機電 2.0 服務新里程
E&M 2.0 A New Journey

機電工程營運基金第二個五年策略計劃
Electrical and Mechanical Services Trading Fund
The 2nd 5-year Strategic Plan

最新進展
Latest Progress

2022 11月 November

機電工程署 EMSD

事例 CASE 1 機電署首次運用機電裝備合成法及建築信息模擬技術更換製冷機系統

The EMSD's First Adoption of MiMEP and BIM Technology for Chiller System Replacement

機電工程營運基金(營運基金)緊貼工程新趨勢，首次結合運用機電裝備合成法(MiMEP)、機械人及建築信息模擬技術(BIM)，為漁農自然護理署轄下的大龍獸醫化驗所更換四部使用超過20年的製冷機。

通過運用機電裝備合成法，可縮短建築期，減低工程對客戶日常運作的影響，加強品質管控，提升工程安全及場地管理效率，配合機械人切割技術及預製保溫技術，只需38天便完成工程，約為採用傳統方式一半的時間。

此外，機電署為工程建立周遭環境的建築信息模擬模型，並利用建築信息模擬技術動態模擬運輸、吊運及模組組裝過程，大幅提升設計透明度和準確度，以至籌備和施工的效率。舉例來說，在冷卻水管模組的裝嵌過程中，團隊利用三維掃描技術把每件已完成裝嵌的模組與建築信息模擬設計模型作比對，確定準確無誤再運送至工地。

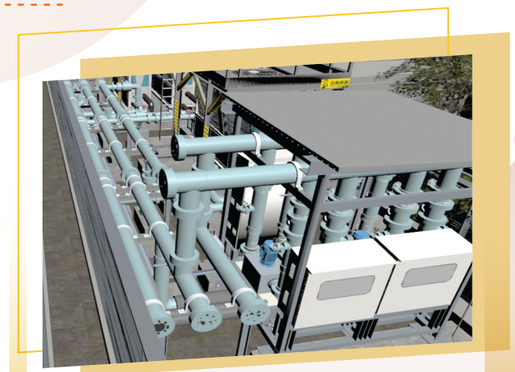
項目完工後，同事更可通過建築信息模擬—資產管理(BIM-AM)系統及無線射頻辨識技術，輕易獲取已數碼化的機電資產資料，提高資產的保養效率，為客戶提供更快捷更高效的服務。項目的成功意義重大，為機電署未來在更多工程上使用機電裝備合成法奠定重要基礎。

Keeping up with new engineering trends, the Electrical and Mechanical Services Trading Fund (EMSTF) applied MultiTrade integrated approach for Mechanical, Electrical and Plumbing works (MiMEP), robotics and Building Information Modelling (BIM) technology for the first time to replace four chillers which had been in service for more than 20 years in Tai Lung Veterinary Laboratory (TLVL) under the Agriculture, Fisheries and Conservation Department.

With the application of MiMEP, the construction period could be shortened, impact of the works on the clients' daily operation minimised, better quality control maintained, and works safety and site management efficiency enhanced. Complemented with robotic welding technology and pre-insulated pipe technology, the project was completed in only 38 days, which is around half of that required under the conventional approach.

Besides, the EMSD specifically created a BIM model for the surrounding environment of the works site and leveraged on BIM technology to simulate the dynamic process of transportation, lifting and module assembly, which significantly enhanced transparency and accuracy of the design as well as preparation and construction efficiency. For example, during the assembly of chilled water pipe modules, 3D scanning technology was adopted to compare each assembled module with the designed BIM model to ensure its precision before delivery to the site.

Upon completion of the project, with the Building Information Modelling Asset Management (BIM-AM) system and radio frequency identification technology, staff can easily acquire digitalised E&M asset information, thus improving asset maintenance efficiency and data accuracy as well as provision of more efficient and effective service to clients. The successful implementation brings great significance to the EMSD and lays a solid foundation for the application of MiMEP in more projects in the future.



團隊在設計過程中應用建築信息模擬技術，成功提升系統及模組設計的準確度。

The team adopted BIM technology in the design process, successfully improving the precision of the system and module design.

機電署善用多項創新技術為大龍獸醫化驗所更換製冷機，包括首次使用機電裝備合成法預製機電組件。

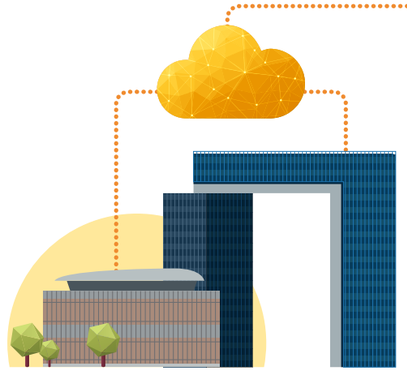
The EMSD applied a number of innovative technologies to replace the chillers at TLVL, including prefabrication of E&M components with the use of MiMEP for the first time.

事例 CASE 2 添馬政府總部率先連接區域數碼監控中心 為未來機電大數據應用揭開新篇章

A New Chapter on Future Application of E&M Big Data Opened When Government Headquarters at Tamar Took the Lead to Connect to RDCC

至今年年底，全港近400幢主要政府建築物的實時機電數據將會連接到機電署的區域數碼監控中心，而添馬政府總部及立法會大樓等已於今年六月率先完成連接。添馬政府核心區建築物的運作數據與數碼監控中心接軌極具意義，標誌着特區政府支持創科及數據安全開放應用，並對其他政府部門及私營機構具良好示範作用。

通過機電數碼化，不單可以遙距實時監察機電設備的運行狀況，更可以即時優化能源效能。現時，機電署的人工智能創新小隊利用收集到的數據，測試數個不同的人工智能模型，為未來機電大數據應用揭開新篇章，可望提升整個香港的發展動能。



By the end of this year, the real-time electrical and mechanical (E&M) data of about 400 major government buildings in Hong Kong will be connected to the EMSD's Regional Digital Control Centre (RDCC). The Central Government Offices at Tamar and Legislative Council Complex were the first to complete the connection in June. The connection of the operation data of the core Government offices at Tamar with the iBMS is of great significance, as it is a clear manifestation of the Government's support for innovation technology and the safe and open data application. This would also set a positive and encouraging example for other government departments and private organisations.

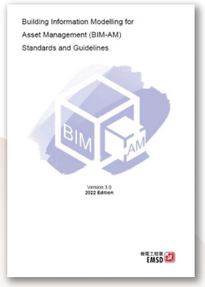
Apart from enabling remote real-time monitoring of the operating status of E&M equipment, the E&M digitisation also provides immediate optimisation of energy efficiency. At present, the EMSD artificial intelligence (AI) innovation team is using data collected to conduct testing on several AI models, opening a new chapter on the application of E&M big data, with a view to enhancing the impetus for the future development of Hong Kong.

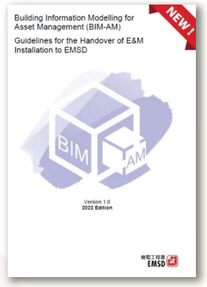
事例 CASE 3 創建「建築信息模擬—資產管理」新工作流程 邁向機電數碼化的新時代

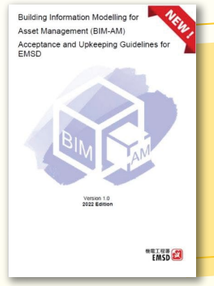
Creating New Workflow for BIM-Asset Management Striding Towards a New Era of E&M Digitalisation

為推動和鼓勵業界廣泛應用建築信息模擬—資產管理技術，機電署於2022年9月出版三本有關建築信息模擬及資產管理應用於機電系統的標準及指引，包括《建築信息模擬及資產管理標準及指引》第三版、供業界參考的《機電項目交付指引》，以及供機電署內部參考的《建築信息模擬及資產管理項目驗收和保養指引》。這三本標準及指引分別載述機電資產的建模要求、建築信息模擬—資產管理項目的交付要求，以及有關管理建築信息模擬—資產管理項目的新工作流程等。隨着上述指引推出，機電署希望能與業界攜手推動建築信息模擬—資產管理的應用，提升資產管理水平，共同邁向機電數碼化的新時代。

To promote and encourage the wider use of Building Information Modelling – Asset Management (BIM-AM) technology in the trade, the EMSD published three BIM-AM related standards and guidelines on E&M installation in September 2022, including the BIM-AM Standards and Guidelines Version 3.0, the Guidelines for the Handover of E&M Installation to EMSD (for the trade) and the BIM-AM Acceptance and Upkeeping Guidelines for EMSD (for internal use of the EMSD). These three standards and guidelines highlight the modeling requirements for E&M assets, the handover requirements of BIM-AM deliverables and the new workflow for managing BIM-AM projects respectively. With the introduction of the above standards and guidelines, the EMSD hopes, in collaboration with the trade, to promote the application of BIM-AM, enhance the quality of asset management and stride towards a new era of E&M digitalisation.







如欲下載有關標準及指引，請掃描二維碼。

Please scan the QR code to download the relevant standards and guidelines.

事例 CASE 4 廣州市技師學院為見習技術員舉辦線上培訓課程

Guangzhou Technician College Conducted Online Training Courses for Technician Trainees

廣州市技師學院和機電署在2020年簽訂《深化機電人才發展合作備忘錄》，雙方近期合辦的5天線上電氣培訓課程已於8月9日圓滿結束。即使疫情嚴峻，依然無阻學員線上線下學習，以及兩地的交流發展。

是次課程有賴廣州市技師學院悉心準備，不但為見習技術員制訂培訓內容及安排運送相關學習設備，更選派世界技能大賽教練組成師資團隊授課。課程以教學理論及實際操作培訓並重，廣州市技師學院的導師在線上示範，本署導師則從旁指導學員。學員通過線上直播接受實務訓練，並經由網上提交習作。這次廣州市技師學院和機電署共同打造既實用又多元化的培訓課程，打破地域界限，並增強兩地之間的學術交流。是次培訓課程讓學員加深對相關專業知識的理解和應用，希望學員能裝備自己，提升技能，為未來的基建出力。

Guangzhou Technician College and the EMSD signed the "Memorandum of Co-operation on Enhanced E&M talent Development" in 2020. A 5-day online electrical training course jointly organised by the two recently was successfully concluded on August 9. Despite the severe epidemic situation, online and offline learning, as well as development and exchange between the Mainland and Hong Kong were unhindered.

This course was well prepared by Guangzhou Technician College, which not only drew up the training content and made arrangement for the delivery of relevant learning equipment, but also assigned coaches of the World Skills Competition to conduct the training. The course focused on both the theoretical and practical aspects, with instructors of Guangzhou Technician College providing demonstration online and the EMSD tutors giving guidance to the trainees at site. The trainees attended the practical training through live webcast and submit assignments online. This time Guangzhou Technician College and the EMSD organised a practical and diversified training course despite the geographical boundaries and strengthened academic exchanges between the two places. The course deepened the trainees' understanding of relevant professional knowledge and application. It is hoped that by this opportunity the trainees can equip themselves, improve their skill set, and contribute to the work concerning the future infrastructure.

廣州市技師學院導師於線上講解和示範，學員仔細聆聽並進行實習。

An instructor of Guangzhou Technician College explained and demonstrated online, and the trainees listened carefully and participated in the hand-on practical training.

導師從旁指導學員和分享心得。

A tutor guided the trainees and shared his experience.

學員一同學習電氣專業知識。

The trainees learned professional electrical knowledge together.

事例 CASE 5 靈活應變成立院舍行動小組　協助院舍改善通風系統

Homes Action Team Set Up Responsively to Help Improve Ventilation Systems

在第五波疫情開始襲港的數月，逾半的死亡個案為安老及殘疾人士院舍院友。特區政府隨後宣布成立跨部門工作小組，由社會福利署主導，醫院管理局、衞生署及機電工程署協助，幫助院舍提升抗疫能力。

本署爭分奪秒與時間競賽，隨即成立院舍行動小組布局迎戰，到院舍進行全方位的通風系統評估，就改善措施提供指引，以增強院舍抵禦日後疫情的能力，減低院友受感染的風險。過程中動員超過一百位同事，他們兼顧日常工作之餘，要在10星期內為全港共738間私營院舍的通風系統進行評估。全賴同事靈活應變，眾志成城朝同一目標進發，使整個行動得以順利完成，切實為院舍院友及負責人排難解憂。

行動小組成員向院舍人員解釋整個評估流程。

A member of the Action Team briefed the staff of an RCH on the assessment process.

機電署人員檢查院舍現場環境和通風設備的運作。

The EMSD staff inspected the environment and operation of the ventilation system of an RCH.

During the first few months that Hong Kong was hit by the fifth wave of the epidemic, more than half of the fatal cases were residents of care homes for the elderly and persons with disabilities. Subsequently, the HKSAR government announced the establishment of an inter-departmental task group, led by the Social Welfare Department and assisted by the Hospital Authority, Health Bureau and the EMSD, to help improve the capability of the residential care homes (RCHs) in fighting against the epidemic.

Racing against time, the EMSD immediately set up the Homes Action Team to conduct comprehensive evaluation of ventilation system at RCHs and provide guidelines on improvement works, with a view to enhancing RCHs' capability to cope with the epidemic in future and reducing the risk of transmission. More than 100 staff were mobilised for the initiative. In addition to their daily duties, they had to evaluate the ventilation systems of a total of 738 private RCHs in the territory within 10 weeks. Their agility, responsiveness, unity and commitment contributed to the success of the entire operation, thus effectively solving the problem for the residents and the responsible persons of the RCHs .

事例 CASE 6 居安思危以策萬全　為電力系統制訂應急預案並進行演練

Taking Precautions through Proactively Formulating Emergency Plans and Conducting Drills for Power Incidents

特定機電團隊(電力)於2022年6月在中環添馬海水泵房舉行了「復電演練」。演練不但加深參加者對電力事故的認識，更提高團隊處理電力事故的應急指揮、協調和支援能力，還增進了同事之間的溝通和默契。

添馬海水泵的主要供電系統是由高壓發電機、高壓電櫃、兩台互作備用的變壓器和低壓電櫃組成。是次演練模擬兩個斷電情況，分別是使用中的變壓器故障及電力公司高壓供電系統故障。團隊就一系列的應急措施，包括呈報事故、啓動復電應急程序、指揮應急小組，以及協調電氣、機械和屋宇裝備服務等進行了明確分工及講解。來自不同部別的隊員互相傳承了重要的專業知識和寶貴的實務經驗，積極就應急預案進行探索和實踐，進一步提升團隊的凝聚力，以防患未然。

The Special Duty Unit (Electrical) held a "Recovery Drill" at Tamar Seawater Pump House in Central in June 2022. Through the drill, not only was colleagues' understanding of power incidents deepened, but the team's command, co-ordination and support capabilities in coping with power failure also improved. Furthermore, communication and understanding among team members were enhanced.

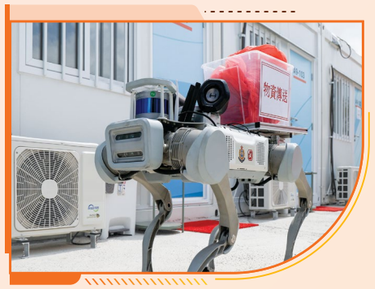
The main power supply system of the Tamar seawater pump consists of a high-voltage generator, a high-voltage cabinet, two transformers for mutual backup, and a low-voltage cabinet. The drill simulated two scenarios, including a faulty transformer in use and failure of the high-voltage supply system in power company. A clear division of responsibilities and explanation on a series of emergency measures, including incident reporting, activation of emergency power resumption procedures, command of emergency teams, and co-ordination of electrical, mechanical and building services, were provided. Members from different divisions shared important professional knowledge and valuable practical experience, actively explored and practiced contingency plans and further enhanced the cohesion of the team for precaution purposes.

同事互相分享經驗和交流技術。

Colleagues shared experience and knowledge.

事例 CASE 7 社區隔離設施試用四足機械人　協助應對疫情挑戰

Quadruped Robot Trialed in Community Isolation Facility to Meet Epidemic Challenges



四足機械人的外型和步行姿勢與動物相似，動作靈活。
The quadruped robot resembles animals in physical appearance and walking postures, and is highly agile.

第五波疫情來勢洶洶，香港特區政府在中央政府協助下興建多個臨時隔離設施，以有效隔離及治療患者和密切接觸者。為了減少隔離設施內的社交接觸，機電署與香港警務處合作，在粉嶺馬適路社區隔離設施開展首個四足機械人試用計劃，運用機械人協助運送物資予檢疫人士。

有別於傳統機械人，四足機械人外型與動物相似，以四肢行動，能適應不同環境，在多種地形上活動自如，包括爬樓梯、上斜坡、在草地上行走等。四足機械人背上設有載物箱，載重量達20公斤。操作人員只需輸入路線指令，機械人便會自動行走、偵測及迴避障礙物，把日常物資由職員區域的貨倉運送到隔離區域內的房間門外，方便檢疫人士自行領取物資。操作人員亦可遙距監測機械人運作狀態和發出指令，確保運送過程順暢。整個運送過程中，工作人員無需與檢疫人士接觸，減低他們受感染的風險。

此外，機電署特別設計了一款自動消毒裝置，為完成運送工作的機械人進行紫外線及臭氧消毒，避免機械人受到污染。由於隔離設施內有大量工作人員走動，且障礙物多，在研發四足機械人的過程中，需要調整機械人的運算程式，再經過多次實地測試及磨合，方可正式試行。未來，機電署會繼續和社會各界攜手合作，積極運用創新科技方案以支援抗疫工作。

Amid the onslaught of the fifth wave of the epidemic, the HKSAR Government has built a number of temporary isolation facilities with the assistance of the Central Government to effectively isolate and treat patients and their close contacts. To reduce social contact in the isolation facilities, the EMSD and the Hong Kong Police Force (HKPF) have been running the first pilot project to use a quadruped robot for delivering supplies to persons under quarantine in the community isolation facility (CIF) at Ma Sik Road, Fanling.

Unlike traditional robots, the quadruped robot has a physical appearance resembling that of animals, and moves with four limbs. It can adapt to different environments and move effortlessly on various terrains, such as climbing stairs, mounting slopes and walking on grass. The quadruped robot has a storage box on its back and can carry a weight up to 20kg. Operators only need to enter route commands, and the robot will automatically walk, detect and avoid obstacles when it delivers daily supplies from warehouses in the staff area to the doorstep of the rooms in the isolated area for persons under quarantine to easily pick up their supplies themselves. Operators can also monitor the robot's operational status and give commands remotely to ensure smooth delivery. In the whole process of delivery, the staff would not come into direct contact with the persons under quarantine, reducing the risk of infection of the staff.

In addition, the EMSD has specifically designed an automatic disinfection device using ultraviolet-C and ozone to disinfect the robot after delivery to avoid its contamination. Due to the large number of staff moving around and obstacles in the CIF, we had to adjust the programme of the quadruped robot during its development, and conduct numerous field tests and adjustments before putting it on trial. The EMSD will continue to work with various sectors of the community and proactively employ innovation and technology solutions in the works against the epidemic.

這個創科方案能有效減少工作人員與檢疫人士的面對面接觸，並有助紓減社隔離設施的人手壓力。
This I&T solution can effectively reduce face-to-face contact between the staff and persons under quarantine, and alleviate manpower pressure in the CIF.

事例 CASE 8 善用創新智能貨倉　支援中醫醫院發展

Leveraging Smart Warehouses to Support the Development of Chinese Medicine Hospital

機電署去年與食物及衞生局(時稱)簽訂了服務水平協議，為其轄下中醫醫院發展計劃辦事處提供與機電設備和醫療電子儀器相關的項目管理和技術諮詢服務。本港首間中醫醫院預計於2025年落成，在規劃和設計中加入創新科技，包括自動化系統和機械人，以提高醫院的運作效率，實行有效管理。

中醫醫院發展計劃辦事處和香港浸會大學一眾代表與機電署人員合照。
Representatives from the CMHPO and HKBU took a group photo with the staff of the EMSD.

為協助客戶深入了解自動化系統，機電署早前邀請了中醫醫院發展計劃辦事處和將承辦中醫醫院營運服務的香港浸會大學代表到訪總部，參觀政府首個智能貨倉，並探討把技術融入中醫醫院日常運作的可行性。

機電署代表當日介紹智能貨倉的運作及當中應用的嶄新科技，包括貨倉自動導航機械車、新式設計貨倉和智慧儲物櫃等，又闡述智能貨倉能精簡工作流程、減少員工勞損受傷機會及提升貨倉儲存量和運作效率等好處。機電署希望通過展示應用創新技術的實質成果，積極向客戶推廣「產業科技化」及「科技產業化」，從而讓市民受惠於創新技術。

代表團聆聽關於智能貨倉機械人(自動導航機械車)和貨倉的設計的介紹。
The delegation learned about the smart warehouse robot (AGV) and the design of the warehouse.

The EMSD signed a Service Level Agreement with the then Food and Health Bureau last year for the provision of project management and technical consultancy services in relation to E&M and medical electronic equipment to the Chinese Medicine Hospital Project Office (CMHPO). The first Chinese medicine hospital (CMH) in Hong Kong is scheduled to be completed in 2025. Innovative technologies, including automation systems and robots, have been incorporated into its planning and design to enhance the operational efficiency and achieve effective management.

To provide the clients with a better understanding of the automation systems, representatives from the CMHPO and the Hong Kong Baptist University (HKBU), the future operator of the CMH, were invited to visit the first government smart warehouse at the EMSD headquarters, and explore the feasibility of integrating it into the daily operation of the CMH.

Representative of the EMSD introduced the operation and the technologies applied to the smart warehouse, including Automated Guided Vehicles (AGV), the newly designed warehouse and the smart lockers, etc. The benefits of using the smart warehouse, including streamlining the work process, reducing the likelihood of staff sustaining injuries, and improving the storage capacity and operational efficiency, etc. were presented. By showing the substantive result of the application of Innovative Technology, the EMSD aimed to actively promote the "Application of Technology in the Industries" and "Industrialisation of Technologies" for the benefit of the public.

工作人員示範使用自助智能儲物櫃。
The staff demonstrated how to use the self-service smart locker.

事例 CASE 9 機電創科日2022暨合作備忘錄簽署儀式

E&M I&T Day 2022 cum Signing Ceremony of Memorandums of Co-operation

機電署於7月19及20日以視像形式舉行「機電創科日2022暨合作備忘錄簽署儀式」，除了提供平台讓業界分享經驗和互相交流之外，也繼2019年與五所本地大學及七間科研機構簽訂合作備忘錄後，分別與香港浸會大學、香港都會大學和職業訓練局簽訂合作備忘錄，建立創科策略伙伴關係，共同支援政府部門應用創科。

在兩天活動中的網上研討會，機電署邀得政府部門、公營機構、機電和創科業界，以及大專院校的代表分享智慧機電應用方案及機電裝備合成法項目的經驗。通過分享成功經驗，啓發參加者的創新思維，以成就更多創新科技應用方案。機電署會繼續與創科策略伙伴合作，利用「機電創科網上平台」為各持份者的創科需求配對解決方案，並為合適的項目提供場地以進行實地試驗，致力構建香港成為世界聞名的智慧城市。

一眾嘉賓主持開幕禮。
The guests officiated at the opening ceremony.

The EMSD held the E&M I&T Day 2022 cum Signing Ceremony of Memorandum of Co-operation was held via video conferencing on 19 and 20 July. In addition to providing a platform for the trade to share their experience and have exchanges, the EMSD also signed memorandums of co-operation (MoCs) with the Hong Kong Baptist University, the Hong Kong Metropolitan University and the Vocational Training Council respectively, following the signing of MoCs with five local universities and seven research institutions in 2019, so as to establish strategic partnership to jointly support government departments in applying I&T.

It is hoped that through the sharing of successful experience, participants would be inspired to develop innovative ideas to achieve more I&T application solutions. The EMSD will, in collaboration with its I&T strategic partners, continue to match solutions to the I&T needs of stakeholders through the E&M InnoPortal and provide venues for projects to conduct field trials as appropriate, in a bid to build Hong Kong into a world-renowned smart city.

副署長／營運服務張遠芳先生代表機電署與三間大專院校代表簽署備忘錄。
Mr. CHEUNG Yuen Fong, Deputy Director/Trade Services, signed the memorandums on behalf of the EMSD with the representatives of the three tertiary institutions.

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如對機電工程營運基金第二個五年策略計劃有任何建議，歡迎以電郵方式向我們提出：
We welcome your suggestions on the second five-year strategic plan for the EMSTF.
For enquiries, please email us at
2nd5yearplan@emsd.gov.hk

如欲瀏覽機電工程署主網頁，請到以下網址：
To view the main website of the EMSD, please visit:
https://www.emsd.gov.hk

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