

Expression of Interest

India – Sweden Collaborative Industrial Research & Development Programme 2025

Company Information

1. Company Name: Envergy Projects Ltd.
2. Company Description: We are an ISO 9001, 14001 & 45001 Certified organization, 38+ countries and has 16 Business Verticals with end-to-end solutions with in-house state-of-art R&D Laboratory driven & supported by lab scale & pilot plants
3. Country (India/Sweden): India
4. Sector and subsector: Environmental engineering
5. Year Established: 2008
6. Company Website: www.envergy.co.in

Contact Information

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Proposed Area of Project/ Proposal: Nanocavitation application in cement and steel industries

Summary of the Proposed Project/Proposal: NanoCavitation have significant applications in both the cement and concrete industry, primarily in enhancing material properties and durability, and in the steel industry, mainly for corrosion and scale inhibition in water systems.

❖ Nanoavitation generated nanobubbles applications in the Cement and Concrete Industry

NanoCavitation generated nanobubbles (NBs) are used as an innovative additive in the mixing water for cement and concrete, leading to several key benefits:

- **Improved Mechanical Properties:** The use of nanocavitation approach generating nanobubbles water (NBW) significantly enhances the compressive and tensile strength of concrete, with studies showing potential increases in compressive strength of up to 60% compared to using plain tap water. This is attributed to the formation of a denser, more uniform microstructure within the cement matrix.
- **Enhanced Durability:** NB improves concrete durability by increasing resistance to water absorption, chloride penetration, and freeze-thaw cycles. The refined pore structure and reduced overall porosity create a tighter material that is less susceptible to environmental damage.
- **Accelerated Hydration and Setting Time:** NanoCavitation act as nucleation sites for the formation of cement hydration products (like C-S-H gel), which accelerates the early hydration process and promotes faster initial strength development.
- **Improved Workability and Rheology:** Due to their negative surface charge and ability to adsorb onto cement particles, NBs help disperse the particles evenly, reducing internal friction (acting as "nano-bearings") and improving the mixture's flowability and pumpability without increasing the water-cement ratio.
- **Sustainability and CO₂ Sequestration:** The technology offers an eco-friendly alternative to chemical admixtures. NBW capable of capturing carbon dioxide (CO₂) has been developed for "carbon-consuming concrete," allowing for CO₂ sequestration within the material and reducing the carbon footprint of cement production.

❖ **Nanocavitation generated nanobubbles applications in the Steel Industry**

In the steel industry, NanoCavitation generated nanobubbles are mainly used in water-related processes, particularly for equipment maintenance and material protection:

- **Corrosion Inhibition:** NanoCavitation generated nanobubbles act as a "green" and inexpensive corrosion inhibitor for steel equipment and pipes, especially in challenging environments like acidic geothermal fluids or circulating cooling water systems. They form a "bubble mattress" or a nanoscopic coating on the metal surface, which physically isolates the steel from the corrosive fluid and can also promote the formation of a protective passivation layer (e.g., silica precipitation).
- **Scale Prevention:** NanoCavitation generated nanobubbles can inhibit the formation of mineral scales, such as calcium carbonate, on metal surfaces. They help to disperse scale-forming particles and alter surface properties, reducing the adhesion of deposits.
- **Cleaning and Defouling:** Electrochemically generated NanoCavitation generated nanobubbles can be used as cleaning agents to remove organic and inorganic fouling from stainless steel surfaces in various industrial systems and further to crack or break the recalcitrant or refractory pollutants.
- **Mineral Processing:** NanoCavitation generated nanobubbles are highly effective in enhancing the flotation of ultrafine minerals (such as fly ash or fine coal), a process used in the steel industry to purify materials, leading to improved efficiency and reduced chemical usage

Main characteristics and specific technological expertise of potential partner you are looking for:

1. Technical competency in cement and steel manufacturing processes
2. In house testing and analytical laboratory for cement and steel parameters
3. Civil and mechanical engineers

4. Geologist
5. Mining engineers
6. Hands on experience in working for cement and steel industries
