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Bezirksregierung Köln
Dezernat 54 „Wasserwirtschaft"
Mr. Wirth
50606 Köln/Cologne
GERMANY

Our reference/ Subject
20171222 RIWA position INEOS permit application ozone installation

Date
22 December 2017

Dear mr. Wirth,

This is the position of the Dutch Association of River Water Works in the Rhine river basin (RIWA-Rhine) to the application of INEOS Köln GmbH (INEOS) for a permit to build an ozone treatment for wastewater of acrylonitrile (ACN) and ethylene oxide (EOX) production at their plant in Cologne/Chempark Dormagen. RIWA Rhine is the association of waterworks in the Netherlands that use surface water from the Rhine river basin as a source for drinking water production. Our mission (in German):

'*RIWA strebt danach, eine Oberflächenwasserqualität zu erzielen, die so gut ist, dass eine naturnahe Wasseraufbereitung zur Gewinnung einwandfreien Trinkwassers ausreicht. Entsprechend Artikel 7 der Wasserrahmenrichtlinie bedeutet dies, dass die Wasserqualität weiter verbessert werden muss, sodass langfristig die Aufbereitungsbemühungen vermindert werden können.*'

In light of our mission we welcome the efforts of INEOS and Currenta GmbH & Co OHG (Currenta) to purify the emission of the acrylonitrile and ethylene oxide production at the left bank of the river Rhine between kilometre 709.8 and 710.8. However, we do have several questions and remarks after reading the application for the installation of ozone treatment at the K31 industrial wastewater treatment plant[1].

According to INEOS the purpose of the ozone treatment is to reduce both the levels of pyrazole and 1,4-dioxane. We are surprised to find out by reading the permit application that ACN and EOX production by INEOS has led to significant emissions of pyrazole [up to 1500 kilograms per day] and 1,4-dioxane [up to 27.4 kilograms per day] into the river Rhine. This must have been the case for years and is still ongoing. Also we are surprised that the permit which was given for the emission of treated wastewater from the INEOS production site or the exhaust canal from Currenta did not address these substances before. Under Dutch law it is not allowed to emit substances that are not addressed in the a given permit. We wonder if this is allowed under German law and how it aligns with the EU Industrial Emissions Directive (IED)[2].

Pyrazole emissions affect the Dutch drinking water production

When Dutch authorities found out in 2015 that significant amounts of pyrazole were emitted into the river Meuse by an acrylonitrile production plant, this led to an immediate restriction in the permit. During this period Dutch water works accidentally found that pyrazole concentrations in the river Rhine were even higher than in the river Meuse and warned the Dutch authorities. The Dutch Authorities issued a search message in August 2015 according to the Rhine Warning and Alarm Plan (WAP). The monitoring results led to a short water intake stop form the Lek Canal at Nieuwegein which serves both Waternet (Amsterdam) and PWN (Province of North Holland). Since September 2015 we know that the INEOS

[1] Antrag auf Änderungsgenehmigung nach § 60 Abs. 3 WHG durch Errichtung und Betrieb einer Teilstrombehandlung für ACN- und EOX-Abwässer durch Oxidation / Antrag auf Zulassung vorzeitigen Beginns gemäß§ 60 Abs. 3 WHG i.V.m. § 17 WHG, 31 July 2017
[2] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

acrylonitrile production plant at Cologne/Chempark Dormagen is by far the main source of the concentrations of pyrazole found at the intake points of our Members along the Rhine river basin. This was substantiated by measurements by the State Agency for Nature, Environment and Consumer Protection (LANUV) of North Rhine Westphalia after they acted on the WAP search message and send out the laboratory vessel Max Prüss[3]. It appears that both Dutch and German authorities were unaware until 2015 that pyrazole was emitted into the rivers Meuse and Rhine, nor did they know by whom and in which amounts. From July 2015 until July 2017 the Dutch waterworks frequently measured concentrations of pyrazole exceeding the signal value of 1 µg/L of the Dutch Drinking Water Regulation[4]. As of July 2017 there is a water quality standard set at 3 µg/l in the Netherlands for pyrazole in surface water used for drinking water production. Are INEOS and Currenta allowed to emit pyrazole into the Rhine and if so, under which conditions? What are the monitoring requirements in the permit through exhaust canal B1?

1,4-Dioxane emissions affect the Dutch drinking water production as well

It is only by reading this application that we now know also 1,4-dioxane is emitted into the river Rhine by the same exhaust as pyrazole. The concentrations of 1,4-dioxane are a concern to the Dutch water works for several years now as it appears in their sources in concentrations exceeding the signal value of 1 µg/L[5]. As a result the Amsterdam water company Waternet has had to apply for a permit to use water from the Rhine river basin as 1,4-dixoane concentrations exceeded this signal value for more than 30 days in a row. Waternet was given a permit on 20 December 2017 with which they can abstract water with a maximum concentration of 3 µg/L 1,4-dioxane under restrictions for a maximum of three years[6].

We are interested to know how and when the EOX production process is forming 1,4-dioxane and how the decision is made to start treating the wastewater from this process with the ozone installation. Exactly how is determined whether the catalyst is in its end state? Are INEOS and Currenta allowed to emit 1,4-dioxane into the Rhine and if so, under which conditions? What are the monitoring requirements in the permit through exhaust canal B1?

In our opinion ozone treatment is not the best available technique

From the case of the emission of pyrazole into the river Meuse we know that biological treatment which is applied there can remove this substance with much better results than the projected 83% in this application[7]. This was not addressed sufficiently in the section of the application in which alternative treatments are described nor were the removal rates and costs specified of all the alternative treatments. There was no mention of the use of a specific Best Available Techniques Reference Document (BREF) or the lack thereof. Also any details on the removal capacity of the biological treatment which is preceding the ozone treatment are lacking: when is the biological treatment being installed and to which amount should this treatment lower the concentrations of which substances?

We understand that one of our members has reached removal rates for 1,4-dioxane up to 80% by using UV/H_2O_2 treatment which in this application is written off as too expensive without much substantiation. Since a meeting with INEOS on 16 April 2016 we have the feeling that the choice for ozone treatment was made too quickly and is based too much on economic rather than environmental principles. After reading this application this feeling became even stronger as it appears that the choice for ozone treatment was made in 2015 already and was based on an article published in 1961. We would like to stress that the quoted Implementation Decision[8] does not mention ozone treatment in the descriptions of wastewater treatment and no substantiation is given in the application why ozone treatment is the best

[3] https://www.lanuv.nrw.de/fileadmin/lanuv/analytik/pdf/ECHO_Pyrazol_2017a.pdf
[4] http://wetten.overheid.nl/BWBR0030152/2017-10-27
[5] https://www.riwa-rijn.org/verloop-14-dioxaan/
[6] https://www.officielebekendmakingen.nl/stcrt-2017-74990.html
[7] in https://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:RBLIM:2017:10043 a removal rate of >99% is mentioned
[8] Commission Implementing Decision (EU) 2016/902 of 30 May 2016 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for common waste water and waste gas treatment/management systems in the chemical sector

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available technique. Also it is unclear exactly on which grounds different tested methods of wastewater treatment are considered to be economically unfeasible. Shifting the costs of monitoring and removal of substances to German and Dutch authorities and/or water works might be economically efficient for INEOS but are not sustainable, leading to higher costs for society in contradiction with the polluter pays principle.

From years of experience the Dutch water works know both the benefits and the adverse effects of water treatment with ozone. Most of them have chosen to refrain from ozone treatment as a whole or to apply additional treatment with activated carbon due to the formation of unwanted - or even hazardous - by-products. The most well-known case is the formation of carcinogenic N-nitrosodimethylamine (NDMA) from the treatment of surface water containing N,N-dimethylsulfamide (DMS) with ozone[9]. We are interested in the detailed results of the laboratory and pilot research which led to the conclusion that no harmful metabolites or persistent substances are formed during the ozone treatment. The application refers to a detailed chemical analysis by GC-MS and HPLC of transformation products in the wastewater treated with ozone in cooperation with the *Fraunhofer-Institut für Grenzflächen- und Bioverfahrenstechnik* IGB. We understand that the main transformation products are formic acid and acetic acid and that a new compound 2-methyl-pteridine is formed but it would be interesting to know which other transformation products are formed as well. Can the results of this research be made available? Will all transformation products be monitored in the wastewater and if so with which frequency and are the monitoring results reported to the competent authority and made available to the public? Are all substances which are present in the wastewater of K31 and canal B1 permitted or are INEOS and Currenta only allowed to emit substances which are mentioned in the permit?

Detailed questions and remarks

In who's permit are emissions regulated? We understand that INEOS is running the K31 WWTP while Currenta is the permit holder of exhaust canal B1 through which the treated wastewater is discharged into the River Rhine. Does the current permit of Currenta for discharges in the River Rhine contain implicit or explicit standards for substances which are present in the water treated by INEOS in K31? If not, when and where will this be addressed and on which BREF will it be based?

When will the ozone installation be built? The application letter for the permit is dated 31 July 2017 and in it is the announcement that the ozone plant will be built at the end of October 2017. Has the building process already started or does INEOS have to wait with until the permit application is finished? Is the biological treatment build at the same time? Will the adapted wastewater treatment be operational in April 2018?

On what grounds is the emission of 2-methyl-pteridine considered to be acceptable? A check on the availability of toxicity data by KWR Water Research showed that no toxicity data is available for 2-methyl-pteridine. The structure of 2-methyl-pteridine shows a heterocyclic ring with complex substituents which are indicative of potential mutagenicity or genotoxicity. The lack of a definitive toxicological assessment in respect to these attributes is unacceptable in our opinion.

How is the wastewater treatment controlled and what if unexpected malfunctions occur? The ozone treatment is supposed to work 24 hours, 7 days per week except during maintenance and repair works. How is the wastewater treatment controlled and in which situations is the production process altered or stopped in order to meet the emission requirements? Which guarantees are built-in to avoid insufficiently treated or untreated wastewater to enter the river Rhine in case of unexpected malfunctioning of the installation? We were unable to find any provisions for storage of untreated water during such a situation.

How is the wastewater quality monitored? We could not find any information about the monitoring program through which the wastewater emissions into the river Rhine are controlled. Are pyrazole, 1,4-dioxane and 2-methyl-pteridine analysed and in which frequency? And what were the concentrations and loads emitted in the past? Also we are very concerned which other substances are being emitted as well. The performed toxicological tests for fish eggs, Daphnia, algae and luminous bacteria all address ecological effects and therefore say little about effects on humans to - for instance - chronic exposure to

[9] see for instance https://www.ncbi.nlm.nih.gov/m/pubmed/18800499/

these substances. We strongly believe that it is up to INEOS and Currenta to take responsibility and be transparent about the substances which are present in the treated wastewater and the amount of each substance that is being emitted into the river Rhine.

Consequences for production of drinking water downstream need to be weighed. The application covers a whole range of legal requirements mentioned in for instance the Water Framework Directive (WFD), the IED, the *Wasserhaushaltsgesetz* (WHG) and the *Industriekläranlagen-Zulassungs- und Überwachungsverordnung* (IZÜV). We were unable to find any consideration of the effects of the emissions of INEOS and/or Currenta to the production of drinking water using the river Rhine as a source. In the Netherlands water that is being abstracted from the river Rhine needs to comply with Dutch Drinking Water Regulation when it is used for drinking water production. As artificial infiltration is part of the production process also the requirements of the Dutch Infiltration Decision need to be met. These are only two of many consequences an emission like the one by INEOS and Currenta have on the production of drinking water. We strongly recommend to take these consequences into consideration in the whole permit process.

Use the target values of the European River Memorandum when water quality standards are lacking

RIWA is part of the coalition of associations of water works along the main European rivers, representing the water protection and drinking water interests of more than 115 million people in 17 countries through which these rivers pass: Germany, Austria, Belgium, Bosnia-Herzegovina, France, Croatia, Liechtenstein, Luxembourg, the Netherlands, Montenegro, Romania, Serbia, Slovakia, Slovenia, Switzerland, the Czech Republic and Hungary. Around 170 water companies have joined forces in the form of our associations. The coalition has a common strategy and vision for the sustainable and prevention-oriented provision of drinking water. In light of this strategy we advocate the precautionary protection of water bodies in order to guarantee that the safe and sustainable provision of drinking water without the need for complicated technical measures and high financial costs will remain possible for future generations. Within the framework of the precautionary protection of resources and the general purity requirements of drinking water, it is helpful if the water to be treated by the water works is already of such a good quality that natural processes are sufficient to produce drinking water. For guaranteeing the provision of drinking water in the future in accordance with the precautionary approach of the WFD target values are set in the European River Memorandum[10] (ERM). If rivers and watercourses do not exceed the target values listed in the tables below, it is possible to use them to produce drinking water solely based on natural treatment steps. This is in line with Article 7 paragraphs 2 and 3 of the WFD: paragraph 2 calls on EU member states to improve the protection of water bodies to ensure that further improvement of existing drinking water treatment efforts is not necessary and paragraph 3 even aims at the reduction in the extent of the necessary treatment processes.

With regards,

RIWA-Rhine

dr. Gerard J. Stroomberg
director

[10] http://iawr.org/docs/publikation_sonstige/efg-memorandum_2013.pdf