



DESTINATION STARTUP

Big Blue Technolgies

One-Sentence Summary of What You Do: Big Blue Technologies makes magnesium metal using a novel process technology that consumes 60% less energy than the dominant incumbent process translating to a reduction of cost of goods sold 50% lower than the monopolistic U.S. producer.

Affiliated Institution: University of Colorado Boulder

Have you formed a company yet? Yes

Funding/Financing: Grant Funding, Direct/Indirect University Support, Angel Funding (including Self or Friends/Family)

Please describe your company and the problem you are trying to solve: Big Blue Technologies (BBT) makes magnesium metal. Magnesium (Mg) is a widespread infrastructure metal commonly associated with 'light- weighting' (vehicles, portable electronics, etc.) but is also used to make high strength aluminum alloys, steel, and titanium. Because of this underlying expansive value, Mg has been classified as a strategic metal, especially for military use, and was tarified long before the trade war of today. The artificial price structure, lack of process innovation, and instable domestic supply has hindered the rate of adoption of magnesium- based products in automotive and aerospace, where estimated demand is 10 to 50 times larger than current global production.

BBT is currently constructing the 3rd largest primary Mg production facility in North America with our Denver- based strategic partner using funding from NSF and the State of Colorado. This facility employs a novel process technology, part of which has been exclusively licensed from the University of Colorado at Boulder. This research partner provided much of the fundamental chemistry and reactor design research as well as the implementation of a successful ore- to- ingot prototype. BBT's process innovation consumes about 60% less energy than the dominant incumbent process, translating directly to a reduction of production cost and larger gross margins. BBT's mission is to accelerate the adoption rate of magnesium by providing a stable and low- cost resource for domestic manufacturers.

What is/was your go-to-market strategy? The total addressable market for magnesium metal is about \$4.5 billion. The two segments experiencing the most growth are aluminum alloys and casted products (combined 55% of TAM), driven by a paradigm of light- weighting for vehicles and portable devices. The compound annual growth rate has been around 6% over the past decade and is expected to remain around 6- 8% as more auto- OEM's use light- weighting as a means of achieving fuel economy targets. Likewise, casted magnesium components typically reduce the total number of parts and hardware for a given application when replacing steel.



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Based on customer discovery interviews, small- to mid- sized casting companies represent the most likely early adopters. These companies are more diverse than aluminum alloyers, and there are more of them. They have the least amount of buying power for their raw metal and therefore are often subject to higher pricing, reducing their competitive advantage. Most have indicated a strong desire for a second domestic and competitive magnesium supplier. However, price and product quality must be on par or better than what's currently available.

Overall, from BBT's extensive value- chain mapping, access to customers and early sales are not limiting. The production of large volumes of metal product remains the largest hurdle for BBT. We've estimated that at least 10,000 tonnes of magnesium could be sold immediately on the spot- sale market, if it was available.

How will/do you generate revenue? Sales revenue from metal sold is expected from direct B2B transactions. From the pilot installation, annual revenues would be around \$200k at maximum operating capacity. The purpose of the pilot is to de- risk the technology and characterize scalability in order to implement a commercial demonstration. This latter effort is planned for 2,000 tons/ year, generating revenue on the order of \$7- 9 million. At this scale, only 5- 10 customers would be needed to fill orders and the technology can be built out in a modular fashion (assuming adequate infrastructure) to accommodate sales growth. Reaching \$100 million in annual revenues implies about 12 primary reactor units for a total annual production capacity of 24,000 tons, or about 20% of total U.S. consumption.

Due to the high capital intensity and long development cycle of BBT's business and technology, the financial model is reliant on highly successful milestone achievement in order to finance the construction and operation of that first large- scale plant. Bridging this pilot- to- demonstration valley can be executed using project finance only after the technology has been substantially de- risked and fairly large equity corporate partner is leveraged for their balance sheet as a means of obtaining any amount of debt financing. Conversely, BBT is prepared to grow slowly and organically initially in order to reach a point where debt- financing can be an option. In either of these extreme case, BBT is working on de- risking its financial model with multiple growth and financing scenarios, focusing on obtaining corporate partnerships and letters of intent from customers.

How will this showcase benefit your company or technology? Big Blue Technologies' venture status is unconventional and just on the periphery of the venture capital boundary. Therefore, finding suitable investors and partners is substantially more difficult. Destination Startup is a platform for us to showcase the amount of effort and progress made on our industrial technology, and obtain exposure to a variety of potential stakeholders, some of whom may also be unconventional.

At the present time, BBT is seeking \$1 million in angel or venture capital to complete its pilot operations and transition to commercial relevance. In the long- term, we are seeking strategic partners who have experience in capital- intensive projects and who understand the logistics of



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establishing industrial plants.

Who are the members of your team and why is this the right team to get the job done?

- The two co-founders, Aaron Palumbo and Boris Chubukov, are original CU Boulder researchers who took up the call-to-arms to spinout BBT. Aaron has relevant project management and fundraising experience and Boris literally wrote the book on magnesium production (his Ph.D. thesis). Jeremiah Jeffries is the lead mechanical engineer, CAD ninja, and all-around versatile fabricator with experience welding, wiring, machining, and designing.
- Mac McCreless is the team's partner and third board member. Mac is a successful entrepreneur in the realm of minerals and metals, adding value as an expert in magnesium oxide ores and distribution logistics.
- Todd Olson, Clint Bickmore and Mark Wallace are all formal, compensated advisors. Todd is the current President of the International Magnesium Association and has his ear to the ground on all things Mg. Clint is a Senior Scientist at SolidPower and provides unequivocal technical advice on science, engineering, and scaling. Mark is a research associate at LASP and provides assistance as needed related to assembly and operation of equipment.
- At the present time, this team has already demonstrated strong competency for executing the scale-up of a process technology, engagement of partners and customers, and careful budgeting and financial planning. The Team is well-equipped to finalize its pilot, establish early sales, and begin the transition to a commercial plant. However, it is still clear that help is needed to navigate the implementation of large- scale industrial operation. The team is always actively seeking advisors to fill this role.