



Alu Circles Initiative

Turning residuals into resources

Market Consultation Results Report

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1. Introduction

The *Alu Circles* Open Market Consultation (OMC), launched by AquaMinerals and De Watergroep with the support of Allied Waters and Corvers, informed technology providers regarding the upcoming procurement of solutions **for the upcycling or recycling of aluminium based sludges from drinking water treatment, beyond current state of the art**, given the fact that several public procurers are facing the same common challenge and are thus looking to purchase one or more joint solutions.

The OMC also aimed to understand the technology providers' capabilities to satisfy the procurers' needs and to obtain market parties' input on the viability of the procurement plans and conditions as described in the market consultation document and annexes. Technology providers had the opportunity to provide their feedback on the subject-matter of a future procurement which seeks to accelerate the research and development of solutions to the alum sludge challenge. The future buyers of solutions are interested in financing the co-creation of solutions.

The OMC started on the date of its publication in the EU's Official Journal (TED) and ends on the date of the publication of this report. The market consultation was organised in the form of a webinar and an online questionnaire. The webinar took place on the 17th of September 2019 at 13.00h CEST. Interested parties registered for participation in the webinar via the email address https://kwr.webinargeek.com/allied_waters by 16th September 2019.

All interested technology vendors were invited to take part in this OMC, regardless of their geographical location, size or governance structure of their organisation. Participation in the OMC was voluntary and non-binding and, moreover, it was done for own account and risk.

For further clarification of the market consultation and annexes, market parties had the opportunity to ask questions during the webinar and via the following email address: nicoline.scholman@alliedwaters.com.

Any technology provider who desired to supply additional confidential information that is not revealed during the OMC process, could send such information (clearly marked as confidential) at the email address mentioned



above, before the end date to fill out the EU Survey questionnaire of the market consultation (30th of September 2019).

Market parties were kindly invited to fill out the questionnaire available at the following link: <https://ec.europa.eu/eusurvey/runner/AluCircles2019>

The questionnaire was to be filled out before 30th of September 2019. The responses to the questionnaire should have not contained any confidential information. As the questionnaire was intended to explore the market 'as-is', there could be no wrong or right answers. The answers provided may be used as input for our procurement strategy and conditions.

After processing the questions and responses of all suppliers, this report communicates the results. In this context we treat all information provided by technology providers as commercially sensitive and we therefore not communicate any supplier specific details. Only the general findings are summarised and communicated. The resulting anonymised report (excluding any confidential information) is published via Tendered on 30th June 2020.

2. The *Alu Circles* need

Aluminium based flocculants are generally used in drinking water plants treating surface water. The remaining sludge is typically sent to a disposal site, as beneficial uses are few. The sum of internal and out-of-pocket costs of disposal often exceeds 100 €/ton sludge (as is). For a water plant producing 100 million m³/year this represents a cost in the order of 100.000 €/year. The challenge is to convert this one-off use of material into a sustainable solution, including upcycling or recycling, at lower cost.

Cost reduction and sustainability are already proven in practice for residuals from drinking water production including lime pellets and ferric sludges. Alum sludges are the next target, the disposal of which comes at substantial and ever-increasing cost. *Alu Circles* is an international initiative that will use innovation procurement to obtain solutions that reduce the costs in the treatment of alum sludges.

While the current costs for disposal or treatment of alum sludges are increasing, the EU policy in this area focuses on and encourages an innovative, circular approach. Therefore, the aim is to find an innovative, beyond state-of-the-art solutions to upcycle or recycle alum sludge, which:

- Are cost effective, hence leading to cost reduction for water utilities
- Contribute to a circular economy approach
- Are available at TRL-level 7 or higher (see figure 1)

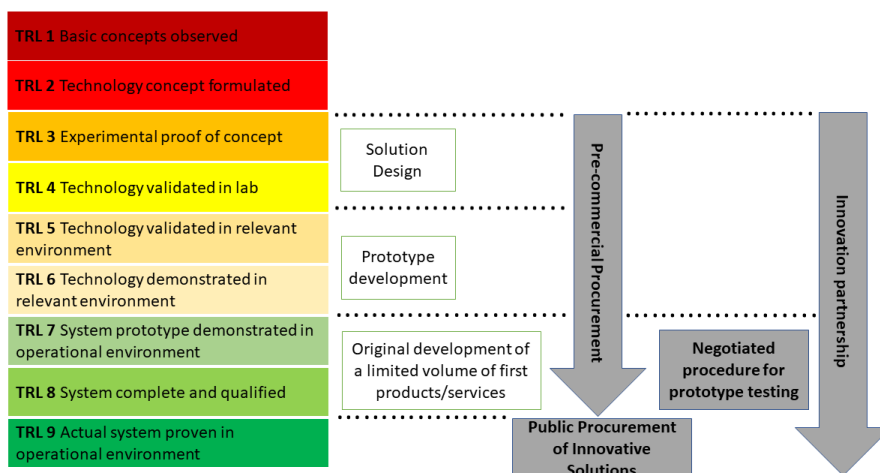


Figure 1: TRL-levels (based on the EAFIP toolkit www.eafip.eu)



3. Joint procurement approach

The *Alu Circles Initiative* organizes a demand side power by establishing a grouping of (EU) water utilities that will prepare and conduct a cross-border innovation through joint procurement to identify the solution to the above mentioned Alum sludge common need. A joint procurement has been chosen to increase the purchasing power of individual procurers enabling technology vendors to deliver better value for money solutions (e.g. economies of scale of production because of the larger potential market/higher value contracts).

Following the Open Market Consultation (OMC) carried out by AquaMinerals (NL) and De Watergroep (BE) with the support of Allied Waters and Corvers, also Scottish Water has expressed its interest to be part of the water utilities group in a joint procurement of solutions for upcycling or recycling of alum sludges. AquaMinerals from the Netherlands will act as the lead procurer on behalf of the water utilities group, therefore, this procurement will be conducted under Dutch law.

Moreover, the results of the market consultation regarding the technology readiness levels and maturity of existing technologies has informed the decision to choose a procedure which allows both for the development and deployment of solutions, since the proposed methodologies/solutions do not reach TRL 7, and only one pre-existing patent presents a methodology at TRL7 which can be developed and tested in an operational environment for further purchase by each water company.

Given that the Innovation Partnership procedure regulated by the European Directives bundles the R&D phase and the deployment of methods/solutions, it has been chosen as the procedure to develop and deploy solutions/methods/processes which can be qualified as so-called 'specialised products', as these solutions / methods / processes can solely be used by contracting authorities operating in the water sector and not in or by other sectors (see the Eafip-based methodology www.eafip.eu).

The Innovation Partnership will be used by *Alu Circles* for a co-creation process with water utilities and researchers in a multi-stage process. The R&D phase will be partially paid by the public procurers, and the market party must bear the other part of the costs itself. The deployment phase will take place on the basis of a framework agreement by every participating water company, if they wish (there is no obligation to do so). The available budget,

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therefore, only extends to the R&D phase and do not comprise the deployment phase.

In addition, a multi-disciplinary approach has been set up to comprise legal, economic and technical expertise required for the proper implementation of the envisaged project.

4. Summary of the feedback to the questionnaire

The following summary compiles the feedback received to the EU Survey questionnaire consisting of 24 questions published on EU Survey:

<https://ec.europa.eu/eusurvey/runner/AluCircles2019>

The results are presented in an anonymized manner as prescribed in the Market Consultation document. The information covers several topics including the ideas on suitable methodologies, classification of technologies, the TRL of solutions, expertise, relevance of patents and advertence of any barriers. In the following questions and answers extracts have been removed to preserve sensitive information.

Questions

1. Do you have an idea of any suitable methodology/approach that can lower the costs of aluminium sludge management (on top of those mentioned in section 7)?

Party X: considers that the most appropriate circularities are on-site or through reuse in wastewater treatment sites, due to the ease in logistics and the reduced need for intensive transversal industry agreements. [EXTRACT REMOVED]

Party Y: considers that reuse of aluminium in the water cycle (or in other industrial sectors linked to aluminium products), can be a suitable approach to implement circular economy. Recovery and reuse of aluminium for added-value applications, such as water treatment or industrial production, can lower the cost of the sludge management and reduce the environmental impact of the waste management. Party Y proposes an advanced technology, based on membrane technology [EXTRACT REMOVED]

2. Do you have knowledge of any suitable methodology/approach for aluminium sludge treatment and upcycling of drinking water residuals (on top of those mentioned in section 7)?

Party X: Nanofiltration using acid resistant membranes [EXTRACT REMOVED]

Party Y: has knowledge on an alternative approach proposed in the literature for the recovery of aluminium based coagulant from the primary sludge produced in drinking water plants, to be reused as coagulant in wastewater treatment facilities.

3. Can you suggest a classification for potential technologies (e.g. per type of residuals etc.)?

Party X: No.

Party Y: suggests that the potential classification of technologies could be conducted based on the final quality of the recovered aluminium (and/or possible uses), efficiency of the recovery and TRL of the solution.

4. Do you have the expertise (e.g. including through consortia) to deliver solutions as described in this document and Annexes?

Party X: is a water technology centre and works closely with the business units that deliver technologies for both the municipal and industrial sectors. Thus, has capacity both in developing and upscaling treatment technologies in complex applications.

Party Y: has a strong background on demonstrating and validating technical solutions for added-value resource recovery and valorization. It is a technological center focused on the application of innovative solutions to the industrial sector, applying the circular economy concept. [EXTRACT REMOVED] Party Y: executed several private projects focused on the recovery of metals (aluminium, iron, zinc, rare earths, magnesium, etc.) from waste effluents (spent baths, slags, ashes, sludge, wastewater, etc.) produced in several sectors (mining, steel, metallurgy, water, etc.). [EXTRACT REMOVED]

5. Are you part of an ongoing research project related to the upcycling of aluminium sludge? Please describe your research project.

Party X: carried out a project for the on-site recycling of alum. At that time it was not successful due to the presence of organic matter in the recovered alum, [EXTRACT REMOVED]

Party Y: has submitted a research proposal at national level to validate a technology available to recover iron or aluminium based coagulants from water treatment sludge [EXTRACT REMOVED]

6. Can you offer relevant functionalities that have not been described in the Market Consultation Document ? If yes, please elaborate.

Party X: proposes 1) recovery of sulfuric acid or use in the leaching process and 2) the solution can be used both for iron and alum recovery, so it will be useful for any municipality

Party Y: can offer a relevant functionality to validate the technologies proposed, demonstrating them in real environments at different scales [EXTRACT REMOVED]

7. Do you commercialize solutions for the treatment of aluminium sludge and upcycling of drinking water residuals? If yes, please elaborate.

Party X: not at the moment, but there is an interest to do so.

Party Y: is a technological center that does not commercialize solutions, but validate, optimize and demonstrate technologies. [EXTRACT REMOVED]

8. At which TRL is your solution, if any?

Party X: current TRL 6. The technology is available commercially, but there needs to be a piloting of it for this application. Process projections have been done and it should be feasible.

Party Y: the proposed technology, [EXTRACT REMOVED] is currently at TRL 5. It could reach TRL 7 after a proper research period in a real environment.

9. Can you describe your approach to developing and testing technologies for the treatment of aluminium sludge and upcycling of drinking water residuals?

Party X: the approach has 4 stages [EXTRACT REMOVED]

Party Y: the proposed technology involves 3 main stages: [EXTRACT REMOVED]

10. Do you have any suggestions for the prototyping and piloting approach?

Party X: with the solution proposed, the best approach would be to pilot the solution at demonstration scale treating part of the sludge flow in a DW facility. No prototyping would be required, commercial modules with low capacity would be used for the pilot phase.

Party Y: several technologies should be piloted in parallel so to be able to compare them under similar circumstances. First the technologies could be tested at bench scale with real wastes of different origins in order to obtain the design parameters for scale-up the technology, compare results between technologies and ensure its transferability and robustness. From bench scale tests, the most promising technologies could be selected for piloting in a real environment. Prototypes can be designed and constructed for implementation in a demo site with real waste, validating the long-term results of aluminium recovery and comparing the recovery efficiencies and qualities obtained.

11. Can you provide any other recommendations to implement the *Alu Circles* procurement considering the TRL of solutions?

Party X: testing of the reuse of recovered alum in a wastewater treatment plant would be valuable, as a low risk application. [EXTRACT REMOVED]

Party Y: recommends the exploitation of innovative solutions at TRL 4-5, with prospect to achieve TRL 7-8

12. What would you consider an appropriate budget for developing your solution beyond TRL level 7? Please elaborate.

Party X: piloting entails taking the solution from a TRL 5 to almost 7-9 [EXTRACT REMOVED]

Party Y: the appropriate budget for validating the technology proposed will depend on several factors such as (i) possibility to perform bench-scale tests to identify parameters for long-term operation and design, (ii) size of the pilot plant, (iii) operational time of the pilot plant (desirable between 6-12months) and (iv) final quality of the recovered product (and so post-treatment needs). [EXTRACT REMOVED]

13. Do you foresee any barriers for the use of existent solutions in different settings? If yes, please elaborate.

Party X: the most important issue is the fact that organic matter present in acid leaching will turn into THM during DW treatment. [EXTRACT REMOVED]

Party Y: no, it is an excellent initiative to implement innovative solutions, taking into account a circular economy approach.

14. Do you foresee any barriers to implement the *Alu Circles* initiative or your proposed solution? If yes, please elaborate.

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Party X: the proposed solution will circumvent the organic matter content problem and achieve good quality alum usable in different applications including very restrictive ones. [EXTRACT REMOVED]

Party Y: possible barriers are related to the final quality of the recovered aluminium, which is going to be linked to the economic aspects of the final implementation of the proposed technology at full-scale. Recovered aluminium should have enough quality for the final use proposed, and this can increment the cost of the treatment or reduce its applicability if not enough quality is recovered. Additionally, regulations for some reuses should be reviewed to ensure the viability (i.e.g. reuse in drinking water applications). Finally the amount of recovered products should fit with the demand for the specific application to ensure constant supply to the end-user.

15. Do you foresee any barriers to forming a pool of water experts for the assessment of technologies?

Party X: no, beyond the IP aspects that will have to be preserved. Companies and organizations should be allowed to keep some of their information confidential and this framework should be established and thought of before implementation.

Party Y: no, a pool of experts for the assessment of technologies is a good option to working forward to the implementation of innovative solution(s).

16. Are there any inadvertencies in the requirements as described in the Market Consultation document ? If yes, please elaborate.

Party X: No

Party Y: No

17. Do you have any reservations regarding the *Alu Circles* approach?

Party X: the information shared here should be kept within the *Alu Circles* team [EXTRACT REMOVED]

Party Y: No

18. What kind of support (technical - such as testing environments - financial or otherwise) do you expect from the contracting authorities?

Party X: economical to fund the pilot and testing costs. Limited operational support on site. Testing sites can be provided.

Party Y: technical and financial support is expected to validate the proposed technology or compare the existing options. Technical support is required to

(i) define the quality of the final product to be reused, (ii) implementation of our proposed technology so to demonstrate it in a real environment (iii) get feedback to improve the technology. For financial support, a budget for the implementation of a proposal is required.

19. Can you indicate whether the listed patents and standards in the prior art analysis (Annex 2) are relevant ?

Party X: some are relevant other not related to the solutions described.

Party Y: yes, they are relevant as they cover different applications

20. What kind of exit-schemes would you expect to implement to safeguard your business & commercial interests? Under what circumstances would you expect to terminate the project?

Party X: achieve a consortium able to implement and demonstrate the proposed technology at pilot scale. The proposal can be validated at pilot scale, with the insight to achieve full-scale application.

Party Y: beyond common contracting aspects in these types of projects and pilotings, contracting authorities and other governing bodies of the consortium should not share confidential information. Economical support or the piloting should be provided. Lack of these two elements would mean termination of the contract

21. Would you be interested to get access to venture capital funds to scale up you solution?

Party X: scaling up would not require venture capital

Party Y: no, it is preferred to scale-up the proposed technology together with a financial partner. [EXTRACT REMOVED]

22. Can you name additional relevant standards and patents? Are you aware of other relevant rights or trade secrets? If so, please provide reference to the relevant patent registration and details, as well as a general description of any relevant rights or trade secrets.

Party X: no

Party Y: no additional information to include.

23. Do you own any IPR relevant to the *Alu Circles*?

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Party X: one related to membrane.

Party Y: No

24. Are you aware of any patents that may constitute a barrier to your delivering a solution in the envisaged *Alu Circles* procurement?

Party X: there is no limitation.

Party Y: no.

5. Outcome and conclusion

Based on the feedback received from the market, the proposed research ideas reach a maximum of TRL 5 or TRL 6. Only one relevant patent of a method shows a prior art at TRL 7¹, which could be developed and brought up to TRL 8 / 9, which is the ideal scenario.

As a follow up of the market dialogue conducted by AquaMinerals and De Watergroep, a decision was taken to set up a joint procurement procedure to develop such method from TRL 7 up to TRL 8 / 9. The joint procurement will be carried out by AquaMinerals, De Watergroep, and also Scottish Water which has expressed its interest. On behalf of this group of water utilities, AquaMinerals shall act as lead procurer and the procurement will be conducted under Dutch law.

The procurement procedure should allow for all the following steps:

- (i) development of a design (as part of the award criteria of the procurement procedure);
- (ii) testing methods in a lab environment – if applicable -;
- (iii) testing methods in a relevant pilot environment as a real live pilot application; and,
- (iv) the deployment and implementation of solutions/methods/processes. In this case, after the R&D, each member of the buyers group could have the option to (iv) i.e. purchase the resulting solutions / methods / processes.

With the purpose to cover the abovementioned steps, the Innovation Partnership regulated by the European Public Procurement Directives² is the chosen procedure, as it covers the development and deployment of solutions. The Innovation Partnership procedure is based on the procedural rules that apply to negotiated procedures with prior call for competition and contracts should be awarded on the sole basis of the best price-quality ratio, which is most suitable for comparing tenders for innovative solutions.

¹ The holder of the patent is Feralco AB. The relevant test and research has been published in (scientific) journals. Although the patent of 2005 is at present void, the method could be developed from TRL 7. <https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2005037714>

² Art.49 of Directive 2014/25/EU on procurement by entities operating in the water, energy, transport and postal services sectors <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0025&from=NL>

Furthermore, it is understood that the solutions/methods/processes to be developed and deployed as part of the Innovation Partnership, can be qualified as so-called 'specialised products', since these solutions/methods/processes can solely be used by contracting authorities operating in the water sector and not in or by other sectors.

The R&D phase will be partially paid by the public procurers, and the market party shall bear the other costs itself. The deployment phase will take place on the basis of a framework agreement by every participating water company, if they wish (there is no obligation to do so). The available budget, therefore, only extends to the R&D phase of the Innovation Partnership procedure carried out by AquaMinerals as lead procurer on behalf of the water companies.

AquaMinerals and De Watergroep, as the initiators of the *Alu Circles Initiative*, expressly offer the opportunity to interested market parties to object to the decision and the substantiation to enter into an Innovation Partnership (hereinafter: the decision of the initiators of the *Alu Circles Initiative*) by instituting summary proceedings before the competent court in Utrecht (arrondissement Midden-Nederland), The Netherlands, within 20 calendar days of the date of publication of this report. This means that the summons must be served to AquaMinerals within the aforementioned period of 20 calendar days. This period of 20 calendar days is an expiry period.

This means that if a market party has not brought summary proceedings before the court in the competent court within the expiry period, that decision is final; he has then processed his rights to challenge that decision. The initiators of the *Alu Circles Initiative* are then free to (further) follow up on their decision. Any requests for (further) motivation of the decision shall not suspend this objection period.

The expiry period also precludes a market party that has not itself instituted summary proceedings within this period from intervening in summary proceedings brought by another market party on the side of that other market party.

The initiators of the *Alu Circles Initiative* shall never be obliged to actually start the intended tender procedure(s).

If summary proceedings are instituted, AquaMinerals (the initiators of the *Alu Circles Initiative*) shall await the outcome of the disputed part before proceeding with the execution of that disputed part of the decision. For the rest, AquaMinerals (the initiators of the *Alu Circles Initiative*) remains entitled (but not obliged) to implement the undisputed part of the decision.

After the outcome in summary proceedings, AquaMinerals (the initiators of the *Alu Circles Initiative*) will consider how to deal with the outcome.

After expiry of the objection period (expiry period) of 20 calendar days, market parties can no longer affect the decision of AquaMinerals (the initiators of the *Alu Circles Initiative*). Any claims for compensation (by market parties that may or may not have commenced preliminary relief proceedings) must be brought in substantive proceedings no later than 60 calendar days after the publication of this final report. Letting this period expire unused is interpreted as waiving the right to claim damages and will (therefore) result in the processing of the right to institute another action for damages.

Since AquaMinerals and De Watergroep (the initiators of the *Alu Circles Initiative*) are of the opinion that it is the interest of technology vendors to understand the consequences of their decision and to avoid any misunderstanding, the following is applicable and explicitly stated in Dutch:

AquaMinerals (de initiatiefnemers van The Alu Circles Initiative) bieden nadrukkelijk de mogelijkheid aan marktpartijen om tegen het besluit en de onderbouwing om tot een innovatie partnerschap over te gaan (hierna: de beslissing van de initiatiefnemers van The Alu Circles Initiative) bezwaar te maken door een kort geding procedure aanhangig te maken in het arrondissement Midden-Nederland binnen een termijn van 20 kalenderdagen na het moment van publicatie van dit verslag. Dat betekent dat de dagvaarding binnen voornoemde termijn van 20 kalenderdagen moet zijn betekend aan het adres van AquaMinerals. Deze termijn van 20 kalenderdagen is een vervaltermijn.

Dat wil zeggen dat indien een marktpartij niet binnen deze vervaltermijn een kortgedingprocedure aanhangig heeft gemaakt bij de rechtbank in het arrondissement Midden-Nederland die beslissing onherroepelijk is; hij heeft dan zijn rechten verwerkt om nog tegen die beslissing op te komen. De initiatiefnemers van The Alu Circles Initiative zijn dan vrij om (verder) gevolg te geven aan hun beslissing. Eventuele verzoeken om (nadere) motivering van de beslissing schorten deze bezwaartermijn niet op.



Deze vervaltermijn staat er bovendien in de weg dat een marktpartij die binnen deze termijn niet zelf een kort geding aanhangig heeft gemaakt, zich in een door een andere marktpartij aanhangig gemaakt kort geding voegt aan de zijde van die andere marktpartij.

De initiatiefnemers van The Alu Circles Initiative zijn nimmer verplicht om de voorgenomen aanbestedingsprocedure(s) daadwerkelijk te starten.

Indien er een kortgedingprocedure aanhangig wordt gemaakt, zullen de initiatiefnemers van The Alu Circles Initiative de uitkomst van het betwiste onderdeel afwachten, alvorens tot uitvoering van dat betwiste onderdeel van de beslissing over te gaan. Voor het overige, blijft AquaMinerals (de initiatiefnemers van The Alu Circles Initiative) zonder meer gerechtigd (maar niet verplicht) tot uitvoering van het niet betwiste deel van de beslissing over te gaan.

Na de uitkomst in kort geding zullen de initiatiefnemers van The Alu Circles Initiative zich beraden hoe met de uitkomst om te gaan.

Na het verstrijken van de bezwaartermijn (vervaltermijn) van 20 kalenderdagen kunnen marktpartijen de beslissing van de initiatiefnemers van The Alu Circles Initiative niet meer aantasten. Eventuele vorderingen tot schadevergoeding (door marktpartijen die al dan niet een kortgedingprocedure zijn gestart) dienen uiterlijk binnen 60 kalenderdagen na publicatie van dit eindverslag in een bodemprocedure te worden ingesteld. Het ongebruikt laten verstrijken van deze termijn wordt uitgelegd als het afzien van het recht om schadevergoeding te vorderen en zal (dus) leiden tot het verwerken van het recht om nog een schadevergoedingsactie in te kunnen stellen.