Mathematical Model of Servo Valve

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伺服阀结构图

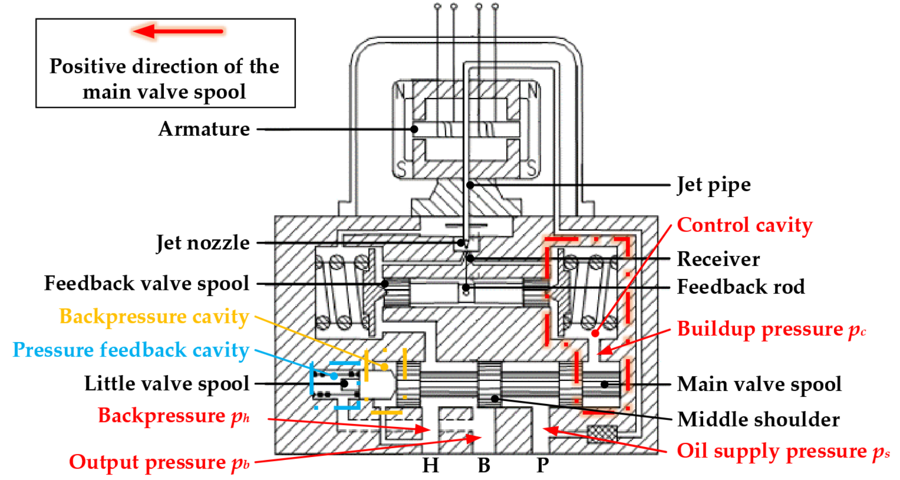

图 1: 伺服阀结构图[1]

工作压力和电流

$$\frac{P}{I}(s) = K\left[\frac{\omega_n^2}{\omega_n^2 + 2\zeta\omega_n s + s^2}\right]$$ [2]

K := pressure control servovalve static gain (压力控制伺服阀静态增益)

$\omega_n = 2\pi f_n$:= apparent natural frequency (表观固有频率)

ζ := apparent damping ratio (表观阻尼比)

P := servovalve differential pressure output (伺服阀压差输出，即**工作压力**)

I := differential current input to servovalve (伺服阀的差分**电流**输入)

s := Laplace operator

拉普拉斯逆变换后：$\frac{\mathrm{d}^2 P(t)}{\mathrm{d}t^2} + 2\zeta\omega_n \frac{\mathrm{d}P(t)}{\mathrm{d}t} + \omega_n^2 P(t) = K\omega_n^2 I(t)$

References

[1] HUANG J, ZHANG Q, ZHAO F, **andothers**. Analysis and suppression of self-excited oscillations in pressure servo valve system[J]. Applied Sciences, 2022, 12(17): 8477.

[2] MATOS M A **and** CADETE V C M. Aircraft Brake System Simulation[R]. SAE Technical Paper, 2022.

Acknowledgement

Thank you!