Oceanic Phosphorus Recovery

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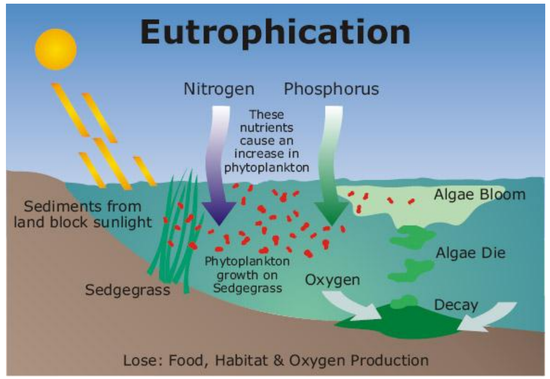
May 22, 2016: **AIChE Projects – Prototype Showcase**

Background

- Accumulation of **phosphorus** in the ocean has been shown to be beneficial to algae but fatal to marine life.
- **37 areas** on the west coast alone currently suffer from low oxygen content, among other maladies, due to algal blooms (eutrophication).

- Marine ecosystems affected by eutrophication may be restored through the reduction of oceanic phosphorus.



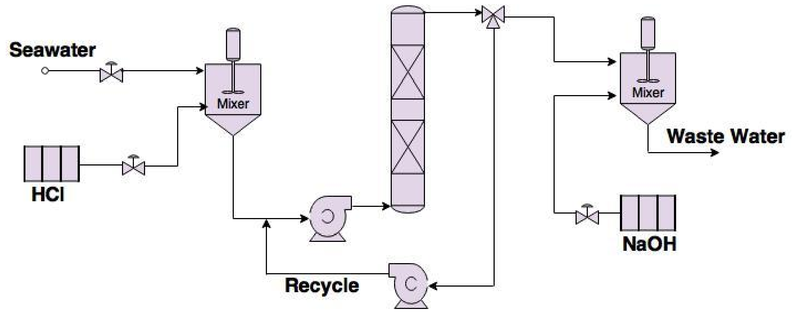
Project Goals:

1. **Clear dead zones** by extracting phosphates with a selective nanocomposite adsorption process.
2. **Recycle** extracts into soil by coordinating with manufacturers to incorporate phosphates into fertilizer.

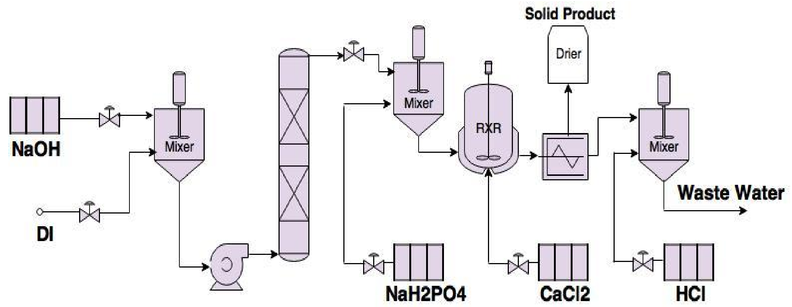
Current Design & Results

OPR's process design consists of two stages:

1. Collection



2. Recovery & Conversion



Focus of Work Thus Far:
Nanocomposite Synthesis & Lab-Scale Process Validation

Synthesized Nanocomposite (MgAlZrOH) can adsorb phosphates from seawater (pH 6) where selectivity is high.

Path Forward

- Determine the **column efficiency** with standard NaH2PO4 solution of known concentration
- Test column efficiency under real conditions with pretreated seawater
- Identify the precipitation of hydroxyapatite produced in our system and its **percent yield to be recycled** as commercial fertilizer
- **Scale and automate** design to involve electronic valves, high pressure pumps, and tighly-packed nanocomposites

Lab scale phosphate extraction by adsorption.

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