

PROCESS DYNAMICS AND CONTROL

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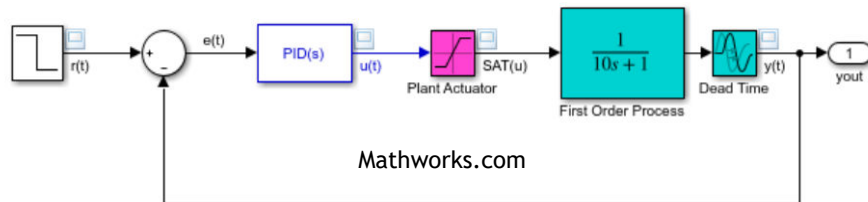


RECAP

- ◉ Integral mode
- ◉ Derivative mode
- ◉ PID
- ◉ Different forms of PID
- ◉ Two-degrees of freedom PID

INTEGRAL MODE AND RESET WINDUP

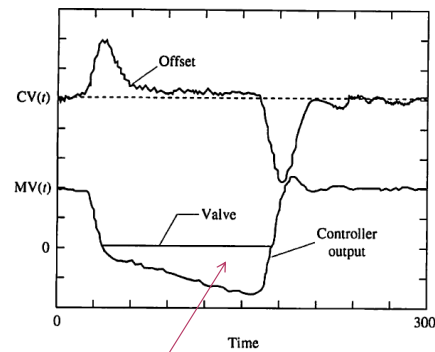
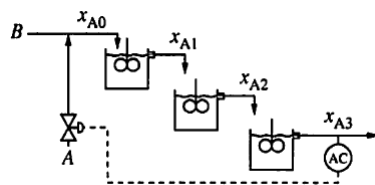
- Integral mode continues to integrate the error even after the valve is saturated
- Accumulation** of integral term outside saturation limits



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RESET WINDUP: EXAMPLE

- Marlin's Process Control book



Accumulation of control action below saturation

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ANTI-RESET WINDUP

- ◉ Reduce or prevent reset windup while maintaining controller performance in normal situations
- ◉ Several ways to achieve anti-reset windup

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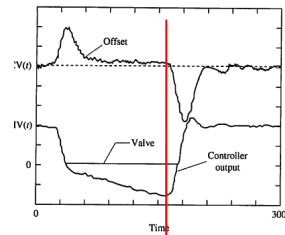
ANTI-RESET WINDUP: INTEGRAL CLAMPING

- ◉ Stop integration when valve is saturated.
- ◉ Prevent accumulation of integral term
- ◉ Faster recovery of control action when the error changes sign.

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ANTI-RESET WINDUP: EXAMPLE

- Control action returns to **normal range** earlier with **anti-reset windup**



Marlin's Process Control book

