



香港機場管理局 Airport Authority Hong Kong

縮短行李分揀系統預防性維修的時間，並提升系統的故障應變效率。

Reduce the sortation system downtime for preventive maintenance and enhance the system fault response efficiency.



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背景 BACKGROUND

行李分揀系統每天高效準確地將約10萬件行李分送到指定的行李裝箱區，確保行李準時送達各航班，所以是整個行李處理系統其中一個最關鍵部分。

行李分揀系統非常重要，如停止運作一分鐘，可導致行李處理系統有33件行李滯後，行李運送亦可能因而延誤，故此我們對維修保養投入大量時間及資源，以提高系統的可靠性。

我們每季進行預防性維修保養檢查，而檢查每部行李分揀器需時最多七小時。每天機場只有在凌晨1時至5時期間相對不太繁忙，檢查時間十分緊迫，因此我們開始尋找方法縮短檢查所需時間。

The baggage sortation system is one of the most critical systems of the baggage handling system (BHS) at the airport. It sorts around 100,000 bags per day efficiently and accurately to the designated make-up areas to ensure the baggage can be loaded to the aircraft on time.

Given the importance of the system, a minute system downtime can lead to 33 bags lagging in the BHS, leading to the possibility of delayed baggage. A considerable time and resources had been spent to maintain and improve its reliability.

Up to seven hours had to spend to check each sorter during the quarterly preventative maintenance tasks. Given a small window available between 1:00 am and 5:00 am every morning when the airport is less busy, the process was extremely time intensive. Hence, we started to look for ways for improvement as to reduce the time needed for this task.

問題成因 CAUSE OF THE PROBLEM

- 根據現有的維修保養程序，須每季以人手進行全面的分揀器機件檢查，以及直線電動機、靜電刷、卡車定位的校準測量
- 視乎分揀器的大小，維修團隊須約二至六小時完成該等部件的檢查及校準測量
- 雖然有一些原廠設備製造商手動工具協助進行維修保養工作，但利用這些工具及相關人力進行維修保養甚花時間，而且低成本效益
- 為提高維修保養標準及質素，並預防任何人為錯誤，必須計及各種考慮因素

- According to the existing maintenance procedure, a quarterly holistic sorter hardware checking and alignment measurement for linear motors, static brushes, T-cart position alignment shall be conducted manually
- The maintenance team requires approximate 2 to 6 hours to complete the inspection and alignment measurement for those components subject to the size of the sorters
- Although some OEM hand tools were provided to assist in the maintenance service, the time duration for maintenance using the OEM hand tools and associated manpower to deliver are significant, and not cost effective
- Consideration may always be arisen in upholding the quality of the maintenance standard preventing any humanity error

解決方法 SOLUTION

- 引入特製的智能分揀檢查工具，這個智能維護工具裝有高解像度攝影機及雷射測距感應器的可插入式底座，方便使用
- 維修團隊進行預防性維修保養檢查時，可提高分揀系統部件定位的成效及準確性
- 大大減省預防性維修保養檢查所需的人力及時間（約70%）
- 由於分揀系統適用性提高，減少了出現故障的機會

- Introduce a bespoke smart maintenance toolkit: "Smart-Sorter-Checker", an user-friendly attachable chassis composing of high definition (HD) camera, laser displacement sensors
- The maintenance team can enhance the efficiency and accuracy in the inspection of sortation system component positions during preventive maintenance
- Significantly reduce/save the manpower and duration of time of such the preventive maintenance (reduced by 70%)
- Mitigate the occasions of fault incidents owing to sortation system serviceability betterment

成果及效益 ACHIEVEMENT & BENEFIT

- 維修保養程序更加高效且準確。這工具亦有助我們評估維修服務承包商的工作質素
- 我們藉着這個方案減輕前線維修保養人員的工作量及壓力，盡顯對他們的關心和理解
- 進行檢查時利用工具達到更準確的定位校準，大大增加分揀系統的運作時間
- 在系統上應用及結合新技術，為預防性維修保養工作建立實用和可持續的方案
- 盡量減少預防性維修保養工作所需時間，騰出更多空間進行系統更新及提升，從而使系統更可靠及可持續運作
- 我們與前線維修保養人員面談時，發現現時維修保養工作流程實際上的各種限制及挑戰，因此為他們研發及推行這個方案，並期望他們反映意見，令方案可更加完善

- The maintenance process was enhanced, not only more efficient, but also more accurate. The tool kit also helps us to evaluate the quality of work done from maintenance contractor
- The solution shows our care and understanding to the frontline maintenance staff by providing the solution to relax their workload and working stress.
- The system availability would be enhanced significantly by having the tool for more accurate alignment during the inspection
- New technologies had been applied and integrated into the system to build up the practical and sustainable solution for preventive maintenance
- Minimizing the amount of time requiring for preventive maintenance allows more maintenance window for system rejuvenation and enhancement works such that the system would become more reliable and sustainable
- By interviewing the frontline maintenance staff, we realize the actual limitations and difficulties of the existing maintenance work flow. We develop and implement the solution for them. We are keen on getting feedback from them to optimize our solution.



1 智能分揀檢查工具俯視圖
The overview of Smart Sorter Checker

2 每天處理超過10萬件行李的分揀系統
The Sortation System that handling over 100,000 bags daily

3 進行預防性維修保養工作時使用智能分揀檢查工具的實際環境
The actual environment on using Smart Sorter Checker during the preventive maintenance