

Remotely Operated Underwater Vehicle and Low-Cost Thrusters, Watertight Enclosures, and Components for Marine Robotic Systems Designers, Researchers, and Student Projects

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CEOCFO: Mr. Jehangir, what is the idea behind Blue Robotics?

Mr. Jehangir: The goal of our company is to enable the field of marine robotics and make it more accessible. It is an industry that has been around a long time but it has traditionally been a relatively high cost industry driven by government and military needs. With the advent of low-cost drones and other electronics and tools to make technology more accessible elsewhere, we felt it was important to take that into the marine world.

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- Rustom "Rusty" Jehangir



CEOCFO: What are the challenges the average person does not realize?

Mr. Jehangir: We design everything; we are not repackaging anything. The challenge most of the time is that you are underwater and electronics and batteries do not mix very well with water. You have to take many steps to make sure that everything is dry and well protected. Nevertheless, there are also some good things about being in the water. Our vehicle, which is a remotely operated underwater vehicle, is basically flying underwater. Unlike a helicopter or airplane, it does not have to hold up its own weight because it can use the buoyancy provided by the water, so we get a great deal more battery life. The advantage of that is that if something goes wrong the vehicle does not fall out of the air, it just keeps floating.

CEOCFO: Would you tell us about the lithium ion battery you have just introduced?

Mr. Jehangir: We had a lithium ion battery designed for our vehicle. The unique thing about it is that compared to most batteries, which are rectangular, this one is arranged in a circular pattern, and most underwater enclosures tend to be circular because that shape lends itself to be very strong without a great deal of material. This battery fits much better in an underwater enclosure and allows us to fit twice the capacity onto our vehicle than we can with an existing off the shelf battery.

CEOCFO: Is it difficult to make a circular shape or is it just that no one thought about it?

Mr. Jehangir: It is built out of cells that are shaped like AA batteries, because if you arrange a bunch of those together you can get them into a circle. That is a different type of battery. The batteries that people use on drones and similar platforms are prismatic lithium ion cells and the cells themselves are rectangular, which it would be very difficult to fit into a round shape. Therefore, we achieved that by using a different cell design that was already available.

CEOCFO: Would you tell us about ArduSub and how that has changed?

Mr. Jehangir: Our ArduSub software is an open source and open hardware control system for underwater vehicles, which actually leverages a bunch of technologies from the aerial drone world. You are basically flying underwater. We mostly use the same sensors, the same algorithms, and we were able leverage that and basically start right off the bat with

control solutions that were more advanced than most of the alternatives on the market, without us having to do much work at all. It was pretty cool to leverage that.

CEOCFO: *Who is using your products today?*

Mr. Jehangir: An incredibly wide variety of people! We did a Kickstarter campaign back in 2014, and during that campaign we were selling an underwater thruster motor. We sold some of them to middle-school students who were doing robotics competitions and we sold some of them to researchers at the Woods Hole Oceanographic Institution, which is one of the premier ocean research organizations. Anything between middle-schooler and research expert is part of our market. We see a great deal to universities and researchers and small businesses that are developing products or prototyping equipment. Other people are focused on low cost technologies now and we make many components that make it easier for them to prototype those technologies. There are also hobbyists who are doing it for fun and can finally afford to do that.

CEOCFO: *Are people looking at your products every skeptical because they are low-cost?*

Mr. Jehangir: We definitely get many questions about the quality of our products and we are happy to answer them. Fortunately, we have been doing this for a few years now and it is starting to catch on. People are realizing that our products are working well. In addition, some of the bigger companies in the industry are starting to use some of our products more heavily and even get inspired by their designs.

CEOCFO: *Would a company tend to buy a range of your products or looking at one or two areas only?*

Mr. Jehangir: We sell a remotely operated underwater vehicle, but we got to the point of selling that by making all of the individual components one-by-one. We made the thrusters, then the watertight enclosures, then the sensors, followed by the cables and electronics, then the lights. Each of those components we designed to be usable on its own to be useful in a wide variety of situations. For example, we have people who buy a watertight enclosure and need it to put their own electronics for some sensor they are developing or for some ROV competition that they are doing as a high school student. Those people will also pick-and-choose other components that they need.

CEOCFO: *What is your global reach?*

Mr. Jehangir: That is a good question; we probably ship to 40 or 50 countries.

CEOCFO: *Are there challenges in shipping some of your products, particularly for the vehicles?*

Mr. Jehangir: It is all about learning how to ship things around the world and the intricacies of what each country requires, what each shipper requires and making sure we are complying with all relevant regulations. That has been a challenge, but you address one challenge at a time and over a few years you build up a pretty vast knowledge about it.

CEOCFO: *How is business?*

Mr. Jehangir: Business is strong and growing! We are working very hard to make sure it stays that way. We are always working on new products, building our customer base and working to maintain the customers we do have.

CEOCFO: *How do you stay focused with so much opportunity?*

Mr. Jehangir: What has worked really well for us is the fact that we design components one at a time. We focus on each component individually and then we move on to the next one. That is what we have been doing for years and it has allowed us to build up a complete integrated vehicle that has many complex components, and we were able to focus on the development of each one very closely during the time that we were working on it.

CEOCFO: *What surprised you as the company has grown and evolved?*

Mr. Jehangir: I am surprised that we have done well! Things have taken off and people are interested. This year, we're starting to see some of our products get copied.

CEOCFO: *Why pay attention to Blue Robotics? Why is the company important?*

Mr. Jehangir: We are working in a well established industry and introducing new technology and lower costs. We are doing it in a very systematic way that can applied to quite a few other industries as well. We just happen to be doing it in this one because there is a great deal of opportunity here.

