CELGARD

A POLYPORE Company

Celgard US Manufacturing Facilities Initiative for Lithium-ion Battery Separator

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Project Overview

- **Timeline**
  - Start date: 02/01/2010
  - End date: 02/01/2013
  - Percent complete*: 90%

  **As of May 5th, 2012*

- **Barriers**
  - Low risk due to proven technology
  - No EPA issues with locations or technology

- **Budget**
  - Total project funding: $49M
    - DOE share: 48.4%
    - Celgard share: 51.6%

- **Partners**

  Collaboration for advanced separator testing with:
  - Savannah River National Laboratory (SRNL)
  - North Carolina State University (NCSU)
  - ESim LLC

Project Objectives – Relevance

- Objectives – Celgard Advanced Battery Separator Manufacturing Facilities:
  - Develop domestic separator manufacturing capacity in support of the DOE Advanced Battery Manufacturing Initiative
  - Create long-term American manufacturing jobs starting within three (3) months of the award
  - Install phased separator production capacity to match domestic lithium-ion battery market requirements
  - Minimize project risk by utilizing:
    - Qualified and trained personnel
    - Proven processes for manufacturing lithium-ion battery separators

Celgard Approach - Product

- Leverage proven product technologies
  - Existing portfolio of Celgard® products are suitable for all lithium-ion battery chemistries
  - Commercially-available products are being targeted for EDV lithium-ion battery applications:
    - Celgard® 2500 PP Monolayer Battery Separators
    - Celgard® 2320 PP/PE/PP Trilayer Battery Separators

Celgard Approach - Project

- Replicate proven manufacturing technology to efficiently produce EDV separator products
  - Celgard expansion is being executed in a two-phase approach to meet market needs:
    - Phase 1: Expand existing Charlotte, NC site to meet commercial scale operation – *Completed and qualified in March 2011*
    - Phase 2: Develop new site in Concord, NC to meet increasing commercial demand – *Site completed and some manufacturing operational*
    - Share expertise between Charlotte, NC and Concord, NC facilities (45 minutes apart)

Celgard Approach - Project

- Minimize environmental impact of expansion sites
  - Phase 1: Charlotte Site
    - Categorical exemption for pre-existing certifications
  - Phase 2: Concord Site
    - Certified NC-EPA site
    - NEPA review complete – Initial finding: No significant impact (FONSI)
  - Certified to ISO 14001 Environmental Management Systems

Accomplishments & Progress

- Celgard® lithium battery separators are currently utilized in multiple vehicles on the road today
- We are actively engaged in the development of battery packs for over 50 EDVs that will be launched between now and 2015

Accomplishments & Progress

- Project milestones on-pace with projected timelines
  - Phase 1: Completed and qualified in March 2011
  - Phase 2: New site complete and operational, COO July 2011
- Creation of U.S. jobs (North Carolina)
  - A total of 363* jobs have already been created as a result of the DOE-related expansion project
  - Celgard has added 232* full-time equivalent (FTE) positions
  - Celgard sub-recipients have already added 131* FTEs

**As reported by Celgard, LLC in documents submitted to FederalReporting.gov for the period ending December 31, 2011.*

Accomplishments & Progress

- Celgard has been honored to host President Obama and other key members of his administration

U.S. Energy Secretary Steven Chu visited Celgard in August 2009 to announce the DOE grant award and again in July 2011 to celebrate the grand opening of the Concord (Phase 2) Site

President Obama tours the Charlotte (Phase 1) expansion area in April 2010

U.S. Labor Secretary Hilda Solis meets with Celgard employees during a plant tour in July 2010

Accomplishments & Progress

- **Phase 1: Expansion at Existing Charlotte, NC Facility**

Existing warehouse space was upgraded / remodeled

Warehouse inventory relocated to offsite storage

New production lines installed and qualified

Accomplishments & Progress

- **Phase 2: New Construction of Concord, NC Facility**

Groundbreaking for the new site was held in September 2010

Pictured from left: **Gerry Rumierz (Celgard), Bryan Moorehead (Celgard), Concord Mayor Scott Padgett, NC Commerce Secretary Keith Crisco, Mitch Pulwer (Celgard), Robert Toth (Polypore), U.S. Congressman Larry Kissell, DOE Program Supervisor Edwin Owens, Cabarrus County Commissioner Grace Mynatt, Marcus Childs (Celgard), and Charlie Steenrod (Celgard)**

Concord Photos

Celgard's Newest Facility in Concord, NC

Local, State and Federal Officials Help Cut the Ribbon at the Grand Opening in July 2011

Concord Photos

October 2011:
First Extrusion Line Startup Team

October 2011:
Completed Internal Qualification of Slitters

November 2011:
Started Steel Erection for Additional Equipment

December 2011:
Oven Line Startup

Accomplishments & Progress

- Expected U.S. job creation over project term:
  - Celgard created more than 200 positions by the beginning of 2012

Cumulative Celgard Job Creation through 2012	
Actual YE 2010	81
Actual YE 2011	232
By YE 2012	251

  - Sub-recipient job growth is expected to track projected Celgard numbers
  - Celgard contractors and suppliers are expected to create more than 1,000 additional jobs over the project term

Collaboration & Partnerships

- Sub-recipients:
  - SRNL (Federal Lab):
    - Celgard is working with SRNL, utilizing the national lab's material testing capabilities for separator quality control
    - SRNL is located in Aiken, SC
  - ESim LLC (Industry):
    - ESim and Celgard are working on performance measures associated with manufacturing separators for the EDV market
    - ESim is located in Columbia, SC
  - NCSU (University):
    - Celgard is working with NCSU to better understand product quality protocols and to establish quality assurance methods
    - NCSU is located in Raleigh, NC

Future Work

- Continue Phase 1 (Charlotte, NC) tasks for 2010 completion:
  - Building up-fit – *Complete*
  - Order and install equipment – *Complete*
  - Labor force hiring and training – *Complete*
  - Qualify total capacity – *Complete*

- Begin Phase 2 (Concord, NC) tasks for 2012 completion:
  - Land purchase – *Complete*
  - Begin construction – *Complete*
  - Order and install equipment – *Complete*
  - Labor force hiring and training – *Completed December 2011 (Entire Labor Force)*
  - Qualify total capacity – *To be completed October 2012*

Summary

- Celgard® lithium-ion separators are proven in EDV battery applications and have already been adopted in commercial EDV applications
- Celgard manufacturing technology is well demonstrated and is being replicated for capacity expansion project
- Celgard capacity installations are on schedule and on track to meet market needs
- As of December 2011, Celgard has added more than 200 U.S. jobs
  - Celgard contractors and suppliers will also add over 1,000 jobs as a result of the expansion project