CONTROLS AND AUTOMATION

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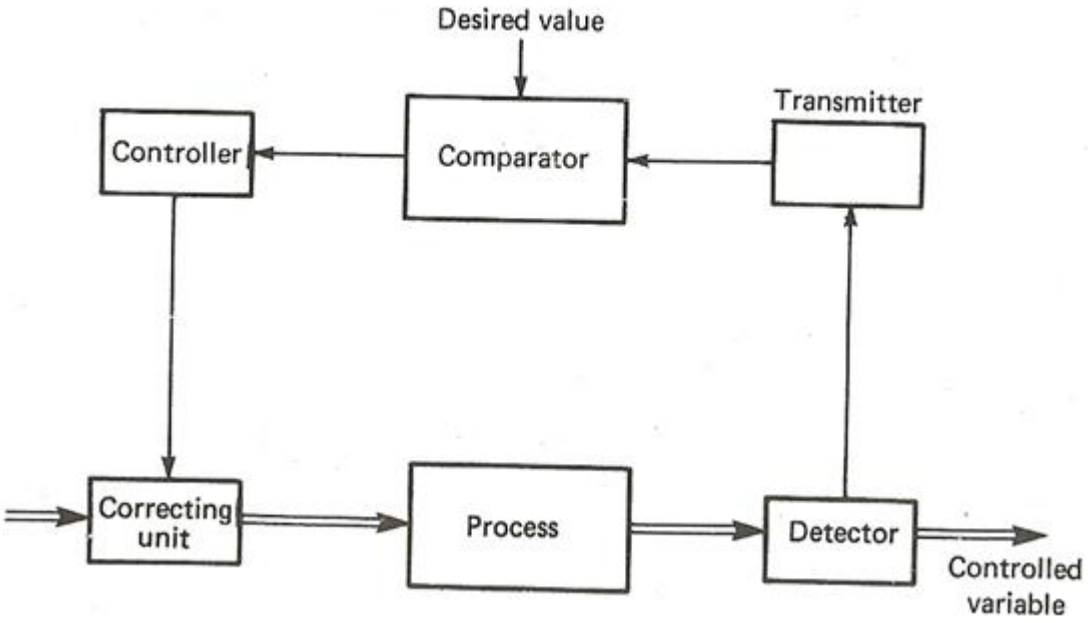
SESSION OBJECTIVES

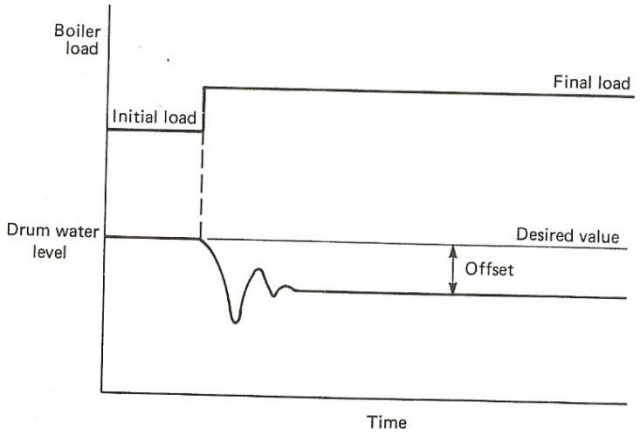
- **Revise Terminology**
- **Understanding P I D controller theory**
- **Valve Positioner and Actuator working**
- **Adjustments and system tuning**
- **Practical / Demonstration**

Total duration – 120 minutes

TERMINOLOGY

- Open Loop system
- Closed Loop System
- Set Point
- Desired Value (dv)
- Measured value (mv)
- Actual value (av)
- Comparator
- Error
- Deviation
- Offset
- Dead Band
- Proportional band
- Settling Time





TYPES OF CONTROL ACTIONS

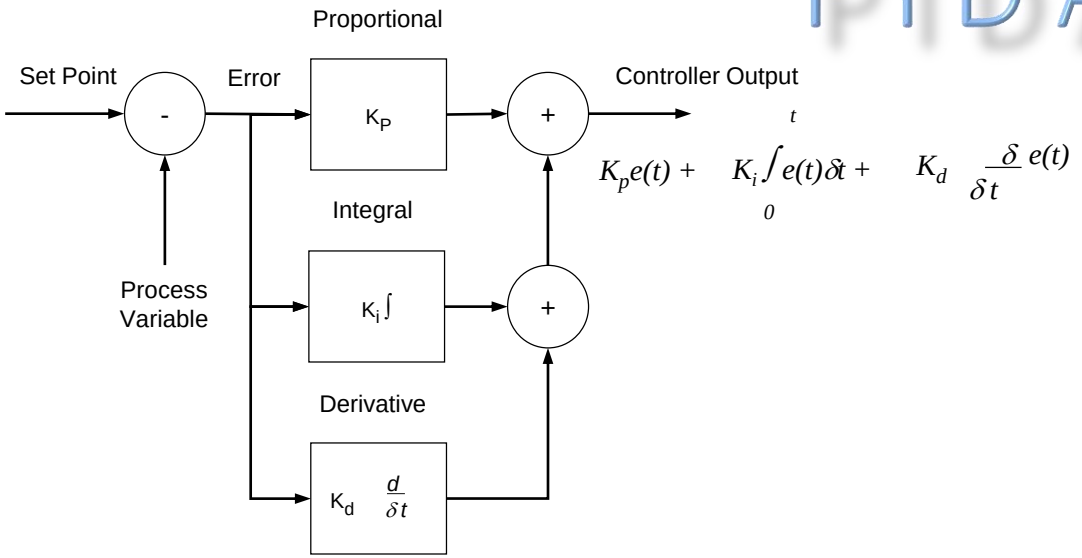
STEP CONTROL

- ON – OFF CONTROL

SEQUENCIAL CONTROL

- PROPORTIONAL CONTROL
- P + DERIVATIVE CONTROL
- P + INTEGRAL CONTROL
- P + I + D CONTROL

PID ACTIONS



PROPORTIONAL - (m)controller o/p is proportional to deviation { e(t)}

$$m = -K_p * e(t)$$

INTEGRAL - <u>Rate of change of (m)controller o/p</u> is proportional to deviation { e(t)}

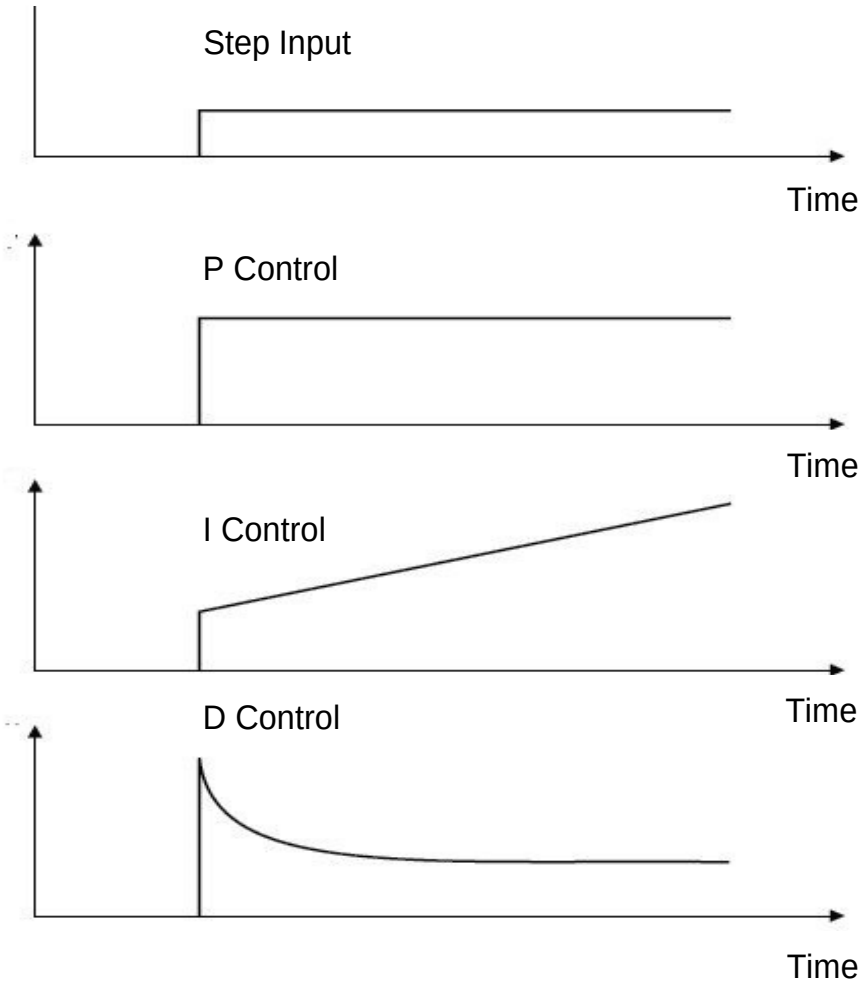
$$dm / dt = K_i * e(t)$$

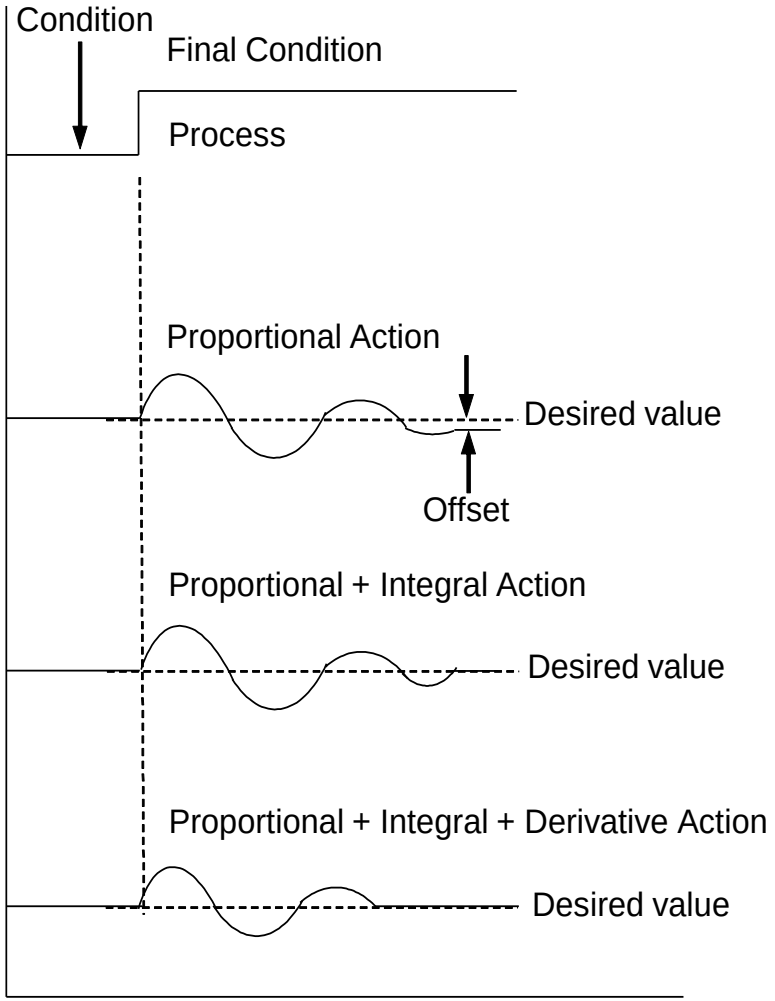
i.e $$m = -K_i \int e(t) * dt$$

DERIVATIVE - (m)Controller o/p is proportional to <u>rate of change of deviation { e(t)}</u>

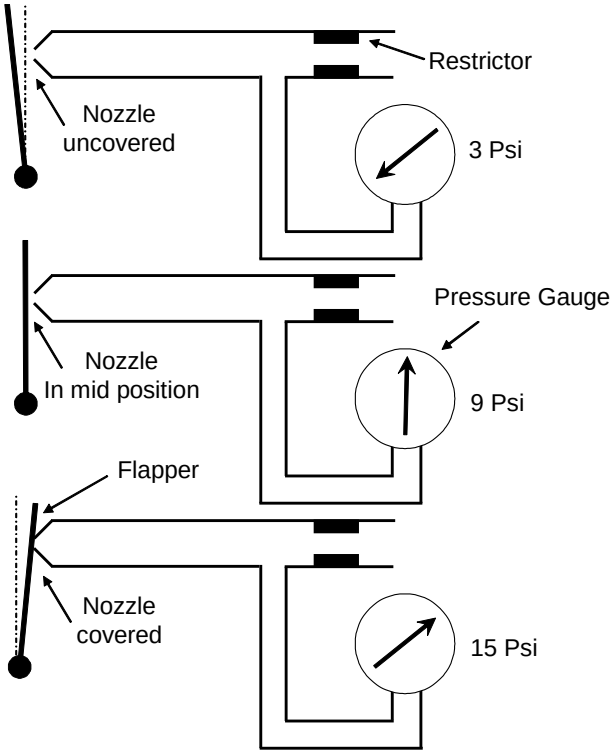
$$m = -K_d * de(t) / dt$$

SYSTEM RESPONSES





SYSTEM BASICS



Nozzle – Flapper arrangement

•Acts as a transducer or an signal amplifier

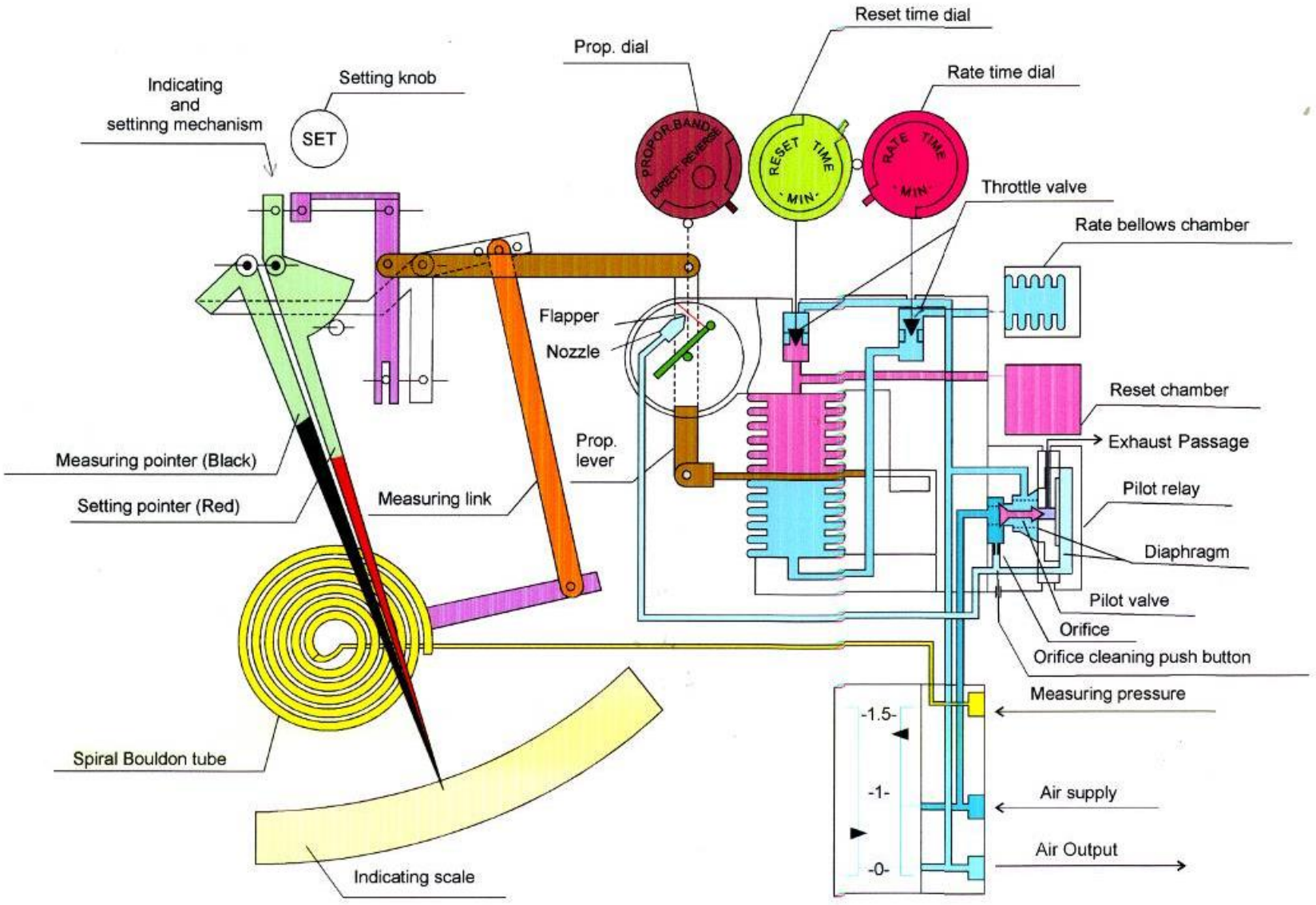
•Supply Air Pr – 1.5 bar
•Control air output pr range – 3 ~ 15 psi

Flapper Movement(X_1, X_2) approx 20 microns

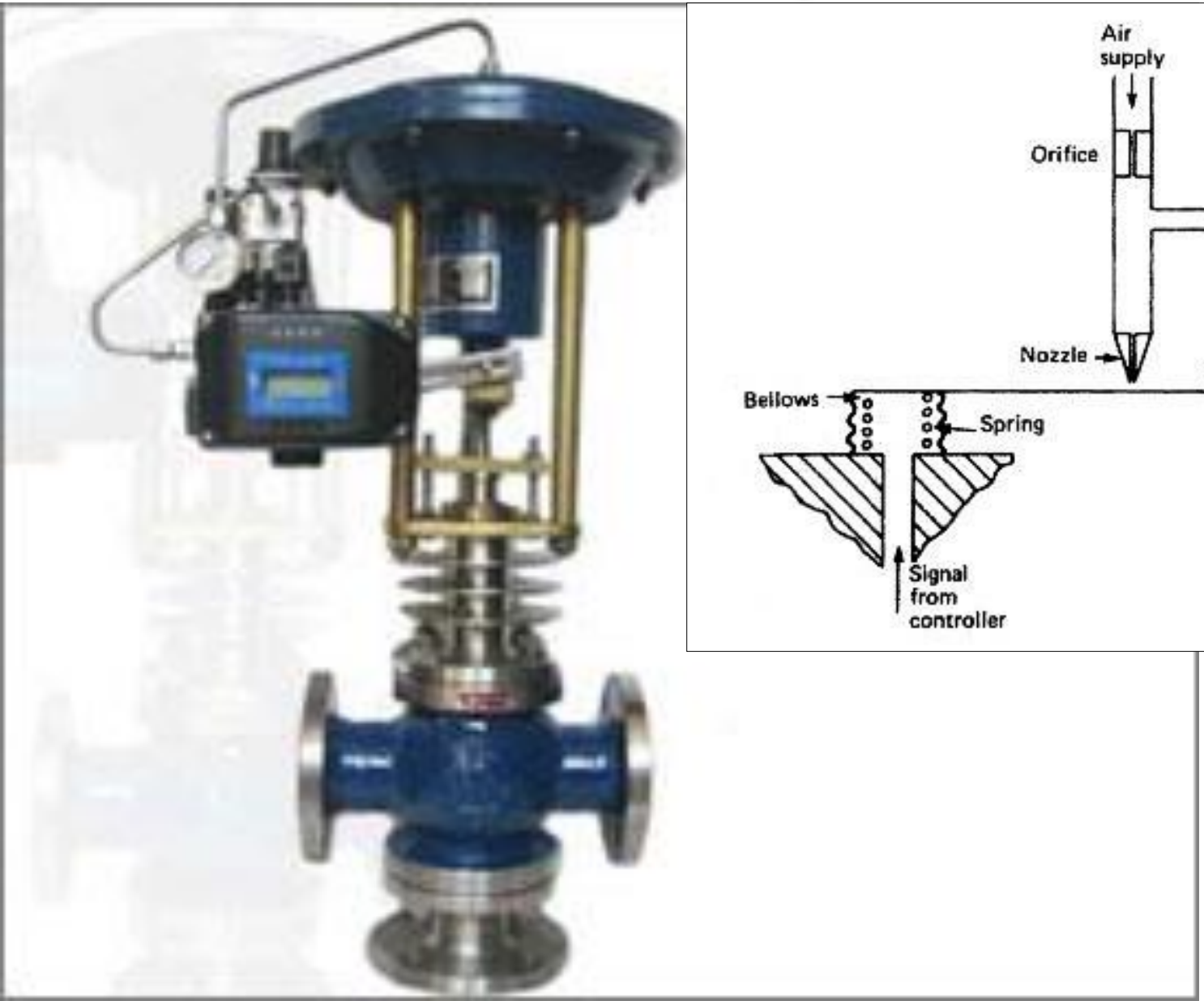
Orifice Dia – 0.25 mm

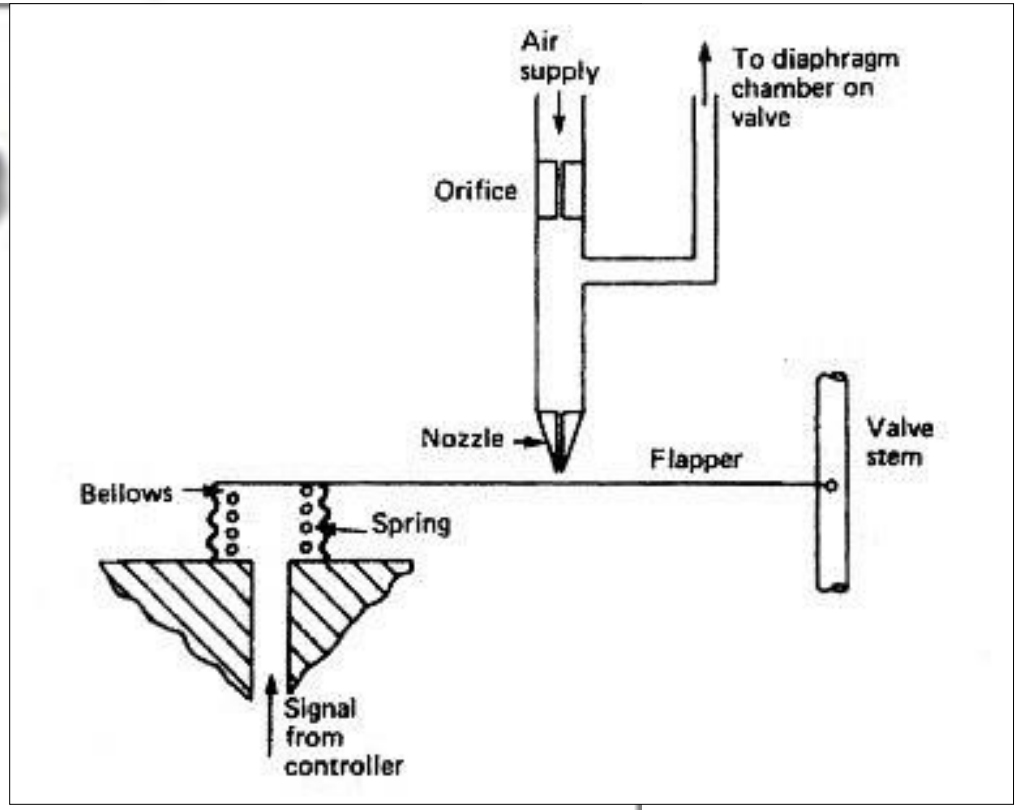
Nozzle Dia – 0.40 mm

WHAT'S INSIDE- NAKAKITA



POSITIONER/ACTUATOR





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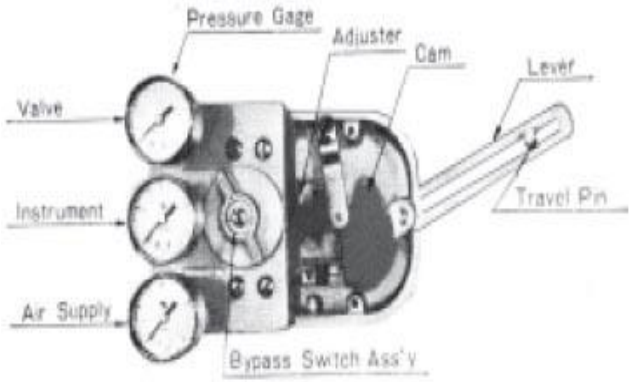

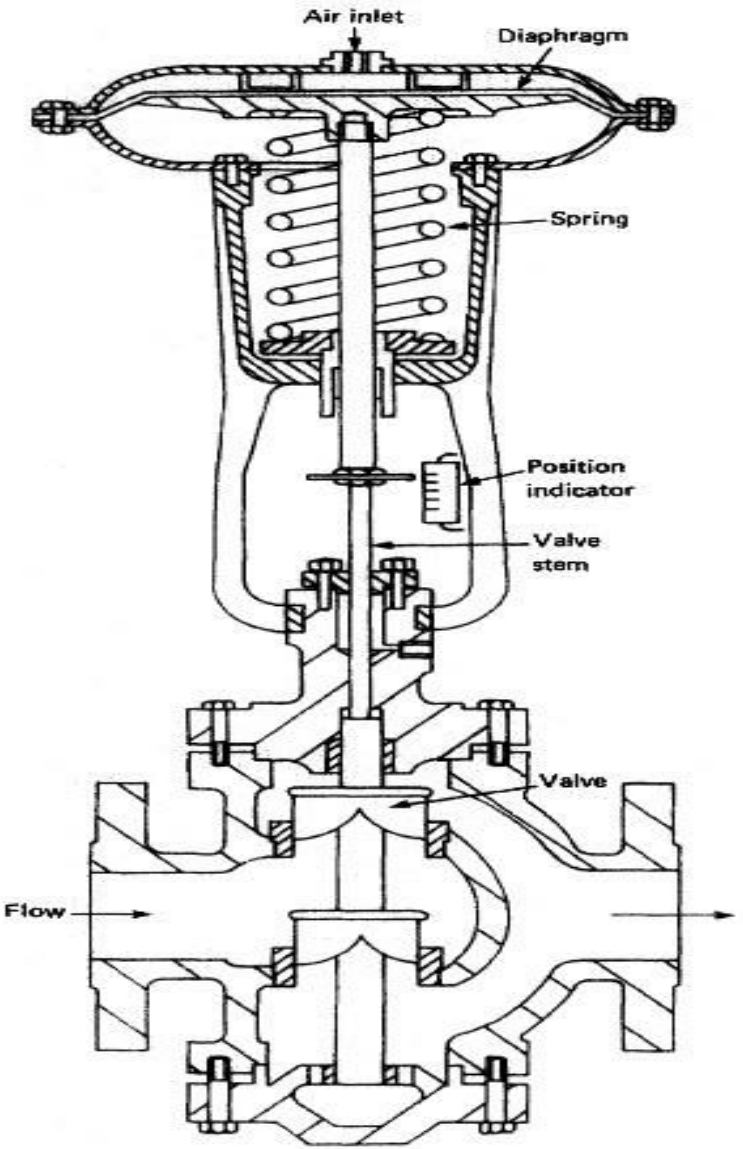

VIGILANCE AND MAINTENANCE

- ✓ **Periodic calibration and cleaning of measuring devices/sensors (e.g. RTD probe in the FO purifier heater line, M/E JCW line etc.)**
- ✓ **Replacement of polyurethane tubes inside the controller every 24 months, as tubes tend to damage due to heat, oil and vibration.**
- ✓ **Quarterly cleaning of nozzle with a thin SS wire (<0.25 mm)**
- ✓ **Weekly cleaning of orifice by depressing the push button.**
- ✓ **Bellows and linkages must be checked for their intactness.**
- ✓ **Watch out for signs of air leakages inside the controller box**
- ✓ **Leakages in signal transmission lines from controller to regulating valve.**
- ✓ **Valve condition and integrity of valve packing/seals, moving surface of valve spindles.**
- ✓ **And most important, cleanliness of supply air. Correct working of filters and Pressure reducers settings.**

THANK YOU