

#DESALINATION

System To Make Seawater Drinkable

A scalable and flexible approach to energy storage



Researchers have achieved a major breakthrough in redox flow desalination, an emerging electrochemical technique that can turn seawater into potable drinking water and also store affordable renewable energy. In a paper published in Cell Reports Physical Science, the researchers increased the redox flow desalination (RFD) system's salt removal rate by approximately 20% while lowering its energy demand by optimizing fluid flow rates.

RFD offers multiple benefits. These systems provide a scalable and flexible approach to energy storage, enabling the efficient utilization of intermittent renewable energy sources such as solar and wind. RFD also promises an entirely new solution to the global water crisis.

"By seamlessly integrating energy storage and desalination, our vision is to create a sustainable and efficient solution that not only meets the growing demand for freshwater but also champions environmental conservation and renewable energy integration," says André Taylor, professor of chemical and biomolecular engineering at New York University Tandon School of Engineering and director of DC-MUSE (Decarbonizing Chemical Manufacturing Using Sustainable Electrification).

RFD can both reduce reliance on conventional power grids and also foster the transition toward a carbon-neutral and eco-friendly water desalination process. Furthermore, the integration of redox flow batteries with desalination technologies enhances system efficiency and reliability.

The inherent ability of redox flow batteries to store excess energy during periods of abundance and discharge it during peak demand aligns seamlessly with the fluctuating energy requirements of desalination processes.

The intricacies of the system involve the division of incoming seawater into two streams: the salinating stream (Image above, CH 2) and the desalinating stream (Image above, CH 3). Two additional channels house the electrolyte and redox molecule (Image above, A). These channels are effectively separated by either a cation exchange membrane (CEM) or an anion exchange membrane (AEM).

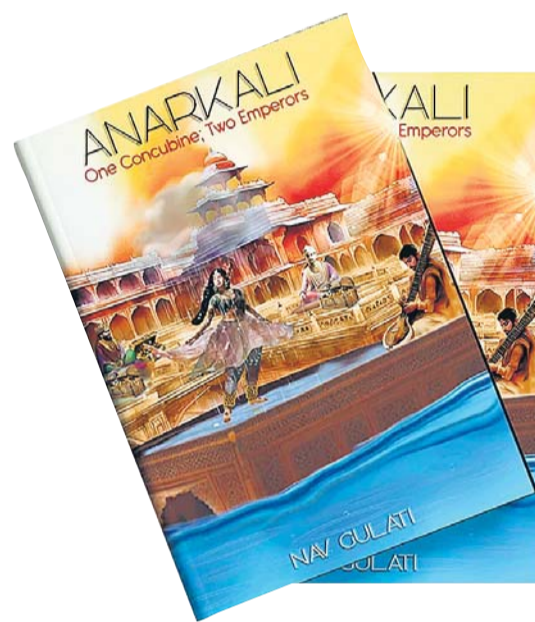
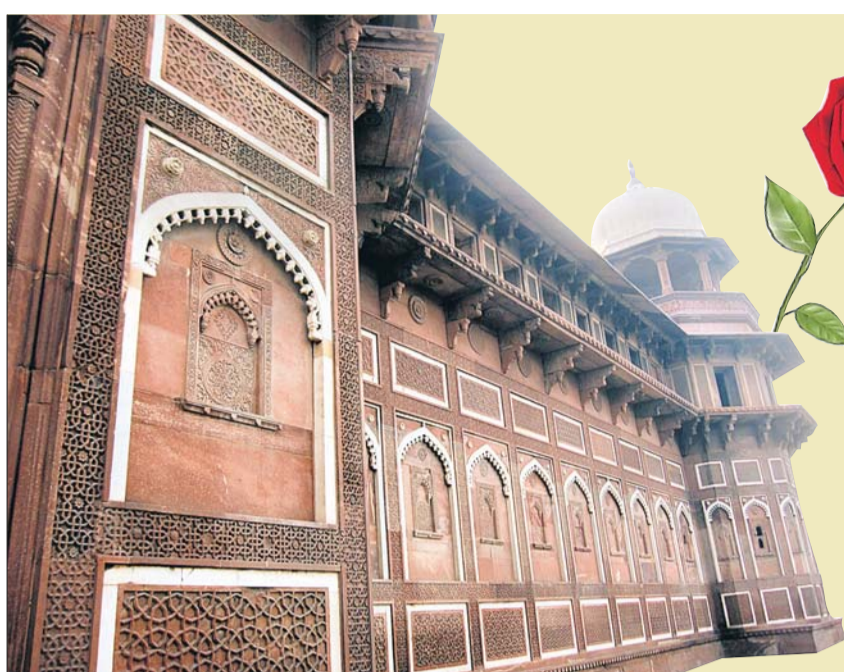
In CH 4, electrons are supplied from the cathode to the redox molecule, extracting Na+ that diffuses from CH 3. The redox molecule and Na+ are then transported to CH 4, where electrons are supplied to the anode from the redox molecules, and Na+ is allowed to diffuse into CH 2. Under this overall potential, Cl- ions move from CH 3 through the AEM to CH 2, forming the concentrated brine stream. Consequently, CH 3 generates the freshwater stream.

"We can control the incoming seawater residence time to produce drinkable water by operating the system in a single pass or batch mode," says first author Stephen Akwei Maclean, Tandon PhD candidate in chemical and biomolecular engineering.

In the reverse operation, where the brine and freshwater are mixed, the stored chemical energy can be converted into renewable electricity. In essence, RFD systems can serve as a unique form of "batteries," capturing excess energy stored from solar and wind sources.

This stored energy can be released on demand, providing a versatile and sustainable supplement to other electricity sources when needed. The dual functionality of the RFD system showcases its potential not only in desalination but also as an innovative contributor to renewable energy solutions.

As climate change and population growth intensify, more regions grapple with water shortages, underscoring the significance of innovative and efficient desalination methods.



Nav's journey as a novelist was ignited by his deep-seated passion for history. His desire to bring the opulence and intrigue of the Mughal and Ottoman Empires to life led him to embark on the literary adventure of a lifetime. The techie in him ensured that his research was methodical and detailed.

He has travelled the world and walked the corridors of corporate powerhouses like Deloitte, IBM, and Ernst & Young. Navketan Gulati or Nav Gulati is a graduate from IIT Kanpur who is also a finance whiz and a MS in computer systems from UCLA in USA. He has authored white papers on diverse subjects, including merger integration and enterprise risk management. Knowing these facts, one would expect that Nav Gulati would be a non-nonsense techie who loves the world of numbers, figures and facts. However, nothing could be further away from the truth for this techie-turned-writer.

According to his school friends, Nav Gulati was an above average student, however he wasn't amongst the top ten percent of the class. However, most of his



Fatehpur Sikri - Shaikh Salim Chisti's tomb closeup.

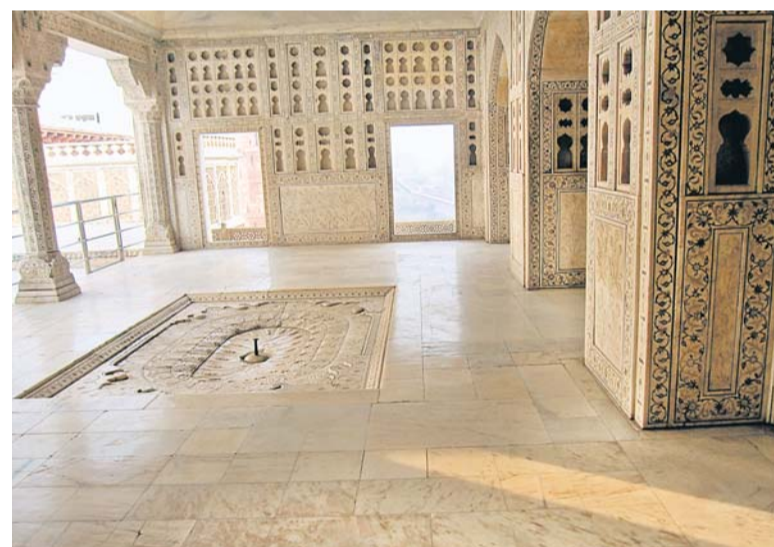
Who was this courtesan Anarkali who wove such a web of lust that entrapped the two emperors? Why would Akbar endanger the future of the Mughal Empire over this concubine? What was Jahangir trying to escape from and why did he desert the ruling of his Empire to Nur Jahan? Amidst grandeur and intrigue, 'Anarkali-One Concubine, Two Emperors', a novel by Nav Gulati enchants with love's power to defy empires and rewrite destiny.

Anarkali

One Concubine, Two Emperors

PART: I

#TECHIE TURNS RACONTEUR



Agra Fort inside view.

I have always been a passionate reader of history of the Mughal Empire and the Ottoman Empire. I also visited some of these sites. Like in Fatehpur Sikri when you see the Turkish Sultan's apartments or in the centre of the Sikri where there is Anup Talav where the dancers used to dance that further embellished the story of Anarkali in my mind's eye. When I read the history of the Ottoman Empire, I discovered that there was an inherent rivalry between the Ottomans and the Mughals as to who would be called the Caliph of Islam and in whose name would the Khutba be read in Mecca. I combined all of that and one line kept ringing in my mind which was 'From one Salim of the Ottoman Empire Anarkali passed to the other Salim of the Mughal Empire'.

The process of writing this book hasn't been easy he says. In writing this book, I have had to transport myself back four centuries to explore what tormented Shehzada Prince Salim (later Emperor Jahangir) and what enraptured his heart with the



Nav Gulati.

moment and relegated to live elsewhere in the remaining six years of Akbar's reign. Where? How did Salim find her again when he became Emperor? Who was this woman, Anarkali that enraptured him? Where did she come from? Is she really the concubine that was entombed live in the now disrespected Anarkali Muqbarain Lahore? Did she consort with any others while she was in exile? Does she have any living descendants? This book is not about lost love, unrequited love, or unanswered love. It explores some questions which still remain unanswered after over four centuries. Many clues remain buried in the Chambers of the Turkish Sultana at Fatehpur Sikri, and in the destroyed remains of Akbar's living quarters at Agra Fort and Chittorgarh Fort.

Nav Gulati believes that the romance between Anarkali and the rebellious Prince Salim was an obsessive romance which was forbidden by the Emperor Akbar not just because she was a concubine and he was a crown prince

Hot Chocolate Day

Hot chocolate has a long and delightful history that goes along with the history of the cacao bean. In fact, the first way that chocolate was enjoyed was as a beverage. Made with creamy milk and yummy cocoa, this sugary sweet treat is delicious when enjoyed by itself, or can be a great basic recipe that can then be used to get creative with by adding unique flavours, spices and even liqueurs. Hot Chocolate Day was established to show appreciation for and encourage the celebration of this delicious drink that soothes and comforts the youngest and oldest of souls - and everyone in between!



#FOOD-TALK

Types Of Pizza Around The World

"Look! We've even eaten our plates!"

Humans have been eating bread with toppings for thousands of years. One of the earliest references was by the Roman poet Virgil, who described "thin wheat cakes as platters for their meal" in his epic poem Aeneid. The characters top their "wheaten cakes" with forged mushrooms and herbs and when they finish, one of them remarks, "Look! We've even eaten our plates!"

Fast forward 2000 years - past the advent of margherita pizza in 1889 and the joy of "Virgil's" "wheaten cakes" can be seen around the world. Consequently, pizzas may be thin or thick, sweet or savory, topped with anything from egg, or olives, anchovies, onions, and even batter. Here are different types of pizza from around the world.



Flammkuchen, France and Germany

Flammkuchen is from the Alsace region on the French/German border and it consists of thin, crunchy dough topped with soured cream and sprinkled with onions and cured ham - typically small pieces of streaky bacon or finely diced schinken, which is similar to lardons, only less fatty.

Flammkuchen is a lighter pizza style that can blur the line between appetizer and main; in any case, it provides a simple balance of dairy, garlic, and umami flavours that pair very well with beers from Alsace or any other German region, for that matter.



Sicilian, Italy

Americans may know Sicilian pizza as a thick, crisp, and rectangular offering lathered in tomato sauce and covered with cheese and assorted toppings, but that's now how it is in the old country. The original style of Sicilian pizza - known by locals as sfincione in Italian or sfinciumi in the Sicilian dialect - has a focaccia-like form that's thick but thinner than its American derivative. There is a tomato base, too, but it is smeared rather than smoothed. Then, instead of mozzarella in the American recipe, Palermo street food vendors opt for local cheeses such as caciocavallo or pecorino.

Pissaladiere, France

The French city of Nice was under Italian control as recently as the 1850s, and it shows in the food. Pissaladiere is a round or rectangular pizza tart topped with olives, anchovies, and herbs upon a thick layer of caramelized onions, producing a sweet, salty, and oily dish that can serve as a hors d'oeuvre or a full meal. Every recipe has a contention or two; in pissaladiere's case, there are disagreements about dough. Caroline Craig, author of "Provence: Recipes from the French Mediterranean," believes that authentic pissaladiere is made with bread dough. Others believe that buttery shortcrust pastry is the superior base to work with.

Fugazza, Argentina

Buenos Aires has some of the highest pizza consumption in the world and the fugazza style is among the most popular. Improvised in Banchero's pizzeria back in the 1930s, the classic fugazza pizza pairs a thick, focaccia-style base with a very liberal topping of thinly sliced caramelized onions. The tomato-free offering is a fresh, crunchy balance of sweet and savoury flavours, but it may lack indulgence for some. In that case, they can opt for the fugazzeta variant, which stacks another layer of dough and stuffs a wad of mozzarella between them. If you sample the city's wares, some chefs may add artichoke, olives, and other Mediterranean staples.



Khachapuri

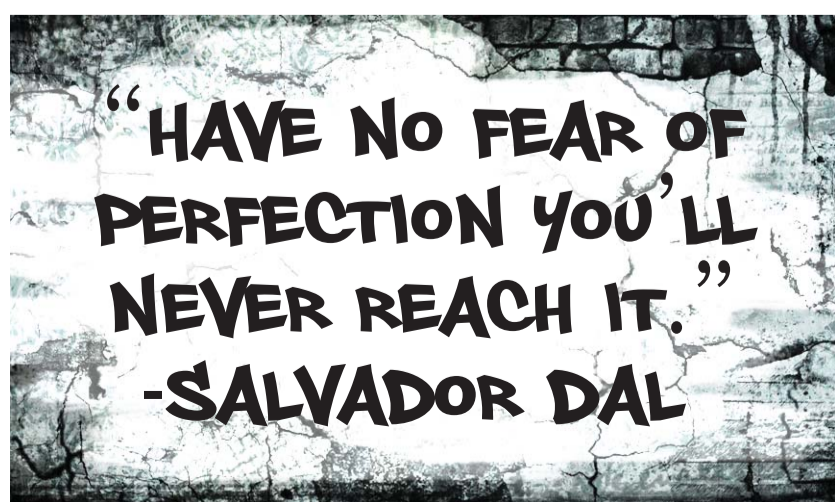
Khachapuri is a big deal in Georgia. The small central Asian state is host to 47 varieties of the cheesy bread dish including the Adjarian style, which mixes flour, yeast, salt, cheese, butter, and an egg. The dough is not so much a base as a bathub, for it is prepared with a thick ridge that holds the cheese, butter, and egg in its core. Just rip the ridge away, bit by bit, and dip them in the indulgent mixture. It will only take a few bites to discover why khachapuri is so dear to Georgians' hearts.

Neapolitan, Italy

Chef, writer, and philosopher Vincenzo Corrado chronicled the Neapolitan pizza - or pizza Napoletana - in the early 18th century. He described what we now know as the marinara: a simple dough base with tomato sauce, garlic, and basil leaves. Cheese wouldn't appear until 1889 when fabled pizza chef Raffaele Esposito added mozzarella and created a new variation - the margherita pizza. Legend has it that Esposito made the dish to honour Queen Margherita of Savoy, presenting an item that was humble, delicious, and emblematic of the red (tomatoes), white (mozzarella), and green (basil leaves) of the Italian flag.



THE WALL

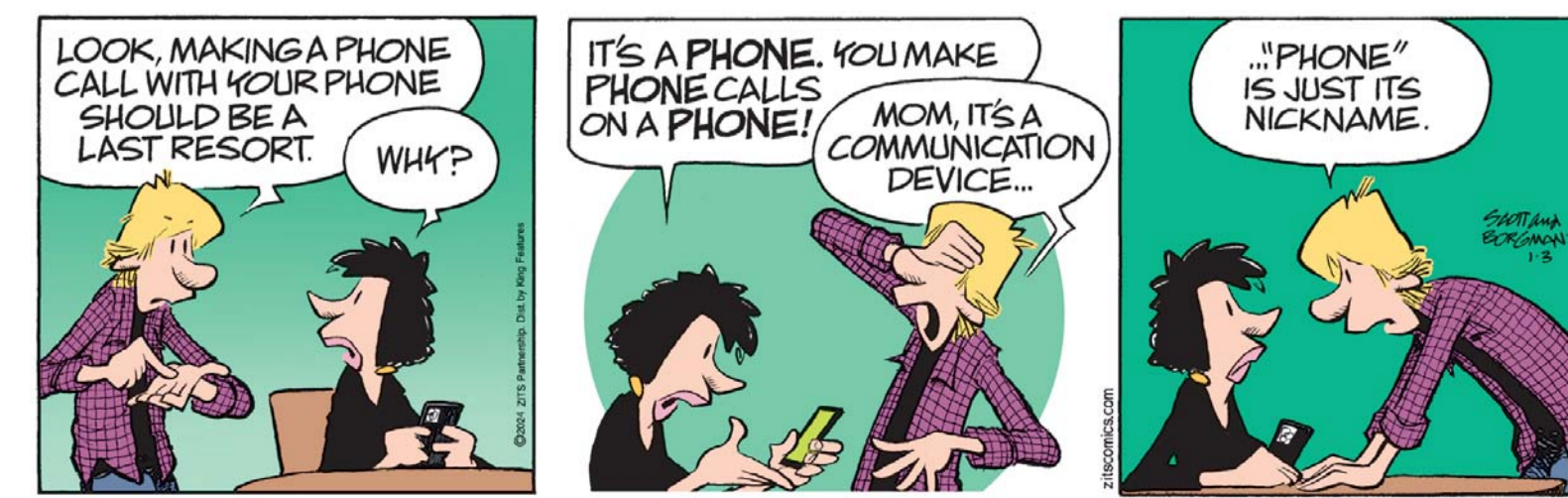


BABY BLUES



By Rick Kirkman & Jerry Scott

ZITS



By Jerry Scott & Jim Borgman

