



Fuel Efficiency in Vehicle Fleet Management

車隊管理的
燃料效益

機電工程署
EMSD

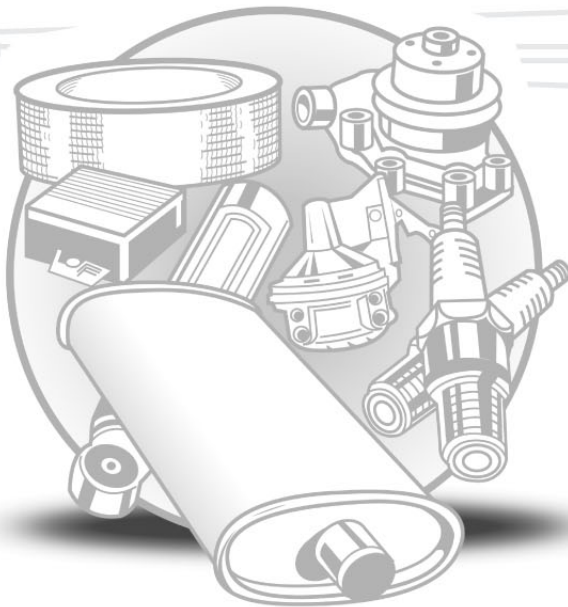


INTRODUCTION

The energy consumption in transport sector was about 35% of the total Hong Kong energy end-use consumption. Improved fuel efficiency in vehicle fleet can reduce the emission of carbon dioxide as well as operational fuel cost. This leaflet provides brief information and suggestions to improve the fuel efficiency of vehicle fleet.

引言

運輸界別的能源消耗量佔香港能源最終用途總量約35%。提高車隊的燃料效益可降低二氧化碳的排放量及在運作上的燃料成本。本冊子旨在簡介和建議如何提高車隊的燃料效益。





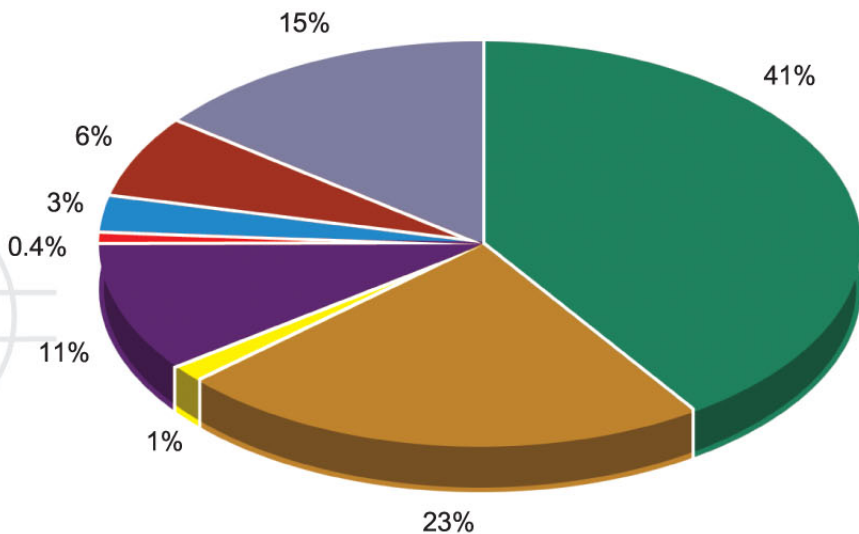
2. FUEL COST

As fuel may account for up to 30% of operating costs, fuel efficiency is one of the key factors to lower the operating cost. Below is the typical operating cost for a 7.5 tonnes gross vehicle weight goods vehicle for reference.



2. 燃料成本

由於燃料成本可佔運作成本的30%之高，因此，燃料效益是降低運作成本的主要因素之一。下圖顯示一輛7.5公噸（車輛總重）貨車的一般運作成本，以供參考。



- Drivers 駕駛者
- Fuel and oil 燃料和潤滑油
- Tyres 車胎
- Depreciation 折舊
- VED 汽車稅
- Insurance 保險
- Maintenance 維修
- Overheads 間接費用

Source: Fuel Saving Tips - Department for Transport, UK
來源：英國運輸部一慳油小貼士



3. MANAGEMENT COMMITMENT

In implementing a fuel efficiency programme for a vehicle fleet, senior management should make a clear and public decision giving practical fuel efficiency priority and commitment.



3. 管理層的承諾

如要為車隊實施燃料效益計劃，高層管理人員應作出明確和公開的決定，把提高燃料效益列為一個優先處理項目，並為此作出承諾。



4. FACTORS AFFECTING FUEL EFFICIENCY

There are many factors influencing fuel efficiency. Awareness of these at all levels of an organization is important. These factors include fuel management, vehicle specification, role of fleet manager, role of driver, strategic load decision, vehicle maintenance, information technology and electronic device



4. 影響燃料效益的因素

影響燃料效益的因素很多，故機構內不同階層的員工都應了解這些因素。這些因素包括燃料管理、車輛規格、車隊經理的角色、駕駛者的角色、載貨策略、車輛維修、資訊科技和電子裝置。



4.1 FUEL MANAGEMENT

A proper fuel management can monitor and manage fuel from the point of entry to the point of use effectively within your operations. It can be based on anything from manual records to sophisticated computer software. The fuel management system varies from large fleets to hold your own bulk fuel stocks to small fleets rely on fuel cards or simple arrangement with a local filling station.



4.1 燃料管理

妥善的燃料管理能有效地監管車隊從燃料購入至最終使用的運作情況。該燃料管理工作可建基於人手編製的記錄或先進的電腦軟件，故燃料管理系統的規模可由小型車隊所使用的油卡或與本地加油站所作的簡單安排以至大型車隊自己擁有燃料儲存倉庫。



4.1.1 APPOINTMENT OF FUEL MANAGER

The appointment of a Fuel Manager is one of the essential steps towards formulating a fuel management programme. The Fuel Manager has responsibilities to:

- Oversee and coordinate the implementation of the programme
- Educate staff and communicate with staff and management
- Promote staff participant and support
- Keep tracks of fuel consumption records and trend
- Monitor programme progress and benchmark organizational performance against targets
- Recommend the commissioning of a Fuel Audit as necessary



4.1.1 委任燃料經理

委任燃料經理是制訂燃料管理計劃的主要步驟之一。燃料經理的工作包括：

- 監督和統籌計劃的實施情況
- 教育員工，並與員工及管理層溝通
- 推動員工參與和支持計劃
- 保存燃料消耗量的記錄和留意燃料消耗的趨勢
- 監察計劃進度，並按目標釐定機構表現的基準
- 有需要時建議展開燃料審核工作





4.1.2 FUEL AUDIT

Fuel audit is a systematic check and review of how fuel is used. In general, a Fuel Audit is conducted by professionals, who will help identify areas of inefficiency and room for fuel saving, and most importantly, recommend action plans for management considerations.



4.1.2 燃料審核

燃料審核是有系統地檢查和檢討燃料的使用情況。一般來說，燃料審核須由專業人士進行，以找出欠缺效益和可節省燃料的空間，並建議有關的改善計劃，以供管理層考慮。

Tips (1): Fuel Efficiency Performance Indicator

A typical measurement of fuel performance indicator is shown below for reference.

貼士(1)：燃料效益表現指標

以下是一般量度燃料效能的指標，以供參考。

$$\text{耗油量生產指數 (Fuel Productivity)} = \frac{\text{行駛距離 (Travel Distance)} \times \text{貨物運載量 (Goods Weight)}}{\text{耗油量 (Fuel Consumed)}}$$

i.e., travel distance in delivering 1 ton of goods per litre of fuel
即每公升燃料運送每噸貨物可行駛的里數





4.2 VEHICLE SPECIFICATION

Badly-specified vehicles are wasting fuel and costing more to operate than necessary. Below are some suggestions to be considered in deciding on the right vehicle.

- Avoid chose over-capacity or low performance vehicle
- Compare vehicle fuel consumption
- Choose high fuel efficiency vehicle and make your choice based on whole-life costs, not simply initial cost.
- Watch out accessories, which will increase fuel consumption, including those will increase the vehicle weight, drag resistance and need additional power
- Drag reducing device
- Type of fuel, engine and government incentives
- Appropriate fuel tank size and position for your operation
- Ask the dealer to advise on your operation
- Try the demonstrator vehicles on road
- Tyre specification, including low rolling resistance tyre



4.2 車輛規格

規格欠佳的車輛會浪費燃料和增加運作成本。以下是一些在採購車輛時可考慮的建議。

- 避免選擇運載量過大或效能低的車輛
- 比較車輛的燃料消耗量
- 選擇燃料效益高的車輛，並根據全期成本（而非純粹根據初期成本）作出選擇
- 留意增加燃料消耗量的車輛配件（避免那些會增加車輛重量和拖曳阻力以及需要額外功率的配件）
- 使用減阻裝置
- 燃料類別、引擎和政府給予的優惠措施
- 燃料缸的大小和位置須恰當，以配合車隊運作的需要
- 要求代理商就車隊運作給予意見
- 在馬路上試車
- 車胎的規格（包括低滾動阻力車胎）



TIPS (2): DRAG REDUCING DEVICE

In spite of various drag reducing devices, nearly half the total drag reduction comes from a cab roof deflector. Up to 80% of the fuel saving benefits of drag reducing devices comes from three components: the cab roof deflector (1), cab extension panels (2) and under-bumper air dam (3).

貼士(2)：減阻裝置

雖然減阻裝置種類繁多，但幾乎一半的總減阻量是來自駕駛室頂折射板。減阻裝置所節省的燃料有高達80%來自3個組件：駕駛室頂折射板(1)、駕駛室延伸板(2)以及防撞槓下風隔(3)



Source: Fuel Saving Tips - Department for Transport, UK
來源：英國運輸部 - 慳油小貼士



4.3 ROLE OF FLEET MANAGER

Fleet manager plays an important role for implementing the fuel efficiency tasks. He may consider the followings in his work to achieve the fuel efficiency goal.

- Assess fuel efficiency as part of driver recruitment process
- Incorporate efficiency saving in training programme for drivers
- A bonus scheme based on fuel efficiency
- Request up-to-date training from vehicle manufacturers
- Communicate effectively with fuel manager and drivers
- Run driver league tables based on fuel economy averages



4.4 ROLE OF DRIVER

The benefits of a fuel efficiency driving style will not only lower fuel cost but it will also lower maintenance and insurance costs.



4.3 車隊經理的角色

在節省燃料方面，車隊經理所擔當的角色十分重要。他可以考慮以下事項，以達到慳油的目標。

- 評估燃料效益，作為駕駛者招聘程序的一部分
- 將慳油措施納入駕駛者培訓計劃內
- 考慮制訂燃料效益獎勵計劃
- 要求車輛製造商提供切合最新情況的培訓
- 與燃料經理和駕駛者有效地溝通
- 根據平均燃料效益定出駕駛者排名榜



4.4 駕駛者的角色

慳油的駕駛模式不但可降低燃料成本，也可減少維修和保險的費用。



4.4.1 DAILY CHECK

Drivers should complete the following daily check of their vehicle before use. Any abnormality must be reported as soon as possible.

- Condition of tyres and wheel fixings
- Correct tyre pressure
- Fuel and lubricating oil system free from leaks
- Exhaust emissions visually normal (black smoke indicates excess fuel)
- Correct lubricating oil and coolant levels
- Lubricating oil viscosity within the manufacturer's recommendations

TIPS (3): THE EFFECT OF TYRE PRESSURE

Tests have found that 20% under-inflation will cause a 10 per cent increase in rolling resistance, leading to 2% deterioration in fuel consumption on average.

Source: Fuel Saving Tips – Department for Transport, UK



4.4.1 每日例行檢查

駕駛者應在每日使用其車輛之前完成以下的例行檢查工作。駕駛者如發現任何異常情況，必須盡快匯報。

- 車胎和車輪裝置的狀況良好
- 車胎氣壓正常
- 燃料和潤滑油系統沒有滲漏
- 視覺檢查車輛排氣正常（黑煙表示使用過多燃料）
- 潤滑油和冷卻劑的液位正常
- 潤滑油黏度在製造商建議的範圍內

貼士(3)：車胎氣壓的影響

有關測試發現，車胎如20%充氣不足，便會增加滾動阻力10%，使燃料消耗量平均增加2%。

來源：英國運輸部－慳油小貼士



4.4.2 FUEL EFFICIENCY DRIVING STYLE

A good driver should equip with the following fuel efficiency driving style.

- Avoid unnecessary acceleration and deceleration
- Avoid unnecessary loading
- Use air-conditioning sparingly
- Switch off when idling
- No over-speeding
- Avoid put your feet on the brake pedal for prolonged period
- Shift to high gear whenever possible and safe
- Plan journey and reduce travel distance
- Consider journey in highways and watch out hilly roads, traffic congestion and speed limit
- Always be ready to learn, no matter how experienced you are
- Know the vehicle average fuel consumption
- Read the vehicle handbook
- Follow vehicle manufacturer recommendations
- Use tachometer green zone
- Take care filling fuel tanks and avoid filling to the brim

TIPS (4): FUEL CONSUMPTION OF IDLING ENGINE

A typical 420 horse power heavy duty truck engine consumes 1.9 litres of fuel per hour at its idling speed.

Source: Fuel Saving Tips – Department for Transport, UK



4.4.2 慳油駕駛模式

良好的駕駛者應遵行以下的慳油駕駛模式。

- 避免不必要的加速和減速
- 避免不必要的負載
- 減少使用空調
- 停車熄匙
- 切勿超速
- 避免長時間把腳放在剎車掣上
- 在可能和安全的情況下轉高檔
- 計劃行程和縮短行車路線
- 考慮使用公路行車，並留意山路、交通擠塞和車速限制
- 不管你的駕駛經驗多豐富，仍保持學習態度
- 留意車輛的平均燃料消耗量
- 細閱車輛手冊
- 遵從車輛製造商的建議
- 保持引擎轉速在轉速計綠區內行車
- 入油時務須小心謹慎，避免滿溢



貼士(4)：空轉引擎的燃料消耗量
一輛420匹馬力的重型貨車引擎空轉時，每小時會消耗1.9公升燃料。

來源：英國運輸部－慳油小貼士

TIPS (5): THE EFFECT OF SPEED ON FUEL CONSUMPTION

It consumes more fuel if the vehicle is running at higher speed. The effect of speed on fuel consumption of a typical 420 horse power heavy duty truck is shown below for reference.

貼士(5)：車速對燃料消耗量的影響

車輛如以高速行駛，會消耗多些燃料。以下是一輛420匹馬力重型貨車在不同車速的燃料消耗情況，以供參考。

speed (km / hr) 速度 (公里 / 小時)	distance(km) 路程 (公里)	fuel used(litres) 所用的燃料 (公升)	fuel consumption (km / litre) 燃料消耗量 (公里 / 公升)
59	22.2	4.1	5.4
80	22.2	6.6	3.4
90	22.2	8.4	2.6

Source: Fuel Saving Tips – Department for Transport, UK
來源：英國運輸部－慳油小貼士



4.5 STRATEGIC LOAD DECISION

Careful loading will improve utilisation of goods compartment and help reduce costs. In addition, strategic load decisions can be used to improve efficiency, for example back-loading. If an operator is able to organise its deliveries and



4.5 載貨的策略

妥善安排載貨能充分使用車輛載貨的空間，並有助降低成本。此外，有計劃的載貨策略（例如回程載貨）可用來改善效率。如果公司能把貨物交收工作組織得好，使車輛可回程載貨，這樣，在貨物交



collections in such a way that it can do a number of back-loads, this can reduce the number of vehicles required, and thus use less fuel in the process.

收過程中所需的車輛數目和所用的燃料便可減少。



4.6 MAINTENANCE

A well-maintained vehicle is certain to be more fuel efficient than a neglected one. Regular replacement of air filter, fuel filter and lubricating oil filter in accordance with manufacturer's recommendation will not just lower fuel consumption, but will also protect the engine.



4.6 維修

保養適當的車輛肯定比缺乏保養的車輛更具燃料效益。根據製造商的建議定期為車輛更換空氣過濾器、燃料過濾器和潤滑油過濾器不但可降低燃料消耗量，而且可保護引擎。

Drivers have an important role since they are likely to be first person to observe signs of trouble. Below is a list of signs that a vehicle needs workshop attention.

- Missing seal in fuel tank cap or signs of fuel spills around filler neck
- Excessive fuel consumption
- Excessive lubricating oil consumption
- Missing tyre valve caps
- Steel caps are much better than plastic ones, providing an effective second line defence against leaking valves
- Missing or damaged drag reducing devices and vehicle body
- In-correct axle alignment and abnormal brake system

駕駛者擔當的角色亦十分重要，因為他們可能是第一個觀察到車輛出現故障迹象的人。以下是一些車輛須要維修的迹象。

- 燃料缸蓋的密封不見了或燃料缸入油喉周圍有燃料溢出
- 消耗過多燃料
- 消耗過多潤滑油
- 失去了車胎閥蓋
- 車胎閥鋼蓋遠較塑膠蓋為好，因為前者能提供有效的第二道防線，防止閥門滲漏
- 缺少或損壞減阻裝置和車身部件
- 輪軸定線不正確和剎車系統不正常





4.7 Information Technology and Electronic Device

There are a lot of ways in which information technology can help to save fuel. Here are a few examples:

- Computer-assisted load planning and vehicle routing
- Satellite navigation can assist drivers on route
- Real time traffic information can avoid traffic congestion
- Use on-board computers to check fuel consumption
- VHF radio communication can facilitate immediate vehicle deployment and control



4.7 資訊科技和電子裝置

利用資訊科技來幫助節省燃料的方法有很多，以下是一些例子：

- 利用電腦進行載貨規劃和定出行車路線
- 衛星導航可協助駕駛者選定路線
- 提供即時交通資訊以避免出現交通擠塞情況
- 利用車上的電腦檢查燃料消耗量
- 甚高頻無線電通訊系統可方便即時調配和管理車輛



Reference:

Fuel Saving Tips * Department for Transport, UK

Fuel Management Guide * Department for Transport, UK

Hong Kong Energy End-use Data * Electrical & Mechanical Services Department, HKSAR Government

參考資料：

慳油小貼士－英國運輸部

燃料管理指南－英國運輸部

香港能源最終用途數據－香港特別行政區政府機電工程署

機電工程署  **EMSD**

機電工程署 能源效益事務處
Energy Efficiency Office
Electrical and Mechanical Services Department
香港九龍啟成街3號
3 Kai Shing Street, Kowloon, Hong Kong
電話 Tel: (852)1823, 2808 3465
傳真 Fax: (852) 2890 6081
網址 Homepage: <http://www.emsd.gov.hk>
電郵 Email: eepublic@emsd.gov.hk