



2018 Global Innovation Award Semi-Finalists



Aqua Allies, Excelsior, Minnesota, USA
D.A.V.I.D. Buoy

Aqua Allies is from the region of Minnesota called the *Land of 10,000 Lakes*. This year, they enjoyed learning about the research process and development of a business plan for their Project. Their goal is to help make the water in the 10,000 lakes safer for swimmers.

E. coli is a dangerous bacterium found in lake water. **The D.A.V.I.D. (Deployable Aquatic Versatile Intelligent Device)**, is a remote, solar-powered buoy that automatically tests lake water for E. coli. D.A.V.I.D. uses a cutting-edge test technology and inexpensive electronics to make testing and wireless reporting reliable and cost effective. D.A.V.I.D.'s process speed and accuracy (over currently lengthy 3-4 manual tests) will keep swimmers safe and decrease the false positives that reduce recreational time and hurt local businesses.



Brick Force, Durango, Colorado, USA
Quadcopter LiDAR Remote Flow Analyzer (QLRFA)

The "Brick" in Brick Force reminds this team to build on each other's ideas and strengths. The "Force" is what binds them together as a team. They love learning about new technologies, building, and programming so they can bring their ideas to reality.

Using water flow data, water managers make the decisions on how water can be used and directed to people. Currently, data collection is manual, sometimes dangerous, and unreliable. **The Quadcopter LiDAR Remote Flow Analyzer (QLRFA)** is a remote controlled, aerial drone that analyzes bathymetry (underwater topography) to aid in the remote collection of flow data. It uses computer modeling and LiDAR to improve water flow.



Brick Torrent, Draper, Utah, USA
KnowFlow

Brick Torrent's team motto is CREAM PIE, an acronym that helps them remember who they are and the values they embody. CREAM PIE stands for: Creative, Resourceful, Eager, Appreciative, Mindful, Persevering, Innovative, and Enthusiastic. They remind each other to learn from failure and accept each other's strengths and weaknesses.

Water damage caused by leaky water pipes and valves results in around \$2.5 Billion in insurance claims each year and affects 3.7 million people with water damage to their homes or businesses. The **KnowFlow** is an affordable leak prevention system that easily attaches to water pipes (no plumbing required) and detects water flow by listening. It tracks individual water habits and when discrepancies are noticed, alters your mobile device via the KnowFlow App.



Coyote Pups Gamma Team, Old Town, Maine, USA
Aquamergency Water Purifier

Coyote Pups Gamma Team is an all-girls, 8th grade team from Central Maine. Their interests include sports, musical instruments, and school. They are unified in their love of STEM and passion for social justice. This group of girls is the perfect representation of #FIRSTlikeagirl.

The **Aquamergency Water Purifier** is a personal backpack purification system which provides a reliable source of clean water, targeted at helping people affected by natural disasters. The backpack uses a

stainless-steel mesh screen, ceramic filter, charcoal filter, and a germicidal ultra-violet (UV) light to kill viruses, parasites, and bacteria. It also removes organic contaminants and debris and can filter water at a rate of approximately one gallon every four minutes!



D++, Tel Aviv, Israel PLASTICKER

D++, founded in 2010, is an eight-member team and is mentored by its own alumni and members of the school's *FIRST*[®] Robotics Competition Team D-Bug 3316. Putting their eight brilliant minds together, they produce A+ inventions.

Plastic water bottles stored or exposed to temperatures greater than 104°F for longer than 15 minutes release a toxic chemical that contaminates the drinking water. The **PLASTICKER** is a disposable sticker placed on water bottle labels that changes color when the water has prolonged exposed high temperatures. The non-toxic thermochromic liquid crystal on the sticker changes color at the exact temperature when the plastic begins leaching chemicals.



FEDAC Mix Wolvineers, Girona, Spain Flood Preventer

The word “Wolvineer” inspired team members through the years, as each team member had some form of Wolviner in their name, thus the FEDAC Mix Wolvineers name came to be. The team enjoys working together and playing football, basketball, and paintball. This year, the FEDAC Mix Wolvineers are participating in the *FIRST* LEGO League Open Invitational in Central Europe.

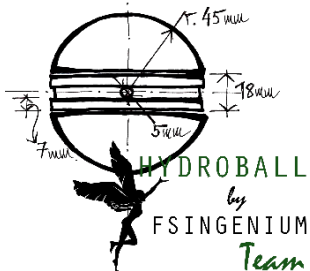
Presently, there isn't a method or system on the market to detect and avoid sewage pipe jams other than educational measures on what is inappropriate waste for pipes. The **Flood Preventer** is a water level sensor-based system that detects the rise of sewage water and notifies waste treatment companies of potential sewage pipe problems to avoid future catastrophes.



FOG Busters, Richland, Washington, USA
FOG Buster 86

The FOG Busters are a 10-member team and self-coined *Foundation Thinkers* (students who like to build on each other's ideas) that clear the "FOG" and brainstorm ideas from each other. The team is a mix of veteran and rookie team members from different schools.

Restaurants use grease traps to treat their wastewater. Food scraps, oil, and grease (FOG) are dumped into these traps. There are no federal regulations on restaurant FOG disposal and it is an increasing problem for aging sewer systems. When cleaning soap meets FOG, it emulsifies and pulls the unwanted FOG through the trap and clogs the sewer system. The FOG Funnel Inceptor, **FOG Buster 86**, grabs the soapy water and transports it with draining water, before the soap can emulsify with the FOG and clogs.

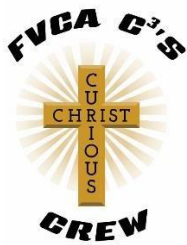


FSINGENIUM, Pamplona, Spain
HYDROBALL

FSINGENIUM is a team with students ages 8-14. They have learned from experience as they tackled this year's Challenge. The team enjoys working hard together and continuing to learn, share, have fun, and dream. FSINGENIUM's aspiration reflects in the image in their team logo, "reach for the sky."

FSINGENIUM team comes from a region in Spain that is an agricultural zone. The team's innovative solution, **The HYDROBALL**, is a tennis-ball sized water conservation tool that gets buried in the soil and precisely measures how much water is available for crops. It provides the user with real-time data via smartphone

technology. With a dual sensor and battery life of 7-years, the HYDROBALL measures both the moisture in the soil and the tension with which the land retains water – that is, the amount of water available for the plant.



FVCA C3s, Neenah, Wisconsin, USA
Solar Safe

The FVCA (Fox Valley Christian Academy) C3's is an 8-member team of 4th-7th graders. They have been to their state Championship two years in a row and are attending the Razorback Invitational Open in Arkansas this year. "Our team loves God with everything we have, and honor him in everything we do, and God lets his blessings fall like rain!"

Millions of people become sick or die each year from polluted drinking water. The FVCA C3's addressed the shortage of clean drinking water with **Solar Safe**, a solar driven purification system that cleans water through condensation and copper. The device floats on bodies of water to wick water into the condensation chamber for purification; it even works on a small, polluted puddle of water!



LEGO Legion, Cincinnati, Ohio, USA
UVeggie

LEGO Legion is a veteran, homeschool co-op team who works collectively to problem solve and enjoy community outreach. The team wears blue bracelets as a dedication to their friend and former teammate, Jonathan, who is currently fighting a rare form of cancer.

International travelers are warned not to have contact with tap water in foreign countries because they have no immunity to microbes in the water. Local produce is rinsed with this same contaminated water. The **UVeggie** is a salad-spinner-like appliance that uses UVC-wavelength light and water to kill microbes and clean produce, so travelers and volunteer/aid workers can eat healthy and enjoy fresh produce. The UVeggie comes in both a motorized and hand-crank version and in several sizes.



TEAM 18468

MH Razorbots, Mountain Home, Arkansas, USA
Venturi Effect Power Supply (VEPS)

The MH Razorbots are made up of students from 2 local schools and several home-schooled students. Their combined, unique assortment of skills and passion has fueled the team's success in creating their Project.

It is important to detect water contamination quickly, and often in remote locations there is no source of power to run testing equipment. The **Venturi Effect Power Supply (VEPS)**, is a self-contained power generating valve fitted with small, inexpensive water turbine generators. It can be installed at any point that needs power to run water quality testing equipment. The valve returns all the water used to generate power back to the water stream.



Operation T.A.C. (Technology & Character), San Clemente, California, USA
SeaSafe Water Analysis Kit

Operation T.A.C. is comprised of rookie and veteran team members, and strongly believes in and uses *FIRST's* Core Values to shape their approach to learning. They believe multiple brains to solve a problem is by far better than one, and positive attitudes will help you solve any problem. They love engineering and their strong team bond grounds them in the value that "what you learn can last a lifetime, whereas winning lasts only for a moment".

Contaminated ocean water from sewer outflows and pollution results in unsafe swimming water conditions at the beach. Long lab test lead times on seawater quality results in delays in reporting to beach-goers. The **SeaSafe Water Analysis Kit** is an on-site ocean water test kit that puts accurate water quality results directly into the swimmer's hands, with results in one hour!



Rain Regents, Leamington, Ontario, Canada
BirdSpa

The Rain Regents are from a brand-new school and their team experience has been an avenue for them to meet new friends and help build their new school community. The team motivates each other to do everything with enthusiasm, efficiency, and an open mind. This is the first year the Rain Regents have participated in *FIRST* LEGO League.

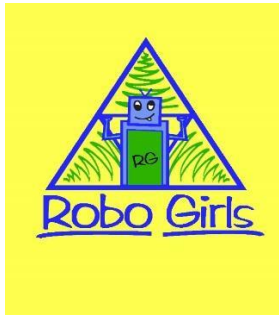
Keeping bird baths can be a health concern, encouraging the growth of harmful algae, bacteria, and disease-spreading mosquitoes in their stagnant water. The **BirdSpa** provides birds with a clean environment to drink and bathe. Unlike conventional bird baths, this innovation automatically cleans and replenishes water to prevent algae, mosquito, and bacteria growth, keeping birds and people safe.



RevForce, Miami, Florida, USA
AWE (Atmospheric Water Extractor)

The Revolution Force (RevForce), is a 4-member team of 7th and 8th graders. The team met each other while participating on an elite Taekwondo competition team. The team spends a lot of time together between Taekwondo practice, school, working on their innovation, and traveling to international competitions.

Rural schools that do not have running water rely on rainwater as their water source. The **AWE (Atmospheric Water Extractor)** is a solar powered, gravity-fed purification system that extracts water vapor from the air and uses cooling and condensing methods to extract clean water. AWE has no negative environmental impacts and requires little maintenance beyond changing filters annually. It can extract roughly a gallon of water per hour, yielding between 15 and 20 gallons of water per day!



Robo Girls, Lexington, Massachusetts, USA
Flood Level Detection

RoboGirls put the “like a girl” in #FIRSTlikeagirl. They are an all-girls 5th grade team. They are all good friends and love programming and working on their Project and its presentation!

Today, people must guess whether their well water is safe to drink after a flood in their area or rely on week-long offsite lab testing to verify its safety. The **Flood Level Contaminant Detection** device is inexpensive to build (less than \$5) and will measure flood water level and warn the well owner of potential contaminants from the flood water.



Rusty Sailors, Ventura, California, USA
Fiber Filter

The Rusty Sailors competed at the Los Angeles Regional Event just five days after the Thomas Fire, California’s largest fire on record. Many team members were displaced and while evacuating their homes made sure to pack their team t-shirts. The team is excited to attend and compete in the Invitational International Razorback Tournament in Arkansas this May.

Microfibers from synthetic clothing make their way from our washing machines into rivers and oceans. The Rusty Sailors’ **Fiber Filter** will capture microfibers at the source – the washing machine. The team uses the LG front-loading drain pump filter and special fabric from Patagonia’s GUPPYFRIEND product to create their filter.



St Clare Transformers 1, New York, New York, USA

Artist's Miracle

The St. Clare Transformers 1 is a veteran team from New York City who aims to: “transform the world one LEGO at a time!” The team has learned the value of teamwork, honing their engineering skills as they transition from *FIRST*® LEGO® League Jr. to *FIRST* LEGO League. They work year-round on *FIRST* LEGO League and one of their most satisfying and time-consuming tasks is the Project!

Have you ever poured paint water down the drain after using it to clean brushes? Little did you realize that you are harming the environment and your pipes. The **Artist's Miracle** is a filtration method used to clean paint water by separating the paint and water, allowing the water to be reused and paint safely disposed.



Super Aqua Squad, Yuma, Arizona, USA

Aqua Box

Super Aqua Squad is a diverse, all-girls #STEMsquad 5th and 6th grade team, who love to laugh and work together! They are passionate about testing, prototyping and presenting their Project.

Helicopters will aerial drop water bottles when they cannot land to deliver clean water in emergency or disaster relief situations. Not all the water bottles survive the drop. The **Aqua Box** safely delivers bottled water to direct targets, providing immediate relief until ground support can arrive. The Aqua Box has a 92.2% success rate from 50 and 100 ft. drops at a speed of 60 miles per hour.



The Dots, Shoreview, Minnesota, USA

DripDrop

The Dots are a veteran team of 7th & 8th graders who describe themselves like the ingredients of a pizza – some natural and wholesome, while others are just a lot of fun to include. Some are mild, while others are a bit spicy, and all have their cheesy moments! When combined, they are a balanced and delicious food that is everyone’s favorite meal.

People underestimate the amount of water that is wasted when they take a shower. The **DripDrop** is a smart water sensor with an accompanying mobile App that tracks water usage while you shower. Unlike current tracking devices, the DripDrop attaches directly to any standard shower head, allowing the consumer more choices over current water tracking solutions. The App’s gaming feature allows you to compete with family and friends on a private social media platform to see who can conserve the most shower water.



Thunderbots, Sacramento, California, USA

UltraOrganix Filter

The Thunderbots are a veteran team that enjoys mentoring local rookie teams. The team works year-round to promote teamwork activities and has a passion for STEM education and community outreach. This team says: “True to the thunder in our name, we create a lot of noise about *FIRST* LEGO League!”

Removing detrimental pathogens and contaminants, including lead, from drinking water can prevent the spread of diseases. The **UltraOrganix Filter** removes bacteria and metal contaminants from water using Solar Water Disinfection in combination with all natural, low cost materials such as cilantro, shells, and charcoal in re-usable filtration bags. Common diseases prevented by UltraOrganix Filter removing bacteria, parasites, metals, and chemicals in the water include, cholera, typhoid, trachoma, hepatitis, leptospirosis, and a poisoning caused by lead, arsenic, and nitrites.
