



新科技除水垢—磁力污水處理

由於中央空調系統使用水冷卻比氣體冷卻可節省能源多達 20%，因此水冷式空調系統廣泛地獲採用，特別是在非住宅建築物及製冷量需求大的地區。香港特區政府現正積極鼓勵業界使用該系統，並容許指定地區內所有新建成或現有非住宅建築物，在空調機組的蒸發式冷卻塔中使用淡水。

水冷式系統於運行時會產生以碳酸鈣為主的水垢，導致熱交換器的效率降低，增加能源消耗。即使水垢薄至 0.2mm，能源消耗量亦會增多 7%。過往，水垢問題主要是採用化學藥處理來解決，並須每半年至一年間，以強酸處理方法進行全面清洗，耗水量大及費用昂貴。以一般商場的空調製冷量 3,000 冷噸為例，用化學藥處理每年總耗費達 64 萬港元（包括 37 萬元污水排泄費及 27 萬元化學藥費）。此外，這方法會排出有毒污水，嚴重污染環境。

隨著科技的進步，市場上已提供了各類較環保的水處理設備，如電子水處理（Electrostatic Charge and Ion Exchanger）及臭氧水處理等。兩者皆可取代化學藥，但前者污水排放量較多；後者雖較環保，仍須排放污水，消耗能源和繳付昂貴的保養及維修費。現今，在中國和西方國家已廣泛採用一種較佳的非化學藥科技—磁力污水處理（簡稱 MWT）來清除污垢。此方法在循環水系統運作時效果極佳，成功率甚高。

在 1998 年美國能源中心在一份報告—“應用非化學科技除垢”(Non-Chemical Technology for Scale and Hardness Control)內詳述其效果如下:- 【目前這種新科技仍欠缺科學理據支持, 事實上就觀察所得, 安裝 MWT 後新的硬垢沒有產生; 而絕大部分的安裝, 都可將系統內的積垢除脫】. 最新發展是在 2002 年, 波蘭的核能物理中心在『歐洲物理學會刊物-2002』發表了研究報告—“磁力應用在工業用水. 二氧化硅的活化”, 以最新的科學實驗証實活化的二氧化硅(SiO₂)是 MWT 防垢和除垢效能中佔最重要的因素, 而磁化水的持續記憶能力是由活化的二氧化硅(Silica Activation) 延續至二至三天, 用理據來証實 MWT 這種非化學科技的除垢效果.

此外, 美國學者推薦 MWT 配合過濾器一同使用, 效果更佳.

新一代的 MWT 已從笨重的「電力激磁」進展至輕巧的「超強永久磁」新設計, 無論是外置或內置式安裝, 皆無須能源運作及維修保養。在設計上可對整個空調水系統進行主動式多次循環物理處理, 令 MWT 的功能不單是除垢和防垢, 亦提昇至防腐蝕、防菌和防藻等效能, 最重要是此設備十分環保, 污水是零排放而不影響空調機組效率。同時, 可節省水費、電費和化學藥費等龐大開支。本公司經銷的強磁污水處理器是新一代的 MWT 並具有上述的效能. 產品是引進美國的永磁材料配合中國專利註冊的防漏磁線路設計, 磁場輸出高達二萬高斯, 超強磁力可穿透厚達 25mm(1 吋) 的金屬管壁運作. 對於鋼管直徑大於 1000mm, 另有內置式永磁設計配合有關鋼管直徑, 以應市場所需.

New Technology on Anti-scale -- Magnetic Water Treatment

Water cooling system is commonly used in non-residential buildings and areas with high cooling demand because the use of water cooled chiller plant can achieve almost 20% energy saving rather than air cooled chiller plant in Central Air-Conditioning Plant (A/C plant). Hong Kong SAR Government broadly promotes the use of water cooling system and allowing all new buildings or non-residential buildings in specified districts using natural water supplies in water cooling process.

Scale deposit (mainly calcium carbonate) will be built up in the process of water cooling system which results in lowering the efficiency and effectiveness of heat transfer and increase in energy consumption. Even a scale film as thin as 0.2mm, energy consumed will be increased by 7 %. At the time being, traditional chemical methods have been used to remove scale deposit which results in expensive chemical cost and huge water wastage. For a small commercial complex with A/C cooling capacity of 3,000RT (Refrigeration Ton),

the annual expenditure on chemical treatment will be up to \$640,000 (\$370,000 for water bleeding-off and \$270,000 for chemical cost). Moreover, this method will critically pollute the environment by water wastage.

Other alternatives to substitute chemical treatment such as Electrostatic charge, Ion-exchanger and even Ozone Treatment are also effectively used in water treatment. However, the problems of expensive water consumption, operation cost, maintenance cost and water wastage still exist. Nowadays, an environmental friendship “non-chemical” technology has been introduced and may substitute all other water treatments – **Magnetic Water Treatment (MWT)**.

In USA, the 1998 Department of Energy (DOE) Report, “Non Chemical Technologies for Scale and Hardness Control”, which described that the magnets on water as follows :-

While the evidence in supporting the technology may be thought of as mainly anecdotal , the fact remains that upon visual inspection after installation of these devices the formation of new scale deposits has been inhibited. In addition, in most case, scale deposits present with the system at the time of installation have been removed.”

In recent 2002, a significant Poland research (**Magnetic Treatment of Industrial Water. Silica Activation**) in the <<European Physics Journal—2002>> validated the effectiveness of magnetic treatment of industrial water. The study provides a scientific explanation for those observed phenomena with evidences and concluded that the activated silica (SiO₂), after magnetic influence, plays a prominent role to inhibit calcium and magnesium to precipitate out as scale formation but to drop out as loosen sludge instead. . In addition, active silica has a short validity period and should be preferably used during 2-3 days. Further, US professor advises that the performance will be much better if **MWT** incorporated with the use of filtration system.

Advancing from the use of conventional electrical connections and electrodes, a new generation of **MWT** technology has been produced which are super strong permanent magnets without using energy in operation and no maintenance .Coupled with thorough physical treatment on the entire water

circulation system, **MWT** has positive effects not only on anti-scale but also on biological processes such as germs and algae control. No water bleeding-off is the most important issue in environmental protection. All the above features have significant impact on saving water, energy and chemical expenses.

MWT is incorporated with imported advanced magnet with built-in circuit on magnetic flux leakage protection design patented in China. The super strength of magnetic flux is designed up to 20,000 gauss which is powerful enough to penetrate thro' pipe thickness of 25mm (1 inch). For pipe size above 1000mm, special design with invasive type **MWT** inside pipe work will be offered to cater for the need.

Key Performance Indicators during normal operation of Chillers:-

主要效能指標 (空調系統正常運行時)

- | | |
|--|-------------------------------|
| a. Corrosion Rate 腐蝕率 | -- < 4mpy (0.1 mm per year) |
| b. Scale Formation Rate 結垢率 | -- < 5g/m2.y |
| c. PH Value 酸鹼度 | -- > 7 |
| d. TDS (Total Dissolved Solid) 總溶解固体濃度 | -- No need to control 不須監控股度數 |
| e. Water bleeding – off 污水排放 | -- Not necessary 不須排放 |
| f. Chemical treatment 化學葯 | -- Not necessary 不須使用 |

Note:

In China, the mutual standard in A/C industry for Corrosion Rate is < 5mpy & Scale Formation Rate is < 5g/m2.y. In Hong Kong, the above standards seem not specified.

附註:

香港空調行業對於腐蝕率及結垢率沒有明確標準,因此,以上兩項指標乃參照中國空調行業內約定俗成的標準.