Tractor Aerodynamic Package Calculator User Guide

The Tractor Aerodynamic Package Calculator is a tool that enables you to determine potential fuel and monetary savings. You can also use it to determine the reduction of greenhouse gas (GHG) emissions resulting from the installation of a tractor aerodynamic package and to estimate the payback for such an investment.

This guide explains the information to be entered in the calculator. It also explains the assumptions and calculations embedded in the calculator, some of which can be changed to better reflect a specific situation.

The Tractor Aerodynamic Package Calculator is organized as follows:

Inputs

1. Cost per unit: purchase and installation cost per tractor:
    - The OEM purchase cost for the tested device was $ 1,160.

      TIP: Input the purchase and installation cost per tractor (P): default value is $1,160.
2. Fuel savings:
    - An FPInnovations track test conducted during the Energotest™ 2010 campaign assessed the influence of an advanced cab fairing package for day-cab tractors. The tested device was an OEM Aerodynamic Package composed of a roof air deflector, side air deflectors, and side extenders. The test resulted in 15.6% fuel savings for the vehicle equipped with the aerodynamic package, compared to the bare baseline configuration.

      TIP: Input the certified percentage fuel savings for your device (F) (as recognized by an independent organization, such as the U.S. Environmental Protection Agency's SmartWay℠ program, or FPInnovation's Energotest™): default value is 15.6%.
3. Annual mileage of tractor:
    - You have the choice of kilometres or miles.

      TIP: Input your tractor actual average yearly mileage (K): default value is 200 000 km.

4. Proportion of annual tractor mileage driven at speeds of 80 km/h or more (%):
    - Aerodynamic devices have greater savings potential when used at higher speeds. The proportion of driving at higher speeds has a direct and significant impact on fuel savings, monetary savings, and investment payback period.

      TIP: Input your actual percentage (p): default value is 80%.
5. Tractor annual applicable mileage:
    - Is calculated as a function of percentage of annual mileage driven at speeds of 80 km/h or more (p), and the average annual mileage of the tractor (K),
    - Using the equation: $S = K \times p$.
6. Fuel price:
    - Fuel price fluctuates and has a direct and significant impact on annual savings and payback period.

      TIP: Input the actual fuel price in ¢/L (X): default is 110 ¢/L.
7. Current fuel consumption:
    - This is your fuel consumption prior to installing the tractor aerodynamic package.
    - You have the choice of L/100 km or mpg (US).

      TIP: Input your actual fuel consumption (Y): default value is 34 L/100 km.

Results

➢ Annual fuel savings per tractor:
- Is calculated as a function of: tractor's annual applicable mileage (S), percentage fuel savings (F), and actual fuel consumption (Y),
- Using the equations:
    - For fuel consumption in L/100 km: $A = f \times S \times F \times Y$
    - For fuel consumption in mpg: $A = f \times S \times F / Y$

- Where f is a conversion factor, calculated based on user's input for units of distance and fuel consumption. The below table is provided for information only:

Unit of S	Unit of Y	f	Conversion factor (f) formula
km	L/100 km	1	km x L/100km
km	mpg	235.25	km x L/100km (=(3.786 x 100/(1.61 x mpg))
miles	L/100 km	1.61	km (=1.61 x miles) x L/100km
miles	mpg	378.60	km (=1.61 x miles) x L/100km (=(3.786 x 100/(1.61 x mpg))

- Example for converting a mileage of 100 000 miles in kilometres and a fuel economy of 6 mpg in fuel consumption to L/100 km:
  - Mileage: 100 000 miles = 100 000 x 1.61 km = 161 000 km,
  - 6 mpg = 3.786 x 100/(1.61 x 6) = 39.2 L/100 km,
  - Total conversion factor: 1.61 x 3.786 x 100/1.61 = 378.60.

  TIP: To obtain the total annual fuel savings resulting from the installation of all aerodynamic packages in your fleet, multiply the annual fuel savings per tractor by the number of tractors equipped with aerodynamic packages.

➢ Annual GHG emission reduction per tractor:

- The most prevalent GHGs released by the burning of diesel fuel are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The production of the other two GHGs is extremely low compared with CO_2, so they are usually not considered for estimation purposes.
- The potential of reducing GHG emissions is calculated based on the annual fuel savings per tractor (A) considering that the combustion of diesel fuel produces 2.7 kg CO_2 equivalent per litre, with the equation: G = A x 2.7.

  TIP: To obtain the total annual GHG emission reduction resulting from the installation of all aerodynamic packages in your fleet, multiply the annual GHG emission reduction per tractor by the number of tractors equipped with aerodynamic packages.

➢ Annual savings per tractor:

- Is calculated as a function of: annual fuel savings per tractor (A), and fuel price (X),

- With the equation: B = A x X,

  TIP: To obtain the total annual savings resulting from the installation of all aerodynamic packages in your fleet, multiply the annual savings per tractor by the number of tractors equipped with aerodynamic packages.

➢ Payback period per tractor:

- Is calculated as a function of: purchase and installation cost per tractor (P), and of annual savings per tractor (B);
- Using the equation: C = P / B.

Disclaimer

➢ The purpose of these simplified models is to demonstrate the cost-saving opportunities available for fleet owners through best practices and fuel saving-devices.

➢ The model can be refined further based on the customer's requirements.

➢ The user is responsible for verifying the accuracy of the results.

➢ In no event shall Transport Canada be liable to any direct, consequential, incidental, special, punitive or other damages.

➢ High-speed track tests at Energotest™ showed fuel savings of up to 15.6% for a day-cab tractor equipped with an aerodynamic package: not all aerodynamic packages for day-cab tractors offer similar performances.

References

Council of Energy Ministers. 2009. On the road to a fuel-efficient truck: A guide for purchasing aerodynamics for heavy-duty tractors and trailers. Natural Resources Canada, Ottawa, ON. http://fleetsmart.nrcan.gc.ca/index.cfm?fuseaction=rfet.index (accessed November 2010).

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EPA (United States Environmental Protection Agency). 2010. Interim requirements to determine eligibility of SmartWay tractors. EPA-420-F-09-045. Washington, DC.

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