

Manufacture of Advanced Battery Metal Containers & Components

H&T Waterbury, Trans-Matic, HTTM LLC

Program Coordinators

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Introduction to Grant Recipient and Partner

Original Grant Recipient: H&T Waterbury (H&T Battery Components)
Joint Venture Partner: Trans-Matic Manufacturing Company Inc.
New Joint Venture Created: **HTTM** LLC



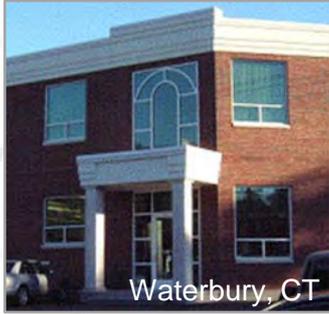
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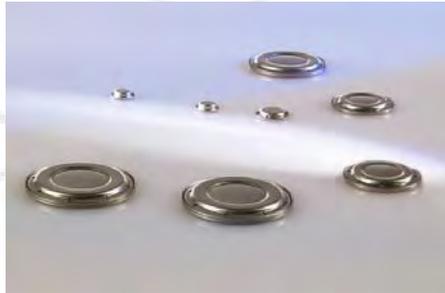
H&T Battery Components division in Waterbury Connecticut originally applied for the DOE ARRA Grant Funding for the Manufacture of Advanced Battery Components. H&T Battery Components is part of the H&T Group of Marsberg, Germany. The H&T company and the Trans-Matic Manufacturing Company Inc. of Holland, Michigan have a history of cooperation and partnership on other projects.

After the award of the grant to H&T, the two companies communicated and decided to form the HTTM LLC joint venture to pursue the advanced battery components market. The joint venture limited liability company is supplying the global advanced energy storage market by developing and producing metal battery container components and assemblies.

Introduction to Grant Recipient • H&T Battery Components



H&T is the leading global producer of consumer battery containers. Production exceeds 8 billion per year from four global facilities. Specially developed high speed presses. Full range of consumer battery products including cans, flat parts, marking and carbon coating. H&T has complete In-house engineering and carbide tooling fabrication. Facilities are ISO 9001, 14001, and OHSAS certified. JV partner of HTTPM LLC.



Introduction to JV Partner • Trans-Matic Mfg. Company



Holland, Michigan



Mesa, Arizona



Suzhou, China

Trans-Matic is a global leader in the development and production of precision engineered deep drawn metal stampings and assemblies. Full service product development with production facilities in the USA and China. Multiple market experience with specialties in: commercial and residential lock hardware components; automotive ABS brake components, fuel rail and powertrain components; and containers for high performance ultra capacitors, lithium ion batteries, and electronic actuators. Trans-Matic was established in 1968 and is privately held. Facilities are ISO 9001, TS 16949, and ISO14001 certified. JV partner of HTTM LLC.



Introduction to HTTM LLC

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HTTM designs, develops and manufactures metal cell containers for lithium ion and other types of high performance batteries for hybrid, plug-in hybrid, and electric vehicles as well as other communication, mobile and stationary power storage applications. Through H&T, HTTM was one of 30 successful recipients of the National Energy Technology Laboratory's major grant funding for Electric Drive Vehicle Battery and Component Manufacturing under the U.S. Department of Energy American Re-investment and Recovery Act.

HTTM provides confidential design and development, rapid prototyping, and ultimately, high volume global production for its customers. Products utilize various metals formed into a variety of cylindrical and prismatic cell containers in custom sizes. Proprietary computer simulation methodologies are used to achieve optimum component design and performance. With state of the art automation, HTTM also produces matching cover/lid assemblies with integrated, laser welded, swaged, and bonded terminations. HTTM container systems can also include integrally formed safety vent features that are engineered to provide a precise release of pressure when needed.

The HTTM LLC joint venture is headquartered in Holland, MI, USA and utilizes many of the resources, expertise and facilities of its parent companies H&T and Trans-Matic. Other HTTM designated locations include Mesa, AZ; Waterbury, CT; Marsberg, Germany; Dongguan, China; Suzhou, China; and Singapore. HTTM is able to provide advanced development and consistent high quality component production to its global customers.

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BENEFITS of the HTTM joint venture in the execution of the ARRA NETL Grant

- Both companies are existing suppliers to Battery OEM's
- Extensive experience in the conventional battery market and related products
- Track record of competitive pricing, high quality, and on-time delivery
- Currently developing and producing lithium ion battery components/assemblies
- HTTM has volume production orders from OEM Li-ion battery customers
- In-house product design, confidential development, prototyping, tooling
- Low and High volume manufacturing expertise, 106 years combined experience
- US manufacturing base with additional global facilities
- Deep draw forming is the primary can production method, others also available
- Also proficient in cover assembly, burst vents, laser weld, automated leak testing
- Financial strength, grant funding, long term investment strategy
- Privately owned and operated. ISO, TS, OHSAS global registrations

■ Timeline

Start date: May 1, 2010

End Date: May 1, 2013

Project is on time and proceeding as planned

■ Barriers

- Materials/processing feasibility
- Rapidly evolving cell technology
- Customer product changes
- Customer/market uncertainty

■ Budget

Total project funding: \$10.2M

DOE share: 49%

HTTM share: 51%

Budget used to date*: 21%

■ Partners

H&T Battery Components

Trans-Matic Manufacturing Co. Inc

Heitkamp & Thumann Group KG

Karotech Inc.

*as of March 30, 2011

Advanced Battery Component Development and Manufacturing

In support of the DOE Electric Drive Vehicle Battery and Component Manufacturing initiative, HTTM is creating a development and manufacturing capability specifically focused on high performance battery container technologies and products. Staff is added as appropriate, along with development capabilities, specialized engineering systems and resources to address OEM customer needs from concept through production launch.

Modify or add manufacturing equipment and processing capability for the production of specialized metal battery cell containers (cans), covers, cover assemblies, and other components suitable for advanced lithium ion batteries for transportation and other power storage applications.

Develop and expand a skilled technical workforce through hiring & training several new professional, semi-skilled and skilled technicians and others.

Implement new capabilities and manufacturing processes beginning in the United States at the Holland, Michigan facility of Trans-Matic, which is part of the newly created HTTM LLC joint venture of Trans-Matic and H&T Battery.

Develop this manufacturing capability for supply of products to the US market and be capable of exporting products to other areas of the world.

Past Success + New Capabilities = New Business Opportunities

Create a JV of H&T and TM and utilize over 100 years of combined technical, tooling and manufacturing experience in the field of deep draw forming, metal stampings and assemblies. Apply this new capability to making advanced battery containers.

The JV approach uses existing facilities and other existing assets. This allows the grant funding to be focused on new equipment and technological advances.

The JV has a global footprint and is prepared to US-based OEM's with global facilities.

Target all major Battery OEM's for sales to offset the market risk of OEM overcapacity and fallout. Leverage existing business relationships with OEM's to successfully penetrate their advanced battery divisions.

The HTTM business model is producing "containers", not just "deep drawn cans".

All types of battery cells require containers, and metal is becoming the preferred construction to ensure safety and durability.

Design and install equipment and processes that are flexible and accommodate cylindrical and prismatic containers of various sizes, alloys of metal, and manufacturing methods. Order equipment concurrent with award of business.

Product Development Approach

Innovation, Development, Prototyping, Design & Process Validation

HTTM establishes joint development agreements with its OEM customers with an approach to product development best described as “turn-key”. From initial product concepts, HTTM works with its US and global customers to take their container parameters and create a manufacturable, high volume production process.

The parent companies of HTTM have an extensive background in containers, battery cans, actuators, high energy capacitors and other electro-mechanical devices. This broad base of product and market experience enables HTTM to directly apply this knowledge and create new products for the advanced battery containers.

Rapid prototyping techniques are used to make affordable mockups and prototypes for design validation, with customer flexibility for quick product changes and iterations.

HTTM has formed a dedicated development and prototyping group. Designs are run through sophisticated forming simulation software to determine feasibility. Production intent prototype tooling is built in-house and run on development/production equipment. This extensive development process provides a roadmap for final product design, tooling and processing methods.

HTTM has in-house measurement, testing and validation for specific component dimensions and performance parameters. This internal capability creates a closed loop development process with retained lessons learned

Creating the State of the Art

With over 100 years of combined technical, tooling and manufacturing experience, and support from the DOE ARRA grant, HTTM has the manufacturing capabilities needed to produce tight tolerance cell container components and assemblies.

HTTM has used its own resources plus the ARRA grant to update current equipment as well as purchase new equipment for forming, cleaning, automated inspection of battery cans, and automated terminal cover assembly.

HTTM has also utilized grant funding to further vertically integrate with new equipment for the automated assembly of container terminal covers. A variety of processes are used including laser welding, swaging, staking, bonding, and GTM.

Real-time in-process automated inspection is done in both the forming and assembly work. Several types of visual and tactile measurement systems are used to verify conformance to specification throughout the processes.

Vertically integrate with new specialized cleaning and packaging equipment to monitor and control component surface finish and prevent contamination

The Project Phases for Each Customer Program

- Phase 1** Establish initial business and technical relationships and with most Battery OEM's. Engage with non disclosure agreements, technical meetings, mockups, etc.
- Phase 2** Sign development agreement with battery OEM's. Co-develop and design the battery container components and assemblies. Build prototype tooling and produce parts for design and process validation. Secure production purchase order from OEM customers.
- Phase 3** Specify, then procure or build production component tooling and equipment. Build/modify production facilities as required. Hire and train staff as needed. Take delivery and install production tooling, presses, automated inspection systems, assembly equipment, cleaning systems and material handling and packaging equipment. Make pilot runs of production level product.
- Phase 4** Gain customer approval of production product. Begin shipping production orders and ramp-up manufacturing output. Continue hiring and training of staff as appropriate.
- Phase 5** Add manufacturing capacity and capability as sales volume increases. Conduct ongoing continuous improvement activities to improve the product and reduce overall cost. Add staff as sales increase.

Project Accomplishments

Advanced Battery Component Development and Manufacturing

HTTM has successfully entered the advanced battery container market and is in the following Project Phases with several OEM Advanced Battery manufacturers:

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
5 OEM's	2 OEM's	2 OEM's	1 OEM	Pending

HTTM is developing, prototyping and producing metal cylindrical and prismatic lithium ion battery containers, cans and covers/assemblies. HTTM is becoming an established "go-to" company for metal battery container systems.

The Electric Drive Vehicle Battery and Component Manufacturing Grant project completion level of 21% is on schedule and on budget. The project work to date reflects HTTM's success with customers, and the ability to modify existing equipment and methods, while also developing and acquiring new equipment and methods.

For the projects in Phase 3 and 4, production tooling and equipment are in place and manufacturing has begun. Production shipments are being made to the domestic and global locations of US based OEM's

Job creation has occurred and continues. Personnel have been hired and trained during the development and launch phase of these customer projects. Additional staff will be added commensurate with production volume increases.

Technical Accomplishments

Advanced Battery Component Development and Manufacturing

Successful commercialization of metal battery cans and cover assemblies in the US.

Manufacturing process designed and installed, producing hermetically sealable container components that can be automatically assembled by OEM customers.

Tool design and manufacturing process for consistently stamping an integral safety vent feature in the can or cover. The tooling/process can be adjusted to achieve very specific burst pressure mean values within a controlled range.

Created and implemented an in-tool automated vent feature measurement system that provides accurate and dynamic feedback on 100% of the parts produced.

Designed and built a precision safety vent burst testing machine that enables ongoing production run validation and lot verification testing.

Developed a metal battery cover with an integrally formed termination feature, replacing separate terminal components and the associated assembly processes.

Utilizing new custom designed and built high speed cover assembly equipment with laser welding, terminal torque test, part presence, dimensional verification, helium leak testing.

Project Milestones

The Project is on pace with planned timelines*

Milestone	Planned Start Date	Planned Completion Date	Status and Comments
DOE Kickoff	6/2/2010	6/2/2010	Completed
Customer Award of Business	4/1/10	11/1/10	Completed
Initial Equipment Ordered	7/20/10	12/30/10	Completed
Initial Equipment Installed & validated	10/20/10	6/1/11	Most installed Some in process
Customer Approval of First Production Parts	2/1/11	3/25/11	On Schedule
Ship First Production Parts	7/15/11	7/31/11	On Schedule

* As of report date of 3/6/11

HTTM has successfully entered the advanced battery container market and is in the launch phase of several customer projects. Personnel have been hired and staff will be added as production volumes increase.

Partners: JV Parent Companies, Customers, Suppliers, DOE/NETL

The original DOE ARRA Grant was awarded to H&T Battery Components of Waterbury, Connecticut.

The Department of Energy has been helpful in administering the grant awards, and has assisted HTTM in efficiently implementing this project.

The HTTM joint venture was created by:

- H&T Battery Components of Marsberg Germany
- Trans-Matic Manufacturing Company Inc. of Holland, Michigan

HTTM is currently working with eight battery OEM's at various stages of business relationship. Several of the OEM's are also ARRA grant recipients.

HTTM is also working with Karotech Inc. of Oxford, Connecticut, a specialty metal components development and production company.

HTTM has several partner suppliers of raw materials, subassembly components and automated machinery and testing equipment

Advanced Battery Component Development and Manufacturing

Continue development of new can and cover designs. Can development will focus on material selection for optimum manufacturability, additional processing simulation capability and enhancements to rapid prototyping techniques. Cover development will focus on new terminal configurations and cost effective assembly and sealing methods.

Continue development and launch of current customer projects with high volume production scheduled for Q3 of 2011. Add additional customers with new products/projects scheduled for Q3 2012 launch.

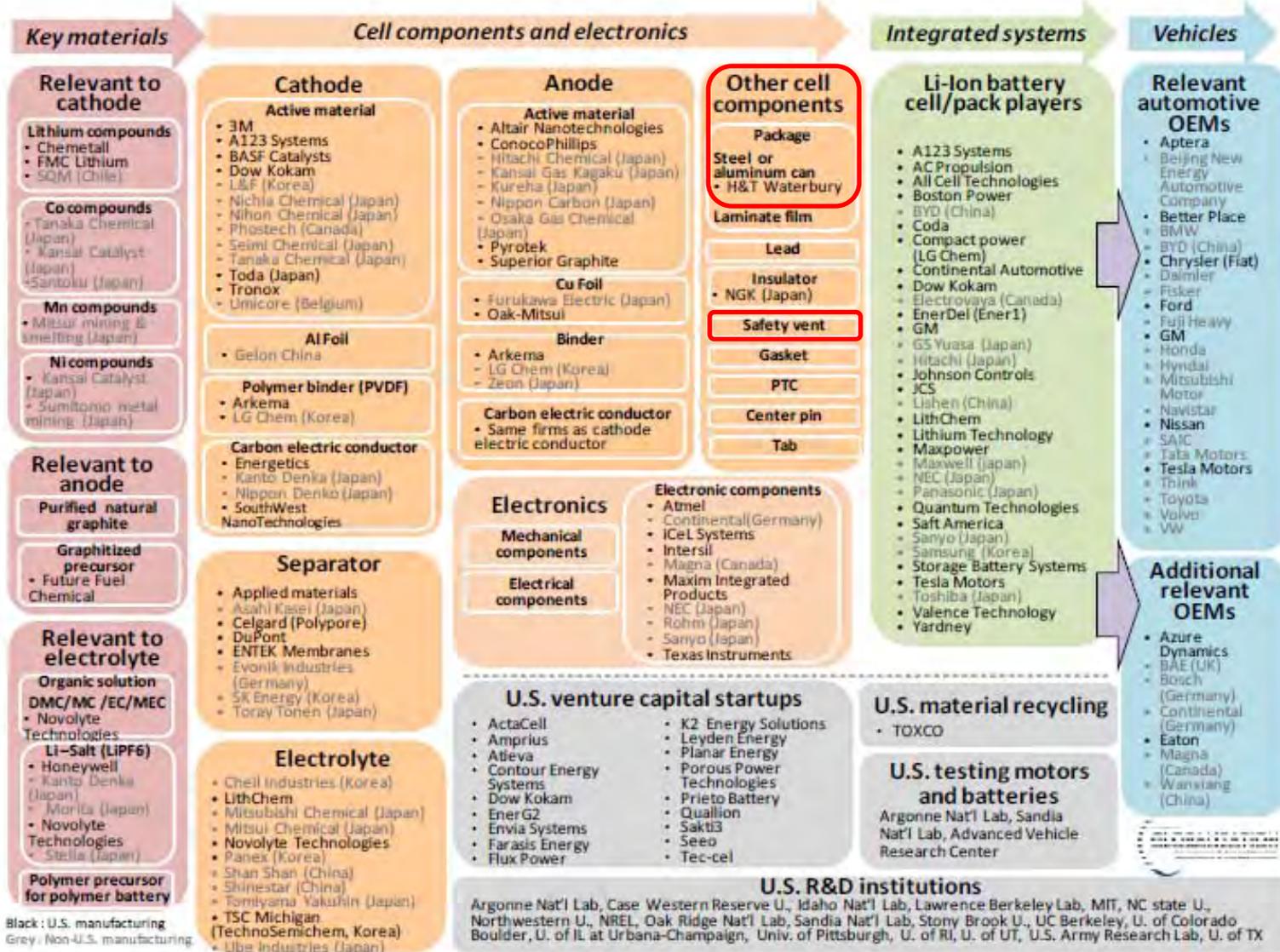
Continue to implement the DOE Project according to schedule and budget.

Continue to add personnel as business is awarded and production sales increase.

Continue to support the DOE initiative for bringing more Advanced Battery technology and production capability to the U.S.

HTTM Value Chain Position

HTTM is an **integral link** in the Advanced Battery Value Chain



A Successful Project

Product



HTTM has developed commercially viable and manufacturable metal container products for the global advanced battery market.

Customer Orders



HTTM has secured production orders with OEM Battery companies and is in the process of launching high volume production manufacturing.

Funding



The DOE ARRA Grant funds are being utilized for resources, equipment, personnel and other product development and launch expenditures.

On Schedule



The Project is on schedule and on budget.

Equipment



Most production equipment is on-site with process validation underway.

Staffing



Personnel have been hired as planned. As the launch progresses, staff will be added according to production ramp-up schedules.

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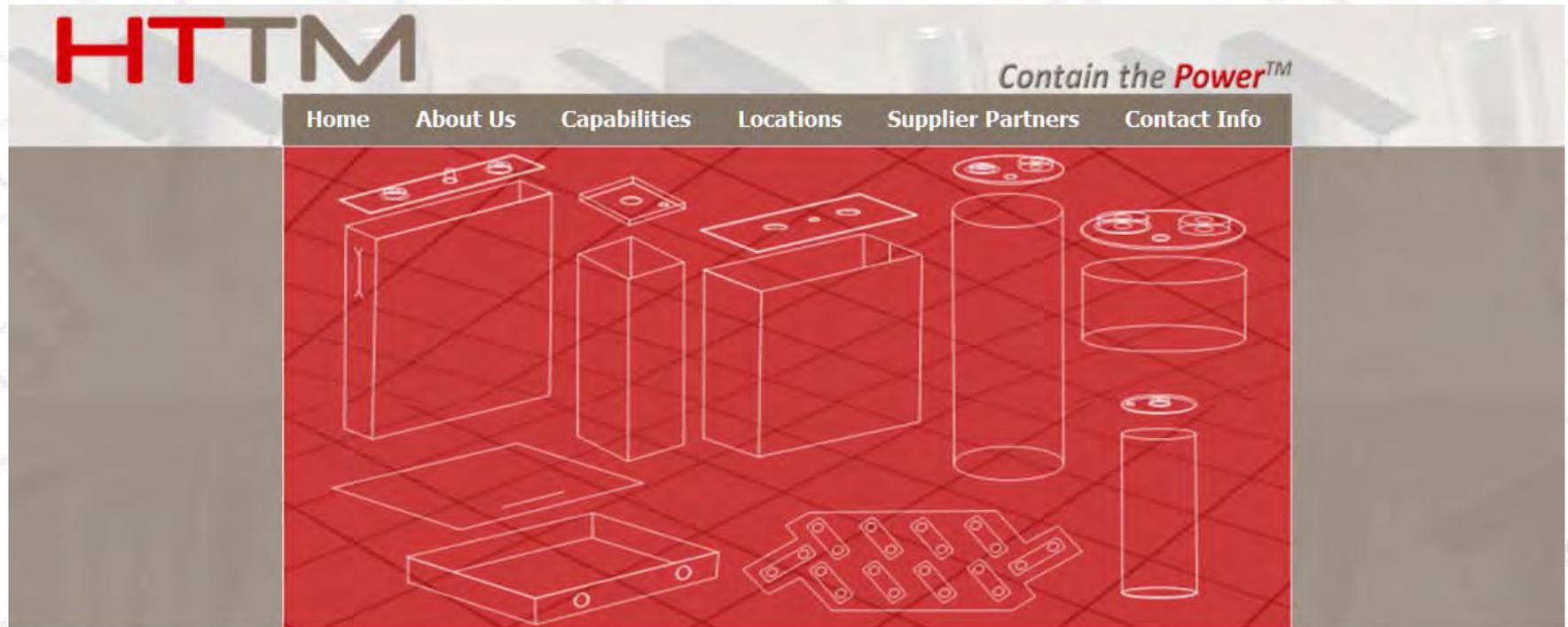
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