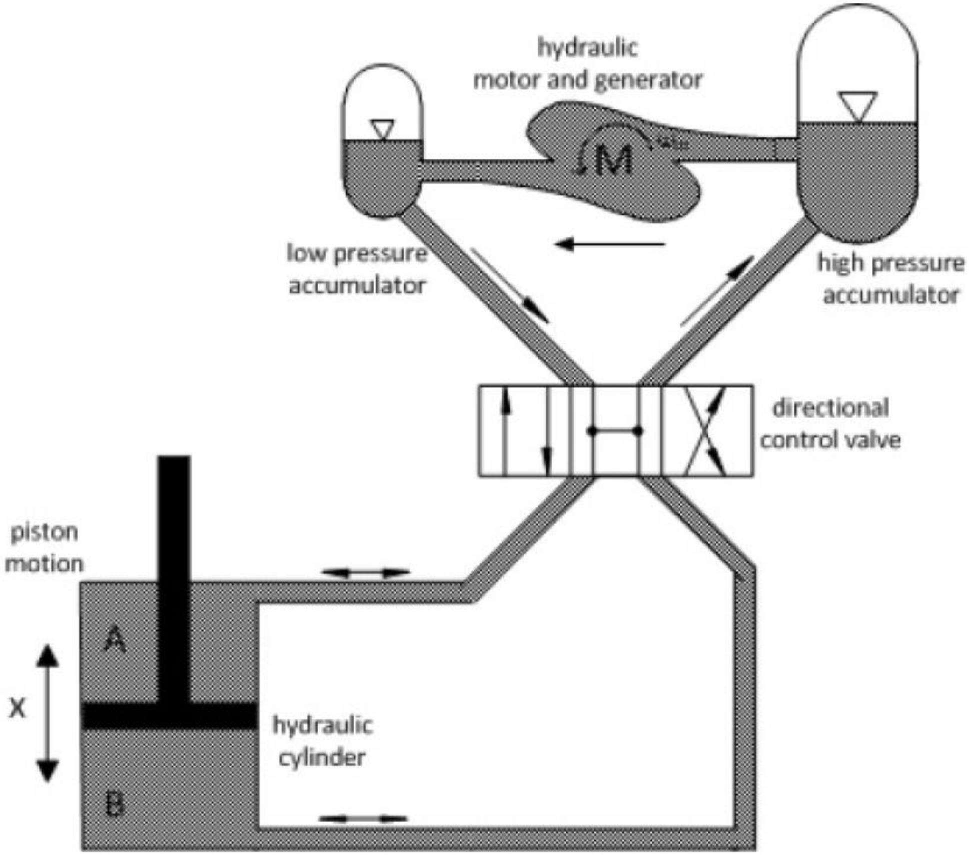
Hydraulic Power Take-Off

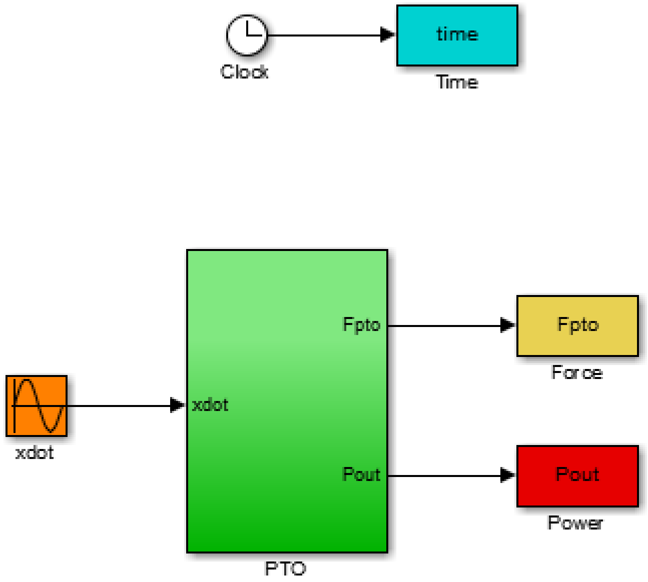
Goals for today

- Introduce Kelley's Hydraulic Power Take-Off Model
- Present the Simulink Model
- Discuss PTO parameters and constraints
- Next Steps

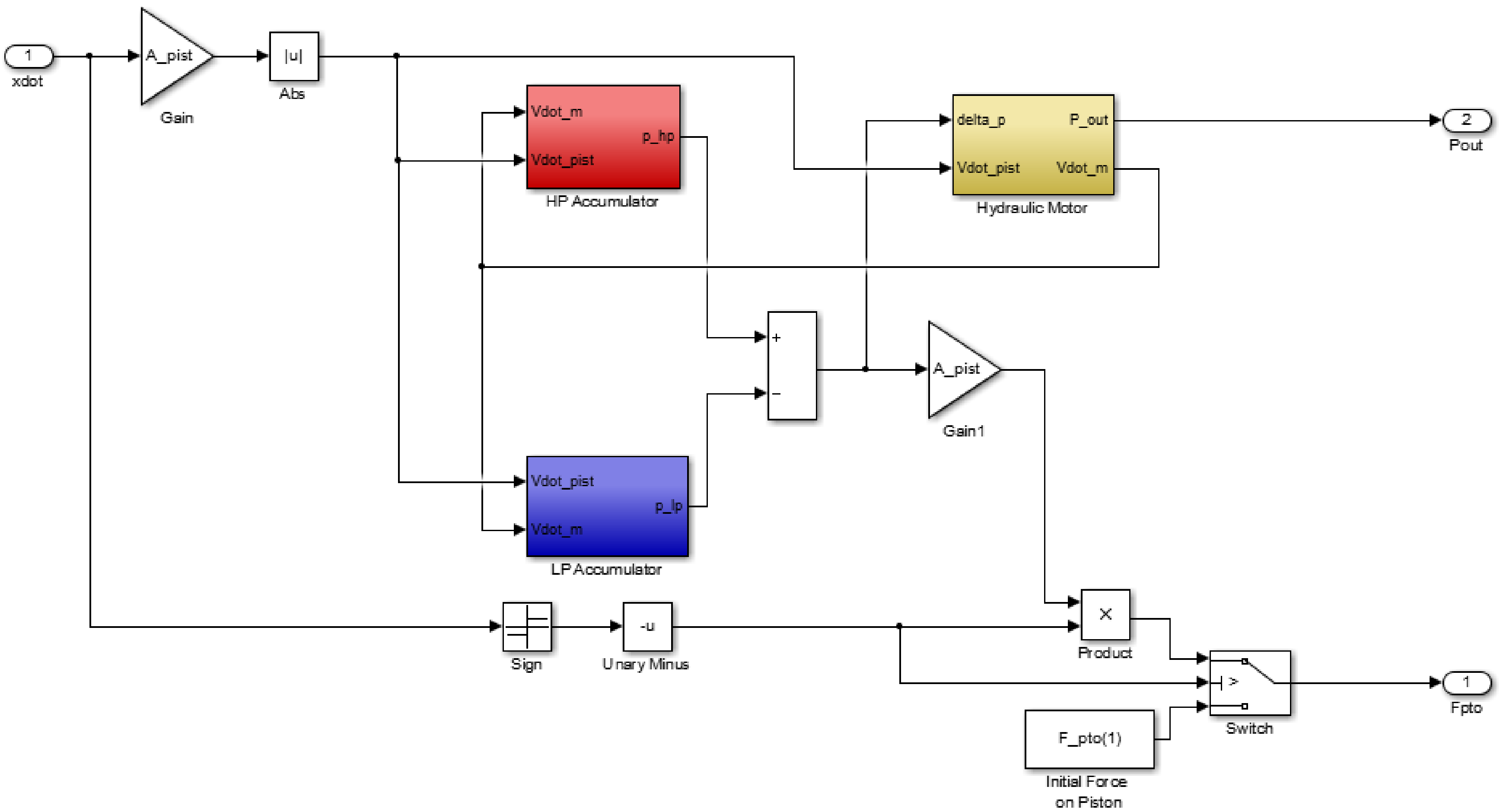
Hydraulic Power Take-Off System



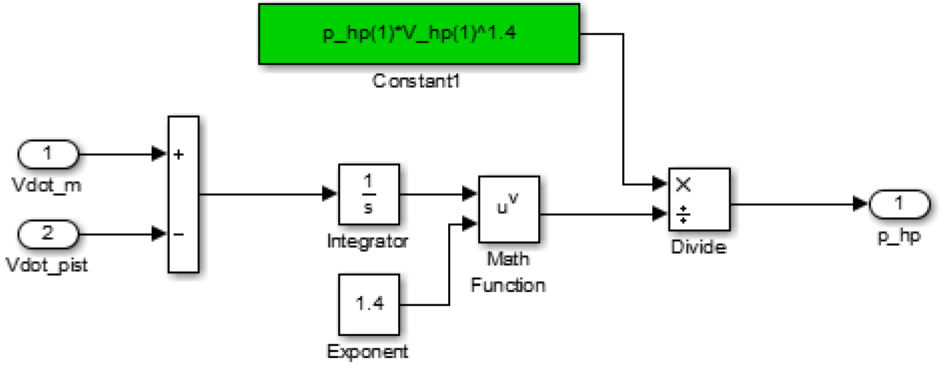
Input and Outputs

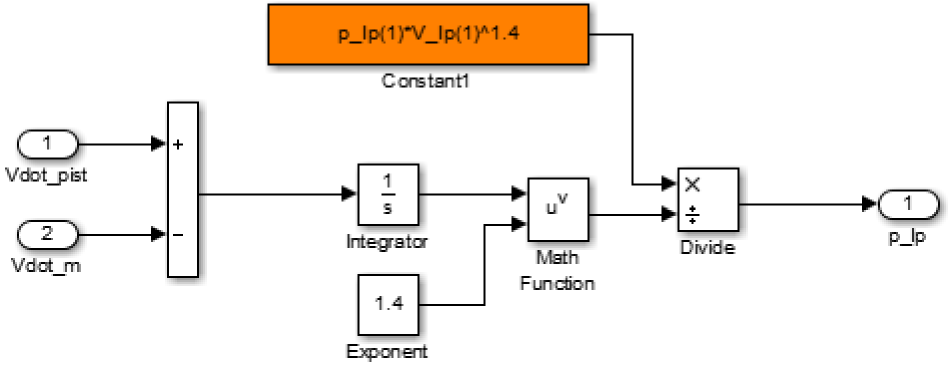


PTO and Control Subsystem for a Hydraulic PTO



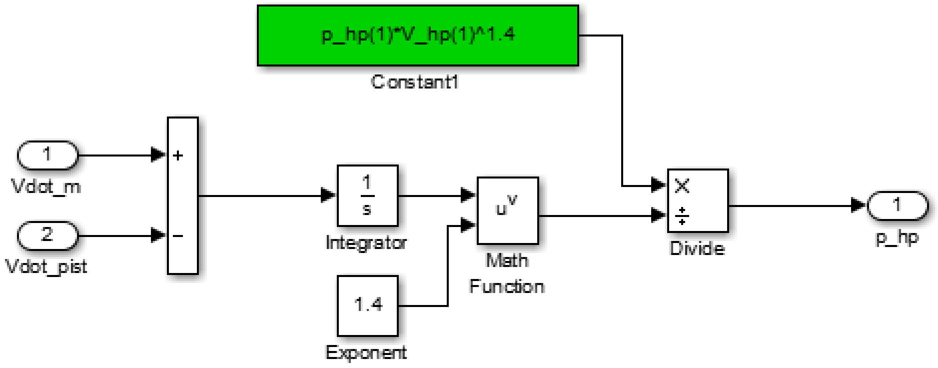
High and Low Pressure Accumulator Subsystems





Formulation

What is the initial condition for the integrator? $\dot{V}_{m,min}$?

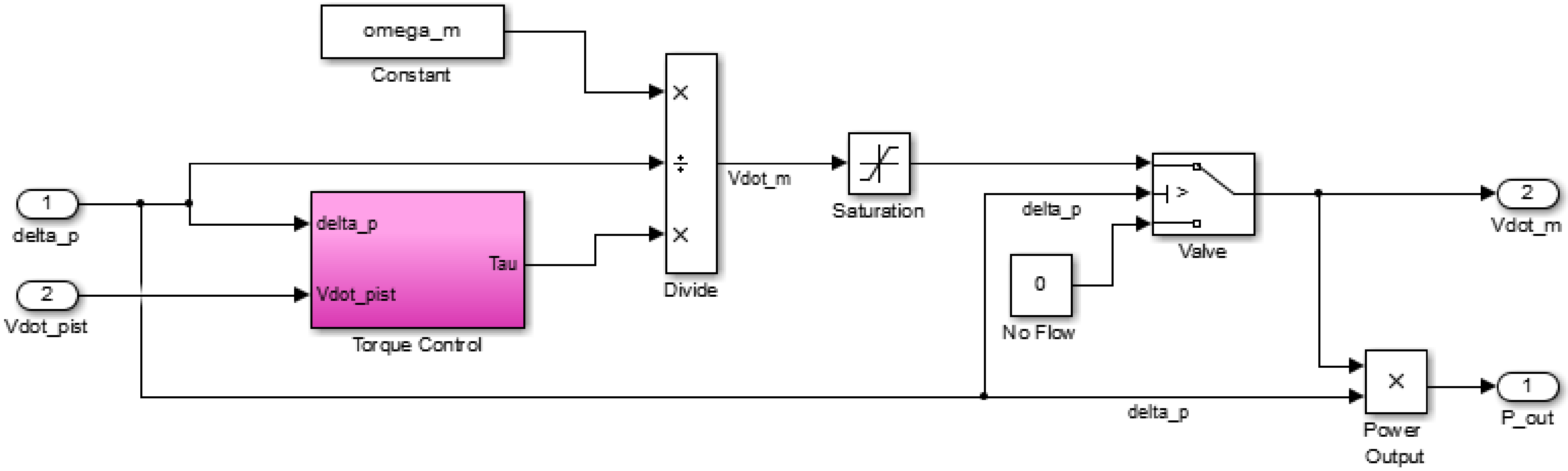


- $\frac{dV_{f,HP}}{dt} = \dot{V}_{HP,in} - \dot{V}_m$
- $\frac{dV_{f,LP}}{dt} = \dot{V}_m - \dot{V}_{LP,out}$
- $\frac{dV_{Ni}}{dt} = -\frac{dV_f}{dt}$
- $P_{Ni}(0)V_{Ni}(0)^{1.4} = P_{Ni}(t)V_{Ni}(t)^{1.4}$

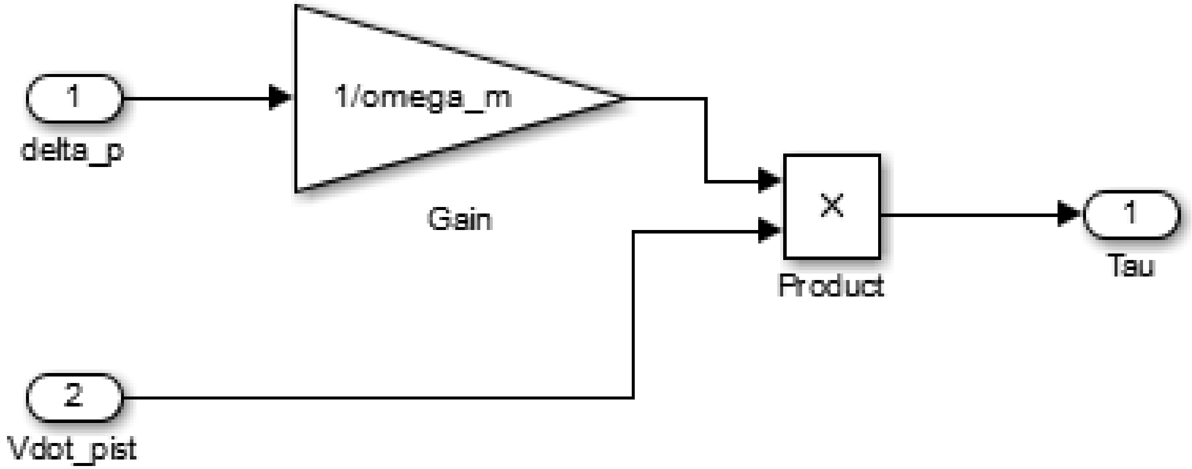
$$V_{Ni,HP}(t) = \int_0^t \left(\dot{V}_m - \dot{V}_{HP,in}\right)dt$$

$$V_{Ni,LP}(t) = \int_0^t \left(\dot{V}_{LP,in} - \dot{V}_m\right)dt$$

Hydraulic Variable Displacement Motor Subsystem



Torque Control



$$\dot{V}_m = \frac{V_g \omega_m}{2\pi}$$

$$\tau_m = \frac{V_g \Delta p}{2\pi}$$

$$\tau_m = \frac{\dot{V}_m \Delta p}{\omega_m}$$

$\tau(\Delta p, \dot{V}_{pist})$

What is the equation for torque in terms of Δp and $\dot{V}_{pist}$?