Heavy vehicle selection guide

Introduction

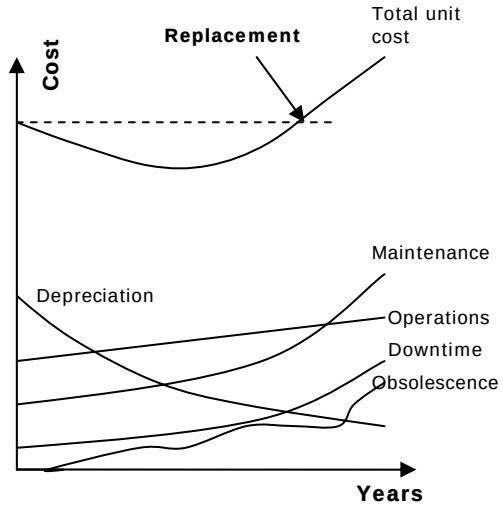
This guide is designed to help you, as a heavy vehicle purchaser, choose the right vehicle to improve your business's efficiency, safety and ultimately – profitability.

The purchase or lease of a new vehicle can add real value to your operation. For example, you'll probably want to boost the vehicle's payload capacity and/or reduce maintenance costs. Choosing a more fuel-efficient vehicle may also be a priority. The right vehicle can help enhance your business image with your customers and you may also want to consider driver preferences. And, of course, there's the basics - improved safety and increased reliability.

Initial purchase price vs life cycle cost

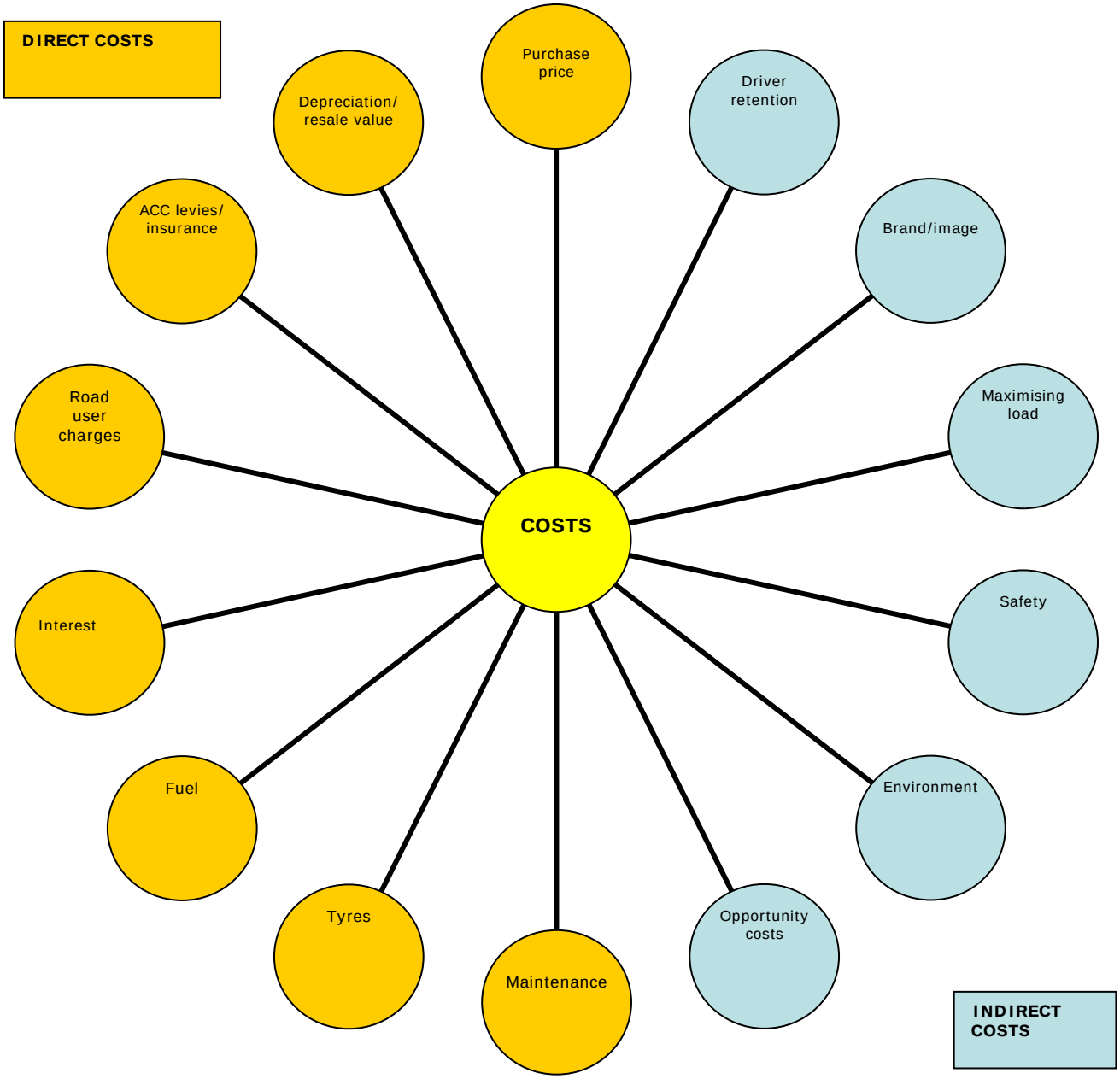
When selecting a new or replacement vehicle, it's advisable to consider the life cycle cost of the vehicle, not just the initial purchase price. What's really important is to minimise all of the direct and indirect expenses throughout the life of the vehicle. Choosing the cheapest vehicle on the market today may prove to be false economy tomorrow.

The graph below shows the cost of operating a vehicle over its life. The point marked 'Replacement' indicates the stage at which the cost of operating the vehicle is greater than replacing it. This point varies according to the resale value of the vehicle purchased.



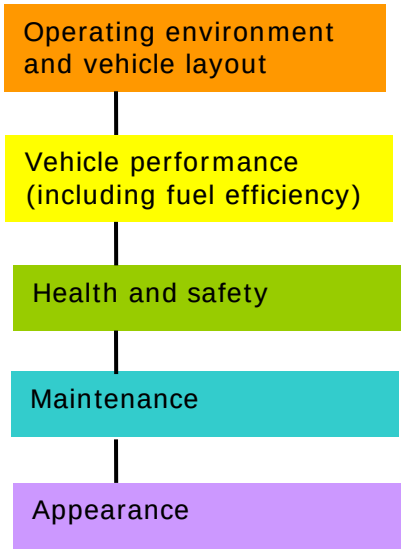
Direct and indirect costs

Both the direct and indirect costs associated with operating a heavy vehicle need to be considered when making your selection.



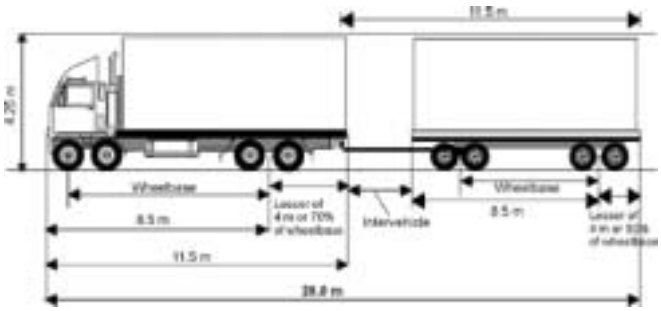
Suggested process for selection

There are five broad areas which should be considered when purchasing or leasing a vehicle. These are shown below.



1. Operating environment and vehicle layout

The first step is to determine what the vehicle will be used for, the conditions it will regularly be operating under and any other operational or legal constraints. This information will provide the basic requirements for the vehicle including the type of loads that it will be able to carry, how much deck space is required, the type of body to be fitted and how loads will be secured. Don't forget to consider requirements such as road user charges (RUC), static rollover threshold (SRT) and the Dimensions and Mass Rule – as these will affect the vehicle's configuration including the number of axles, deck length and suspension.



Begin by considering the load space requirements when working out the configuration. Engine size doesn't matter, that comes later.

Assess your proposed vehicle's nominal SRT using the default values in the SRT calculator.

http://www.landtransport.govt.nz/srt-calculator/index-srt.html

The following links are worth checking:
http://www.landtransport.govt.nz/commercial/

http://www.landtransport.govt.nz/rules/vehicle-dimensions-and-mass-2002.html

http://www.landtransport.govt.nz/factsheets/13.html

http://www.landtransport.govt.nz/rules/heavy-vehicles-2004.html

2. Vehicle performance

Overall vehicle performance has a major impact on the success of an operation. Once the basic layout of the vehicle has been has been decided, the next task is to consider specific factors affecting performance, such as engineering and vehicle components.

Pay particular attention to engine power, torque requirements, transmission gearing, differential ratios, wheels and tyres. You should aim to ensure that there is sufficient power available to handle the work required using the least amount of fuel and with the lowest-possible life cycle costs.

Vehicle performance is also affected by the engine cooling system, exhaust system, air conditioning and other engine and transmission-related equipment.

Fuel efficiency

With fuel typically accounting for over 11 percent of the cost of operating a vehicle, any savings in fuel use can make a significant difference to vehicle operating costs. A saving of 10 percent in fuel costs can affect profitability by as much as 30 percent.

There are a number of ways in which vehicle fuel usage can be reduced:

- The engine size should be carefully selected to closely meet the required demand – bear in mind that every additional 5 hp can increase fuel consumption by two percent.
- Fitting aerodynamic cab deflectors and reducing inter-vehicle spacing can improve fuel efficiency by at least six percent – and in some cases more than 20 percent (depending on the body fitted and the load carried).
- Road speed limiters or cruise control features can result in fuel savings of up to six percent if set correctly.
- Vehicles with semi-automatic and fully-automatic transmissions are gaining favour as they now use the same or less fuel than manual transmissions.

Performance checkpoints

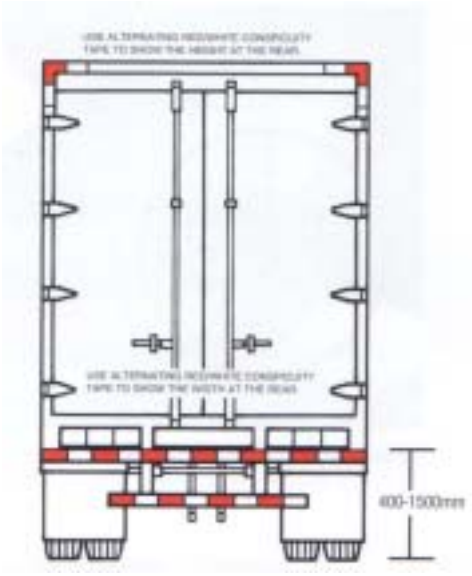
- An engine geared to run at 1,450 rpm at 100 km/h uses approximately four percent less fuel than one geared to run at 1,600 rpm at the same speed.
- Idling is more common than you may think and can add 20 to 30 percent to truck operating hours.
- A fixed drive fan can use 10 percent of the engine power all of the time but may only be required for 2–5 percent of the time. Consider fitting electrically-driven thermostatically-controlled fans. Determine whether it is necessary for the fans to turn on automatically when the air-conditioning system turns on.
- At highway speeds, over half the energy required is used to overcome aerodynamic drag. A reduction of aerodynamic drag of 25 percent will reduce highway fuel consumption by 10–15 percent. Reductions in aerodynamic drag of up to 50 percent have been achieved – however, care needs to be taken to ensure the power-train receives sufficient cooling.
- Dead insects behind the front windshield indicate an airflow problem.

3. Health and safety

There are a number of road safety and occupational safety and heath issues that must be taken into account. These can be divided into the following groups:

a) Features that affect the normal driving of the vehicle, or its driveability. This includes the vehicle's handling, the effectiveness of the lights and cab layout.
b) In-service reliability, to reduce risk of a failure that could cause a crash.
c) Active safety features that help avoid a crash occurring should the driver, or another road user, make a mistake. Examples include anti-skid braking (ABS), traction control and road speed limiters.
d) Passive safety features that protect the driver when a severe crash is unavoidable, including safety belts, under-run protection and crashworthy cabs.
e) Driver occupational safety and health issues such as the provision of safe access into the cab, the quality of the driver's seat, cab noise, the fitting of tail lifts and other devices.

Other safety features that can increase safety for your drivers and other road users include daylight running lights and conspicuity tape. Certification requirements also need to be addressed.



Check out the Land Transport NZ Heavy vehicle visibility code

When purchasing a vehicle, you also need to ensure all legal requirements are met, as specified in the traffic regulations, the Land Transport Rules and the Health and Safety in Employment Act (HSE).

For example, if you are choosing between two similar vehicles and one has enhanced safety features, then under law you must choose the safer vehicle (under the 'all practicable steps' provisions of the HSE).

Safety checkpoints

- The performance of the brakes requires particular attention, including whether anti-skid braking (ABS), electronic braking systems (EBS) and other brake technologies should be fitted.
- Many trucks now comply with the European ECE 29 cab strength requirements, providing the driver with added protection should the vehicle roll or suffer a head-on crash.
- Under-run protection saves lives. Some trucks are now factory-fitted with front, side and rear under-run protection.
- Health and safety considerations are increasingly important now that the cab is deemed to be the driver's place of work.
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4. Maintenance

Maintenance is an important consideration when selecting a new vehicle as maintenance (excluding lubricants and tyres) typically makes up 5–10 percent of operating costs. Maintenance costs typically increase as the vehicle gets older and will be higher if the vehicle is routinely operated in harsh conditions.

Servicing vehicles infrequently may save on maintenance costs in the short-term but is likely to result in breakdowns, which are expensive, not just in terms of repair costs, but in terms of the cost of delayed delivery to your clients.

So, adopt the aim of having zero breakdowns through appropriate vehicle selection and regular maintenance programmes. Ask around to see if the vehicle you are considering is regarded as reliable by other operators. Consider features that improve reliability, such as the use of synthetic lubricants in axles and transmissions and 'sealed-for-life' bearings.

Maintenance checkpoints

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- The amount of fuel consumed is a better indicator of engine wear and when to service a vehicle than distance travelled.
- Synthetic lubricants out-perform mineral lubricants at all temperatures. They can reduce fuel consumption by up to 0.5 percent in summer and two percent in winter.
- A 15 psi under-inflation of tyres will increase rolling resistance by six percent and increase the likelihood of tyre blowouts and flats.

5. Appearance

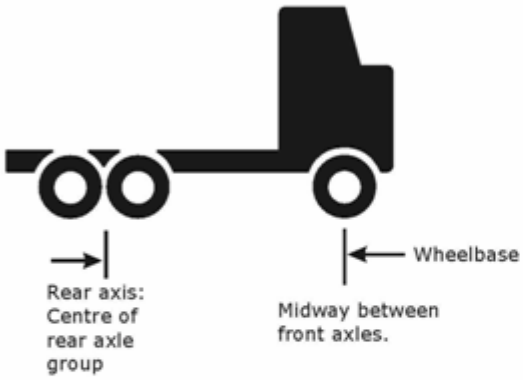
Appearance and functionality of the vehicle can have a significant effect on attracting business and retaining drivers. Consider choosing a cab layout which will enhance driver comfort and a vehicle style which will appeal to your clients (for example, some clients do not like aggressive looking trucks). Vehicle livery and features not only enhance your company's image but can also ensure the driver feels proud of the vehicle and will look after it.

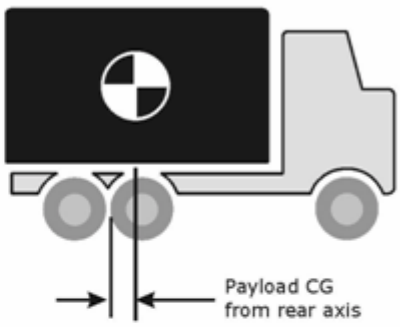
Checklist

Operating environment and vehicle layout	
• Estimated total kilometres which will be travelled each year	
• Type of loads to be carried	
• Location at which vehicle will based (main depot or secondary depot)	
• Accessibility to loading/unloading areas	
• Number of drivers who will regularly use the vehicle	
• One-way or return trips	
• Expected maximum and average payload	
• Average daily utilization of the vehicle	
• Average daily load factor	
• Will vehicle be operating on hilly terrain, off-highway, in congestion etc?	
• Will vehicle be required to operate any additional equipment, eg Hiab?	
• Will vehicle be required to tow a trailer?	
• Will vehicle stay on the same work for all its operational life?	
• Will vehicle be required to comply with any specific industry sector requirements, (eg tankers)?	
• Type of body required to carry the load?	
• Load securing arrangements	
• What is the best configuration for the intended task?	
• What are the expected dimensions?	
• Are the weight and height limits required to comply with SRT workable?	
• Is the tare mass as low as is practical?	
• What are the expected axle loadings?	
• What will the GVM and GCM be?	
• How will the configuration affect road user charges for that vehicle?	
• What types of specifications have worked best in previous operations?	
Vehicle performance	
• Is the area at which vehicle is based hilly or flat (startability)?	
• How steep are the hills that the vehicle is likely to have to negotiate (gradeability)?	
• Is the vehicle likely to be operated off-road?	
• What is the main type of road surface the vehicle will be operating on?	
• What are the temperature extremes?	
• What are the prevailing winds?	
• Engine option, fully electronic (fly by wire)	
• Transmission type, (synchromesh, constant mesh, non-synchromesh, automatic, automated)	
• Final drive ratio	
• Exhaust (the greater the back-pressure, the greater the amount of fuel used)	
• Cooling fan (specify the smallest variable speed fan necessary for requirements)	
• Fuel tank size (carrying excessive amounts of fuel reduces payload capacity and increases running costs)	
• Radiator shutters	
• Auxiliary braking, (engine brake or retarder, what type of retarder)	
• Type of brakes (ABS, EBS or conventional – drum vs disc)	
• Running auxiliary equipment when vehicle stationary	
• Speed limiting	

• On-board vehicle monitoring	
• Will cruise control be an advantage?	
• Type of suspension (air or leaf springs?)	
• Type of tyre (super single or dual?)	
• Tyre tread pattern	
• Central tyre pressure monitoring	
• Set back or conventionally-mounted front axle?	
• Conventional or low maintenance hubs and bearings?	
• Type of cab (full sleeper, day cab, extended cab. COE vs conventional)	
• 'Dress up' equipment that improves return on investment	
• Air conditioning	
• Type of seating	
• Will existing drivers need re-training?	
Health and safety	
• Brake system including ABS, EBS, discs vs drums etc	
• Under-run protection (sides, rear and front)	
• Seat belts	
• Conspicuity	
• Cab strength under impact (to the ECE 29 standard)	
• Do the mirrors provide good side and rear visibility? Should the mirrors be heated?	
• Driver access to the cab	
• Seat adjustment	
• Driver comfort	
• Cab layout	
• Storage space in the cab	
• Load securing provisions	
• Lifting equipment such as tail lifts	
Maintenance	
• Service intervals	
• Cost of service and parts	
• Lubricants	
• Service support package (if outsourcing maintenance)	
• Sealed-for-life bearings	
• Availability of parts	
• Reliability and expected life of components	
• Compatibility with other vehicles in the fleet	
• Knowledge of staff undertaking the repairs	
• Expected life cycle cost of maintenance	
Appearance	
• Styling	
• Signage	
• Driver preference	
• Brand promotion	
• Client requirements	
• Overall image	

Calculating axle weights





Step 1: Write down the estimated payload in tonne

Payload
P = _____ Tonne

Step 2: Write down the tare weight

Tare
T = _____ Tonne

Step 3: Measure the distance between the centre of the front and rear axle groups.

Wheelbase
A = _____ Metres

Step 4: Calculate the distance from the rear axis to the centre of the load

CG of payload
B = _____ Metres

Step 4: Obtain the unladen weights by axle group from the vehicle manufacturer

	Front axle	**Rear axle**	
	Unladen weight	Unladen weight	
UF=			Tonne

Step 4: Multiple P x B and divide by A

Payload weight
PF= _____ Tonne

Step 5: Add UF to PF

Front axle group weight
FA= _____ Tonne

Step 6: Add P +T subtract FA

Rear axle group weight
_____ Tonne

This procedure can be equally applied to trailers.
For semitrailers it is easiest to treat the hitchpoint as the trailer's front axle group.
For tractors the hitch load is the payload and is centred in the fifth wheel.