**Study and Proposed Pilot of Biogas Water Wash and Struvite Recovery Process at MMSD’s Wastewater Facilities**

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### Objective

**Biogas Water-wash**
- Clean and purify biogas to remove H2S and Siloxanes using a much lower cost approach.
- Upgrade CH4 content from 65% in raw biogas up to 98%.
- Utilize separated CO2 for beneficial use in wastewater treatment processes involving pH, alkalinity adjustment and phosphorus removal.

**Goal of Pilot: Biogas Water-wash**
- Determine Water Wash System Performance; inputs/outputs
- Determine Water Wash Energy Balance
- Assess CO2 Benefits; Alkalinity/pH control, phosphorous removal

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**Introduction**

A new low-cost biogas purification approach that uses water as a natural solvent to clean the gas and produce Renewable Natural Gas (RNG) is being developed. The high-quality RNG biogas fuel can be used seamlessly with natural gas, providing a greenhouse gas neutral fuel alternative. In addition, the separated CO2 gas has beneficial applications in wastewater treatment, e.g., pH/alkalinity adjustment and phosphorus removal.

To date, UWM has completed a preliminary design analysis using ASPEN PLUS™ simulations, a chemical process optimization software which provided performance results covering a wide range of operational conditions.

The next step in verification of this biogas purification technology is to perform a proposed pilot test at Milwaukee Metropolitan Sewage District’s (MMSD) South Shore wastewater treatment facility and conduct laboratory testing in conjunction with this work together with Energy Tech Innovations, LLC.

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**Preliminary Analysis**

**ASPEN Plus Simulations**

The separated CO2 can be used to provide beneficial pH/alkalinity adjustments in wastewater treatment. The use of CO2 for phosphorous (P) treatment will also be analyzed. Digester effluent samples will be tested to see the effects of CO2 and corresponding changes in pH and phosphorus removal with the addition of MgCl2.

The figure below shows Westerner et al.’s work at North Carolina State University and North Carolina A&T State University, 2009.

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**Analysis to CO2 Benefits**

**Financial Significance/Benefits:**
- Low cost system, targeting 30% savings
- Potential low operating pressure, 50 psig
- Gas contaminant removal, H2S and siloxanes
- Less costly than natural gas to produce
- Beneficial use of CO2 into wastewater treatment processes for pH/Alkalinity and Phosphorus removal

**Innovation in Biogas Purification Approach:**
- Non-metallic materials and unique internal features
- Modular system scalable from small to large
- Parallel arrangement increases flow while series increases purity by using one or more absorbers
- Flexible arrangement configurations

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**Bibliography**