It is estimated that by next year, China will have overtaken the USA as the largest emitter of carbon dioxide in the world. It is hardly an achievement worth celebrating. Yet at the same time, it is the consequence of an unparalleled process of modernisation taking place in Chinese society. However, it is a process that sadly does not always give highest priority to environmental considerations.

Today, half of the world’s population lives in cities (the figure is even higher in Asia) and this is expected to rise to 75% by the year 2050. A significant proportion of the pollutants in the world are estimated to come from our cities - including 70% of the CO₂ emissions that are caused by people. Similarly, the problem of waste management is generally greater in the cities than in rural areas. On the other hand, financial and organisational resources for bringing about change are more readily available in the cities than in rural regions. In other words, the cities bear responsibility for both the problem and the solution to a great many of our environmental challenges.

Korea is 30 years ahead of China in its economical development. In a very short space of time, both countries have developed from extreme poverty to considerable prosperity. Both countries have also gone through and are still experiencing the same extreme process of urbanisation. A look at Korea may give us some indication of how China will develop. Can the environmental technology solutions used in Korea be applied in China too?

It is difficult to make any general conclusions. However, it is possible to find some good examples. Waste incineration for the production of electricity and district heating and segregation of waste at source have all been standard solutions in Korea for many years and are now making headway in China. However, there seems to be little understanding that investments in the environment is not in conflict with economical gains and growth. Yet there are brilliant exceptions to this too. Macau is one such exception. Environmental awareness in Guangzhou has gained a strong political foothold too. In both cases, vigorous economic development and great dependence on overseas visitors and foreign companies have put the environment on the local political agenda.

Jonas Törnblom
Editor
As many Envac Concept readers would remember, in February of 2005 we started working on the development of this R&D project after the Executive Board of Directors approved it.

About two years later, it is coming to its end. We are now releasing two new outdoor inlet versions in a modern urban design.

The two new-developed versions, called TOWER and NOA, have different shapes and optional items in order to cover the widest range of requirements identified by the user study conducted in the first phase of the development.

In any version of above, we could customize both the exterior finish and optional accessories, depending on the requirements and design criteria of each installation.

Essential in this project, has also been the constant assessment of a leading Spanish company, owned by the ONCE Group (Spanish organisation for blind people) specialised in accessibility and ergonomic aspects for disabled and aged people.

The first series of the TOWER version has just been manufactured and 26 units have been sent to Korea, for installation in the Gwacheon City project, where they have currently been installed.
The Han River miracle

The Korean miracle is impressive. At the end of the Korean War in 1953, Korea was one of the poorest countries in the world. Since 1962, the country has achieved an unprecedented growth in prosperity. Today, it enjoys a standard of living on a par with Europe. Its highly successful economic growth has resulted in extreme urbanisation. South Korea has a population of 48 million, with almost half of the population living around the capital of Seoul. It is hardly surprising that such urbanisation sometimes conflicts with Korean culture and traditions. One such area is waste management.

Korean refuse is different to refuse in other countries. Korean households generate more food waste per capita (than European countries). And the consistency of this waste is also less solid than we are used to in other countries. This is naturally a consequence of Korean culinary traditions that has repercussions for the storage, collection and disposal of waste. Since the food contains a high level of salt, farmers are not interested in using compost made from food waste, which is why practically all food waste is incinerated.

Young-hoon Jung, who is Envac’s Operations Manager in South Korea explains, “We cannot even consider storing waste indoors. From a hygiene point of view, it would create unacceptable problems”. Traditionally, rubbish bins are placed outdoors, but this gives rise to a major problem in the very densely built region of Seoul with its intensive street life. Not only does it encourage flies and rats, it also a sanitary nuisance for both the residents and the waste collection workers.

INTEREST IN UNDERGROUND WASTE SOLUTIONS

In this light, it is not surprising that Envac’s underground waste transportation systems are attracting so much interest. Korea has quickly become an important market for Envac. “The technology has to be adapted to the consistency of the organic matter. We have had to develop special technological solutions to be certain that all waste is sucked through, that no sticky remnants become lodged in the pipe system and that we maintain a high standard of hygiene,” Young-hoon Jung points out.
Gwacheon 11 - The mayor recommended Envac to us

Gwacheon City is situated 15 kilometres south of Seoul’s city centre. Set in an area of natural beauty, surrounded by green hills, Gwacheon is the most prosperous city in the whole of Korea. And the city is anxious to maintain its flourishing community. The mayor of the city is most solicitous about upholding Gwacheon’s image as the Green City - at all levels. Consequently, one of the areas given priority is waste management.

Gwacheon has two newly constructed areas that incorporate Envac’s technology. One is Gwacheon no. 11 which has just been completed, and the other is Gwacheon no. 3 which is in the initial phase of construction.

“The Mayor of Gwacheon recommended Envac to us.”

Construction work began on Gwacheon 11, a residential area, in March 2005 and the last of the 690 apartments are due for completion in May 2007.

All newly constructed areas with more than 500 apartments have to install an underground waste transportation system. The city pays 70% of the costs of the terminal.

The Envac system has been ordered by the Property Owners Association for the Development of Gwacheon 11. This is an association for owners who previously had property in the area

Hang-suk Yang, chairman for the Property Owners Association for the Development of Gwacheon 11

The underground waste transport system in Gwacheon 11 will handle 1.5 tons of waste every day.
and who are now responsible for the implementation of the project. The Property Owners Association, which has engaged the construction company Samsung Construction for the construction of the houses, is purchasing the waste system directly from Envac in Korea. The primary reason the association decided to install an automated waste collection system was to improve the standard of hygiene in the area. “Before making a decision, we looked at a number of systems in Korea, including Envac’s systems and those of other companies,” explains Hangsuk Yang, who is chairman for the Property Owners Association for the Development of Gwacheon 11.

**ONLY OUTDOOR INLETS**

A total of 26 outdoor inlets are currently being installed in the area. These will be for two separate types of waste; combustible waste and food waste. However, only outdoor inlets are being installed. **Solutions improving the hygiene have the highest priority.**
waste. Under Korean legislation, food waste must not be collected together with other refuse. Hang-suk Yang explains that although the buildings are 15 storeys high, it was decided to install outdoor inlets because experience of chutes in the past has been poor. Under South Korean regulations, it is illegal for chutes to be connected to bins or skips. “Although in some places chutes are connected to underground waste transportation systems similar to the Envac model, they don’t work satisfactorily,” remarks Hang-suk Yang.

“The highest real estate prices in the country.”

The residences being built are exclusive apartments and, since Gwacheon is so attractive, they are fetching the highest prices in the country. A three-room apartment with a living area of 80 square metres will cost around half a million Euro.

All the apartments are connected to the district heating system, but there is no common district cooling system. Because of the soaring summer temperatures, all the apartments however have to be individually air-conditioned.

<table>
<thead>
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<th>Facts – Gwacheon 11</th>
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<tr>
<td>Length of pipe system (when completed)</td>
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<tr>
<td>No of fractions</td>
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<tr>
<td>Capacity (tons per day)</td>
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<td>No of inlets</td>
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<td>Operation start</td>
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Gwacheon 3 - Green profile sells better

Gwacheon 3 is another exclusive residential area being built in the city. The 51 buildings being constructed here will house 3,143 apartments. Furthermore, three commercial buildings are being erected to accommodate department stores, restaurants, offices, sports clubs, etc.

All in all, the district will have some 12,000 residents once it is completed in September 2008. Prices for apartments here are expected to be even higher than in Gwacheon 11.

All the apartments are connected to the municipal district heating system that is run on waste and liquified natural gas (LNG) and have high-capacity, wireless Internet access.

THOROUGH ANALYSIS OF ALL AVAILABLE WASTE COLLECTION ALTERNATIVES

Meong-Su Jang, chairman of the Property Owners Association for the Development of Gwacheon 3, went to the city of Yongin, south of Seoul, two years ago to inspect Envac’s...
system there. He was greatly impressed by how well it worked and how clean it was. “The system was ideal for the green profile we were trying to give this area,” Meong-Su Jang tells us.

“We signed a contract in late December last year and began installing the underground waste transportation system this April.” Outdoor inlets will be installed in this area too, for two separate types of waste - mixed waste and food waste.

“The system was ideal for the green profile we were trying to give this area.”

SOME OF THE FUNDING COSTS SHOULDERED BY THE CITY
Here too, the city is shouldering 70% of the costs for the terminal, while the pipe network and inlets are being financed by the building contractor. When the waste system has been fully developed, responsibility for its maintenance and operation will be handed over to the city.

The decision to invest in the Envac system is justified by the fact that it will increase the value of the apartments.

That’s why the green marketing for these areas includes Envac’s waste system as one of the positive features, alongside the verdant spaces and pure mountain water.

**Facts – Gwacheon 3**

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<td>No of inlets</td>
<td>45 (Combustible), 29 (Food waste)</td>
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Sooji - a unique system and an excellent reference

The underground waste system in Sooji, in Yongin City, is one of two examples in the world where waste is sucked straight into an incineration facility. The waste transportation system, delivered by Envac in 2000, is basically similar in design to all pneumatic waste transportation systems. The difference is that one of the waste fractions is sucked straight into the waste chamber at the incineration plant. This effectively eliminates all physical handling of the waste and all transportation by lorry.

In Yongin City, 14,000 of its 125,312 apartments are connected to Envac’s automated waste system in the city district of Sooji. These 14,000 apartments generate 20 tonnes of waste each day, which goes straight to the incineration plant in the centre of this residential area.

FOOD WASTE IS NOT COMPOSTABLE

Both food waste and mixed refuse are incinerated here. Efforts are under way to develop a method that will leach the salt out of the food waste so it can be composted instead.

Chang-su Kim, Head of the Waste Services Department in Yongin City tells us, “There’s certainly been some opposition to having an incineration plant in the middle of a residential area. But we try to inform the local residents as often as we can.”
Regular measurements of dioxin emissions are carried out and show that emissions are well below Korea’s current emission limits. “The most recent measurement showed an emission level of 0.01 ng/m$^3$, which compares favourably with the emission threshold of 10 ng/m$^3$, ” Mr. Kim points out.

**LOWER HEATING COSTS**

The incineration plant only produces heating, unlike other incineration plants nearby which produce both heating and electricity. The heating is distributed as district heating to the apartments in the area. This has meant a 50% reduction in heating costs for all those connected to the district heating network from the waste incineration plant. As well as the waste sent for incineration, the Envac system also handles non-combustible waste.

**SATISFIED USERS**

“We are highly satisfied with the Sooji facility,” exclaims Chun-Yong Ha, Managing Director of Envac Korea. “Our users are very satisfied and the facility has given us virtually trouble-free operation since day one. It is the best reference we could wish for,” Chun-Yong Ha says in conclusion.

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*The local management building connected to the combined collection station and incinerator.*
Major investments in waste incineration and automated waste collection systems
The Waste Services Department in Guangzhou and the city’s mayor have been lobbying for the installation of an Envac system in their city. One of the main reasons for this was to improve the environment in respect of waste collection in the city.

Guangzhou’s Waste Services Department is responsible for all waste management in the city of Guangzhou. It handles a total of 7000 tonnes of waste each day. 1000 tonnes are sent for incineration, the rest goes to waste disposal sites. “We estimate an increase to 8000 tonnes a day by 2010. Our capacity for waste incineration will then be 2000 tonnes in a new incineration plant that is currently under construction and then 3000 tonnes a day at a later date in another plant, which is in the planning stage. Moreover, we are building a compost facility that will be able to take 1000 tonnes a day. This means that by 2010 we won’t have much need of waste disposal sites,” explains Xu Jian-Yun, who is Deputy Managing Director at Guangzhou’s Waste Services Department.

The compost facility will mainly handle all food waste from restaurants. Some of the waste will be used to create biogas and some will be composted.

UNCONTROLLED RECYCLING
At present, there are no plans for the recycling of other waste fractions. “A high percentage of reusable materials is already recycled today,” Mr. Xu points out. “Everything of value disappears in the collection process because people sift through the waste in skips and dustbins, looking for objects that can be reused in one way or another. But we will be introducing a more controlled process of recycling at some point in the future.”

PROFILE PROJECT FOR THE CITY
The new development in JinShaZhou is a profile project for the city of Guangzhou. The best housing environment in the city will be created for a total of 120,000 people.

“Everything of value disappears in the collection process because people sift through the waste in skips and dustbins, looking for objects that can be reused in one way or another.”
A pilot project for Guangzhou - a mega project for Envac

3.6 million square metres of residential property, plus 360,000 square metres of commercial premises, schools, etc. are to be built on an area of nine square kilometres. Once it is completed in a couple of years, 120,000 people will be living in this area, which is called JinShaZhou.

The JinShaZhou project involves the construction of three kinds of residential buildings: low-rent apartments, (33%), co-operative apartments costing Euro 550-600 per square metre (25%) and apartments with free market pricing (42%).

The initial phase of the JinShaZhou project is the construction of the New Community area. Work is being completed on 6116 apartments, which will be ready for occupation in October 2007. All the financing for the project comes from the city of Guangzhou. The inauguration of the Envac system is due to take place at the same time. The rest of the area will be financed with private funds and built as soon as the first area is completed.

“That’s why it is so important that the Envac installation is a success,” points out Li Chon-kun, who is the new Community Project Manager. “We will be building the most state-of-the-art residential area in the whole of the Canton region. A pilot project for new technologies with a green profile,” Mr. Li explains.

The property is being built on virgin soil, an area of natural beauty right next to the river.

FOUR ENVAC SYSTEMS IN PARALLEL

All in all, four Envac systems will be built. The systems will transport one waste fraction to one of four collection stations. From there it is then taken by lorry for incineration. The success of the system will determine the future of the technology in this region of China.

It will take nine months to install Envac system in the first phase of the New Community. With two shifts a day, the pace of construction is very high. Operations may possibly be extended to three shifts, because as Mr. Li points out, meeting the deadline is the highest priority. “The mayor of Guangzhou has promised that the waste system will be inaugurated in October - and so it must be.”

CONVENTIONAL COLLECTION SYSTEMS IN CHINA

We ask Mr. Li how the waste would have been dealt with if they had not chosen an underground waste transportation system. “We would have used the same solution as in other projects. The residents dump their rubbish into a bin that has been placed for that purpose in the stairwell on each storey of every apartment block. During the night, cleaning staff load these bins into the lift and take them down to the ground floor where they are emptied into larger skips and then driven away by lorry.”

Obviously, the Envac system will make a huge difference in hygienic conditions in properties, much to the
joy of both residents and maintenance staff. But is also involves a higher than normal investment cost for waste management.

However, while everyone is on tenterhooks waiting to see if the underground waste system will be a success, Mr. Li emphasises the fact that they have no experience of the system and Envac’s involvement throughout the implementation process is therefore absolutely necessary. He would also like more of the parts to be manufactured locally to reduce the costs of the system. Mr. Li ends by saying, “I am convinced that everyone living here will appreciate the system. But if we are going to incorporate it into other projects, the costs must be lower.”
Macau - piles of rubbish a thing of the past

Twenty years ago, Macau was a small, insignificant and rundown Portuguese colony. Progress has been swift since the city’s integration with China in 1999. Macau is the only city in China where gambling and betting are legal. Casinos are being constructed at a furious pace and, after Las Vegas, Macau now ranks as the world’s second largest gambling city. In this light, it is not surprising that the city is making major investments to improve hygiene and environmental conditions. But this area has not always been given such high priority.

When Humberto Basílio came to Macau from Lisbon in 1985 to assume responsibility for the colony’s waste, water and sewage systems, it was high time that something was done. Macau was filthy. It had no regulated waste collection service - people just dumped their rubbish in the streets. The sewage system was in a state of collapse and sewage water was being illegally piped off by farmers to fertilise their crops. There were no facilities for the treatment of sewage sludge in Macau. The sludge was being shipped off to China instead. “The vessels transporting the waste were often hijacked and the cargo was sold illegally as dung,” recalls Humberto Basílio.

WASTE COLLECTION VEHICLES UNABLE TO GET TO THE RUBBISH

“We were having dire problems with rats and cockroaches because there was rubbish everywhere.” To get on top of the problem, the very first regulated waste collection service was introduced in 1985. Humberto Basílio recollects, “This was easier said than done however!” The waste collection vehicles that had been ordered were too large to drive along the city streets. They were quite simply unable to get to the rubbish. The myriad of wires that hung low and illegally between the buildings posed the greatest problem. Humberto Basílio tells us how he had to walk up and down the streets, with employees from the electricity company in tow, removing these obstacles with wire cutters so that the collection vehicles could drive through.

PIONEERS IN WASTE INCINERATION

Once the collection service was more or less in order, it was time to focus on dealing with the waste that was being collected. Since the early 1980s, the city’s refuse had been taken to a waste disposal site on the island of Taipa, south of the city centre. The waste was being dumped in a gravel pit that had been worked to build a horse-racing course on the same island. However, this site was soon full and there was nowhere else to dispose of the waste. “We discussed the problem with China and we were prepared to pay to get rid of the refuse, but the Chinese did not want our lorries crossing the border,” Humberto Basílio relates.

So the only other alternative was to build an incineration plant. “We visited Korea, Japan and Singapore to look at incineration plants there before making a decision.” The plant on the island of Taipa in-
cinerates 900 tonnes a day and complies with the European emission standards. The plant is currently being extended with three additional incinerators to handle a further 900 tonnes a day.

When we asked whether the locals had demonstrated against the incinerator, Humberto Basílio answered that there had been no protest from the people of Macau. However, environmentalists from Hong Kong came over and raised objections when the first incineration plant was being constructed.

NEXT VENTURE: UNDERGROUND WASTE TRANSPORTATION SYSTEM
In addition to incineration facilities, Macau is investing in other areas too. At the 1998 Expo in Lisbon, Mr. Basílio learned about Envac’s underground waste transportation technology.

“I realised immediately that this had to be the right solution for the densely built-up city of Macau.”

But at that time we didn’t have the wherewithal to invest in the system”, Humberto Basílio recollects. Back then, obtaining public funds for environmental enhancement was not an easy task.

It’s a different story altogether now that the city has a prosperous economy from its gaming operations. That’s also the reason why it has been decided to install an underground waste system in the Hac Sa Wan district of the city.

This is a residential area inhabited by about 10% of Macau’s population. 5,000 metres of pipes are being dug into the streets to connect 10,000 households via outdoor inlets on the pavements. 60 tonnes of refuse will be transported through the system every day once it is fully operational in mid 2008.
PILOT FACILITY FOR THE WHOLE OF MACAU

“We are treating this as a pilot project,” Humberto Basilio says, “and we have learned a great deal so far. Installing the pipes, for instance, was more difficult than we had anticipated. Due to the lack of drawings or plans of what underground installations were already in place, there were plenty of surprises awaiting us.”

However, it is felt that the experience gained now will be of beneficial use in later phases. The city is planning to install underground waste transportation systems in the whole of Macau, provided the pilot project is a success. Humberto Basilio has come a long way in Macau and he should be proud of what he has accomplished. The quality of the water in the city is as good as that in any conurbation. Refuse is no longer dumped and

Macau is rapidly transforming into a role model in South East Asia when it comes to a high-quality infrastructure for waste, water and sewage.

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5,000 metres of pipes are being dug into the streets to connect 10,000 households via outdoor inlets on the pavements.

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Facts – Macau, Hac Sa Wan

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<td>Operation start</td>
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In May 2007 Envac received an order to install an automated waste system in PaJu Unjung, situated north of Seoul, Korea. This is one of the largest orders in the history of the company. The area is mainly residential, with some commercial surfaces and will be in total 9,5 million m². When completed, the Envac system will handle waste from 46,054 households. Four parallel underground waste handling systems will be installed connecting to four collection stations. The system will handle two separate waste fractions, organic waste and combustible waste.

The customer, The Korea National Housing Corporation has claimed that the prime reason for the decision to install the Envac technology in the area has been of environmentally improved living standard.