

Flue Gas Desulphurisation Plants at Lamma Power Station 南丫發電廠煙氣脫硫裝置

To minimise the impact of electricity generation on the environment, HK Electric embarked on the retrofit of a Flue Gas Desulphurisation (FGD) Plant to one of its 350-MW generation units at Lamma Power Station as early as 1993.

We are the first power company in Hong Kong to install FGD for reducing Sulphur Dioxide (SO₂) emission during power generation. Today, all coal-fired units in service are fitted with FGD to produce cleaner energy.



為致力減少發電過程對環境的影響，實踐公司對保護環境的承諾，港燈早於1993年便在南丫發電廠的其中一台350兆瓦發電機組加裝全港首部發電用途的煙氣脫硫裝置。

港燈是全港首間裝設煙氣脫硫裝置的電力公司，以減少發電過程中二氧化硫的排放。目前，港燈仍在使用的燃煤機組均已安裝煙氣脫硫裝置，以提供更潔淨能源。

FGD Process System

The FGD process selected by HK Electric is the “limestone-gypsum wet scrubbing system” which is a well-developed technology capable of removing over 90% of the SO₂ in the flue gas. It is renowned for its high reliability and impressive track records. Hence it is predominantly used in the power industry.

The FGD at Lamna uses limestone slurry as the absorbent for SO₂. Flue gas from the boiler is directed to the absorber inside which limestone slurry is sprayed onto layers of grid packing, or directly sprayed out from the spray banks. SO₂ and limestone slurry thus come into contact and they react in the presence of water and oxygen to form gypsum. The slurry is recycled

in the absorber by recirculation pumps and air is injected into the slurry to enhance gypsum formation.

For effective dispersion, the gas leaving the FGD has to be above 80°C. This is achieved through heat exchange with the incoming hot flue gas in the gas reheater, before exiting through the 215-metre chimney.

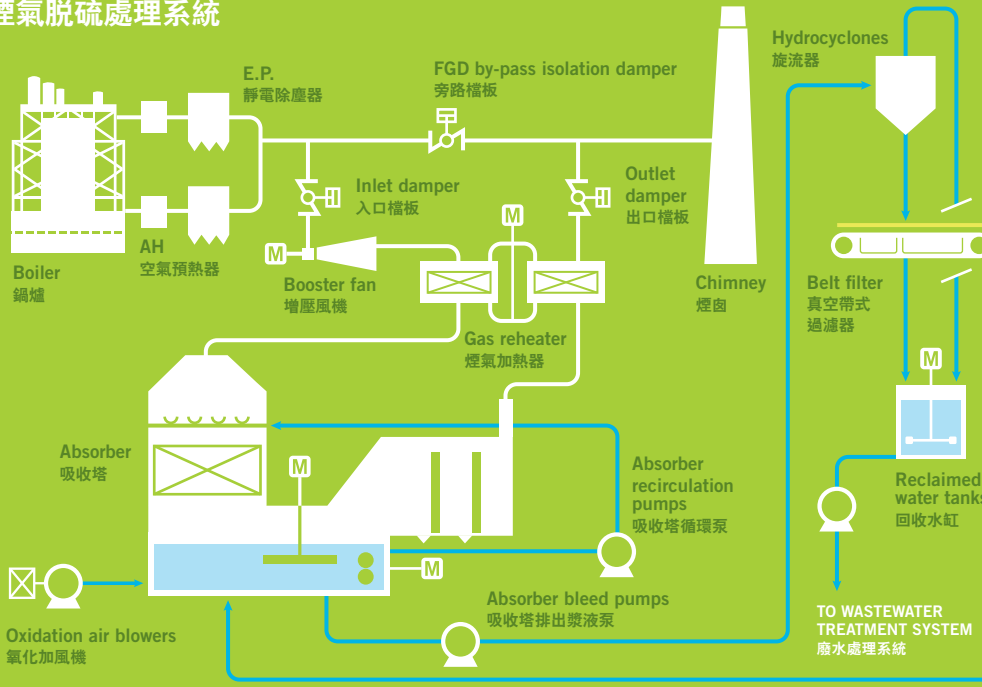
The limestone/gypsum mixture is re-circulated inside the absorber until the resultant slurry is rich in gypsum and no longer useful for removal of SO₂. This is then bled off for dewatering and gypsum removal. The water extracted is directed to the wastewater treatment system before discharge.

Basic Principle

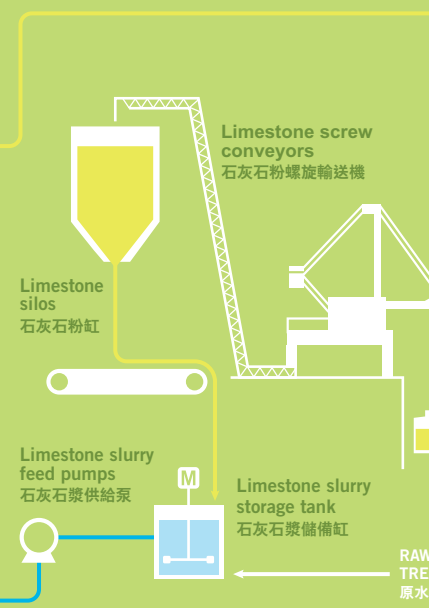
Sulphur Dioxide
+ Limestone

Gypsum
a chemically
stable product

FGD Process System 煙氣脫硫處理系統



Limestone & Gypsum Handling 石灰石及石膏處理系統



煙氣脫硫 處理系統

港燈選用的脫硫方法為石灰石／石膏濕潤式擦洗處理系統，這種技術發展得相當成熟，能有效清除煙氣中90%以上的二氧化硫。由於此系統可靠性高，運作表現良好，因此廣為業界採用。

南丫發電廠的煙氣脫硫處理系統採用石灰石漿液為二氧化硫的吸收劑。鍋爐產生的煙氣被引入吸收塔。塔內的石灰石漿液被噴灑在多層柵格上或直接由噴淋層噴出。二氧化硫和石灰石漿液相遇，並與水分和氧氣產生化學作用，形成石膏漿液。漿液在吸收塔內由再循環泵加以循環，再注入空氣以助石膏形成。

為使從脫硫系統排出的煙氣有效地擴散，煙氣必須達到攝氏80度以上。因此，脫硫後的煙氣會先在煙氣加熱器內與分隔進入的熱煙氣作熱交換，以達至所需高溫，再從215米高煙囪排出。

石灰石／石膏混合物在吸收塔內會被循環，直到石膏含量接近飽和，不再適用於脫硫為止。被排出的混合物會被清洗及脫水成石膏。抽出的水經廢水處理系統處理過後才會被排放出外。

基本原理

二氧化硫 + 石灰石

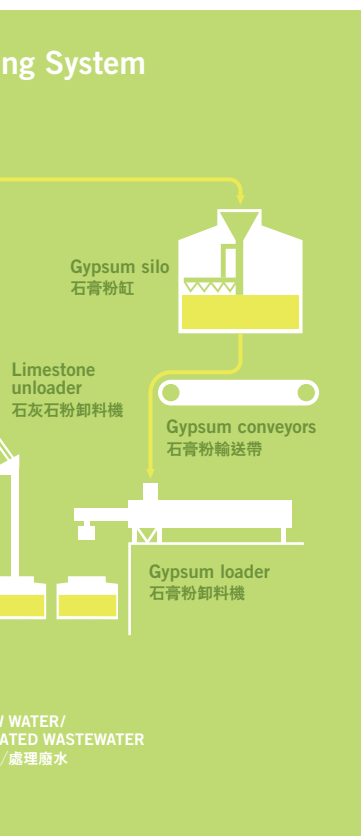
石膏
一種化學上非常穩定的
產品

Limestone & Gypsum Handling System

Limestone slurry used in the absorber is prepared by mixing limestone powder with raw water or even recycled wastewater. Limestone is purchased in powder form and has a purity exceeding 96%. This is delivered to the east-unloading jetty by barges and transferred to silos for storage. Transfer and storage of limestone all take place inside air-tight equipment to avoid dust leakage.

Gypsum discharged from the absorbers is dewatered through hydrocyclones and vacuum belt filters to a moisture content of about 10%. These gypsum cakes of purity over 90% are transferred through conveyers to gypsum silos.

The gypsum cakes stored inside the silos are reclaimed through a series of enclosed belt conveyors and finally barged away for industrial applications, such as in making gypsum boards and cement, both locally and overseas.



石灰石及石膏處理系統

吸收塔內所用的石灰石漿液是靠混和石灰石粉和原水，或回收的廢水而成。石灰石於採購時為粉狀，純度逾96%。石灰石粉由駁船運載至發電廠東面的卸料碼頭，再轉送往石灰石粉庫儲存。整個運送和儲存過程皆在密封式設備下進行，以防洩漏灰塵。

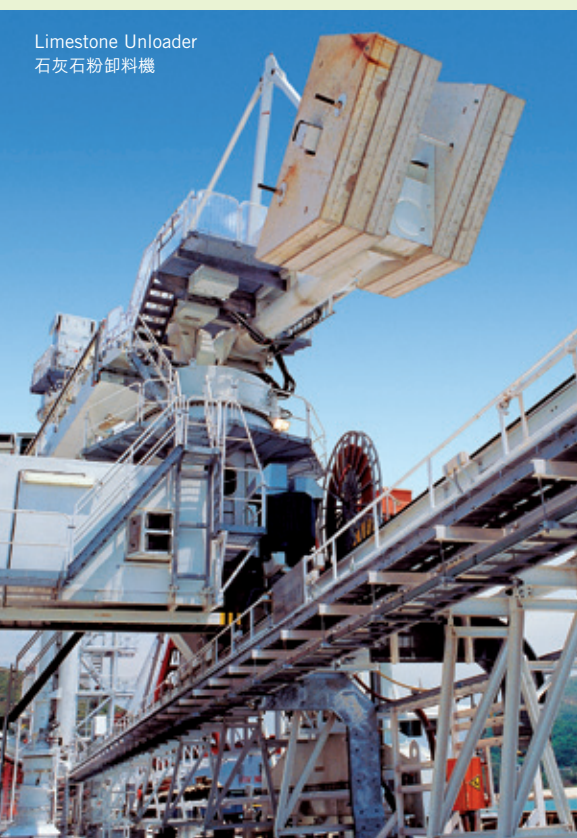
吸收塔排出的石膏漿經旋流器及帶式真空過濾器脫水後，含水量只有10%左右。這些純度高於90%的石膏經運輸帶運載至石膏粉庫。

儲存於石膏粉庫內的石膏經一組密封式的運輸帶取回，最後以駁船運載至本港或外地作工業用途，例如製造石膏板 and 水泥等。

Cleaner Electricity

Currently, all coal-fired units in service at Lamma Power Station are equipped with FGD plants, some are also fitted with low NO_x (Nitrogen Oxide) burners. FGD units have proved to be highly successful in removing over 90% of the SO₂ in the flue gas, while the state-of-the-art low NO_x burners in boilers are able to reduce the emission of NO_x by up to two-thirds as compared with conventional burners.

Together with more gas-fired combined cycle units in operation, nearly all the electricity generated at Lamma Power Station comes from either gas-fired units or coal-fired units fitted with FGD plants or with also low NO_x burners, which can further reduce emissions from the generation process, and help meet the emission reduction targets set out by the HKSAR Government.



Limestone Unloader
石灰石粉卸料機



Technician carrying out routine maintenance of the limestone conveyor
工程人員對石灰石粉輸送機進行日常維修工作

供電更為環保

目前港燈仍在使用的燃煤機組均已安裝煙氣脫硫裝置，當中部份機組更同時裝有低氮氧化物燃燒器。裝有脫硫裝置的機組能有效除去煙氣中90%以上的二氧化硫；而燃煤鍋爐改裝了低氮氧化物燃燒器後所釋出的氮氧化物，亦較傳統燃燒器減少達三分之二。

有了這些減排設施，配合增加使用天然氣發電的聯合循環機組，南丫發電廠幾乎所有電力產量，均由天然氣發電的聯合循環機組或裝有煙氣脫硫裝置或連同低氮氧化物燃燒器的燃煤機組產生，以進一步減低發電過程中的排放，有助達至香港特區政府訂下的減排目標。