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Development of a New CVT featuring High Efficiency and Wide Ratio Coverage

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The Jatco CVT-X (CVT-X) has been newly developed to meet global environmental requirements and features high efficiency, wide ratio coverage and excellent compatibility with downsized turbocharged engines.

Figure 1 shows a cross-sectional view of the CVT-X and the major technologies it incorporates. This paper describes the technologies having a large effect on improving fuel economy. The CVT-X adopts a standard 4-axis structure without an auxiliary transmission from the standpoints of transmission efficiency and suppression of overall length for ensuring vehicle mountability. The new unit adopts a short-pitch chain and thinner pulley shafts in order to minimize the center distance between the shafts as well as the pulley outer diameter, thereby achieving ratio coverage of 8.2

In addition, the combined adoption of an electric oil pump (ELOP) enabled the mechanical oil pump (MOP) to be downsized for reducing its mechanical energy loss by 5.4%. The downsized MOP alone is used when following the flow of traffic in city driving; the ELOP is activated at times of sudden acceleration or deceleration and the use of conventional stop-start as well as stop-start coasting with the engine turned off in low-speed driving.

Moreover, a dedicated oil passage was provided for the torque converter lockup (LU) clutch, enabling the volume of the hydraulic pressure chamber to be reduced. This improves controllability of the rotational speed difference between the engine and the turbine when the LU clutch is engaged. In addition, a multiplate LU clutch was adopted to suppress the temperature rise at the sliding surface of the facing friction material. As a result, the rotational speed difference control that was previously applied only during acceleration at a small accelerator pedal angle can now be used in all speed ranges for a 1.3% improvement in fuel economy.

Along with various measures for reducing friction, a resin baffle plate with a rubber seal was adopted that suppresses oil inflow to the differential gear chamber, which reduces churning resistance for a 5.1% reduction of mechanical energy loss.

The adoption of these measures for improving fuel economy enables the CVT-X to contribute to an 8% improvement in vehicle fuel economy under the U.S. combined city/highway driving mode.

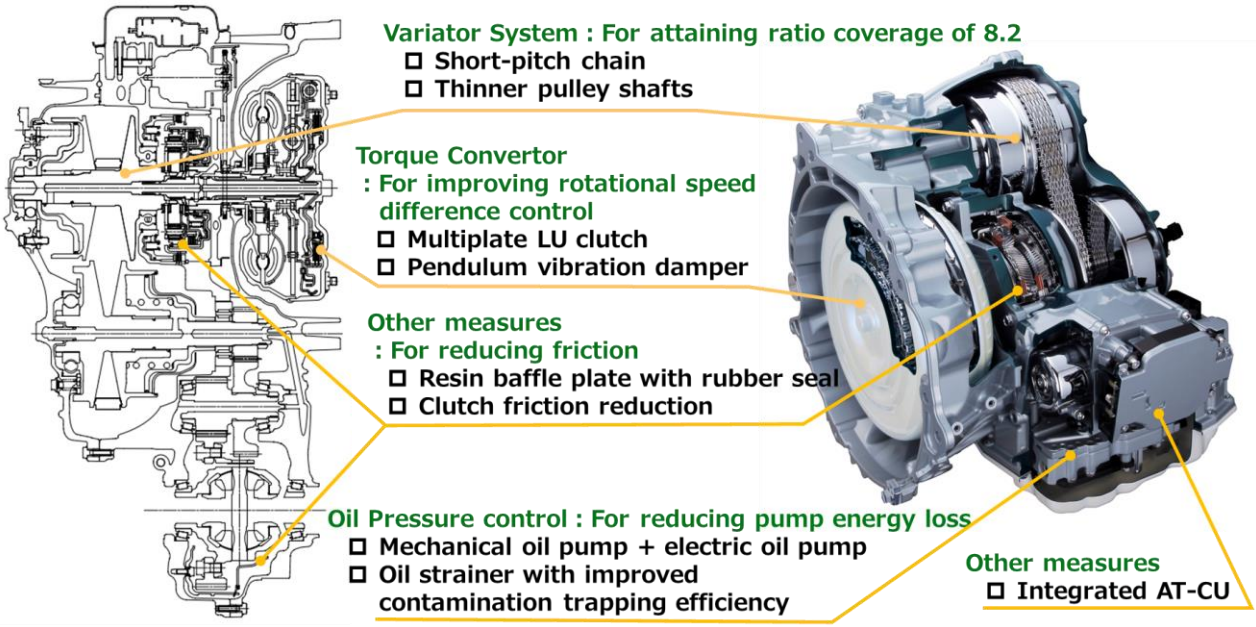

Fig. 1 Cross-sectional view and major technologies