SOLIDWORKS

TEAM WITCH DOCTOR
DEVELOPING BATTLING ROBOTS WITH PERSONALITY AND PIZAZZ WITH SOLIDWORKS SOLUTIONS

Case Study

BattleBots Team Witch Doctor, whose robot is shown here sending pieces of an opposing robot flying, relies on SOLIDWORKS design, simulation, and visualization solutions to develop and improve each robot that competes in the popular "BattleBots" television series.

DASSAULT SYSTEMES

Challenge:
Develop battling robots quickly and cost-effectively to grow and maintain the competitiveness and popularity of Team Witch Doctor as part of the "BattleBots" television series, while simultaneously making more-rugged, cool-looking, and winning robot designs.

Solution:
Secure a sponsorship from Dassault Systèmes SOLIDWORKS in the form of CAD, simulation, and visualization software licenses so the team can leverage a range of productivity-enhancing solutions, including topology optimization tools.

Results:
- Iterated more than 20 versions of each season's robot
- Managed strength, stiffness, and weight more effectively with topology studies
- Brought color, personality, and pizazz to robot and team aesthetic
- Inspired young fans to become engineers and robot builders

Andrea and Michael Gellatly share more than an appreciation for battling robots as the team captain/weapon operator and lead designer/driver respectively for "BattleBots" fan favorite Team Witch Doctor. As husband and wife, they've made a commitment to sharing their lives together—a relationship that began through their love for building competitive fighting robots. The couple first met at a BattleBotsIQ competition when Andrea was a high school senior leading a team from a girls-only Catholic high school and Michael was a college sophomore interested in joining the Robotics Club at the University of Miami, where he majored in mechanical engineering.

Just a year later, the pair would meet again as members of the University of Miami Robotics Club, where their passion for robots and personal relationship continued to grow. "We're both engineers and both love building competitive fighting robots," Michael notes. "In my day job, I design robotics surgery products where there are truly lives on the line, so designing and building battling robots represents a fun break. Andrea was our BattleBotsIQ team captain at the University of Miami and continues in that role for Team Witch Doctor because she's very good at interfacing with our fans, giving our team a distinct personality, leading our development effort, and inspiring engineers of the future."

"My role as captain of Team Witch Doctor is to orchestrate all of the development activities so that everything comes together in time for the competition," Andrea explains. "I run it like an engineering project with Mike as the lead designer and other team members responsible for other areas, such as batteries, electronics, assembly, programming, and pyrotechnics. I'm also involved with fundraising through merchandise sales and sponsorships, and have partnered with the BattleBots organization to publish the "B Is for BattleBots" book for kids. That was a fun project because I really want to ignite a fire and passion within the next generation of robotics engineers."

When BattleBots CEO Trey Roski signed a deal with ABC to reboot the "BattleBots" television series in 2015, he reached out to known robotics teams to quickly acquire the talent necessary for the first season of the rebooted competition. So, of course, he called Andrea, and Team Witch Doctor was formed. Because the team faced a short development cycle in that first season of the reboot, they decided to use familiar design and engineering tools. Andrea started using the SOLIDWORKS® 3D design system in high school, and Michael uses SOLIDWORKS in his engineering work. The team has since secured a sponsorship from Dassault Systèmes SOLIDWORKS in the form of CAD, simulation, and visualization software licenses.

"Last season, we were over weight by four pounds and had to cut away sacrificial pieces to make weight. With SOLIDWORKS topology optimization tools, we learn where we can cut material and weight that not only doesn't sacrifice strength and stiffness but actually improves both. We've cut five pounds from our current design while strengthening the robot in key areas."

— Michael Gellatly , Lead Designer/Driver

"SOLIDWORKS is really good for designing parts and assemblies, and conducting engineering assessments of a design," Michael stresses. "That's why we continue to use it, and we're very excited about leveraging the SOLIDWORKS Simulation topology optimization tools."

ITERATING MORE THAN 20 VERSIONS

Using SOLIDWORKS solutions, Team Witch Doctor designs and builds new, improved versions of the Witch Doctor robot for each "BattleBots" season, working collaboratively and iteratively to improve its robot's performance. The process is certainly working, as Team Witch Doctor made it to the final match in the 2019 BattleBots competition, losing to Team Bite Force after an epic back-and-forth battle.

"The way that we work with SOLIDWORKS in developing each season's robot is to have Mike work on the overall design and have other team members contribute their specific part of the robot," Andrea points out. "We work remotely, so we'll share our screen with other members of the team and conduct a bunch of design reviews to continually refine our design."

"We probably go through more than 20 iterations on each robot before the competition to improve our robot every year," Michael adds. "For example, we used SOLIDWORKS multi-body sheet metal tools to develop the rib cage on our robot, which has become a signature Witch Doctor trait. We came up with roughly 20 ways to do the ribs before settling on our final version. With SOLIDWORKS, we can iterate quickly and continue to iterate until our application is accepted and it's time to build the robot."

BALANCING STRENGTH, STIFFNESS, AND WEIGHT WITH TOPOLOGY STUDIES

An important SOLIDWORKS Simulation tool that the team is using on the next version of the Witch Doctor robot is topology optimization. The team plans to use topology studies to better balance the relationships between weight, strength, and stiffness on the robot.

"The first thing we do when we arrive at the competition is to weigh the robot, because if we don't make it under the 250-pound weight limit, we can't compete," Michael says. "Last season, we were over weight by four pounds and had to cut away sacrificial pieces to make weight. With SOLIDWORKS topology optimization tools, we learn where we can cut material and weight that not only doesn't sacrifice strength and stiffness but actually improves both. We've cut five pounds from our current design while strengthening the robot in key areas."

ROBOT AND TEAM PERSONALITY INSPIRE FANS OF ALL AGES

While some BattleBots teams focus on their robot's fighting capabilities and don't even think about a paint job, and others concentrate more on the robot's aesthetic appearance than its destructive potential, Andrea says Team Witch Doctor is the only team that tries to do it all. "We've received some criticism that if we spent less time on our top hats and costumes and more time on developing our robot, we'd win it all," Andrea says.

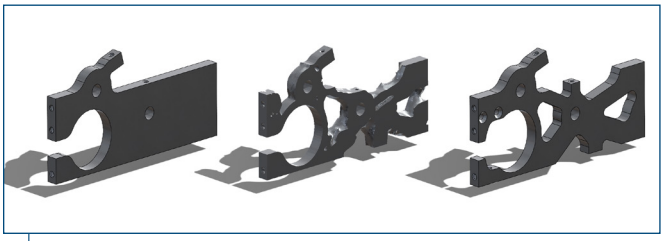
"We actually try to do both because it's important for our team and our fans that we have our own personality and identity," she adds. "We don't believe that we have to choose one or the other. We also believe that by producing aesthetically pleasing robots and building excitement around our team, we'll continue to expand support among the public for competitive robotics, and inspire young people today to pursue a rewarding, fun career in robotics engineering."

Focus on Team Witch Doctor

Headquarters: 300 S. Melrose Drive
Miami Springs, FL 33328
USA
Phone: +1 954 557 8641

For more information
www.teamwitchdoctor.com

One of the more popular BattleBots teams, Team Witch Doctor utilizes SOLIDWORKS design, simulation, and visualization tools to design and engineer robots that combine a robot's destructive potential with its aesthetic appeal, providing the team with the personality and pizzazz that have made Team Witch Doctor a fan favorite.



As these three images illustrate, Team Witch Doctor leveraged SOLIDWORKS Simulation topology studies to optimize an existing part (image one) to cut weight without sacrificing strength. Team Witch Doctor then refined the suggested geometry (image two) to produce the final, lighter, yet just as strong part design (image three).

DASSAULT SYSTEMES | The 3DEXPERIENCE® Company

Americas
Dassault Systèmes
175 Wyman Street
Waltham, Massachusetts
02451-1223
USA

Europe/Middle East/Africa
Dassault Systèmes
10, rue Marcel Dassault
CS 40501
78946 Vélizy-Villacoublay Cedex
France

Asia-Pacific
Dassault Systèmes K.K.
ThinkPark Tower
2-1-1 Osaki, Shinagawa-ku,
Tokyo 141-6020
Japan