

# China & Norway intensify recycling project

By WANG DANNA

Talking with Kåre Helge Karstensen, chief scientist & special advisor of the Norwegian Foundation for Scientific & Industrial Research (SINTEF), you cannot help but be impressed by his enthusiasm for his job.

Since 2004, Kåre has been heavily involved in the Environmentally Sound Management of Hazardous and Industrial Wastes in Cement Kilns in China project.

Early on Sep 28, 2006, Chinese MOFCOM and Norwegian MFA signed the project agreement. In March of 2007, Foreign Economic Cooperation Office, Ministry of Environmental

Protection of the People's Republic of China (FECO) and SINTEF signed the project contract. China Research Academy of Environmental Science is as the project technical implementation agency. Chinese Building Material Academy (CBMA), Tsinghua University, pilot cement plants and local EPB are also joining the project.

Initially it was anticipated that the project would finish in spring next year, but "We have decided to extend the cooperation for another two or three years and will be looking a lot more at implementation," Kåre said.

"In the past few years, we concentrated on five pilot demonstration projects in Hubei, Dalian, Beijing, Chengdu and

Guangzhou. For the further cooperation, we'd like to try to involve more companies, plants and experts. We aim to have more conferences and meetings and also write more articles in the appropriate technical journals," he said.

The main goal of the project is to build regulations, technical standards and criteria of cement kiln co-processing activities for hazardous and industrial wastes under the compliance with the Stockholm and the Basel Convention.

Through practising co-processing in the five pilot demonstration kilns, increase engineering practice level, the project is expected to provide information of establishing the basis for large scale imple-

mentation of safe and environmentally sound treatment and recovery of hazardous and industrial wastes in the Chinese cement industry and promote development of cement kiln co-processing for hazardous and industrial wastes in China.

Kåre said: "By learning from the experiences of other countries, we would like to make it possible for China to avoid making same mistakes made by others.

Kåre said: "China is committed to using more alternative fuels and raw materials in its cement industry on a daily basis once the correct protocols are established. Making this a reality is our ultimate aim."

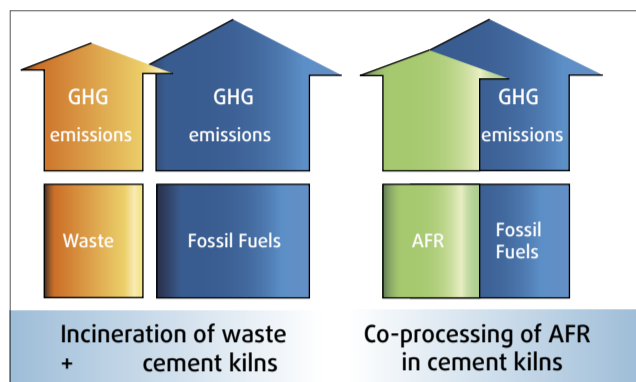
With the completion of the project, a blueprint for its im-

plementation, entitled "Guidelines for the Co-processing of Hazardous Wastes in Cement Kilns", has now been sent to the relevant authorities and is expected to be speedily approved. It is expected then to provide a basic background for standard operating manual for the cement industry.

Yan Dahai, an associate professor of the Research Institute of Solid Waste Management of the Chinese Research Academy of Environmental Sciences, has been involved in the project from the beginning. Commenting on the current state of play, he said: "The Guidelines represent a unified protocol for all cement plants looking to co-process hazardous wastes."



Cement plants play an important role of the co-processing of hazardous wastes in cement kilns for the ongoing sustainable development of the cement industry and the abolition of potential pollutants.  
Yang Shizhong



The co-processing of hazardous wastes in cement kilns has its own unique features in these areas - emission control standard and measures are different from those of hazardous waste incinerators and that of cement production, and the same applies to risk control and measures for health and safety in cement production using co-processing of hazardous wastes, and can not impose any negative influences on the production of cement for construction usage.

## New plan promises major reduction in incinerator levels

By LIAO WEI

Co-processing of hazardous wastes in cement kilns has been practiced for more than 30 years and is acknowledged to be highly feasible for sound treatment of hazardous waste. This process has developed substantially over the last 20 years and is now globally recognized as one of the preferred methods of disposing of a wide range of problematic materials.

As part of the process, two procedures are carried out simultaneously in the cement kiln - cement manufacturing and waste disposal. Although performed jointly, neither the quality of cement produced nor the environmental impact is compromised.

Compared to constructing specialized incinerators alone, co-processing in cement kilns has the potential of saving on investment, incurring low operational costs and offering a completely harmless means of disposal, as well as several other unique advantages. Specifically speaking, the characteristics of the cement production process allow the use of a wide range of waste materials as both fuel and raw materials.

Many environmental benefits are thus obtained, including an energy yield approaching 100 percent - maximizing the recovery of energy from waste. The high temperatures (about 1800°C) of the cement kilns with a high residual time (above 5 seconds) - represent ideal conditions for the virtually complete destruction of all organic material used as fuel. Inherent cleaning of gases using lime (a basic ingredient of cement) occurs while the temperature in incinerators is about 1200°C at a low residual time (about 2 seconds). Cement kilns also have a strong thermal stability. Due to the large capacity of cement kilns, a wide range of hazardous wastes can be dealt with. This results in no waste residue (total incorporation of ash into finished product) but a high level of environmental performance and a global reduction of CO2 emissions.

Overall, the cement kiln co-processing of hazardous wastes provides high temperatures, long residence time, surplus oxygen, good mixing and an alkaline environment, as well as the efficient recovery of all energy and raw material substitutes in the hazardous waste.

## Strict adherence to cement kiln eco-guidelines urged

By DAN NA

When the first phase of Sino-Norwegian cooperation on Environmentally Sound Management of Hazardous and Industrial Wastes in Cement Kilns in China came to an end, a guideline, based on lessons learned, best practices, technical research, experiments and demonstrations, was developed. This aims to constitute a uniform standard for all the cement plants co-processing of industrial and hazardous wastes in order to prevent environmental pollution and accidents during operation.

Several cement plants in China contributed to the guidelines during the initial stages of the project. Those plants have now gained technical know-how and experience of waste management as well as developing a new revenue stream. They can also reduce the cost of their operations as they use less fuel and less raw materials.

Frederic Vallat is the Industrial Ecology Regional Vice President and a senior executive of Lafarge Shui On (Beijing) Technical Services Co Ltd. Commenting on the success of the project, he said: "It's a win-win situation. The co-processing of waste in cement kilns could represent environmental and economic salvation for China."

One of the important tests of the stabilization of the heavy metals in the processed cement took place in Chengdu's Lafarge

Shui On Cement Ltd, a joint venture between the France-based Lafarge Group, the world leader in building materials industry, and the Hong Kong-based Shui On Construction and Materials Ltd.

At the request of the project, the test in Lafarge was an investigation into the effects of the heavy metals embedded in the clinker and cement and their ultimate environmental impact. The aim of the study was to establish the long-term implications of the process.

The heavy metals used in the test came from a number of different chemical companies and were fed into the kiln as pure chemicals. The cement samples were then selected for further investigation and chemical analysis in a bid to establish their impact on the finished cement product.

The test directly addressed prior concerns that stabilized heavy metals would be harmful to health or to the environment. It proved that it is incumbent on all those involved in co-processing to exhibit the maximum care and ensure there are no subsequent hazards to the cement quality or in terms of any emissions generated.

Heavy metals are always present in raw materials and a certain amount of the element in cement is common. As part of the process, they are firmly locked into the structure of the cement, with no possibility of leakage or seepage.

Frederic said: "All the research that we've conducted shows that the heavy metals stabilized in the cement will be there in perpetuity. People need to have no worries about the safety of the product as a building material."

Studies into the potential of co-processing began almost 40 years ago. All the research date shows that, if the process is carried out responsibly, there is no possible negative impact.

The study noted the importance of adequately training technicians and transferring knowledge from other countries with previous experience.

Kåre said: "I hope that we can reach out more to more Chinese cement companies. I cannot over-emphasize the importance of running this process strictly by the book. Safety and security are a crucial part for the people involved in the operational process."

Echoing his words, Frederic said: "When a plant is starting to process raw material, it should be obliged to secure a permit from the local environmental government body. This should clearly state which wastes the plant is authorized to process and to which specific volume."

"Safety and security measures during the selection, transportation and unloading of the hazardous waste are all crucial parts of the operation. It is vital that all the relevant safety protocols, as outlined in the guidelines, are observed at all times."



The co-processing treatment of hazardous wastes needs to adhere to very strict standards of environment protection and risk control to counter safety and health concerns.  
Yang Shizhong

## Co-processing pioneers spread the word across China

By SONG PING

The management of massive amounts of industrial and hazardous wastes is one of the major challenges facing China. It is also a bottleneck for a number of heavy industries. As part of addressing this problem,

many developed countries have now taken the environmentally friendly option of co-processing this waste in cement kilns, rather than using less ecologically-sound incinerator plants. China, too, is now on the verge of embracing this alternative.

This co-processing has proven to be an effective means of

treating industrial and hazardous wastes. Its implementation, however, takes some time, but there are already several businesses pioneering its use.

Beijing Cement is one such pioneer and has now become the largest treatment facility for hazardous wastes in Beijing. Its existing facilities have an annu-

al capacity to co-process 80,000 to 100,000 tonnes of waste and can accommodate wide range of substances on the National Hazardous Wastes List.

Another such early-adopter is the Ningbo Shunjiang Cement Co Ltd, which specializes in the treatment of industrial sludge using the co-processing approach. In 2006, a total of 22,782 tonnes of heavy metal sludge were processed and, in the first four months of 2007, around 11,546 tonnes of waste were treated.

Guangzhou Zhujiang Cement Co Ltd has developed an expertise in treating the most typical waste products, including waste plastics and pre-treated leather. Its process involves classifying, sifting, drying, crushing, packaging and deploying to ensure the quality of its cement and the protection of the environment.

In addition to the above companies, other sites are also adopting the approach. In Sichuan, two businesses are jointly running a co-processing

project - the Nanshan Cement Plant of Lafarge Shui On and the Fuhuang Cement (Group) Co Ltd. Another such joint venture involves the Dalian Onoda Cement Co Ltd and the Shanghai Wan'an Enterprise General Corporation. Together they dispose of a range of waste products using co-processing in cement kilns to replenish fuels and raw materials. This has proved not only environmentally safe but also economically viable.

To ensure safe practices in the future, China has taken various strategic approaches to promoting co-processing projects. On September 28, 2006, China signed an intergovernmental agreement on co-processing in cement kilns, part of an international cooperation project. Several domestic projects have also been undertaken, all aimed at dealing with a range of waste products. China is now committed to promote such programs in a bid to solve its waste pollution problems in an environmentally sound fashion.



Dujiangyan Plant of Lafarge Shui On Cement Ltd, one of the partner of the Sino-Norwegian project.  
Yang Shizhong

## New treatment set to prove waste reclamation Holy Grail

*Editor's Note: Kåre Helge Karstensen is the chief scientist & special advisor of Foundation for Scientific & Industrial Research (SINTEF) of Norway. Here he outlines his belief that co-processing may prove the answer to China's growing waste pollution problem.*

waste treatment, improved sustainable energy and resource efficiency as well as a significant reduction of green house gas emissions, due to the reduced consumption of fossil fuels and limestone.

A similar substitution of fossil fuel and raw material in the Chinese cement industry,

as in Europe could mean a reduction of the CO2 emissions in the order of 100 million tonnes per year or more, when compared with incinerating or landfilling the wastes. When the cement industry begins to substitute fossil fuel and raw materials with waste

materials, they are subsequently regulated as waste management activities. These receive more scrutiny than conventional cement production, implying investment in improved performance, and as a consequence, reduced overall emissions.

### What remains to be done?

This project has conducted studies under Chinese baseline conditions for implementing a sound co-processing practice, compiled lessons learned on the best examples of international practice, built capacity among stakeholders, developed guidelines/standards and conducted several pilot demonstrations around China, leading to the destruction of hundreds of thousands kilo of hazardous chemicals.

Co-processing has just begun in China and responsible implementation will take time. To ensure safe and sound practices in the future, it needs to develop a proper regulatory system, with adequate guidelines, standards and permitting systems, and to build broad capacity on all aspects of co-processing, covering central and local authorities, academia and consultants, cement and waste industry, as well as media and NGOs.

Many now believe that cement kilns have proven to be an effective means of recovering value from waste materials. Co-processing in these kilns is now a viable option for treating industrial and hazardous wastes in many developed countries.

Co-processing has been the sole solution for organic hazardous waste treatment in Norway for more than 25 years. The process recovers a significant amount of the waste in Europe and treats 25 percent of the hazardous waste produced in the US.

China currently has thousands of cement plants in operation, producing 1.4 billion tonnes of cement - 50 percent of the world's total production. The Chinese cement industry consumes over 2 billion tonnes of virgin raw materials, more than 150 million tonnes of coal and about 150,000 million kWh of electricity annually. It is responsible for emitting carbon dioxide, large amounts of dust, NOx and SO2.

### A win-win concept?

Co-processing means the recovery of the valuable energy and materials in the wastes by using existing facilities. This reduces the need to invest in new, expensive and purpose-built incinerators. The immediate incentive for the cement industry is cost savings. For instance, they need less coal and fewer raw materials.

The advantages for society overall is increased capacity for waste and hazardous



Kåre Helge Karstensen

## History of FECO/MEP

Foreign Economic Cooperation Office of Ministry of Environmental Protection of the People's Republic of China (FECO/MEP) was officially established after the approval of the State Commission Office for Public Sector Reform in 1997.

The responsibilities of FECO/MEP include: utilizing financial resources, funds and grants from international financial organizations, bilateral organizations/countries, managing other international cooperative affairs, collecting information about international projects with financial assistance and assisting in compiling the plans for international projects with financial assistance, collecting information about candidate projects with international financial assistance and as-

sisting in project selection and assessment, contacting with relevant departments of the focal points whose responsibilities are to attract foreign financial resources and guiding the implementation of international projects with financial assistance in different localities and for different departments, formulating management rules related to international projects with financial assistance and managing and implementing the international projects with financial aid undertaken by MEP, assisting international organizations to integrate environmental elements into non-environmental projects and assisting in evaluating environmental impact assessment of international projects with financial assistance.