Aquarium Chiller

Saben Denbow, Kirk Pierce, Mario Vazquez, and Jacob Lee

Stephen F. Austin State University, Department of Physics, Engineering and Astronomy

Customer Requirements

Adjustable:
The chiller must have a range of temperature in which it can be set to for cooling. This allows the user to choose the temperature of the water for their aquarium.

Temperature Gauge with Screen:
Alongside being adjustable, the chiller must be able to show the user the proper temperature on a screen.

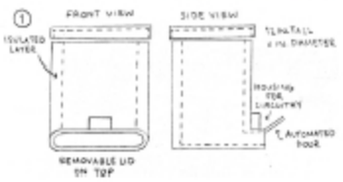
Compatible:
The design must be compatible with aquariums that have other attachments, such as filters, fans, lighting, or lids.

User-Friendly:
Ideally, the chiller will be easy to assemble, use, and clean on a regular basis if necessary.

Inexpensive:
The chiller should be low cost in comparison to other high-power chillers on the market, which are primarily targeted for larger aquariums.

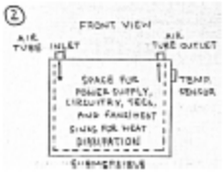
Low Disturbance:
The chiller must not create too much water movement within the tank, which has the potential to disturb or stress any animals inside.

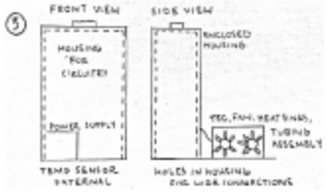
Conceptual Designs



- Insulated walls
- Automated door to release ice
- User controlled door through app
- Does not sense or maintain temperature
- 12 in. tall X 8 in. diameter

- Submersible aluminum block housing for circuitry
- Thermoelectric coolers cool housing to drop water temperature
- Inlet and outlet for air tubing to disperse hot air generated
- Reads temperature and adjusts cooling





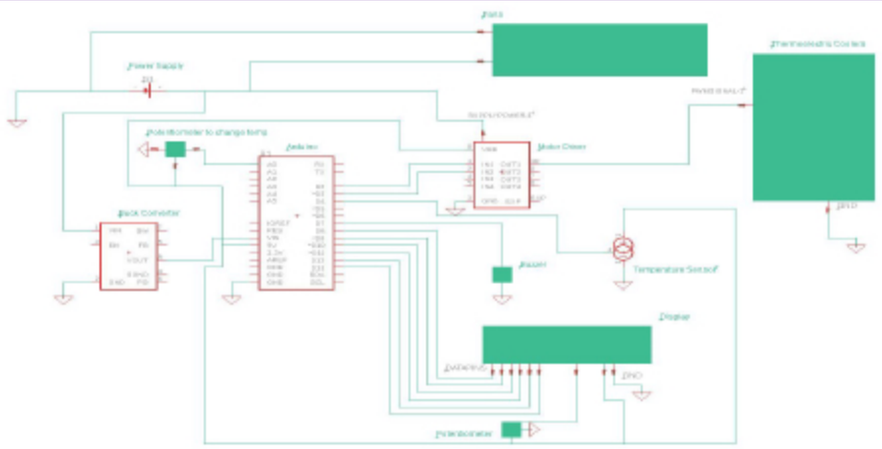
- Thin housing for circuitry
- External fans, heat sinks, and TECs for cooling
- Plastic/aluminum tubing to draw and cool water
- Reads and maintains temperature
- Adjustable temperature via dial

Our Goal

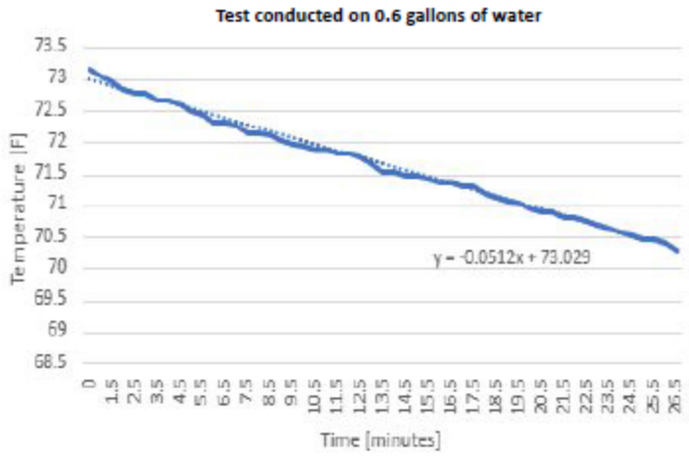
Current chillers are either bulky and expensive, or small and unreliable. A vast majority of chillers will not read and maintain water temperature or let the user choose how cold to make the aquarium. Those that do have these options are hundreds of dollars and are made only for large tanks.

Our team chose to reinvent the aquarium chiller by designing a product intended for smaller tanks that is effective, safe, and worth the price with many additional features.

Electrical Schematic



Thermoelectric Cooler Testing



- Cools approximately 3° in 27 minutes
- Larger volumes of water take longer to cool
- Slow decrease in temp. is ideal for inhabitants
- Temperature easily maintained upon reaching temp. goal

Bill of Materials

DESCRIPTION AND NO.	QTY	PRICE	TOTAL
Teylenten Robot TEC (5 pack)	1	$14.88	$14.88
Buck Converter	1	$13.99	$13.99
Motor Driver	1	$10.99	$10.99
Temperature Sensor (3 pack)	1	$13.49	$13.49
Arduino UNO REV3	1	$28.50	$28.50
Aluminum Cooling Block	1	$9.98	$9.98
Marvel Star 12V DC Pump	1	$13.99	$13.99
PVC Clear Tubing	1	$7.98	$7.98
Thermal Tape (10mm X 25M X 0.2mm)	1	$9.99	$9.99
Anbull SMPS 110V AC to 12V DC Power Supply	1	$55.99	$55.99
Wathai DC 12V Fan (2 pack)	2	$12.99	$25.98
Tatoko Aluminum Heat Sink	2	$13.99	$27.98
		Total (Before Tax)	$233.74

Design Specifications

Physical Description:
- Purple plexiglass, external PVC tubing, aluminum cooling block
- Main housing 12in x 7in x 3in
  - Bottom plate is 12in x 7in
  - The plexiglass is 1/8-inch glass
- Programmed Arduino for temperature control

Life Cycle Targets:
- 5-10 years with proper use and regular cleaning

Required Training:
- No training required for unit operation

Market Identification:
- Targeted towards fish owners and fish specialty stores
- Initial demand limited to < 500 units
- Competing with other brand chillers with less features
- Advertising done through pet stores and social media

Financial Requirements:
- Target manufacturing cost < $180 with new BOM
- Estimated retail price < $200

The Future of Our Chiller

- Using a smaller, cheaper power supply that can fit inside the housing, saving space and expenses.
- Using a smaller breadboard and Arduino also saving space.
- Making our housing out of a cheaper, thinner plastic rather than plexiglass
- Altering dimensions to make the product smaller overall. With smaller internal components, the housing can be downsized.
- Changing to code to shut down fans and motor when TECs are off

Contact

Saben Denbow
denbowsr@jacks.sfasu.edu
(832)-784-0102

Kirk Pierce
piercekm1@jacks.sfasu.edu
(936)-525-0523

Mario Vazquez
vazquezmi@jacks.sfasu.edu
(936)-707-6396

Jacob Lee
jlee@jacks.sfasu.edu
(409)-382-5396

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