HAMMOND
HAMMOND GROUP, INC.

1414 Field St.
Hammond, IN, 46320
Tel: 219-931-9360

Re: Project Proposal - California Community Protection and Hazardous Waste Reduction Initiative

Introduction

Founded in 1930, Hammond Group, Inc. (HGI) is a specialty chemical company that is advancing hybrid automotive and renewable energy markets through proprietary battery chemistry.

HGI supports these emerging markets with two manufacturing operations in Hammond, IN and another facility in Pottstown, PA. HGI also has International operations in Gateshead, England; and another in Kuala Lumpur, Malaysia.

In 2015 HGI completed their state-of-the-art Lead Acid Battery Laboratory: $E=(LAB)^2$ at 3100 Michigan Street. This facility is a center-of-excellence for ongoing development of advanced battery & energy storage chemistry. It also houses a high-capacity performance additives production line that serves all of North and South America. In 2016 HGI completed the outside remodel of their powdered metallurgy plant located at 2308—165th Street.

HGI believes innovative lead acid battery additives can be used to maintain rated battery performance and life while complying with new DOE regulations that in turn serve to reduce overall CO_2 emissions. Lead-acid batteries are 100% recyclable and generate much less waste relative to other technologies such as lithium-ion which cannot be economically recycled at end-of-life.

HGI proposes to enter into a cooperative pilot project with the California Department of Toxic Substances Control (DTSC) to investigate the hazardous waste reduction benefits of one or more HGI technologies currently under research and development.

Background

Over one-hundred fifty billion kilowatt hours of electric energy valued at $19 billion per annum is wasted due to idle load consumption. Wasted electricity generation results in 100 million metric tons of CO_2 emissions per year from coal and natural gas fired power generation plants. The California Energy Commission (CEC) addressed idle load inefficiencies by implementing regulations focused on consumer and commercial battery charging systems. The U.S. DOE followed suit in 2016 by adopting the CEC's consumer standards. Effective no later than June, 2018 the new DOE standard requires battery charging systems greater than 2kW not to exceed 110% of charge return factor (10% overcharge), thereby impacting current battery design performance. This DOE mandate creates a new challenge for lead acid batteries used in deep cycle applications such as fork lifts and golf carts which were designed to accept a 20% overcharge to maintain rated performance and battery life.

HAMMOND
HAMMOND GROUP, INC.

A reduction in battery charging energy translates to less power required from carbon based power plants. This net reduction in electrical power can be measured in terms of kilowatt hours otherwise used to overcharge batteries from 110 to 120%. Therefore, the kilowatt hours saved are a key performance metric that can be correlated to a reduced carbon footprint.

Hammond Group, Inc. in a combined effort with battery manufacturers is researching solutions to address the DOE's lower charge return regulations. Innovations in lead acid battery additives for both positive and negative plate chemistries have been shown to improve charge acceptance efficiency. A combination of Hammond's SureCure™ used in positive plates and an expander formulation (AE Capacity) used in the negative plates effectively improved charge acceptance and charge efficiency in deep cycle batteries. Test results are promising for batteries using these additives. Data suggests that rated capacity requirements can be met with the mandated 110% charge return factor.

Lead acid batteries are an established technology; new additives will not be impeded by existing regulations. That said, potential battery customers will require validating data and field testing. Collecting requisite data will require an estimated 24 months. If started today, a final report would be anticipated by June 2019.

Hammond Group, Inc. has more than 86 years' experience manufacturing battery oxides and specialty additives in service to the world's battery industry. We are responsible to our employees, customers and our community. We operate far below our EPA-regulated air emission standards and with zero-discharge process water. Our plants operate under negative pressure, with centralized vacuum systems linked with HEPA filters. Any unsuitable lead product is recycled.

Hammond Group takes responsibility for our employee health and safety. Our plants operate under work practices and hygiene programs with worker blood lead levels constantly monitored. Our EHS director oversees all OSHA compliance, EPA compliance, and employee work practice training. Apart from workplace lead hygiene, Hammond supports employee programs including free wellness screening, flu shots, and reward-based weight management. In 2015, Hammond became a smoke-free company.

1414 Field Street, Hammond, Indiana 46320
Voice: (219) 931-9360 Fax: (219) 937-2367

HAMMOND
HAMMOND GROUP, INC.

Pilot Project Proposal

HGI proposes that the company engage with DTSC to conduct a pilot project wherein HGI proposes that DTSC review the technology and supplied data and write an official opinion of HGI's Charge Acceptance improvement technologies with respect to reductions in lead utilization and "source reduction" compared to traditional battery designs.

Phase I:

1) HGI will promptly submit to DTSC public and confidential data (via secure server access) regarding two charge acceptance improvement efforts:
    a. TAP16-005: Improved Charge Acceptance for Gp.31 Bus Battery
        i. These batteries, if brought to market, would be used in place of traditional starting, lighting, and ignition batteries for internal combustion powered busses.
    b. TAP16-019: Improved Charge Efficiency on Deep Cycle Batteries
        i. These batteries, if brought to market, would be used in place of traditional deep cycle batteries for golf carts and other mobile electric transportation systems.
2) DTSC will evaluate that data, and if it believes it is a viable technology, produce a report confirming such conclusion.

Phase II: (assuming step I.2 results in a DTSC decision to continue pursuing the project)

1) HGI will work with its manufacturing partner(s) to produce bench-scale production test batteries using the developed technologies.
2) HGI will lab test batteries to demonstrate the advantages of advanced expanders on charge acceptance.
3) HGI will monitor the performance of those new-spec batteries in comparison to same-location traditional design batteries over the course of one year in laboratory environments.
5) Comparative performance data will be made available to DTSC during and at the completion of the test.
6) Comparative and lab performance data will be validated so real use results may be projected to markets.
7) DTSC will review the comparative data and publish a public review of that data.

1414 Field Street, Hammond, Indiana 46320
Voice: (219) 931-9360 Fax: (219) 937-2367