

Green data centres for a sustainable future

One man's ambition has led to development of revolutionary submerged data centre cooling solution



by Gailyn Yap

THE turning point in information technology veteran Mathew Rajendra's life came in 2005. He was 33 and survived a crash-landing at the Subang Airport. Thankfully, he

walked away from the aircraft without a scratch.

But it was this near miss that set him on an ambitious path to make a significant impact in the world before he turned 40.

It eventually led to the establishment of Green Data Center LLP, which leverages on a revolutionary submerged data centre cooling solution he developed.

With more than a decade's experience in the ICT sector, Rajendra - who at the time was a trainer - was well positioned to see the problems plaguing the industry. The most prominent of which was the detrimental affect IT had on the environment.

The ICT industry alone generates approximately 2% of carbon dioxide emissions worldwide, which is comparable to that emitted by the global aviation industry.

However, experts predict ICT-based emissions are the fastest-growing and may account for 4% within the next few years, owing to the exponential demand for data centre capacity which utilises huge amounts of energy, especially for cooling.

Realising the serious environmental risks it poses, Rajendra started a non-governmental organisation in 2007.

Called the Green Computing Initiative, it has grown into a global champion for green ICT, mainly focusing on training and education initiatives.

Still, Rajendra was not satisfied. As he explains it, "The NGO was making an impact, but I knew it wasn't the significant thing I was heading for."

Determined to come up with a

tangible idea that can prove going green in ICT brings savings instead of costing a fortune, he focused on research once again in 2010.

His tenacity resulted in the creation of a prototype for an end-to-end fluid submersion data centre cooling solution, which he dubbed Eco2, short for economical and eco-friendly.

"I wanted to walk the talk. Going green shouldn't mean having to spend a lot of money, it should mean a lot of savings at the end of the day.

"Many people are pushing green, and they're marketing it as a gimmicky premium model. I don't believe in that," he says.

Going against the flow

His efforts were a timely one, as 2012 marked the start of a government push to position the country as a data centre hub, owing to its potential to become a substantial economic contributor.

He clinched a government grant to develop "proof-of-concept" for the technology that year. It was followed by a 2014 grant from the Ministry of Energy, Green Technology and Water to set up a pilot site.

"Once we built the site, we invited experts from the government, academia and industry to come over for one week.

"Everyone was asked to find fault with the technology within that week, but in the end, there wasn't anything significantly wrong with it," he shares.

The difference Rajendra made is that instead of building conventional technology for data centres, he focused on innovative technology to reduce the industry's environmental impact.

"I went in the opposite direction and people thought I was crazy to go against the flow. There are over eight million data centres globally and more will be built in the next few years," Rajendra says.

Data centres are a major contributor to greenhouse gas emissions in the ICT industry. With the number of data



Rajendra sees immense potential to apply the company's cooling solution outside of the ICT industry

centres predicted to hit 8.7 million worldwide next year, the situation can only worsen. This is where Green Data Center LLP wants to make a difference.

To understand how the company's technology differs, it is important to

first understand the basic set-up of a data centre.

A typical data centre requires air-conditioning systems and raised flooring to ensure consistent low temperatures to prevent servers from overheating.



From left: MDEC stakeholder engagement VP Niran Noor, APCA 2015 school project winner Chong Hwa Independent High School's Low Weng Fei, sustainability and environment technology winner Green Data Center LLP's Rajendra, communications winner BNetworks Sdn Bhd's Tharainindran K Gannaslin, and MDEC chairman Tan Sri Abdul Halim Ali at the APCA 2015 awards ceremony in Sri Lanka.

Awards lead to opportunities

FOR the inroads it has made in green technology, Green Data Center LLP has received a number of accolades and awards.

These include the MSC Malaysia Asia Pacific ICT Alliance (APACTA) Awards 2015, the International APACTA Awards 2015 for the best sustainability and environment technology, and the United Nations ICT Award.

The awards are a reminder for its CEO Mathew Rajendra to stay on track and not veer off to other ventures.

"All these awards are humbling. Now there's an unbiased third-party that's clearly validating what we've been doing, and that shows we're headed in the right direction.

"I've always been an entrepreneur and

Unearthing local ICT gems

AWARDS such as MSC Malaysia Asia Pacific ICT Alliance Awards (APICTA) are a key part of the ICT enablement ecosystem and give businesses a stepping stone, says National ICT Association of Malaysia (Pikom) councillor Stan Singh-Jit.

A prominent annual awards programme, APICTA was initiated in 1999 by the Malaysia Digital Economy Corp (previously the Multimedia Development Corp) and organised by Pikom to unearth unpolished gems of the ICT industry.

Merit winners and winners of the awards represent the country at the international level APICTA where they go up against national award winners from other economies.

Members of the Asia Pacific ICT Alliance, these participating countries take turns to host the international awards programme with last year's event held in Sri Lanka.

In last year's local edition of the awards, there were 17 categories with about 220 applicants.

At the finale of the international edition, eight awards were won by Malaysian companies with three winners and five merit winners. The achievement was second only to Taiwan with four winners and two merit winners.

"The intention behind the awards is to recognise companies with good products and services, be they start-ups or those that have been around for 10 to 15 years.

"These companies are hungry to grow. They want a platform to launch their products and gain visibility. APICTA provides the platform for them to do just that," Singh-Jit says.

Singh-Jit, who has also been the awards programme's chief judge for the country for the past five years, says experienced judges are engaged to ensure the winners and merit winners that attend the international awards are fully prepared.

"Before attending the international stage, we put them through a stringent dry run to show them what happens at that level.

"The platform for local and international is different, so there's a need to coach them, to let them know how things are judged internationally, and the dos and the don'ts," he says.

However, there is also an issue of continuity where a number of MSC Malaysia

The lack of continuity and momentum following award wins leads to failure, which Pikom wants to address, says Singh-Jit



APICTA's past winners no longer exist.

Singh-Jit says the lack of continued support is a reason these companies fail, as they are often lost on what to do next once they win the award.

This is why Pikom is looking to introduce award winners to mentoring or coaching programmes as a way to leverage on the momentum gained through winning awards.

It is in talks with Cradle Fund Sdn Bhd to channel the award winners to its Coach

and Grow Programme (CGP).

Cradle Fund was set up in the 2011 Budget. Its CGP is a market driven programme intended to bring together key players in the entrepreneurial ecosystem to train existing entrepreneurs to grow their businesses and move into international markets.

Pikom is also looking at business-to-business matching and creating business networks for its local and international award winners.

It is no exaggeration to say that close to 70% of the budget in a data centre goes to energy overheads, to ensure the servers run 24/7.

Looking to the past

Rajendra had to think out of the box to come up with a solution to deal with the challenge.

"Water is a better conductor of heat when compared to air. While I can't be dunking servers into water, I just knew liquid was the way to go.

"What I did was think back to how our ancestors conserved energy about a century ago, bring it forward today and implement technology to make it a good solution," he says.

Using the "flashback method", as Rajendra calls it, the company looked at the utility poles used in Jakarta and Thailand back in the 1920s.

Big tanks would be attached to the base of these poles, which contain transformers that lower voltage to a level safe for home-use.

Back then, the transformers had to

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— Rajendra

be cooled as they would explode once overheated. Thus, the tanks containing transformers were filled with coolant to solve the problem.

"It worked very well, and if transformers can be dunked into a coolant, why not servers? I did more research into the coolant they used in the 1920s, but it wasn't very green. I could have easily taken that solution, hoped for the best and taken the glory," he says.

The next challenge was to create a sustainable coolant as the one used previously was a by-product of petroleum. Hence, it had to satisfy four criteria - be renewable, sustainable,

biodegradable and non-toxic.

With that in mind, five different chemical engineers were engaged to work on a specific characteristic to be merged into the coolant formula.

By submerging servers into the coolant, the heat generated by them is transferred to the coolant, which is transformed into energy to power pumps that regulate coolant temperature.

As a result, Rajendra says capital expenditure on new data centres can be reduced by 70%, and operating expenditure cut by 50%, in which cooling will be done by 90%. This dramatically reduces the carbon footprint.

An Eco2 data centre has servers that are submerged in coolant in horizontal racks on the floor, instead of the conventional standing racks.

This removes the need for costly infrastructure set-ups as it can be installed in any location that has basic cement flooring, standard fire protection, and power.

Rajendra says the system opens the floor to data centres deployed in store-houses and warehouses and expresses his desire to roll out the technology on a large scale, such as in a swimming pool.

"I want to push the limits of this technology and create more mindboggling stuff. Think large scale deployments of servers in a six-foot reservoir, or in swimming pools.

"Why do we have to build data centres as buildings when we can get an abandoned warehouse and repurpose it?" he opines.

As the technology renders high-powered air-conditioning equipment and the countless server fans unnecessary, noise generated

by data centre equipment is reduced to a minimum.

This also drives down equipment maintenance costs and extends their lifespan because server fans run at high speeds, bringing in air to cool servers. However, it also pulls in dust, causing problems for components which then need to be replaced.

Taking the next step

The company has also engaged several major server manufacturers including Dell, HP and Asus to test their equipment in the Eco2 environment.

"The problem we had with submerging servers was voiding the warranty, so we had to engage the manufacturers," says Rajendra.

He says manufacturers see the benefits of the system and are working on introducing submersible-ready Eco2 servers.

Furthermore, there are wide possibilities for the use of the Eco2 coolant outside of the ICT industry. An Australian company operating solar farms in the desert is considering using the technology.

They plan to use it to cool the temperature of lithium batteries in which electricity generated by the solar farms are stored. Green Data Center LLP is working on a pilot site within a 20ft container.

Defence systems application is also feasible, where the coolant is used to cool lasers that are used in place of bullets, or for military application where technology worn by soldiers can send data to a data centre housed in a computing combat unit that's deployed on a battlefield.

The challenge it faces is global expansion in line with its five-year plan, where the company is looking to build the brand internationally.

Part of this plan includes securing 10 distributors worldwide and potentially building more pilot sites.

"We have a small market in the country but it's a stepping stone. We need to get out there and do business. We want to push our products out there, and we think it stands a very good chance," he concludes. [enr.com](#)

set up my first business when I was 19. Without this structure, it's very easy for me to go off the path," he says.

The recognition gained through winning awards has served the company well and opened doors to new opportunities.

Prior to winning them, potential investors viewed the company and its technology with caution and suspicion.

But the tone of the conversation has now changed, and they see less risk in being associated with Green Data Center LLP and are more open to discussions.

"It's human nature to be suspicious when you don't understand something. So third-party endorsement plays an important role. It's not just me blowing hot air to investors. It's what helps us get the word out internationally," he says.

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Green Data Center LLP has won the MSC Malaysia APICTA 2015 and the regional APICTA 2015 awards.

