SOCIETA' CHIMICA BUSSI S.P.A. (SCB) – Application for Authorisation

Submission number: **JC547026-53**

Communication number: **AFA-C-2114472338-42-01/F**

Subject: **Request for additional information**

Date: **13 June 2019**

Question 1 (CSR)

You mentioned in the CSR p.96 that 'the maintenance tasks are infrequent and cannot be planned for inclusion in the monitoring campaign'. Please clarify if for the new Bussi site non-routine maintenance activities have been considered and will be included in a future modelling assessment?

Yes, as outlined in section 9.1.5 (Worker contributing scenario T4 – maintenance and cleaning) non-routine maintenance activities have been considered in the exposure assessment. As outlined there, the exposure during cleaning has been calculated on basis of monitoring values as this activity cannot be modelled with the Advanced REACH Tool (ART). Maximum monitoring values obtained for cleaning activities in the former monitoring campaign for the 2015 Caffaro Brescia AfA have been used in a worst-case approach for the assessment of worker exposure during cleaning activities.

Possible exposure during – infrequent – maintenance has also been considered and has been modelled as handling of contaminated objects using ART. Details of the modelling assumptions are described in section 9.1.5 of the CSR. In section 9.1.2.6 (Risk characterisation) the possible risk for mechanical day workers associated with the possible exposure during maintenance is disclosed.

The assumptions made for the modelling will be verified under routine work place conditions in the future plant in Bussi sul Tirino and will be adapted, if necessary, for future modelling. However, as the assumptions for the existing modelling are based on workplace experiences from 9 chlorate producing sites which work under comparable conditions there is high confidence that the assumptions made for the modelling provide a realistic estimate for this task.

Question 2 (CSR)

Please provide information on preventive maintenance programmes related to the PPE which will be used (frequency of change, availability, supervising of the correct use of the PPE) at the new Bussi site?

All matters on PPE is in Italy regulated by the Italian Legislative Decree (81/2008 on health and safety in workplace):

- Art 73: information, education and training

- Art 74: definitions
- Art 75: compulsory use
- Art 76: PPE requirements
- Art 77: obligations of the employer
- Art 78 : obligations of the employees
- Art 79: criteria for identifications and use

In particular Attachment n° VIII (general indications on specific protections) identifies how to select the proper PPE according to the risk assessment.

At present, in the Bussi site the PPE (gloves, apron, overall, mask, etc.) use for personnel is regulated, according with HSE department, by the DVR (Risk Assessment Document) and operative manuals of each plant or department. These documents specify the available PPE in Bussi site's warehouse and the tasks for which they are used. Each department has spare PPE to be supplied to workers in the case of necessity.

Some PPE (such as overalls, aprons, shoes) are supplied once or twice a year, but they are changed immediately in the case of damage or contamination.

Single-use PPE (such as certain types of overalls and gloves, powder masks, mask filters) are disposed of after use.

PPE is disposed of in any case before its expiry date.

On the basis of DVR and operating manuals, a specific plan is generated by the HSE officers and by responsible persons of the departments, outlining the scope, conservation, wearing and duration of PPE. The same information is given to the external maintenance workers.

Responsible persons of the departments and HSE people are in charge to verify the correct use of PPE by the workers (both internal and external). Additional, regular training of the workers takes place (at least twice a year).

Therefore, SCB will follow the prescriptions to select the PPE for the sodium chlorate/sodium chlorite plants (see CSR - Part A) and will implement the existing organisation to the chlorite plant, taking into account the Caffaro experience and the specific needs of this plant due to the presence of sodium dichromate.

Question 3 (CSR)

Please specify if the proposed monitoring programme covers both: workers exposure and environmental exposure in the new facility?

As in the existing Caffaro Brescia plant, future monitoring activities in the SCB plant in Bussi sul Tirino will include both: static monitoring at the workplace to cover workers exposure during the different tasks as well as monitoring of the control room. Further, environmental air monitoring in the close vicinity of the plant is planned.

Additionally, a control system will be in place which will continuously monitor the redox potential in the wastewater exiting the chlorite plant. Wastewater of the sodium chlorite plant will be collected in a tank of a ca. 20 m^3 volume and addition of sodium bisulphite to reduce chromium VI, together

with other oxidising compounds (such as chlorate, chlorite and hypochlorite), will be regulated automatically depending on the results of the measured redox potential.

Once a day SCB will analyse the total amount of chromium and the Cr(VI) amount in the overall wastewater from the site. Once a month analysis of total amount of chromium and Cr(VI) of the waste water from sodium chlorite plant will be performed.

Question 4 (CSR)

Please describe the available air abatement techniques (filter type) as well as the effectiveness for environmental release control at the site.

The entire chlorate production is located in an open hall (under canopy). There are no air abatement techniques in place. However, due to the fact that chromium VI is only used dissolved in liquids and due to its low volatility air emission is considered as very low.

The main flow leaving the sections of the plant containing chromate is the chlorine dioxide / chlorine / air / water vapour mixture, which is sent to the dioxide /chlorine recovery system (washing /reaction towers) from where it is returned to the sodium chlorate production in a closed loop so that no environmental release is assumed. Secondary flows coming out are the condensates of water evaporate by the cells (condensed in a hydrogen cooler) and by the evaporator which removes the excess of water (fed by hydrochloric acid). Both condensates will be recycled, as much as possible (ca. [redacted] (range: >70%)), to absorb the HCl obtained by the by-produced chlorine, which comes back to the plant as a raw material. The remaining unused condensate is collected in the wastewater tank where superfluous Cr(VI) will be reduced.

Environmental air monitoring in the vicinity of the plants during the monitoring campaign performed for the first AfA in 2015 (pumps located about 50 to 100 m away from the production buildings) revealed that environmental Cr(VI) concentrations were in a range which was below the limit of quantification (2.4 ng/m^3). Measurements for Caffaro Brescia, where most parts of the plant are also installed in an open hall, i.e. under comparable conditions as in the future SCB plant in Bussi sul Tirino, revealed even lower concentrations ([redacted] (range: <1 ng/m^3); for details see Annex 3B of the CSR) at places where the different tasks are performed.

Future monitoring activities are planned at places where different tasks are performed and in the close vicinity of the production site, to control for potential occupational and environmental releases (see answer to Question 3).

Further, the site is built upon an [redacted] to prevent any leakage to the surrounding area in case of any accidental release. These structural works together with the high percentage of re-use (ca. [redacted] (range: >70%)) of the process water and the wastewater collection system in place, where Cr(VI) in the waste water is reduced to Cr(III) before release to the environment (in relation to monitoring the effectiveness of the reduction in place, see answer to Question 3) aim at a minimisation of the overall Cr(VI) release to the environment.

Question 5 (CSR)

Please describe contaminated solid waste handling operations at the site.

Solid waste contaminated with Cr(VI) may occur in the form of:

- Contaminated PPE (gloves, respiratory protective equipment, single-use overalls, contaminated overalls or shoes)
- Contaminated single-use laboratory equipment or contaminated single use paper towels
- Contaminated single use mechanical's workshop fabric towels
- Particles from the candle filters which might be included in the wash water.

Contaminated single use laboratory equipment, single-use paper towels, single-use fabric towels and contaminated PPE will be collected in separate waste bags and are collected by an authorised hazardous waste transport company (e.g. [redacted]) which is responsible for the further handling of the hazardous waste.

We do not use always the same company, but we can choose among several qualified companies.

The wastewater from the candle filters (containing particulates) will not enter the wastewater reduction system but will be collected and sent to an authorised hazardous waste treatment off-site.

Question 6 (AoA)

Could the applicant elaborate more and provide a non-confidential plan describing "Future R&D activities of the applicant" as applicable to this authorisation application.

Decades of research have been carried out around the world by manufacturers of sodium chlorate and by other researchers without any feasible alternatives for Cr(VI) being identified. We are aware that research is ongoing but so far no alternative that would enable the complete removal of Cr(VI) from the process has been identified, current levels of potential worker exposure to Cr(VI) are already very low and will be very low in the company's new plant. The use of sodium dichromate represents the Best Available Technique for the production of sodium chlorate. There is no alternative technology known to be used anywhere in the world because the use of sodium dichromate simply allows the most efficient generation of sodium chlorate. It must be appreciated that electricity is by far the most important cost in the production of the sodium chlorate and the use of a sub-optimal alternative could seriously drive production costs up and seriously reduce energy (resource) efficiency. This will make Società Chimica Bussi uncompetitive, thus leading to the loss of the significant investment made into our new plant.

It should be noted that any variation in the chlorate plant can have a strong impact on the chlorite manufacture in particular during the chemical generation of chlorine dioxide in a very complex and delicate acidic environment where solids, liquid and gases coexist and where the stability of the produced gases (a mixture of chlorine and chlorine dioxide) has to be verified and preserved in case of substitution of chromium VI salts with other additives.

[redacted]

[redacted].
Therefore, our plan for R&D over the requested review period is envisaged to include:

1. Monitoring of the scientific literature for relevant developments. This will include monitoring of relevant scientific journals and the patent literature. Where relevant research is identified, we will consider communicating directly with the relevant researchers to obtain additional detail, if this is forthcoming.

2. Regular communication with known suppliers of electrodes and our technology supplier ([redacted] to enquire on new developments in the field of additives, electrode coatings and electrode materials.

3. As the achieving of a technology without the use of sodium dichromate will be surely communicated to the scientific community, a regular check of competitors news will give us the possibility to contact them to enquire on innovation. We recognize that competitors may not be willing to share with us all the details of their relevant research; however, they could be available to share the technology on the basis of an agreement for licencing or for common research developments. However, it would be important that any new, technically and economically feasible technologies are adopted across the board to ensure competition is not disrupted and any impacts on EEA competitiveness can be mitigated. Note that all EU producers of sodium chlorate are also authorisation holders, so the same applies equally to all manufacturers of sodium chlorate.

4. Società Chimica Bussi will consider funding primary research to be undertaken on its behalf. We aim to investigate funding, for example, PhD projects in knowledgeable, relevant institutions (ideally within Italy).

5. We aim to record our progress on a regular basis in order to be able to present our findings and efforts in any future Authorisation review report that we may have to generate.

Question 7 (SEA)

Can applicant elaborate more on activities and timing (~a plan for substitution) foreseen to substitute Sodium dichromate during the review period as described in section "5.4 Factors relating to the duration of the review period". In particular, the applicant could expand on information provided in the following sentences: "They believe that at least 12 years are required from 2019 in order to undertake the R&D necessary to develop an alternative and to prove this at the industrial level, for example to achieve the same cathode lifetime). Once a new technology has been identified, it will then need to be piloted and scaled up to industrial production levels. This may take up to a period of 8 years from initial industrial trials to full use."

On the basis of the future R&D activities detailed above and assuming that a promising alternative is identified (the timescale for finding an alternative is not possible to predict at present), irrespective of the identity of such alternative, several steps would need to be taken before the use of sodium dichromate could be abandoned. These are detailed in the table below.

The R&D stage would need to address several technical aspects (construction materials, electrodes lining and electrodes materials, kinetics of the chemical reactions, efficiency of power consumptions, etc.) and would take no less than 3 years. The concept for a pilot plant would therefore be available

not before year 4 from the start of the project. It should be noted that Società Chimica Bussi does not have the technological know-how on the electrodes so an R&D partner would have to be identified and brought on-board.

Once the pilot plant has been completed and only if its functioning has produced satisfactory results, the possibility of scaling-up would need to be explored. At the same time, the costs and benefits would be analysed, and the safety and environmental aspects investigated. Even if everything goes according to plan and the pilot plant produces the expected results, this stage would take no less than 3 years and six months.

The following steps entail the design of the industrial installation, the selection of the engineering partners and equipment vendors, the applications for the necessary authorisations and building permits and the training of personnel. This stage is expected to take not less than 3 years.

Finally, the construction of the industrial installation can be expected to take no less than 12 months.

Theoretical time plan for the implementation of an alternative technology under a theoretical future R&D project						
Step	**Name**	**Duration (in months)**	**Project months #**		**End of Step**	
			Start	**Finish**	**Years**	**Months**
1	Project preparation: concept design & budget	**12**	1	12	1	0
2	**Decision-making 1 – Approval of R&D laboratory work**	**1**	**13**	**13**	**1**	**1**
3	R&D laboratory work	**36**	14	49	4	1
4	Verification of the results of the R&D project and combination of the results for all relevant issues; conception of the pilot plant design; evaluation of costs and benefits of the innovation (including environmental and safety aspects)	**6**	50	55	4	7
5	Pilot plant basic engineering design and budget	**6**	56	61	5	1
6	**Decision-making 2 - Approval of pilot plant construction and further R&D work**	**2**	**62**	**63**	**5**	**3**
7	Selection of pilot plant engineering contractor(s); selection of vendors list (special equipment)	**3**	64	66	5	6
8	Pilot plant design, construction and R&D work	**24**	67	90	7	6
9	Verification of the results of the pilot plant; conception of the industrial plant design; evaluation of costs and benefits of the innovation (including environmental and safety aspects)	**12**	91	102	8	6
10	**Decision-making 3 – Approval of investment for industrial plant basic design**	**3**	**103**	**105**	**8**	**9**
11	Selection of basic engineering contractor(s) for industrial plant; validation of vendors list (special equipment)	**3**	103	105	8	9
12	Basic and preliminary engineering design for applications and budget; HazOp study	**9**	106	114	9	6
13	Application for major risk authorisation	**8**	115	122	10	2
14	Application for the change of IPPC permit	**12**	115	126	10	6
15	Preparation of EIA and its approval	**12**	115	126	10	6
16	Securing investment funds	**4**	123	126	10	6
17	Selection of engineering EPC contractor(s) for industrial plant	**6**	121	126	10	6
18	**Decision-making 4 – Approval of investment**	**3**	**125**	**127**	**10**	**7**
19	Project for building permits	**3**	128	130	10	10
20	Building permits	**2**	131	132	11	0

21	Detailed engineering work	**9**	128	136	11	4
22	Training of personnel	**3**	142	144	12	0
23	Purchase and delivery of new equipment	**8**	133	140	11	8
24	**CONSTRUCTION (Mechanical completion)**	**12**	**133**	**144**	**12**	**0**
25	Commissioning of converted unit	**2**	145	146	12	2
26	Testing of new installation	**3**	147	149	12	5
27	Guarantee test	**1**	150	150	12	6
	Total duration	**150 months or 12 years and 6 months**				

Question 8 (SEA)

Please estimate impacts on employment using Dubourg (2016) methodology: https://echa.europa.eu/documents/10162/13555/unemployment_report_en.pdf/e0e5b4c_2-_66e9-4bb8-b125-29a460720554

To estimate the impacts on employment, the analysis followed the Dubourg (2016) methodology. In particular, to estimate the total present value of the social costs of the lost jobs or, in this case, of the jobs non-created, we used the ratio of social cost per job loss over annual pre-displacement wage presented in Table A7 of Dubourg's Appendix, which for Italy is 3.03. This factor has been combined with the projected pre-tax salaries of the personnel that would be impacted under the non-use scenario in Section 3.5.2, bottom of page 39.

Questions 9 & 10 (SEA)

Please estimate labour needs, i.e. Full-Time Equivalent (FTEs) jobs, connected to the use of Sodium Dichromate.

Please estimate expected direct and indirect job losses in case of non-authorisation.

Full-Time Equivalent direct ([redacted] (range: 10-50)) and indirect ([redacted] (range: 50-200)) jobs connected to the use of sodium dichromate, which would not be created under the non-use scenario, are presented in Section 3.5.2 and summarised in Table 3-11 at page 39. The calculation spreadsheet is provided as requested.