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**Table 26. Standard Technology Matrix For Cars[1]**

| | Fractional Fuel Efficiency Change | Incremental Cost (1990$) | Incremental Cost ($/Unit Wt.) | Incremental Weight (Lbs.) | Incremental Weight (Lbs./Unit Wt.) | Introduction Year | Fractional Horse-power Change |
|---|---|---|---|---|---|---|---|
| Unit Body Construction | 4 | 100 | 0 | 0 | -6 | 1980 | 0 |
| Material Substitution II | 3.3 | 0 | 0.4 | 0 | -5 | 1990 | 0 |
| Material Substitution III | 6.6 | 0 | 0.6 | 0 | -10 | 1998 | 0 |
| Material Substitution IV | 9.9 | 0 | 0.9 | 0 | -15 | 2006 | 0 |
| Material Substitution V | 13.2 | 0 | 1.2 | 0 | -20 | 2014 | 0 |
| Drag Reduction II | 2.3 | 40 | 0 | 0 | 0 | 1988 | 0 |
| Drag Reduction III | 4.4 | 85 | 0 | 0 | 0.2 | 1992 | 0 |
| Drag Reduction IV | 6.3 | 145 | 0 | 0 | 0.5 | 2000 | 0 |
| Drag Reduction V | 8 | 225 | 0 | 0 | 1 | 2010 | 0 |
| Roll-Over Technology | -1.5 | 100 | 0 | 0 | 2.2 | 2004 | 0 |
| Side Impact Technology | -1.5 | 100 | 0 | 0 | 2.2 | 2004 | 0 |
| Adv Low Loss Torque Converter | 2 | 25 | 0 | 0 | 0 | 1999 | 0 |
| Early Torque Converter Lockup | 0.5 | 8 | 0 | 0 | 0 | 2002 | 0 |
| Aggressive Shift Logic | 2 | 60 | 0 | 0 | 0 | 1999 | 0 |
| 4-Speed Automatic | 4.5 | 285 | 0 | 10 | 0 | 1980 | 0 |
| 5-Speed Automatic | 6.5 | 435 | 0 | 20 | 0 | 1995 | 0 |
| 6-Speed Automatic | 8 | 570 | 0 | 30 | 0 | 2003 | 0 |
| 6-Speed Manual | 2 | 100 | 0 | 20 | 0 | 1995 | 0 |
| CVT | 10.5 | 615 | 0 | -25 | 0 | 1998 | 0 |
| Automated Manual Trans | 8 | 100 | 0 | 0 | 0 | 2004 | 0 |
| Roller Cam | 2 | 16 | 0 | 0 | 0 | 1980 | 0 |
| OHC/AdvOHV-4 Cylinder | 3 | 80 | 0 | 0 | 0 | 1980 | 10 |
| OHC/AdvOHV-6 Cylinder | 3 | 100 | 0 | 0 | 0 | 1987 | 10 |
| OHC/AdvOHV-8 Cylinder | 3 | 120 | 0 | 0 | 0 | 1986 | 10 |
| 4-Valve/4-Cylinder | 8 | 205 | 0 | 10 | 0 | 1988 | 17 |
| 4-Valve/6-Cylinder | 8 | 280 | 0 | 15 | 0 | 1992 | 17 |
| 4 Valve/8-Cylinder | 8 | 320 | 0 | 20 | 0 | 1994 | 17 |
| 5 Valve/6-Cylinder | 8 | 300 | 0 | 18 | 0 | 1998 | 20 |
| VVT-4 Cylinder | 2.5 | 45 | 0 | 10 | 0 | 1994 | 5 |
| VVT-6 Cylinder | 2.5 | 115 | 0 | 20 | 0 | 1993 | 5 |
| VVT-8 Cylinder | 2.5 | 115 | 0 | 20 | 0 | 1993 | 5 |
| VVL-4 Cylinder | 4 | 170 | 0 | 25 | 0 | 1997 | 10 |
| VVL-6 Cylinder | 4 | 260 | 0 | 40 | 0 | 2000 | 10 |
| VVL-8 Cylinder | 4 | 330 | 0 | 50 | 0 | 2000 | 10 |
| Camless Valve Actuation-4cyl | 7.5 | 450 | 0 | 35 | 0 | 2009 | 13 |
| Camless Valve Actuation-6cyl | 7.5 | 600 | 0 | 55 | 0 | 2008 | 13 |
| Camless Valve Actuation-8cyl | 7.5 | 750 | 0 | 75 | 0 | 2007 | 13 |
| Cylinder Deactivation | 4.5 | 250 | 0 | 10 | 0 | 2004 | 0 |
| Turbocharging/ Supercharging | 6 | 650 | 0 | -100 | 0 | 1980 | 15 |
| Engine Friction Reduction I | 2 | 25 | 0 | 0 | 0 | 1992 | 3 |
| Engine Friction Reduction II | 3.5 | 63 | 0 | 0 | 0 | 2000 | 5 |
| Engine Friction Reduction III | 5 | 114 | 0 | 0 | 0 | 2008 | 7 |
| Engine Friction Reduction IV | 6.5 | 177 | 0 | 0 | 0 | 2016 | 9 |
| Stoichiometric GDI/4-Cylinder | 7 | 300 | 0 | 20 | 0 | 2006 | 10 |
| Stoichiometric GDI/6-Cylinder | 7 | 450 | 0 | 30 | 0 | 2006 | 10 |
| Lean Burn GDI | 5 | 250 | 0 | 20 | 0 | 2006 | 0 |
| 5W-30 Engine Oil | 1 | 22.5 | 0 | 0 | 0 | 1998 | 0 |
| 5W-20 Engine Oil | 2 | 37.5 | 0 | 0 | 0 | 2003 | 0 |
| OW-20 Engine Oil | 3.1 | 150 | 0 | 0 | 0 | 2030 | 0 |
| Electric Power Steering | 2 | 140 | 0 | 0 | 0 | 2004 | 0 |
| Improved Alternator | 0.3 | 15 | 0 | 0 | 0 | 2005 | 0 |
| Improved Oil/Water Pump | 0.5 | 10 | 0 | 0 | 0 | 2000 | 0 |
| Electric Oil/Water Pump | 1 | 50 | 0 | 0 | 0 | 2007 | 0 |
| Tires II | 2 | 30 | 0 | -8 | 0 | 1995 | 0 |
| Tires III | 4 | 75 | 0 | -12 | 0 | 2005 | 0 |
| Tires IV | 6 | 135 | 0 | -16 | 0 | 2015 | 0 |
| Front Wheel Drive | 6 | 250 | 0 | 0 | -6 | 1980 | 0 |
| Four Wheel Drive Improvements | 2 | 100 | 0 | 0 | -1 | 2000 | 0 |
| 42V-Launch Assist and Regen | 3 | 600 | 0 | 80 | 0 | 2005 | -5 |
| 42V-Engine Off at Idle | 4.5 | 800 | 0 | 45 | 0 | 2005 | 0 |
| Tier 2 Emissions Technology | -1 | 120 | 0 | 20 | 0 | 2006 | 0 |
| Increased Size/Weight | -1.7 | 0 | 0 | 0 | 2.55 | 2003 | 0 |
| Variable Compression Ratio | 4 | 450 | 0 | 25 | 0 | 2015 | 0 |

[1] Fractional changes refer to the percentage change from the 1990 values.
Sources: Energy and Environment Analysis, *Documentation of Technology included in the NEMS Fuel Economy Model for Passenger Cars and Light Trucks* (September, 2002). National Research Council, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards* (Copyright 2002).