Section 6

# AUTOMATIC TRANSMISSION FLUID

- **Transmits engine torque**
- **Controls hydraulic system**
- **Applies clutches and brakes**
- **Lubricates moving parts**
- **Removes heat from internal parts**
- **Cleans**

**Lesson Objectives:**

1. Describe the purpose for the following oil additives:

   a. Viscosity index improver
   b. Oxidation inhibitors
   c. Anti-foaming agent
   d. Corrosion inhibitors
2. List the three types of ATF and their application in Toyota automatic transmissions.
3. Identify automatic transmission fluid conditions and their cause.

The automatic transmission hydraulic system requires special fluid for the transmission to operate properly and provide a long service life. A filter is used to clean the fluid and prevent wear and damage from occurring to the components of the transmission. An oil to water cooler is also provided in the radiator of the cooling system in order to remove excessive heat from the fluid. In addition, since the engine cooling system reaches operating temperature quicker than the transmission, the cooler helps to warm-up the transmission fluid.

## Function of ATF

Automatic transmission fluid is a high-grade petroleum product containing several kinds of special chemical additives and is abbreviated as ATF. This fluid plays various important functions in the automatic transmission. It is pressurized by the transmission oil pump and fed to the torque converter and transmits the torque generated by the engine to the transmission. The pressurized ATF flows through the passages and valves to operate the clutches and brakes that control the planetary gears and other moving parts. In addition it cools, cleans and lubricates all moving parts.

## ATF Additives

In order to perform all these functions for thousands of miles and deliver satisfactory performance, a number of additives are used to deal with the environment of close tolerances, high heat and rotating components.

### Viscosity

ATF is subjected to a wide range of temperatures from -77°F to 338°F. When temperatures are low, viscosity increases and ATF does not flow well. As a result, shift timing may be delayed, slippage at bands and multiple disc holding devices may occur. On the other hand, if the temperature is too hot, the fluid thins out and the lubrication film may break down, causing metal to metal contact and wear. Therefore viscosity is one of the most important factors affecting ATF's ability to operate the torque converter, valve body components and the holding devices. ATF includes a viscosity index improving agent to maintain viscosity at high temperatures and pour point depressants to improve low temperature flowability.

### Thermal and Oxidation Stability

ATF temperatures reach around 212°F at normal speeds and up to about 300°F under severe operating conditions. The surface temperature of clutch disc may heat up to 660°F or more. Therefore ATF must have good thermal resistance. If it does not, deterioration due to heat causes a chemical reaction to occur, leading to greater oxidation of its oil molecules which causes formation of varnish, sludge and acids which leads to internal damage. Oxidation inhibitors are used to combat heat related fluid breakdown.

**Defoaming Characteristics**

ATF is violently churned and sheared between the impeller and turbine in the torque converter. During periods of high vortex, the shearing of ATF creates a tremendous amount of heat. The churning and shearing of fluid causes it to foam as air is mixed with the fluid. Foam reduces pressure and promotes slippage, wear and oxidation of the fluid. An anti-foaming agent is added to ATF to prevent air bubbles and reduce the lifespan of bubbles that do form.

**Corrosion Inhibitors**

Water and oxygen cause rust formation or etching of metal components. Corrosion inhibitors are added to coat and adhere to metal components and prevent moisture from accumulating and causing damage.

## ATF Types

Three types of fluid have been used in Toyota automatic transmissions. Type T is the latest type to be used and is found in All-Trac transaxles (A241H and A540H). Type F was used in early Toyota automatics up until August 1982. All front engine front drive transaxles used Dexron II. In July 1983 all Toyota transmissions, front wheel drive and rear wheel drive used Dexron II.

***ATF Used by Toyota***

- **Type ”T”**
  **All-Trac Transaxles A241H & A540H**
- **Dexron II**
  **All Toyota Automatic Transmissions since 1984 (except All-Trac)**
  **Prior to 1984 — A55 (1983), A41, & A140**
- **Type ”F”**
  **All Toyota Automatic Transmissions prior to 1984**

## Fluid Condition

While checking the fluid level, the condition of the fluid should be evaluated. The condition of the fluid can tell you about what can be expected inside the transmission and may confirm the test drive symptoms.

If the fluid is dark reddish brown or brown-black and smells burnt, this may indicate that the fluid has not been changed at proper intervals. Removing the pan may reveal large amounts of sediment, indicating a failed multiplate clutch or brake. Flakes in the fluid indicate a massive internal failure.

If the fluid is milky colored, coolant is mixed with the ATF. In advanced stages, the engine may overheat and you will find oil in the coolant system. In some cases, water may enter the transmission case through the breather cap or dip stick tube due to flooding or driving in adverse weather conditions with a filler tube that has not been capped with the dip stick.

Aerated fluid can be caused by low fluid level or high fluid level as discussed earlier. Small bubbles will cover the dip stick as an indication of this condition. In advanced stages, it will cause oxidation and varnish buildup. Air is whipped into the fluid and heat will cause the fluid to oxidize. Varnish build-up will cause the valves in the valve body to stick.

As a rule of thumb, transmission fluid should last 100,000 miles if the operating temperature remains no higher than 175°F. For every 20 degrees of temperature increase, the projected service life of the fluid is cut in half. For example, if operating temperature is allowed to remain at 195°F, the service life of the fluid would be 50,000 miles.

## Notes