機械液壓伺服系統案例設計分析

國立雲林科技大學機械系
任志強 教授

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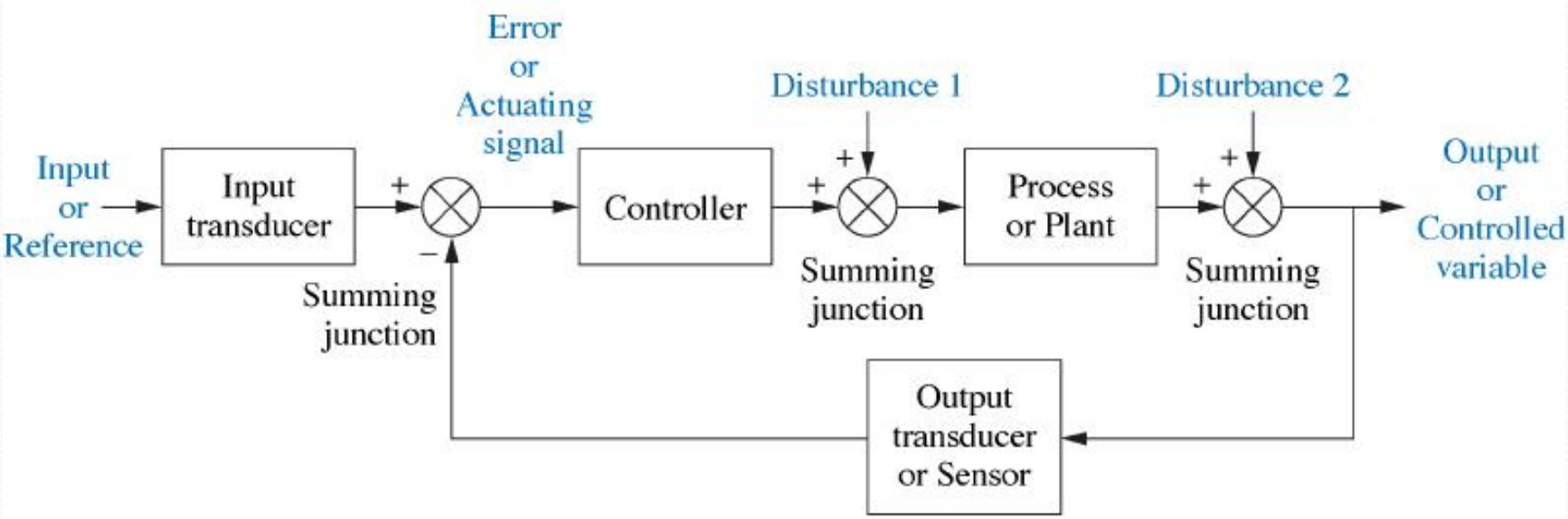
導論I：自動控制及閉迴路控制系統



- Advantages
  Greater accuracy (compared to open loop sys.)
  Less sensitive to noise, disturbances and changes in the environment
  Transient response and steady-state error can be controlled more conveniently
  Adjustment of gain of compensator with greater flexibility
- Disadvantages
  More complex and more expensive

導論II：電氣-液壓 vs. 機械-液壓伺服系統

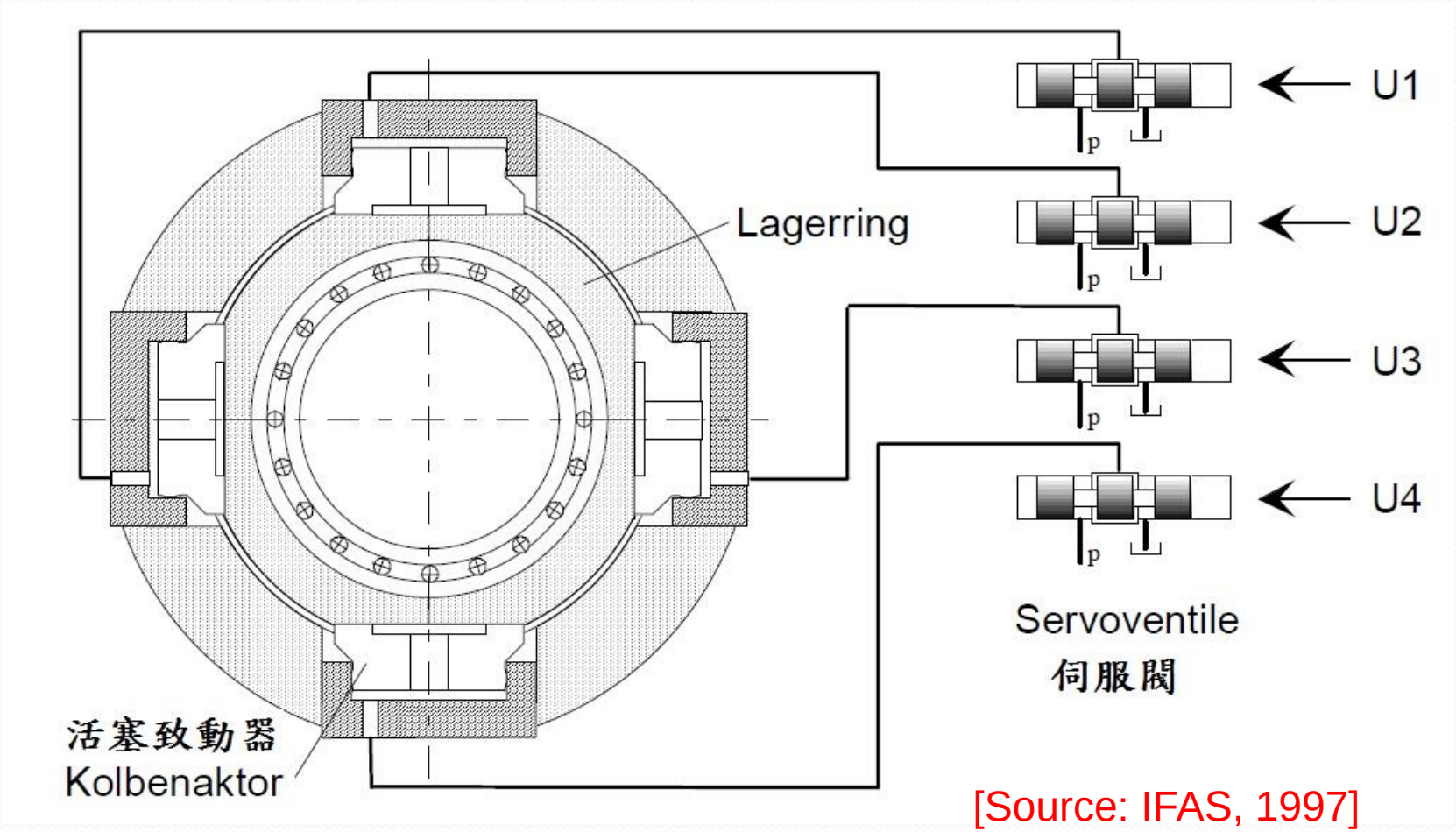
◆ Classification of servo-hydraulic systems:

- Electro-hydraulic system
- Mechanical-hydraulic system

Electro hydraulic control (main-stream, 主流設計)

- Combining the flexibility of electronic information processing and the large power of hydraulic actuation .

案例 1：液靜壓軸承(E-H)(1/5)



[Source: IFAS, 1997]

案例 1：液靜壓軸承(E-H)(2/5)

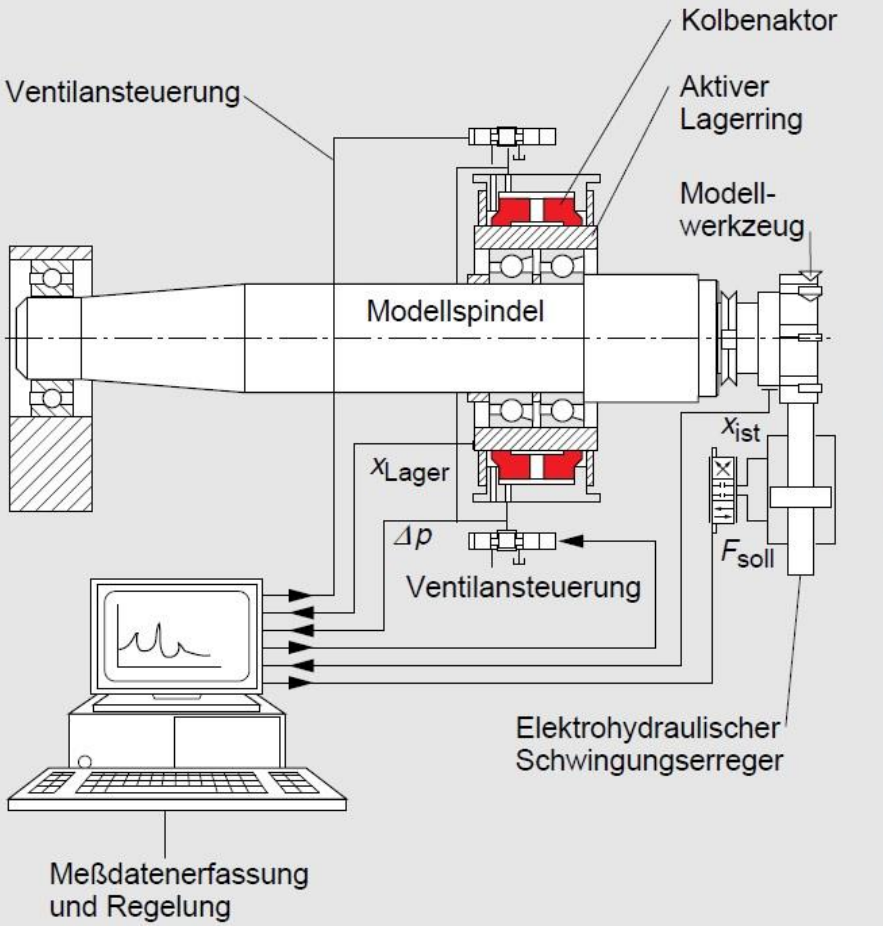
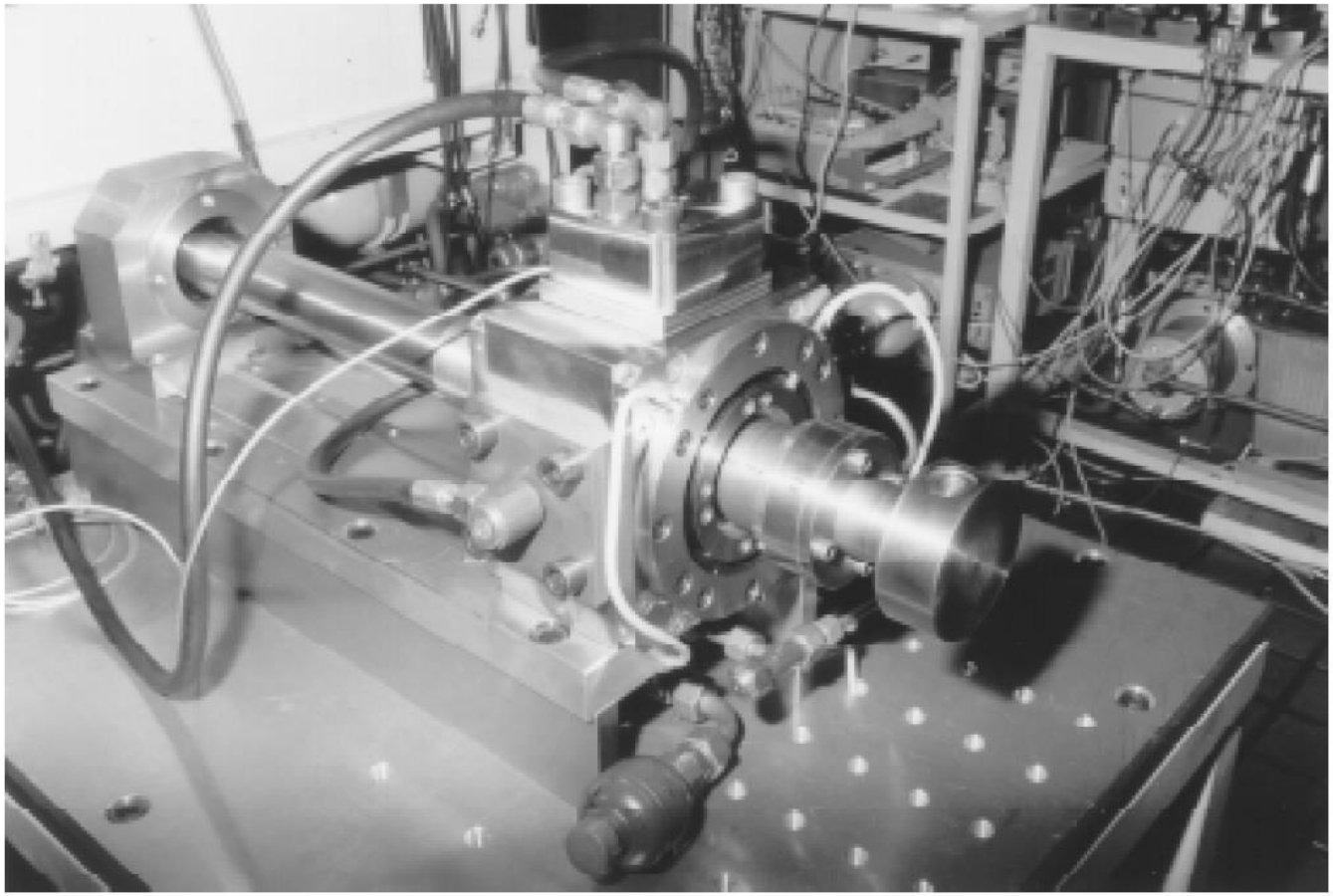


Bild 3:
Prüfstand, auf dem Spindellage-rungen unter möglichst praxis-nahen Bedingungen getestet werden.

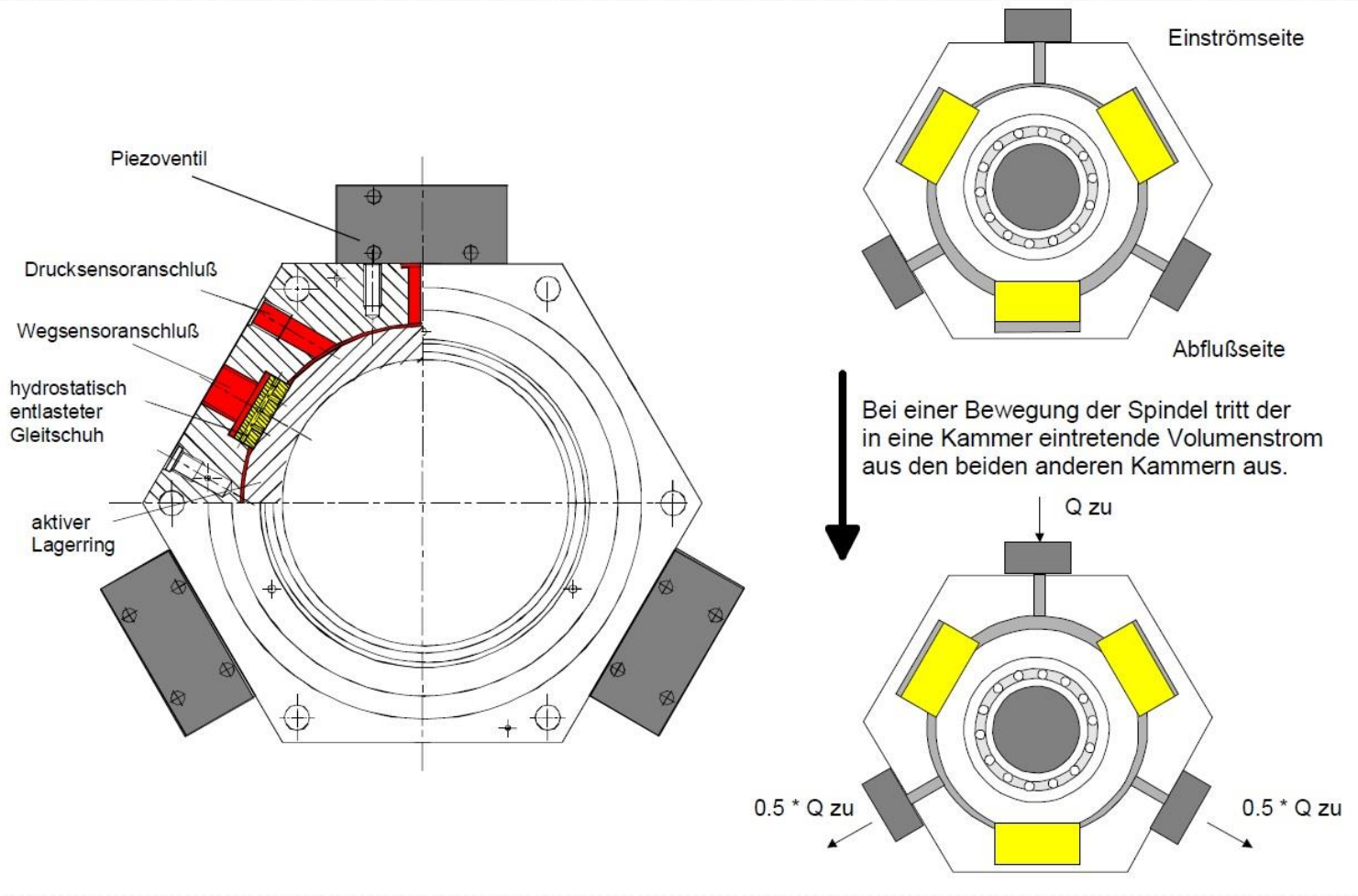
[Source: IFAS, 1997]

案例 1：液靜壓軸承(E-H)(3/5)



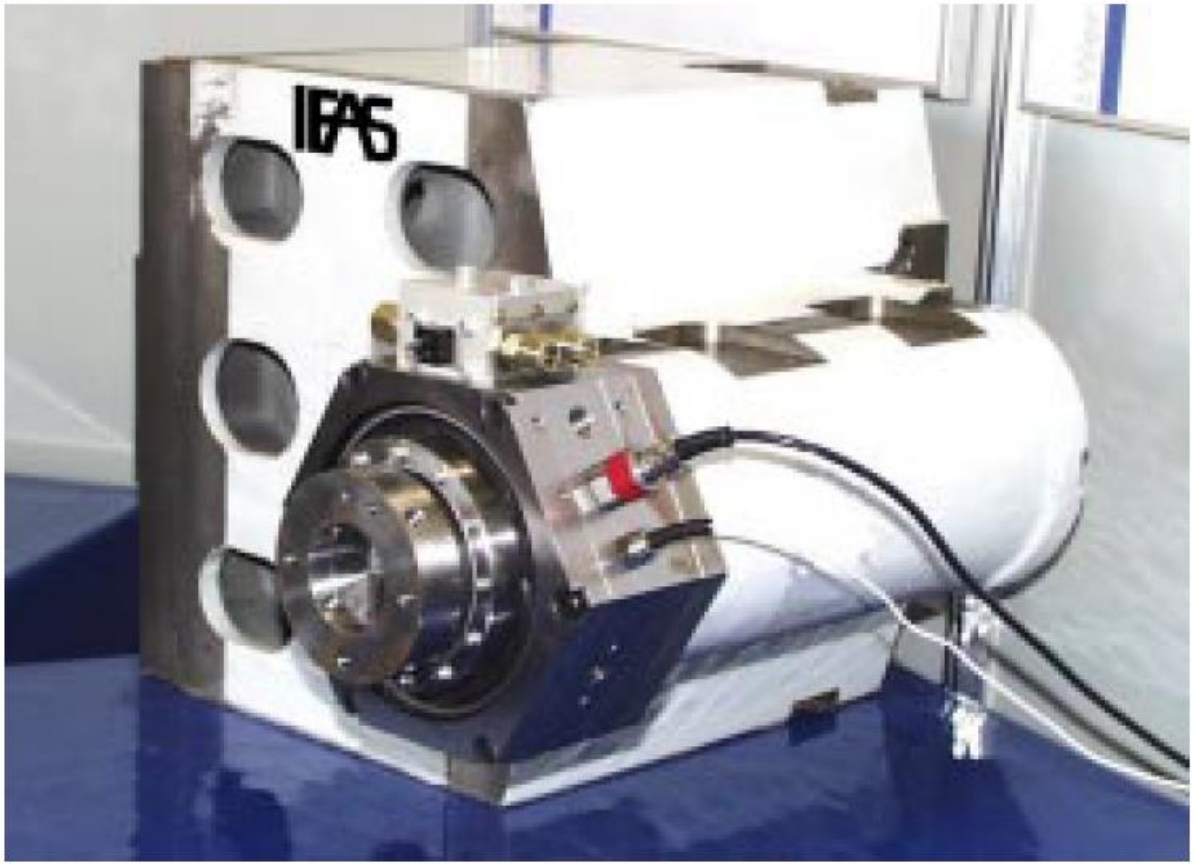
[Source: IFAS, 1997]

案例 1：液靜壓軸承(E-H)(4/5)



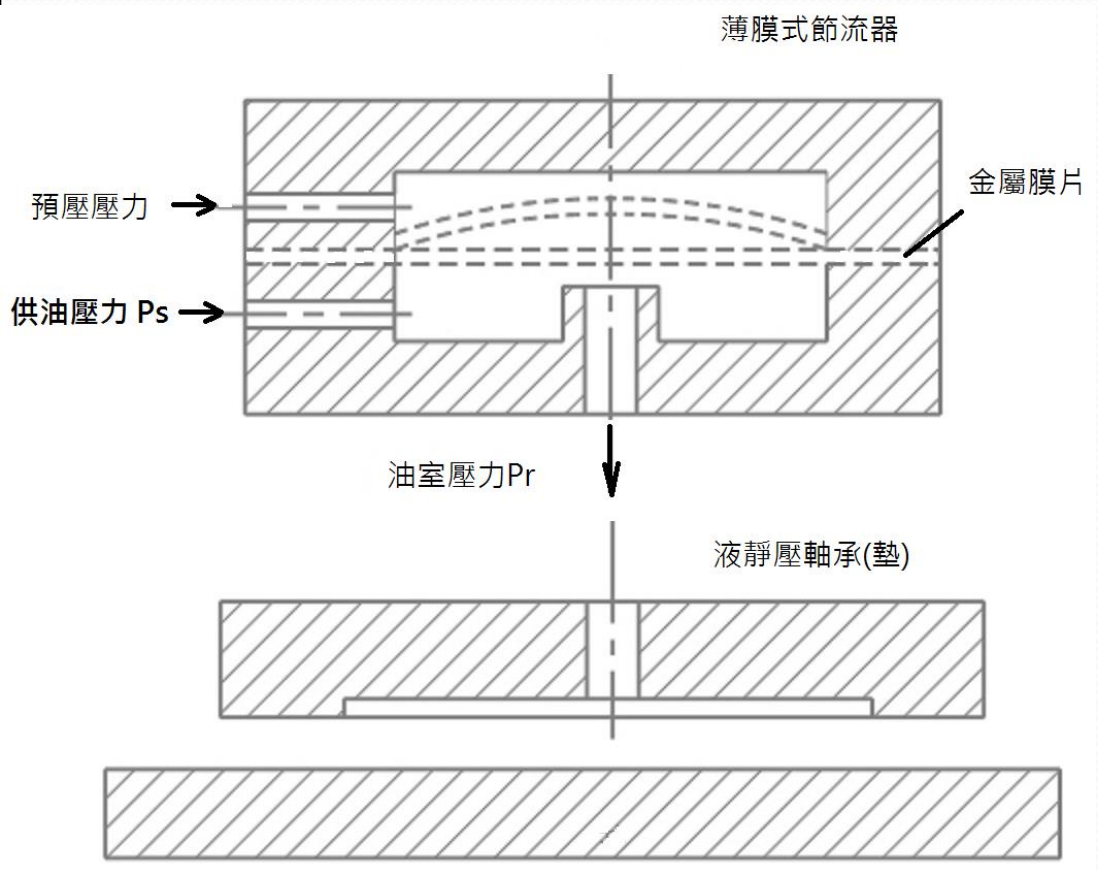
[Source: IFAS, 2000]

案例 1：液靜壓軸承(E-H)(5/5)

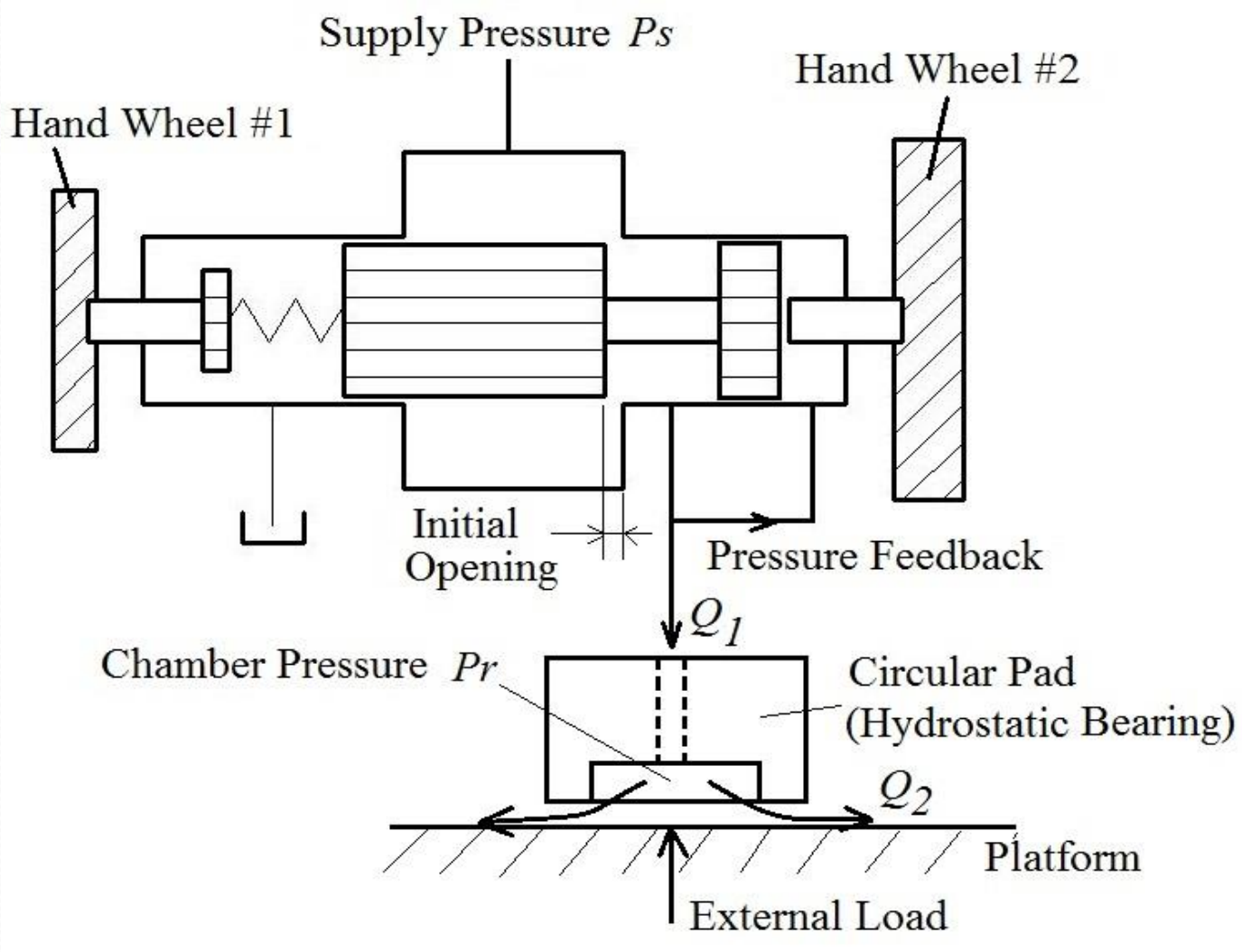


[Source: IFAS, 2000]

案例 1：液靜壓軸承(M-H)(1/6)



案例 1：液靜壓軸承(M-H)(2/6)



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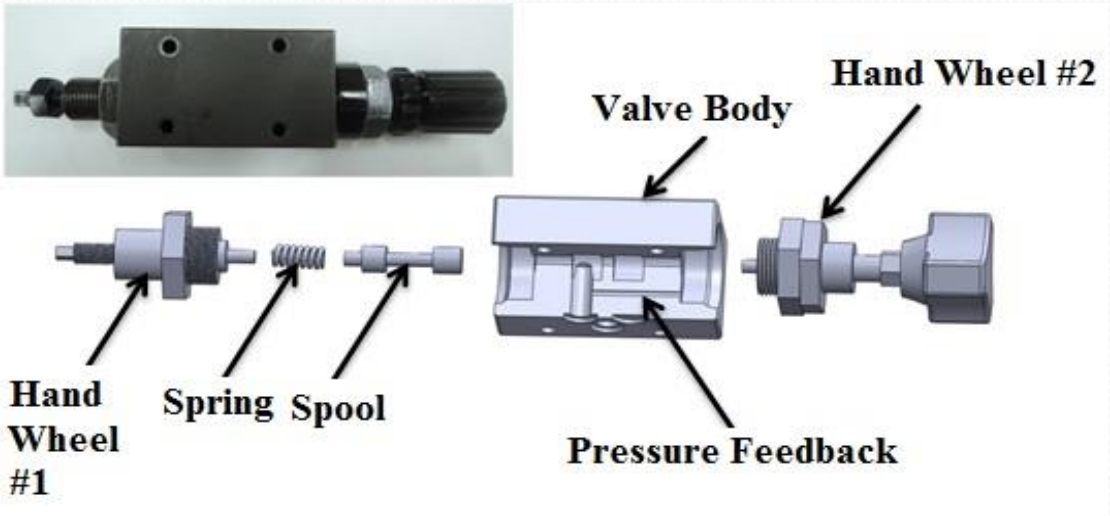

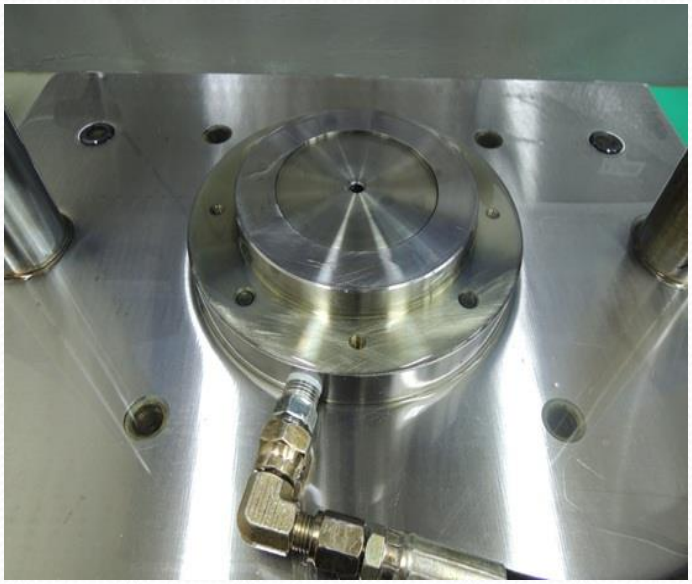

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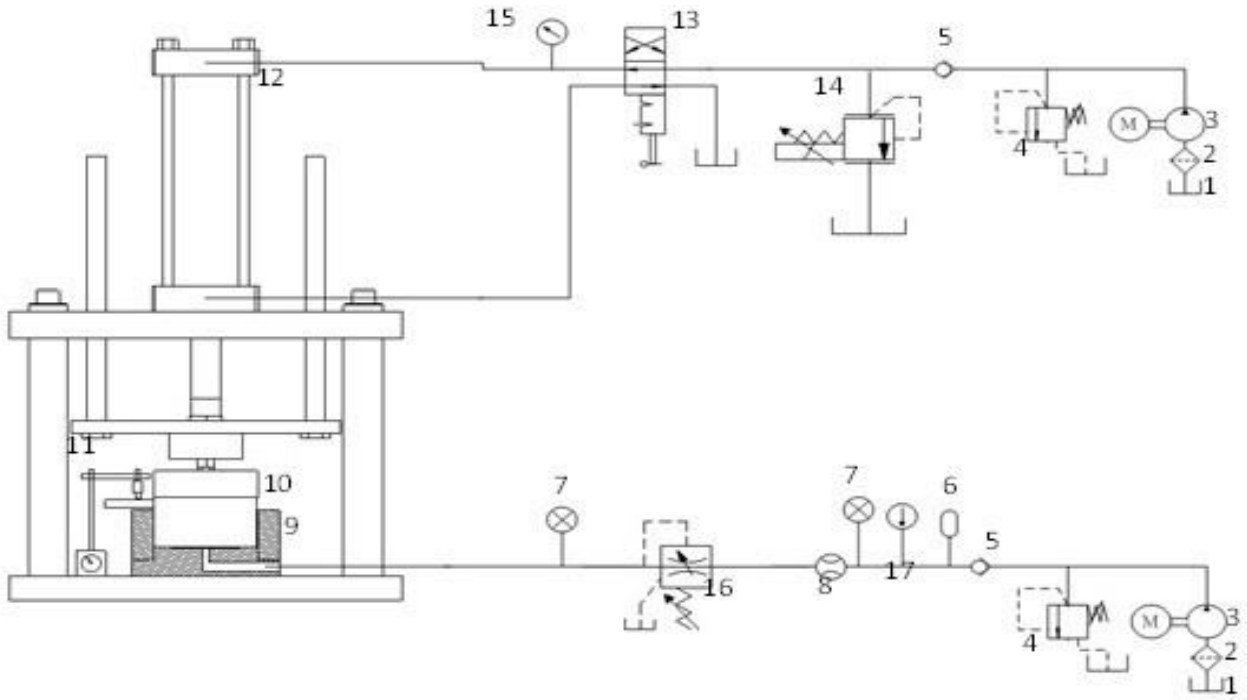
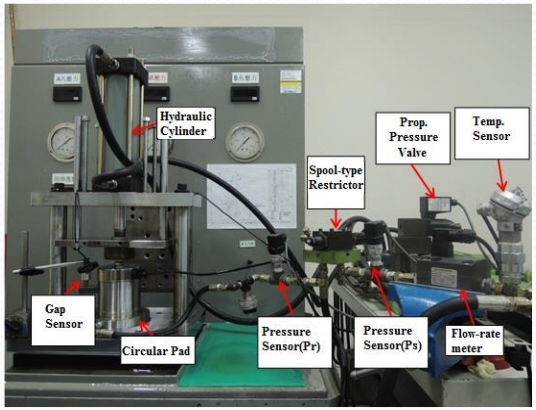


1. Oil Tank
2. Filter
3. Pump
4. Relief Valve
5. Check Valve
6. Accumulator
7. Pressure Gauge
8. Flow-rate Meter
9. Circular Pad
10. Load Cell
11. Gap Sensor
12. Cylinder
13. Switching Valve
14. Proportional Pressure Valve
15. Pressure Gauge
16. Tested Restrictor
17. Temp. Gauge



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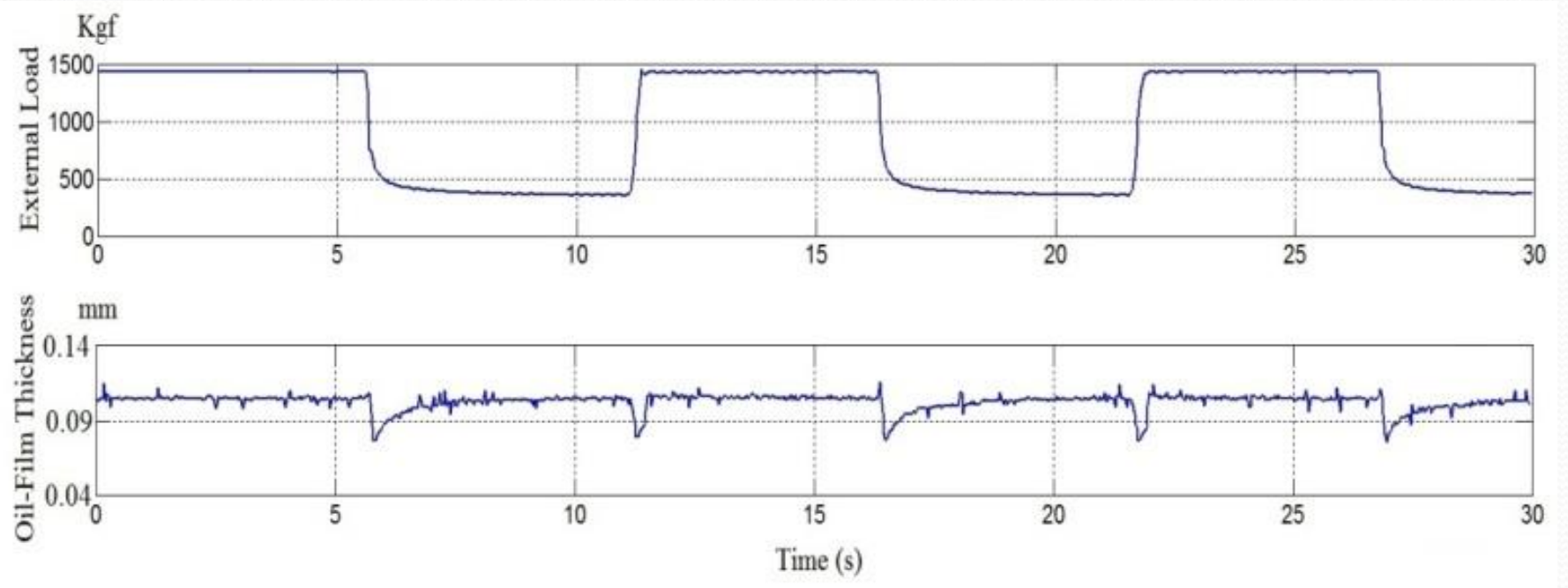
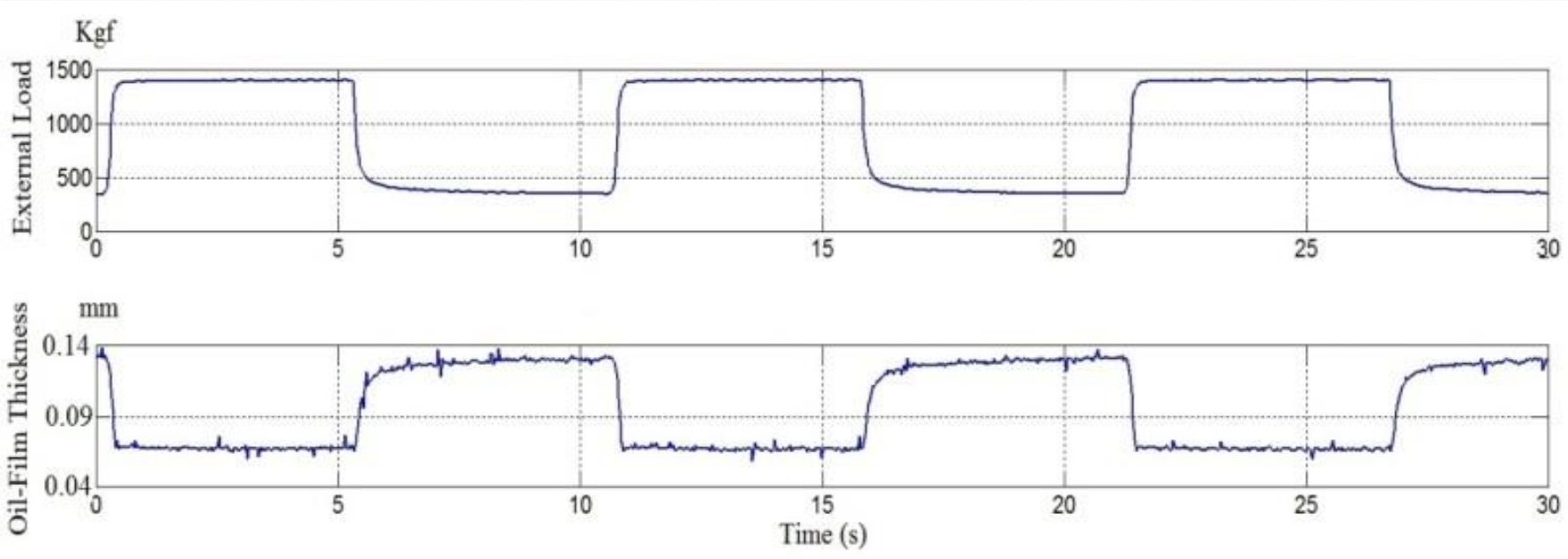


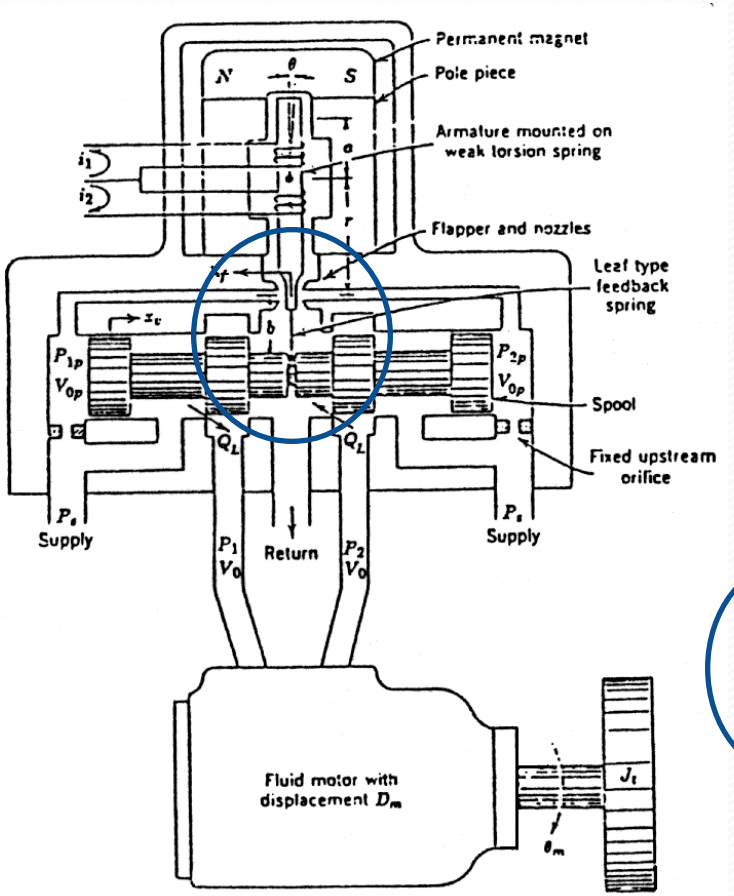
Experimental results of hydrostatic bearing **with** restrictor

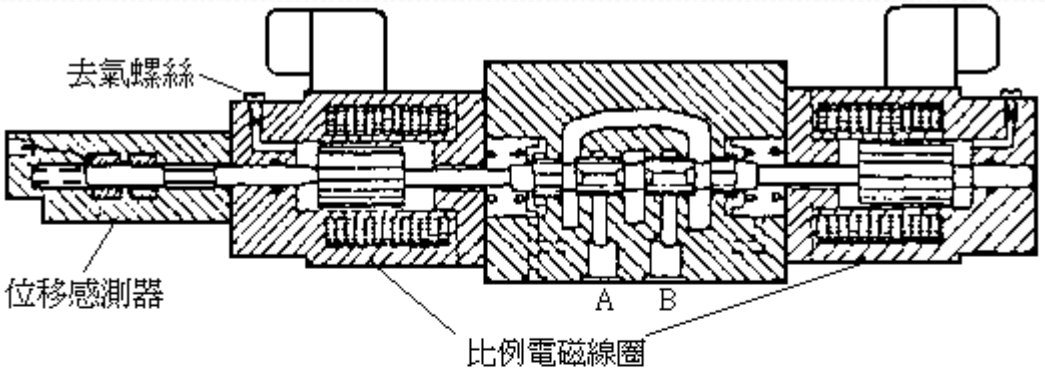
案例 1：液靜壓軸承(M-H)(6/6)



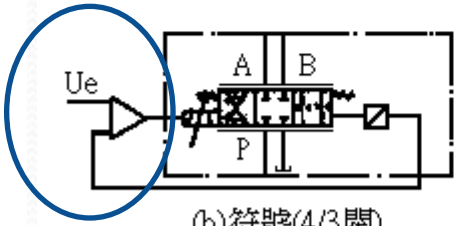
Experimental results of hydrostatic bearing **without** restrictor

案例 2：液壓伺服閥及比例閥

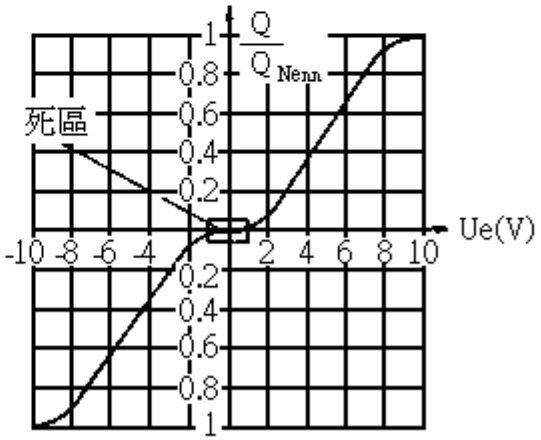




(a)結構圖

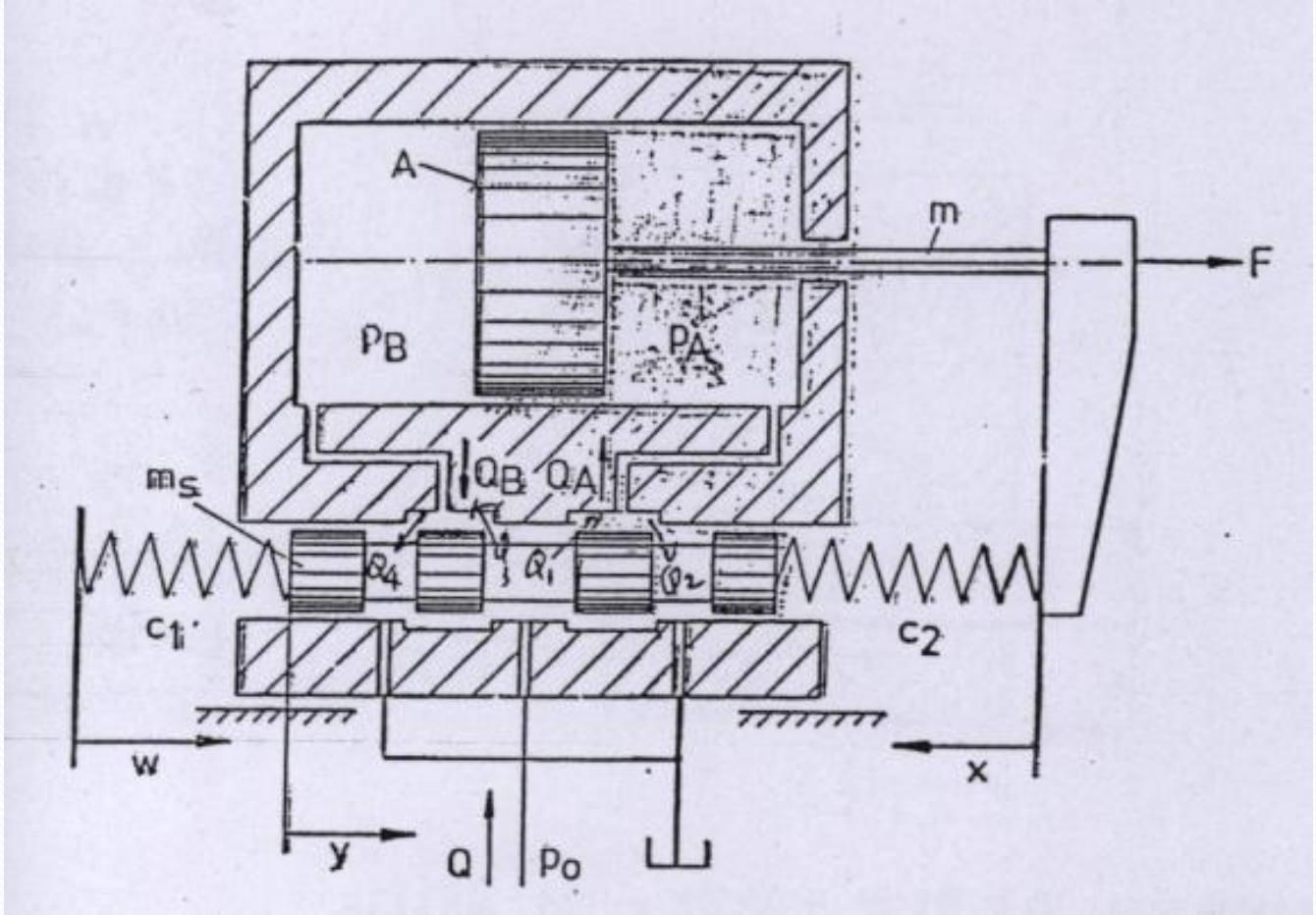


(b)符號(4/3閥)

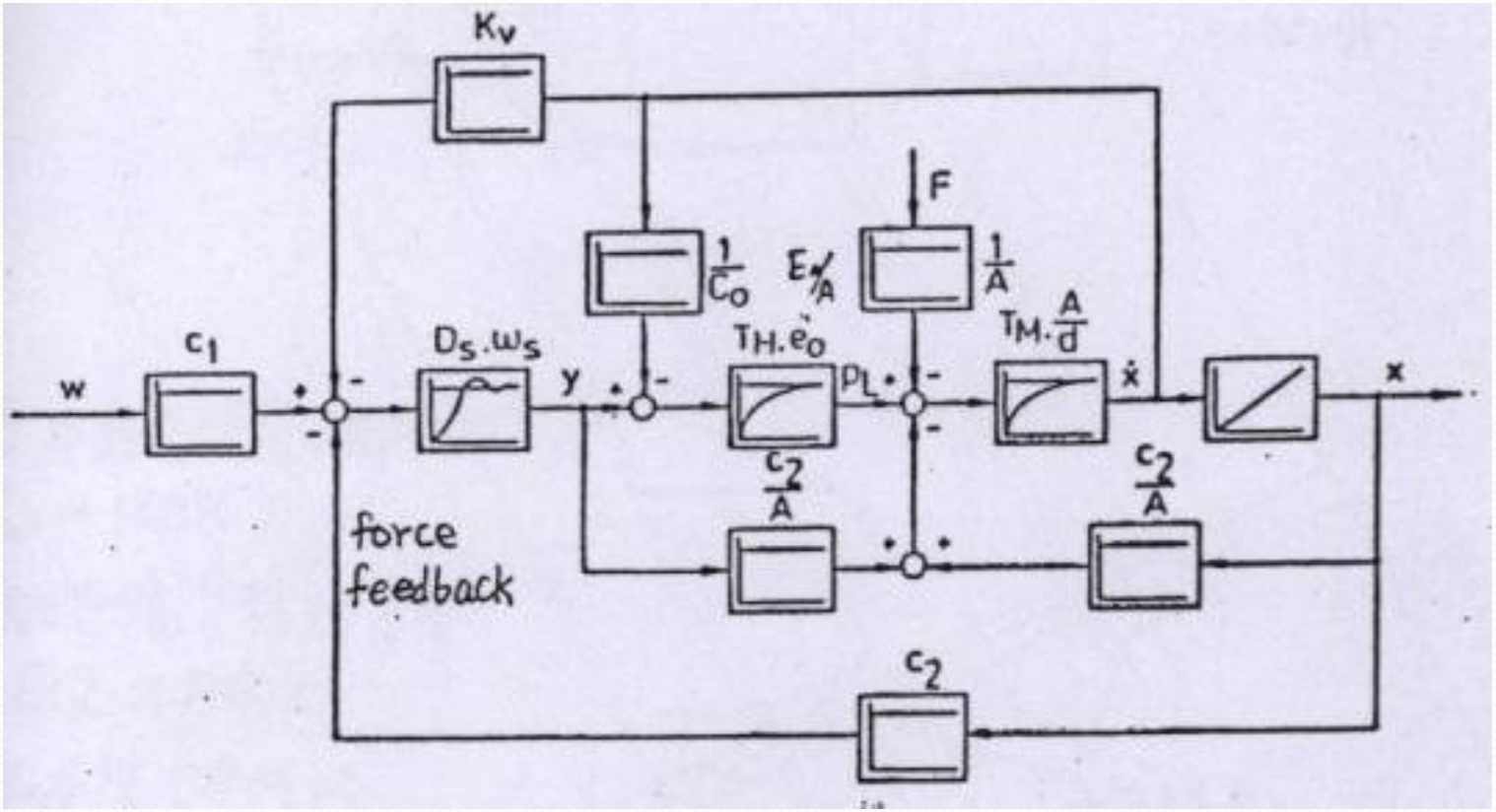


(c)流量-控制訊號曲線

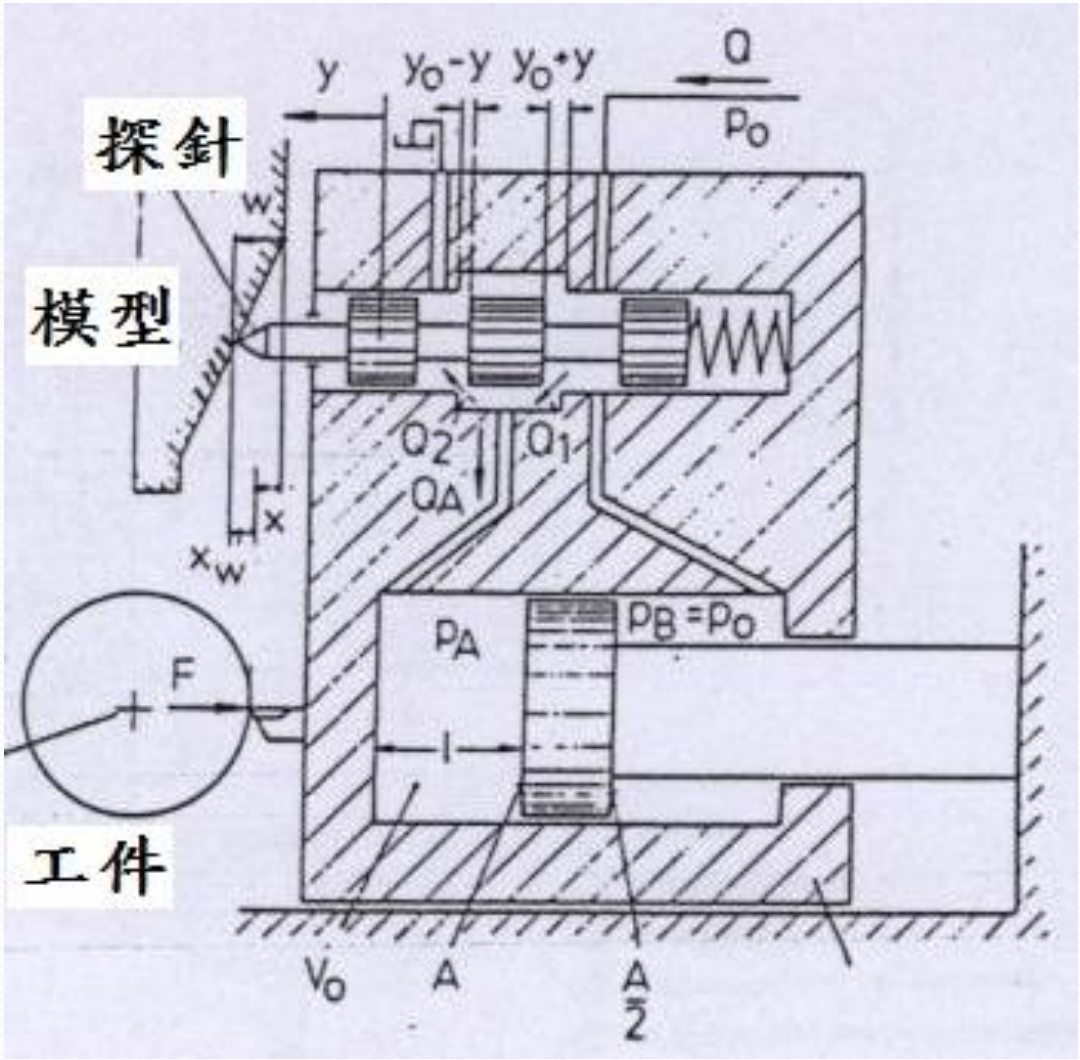
案例 3：液壓力量放大機構(1/2)



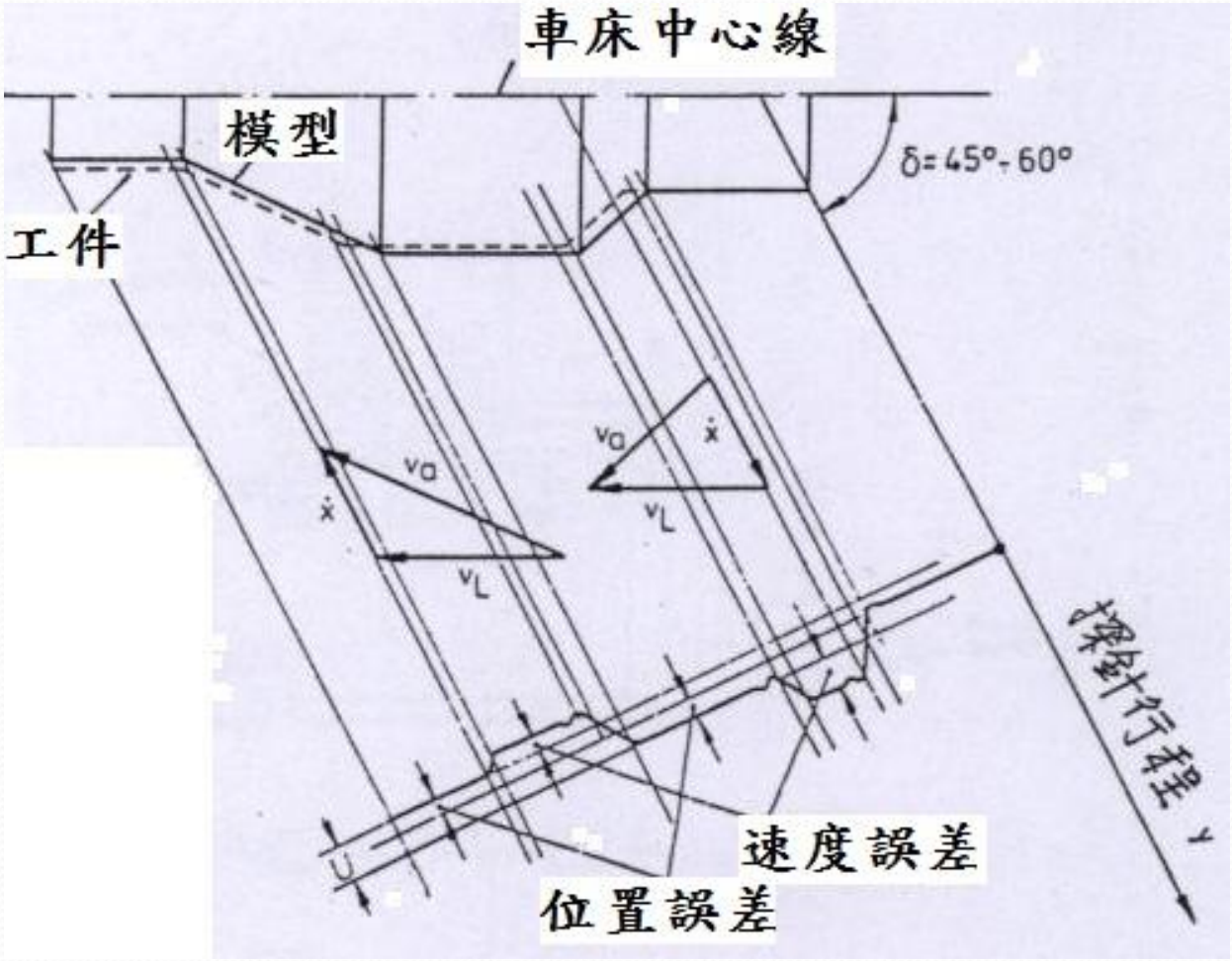
案例 3：液壓力量放大機構(2/2)



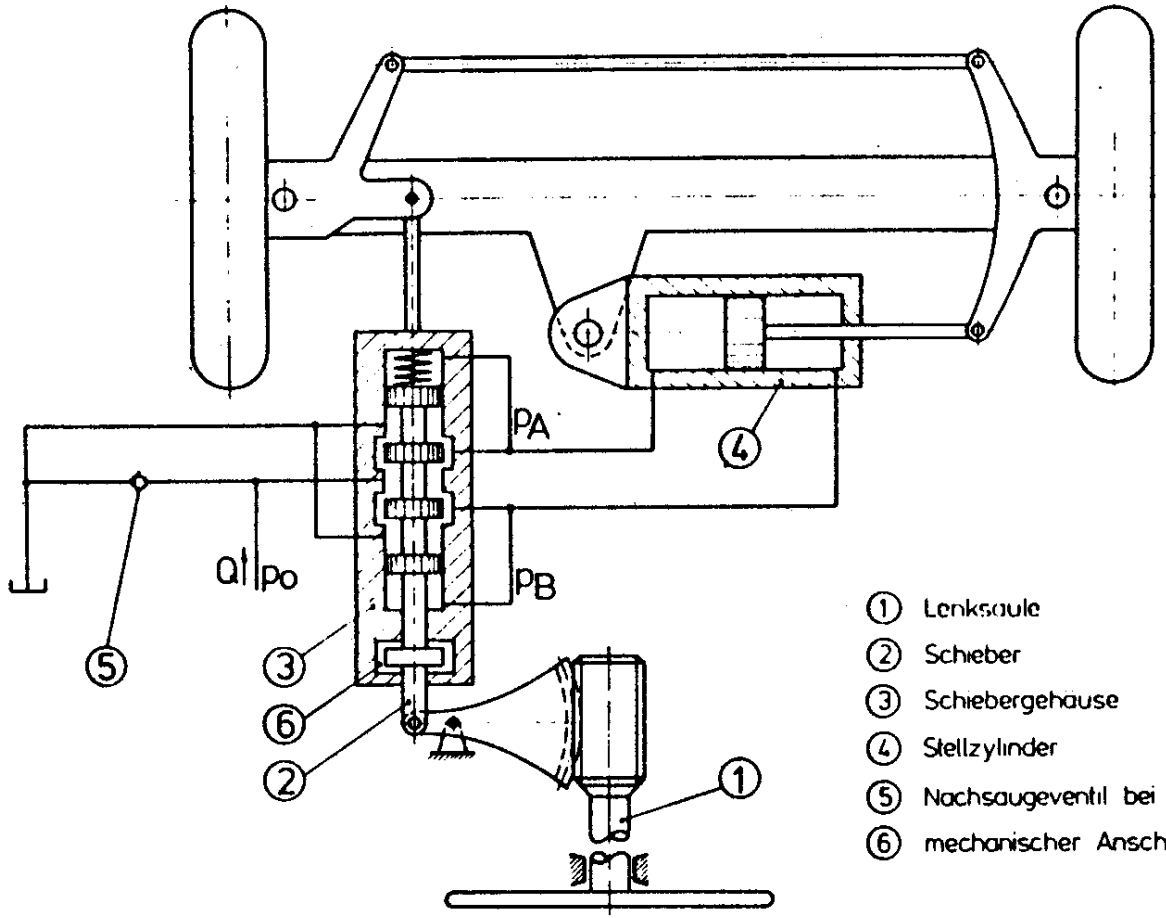
案例 4：液壓靠模車床(1/2)



案例 4：液壓靠模車床(2/2)



案例 5：液壓動力方向機


pA
pB
Qt
Po
① Lenksaule
② Schieber
③ Schiebergehäuse
④ Stellzylinder
⑤ Nachsaugeventil bei Notbetrieb
⑥ mechanischer Anschlag (Notbetrieb)

結論

1. 不論是電氣-液壓 或是 機械-液壓伺服系統均是閉迴路控制系統，都具備了自動控制的架構。

2. 電氣-液壓伺服系統確為現今主流架構，因其具備了精度高、易於控制、反應快、容易調整等等的優點；但是機械-液壓伺服系統並未從市場上消失，因其具備了低成本、結構簡單強健、故障率低等不易被取代的優點。

謝謝聆聽！

Thank you for your Attention!