



# **Isothermal Battery Calorimeter Technology Transfer and Development**

**Cooperative Research and  
Development Final Report**

**CRADA Number: CRD-12-461**

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## Cooperative Research and Development Final Report

In accordance with Requirements set forth in Article XI.A(3) of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

**Parties to the Agreement:** NETZSCH Instruments North America, LLC

**CRADA Number:** CRD-12-461

**CRADA Title:** Isothermal Battery Calorimeter Technology Transfer and Development

**Joint Work Statement Funding Table Showing DOE Commitment:**

| <b>Estimated Costs</b> | <b>NREL Shared Resources</b> |
|------------------------|------------------------------|
| Year 1                 | \$ 16,722.00                 |
| Mod 1                  | \$ 12,000.00                 |
| Mod 5                  | \$ (8,000.00)                |
| TOTALS                 | \$ 20,722.00                 |

### **Abstract of CRADA Work:**

During the last 15 years, NREL has been utilizing its unique expertise and capabilities to work with industry partners on battery thermal testing and electric and hybrid vehicle simulation and testing. Further information and publications about NREL's work and unique capabilities in battery testing and modeling can be found at NREL's Energy Storage website: <http://www.nrel.gov/vehiclesandfuels/energystorage/>. Particularly, NREL has developed and fabricated a large volume isothermal battery calorimeter that has been made available for licensing and potential commercialization (<http://techportal.eere.energy.gov/technology.do/techID=394>). In summer of 2011, NREL developed and fabricated a smaller version of the large volume isothermal battery calorimeter, called hereafter "cell-scale LVBC."

NETZSCH Instruments North America, LLC is a leading company in thermal analysis, calorimetry, and determination of thermo-physical properties of materials ([www.netzsch-thermal-analysis.com](http://www.netzsch-thermal-analysis.com)). NETZSCH is interested in evaluation and eventual commercialization of the NREL large volume isothermal battery calorimeter.

### **Summary of Research Results:**

NREL transferred its technology and know-how to NETZSCH through several site visits, as well as email and conference calls. Based on NREL's input, NETZSCH designed and fabricated two prototype isothermal calorimeters for medium-size cells and small modules. This prototype had features for ease of use of the hardware and software to eventually become a commercial unit. Initially, the NETZSCH prototype had difficulty achieving the specified accuracy.

NREL supported NETZSCH with troubleshooting to identify the causes of inaccuracies and provided solutions to improve the accuracy. As part of this activity, NETZSCH sent one prototype calorimeter to NREL for evaluation and calibration. NREL further provided input to improve the stability of baseline heat measurement crucial to the getting the desired accuracy.

NETZSCH used the information and finalized the design and development of their first commercial isothermal battery calorimeter called IBC-248. Further information about this product could be found in [http://www.netzsch.com/fileadmin/user\\_upload/netzsch-thermal-analysis/products/pdfs/Flyer\\_NIB\\_IBC284\\_1113w.pdf?1383911393](http://www.netzsch.com/fileadmin/user_upload/netzsch-thermal-analysis/products/pdfs/Flyer_NIB_IBC284_1113w.pdf?1383911393)

NREL and NETZSCH were selected for an R&D 100 Award in 2013.  
<http://www.nrel.gov/vehiclesandfuels/energystorage/news/2013/3300.html>

NETZSCH is now commercializing the IBC-248 units.

### **Subject Inventions Listing:**

None developed under this CRADA

### **Report Date:**

October 24, 2014

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