Journal of Zhejiang University-SCIENCE A
(Applied Physics & Engineering)

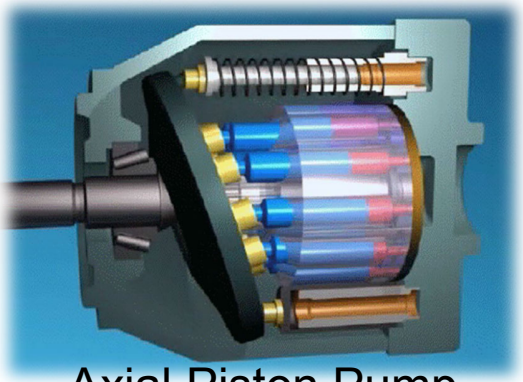
A new design method for the transition region of the valve-plate for an axial piston pump

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Background



Axial Piston Pump

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

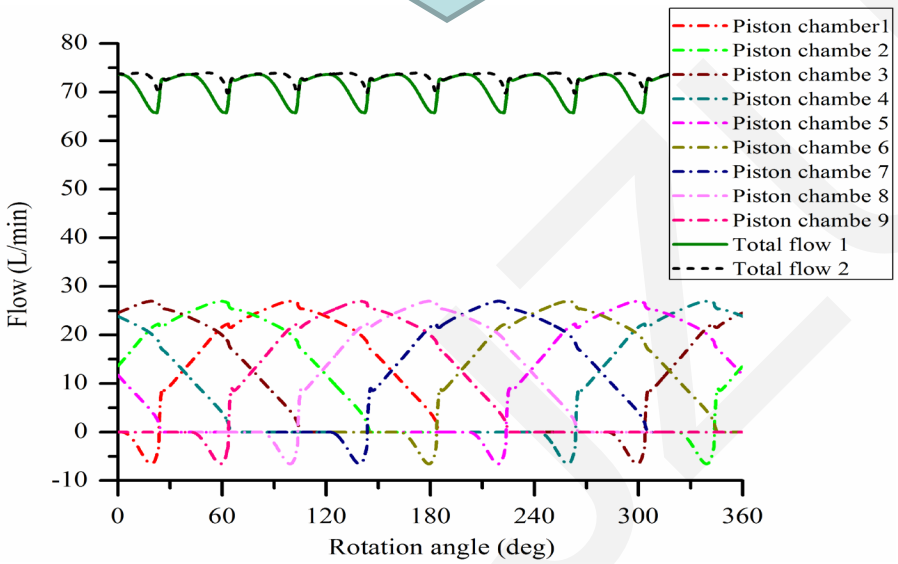
Increasingly strict Requirements on Work Environment

Reducing the Noise of Axial Piston Pump

Analysis of Noise Sources

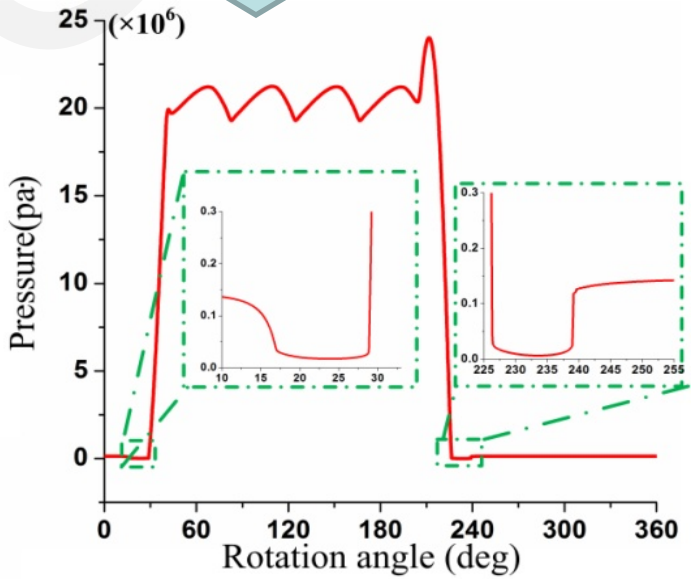
Noise in Axial Piston Pump

Fluid Borne Noise → **Reason**



Flow ripple in the Pump Outlet

Structure Borne Noise → **Reason**

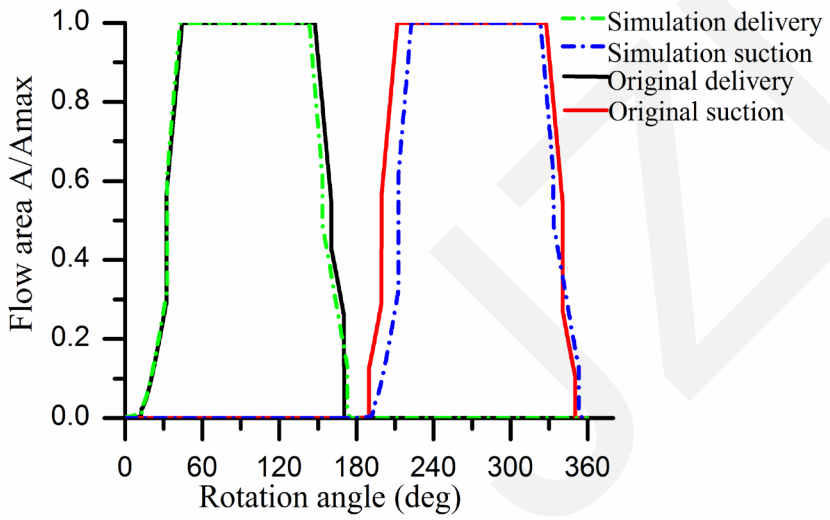


Pressure variation in piston chamber

New Design Method

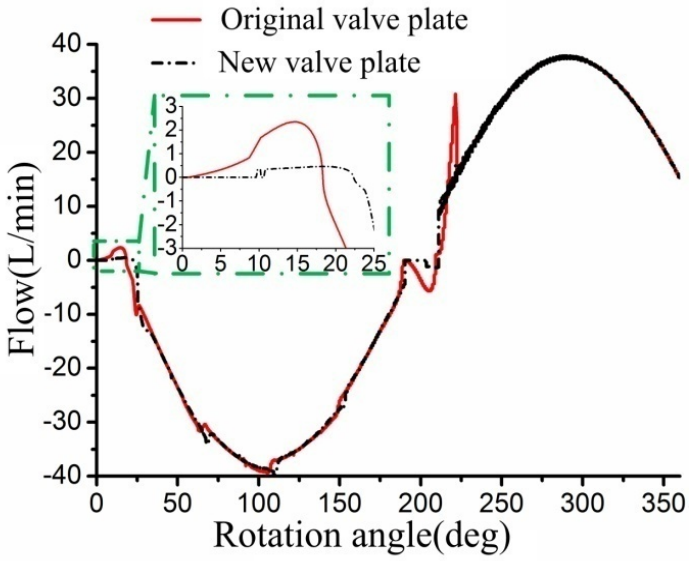
Approaches

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.

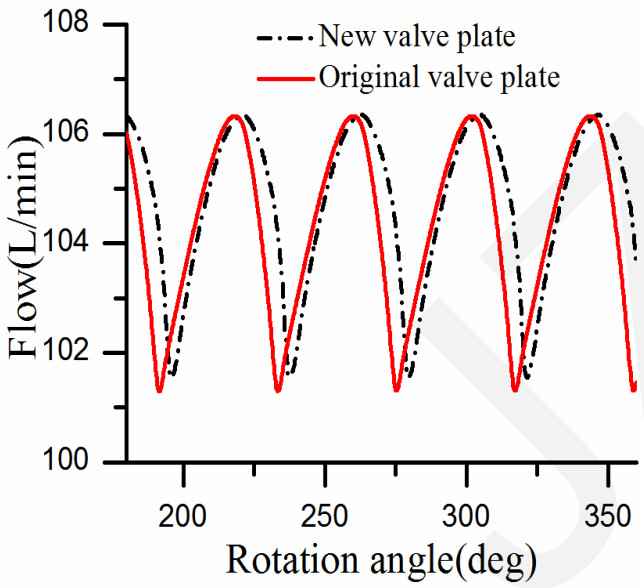


Comparison of transient reverse flow

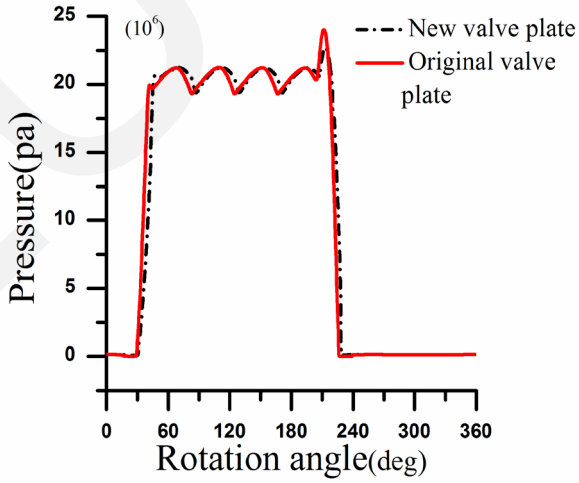
Result of Simulation

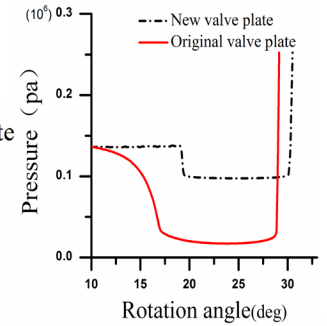
The Result of Simulation with different valve plates

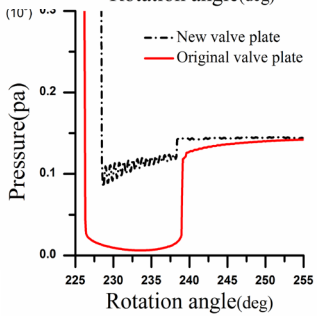
Flow Ripple in the Pump Outlet



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.

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