

# Dual Discharge Vane Pump for 1-Motor Hybrid



Various types of hybrid electric vehicles (HEV) have become common, one of which is the 1-motor HEV (1M-HEV) in which the AT torque converter is replaced by a motor. Since 2019, JTEKT has been mass-producing pumps optimized for 1M-HEV based on its vane pump for hydraulic power steering that it has been producing for many years.

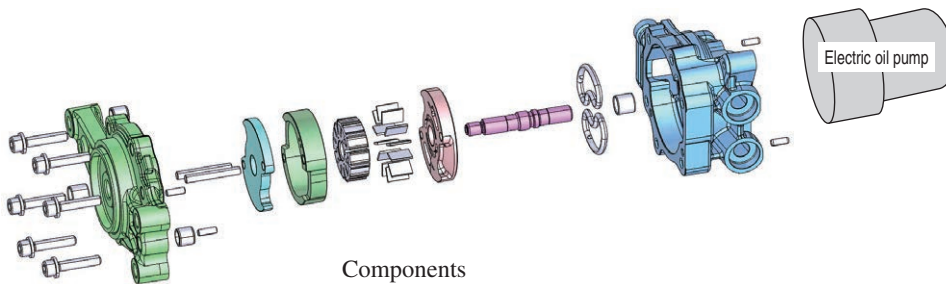
This paper introduces our more efficient vane pump developed by splitting discharge paths into dual circuits and modifying design specifications.

## Development Objectives

- ① Improved fuel efficiency through reduced pump driving torque
- ② Improved hydraulic response at startup that matches the HEV unit motor characteristics
- ③ Improved case rigidity to enable rear mounting of the electric oil pump

Pump specifications

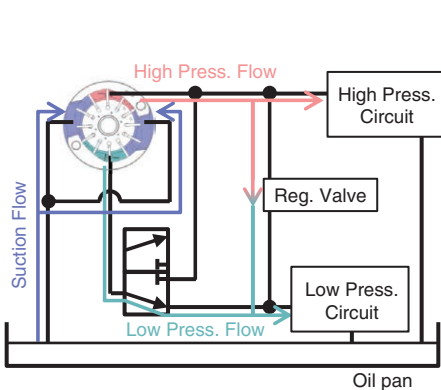
Theoretical displacement	12.6 cm <sup>3</sup> /rev.
Rotational speed	~ 7 900 min <sup>-1</sup>
Load pressure	~ 3.5 MPa



Components

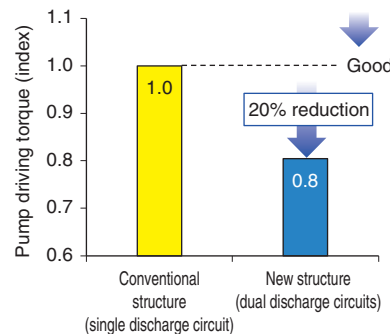
## Features

- ① By splitting the discharge paths into dual circuits, oil can be directly supplied to both the high-pressure circuit (used for clutch crimping, etc.) and the low-pressure circuit used for lubrication, enabling decreases in energy loss and reduced driving torque.
- ② Part design specifications have been optimized by simulating the behavior of pump internal components during start-up, enabling improvements to hydraulic response.
- ③ The case shape has been optimized using FEM vibration stress analysis (front/rear, top/bottom, and left/right direction of vehicle mounting), ensuring both weight reductions and the required strength are achieved.

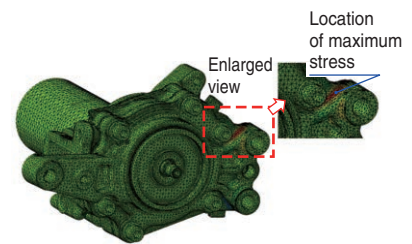


Hydraulic circuit

Lubricant temperature: 80°C, Rotational speed: 1 800 min<sup>-1</sup>, Discharge pressure: 0.5 MPa (high pressure), 0.3 MPa (low pressure)



Pump driving torque



Vibration stress analysis

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