

# milieu

SHARING OUR WORLD, CARING FOR OUR ENVIRONMENT

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March / April 2006



## The 'Environmental' Team Needs You!

Find your calling

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**Sniffing Out a Good Idea**  
From academic to  
environmental entrepreneur

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**Taking Ownership  
to New Levels**  
What makes a win-win-win?

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# When the Environment Means Business

Singapore has always been a leader in the adoption of new and innovative technologies in the environmental and water industry. These sectors provide tremendous potential in the coming years, and have been identified as an additional area for development by the National Research Foundation. This issue of *Milieu* focuses on how the MEWR family and its partners are developing Singapore into a global water and environmental hub.

Since Singapore's early years of development, the private sector has worked closely with the government to provide environmental services and develop environmental technologies. Recent years have seen the emergence of a vibrant and dynamic environmental industry, and the government has been actively exploring ways to work even more closely in partnership with the private sector to provide high-quality environmental infrastructure and services. Examples include a desalination plant built by Hyflux and an incineration plant to be built by Keppel under the Design-Build-Own-Operate initiative. (See page 4)

By building up a pool of players with the requisite expertise, NEA and PUB will enjoy greater outsourcing options. And that ultimately means greater cost savings for Singaporeans. →



Every day, all over Singapore, people are doing their part to care for our environment. Read about it in *Milieu*, and see how you can make a difference – because it's your environment too.

*Milieu* is a bi-monthly newsletter by the Ministry of the Environment and Water Resources (MEWR), in collaboration with the National Environment Agency (NEA), PUB and 3P (Public, Private and People) owners of the environment.

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## SINGAPORE AS A HUB

The government is positioning Singapore as a water and environmental hub, and has in place measures to help local companies showcase their products and services to a wider audience. These include the Innovation for Environmental Sustainability fund and the Environmental Test-bedding Initiative. Technical support is provided for companies' overseas projects in areas where the government has traditionally provided the service. MEWR has also been organising business missions overseas with IE Singapore, to explore new markets. The objective is to encourage and help companies to undertake innovative projects that will help meet our goal of environmental sustainability. *(More on pages 6 and 7)*



## EXPORTING INNOVATION

"Singapore is constantly innovating and adopting new technologies to stay at the forefront of the water and environment industries," says Eng Tiang Sing, MEWR's Director of 3P Network. "This is clearly illustrated in our NEWater story, where the use of membrane technology has helped us in our push towards self-sufficiency in water and at the same time, spawned a new membrane technology sector in Singapore."

In fact, Singapore is seen as a leading adopter of membrane technology and Singapore's water companies have been able to showcase as well as export these capabilities to new markets such as the Middle East and China.

Among the many local companies already competing outside their home market are:

Hyflux, Keppel, Dayen Environmental, Aromatrix and Salcon. *(Read about Salcon on page 12)*

Another homegrown environmental company that has stamped its mark internationally is SembEnviro, which is present in India, China and Australia. "To a large extent, other countries look upon Singapore as a successful model of privatising waste management with a good track record," says Heng Chiang Ngee, President & CEO of SembEnviro. "As Singapore develops into an environmental hub, local companies have an opportunity to introduce Asian solutions ideal for our climate and yet scalable to similar cities."



## THE CHALLENGE

As Singapore continues to grow, we will face increasing resource challenges and intense competition from other countries. Given Singapore's size, it is difficult for the environmental industry to thrive if it relies only on domestic demand. Therefore, it is critical to invest in excellent environmental infrastructure, and build up local companies' capabilities to develop innovative solutions. The MEWR family and its partners are committed to this.

Singapore can help make a difference to environmental sustainability, here and beyond our borders. What it will take is improved expertise and the right people with passion and in the right professions. *(See pages 8 to 11)*

## INTERNATIONALLY ACCLAIMED!

Singapore has won three international awards at the second Global Water Awards, held in Dubai in March 2006.

PUB was named the Water Agency of the Year 2006, an award given out for the first time. Hyflux won the Water Company of the Year 2006 award and its SingSpring Desalination Plant at Tuas was Runner-up in the Desalination Plant of the Year 2006 category.

The annual Global Water Awards, organised by Global Water Intelligence, are widely recognised as the most prestigious symbol of achievement in the global water industry.



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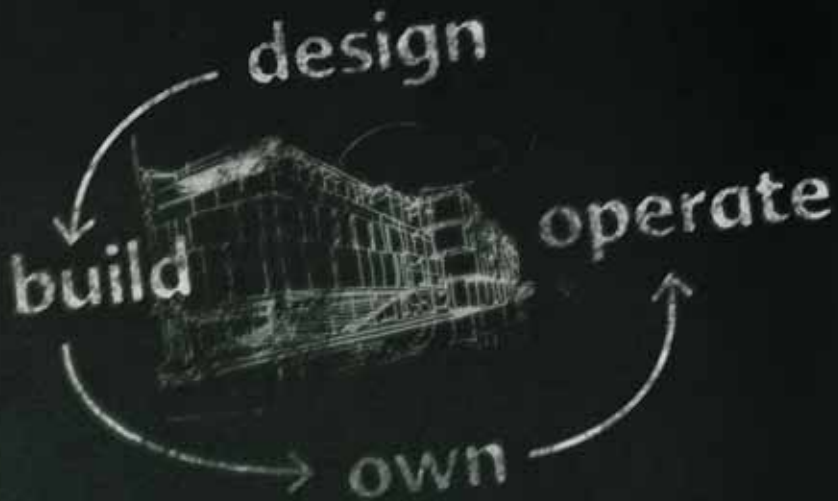
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# Taking Ownership to New Levels



The government used to assume sole responsibility for providing environmental infrastructure. Later, the private sector was engaged to design and build such infrastructure. Now, the MEWR family is, allowing certain projects to be designed, built, operated and owned by the private sector. *Milieu* talks to two companies who have firsthand experience of this form of Public-Private Partnership.

Homegrown water specialist Hyflux has been steadily expanding its involvement in environmental infrastructure. In 2005, it completed Singapore's first desalination plant.

"In our first few projects Hyflux was a process specialist," says Gireesh Bhat, Vice President Special Projects. "We subsequently expanded into Design, Build and transfer projects. The Design, Build, Own, Operate (DB00) contract for the Tuas desalination plant was a natural progression."

The DB00 project has built up Hyflux's expertise, from the technocommercial to legal and financial, including project financing, notes Mr Bhat.

## **Taking on the world**

Another beneficiary is Keppel Corporation, currently executing a DB00 contract for Singapore's fourth and largest NEWater plant.

Wong Khai Theen, Senior General Manager and Director of Keppel Integrated Engineering, believes that "the DB00 plants in Singapore would enable

us to move even more aggressively overseas. It is also a commitment from Keppel to our existing and potential clients, that we are in this business for the long haul."

As for Hyflux, "the Tuas plant has put Singapore, Hyflux and PUB on the map," declares Mr Bhat. "The experience gained has enabled us to grow in China and the Middle East. We are now building the biggest DB00 desalination plant in China."

## **Win-win and more**

Mr Wong describes DB00 as a win-win. It's a steady income stream, promotes innovation and beefs up the company's track record. "The Ulu Pandan NEWater plant will utilise our in-house technologies and demonstrate that we are able to offer one-stop solutions for both thermal treatment and water treatment."

At the same time, DB00 is a cost-effective way to provide environmental services and infrastructure, which spells good news for the government – and the consumer. So, make that a win-win-win.

# A Good Day's Work Becomes Better

by Thia Kai Feng,  
3P Network Division

**Dirty, unhygienic, strenuous, low paying – words often used to describe jobs in cleaning, pollution control, pest management, waste management and recycling. But the “1000 for 1000” initiative has started changing things.**

**Target** → Upgrade, redesign and match 1,000 jobs in the environmental sector paying more than \$1,000 a month.

**Timeframe** → October 2003 to March 2005.

**Implementers** → NEA, in close collaboration with the Town Councils, Workforce Development Agency, National Trades Union Congress (NTUC) and employers.

**Methods** → Mechanisation to increase workers' productivity, and training courses to help workers be more effective and take on supervisory roles. This allows workers, especially those on performance-based contracts, to command higher salaries. Also, with high-tech equipment, workers handling dirt or waste are less likely to come into direct contact with it. These improvements make environmental jobs more attractive to Singaporeans.

**Result** ↓

Target exceeded by end March 2005. By end February 2006, NEA had re-created and matched another 635 jobs. NEA is continuing its efforts under NTUC's Job Re-creation Programme, which will re-create jobs paying \$1,000 to \$2,500 in 12 industry sectors including the environmental sector. The aim is to help low wage earners and older workers.

## Top “Re-Creator”

When is recreation no walk in the park? When you're re-creating jobs. NEA's tireless efforts were recently recognised. The environmental sector recently won the Top Achiever Award under NTUC's Job Re-creation Programme.

## Upgrading –

### both job & family life

Mdm Tan Keng Ngau, 65, was an office cleaner. Paid \$600 a month, she worked from 4.00 to 11.00 pm daily, including Sundays and public holidays. As the odd hours took a toll on family life, she resigned.

She later joined SembCorp Environmental Management and passed a module under the National Skills Recognition System. Now in charge of cleaning two HDB blocks and a multi-storey carpark, Mdm Tan works from 7.00 am to 1.00 pm – drawing the same pay as before, although she now works only half a day. (She would earn over \$1,000 working full-time.) With newfound confidence after completing one course, Mdm Tan is determined to upgrade herself and will soon attend another.

“I'm very happy with my job, especially the working hours. It gives me more time for my family,” she says. “My employer also provides training for workers to upgrade themselves. I will recommend it to relatives and friends.”



# Sniffing Out a Good Idea

by Lim Poh Yen,  
3P Network Division

Continuous innovation is crucial to the growth of the environmental industry. Since their inception in 2003 and 2001 respectively, the Environmental Test-bedding Initiative (ETI) and the Innovation for Environmental Sustainability (IES) Fund have been helping environmental companies to develop ideas and bring them to market. *Milieu* takes a look at one company that has benefited from these programmes.

**“ A good idea is a terrible thing to waste. Lack of funding should not stand in the way and prevent a good idea from taking off.”**

– Dr Yaacob Ibrahim, Minister for the Environment and Water Resources, speaking at Ennovation 2005

Bad smells spell good business for Aromatrix, one of the few companies in the world to specialise in biological odour control systems. The first recipient of the ASEAN Outstanding Engineering Achievement Award in 2004, this homegrown company has developed innovative, commercially proven products.

#### **A germ of an idea**

It all began when Dr Lawrence Koe, a professor at the Nanyang Technological University’s School of Civil and Environmental Engineering, pioneered a new way to remove odours. The conventional way of dealing with odours was to treat them using hazardous chemicals. Dr Koe, however, came up with the ingenious bio-trickling method, where cultured bacteria are employed to “eat” odours. Not only was this method safer and environmentally friendly, it was also more cost-efficient and required a smaller footprint.

At the same time, companies frequently approached Dr Koe to collect and analyse air samples, design and install odour control systems, and even to monitor and maintain such systems. It then dawned on him that “there was no one company that provided a total solution to a client.”

Thus began Dr Koe’s path from academic to environmental entrepreneur.

### To market, to market

But bringing the technology from the lab to the market was no easy task. A helping hand from the then Ministry of the Environment proved to be crucial. In 1999, Aromatrix worked with the Ministry to field test its technology, and developed AroBIOS, its first-generation odour control system.

“The trial testing allowed Aromatrix to successfully demonstrate that the technology is viable,” recounts Dr Koe. “It also enabled us to further understand the technology and identify areas we could improve upon.”

Aromatrix has already made inroads into overseas markets like China and Australia, winning lucrative contracts to treat odorous air. Although AroBIOS is currently the leading technology, surpassing that of its Dutch, Australian and American rivals, Dr Koe is quick to emphasise that “the world has competitors that learn very quickly and to have an (technological) edge, you need to conduct your in-house R&D.”

With this in mind, Aromatrix is test-bedding the second generation of AroBIOS at Kranji Water Reclamation Plant. As with other projects covered by the ETI, the environmental agencies (in this case, PUB) provide the facilities and manpower to make test-bedding possible.

### Money matters

While he appreciates the ETI’s assistance, Dr Koe notes the importance of the IES Fund as well. “Small companies cannot afford the hundreds of thousands of dollars that are often needed for meaningful R&D. Without such funding, it is unlikely that Aromatrix would be able to develop new odour control technologies.”

The results of the ETI and IES Fund are proving to be real and rewarding – for the recipients and the industry as a whole. Each new product making its way into the marketplace is an encouraging step towards making Singapore a vibrant environmental hub.

And best of all, these good ideas are helping the global environment.

## Other companies capitalising on the ETI and IES Fund

### ***Intraco: Intelligent lighting control and monitoring system***

Holland-Bukit Panjang Town Council is test-bedding an intelligent energy-saving lighting system that dims lighting in common areas as the night wears on and fewer people are around.



The system cost \$51,000, but could generate annual savings of \$500,000. Also, each light can be monitored via remote computer. That means no more laborious checks, so maintenance staff can focus on more critical works.

### ***GPac Technology: Eco transportation packaging***

Pallets and corner boards are used to protect goods during transportation and to facilitate storage. They are usually made from virgin wood or plastic.

GPac has developed the technology to produce eco transportation packaging products from horticultural and wood waste. Besides commercial success, the project encourages a higher recycling rate for horticultural and wood waste and less use of virgin wood and plastic.



### **IES Fund**

\$10.6 million  
33 projects  
(19 completed)

### **ETI**

19 projects



# The 'Environmental' Team Needs You!

by Francis Tan,  
3P Network Division,  
MEWR

## Testing the waters – in more ways than one

Since childhood, Low E-Wen has loved nature and wanted to be a biologist. Her dream came true in 2004 when she graduated from the National University of Singapore with an honours degree in Science, majoring in Biology.

"I concentrated on Ecology," E-Wen explains, "which means I got to study the natural ecosystems in the wild, the flora and fauna unique to each place, the impact of humans and even bacteria and viruses."

### On-the-job opportunities

Now a biologist at PUB, E-Wen tests the biological quality of water in our reservoirs, treatment plants and water tanks. But far from being stuck in a lab all day, she can be found on frequent field trips to the reservoirs. These are what she enjoys most about her job. Together with a team of technicians, she goes by boat to collect water samples, study the plants growing in the reservoirs and determine what fish species should be introduced to maintain the delicate ecosystem.

Aside from day-to-day work, E-Wen applies her skills to several PUB projects. One joint project with Nanyang Technological University and local firm Environmental Professionals recently won the Innovator Award and Enterprising Agency Award under the public service Enterprise Challenge Awards. The project involved removing nutrients from water before it flows into the reservoirs; this reduces excessive algae growth in reservoir water and saves on reservoir maintenance costs.

### Opening young minds

E-Wen also has the opportunity to influence youngsters through school outreach projects. "Once, we showed a group of schoolchildren the natural biodiversity at Upper Seletar Reservoir," she recalls. "They were so excited to see the live specimens of fish, and insisted on going for a boat ride even though it was threatening to rain. They asked so many questions about the plants and fish and wanted to learn how to use the microscopes. It was really heartening to see their interest in nature."

Some day that interest might be put to good use for the environment. Who knows, some of those kids might follow in E-Wen's footsteps.



Low E-Wen  
Biologist

**When someone talks about jobs in the environmental and water sectors, what comes to mind? Cleaners, garbage truck drivers and pest controllers?** In reality, there's a lot more to the industry. Whether your interest is in the sciences, engineering, business development or just reaching out to people, there's a job that will fit you. Best of all, you'll be making the world a better place! *Milieu* profiles four individuals who've found their niche in this fast-growing sector.



## Tricia Tan 3P Partnership Facilitator

Now a 3P Partnership Facilitator with the South West Regional Office, Tricia interacts with grassroots organisations, introducing public health programmes such as “Mozzie Attack” and “My Environment Shines @ South West”.

Tricia's job requires commitment, patience, tact and a strong belief in the product. “When our section was formed, we had to cold-call our partners to ‘sell’ such programmes,” she says. “But the fruits of our labour are paying off. I find it very fulfilling when they start promoting public health and environmental matters on their own. It shows a degree of internalisation and is definitely a move in the right direction.”

### Not just a job

Tricia Tan Su Ping joined NEA in 2001, after graduating from the National University of Singapore with a double major in Biochemistry and Physiology.

“My studies were largely unrelated to the environment industry,” confesses Tricia. “You could say that my career choice is somewhat of a calling – I care very much for the environment.”

### Great exposure

After just a few years at NEA, Tricia has been exposed to many aspects of environmental work. Her first year was spent in the Environmental Health Department handling contracts and attending to crematoria, columbaria and cemetery matters. Next was a one-year stint with the then Central Environmental Health District Office, inspecting coffeeshops for food hygiene compliance.

The job has also helped Tricia to overcome her natural shyness. She now enjoys interacting with NEA's partners, getting to know them for the people they are, not just the roles they play.

### An occupational hazard

True to her calling, Tricia declares, “It's my practice not to litter, and to recycle as much as I can. I'm hoping I can influence more and more people as I plod along.”

Far from “plodding along”, she's an avid traveller who cannot help bringing her work with her. While in Japan, she observed their public cleansing measures and anti-littering practices. And during a holiday in Genting Highlands, she was on the lookout for innovative bin designs to introduce in Singapore.

You could say that her love for the job is an occupational hazard.

# Max Wong

## Undergraduate

### Engineering his career

Max Wong Geng Hai received several scholarship offers but decided to accept PUB's. He is currently studying Engineering at the National University of Singapore.

His studies will equip Max with the technical skills directly relevant to running and maintaining PUB's generators. But the range of potential projects for an engineer in the environmental sector is mind-boggling. In PUB alone, engineering assignments abound, including complex projects like the Deep Tunnel Sewerage System and Marina Barrage. (The former recently won the Engineering Achievement Awards.)

Besides skills and intellect, what will stand Max in good stead when he starts work is his passion for the environment – and a strong conviction that workable solutions exist. When asked what difference he wishes he could make to the world, he replies: "Clean water for everyone! I believe it's possible – just a matter of time."

Max's future career is full of interesting possibilities. He looks forward to joining the PUB, where he may be involved in jobs as diverse as encouraging people to enjoy the waters as part of PUB's upcoming Active, Beautiful, Clean (ABC) Waters programmes, to being part of a team doing research and development, and building up Singapore's water industry.

# Goh Chin Aik

## Environment Veteran

### A job with hot prospects

Every time you take out your garbage, it's collected and sent to one of Singapore's four incineration plants for disposal. And chances are, Goh Chin Aik has had something to do with it.

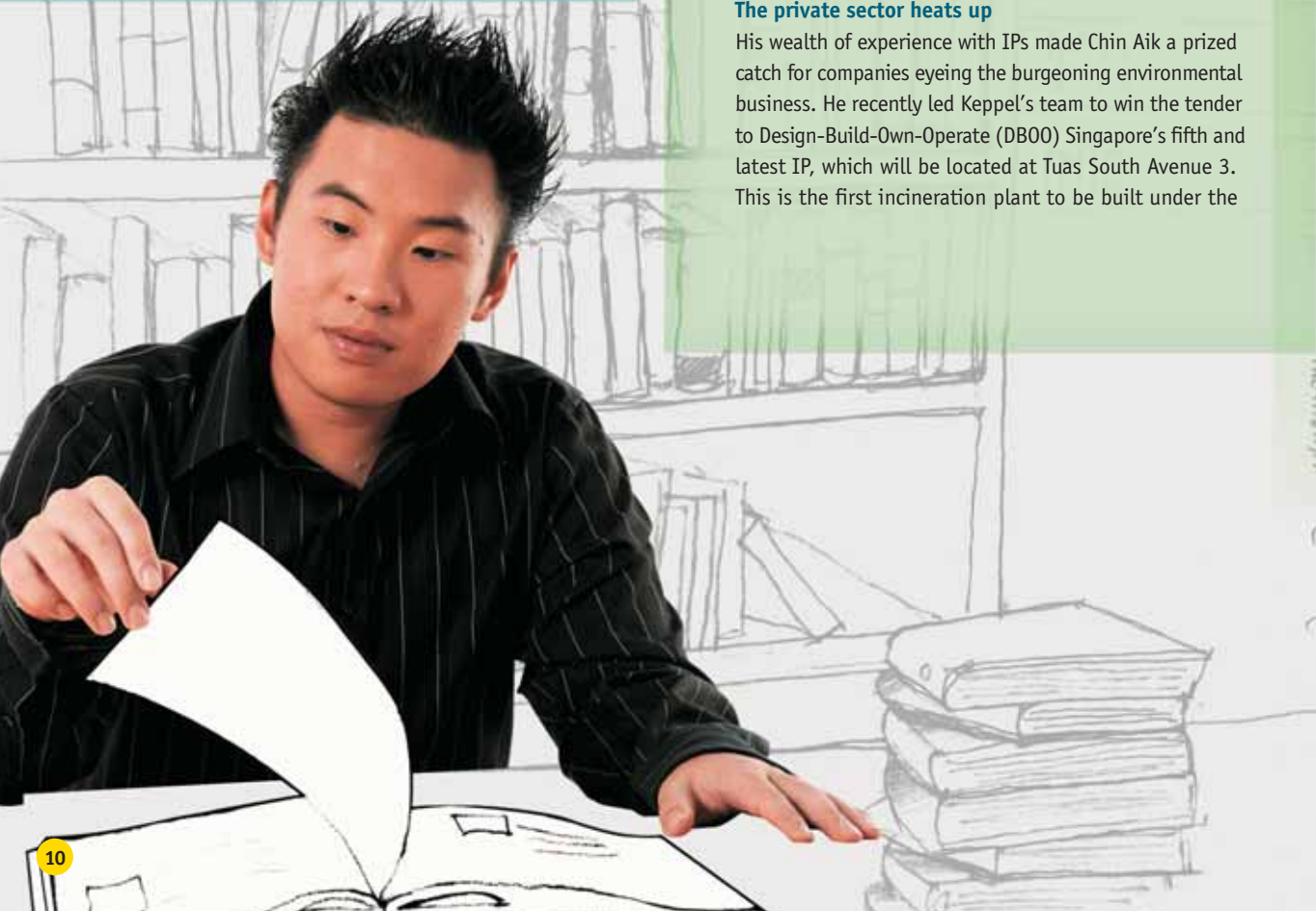
Imagine a 20-year career revolving around incineration plants. But Chin Aik has seen his prospects going up – not in flames – but by leaps and bounds. As a fresh graduate from the National University of Singapore in 1985, he joined the then Ministry of the Environment as an engineer at the island's first incineration plant (IP) in Ulu Pandan.

"At the time, I wanted to get a right starting point where I could apply what I'd learnt and build a solid engineering foundation," he recalls. "I later developed my career in the environmental industry, which I have found very challenging and demanding."

From there, Chin Aik was then involved in commissioning and the starting of operations for Singapore's second IP at Tuas, followed by the design, construction and management of the third IP at Senoko. For the fourth IP at Tuas South, he was also involved in the design and conceptualisation.

### The private sector heats up

His wealth of experience with IPs made Chin Aik a prized catch for companies eyeing the burgeoning environmental business. He recently led Keppel's team to win the tender to Design-Build-Own-Operate (DBOO) Singapore's fifth and latest IP, which will be located at Tuas South Avenue 3. This is the first incineration plant to be built under the



Public-Private Partnership (PPP) initiative and will generate an estimated S\$450 million in revenue for Keppel Integrated Engineering (KIE) over 25 years. When completed in 2009, the plant will be able to treat 800 tonnes of solid waste per day to generate more than 20 megawatts of 'green' energy.

Before this, Keppel had had limited expertise with IPs, and Chin Aik was recruited in 1999 in part to share his experience and provide technical inputs. In this way, knowledge transfer takes place to facilitate the build-up in capabilities within the waste management sector.

Today, Chin Aik is the General Manager (Business Development) at KIE, the environmental technology and engineering arm of Keppel Corporation. One of the most challenging tasks he faces is how to bring together a project team with the requisite skills set and how to recognise each individual's strength for optimum results. This makes it all the more satisfying when a project is successfully completed through the teamwork and determination of his team.

#### **Warming up overseas**

As the GM for Business Development, Chin Aik is responsible for growing KIE's business, not just in Singapore, but also internationally. Over the years, he has helped to secure projects including waste-to-energy IPs in China's Guangzhou, Suzhou and Changshu cities, as well as to acquire environmental technologies.

Racking up the frequent flyer miles naturally comes with the territory. At one point, the father of two was travelling so much that he occasionally got his hotel room numbers mixed up and ended up trying to get into the wrong room!

Besides the extensive travel, growing the business overseas also means experiencing a different working environment.

It has been both an eye-opener and a challenge. For example, while the engineering curriculum in Singapore is very wide, engineers in China are very specialised. Chin Aik once asked a Chinese engineer to re-calculate the thermal cycle, not realising that thermodynamic modules were not part of his engineering course. "But what impressed me is that he managed to learn this key concept within a week."

#### **Choices and opportunities**

If you are considering following in Chin Aik's footsteps, our veteran has this advice to offer: "The waste industry has become more and more important in recent years, and it offers you a wide spectrum of opportunities to explore – solid waste, wastewater, sludge, hazardous and medical waste, etc. You can also choose to be in project management, design, operations and maintenance, enforcement or project development."

"Each will offer its own unique challenges and opportunities. The choice is yours."



# The World's Their Oyster

Singapore aims to be the place where the best minds and technologies for the environmental sector meet. Today, Singapore's expertise is employed worldwide. Milieu talks to one company that has contributed to – and benefited from – overseas expansion.

As a leading water and wastewater treatment specialist, Salcon is the company that designed and built Singapore's first dual membrane-based desalination plant for the Senoko Power Station. But did you know that this is the seventh desalination plant Salcon has built – and that all its other plants are overseas?

Because of the small domestic market, Salcon's General Manager for Water & Environmental Engineering, Tan Kwee Kok, says, "The only way to grow our business is to be global."

## Reaching out

Salcon has designed and built more than 500 turnkey industrial and municipal water and wastewater treatment plants in 55 countries, ranging from the Middle East to the Maldives, China and Europe.

The impressive track record hasn't come easily, though. In each market, Salcon faced cultural differences and had to identify trustworthy local partners and sub-contractors. And the challenges keep coming.

"The world is getting smaller, and there are many competitors," notes Mr Tan. "We have to provide high

quality in materials and products, reliable services, good value for money and a proven technological edge." This approach has qualified Salcon to build treatment plants for some of the world's largest energy projects, such as the Hawiyah Project in Saudi Arabia and the Dolphin Energy Project in Qatar.

Other Singapore-based companies in the international environmental arena include Dayen, SembCorp Utilities, SembEnviro, Keppel Seghers, Hyflux, and Aromatrix. Together, they keep Singapore's flag flying high.

## Missions possible

Singapore's environmental and water industry offers a wide range of technologies, products and services. To accelerate the expansion of Singapore-based companies overseas, the MEWR family has been working with IE Singapore, to organise Minister-led business missions. These trips showcase Singapore's expertise, raise the companies' profiles and allow them to meet government officials and potential partners.

The help doesn't stop there. When leads obtained from these missions translate into concrete projects, PUB and NEA provide technical advice and may even second staff to the companies to help in their bids.

Being a hub also means that Singapore welcomes foreign environmental companies to base themselves here as they expand in this region. They are welcome to conduct R&D and test-bed their technologies here as well.