

A new design method for the transition region of the valve-plate for an axial piston pump

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Background



Advantages

1. High Pressure
2. Fast Speed
3. High Power to Weight Ratio

widely
used in

1. Construction Machinery
2. Agricultural Machinery
3. Mining Machinery
4. Plastic Processing Machinery

Increasingly strict Requirements
on Work Environment

Reducing the Noise
of Axial Piston Pump

Analysis of Noise Sources

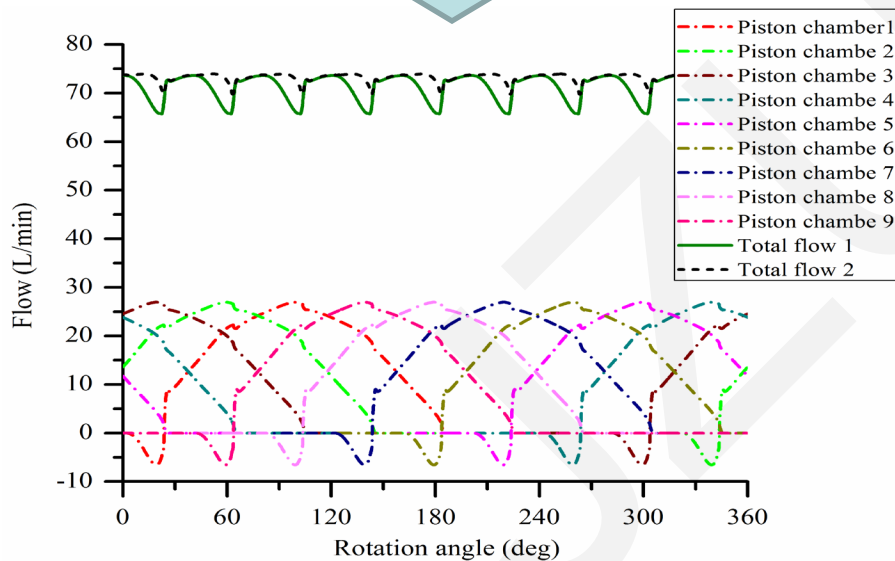
Noise in Axial Piston Pump

Fluid Borne Noise

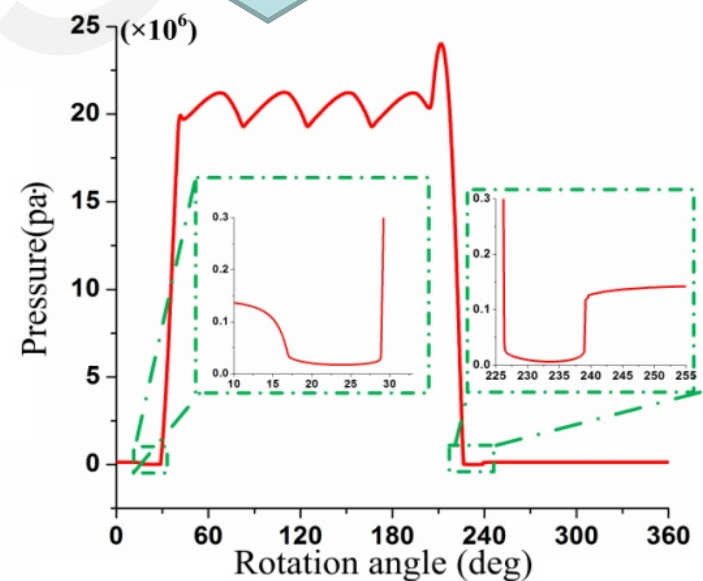
Structure Borne Noise

Reason

Reason



Flow ripple in the Pump Outlet

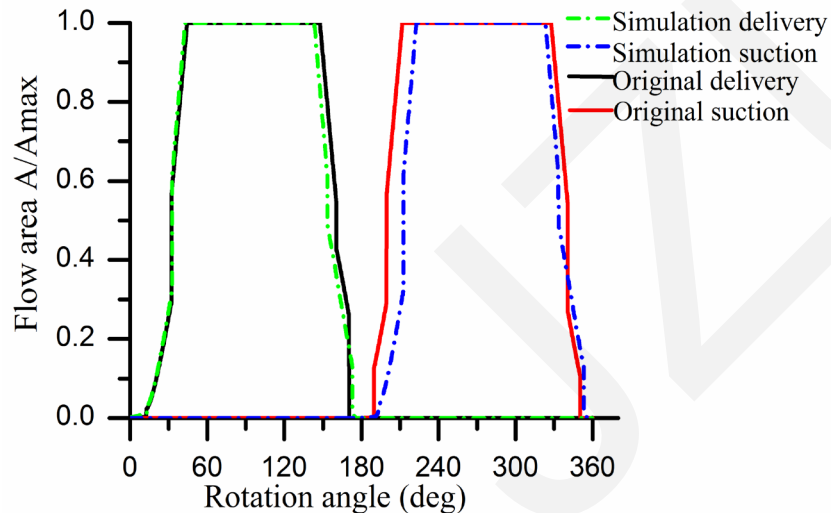


Pressure variation in piston chamber

New Design Method

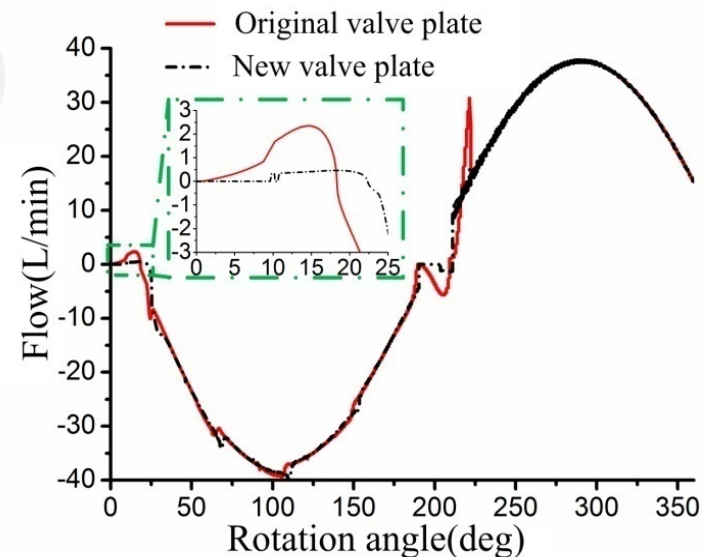
Approaches

1. matching accurately the flow area between the piston chamber and kidney groove needed by compression and decompression.



Variation of flow area between piston chamber and the kidney groove

2. reducing the peak value of transient reverse flow by making it evenly distribute.

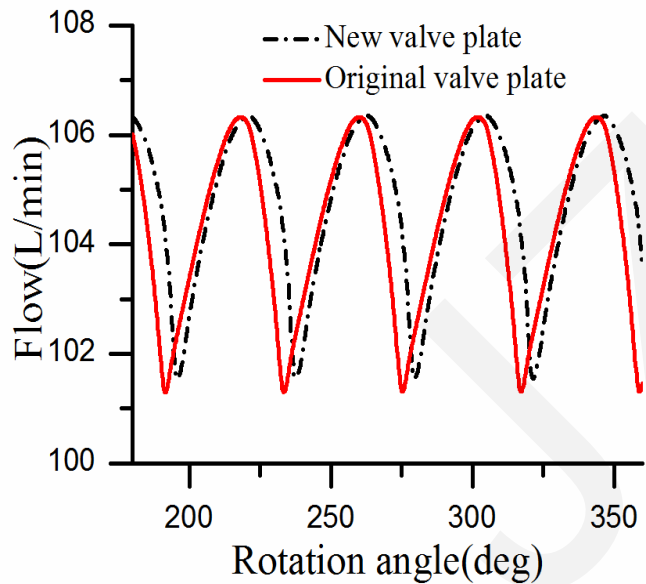


Comparison of transient reverse flow

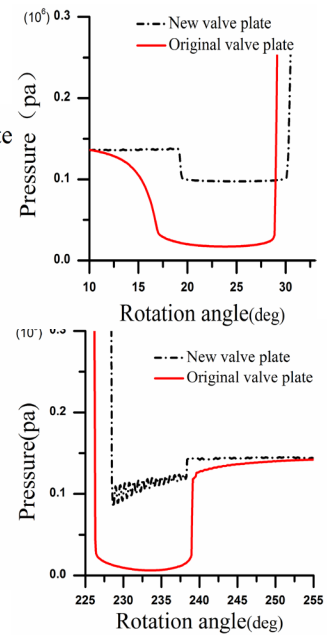
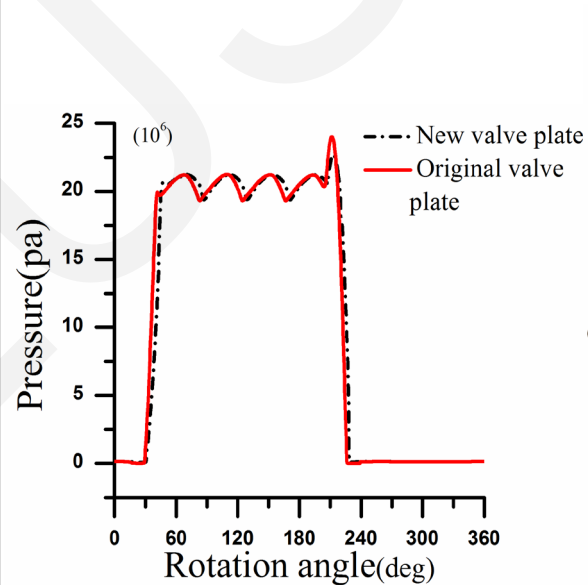
Result of Simulation

The Result of Simulation with different valve plates

Flow Ripple in the Pump Outlet



Piston Chamber Pressure



Conclusions

- Applying the valve plate designed with this new method can reduce the flow pulsations in the discharge line and basically eliminate the pressure overshoot and undershoot in the piston chamber. Thus the noise of the axial piston pump is effectively lowered.