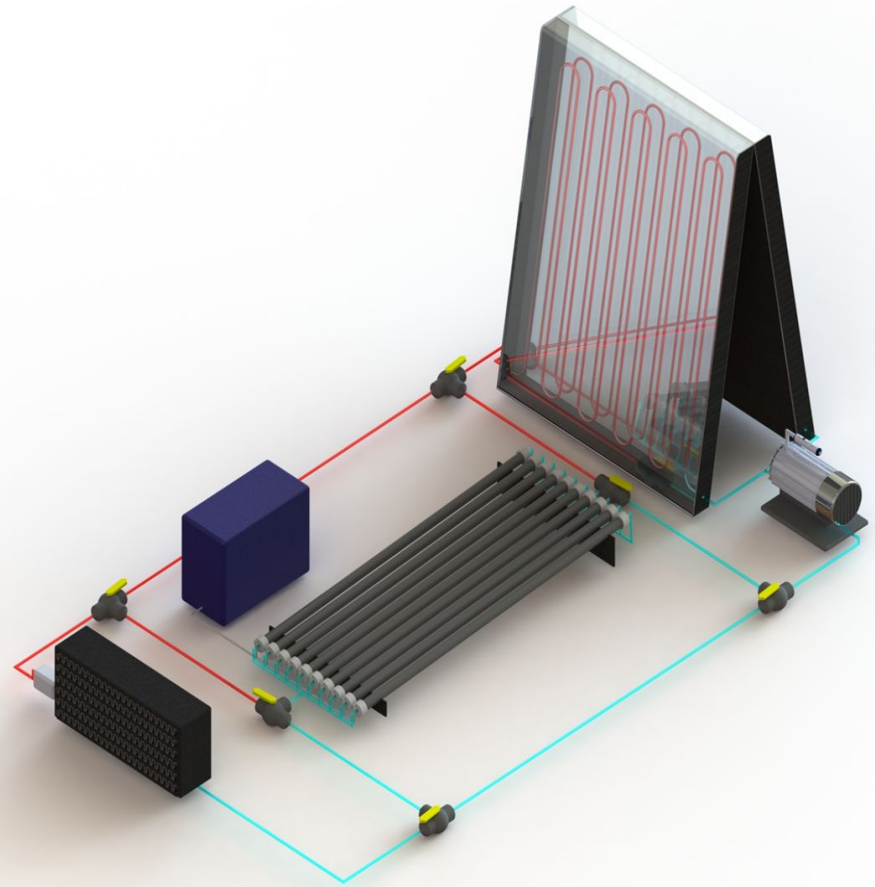


The SINC

By ENOVA Calgary

- S - Sustainable
- I - Ice
- N - Nucleation
- C - Contraption



THE PROBLEM : NORTHERN WATER INSECURITY

Canada's Water Crisis
A fight for safe water in Lytton First Nation

October 2, 2019 12:01AM EDT

Nfld. & Labrador

Canada: Blind Eye to First Nations
Neskantaga Community Needs Compensation, Assistance

Water shortage causes mass layoff in Twillingate

THM troubles grow in N.L. water supplies, tests show

Number of communities with high levels of disinfection byproduct have nearly doubled since 2000

The Right to Water

Finding a fix for Newfoundland troubled drinking water

December 20, 2018 4:37pm EST

SAFE WATER FOR FIRST NATIONS

In the Neskantaga First Nation, undrinkable water is a crisis of health and faith

Nearly 100 people have fled the northern Ontario First Nation after pumps failed and cut off water supplies. A nearly 25-year boil advisory is set to end next month, but the community is skeptical a new treatment system will be ready

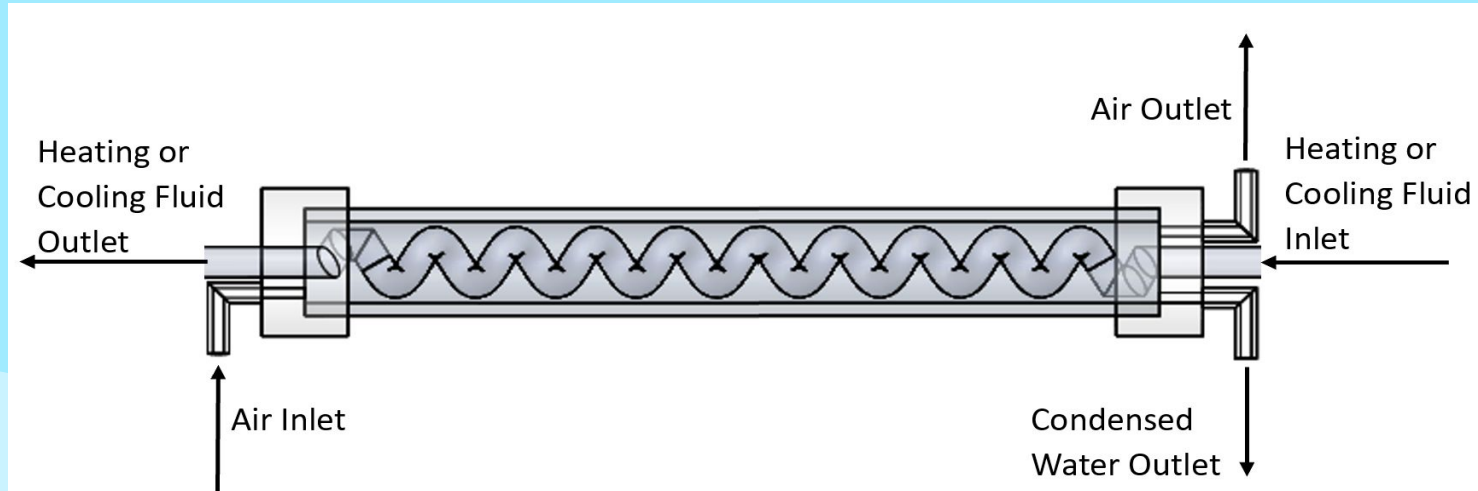
Canada: The Right to Water in First Nations Communities

Photo: Arriving at the Shoal Lake #40 reserve by ferry. The lake provides all the drinking water for the city of Winnipeg but the people of Shoal Lake #40 have long been under a boil water advisory because the federal government has failed to replace the community's inadequate water treatment system.

Many communities in Northern Canada suffer from a lack of clean drinking water, and this issue of water insecurity disproportionately affects Indigenous Canadians. Due to the region's extremely cold climate, traditional dew collection methods are not realistic, as frost forms rather than liquid water.

OUR SOLUTION

The SINC (Sustainable Ice Nucleation Contraption) is an outdoor water collection system designed for northern communities affected by water scarcity. The SINC cools humid air, collects frost on its surface, and melts the resulting frost to form liquid water.



OUR INSPIRATION



THERMOREGULATION

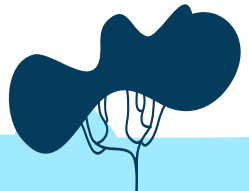
The Rainbow trout uses a countercurrent heat exchange system to keep warm in cold water. Conversely, the Thomson's gazelle. The systems of the gazelle provided inspiration for cooling the SINC to accelerate frost formation, similarly to how the trout provides inspiration for the heating system to melt the formed frost.

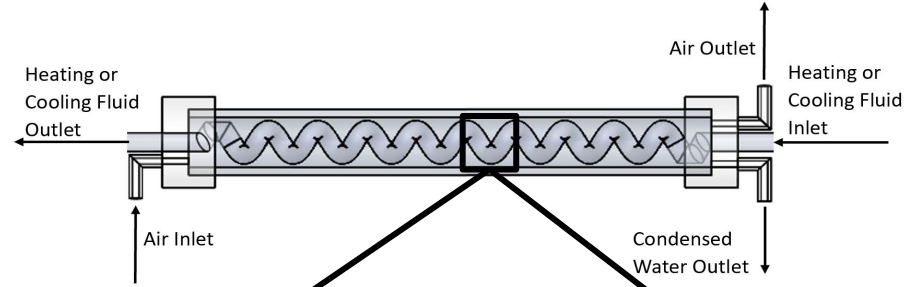


EXTREME TEMPERATURES

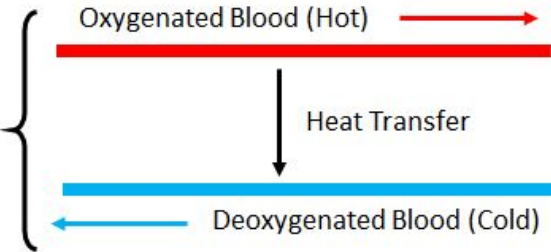
Arctic flora like Lichen thrive in extremes conditions, and produce moisture in an environment devoid of available liquid fresh water.

Lichen's ability to collect water through its ice nucleation mechanism is very promising in terms of potential application to solve water scarcity problems in isolated, Northern Canadian communities.

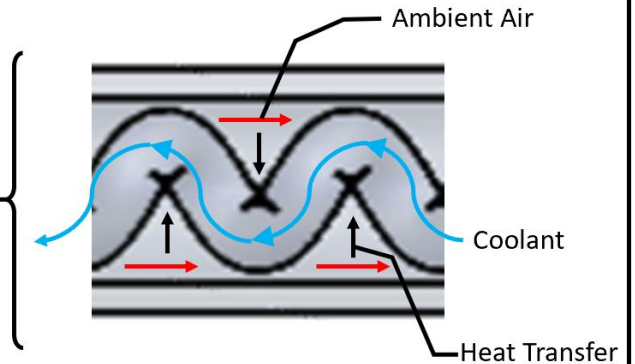


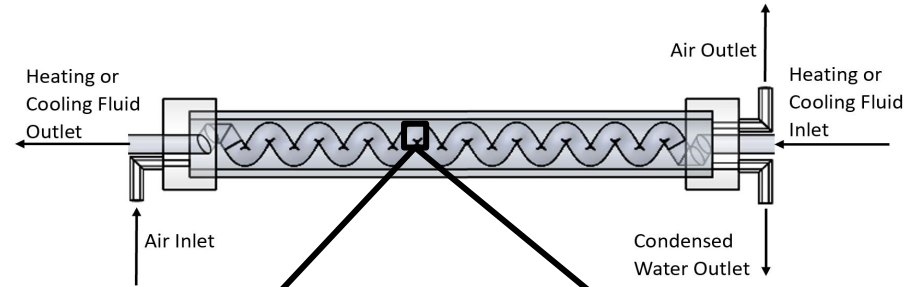
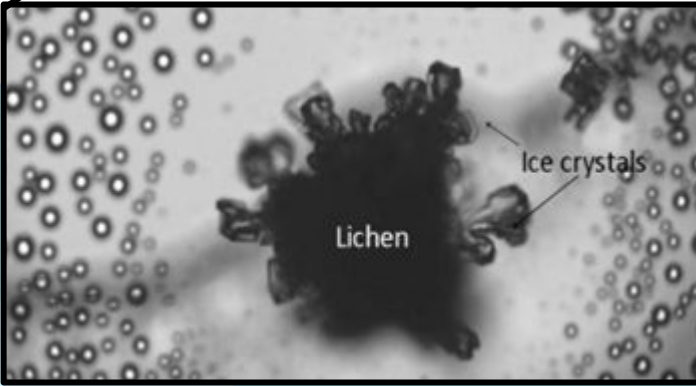
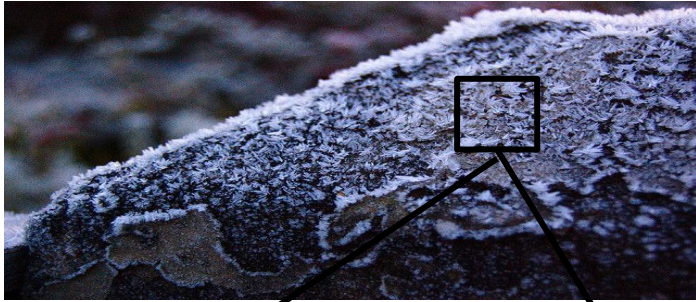


Thermoregulation
in Gills



Thermoregulation
in The SINC





WHAT THE SINC BRINGS TO THE TABLE



COST EFFECTIVE

Material	Cost (USD)
Cork (sq. ft.) ⁷	\$2.11
PVC pipe (1") ⁸	\$0.37/ft
HDPE pipe (1/4") ⁹	\$0.20/ft
R717 refrigerant ₁₀	\$0.60 - \$4.65/kg

WITHSTANDS HARSH CONDITIONS

Provides water where traditional water supply infrastructure may be flawed or unavailable, and the climate does not always allow for dew or rain collection.



EASILY IMPLEMENTED

Modular, cost effective design can be transported in components and assembled on site.

SUSTAINABILITY

Through the use of sustainable energy sources, such as solar this product would allow for a sustainable water source on a community-scale. Eventually, this would remove the need for large, centralized water treatment plants.

Stakeholder Feedback

What is the best advantage of this design?

"If it is a passive system the way you describe it then it would certainly be an advantage for local communities."

- Dr. Marjan Eggermont

"The modularity of the design; it can be scaled up or down to fit needs."

- Mario R. Ochoa, P.Eng

"Its use of night and day cycles drastically reduce the electrical consumption of the system which often plagues water heating and cooling operations."

- Jorge Zapote,

What sets our design apart from currently available solutions?

"Currently many Arctic communities don't have permanent water infrastructure. Water can be trucked in for drinking and other uses. This design would provide a distributed source of water which would be very helpful for individual households or communities if it can be scaled up."

- Gideon Mentie, Civil Engineering EIT

What changes would you make to this design?

"Water tastes better when a few mineral salts are present. You may need to add some back in at some point"

- John Schelske, Occupational Hygienist/Chemist

"Implementing a leak prevention/measurement system on the device to prevent/identify any possible leaks."

- Indira Cabrera, Bioanalyst

"In Canada there is lots of waste heat around in winter as we do a lot of heating. If you could use that heat, your process would be very efficient."

- John Bulger, PhD in Chemistry

"Make the heat exchangers matte black."

- Rustem Shaykhutdinov, PhD in Physics

Other things to consider?

"What is the cost of the energy? What season is this designed to work in?"

- Alsu Nazyrova, PhD in Chemistry

"The water produced from the system must meet the Federal Guidelines for Canadian Drinking Water Quality."

- Water Quality Leader at The City of Calgary

TEAM DYNAMIC



ENOVA Biomimicry Club at the University of Calgary: Working to promote, educate, and be involved in the incorporation of nature into design.



Team

Beth Mentie
Logan Boras
Aiza Awan
Mario Ochoa
Madina Shayne



Skill Sets

An integral part of our team's ability to succeed and come up with innovative designs was our different backgrounds & fields of study. Our team has people studying a variety of different fields, such as mechanical engineering, chemical engineering, software engineering, and sociology. This diversity within our team helped bring unique perspectives to team discussions & increase our team's productivity and creativity in our design.



Working Together

Our team held weekly meetings, mainly to keep everything organized. Goals were set, tasks were assigned to each member, and we brainstormed when needed. We communicated very well as a team and there were never any conflicts. Overall, our team worked together in an exemplary manner.

CREDITS: This presentation template was created by **Slidesgo**, including icons by **Flaticon**, and infographics & images by **Freepik**.

Thanks!

Do you have any questions?

enovacalgary@gmail.com

 @enovacalgary

