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EXPANDED CLAY AGGREGATE (ECA)

APPLICATION IN PRETREATMENT OR TREATMENT OF SURFACE WATERS, LAKES, WATER BODIES

Why Expanded Clay Aggregate (ECA):

- Expanded Clay Aggregate (ECA) provides a new, cost effective and consistent ways in addressing environmental concerns such as wastewaters, sewage, storm water and industrial effluents. These serve as a threat to our ecosystem as well as our clean water.
- Expanded Clay Aggregate (ECA) is an environmentally friendly product that is design to correct the above mentioned environmental crisis.
- Expanded Clay Aggregate (ECA) provides low-maintenance product that meet government regulations; where there is no chemical use, specialized equipment are used and no major facility upgrade is required.
- As a replacement for sand, Expanded Clay Aggregate (ECA) is a newly developed technology that serves as a filter medium in the treatment or pretreatment of surface waters, lakes and all other water bodies.

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Why Expanded Clay Aggregate (ECA):

- Expanded Clay Aggregate (ECA) is an exceptional filtering material for suspended solids, metalloids, oil and other poisonous hydrocarbons (Pyrene, Flouranthene, and Phenanthrene).
- Expanded Clay Aggregate (ECA) is considered as one of the best filtering material because of its durability, alongside with its porous structure and its increased surface area.
- Expanded Clay Aggregate (ECA) has a long-term capacity to absorb pollutants and maintain hydraulic conductivity due to its durability and increased surface tension. And these bring about a sustainable and effective water treatment.
- Expanded Clay Aggregate (ECA) can also be used as a bio-filter in treatment of swimming pools rather than using energy-consuming and expensive chemical water filter.

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Why Expanded Clay Aggregate (ECA):

- Expanded Clay Aggregate (ECA) is 100% inert, natural, durable and rot-free, providing an ideal biological filtration for ponds, pools or wastewaters. Also, numerous studies have shown that, it is highly unnecessary to treat wastewaters with chemicals, that it is advisable to use bio-filtration method which requires less energy.
- Agricultural wastewaters such as olive mill wastewater, swine wastewater (contaminated with oxytetracycline), and water contaminated with herbicides (2-MethylChloroPhenoxyAcetic acid). These wastewaters can be treated using Expanded Clay Aggregate (ECA) as the bed substrate and planted with Phragmites australi.
- Swine wastewater and Olive mill wastewater contains total suspended solids and high organic content, these pollutants can be removed by this process (planted Expanded Clay Aggregate (ECA) bed) with an efficiency higher than 80%.

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Why Expanded Clay Aggregate (ECA):

- Concerning water contaminated with Herbicide (2-MethylChloroPhenoxyAcetic Acid), study has showed that Expanded Clay Aggregate (ECA) has high sorption ability for the herbicide (2-MethylChloroPhenoxyAcetic Acid), so the removal efficiency is about 56-97%.

- Therefore Expanded Clay Aggregate (ECA) is considered as the best substrate for agricultural wastewater treatment.

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Why Expanded Clay Aggregate (ECA) Is Preffered To Other Aggregates?:

The use of Expanded Clay Aggregate (ECA) over other aggregates in the treatment or pretreatment of surface waters and lake bodies is dependent on the following factors:

- Expanded Clay Aggregate (ECA) physical properties
- Expanded Clay Aggregate (ECA) Performance properties

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Why Expanded Clay Aggregate (ECA) Is Preffered To Other Aggregates?:

Physical Properties:

The physical properties of Expanded Clay Aggregate (ECA) includes the following:

- It’s dependable and consistent
- Expanded Clay Aggregate (ECA) is chemically and physically inert
- Expanded Clay Aggregate (ECA) has great hydraulic conductivity which allows fast and free drainage/binding of pollutants such as phosphorus.
- It has an increased surface area
- Due to its ceramic properties, it reduces material degradation
- Reduced handling costs

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Why Expanded Clay Aggregate (ECA) Is Preffered To Other Aggregates?:

Performance Properties:

- Expanded Clay Aggregate (ECA) has a lower maintenance cost and it's economical
- It's readily available and easy to use in treatment of waste water, sewage and industrial effluents.
- It has a predictable performance and longevity
- It employs ion exchange for an effective treatment process
- It removes solid material that can bring about clogging
- Effective reduction or removal of arsenic, phosphorus, metals, oil, grease and poisonous hydrocarbons.
- It combines effluent filtration and nutrients removal for cleaner discharge.
- It has a greater surface area which makes filtration of pollutants effective.

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Why Expanded Clay Aggregate (ECA) Is Preffered To Other Aggregates?:

- Industrial by-products such as slags are very risky to introduce due to possible leaching properties of heavy metals and this cannot be easily foreseen.
- Substrates such as fly ash and other fine particles would be more difficult to use because they would have to be blended, making them less desirable and they are more costly to apply than larger diameter media such as ECA.
- Also, high transportation costs rule out non-local products.
- Lastly, calcium products (amorphous) will eventually cementify and this will reduce the effectiveness in the filtration systems.

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Why Expanded Clay Aggregate (ECA) Is Preffered To Other Aggregates?:

- Considering all these factors, Expanded Clay Aggregate (ECA), dolomite and all other natural activated diatomaceous earth are the substrates most likely to be used for treatment or pretreatment of water at Tahoe.
- These materials are specifically, aluminum, iron or calcium based and many of these have a high specific surface area; and all have low transportation costs.

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Expanded Clay Aggregates (Eca) And Its Application In Treatment Or Pretreatment Of Lakes, Surface Water And Other Water Bodies

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Using Expanded Clay Aggregate (Eca) In The Treatment Of Landfill Leachate In On-site Lagoons And Constructed Wetlands:

- High-tech landfill leachate treatments systems are often shun due to high operation and construction costs. An alternative integrated technique in the treatment of landfill leachate was carried out.
- A biological treatment system was performed by collecting leachate from a community sanitary waste landfill on-site, as this area has a cool temperate continental climate.
- This treatment system was constructed in a ravine and this has been in used since June 1992.
- The filter used was Expanded Clay Aggregate (ECA) of 12-20mm in size.

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Using Expanded Clay Aggregate (Eca) In The Treatment Of Landfill Leachate In On-site Lagoons And Constructed Wetlands:

- As per the reference of National Center for Biotechnology Information, U.S. National Library of Medicine, Two (2) parallel constructed wetlands were introduced and they were planted with Typha latifolia and Phragmites australis.
- The integrated treatment system has no moving parts aside the aerators/mixers. At the end of the whole treatment process, the overall removal of Phosphorus, Nitrogen, Iron, pathogens and organic matters is about 75-96%.
- This research shows how Expanded Clay Aggregate (ECA) is highly effective in the treatment of landfill leachate.

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Physico-chemical Screening Of Phosphate-removing Substrates (Expanded Clay Aggregate) For Use In Constructed Wetland Systems:

- The research objective was to show how Expanded Clay Aggregate (ECA) as a substrate enhances phosphate removal from waste water in a constructed wetland system (subsurface horizontal flow).
- Measured properties where: Cation Exchange Capacity (CEC), pH, hydraulic conductivity, specific surface area, porosity, and phosphate (P) adsorption capacity.
- Out of the substrates used, Expanded Clay Aggregate (ECA) showed the highest Phosphorus adsorption values, followed by limestone, and bauxite.
- On this basis, it was confirmed that Expanded Clay Aggregate (ECA) had the great combination of properties as a substrate for constructed wetland systems.

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Potential Application Of Adsorptive Media (Expanded Clay Aggregate) To Enhance Phosphorus Uptake In Stormwater Basins And Wetlands At Lake Tahoe:

- Phosphorus removal by basins and wetlands in Lake Tahoe may be enhanced by fabricating the systems to filter storm-water through an aggregate media that has higher phosphorus removal capabilities than local parent material. Substrates that are rich in aluminum, calcium and iron mostly have enhanced phosphorus removal.
- The substrates can be engineered, naturally occurring, byproducts of water or industrial treatment processes, and so on.
- Phosphorus removal generally occurs through precipitation and/or chemical adsorption and much of the phosphorus can be irreversibly bound.
- The only standard medium and substrates that is highly effective in the removal of phosphorus is Expanded Aggregate Clay (ECA).
- This medium, which possesses with a high positive surface charge, can also irreversibly remove phosphorus.

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Potential Application Of Adsorptive Media (Expanded Clay Aggregate) To Enhance Phosphorus Uptake In Stormwater Basins And Wetlands At Lake Tahoe:

- Physical factors also affect Phosphorus removal. Particle size and specific surface area affect filtration capacity, contact area between the surface area and the water, and also blinding and clogging.
- Other non-performance factors such as costs, application logistics, and environmental considerations narrow the list of possible media for treatment or pretreatment of water bodies.
- Industrial by-products such as slags are very risky to introduce due to possible leaching properties of heavy metals and this cannot be easily foreseen.
- Substrates such as fly ash and other fine particles would be more difficult to use because they would have to be blended, making them less desirable and they are more costly to apply than larger diameter media such as Expanded Clay Aggregate (ECA).
- Also, high transportation costs rule out non-local products.

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Potential Application Of Adsorptive Media (Expanded Clay Aggregate) To Enhance Phosphorus Uptake In Stormwater Basins And Wetlands At Lake Tahoe:

- Calcium products (amorphous) will eventually cementify and this will reduce the effectiveness in the filtration systems.
- Considering all these factors, Expanded Clay Aggregate, dolomite and all other natural activated diatomaceous earth are the substrates most likely to be used for treatment or pretreatment of water at Tahoe.
- These materials are specifically, aluminum, iron or calcium based and many of these have a high specific surface area; and all have low transportation costs.

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EXAMPLE CITATION

The Use Of Expanded Clay Aggregates (Eca) For The Pretreatment Of Surface Waters On The Example Of A Tributary Of Lake Klasztorne Górne In Strzelce Krajeńskie:

The study shows the treatment of river water based on Expanded Clay Aggregate (ECA). ECA is lightweight mineral aggregate containing components that enhance phosphorus adsorption (aluminum, calcium, manganese, iron).

A study plant was built on a nutrient rich in Nitrogen(10 mg d/m3) and Phosphorus (0.4 mg d/m3), small, and natural watercourse (Młynówka River, a tributary of Noteć basin, the municipality of Strzelce Krajeńskie).

On the basis of this study, the calculated work-ability/effectiveness of ECA filters in removing large amounts of contaminants from water was: Nitrogen (6-7%), Phosphorus (10-14%), and for suspensions (12-25%).

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The success of the treatment is highly influenced by the hydraulic load.

The ease of operation, simplicity of performance, and low cost of maintenance and construction, the pretreatment plants based on Expanded Clay seem to be a promising technique for the protection of surface waters in catchments of streams and small rivers.

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Benefits Of Using Eca In Treatment And Pretreatment Of Surface Water, Lakes And Other Water Bodies:

- It’s dependable and consistent
- Expanded Clay Aggregate (ECA) is chemically and physically inert
- Expanded Clay Aggregate (ECA) has great hydraulic conductivity which allows fast and free drainage/binding of pollutants such as phosphorus.
- It has an increased surface area
- Due to its ceramic properties, it reduces material degradation
- Reduced handling costs
- Expanded Clay Aggregate (ECA) has a lower maintenance cost and it’s economical

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Benefits Of Using Eca In Treatment And Pretreatment Of Surface Water, Lakes And Other Water Bodies:

- It’s readily available and easy to use in treatment of waste water, sewage and industrial effluents.
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