

## RESEARCH ACTIVITIES

**Dr. Mark E. Zappi, PhD, PE**  
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### Career Overview

Dr. Zappi works in three primary areas of research: production of green fuels and chemicals, environmental engineering, and energy markets development. He has worked for the Department of Defense's Engineering Research and Development Center; Department of Chemical Engineering at Mississippi State University; and the University of Louisiana (UL). Over his career, he has more than 200 publications, given over 300 presentations, secured over \$40M in R&D funding, and led numerous large R&D units. Currently, he holds the BORSF Endowed Chair in Bioprocessing and serves as the Executive Director of the Energy Institute of Louisiana. He is a full professor in both the Departments of Chemical and Civil Engineering (tenured and home unit is Chemical Engineering).

### Summary of R&D Activities

**Production of Green Fuels and Chemicals** – A new generation of fuels and chemicals are being produced using renewable feedstocks (biomass) and/or processes designed to minimize their ecological footprint (sustainable production methods). Example research Dr. Zappi is involved with includes: production of high quality biogas from waste inputs such as manures, sewage, and/or foodwastes; conversion of waste wood into biocoal; production of high-end adhesives from waste sewage sludge; and production of lipids from novel biological sources (microalgae, bacteria, and yeasts). In particular, his goal is to develop technologies that can take wastes generated in urban areas and produce a wide variety of valuable chemicals and fuels; thereby, making urban areas a source for the new generation of biorefineries.



**(L to R) Culturing Microalgae, Pilot Scale Anaerobic Digester, & Production of Lipids from Yeast**

**Environmental Engineering** – Dr. Zappi is convinced that man's industrial activities and residential systems can be completely ecologically neutral. To accomplish this vision, he

is focusing on developing treatment technologies that utilize chemical, biological, and/or physical mechanisms for destroying/removing pollutants from contaminated media (water, soil, wastes, and air). Example treatment processes include peroxone oxidation, anaerobic digestion, production of natural adsorbents, UV oxidation, and design of advanced high performing polymeric adsorbents. Recently, he is leading a team that was funded by NASA to develop a method for converting human-derived wastes at NASA human space camps on Mars into energy products (\$2.2M grant). His work ranges from the basic aspects of R&D, such as elucidation of functioning mechanisms, to design oriented applied R&D, such as design of a novel digester system.



**(L to R): Bioslurry treatment of contaminated soil, insitu chemical oxidation using Fenton's Reagent, and development of a kenaf-based adsorbent**

**Energy Markets Development** – Dr. Zappi researches issues that either control the global markets for energy systems or serve as impediments to the commercialization of novel, new energy processes. He is often sought-after to present his findings to investor and technology developers. Dr. Zappi often assist economic development entities with assessing and recruiting new energy companies into their regions. He also provides technical due diligence to investor groups. He currently holds three US patents with five more pending involving technology commercialization.