PETRONAS Tutela

PETRONAS

Know Your Product : Tutela Driveline Series

What is Driveline?

The driveline of your vehicle transfers power from the engine and transmission to the wheels. It is the axels, driveshaft, wheels, joints and differentials. These components handle the full force of your vehicle.

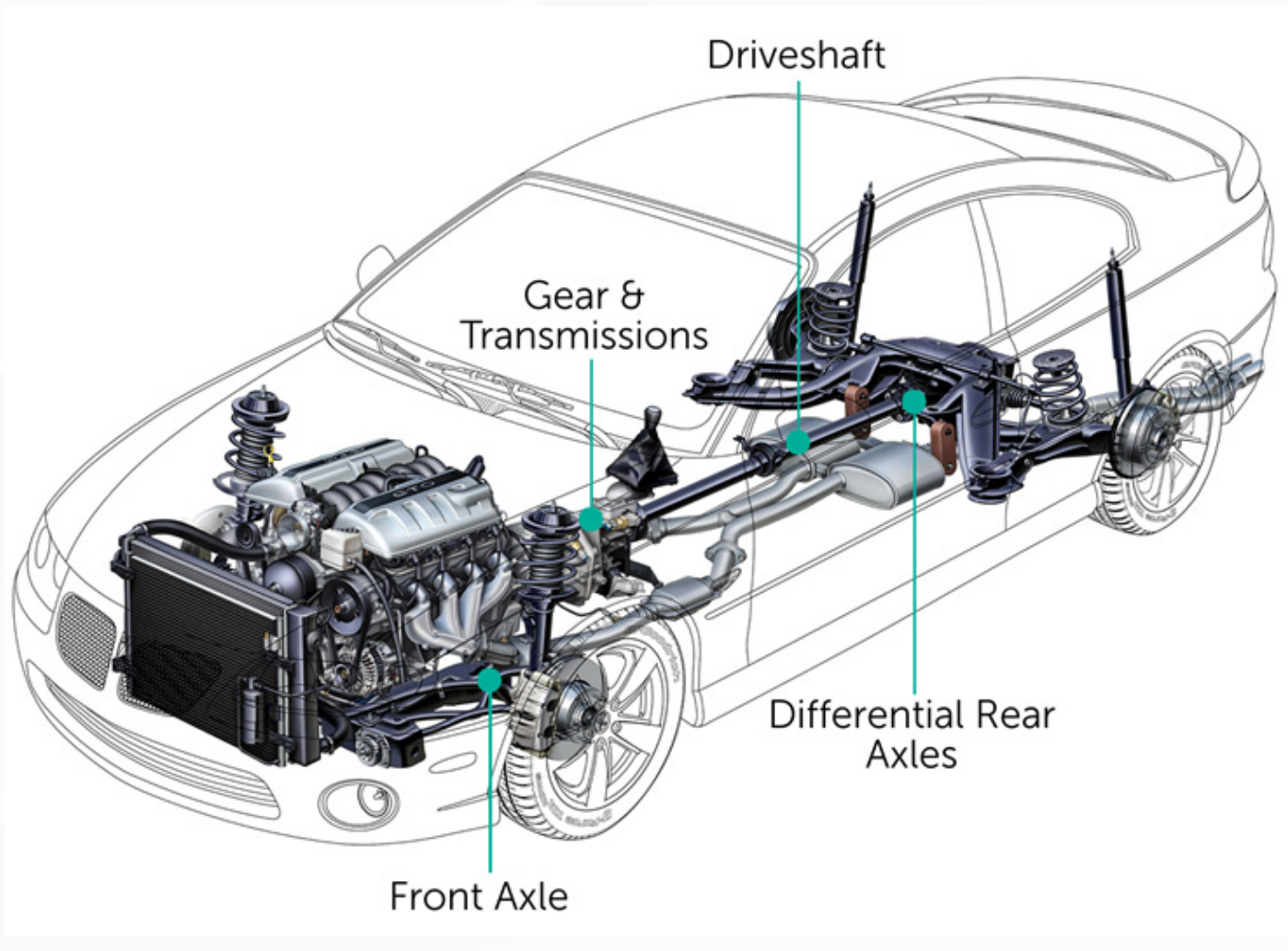

Figure 1 Driveline component in a vehicle
(Source : Lead Academy PLI Training)

The Transmissions System

Diesel engines and petrol engines are quite similar. They are both internal combustion engines designed to convert the chemical energy available in fuel into mechanical energy. This mechanical energy moves pistons up and down inside cylinders. The pistons connected to a crankshaft, and the up-and-down motion of the pistons, known as linear motion, creates the rotary motion needed to turn the wheels of a car forward.

Both diesel engines and petrol engines convert fuel into energy through a series of small explosions or combustions.

Automatic Transmission Technology Evolution

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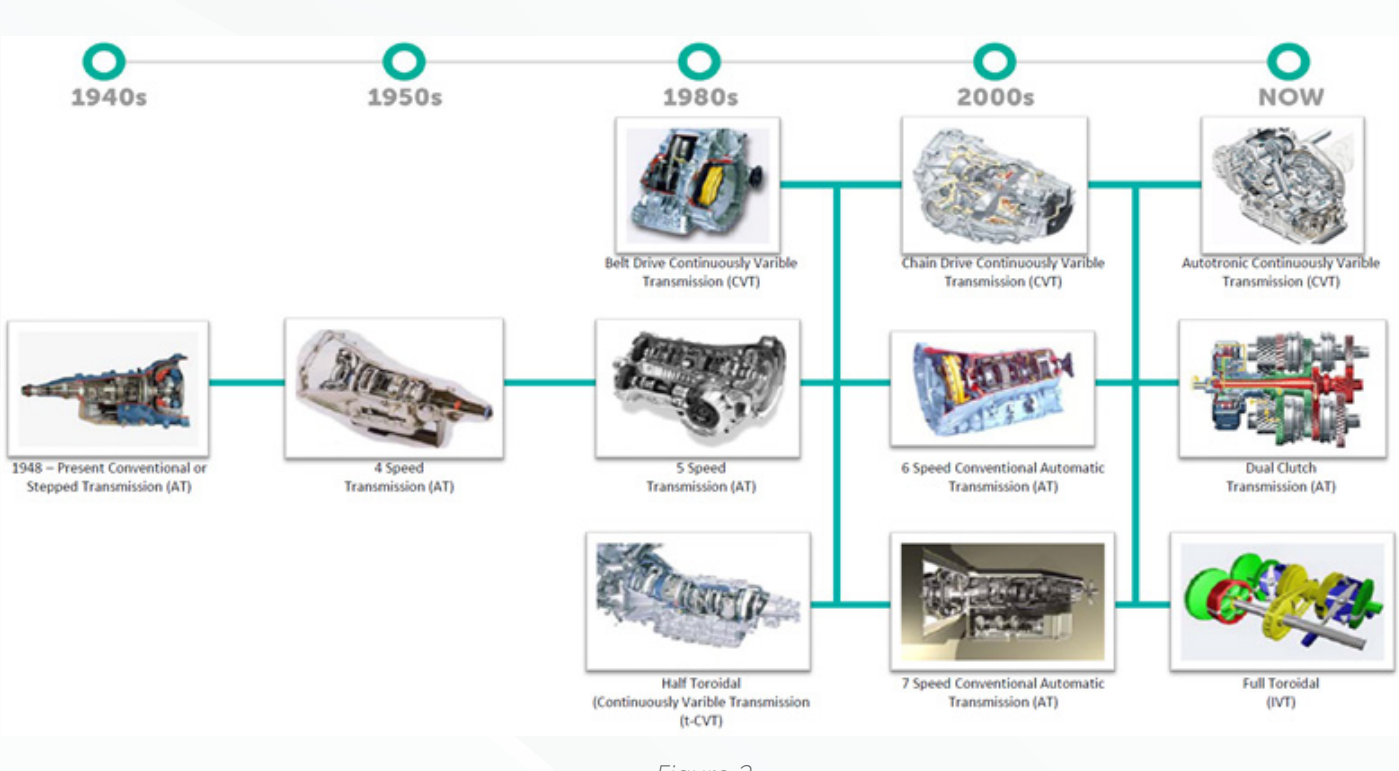
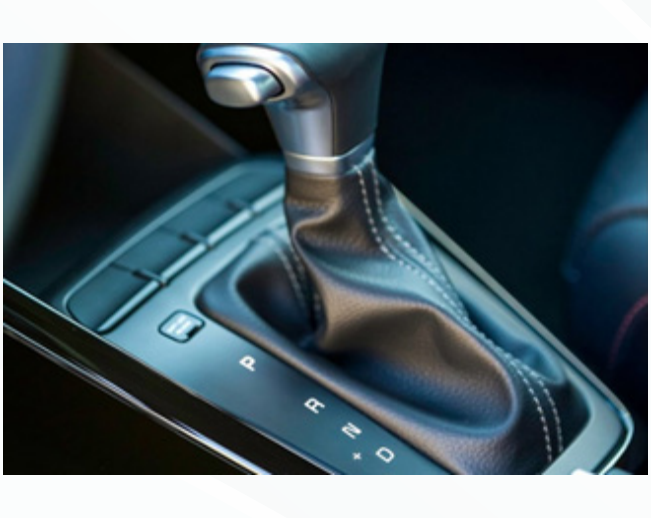


Figure 2
(Source : LEAD ACADEMY TUTELA TRAINING)



Automatic Advantages of an Automatic Transmission

Automatic transmissions offer this sort of convenience of not having to control the gear changes manually. Vehicles with conventional automatic transmissions are known to be cheap when it comes to maintenance, which roughly translates to having the least maintenance cost among the three transmission types.

Automatic — Which Gets Better Fuel Economy? — Manual

Automatics could use up to 10% more fuel than their manual equivalent. With modern developments in automatic transmissions; electronic and hydraulic systems take up clutch operation and gear change and achieve an end fuel consumption that can often be as economical as a purely manual version

Advances in automatic transmissions have improved their efficiency to the point that the automatic version of a vehicle often gets the same or better fuel economy than the version with a manual transmission.

Transmission

Fundamental of automatic transmission changes gear automatically and does not need a gear stick or clutch operation by the driver.

The engine connects to a Torque Converter which is then connected to a gear system and then to the transmission. The gear system is called a Planetary Gear system which consists of a gear in the middle called Sun Gear and three gears around it called planetary gears which are covered by the ring gear. These parts, in combination, make an automatic transmission.

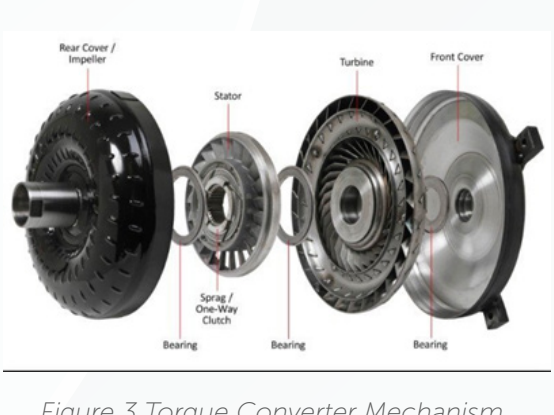


Figure 3 Torque Converter Mechanism
(Source : https://gomechanic.in/blog/dct-cvt-amt-automatic-car-transmission)

The outer side of a Torque Converter has the flywheel which connected to the engine that rotates the entire structure. The rotation makes the pump push out fluid at high speed. This fluid causes the turbine to rotate. The fluid kept on turning in a counterclockwise direction separated in two sections and kept spinning with the help of a stator in the middle. The turbine that connected to the shaft which connects to the rest of the system.

The pump and turbine have set of vanes in them to direct the fluid movement. In the pump, fluid flow between the vanes is then ejected at speed the engine rotating. In the turbine, fluid goes into the hole pushes the turbine at a rate which fluid fed. The turbine rotates in the opposite direction, thus absorbing the torque that the liquid carries. After the fluid left with almost no energy of its own, it goes to stator which pushes it towards the pump. The power then transferred to the gear system.

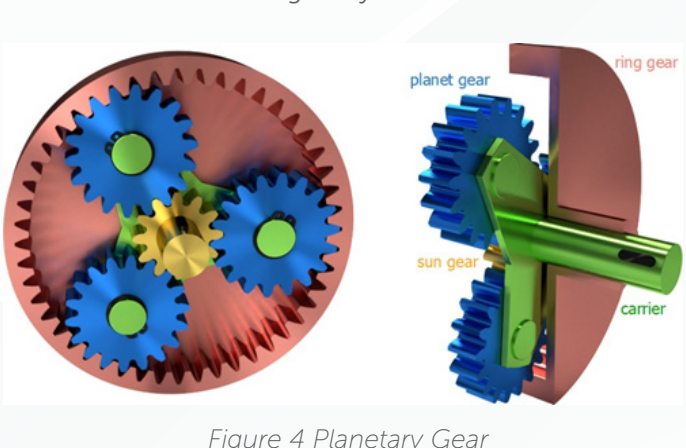


Figure 4 Planetary Gear
(Source : https://www.tec-science.com/mechanical-power-transmission/planetary-gear/epicyclic-planetary-gear)

The planetary gear train is a mechanical system in which the gears connected with a set of bands and clutches. When the driver changes gears, the bands hold one gear still while rotating another to transmit torque from the engine and increase or decrease gears.

The different gears are sometimes called the sun gear, the ring gear, and the planetary gear. The arrangement of the gears determines how much power will flow from one gear to another and out to the drive train of the vehicle when you shift.

Automated Manual Transmission (AMT)

In automated manual transmissions, electromechanical or hydraulic actuators take over the clutch and shift actions. In either case, individual driving pleasure not diminished because drivers can decide whether they want to use the automatic mode or shift manually using switches or levers. With their optimised shift strategies, automated manual transmissions reduce torque interruption to a minimum. Sensors register and convey all the relevant information to the control system.

By using this data, the system calculates the shift points and controls the shift and clutch processes automatically. The technology even intervenes in driving operations to improve safety – such as automatically interrupting the torque flow briefly to counter the risk of skidding. The automation components can also use in start-stop as well as hybrid applications (2)

DCT (Dual Clutch Transmission)

The dual-clutch system consists of two separate clutches, which allow two gears engaged at the same time. One of the gears is transferring torque, while the next is already pre-selected. The entire shift process takes only a few hundredths of a second, without torque interruption and with minimal loss of power.

A specially developed electronic control unit regulates the dual-clutch system and the transmission actuation. It monitors all relevant parameters such as speed, rpm, and transmission ratios and adjusts shifting depending on the driving situation. Dual-clutch systems combine the comfort of an automatic transmission with the sporty handling of a manual transmission. The result is faster, smoother acceleration and superb shifting dynamics.

A dual-clutch system can be used in all passenger cars, especially high-performance vehicles.

Figure 5 -ZF AMT Gearbox

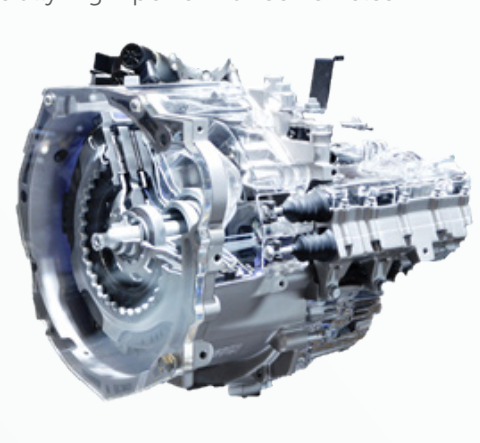


Figure 6 - Hyundai 7 speed dual-clutch transmission
(Source : https://commons.wikimedia.org/wiki/File:Hyundai_7_speed_dual_-clutch_transmission_Spielvogel.jpg)

Continuously Variable Transmission (CVT) System.

Continuously Variable Transmission or CVT gearbox is another popular type of gearbox. It is smoother than the traditional automatic gearbox, although some users find it slow on shifting. A CVT is similar to an automatic in that it doesn't use any input from the driver. A CVT doesn't have any gears. Instead, it has two pulleys. One pulley connects to the engine, and the other connects to the wheels.

Figure 7 Nissan XTRONIC CVT
(Source : https://asia.nissannews.com/en/releases/release-8a0d2f3353d7723c4c3fcf8e1502857b-xtronic-cvt-the-highlight-for-all-new-crossover)

A flexible belt connects the two pulleys The width of the pulleys changes depending on how much power the vehicle needs. When one pulley gets larger, the other one gets smaller. Since neither the pulleys nor the belt is fixed, they can provide an infinite number of gear ratios, unlike the automatic, with a set number of gears.

Technology has progressed so that today the CVT gearbox is a better option than it used to be, both in driving enjoyment and efficiency. Nissan has developed a CVT gearbox called Xtronic, which features 'steps' in its power delivery to make it feel more like a conventional gearbox by 'shifting' through the gears

Hidden Heroes: Automotive Transmission Fluid

Automatic transmissions generate even more intense heat than manual ones, so lubricant fluids often degenerate more quickly. Low levels of liquid or fluid with deposits within the transmission system can cause slipping and shifting issues – and overheating can lead to malfunction and a decrease in parts' overall life.

A primary role is transfer torque from the input impeller of the torque converter via the stator to the turbine, which is connected to the gears. The fluid then has to lubricate and cool the friction surfaces, lubricate the gears and bearings, act as a hydraulic fluid, prevent the formation of deposits, and inhibit corrosion.

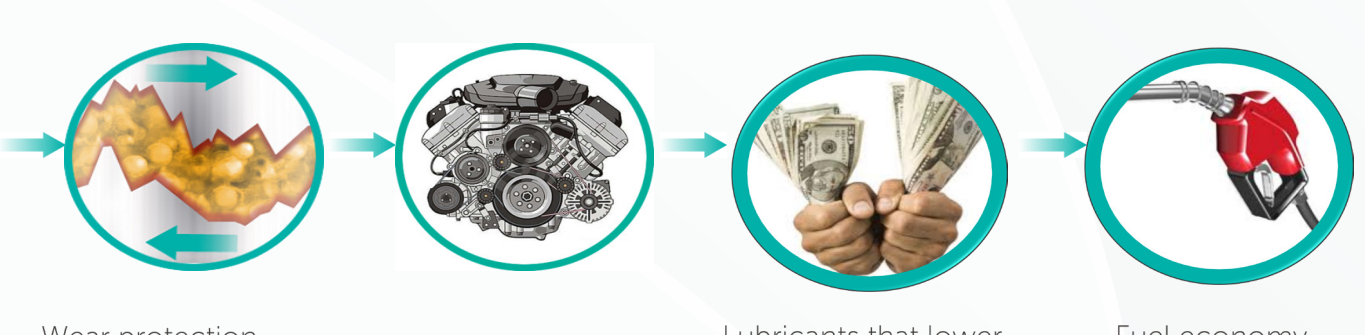


Figure 8 - Key Driver of ATF Technology – Lead Academy PLI Training

ATF Performance Requirement

High-quality transmission fluid must have high levels of oxidation stability to withstand high operating temperatures. It is also has a degree of fluidity that ensures easy operation in cold weather, stable viscosity properties, closely controlled frictional behaviour to ensure quiet, consistent, and chatter-free take-up of power in the internal brakes and clutches. It must preserve all these properties throughout its service life to maintain consistent lubrication performance and gear-change characteristics.

ATF Specification Timeline

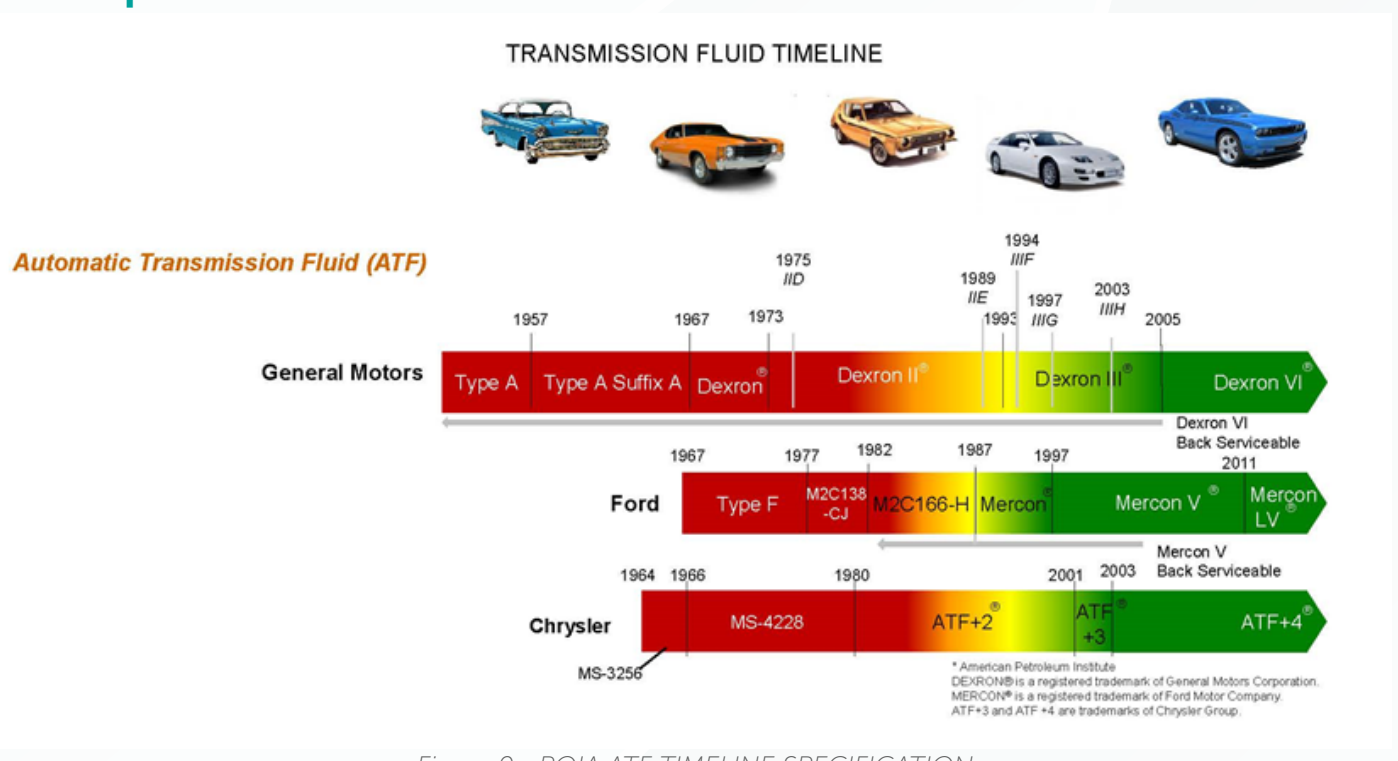


Figure 9 - PQIA ATF TIMELINE SPECIFICATION
(Source : https://pqia.org/updated-timelines)

North America ATF Specification

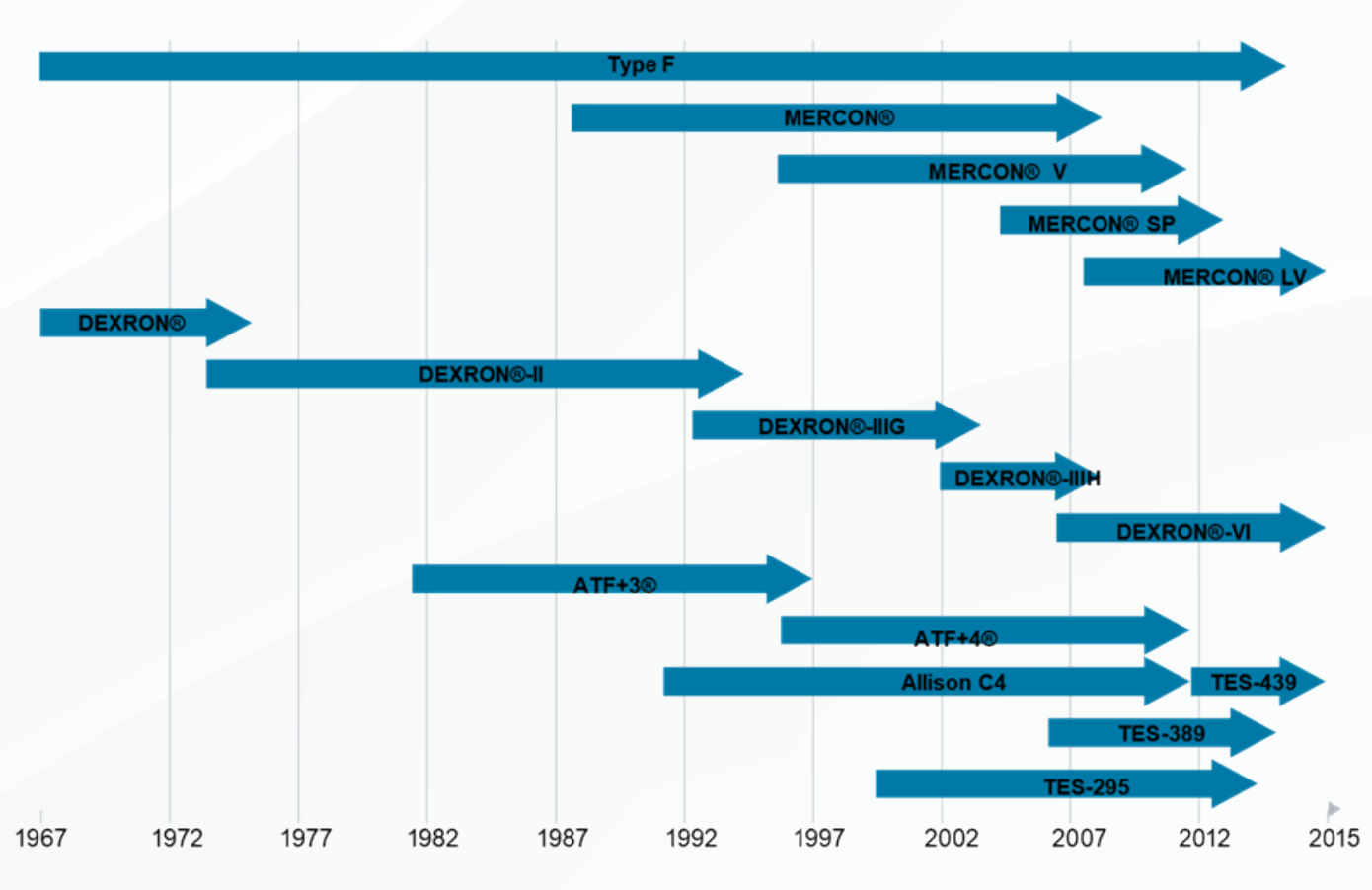


Figure 10 – Infineuml 05-power-transmission-fluids-southern-asia-2019

Ford

1 FORD TYPE F
An old ATF first introduced in 1967 and used in all Ford products before 1977, and in some until 1980, also used in various import vehicles of the period, including Mercury Capri, Jaguar, Mazda, Saab, Toyota, and Volvo. Type F is not compatible with any other ATF. Specifically, it is not compatible with Mercon ATFs.

Mercon

2 MERCON V
the most common Ford ATF in late-model Fords, is very much like Dexron III. Should not be used in a transmission requiring Ford Type F

2 MERCON LV
the latest Ford ATF, it is factory fill in 2008 and later Fords. The LV stands for "low viscosity." It is a fully synthetic ATF. It is not compatible with earlier Mercon fluids, so it should neither be mixed with Mercon, or Mercon V used to replace those fluids. It is not compatible with any other liquid, either.

Dexron

3 DEXRON, DEXRON II, IID, AND DEXRON IIE
These are the original GM Dexron ATFs and are no longer licensed by the company, having been superseded by Dexron III, which has now itself been superseded by Dexron VI. The difference between Dexron, II, and IIE was mostly in the oxidation inhibitors.

3 DEXRON III AND IIIH
The OE ATF at GM for many years and widely adopted by other manufacturers. General Motors now considers all of them to be obsolete and discontinued licensing Dexron IIIH in 2006. Dexron IV was an upgraded version of Dexron III, which was used by GM only briefly.

3 DEXRON VI
the newest GM ATF, it was developed specifically for the new six-speed automatic and is a synthetic blend (meaning it has some conventional base stocks). That transmission has tighter internal tolerances and required a fluid that had higher shear strength that Dexron III.

Chrysler

4 CHRYSLER ATF+2
Also called 7176 D—first used in 1997, added oxidation protection and better cold-weather flow than 7176

4 CHRYSLER ATF+3
Also called 7176E—designed for four-speed automatics, uses better quality base oils to obtain higher strength than ATF+2. Should always be used in 1999 and earlier Chrysler manufactured minivans, rather than later versions of Chrysler ATFs.

4 CHRYSLER ATF+4
Also called ATE—a synthetic ATF introduced in 1998, it should always be used in any vehicle in which ATF+4 is specified. It can be used in Chrysler vehicles manufactured in prior years, except for minivans from before 2000, which use the 41TE/AE transmission. It is not compatible with Dexron or Mercon fluids.

Allison

5 ALLISON C-4 TORQUE FLUID
A commercial designation by Allison Division of GM for the heavy and medium-duty automatic transmission fluids. Based on Allison specification TES-389 in 1991; Allison Transmission implemented one of the first approval systems for particular brands. Allison Division no longer supports this specification. General Motors Dexron III or Ford Mercon fluids sold today to qualify to the specification requirements.

Japanese ATF Specification

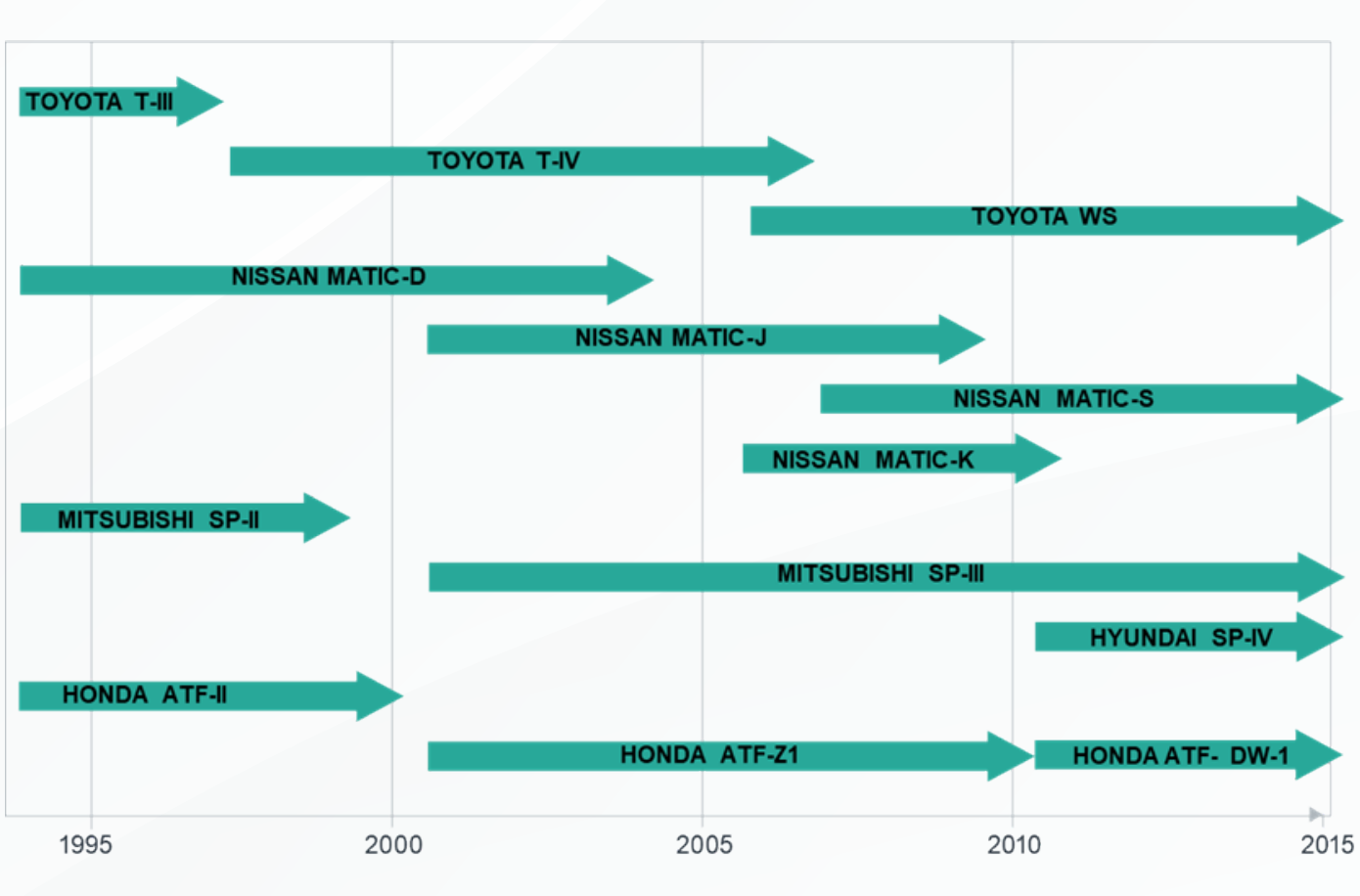


Figure 11 – Infinieum 05-power-transmission-fluids-southern-asia-2019

Honda

Honda specifies honda ATF-Z1
For their automatic transmissions, other than CVT models.

Honda ATF-DW1
For newer Honda vehicle 2005 or later, supersede Honda ATF-Z1

Honda Continuously Variable Transmission Fluid
Honda ATF for CVT vehicles. Introduced in 1996, Honda discontinued it for a time and instead recommended ATF-Z1. Later, Honda returned to this fluid for CVT applications.

Toyota

Toyota Types T, T-II and T-III
The specifications for the Toyota ATFs, which have now been superseded by Type T-IV.

Toyota Type T-IV
Toyota fluid specified for Toyota and Lexus vehicles and sold only at Toyota or Lexus dealers or online.

Toyota WS
This is the newest Toyota fluid, and it is also a lower viscosity fluid than Type T-IV. The "WS" stands for "world standard." It is also used in Lexus vehicles.

Nissan

Nissan Matic D
is a Nissan fluid, which is Dexron III.

Nissan Matic J
factory specified for specific Nissan models.

Nissan Matic K
is a factory specified for specific Nissan models

Nissan Matic-S
Use in most automatic transmissions. Matic-S is the replacement for Matic-J.

Mitsubishi

Mitsubishi Diamond SP-II and SP-III
The automatic specifications for the Mitsubishi fluid

Hyundai

Hyundai ATF SP-IV
A synthetic Automatic Transmission Oil which can be used for a six-speed-transmission in Hyundai and KIA-vehicles.

Tutela ATF Product Range

PETRONAS Tutela Automatic Transmission Fluids provide enhanced thermal and oxidation resistance to retain a stable viscosity at a wide range of temperatures. The benefit provided helps optimise transmission efficiency for a range of vehicle types – leading to improved fuel economy. It also extends the fluid's life by preventing the formation of deposits, delivering a smooth, shudder-free drive, and lengthened Oil Drain Intervals for reduced servicing requirements.

Product Performance Level

	VALUE	PREMIUM		PRESTIGE	
	100 PROTECTION	300 PROTECTION	500 IMPROVED PROTECTION	700 EXCELLENT PROTECTION & LONGER OIL LIFE	900 MAX PROTECTION & MAX OIL LIFE
ATF	ATF D2 ATF TASA	ATF D3	ATF 500 HD Multi ATF 500	ATF 700 HD Multi ATF 700	ATF 900 HD

PERFORMANCE →

Business Benefits

- Enhanced vehicle availability and reduced operating costs
- Improved Drain Interval
- Extended component life through excellent anti-wear, gear and bearing protection
- Outstanding performance in even the toughest conditions – exceptional thermal and oxidation resistance delivers stable viscosity and prevents the formation of deposits and sludge to prolong oil life and decrease service costs
- Protection of all moving parts – higher shear stability for constant film strength and adequate lubrication

Driver benefits

- Improved driving experience
- Smooth start-up and gear shifting even in cold conditions due to exceptional low-temperature viscosity that provides improved lubrication
- Significantly reduced transmission noise
- Outstanding anti-shudder performance and enhanced driving comfort through superior friction durability