative, but it does not have the same properties with regard to viscosity, tendency for coagulation and

[9] Although one company has identified one alternative for a smaller part of its production. (#2245)

evaporation heat. Such technical feasibility aspects need to be solved before assessing the economic feasibility. SEAC notes the information about the use and lack of alternatives on the man-made fibre sector and the sector's concern indicating that the whole sector would close down if DMF and aprotic solvents with similar characteristics (and hazards) are banned or if the DNEL values proposed by the Dossier Submitter were introduced.

During the public consultation IVC[10], claiming to represent 100 % of the EU man-made fibre industries submitted further information (#1957, # 2029, #2030, #2031, #2032 and # 2245) concluding that at present, the industry cannot comply with the DS-proposed DNEL of 3.2 mg/m^3 for inhalation for all workers as proposed in the restriction dossier, nor to level agreed by RAC. Furthermore, the IVC stated that they would not be able to identify cost-effective technical measures that could further reduce the exposure to DMF in the near future. However, exposure assessment made for IVC concluded that monitoring showed that the annual mean of exposure levels for the process with the largest exposure was 6.5 mg/m^3 in 2018 and the 90th percentile was 8.5 resulting in a risk characterisation ratio of 2.66 (based on originally proposed DNEL value). SEAC notes that using the RAC agreed DNEL value the RCR value would be 1.5 for one activity (PROC10) for the combined route of exposure (inhalation and dermal); the RCR value, which might have been overestimated, is slightly above 1 (1 is considered safe).

SEAC notes the PC information by IVC, which indicates that theoretically it would be possible to further reduce the exposure to the RAC agreed level by using administrative measures like job rotation and personal protection equipment (PPE). However, according to their analysis it is not desirable or practical, and they point out that increased use of PPE effects on the welfare of workers would need to be balanced against the benefits from reduced DMF exposure (#2247). Based on information from one smaller producer, IVC indicated that costs of new equipment for controlling exposures through increased ventilation would cost at least about €150 M, and would only result in an exposure level between the present OEL and the RAC agreed DNEL level. In addition, additional energy inputs would be needed and there would be limited opportunity for recovery given the lower concentrations in gas stream.

Based on this information SEAC does not find it likely that the proposed restriction would result in the termination of the production of man-made fibres in the EU, however SEAC recognises that the companies involved might need to make technical and operational adjustments. SEAC further notes that technical means alone could be costly and need some adjustment time, however, use of PPEs and e.g. job rotation in the meantime may result in costs significant lower than costs related to technical means. As in the case of the PU-coating and membranes sector, the preference for following the hierarchy of control principle makes it difficult to estimate the total cost for risk reduction. The decision on how to address the risks has to be done on a case by case basis and as a result, the estimation of the aggregated cost for required activities is not straight forward.

As no close down of the production is expected SEAC does not find it likely that the proposed restriction will have great impact down the man-made fibres supply chain. SEAC notes that in the case of termination of the production, the Dossier is not clear with regard to the impacts on industries which are depending on materials for which DMF has been used in the production (indirect users). In the argumentation for why the man-made fibre sector cannot increase the prices in order to transfer possible costs, the dossier says that fibres requiring DMF could still be imported and it does not matter whether DMF or DMF made fibres are produced locally or

[10] IVC is the association of the German, Austrian and Swiss Man-Made Fibres Industries

imported from outside the EU. This is not in line with the argumentation in social impacts where it is said that the termination of the fibre production could endanger several thousands of jobs. The Dossier Submitter indicates that this reflect inconsistencies in the information from industry. However, since termination of production of the man-made fibres are not envisaged, SEAC has not studied this aspect further.

Other sectors

For the industrial use of DMF, for the manufacture of non-metallic mineral products and for the manufacture of perfumes/fragrances no risks were identified by the Dossier Submitter with the originally proposed DNEL values and the outcome is even clearer in case of RAC derived DNELs. This has been confirmed by RAC.

During the public consultation the pharmaceuticals sector and industrial gas sector (Petrochemicals) have indicated in their comments (Comments # 1976 and 1987 respectively) that they support the proposed restriction. According to the two sectors, the exposure on their sectors is already at the level required in the original restriction proposal. This can probably be linked to fact that these sectors operate with rather closed systems. For pharmaceuticals as well as other industries using DMF (Production of fine chemicals, phenolic resins, medical devices, sport equipment, chemical and pigment-dyes) no information pointed out needs for further risk reduction measures (and accompanying costs). For the industrial gas sector, the Dossier Submitter, indicating that the current exposure level is already below the originally proposed DNELs estimated costs to be between €0 and 5 M without giving details.

The only remaining use for which RAC has identified a certain risk[11] for industrial workers is the production of polymers[12]. However, except for the man-made fibre sector, no information is available for that sector.

Hence, for other sectors it is not expected that the proposed restriction will cause any costs or at the most minor costs.

Overall cost estimate

Based on the above reasoning SEAC finds that the overall cost estimate presented by the Dossier Submitter severely overestimates the cost of the restriction.

For all uses where the risk is not yet adequately controlled it seems possible to implement PPEs and administrative risk reduction measures. In some cases users will have the possibility to over time introduce further technical risk reduction measures. The costs of such measures are reduced with lengthened adjustment time, however, it is not possible for SEAC to give an estimate on the related costs. Furthermore, in some cases the same magnitude risk reductions would be required due to other policies (e.g. BREFs), and additional costs due to the proposed restriction may be reduced significantly, in form of interests for advanced investments.

[11] RCR for inhalation 1.4 and for dermal exposure 1.0 leading to a combined RCR of 2.4

[12] IVC thinks that man-made fibre sector belongs to this sector. However, the impacts on this sector is described above

Benefits

Summary of proposal:

A quantification of health effects was possible for i) hepatotoxicity effects including alcohol intolerance and ii) carcinogenicity, while a qualitative assessment was given for iii) developmental effects.

Chronic DMF exposure might result in negative health effects for all workers, e.g. general loss of well-being, hepatic injury (elevated enzyme levels) and alcohol intolerance. When drinking alcohol after being exposed to DMF, workers suffer from such as face flushing, palpitation, headache, dizziness, body flushing and tremors. Even if not a disease itself, the symptoms cause discomfort and may be an early sign of liver damage. On carcinogenicity potential endpoints for further investigation in the health impact assessment are general loss of well-being and neoplastic lesions.

The most relevant affected human health endpoints of DMF are reproductive and developmental effects; however, there is no information available in the literature about cases of reproductive or developmental effects in humans after exposure to DMF.

The Dossier Submitter has used Quality-adjusted-life-years (QALY) approach and considered three types of cancer, namely prostate cancer, liver cancer and skin melanoma, and liver-related effects (liver cirrhosis as a proxy). Using the lowest and highest gain in QALYs for each type of cancer and for liver cirrhosis, the total monetary value of health impacts is estimated to be €50-150 M per year and €550-1 750 M (NPV) calculated for a 15-year period (based on information from PU-coating, membranes and man-made fibres industries). No health impacts are expected from the industrial gases industry. Almost all of the quantified health impacts (99.7 %) were related to liver effects (cirrhosis).

The Dossier Submitter acknowledges, that there exists significant uncertainty about a large number of parameters and assumptions and that the results must be interpreted with caution. In the qualitative description of the benefits, the Dossier Submitter names alcohol intolerance to be considered as the main effect for the proposed restriction as an early indicator of liver damage.

SEAC conclusion(s):

SEAC finds the proposed restriction to provide clear benefits. The quantitative benefits appear less than estimated by the Dossier Submitter, however with great uncertainty (being) up to €77 M over the 15 years period. The effectiveness of the restriction is supported by qualitative analysis, as many of the benefits can be qualitatively described. It is noteworthy, that the main reason for the restriction is to avoid reprotoxic effects in form of developmental effects, however, the quantified benefit assessment is based on hepatotoxicity effects.

The RAC DNEL is derived on the reprotoxic endpoint. The identification of the development effect is based on reduced fertility and malformations in animals. Unfortunately, as mentioned above there is no quantification of the benefit available.

The DNEL derived on hepatotoxicity for humans is at approximately the same level as the reprotoxic effects. For the alcohol intolerance effect[13] related to hepatoxicity, SEAC considers that the quantified benefits are about € 35-77 M over 15 years (NPV). However, the uncertainties related to this estimate are high and the estimate is most likely overestimated.

With regard to carcinogenic effects SEAC does not find it justified to conclude that the restriction will result in fewer cancer cases, even if IARC considered DMF as probably carcinogenic in class 2A. SEACs view is based on the fact that the substance is not classified as carcinogenic, that the Dossier Submitter concluded that there is no basis for changing the classification and that the study which the Dossier Submitter used for the quantification did not find a causal relationship between exposure to DMF and cancer and especially not for testes cancer.

Hence, the restriction is estimated to provide quantitative health benefits, only related to liver effects (alcohol intolerance). This results in significantly lower benefits (vs. originally estimated by the Dossier Submitter) giving a range between €35 to 77 M over 15 years (NPV). This estimate, although an order of magnitude below the Dossier Submitter's estimate, implies significant benefits from the restriction.

SEAC agrees with the Dossier Submitter that although the quantitative health effects are quite uncertain, qualitative results provide support for them. The numerous human and animal study results form a solid basis for the proposed restriction by means of reporting consistent adverse effects to human health. This is confirmed by RAC and further described in BD E.4.1.1

As a whole, based on the assessment reported and accounting for both quantitative and qualitative evidence, SEAC finds the proposed restriction to provide clear benefits, which are (only) partly quantified.

Key elements underpinning the SEAC conclusion(s):

SEAC agrees to the general model used for calculating health benefits related to the restriction.

The benefits are estimated based on information on:

a) Number of exposed workers
b) Incidence rate – based on studies of workers exposed to DMF
c) Relationship between parameters and diseases
d) Loss of QALY points due to disease
e) Monetarisation of QALY points
f) Calculation period – and discount rate.

These parameters are discussed below.

The number of exposed workers is limited to exposed workers in the PU-coating, membranes and man-made fibre sectors. Based on information on a questionnaire survey the Dossier Submitter estimated that between 1 300 to 2 500 workers will benefit from the restriction. The Dossier Submitter considers this as a rough estimate, and SEAC has no reason to challenge this estimate.

SEAC agrees that statistical data on incidences rates of a disease within a population can be

[13] The dossier submitter also see alcohol intolerance as a "premarker" for a future liver disease

used when a dose-response function is not available. SEAC notes that an assumption on how a change in exposure may change prevalence (or incidence) creates uncertainty in relation to the incidence rate as the level of exposure itself has an influence on the result.

For the liver effect the incidence rate is calculated based on a number of specific studies where exposed and non-exposed workers have been tested for liver related parameters. The exposure levels[14] of the exposed workers seem to be not far above the present OEL value, and the studies are therefore considered to be relevant for the evaluation of the proposed restriction in relation to the baseline exposure. SEAC notes that the incidence rate values in different studies differ significantly (range 4-75 %)[15] and this adds to uncertainty. SEAC notes that this also reflects that the studies have not used the same liver parameters.

A major issue is how human monitoring data can be transposed into real number of specific diseases. For liver effects, the Dossier Submitter assumes that in general elevated levels of specific parameter always lead to cirrhosis. SEAC notes that no information is viable which indicates higher incidence rate of cirrhosis in the exposed population even if higher liver parameters are found for up to 75 % of workers in some studies.

Secondly, SEAC questions to what extent cirrhosis can be used as an appropriate proxy for the liver effect in the form of alcohol intolerance, i.e. whether the pain, discomfort etc. are comparable to cirrhosis symptoms. The symptoms registered by DMF users are e.g. face flushing, palpitation, headache, dizziness, body flushing and tremors. However, exposed workers can avoid these effects by not drinking alcohol. The question is whether alcohol intolerance at all is a disease[16], but it can be considered as an early indicator of liver damage [toxicity] which might later result in other health impacts[17]. On the other hand, the symptoms due to DMF use can be seen to limit consumers' behaviour and fulfilment (enjoyment of

[14] Cai et al, (Cai et al. (1992) reported that in workers exposed to max. 21 mg/m^3 DMF, the levels of liver function indicators were similar to controls). There was, however, a dose-dependent increase in subjective symptoms, especially during work, and authors suggested that a level at which no alcohol intolerance would occur is below that causing liver damage. Fiorito et al,: 21 mg/m^3; Redlich, Lou 9-75 mg/m^3.

[15] For SEAC information (to be deleted in next version). In the 1st DO the rapporteur questioned the calculation of the incidence rate, which was derived by comparing the estimated number of new cases with the number of disease free years. The number of disease free years is calculated as the number total working years for those in the study which are not exposed + half of the working years for those which during the study have been affected due to DMF (assuming disease onset half of the study period). Especially, it was not clear why the disease onset should be related the length of study period as such. Some of the studies are assumed to be performed in 1 year and others 16 years. This is quite similar to what I found in the first sheet of the excel folder attached to this mail (incidence rate – total number) where I took the approach to calculate the estimated total number of cases during the studied time period on the basis of your calculated incidence rate and assuming that the same affected person is not counted twice. I checked what the effect would be of different assumptions for disease onset for the different studies mentioned in the "exposed workers incidence" sheet. It does not influence the result very much. The assumption (not logic) that it depends on the length of the study period and not the same for all – statistically may just reflect that the incidence rate is considered to be constant. – An excel sheet can show that it works.

[16] If it is not considered a disease at all, the impact of DMF exposure could be considered as a loss in welfare due to not being able to drink/enjoy alcohol. This approach has not been developed further.

[17] According to animal studies as well as human biomonitoring data, exposure to DMF influences the function of the liver, e.g. changes in liver function symptoms which is not directly linked to alcohol intolerance. The Dossier submitter indicates that this could imply lower body weight, probably combined with some loss in general well-being. The incidence rate for liver functions enzymes are much lower than the incidence rate for the alcohol intolerance.

alcohol) and to cause decreased utility in that manner.

Thirdly, SEAC questions the longevity of the (hepatotoxicity) health effects noting that the Dossier Submitter originally assumed the effects to be chronic, implying that the welfare loss is assumed to continue for the rest of a person's life. However, the Dossier Submitter elsewhere indicated that the hepatotoxic effects in form of alcohol intolerance are fully reversible. This is in line with a study mentioned in the report (p. 401 (original dossier)) covering seven workers for which liver biopsies had shown abnormal high values, and which found that the liver values returned to normal after 4-22 months after absence from the working area. As a result, the Dossier Submitter later indicated that the estimation should be adjusted. In the revised version the Dossier Submitter followed the advice from SEAC to assume that the effect of alcohol intolerance is for 1 year only. The assumption of one year is also somewhat ad hoc, however, it appears as an acceptable proxy and simplifies the estimation. As a natural consequence, the estimated potential harm clearly decreases as the affected workers now suffer shorter time from the disease.

The originally calculated incidence rate was based on an assumption that the onset of the disease would be half of the observation period in the studies used for deriving the incidence rate. In average observation period was about 5.7 years implying that the time average period from exposure to onset was assumed to be 2.85 years. To be consistent with the assumption that the alcohol intolerance effect resulting from one year's exposure only last for 1 year, the estimated incidence rate ends up being higher than identified by the Dossier Submitter (40 % compared to 14.9 %)[18].

The QALY approach provides a measure that integrates quantity of life with quality of life, i.e. a quality adjusted life year. An important issue is to determine the QALY score of the individual diseases. The Dossier Submitter presents scores identified in different meta studies. For the liver disease, the Dossier Submitter uses QALY scores of cirrhosis as a proxy, and finds values between 0.08 and 0.25. The 0.08 value is based on the Tengs and Wallace and recommended by RPA in a study for the ECHA (RPA, 2015), while the 0.25 represents the highest range in the global burden of disease Network. The central value of this study is 0.18 (See the Background Document, section E).

The symptoms for (decompensated) cirrhosis mentioned in global study is having swollen belly and swollen legs, weakness, fatigue and loss of appetite.[19] However, as the effect is linked to alcohol consumption and therefore can be avoided, SEAC think it would not be appropriate to use the highest number of avoided QALYs per person (0.25)[20], but will base the further calculations on the lowest estimate 0.08 QALY loss per person per year[21].

The value for one life year of good health (1 QALY) is estimated to be € 75 000. SEAC notes that the value of the QALY is debateable. The Dossier Submitters bases the value on a measure of value of a statistical lift (VoSL) of around €1.5 M for a 40-year-old person. SEAC finds this acceptable, although notes that the value used appears somewhat low as the value

[18] For SEAC info: the incidence rate calculated by the dossier submitter was based on incorrect numbers of exposed workers in some of the studies. Correcting for this the incidence rate would be 18.9%, but then it also have to be corrected for the fact that the effect only lasted for one year

[19] But more generally, Liver cirrhosis is a serious life-threatening disease.

[20] A score of 0 means death and a score of 1 means perfect health for one year. A QALY gain of 0.08 indicates that an individual who would have had the disease after exposure to DMF will now, due to the restriction, gain 0.08 QALY.

[21] If the score of 0.25 is used the estimated benefits (also monetarised) would be approximately 3 times higher)

per statistical life referred by SEAC is between €3 M and €5 M (REF to SEAC paper). The QALY is monetised using a WTP-based value of a QALY through survey-based research. A survey[22] conducted in 10 countries estimated an overall range of mean WTP per QALY to be between $18 000 and $77 000. Hence, the value per QALY used by the Dossier Submitter (€75 000) is just above this range[23]. Lastly, SEAC notes that QALYs only reflect disease burden due to direct changes in quality of life (well-being) and not direct health costs (medicines, hospitalisation), nor loss in productivity.

Using these assumptions the exposure of 1 300-2 500 workers in the two sectors, as identified in the questionnaire survey, would imply that 520-1 000 workers continuously would have alcohol intolerance. The cost per case per year would be 0.08 × 75 000= 6 000 and hence the restriction would result in total benefits per year of €3.1 – 6.0 M. The total cost calculated over the 15 years period using a discount rate of 4% would result in an avoided loss of €35-68 M(NPV)[24]. SEAC notes that the original DS estimate was approximately 15 times higher[25] than the revised SEAC estimate.

SEAC further notes that the Dossier Submitter has used a discount rate of 4 % per year. Although SEAC consider this to be an often used practice, SEAC notes that this does not take the income elasticity of health into account. As the SEA guidance recommends to use a declining rate for discounting of health effects it could have been justified to use 2 % for benefits before 30 years. SEAC notes that in that case the quantified benefit values would have been estimated to €40-77 M.

Table X Monetarised benefits of the restriction for workers in PU-coating sector and man-made fibre sector, assumptions and estimation (15 years)

Number of exposed workers	1 300-2 500
Incidence rate – studies of workers exposed to DMF (liver effects)	40 %
Relationship between measured parameters and disease	1-1
Length of disease	1 year
Lost QALY point due to disease	0.08
Monetarisation of 1 QALY point, €	75 000
Calculation period and discount rate	15 years; 4% (2%)
Calculated health benefits, Million €	35-68 (77)

[22] For SEAC info: The survey was conducted in 10 countries (Netherlands, UK, France, Spain, Sweden, Norway, Denmark, Poland, Palestine and Hungary) and in total 39 922 people completed the survey (overall response rate of about 60 %).
[23] $18000 – $77000 in 2010 is approximately €15,000 – €65,000 in 2018 prices (inflation 12.3% from 2010 to 2018)
[24] To the extent the BREF process would result in similar risk reductions as the proposed restriction, only the benefits for the interim period should be included in the benefit assessment.
[25] Compared to the DS low value of a QALY value of 0.08 the Dossier central value was €567. Estimating for 1300 and 1700 workers respectively the benefit related to cirrhosis is €500 M and €650 M.

Carcinogenicity

For carcinogenicity, the Dossier Submitter notes that DMF is not classified as carcinogenic. SEAC further notes that the study by Walrath (1989), on which basis the Dossier Submitter performed the quantification, concluded that there was no causal relationship between exposure to DMF and cancer effect. IARC[26] has classified DMF as probably carcinogenic to humans (group 2A) but even if this conclusion was based on "sufficient animal data", the evidence in humans was considered to be only limited as a positive association between exposure to N,N-dimethylformamide and cancer of the testes had been observed. However, in the Walrath study a (non-significant) negative association between exposure for DMF and cancer of the testes was found. Therefore, SEAC does not find it appropriate to include the quantification of the carcinogenic effects in the overall estimation of benefits.

Overall, SEAC concludes that the health benefit from the restriction in the PU-coating and man-made fibre industry, based on the QALY approach would be around €35-77 M (NPV) over a 15 years period. This is solely based on liver effects. SEAC acknowledges that the estimation includes large uncertainties.

SEAC notes that the benefits may occur also in other industries using DMF. RAC identified possible DMF related risks not to be adequately controlled for workers in the production of fine chemicals, pharmaceuticals and polymers.

Furthermore, as the QALY approach is used, neither benefits in form of direct health costs (medicines, hospitalisation) nor in loss of productivity are taken into account.

Finally, and most importantly, SEAC underlines that any developmental impacts, although thought to be the most relevant affected human health endpoints, are left out from the quantification as there is no information on them available in the literature.

Other impacts

Summary of proposal:

The Dossier Submitter indicates that due to the termination of 50 % of PU-coating, 500-1 000 jobs will be lost and due to the termination of all production of man-made fibres, 1 000-2 000 jobs will be lost. Furthermore, the restriction could endanger additional 1 000-2 000 jobs employed by the suppliers to the man-made fibre industry.

SEAC conclusion(s):

As mentioned above, SEAC considers it unlikely that the proposed restriction will result in termination of production in the EEA. Actually, if administrative measures should be needed to reduce the time where individual workers are exposed to DMF, this could result in principle in further jobs, however, likely causing a decreased efficiency, which in turn would be reflected in higher costs and potentially reduced competitiveness.

Due to the (international) competition it will not be possible for the DMF users in all sectors to transfer costs of further risk reduction measures (by increasing the prices) to their customers. For some products this may be possible. For instance, the man-made fibre

[26] https://monographs.iarc.fr/wp-content/uploads/2018/06/mono115-04.pdf

industry has indicated that companies operating in specialised markets, for which alternative suppliers are not readily available it might be possible to transfer the (compliance) costs to their customers.

SEAC agrees, that for RO1 (the ban) impacts on costs and wider effects can be expected to be large. This is described in detail in the background document and supported by comments received via the public consultation regarding the industrial gas sector (e.g. #1986), the man-made fibre sector (e.g. #2245) and PU-coating and membranes sector (e.g. #1986)

Overall proportionality

Summary of proposal:

The Dossier Submitter concludes the (proposed) RO2 to be proportional. The conclusion is based on a comparison of the monetised costs and benefits. The costs of the restriction proposed are described to be limited and even further reduced from the presented values in case an adjustment time is extended. The quantified benefits alone cover the costs, and non-quantifiable benefits give further support to the benefit estimation.

Alternative ROs discussed in the proposal have been assessed to be less (or even non-) proportional.

The Dossier Submitter acknowledges, that "There exists significant uncertainty about an important number of parameters and assumptions that may affect the balance of costs and benefits" and that the results of the calculations presented therefore must be interpreted cautiously.

RAC and SEAC conclusion(s):

SEAC note the clear benefit of the restriction: 1 300-2 500 workers, that are currently exposed to DMF at their workplaces at a level which might cause (i) developmental effects to their children, or (ii) liver effects, would be able to continue their work while reducing the risk for their health.

SEAC notes that one of the main benefits – avoiding reproductive and development effects - is not quantified, nor monetised.

Related to liver effects, SEAC finds it likely that the health benefit from the restriction in the PU-coating, membranes and man-made fibre industry range between €35-77 M (NPV) over the 15 years assessment period. However, this estimate is quite uncertain.

SEAC further notes that the restriction will also avoid exposure in other sectors where exposures might be higher than the considered DNELs.

With regard to the costs estimate only limited information on the aggregated costs for needed risk reduction measures is available. PPEs and administrative risk reduction measures can be implemented with relatively low costs, and more advanced/higher tier risk reduction technologies can be implemented gradually.

SEAC notes that the proposed restriction in principle follows the traditional way of ensuring that chemicals are used safely (REACH Regulation, title II – V). The DNEL is a calculated based on hazard data combined with factors to address variations and uncertainties for when an exposure can be considered safe. As a result the Dossier Submitter disagrees with the registrants on the level of exposure that can be considered safe. Hence, the proposal is developed to bring the exposure to the safe level.

Overall SEAC finds the RAC modified proposal to be proportionate, as the benefits are clear and the costs appear moderate.

Uncertainties in the proportionality section

The overall conclusion that sufficient risk reduction can be achieved, by accepting use of PPEs and administrative measure as last options, has not been confirmed by the PU-coating and membranes nor the man-made fibre industry.

Uncertainties in RACs risk assessment regarding the present exposure are relevant for the evaluation of need to reduce exposure as there might still be other uses of DMF where risks are not adequately controlled.

As discussed in the RAC section on characterisation of risks it is not clear whether risks actually exist in all areas covered by the risk assessment. E.g. industry organisations for PU-coating, membranes and man-made fibre industries have submitted information in the public consultation that roller or brushing application (PROC 10) and hand mixing with intimate contact (PROC 19) for which the highest risk levels were identified in the considered exposure scenarios, are not current industrial practices. This causes some uncertainty to the benefit estimation; but obviously if no risks exist, no further risk reduction measures are needed, and hence no cost will occur.

It is not clear how representative the estimated avoided health benefits are. For instance it is not clear whether cirrhosis is an appropriate proxy for liver effects, what the exposure in case of no restriction would be, and what the number of diseases related to different exposure levels are and to which extent the changes in liver parameters will result in real diseases. Industry has indicated that respecting the inhalation OEL of 15 mg/m^3 they have not observed cases of diseases apart from alcohol intolerance. These issues cause significant uncertainty to benefit estimation. Furthermore, as mentioned above, although the main reason for the restriction is to avoid reprotoxic effects in form of developmental effects, the benefit assessment is only based on hepatotoxicity effects.

Practicality, incl. enforceability

Justification for the opinion of RAC and SEAC

Summary of proposal:

According to the Dossier Submitter, based on the information received from industry, the industrial gases industry would face no difficulty under the proposed restriction because the current exposure levels are well below the proposed DNELs. However, the Dossier Submitter states also that the proposed restriction is not implementable for the man-made fibre industry neither the PU-coating industry. Both industries currently comply with the occupational exposure limit (IOEL) of 15 mg/m³. The proposed restriction would require a reduction from 15 mg/m³ to 3.2 mg/m³, which would not be economically feasible for those industries. In order to meet more severe DNEL values, exponentially increasing investments and costs would be needed. Both industries face fierce international competition and would not be able to pass on the increased costs on customers.

The restriction proposed is deemed to be enforceable.

RAC and SEAC conclusion(s):

With the DNEL values agreed by RAC, SEAC considers it likely that the proposal will be implementable for all sectors including the PU-coating and membranes and man-made fibre industries.

The costs for upgrading plants and substitution may be significant for some sectors. However, the adequate control can be achieved in the short term by the use of PPEs and administrative measures, if higher levels measures in the hierarchy of control regime under OSH are not technically and economically feasible.

Furthermore SEAC (and RAC) find the restriction to be enforceable and monitorable. SEAC considers that there is no need for additional enforcement activities than those to be performed under the “normal REACH enforcement scheme”.

Key elements underpinning the RAC and SEAC conclusion(s):

Due to the proposed restriction registrants of DMF would have to review their registration dossiers, including the Chemical Safety Reports (CSRs), and include relevant toxicological information in line with the mandatory DNEL levels. The exposure scenarios (ESs) generated have to be updated, to present safe use conditions when the DNEL values proposed in the restriction are used. Following the update of the CSR, Safety Data Sheets (SDSs) have to be updated, to make them consistent with the CSR.

Formulators will have to update their SDSs, to include the relevant information from the CSR for the substance, including DNEL values and ESs and suppliers will have to update the SDS ‘without delay’.

The end-users must identify and apply accordingly the appropriate measures to control risks. These measures are normally communicated to Downstream Users by the supplier via the SDSs. Should their use be outside the conditions described in an exposure scenario attached to SDS or for any use his supplier advises against – according to Art 37 (4) they must prepare a chemical safety report in accordance with Annex XII to REACH.

As indicated in the cost section above, SEAC and RAC find it feasible for all industries involved to reduce the exposure to the proposed level.

According to Fedustria (PC #1986) the coating industry is testing different options to improve the ventilation and decrease the diffuse emissions to further reduce the exposure to DMF in the near future. Measures, like fully enclosing of the head of the coating line, cleaning of the pumps in separate rooms equipped with ventilation, increasing and improving the ventilation efficiency at several places and introduction of pneumatic closed covers, are thought to look promising but will require more time to be implemented by the whole industry. However, it is expected that the combination of all the separate measures currently under investigation will bring the exposure concentrations of DMF below the proposed DNEL of 3.2 mg/m^3. SEAC understands that the described measures can be both costly and time consuming, but notes that in the meantime PPE and administrative measures should be sufficient to comply with the RAC derived DNEL values.

It will for some uses also be possible to substitute DMF with another less dangerous substance. However, there is no indication on number of users who in the short run could rather replace DMF and what the related practicalities would be.

For the man-made fibre sector, IVF has described several risk reduction measures, but indicates that most of them, e.g. automation, enclosure and increased ventilation have already been implemented in the industry. Therefore, wider use of PPE and job rotation is mostly considered.

Regarding enforcement, SEAC considers that there is no need for additional enforcement activities than those to be performed under the "normal REACH enforcement scheme"[27] under REACH. The only difference is the level of the DNEL value, which is to be used in the risk assessment and which has to be communicated to downstream users. The level of the DNEL value itself does not imply changes in enforcement.

The Dossier Submitter indicated that manufacturers, formulators, industrial users and professional users of DMF must be able to demonstrate at the request of enforcement authorities that they comply with the above restrictions. This can be done by maintaining an adequate exposure monitoring program. In the Forum's opinion, having a monitoring program must be also part of the proposed restriction. SEAC notes, that REACH does not require monitoring programme for other substances with similar risk profiles and that setting this requirement would result in further costs.

Forum notes that in some countries the proposed restriction poses some organisational difficulties. In several Member States the responsibility for the enforcement of workplace

[27] According to Article 31, and 32, a supplier of a DMF shall provide the recipient with a safety data sheet including a chemical safety report with relevant exposure scenarios (or relevant information about the substance that is necessary to enable appropriate risk management measures to be applied to ensure safe use of chemicals in case a safety data sheet is not required) which makes it possible for downstream users to identify, apply and recommend the relevant measures further downstream (Article 37).- Downstream user obligations to be enforced. Note if use is covered by exposure scenarios set up in the safety data sheep the obligation is to apply appropriate risk management measures (RMMs) and operational conditions (OC) proposed in (extended) safety data sheet (ext-SDS) or other information received from the supplier to adequately control the risks identified.

safety and the environmental protection are split between different authorities. Thus, this workplace related restriction in REACH may lead to mixed competencies. SEAC finds that this issue is not specific for the proposed restriction, as it applies to all industrial and professional use of chemicals where workers might be exposed and SEAC does therefore not evaluate this further.

Monitorability

Justification for the opinion of RAC and SEAC

Summary of proposal:

Regarding monitorability, there are no specific concerns as this can be done through enforcement. Further, monitoring of exposure levels is already carried out under worker protection legislation and hence, it should be no problem to adopt similar activities in case of the proposed restriction.

RAC and SEAC conclusion(s):

SEAC notes that the proposed restriction in principle follows the traditional way of ensuring that chemicals are used safely. Same procedures can be used.

Key elements underpinning the RAC and SEAC conclusion(s):

UNCERTAINTIES IN THE EVALUATION OF RAC AND SEAC

RAC

Summary of proposal:

Add summary of Dossier Submitter proposal from the Uncertainties section of the Annex XV restriction report.

RAC conclusion(s):

Add conclusion of RAC.

Key elements underpinning the RAC conclusion(s):

Add analysis that justifies the conclusion given above[12]

SEAC

Summary of proposal:

The major uncertainties are related to the parameters of human studies that do not allow establishing a consistent pattern of exposure and dose-response for the increase in incidence of critical health effects. Therefore, instead of going for quantitative impacts, an (extensive) qualitative description was given along with some alternative quantitative proxies of the potential health effects (risk reduction potential, population of workers for which the risk is reduced) to provide insight in the magnitude of the potential effects.

The assessment of non-health-related socio-economic impacts may be subject to three types of uncertainty. First, quantitative results are only presented for the industrial gas sector, the fibre sector and the PU-coating and membranes sector. No quantitative assessment is made for other industries. Hence, presented results concern only a part of affected actors.

Second, the lack of accuracy in collected data and in the robustness of the adopted methodology introduce uncertainty. In particular, estimation of market growth rates, total market size, as well as margins, turnovers and closing costs may be subject to uncertainty. Furthermore, there is naturally uncertainty concerning the firms' reactions.

Third, received answers from companies or associations representing (inherently uncertain response of) a given industry were extrapolated to all uses, which poses uncertainty, as the exact data for non-responding companies are not known.

SEAC conclusions:

SEAC agrees that as a whole there are very large uncertainties related to the Dossier Submitter's estimation of the socio-economic impacts of the restriction. However, according to industry information it is possible to address possible risks by use of PPEs and administrative measures, which will severely reduce the cost estimated. Therefore the uncertainty is of less importance.

Key elements underpinning the SEAC conclusion(s):

The most important uncertainty is related to the possible reaction by industry, especially whether it is possible for the PU-coating sector and the man-made fibre sector to introduce further risk reduction measures and thereby avoid close-down of the production in EEA.

Moreover, the cost estimate is very uncertain, and the question of scaling from companies that have answered the questionnaire is drowning in uncertainty about cost figures for those who submitted information and for parameters which have not been taken into account.

Regarding information from other industries, SEAC notes that the cost of implementing further measures to reduce the exposure to the proposed DNEL values is summarised as it is not known which industries, and how many plants which have to implement further risk reduction measures. However, as indicated above PPEs and administrative measures which can be characterised as low cost measures can be used if other measures are not feasible to implement, especially in the short run.

The quantified health benefits are also characterized by significant uncertainty. The following elements can be listed:

- Number of workers with exposure at the OEL level or higher
- Incidence rate for exposed workers due to limited information on odds ratios and exposure levels in studies used for the estimation
- All quantified health benefits are related to liver effects (cirrhosis) while reprotoxic effects are not quantified.
- Whether Cirrhosis is an appropriate proxy for the liver effect and whether measured changes in liver parameters can be interpreted as disease

Furthermore following elements have not been taken into account:

- Other health benefits are not taken into account. The effects of DMF found in other organs (kidney) in animal studies are difficult to extrapolate to human health effects. Whether specific effects to organs will occur in humans is uncertain. Besides, these effects are so-called sub-clinical and no clear disease can be determined for humans. Thus, effects to other organs have not be evaluated.
- Health benefits for DMF exposed workers outside the PU-coating, membranes and man-made fibre industry.
- Direct saved costs related to avoided health effects, e.g. in hospitals and loss of productivity.

REFERENCES