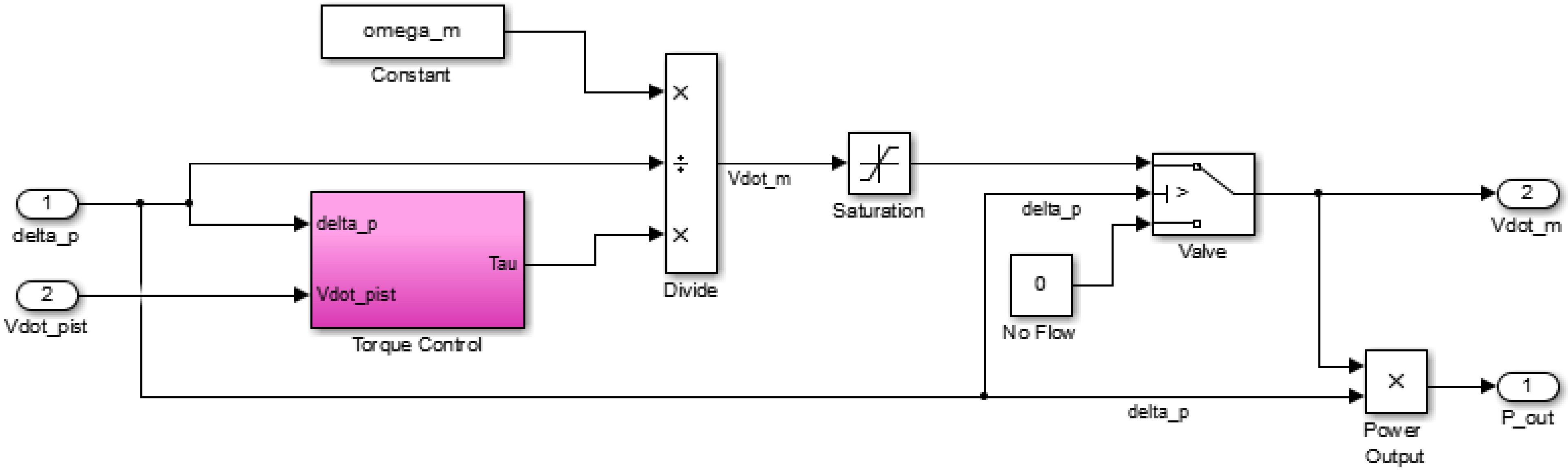
Hydraulic Power Take-Off

Goals for today

- Discussion of Torque Control
- Present the Hydraulic PTO Simulation Results
- Hydraulic PTO with Different Piston Areas
- Questions on Relative Rotary Motion
- Direct-Drive Design
- Next Steps

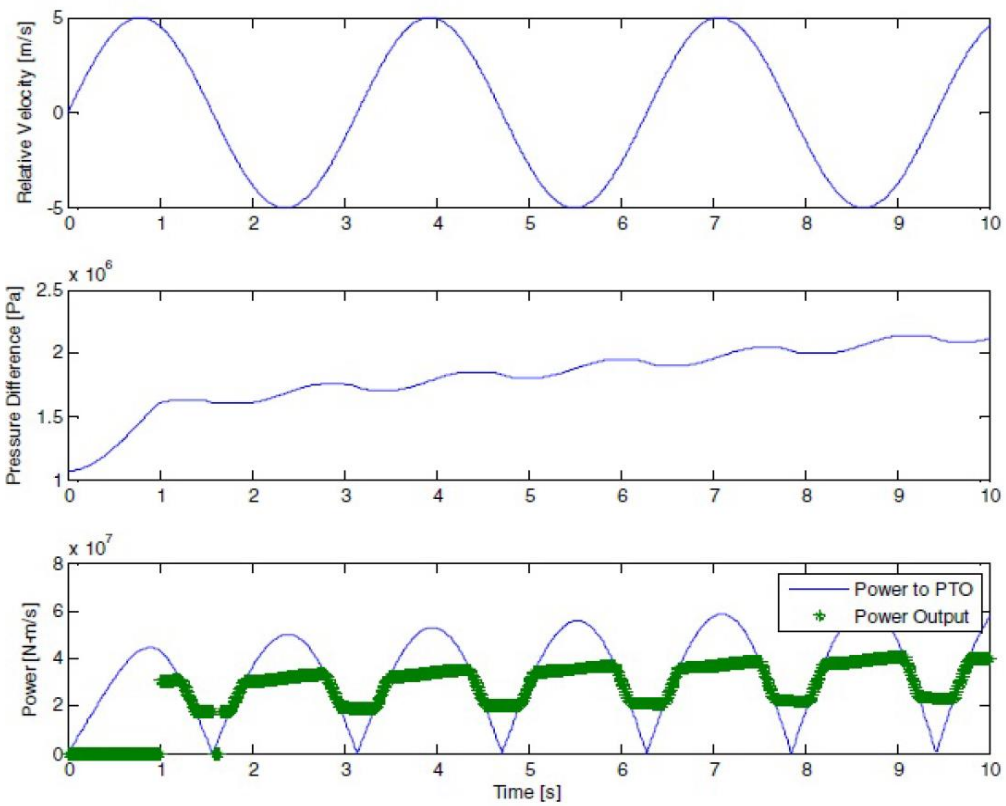
Hydraulic Variable Displacement Motor Subsystem



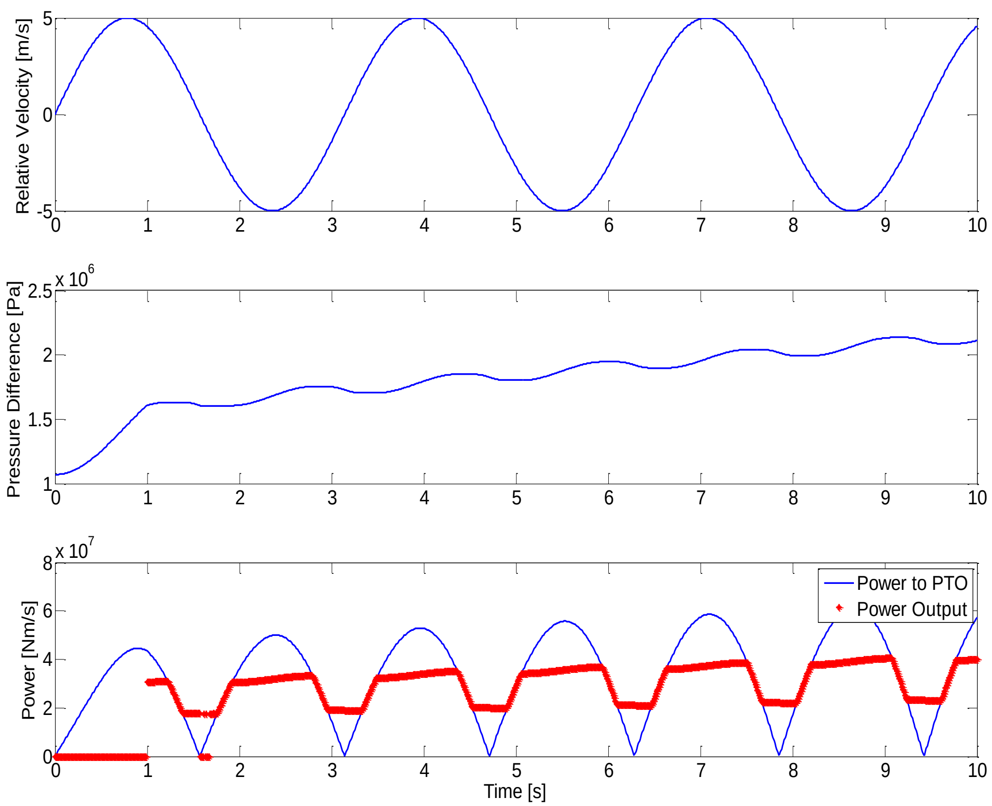
$$\tau = \frac{\dot{V}_{pist}\Delta p}{\omega_m}$$

$$\dot{V}_m = \frac{\tau\omega_m}{\Delta p} = \dot{V}_{pist}, where \qquad \dot{V}_{pist\_min} \le \dot{V}_m \le \dot{V}_{pist\_max}$$

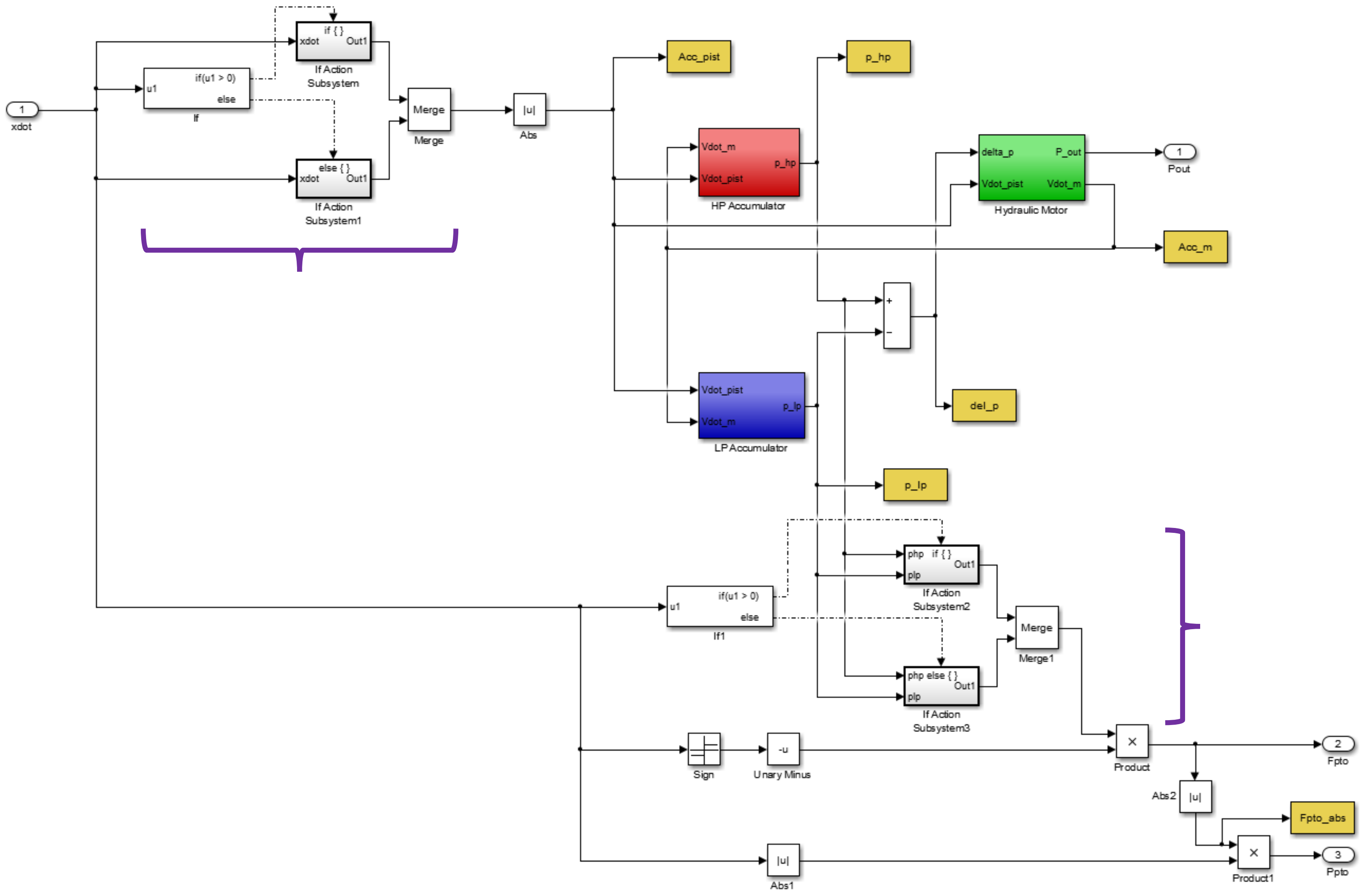
Kelley's Plots

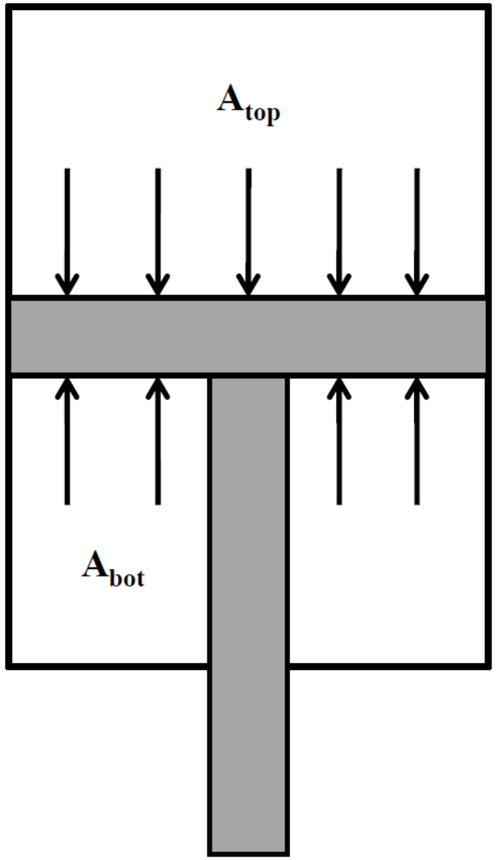


Nak's Plots

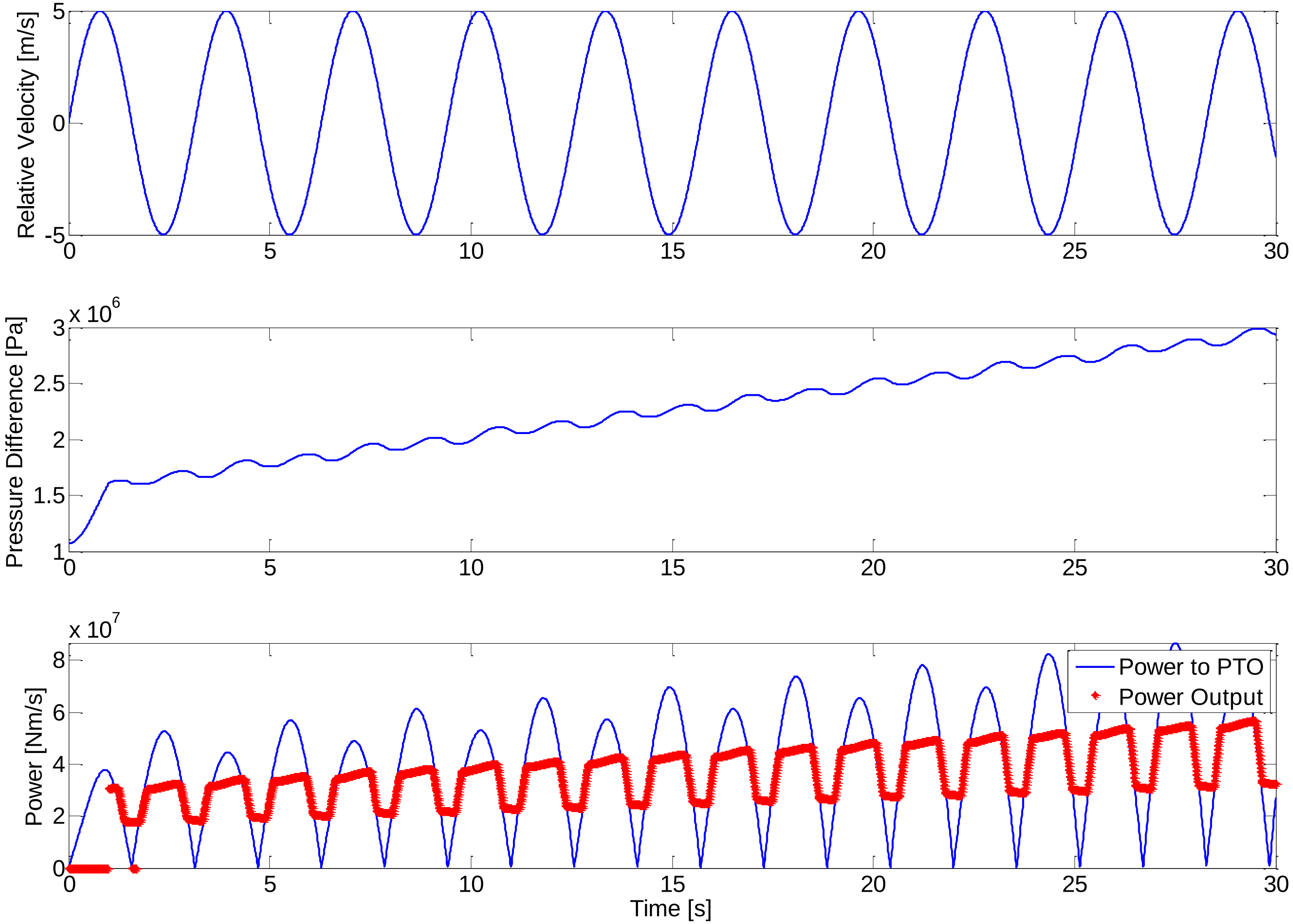


Different Piston Areas

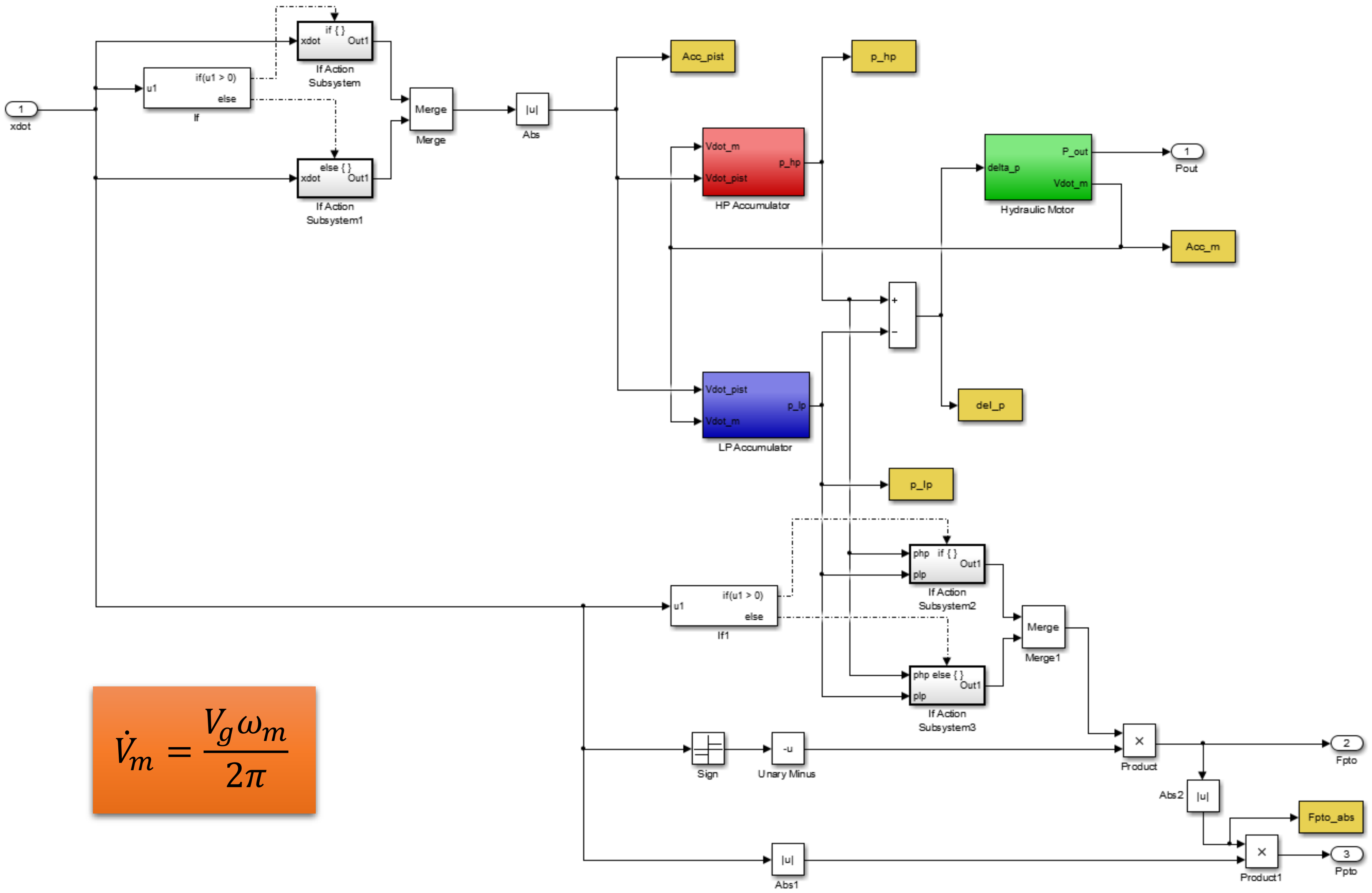




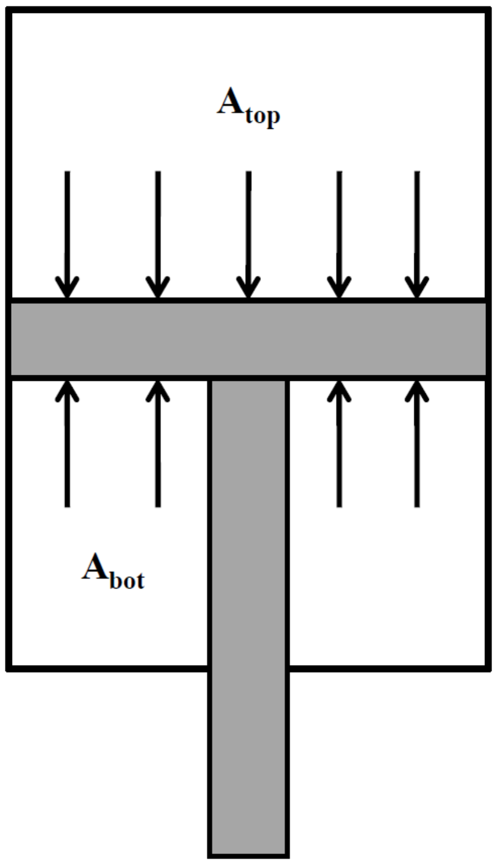
Different Piston Areas (cont.)



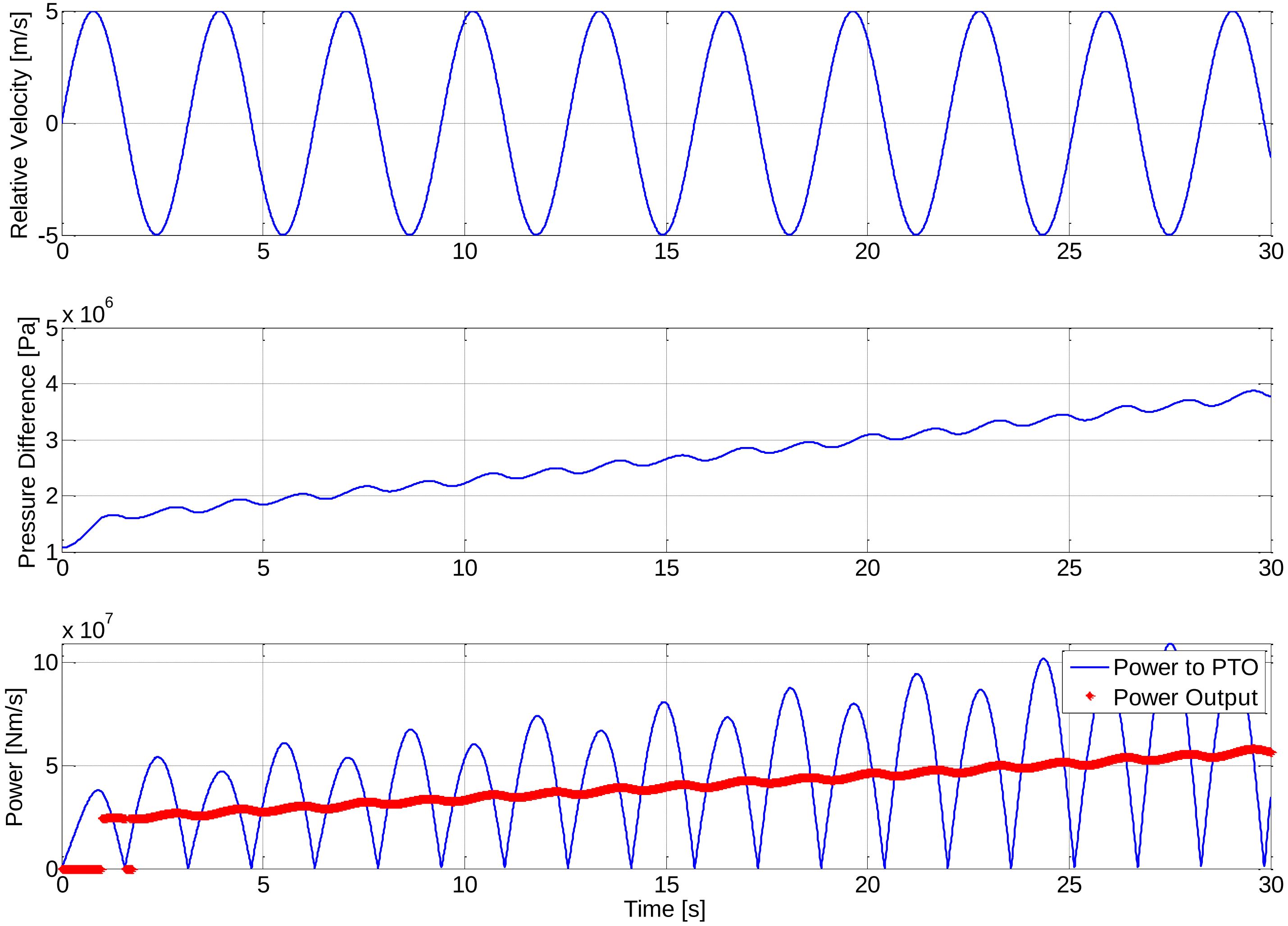
Constant Motor’s Volumetric Flow



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

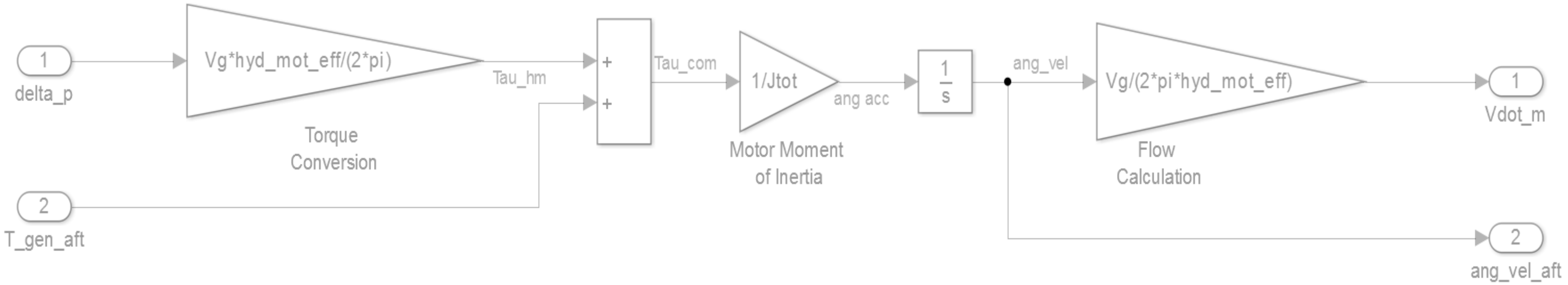


Constant Motor's Volumetric Flow (Cont.)

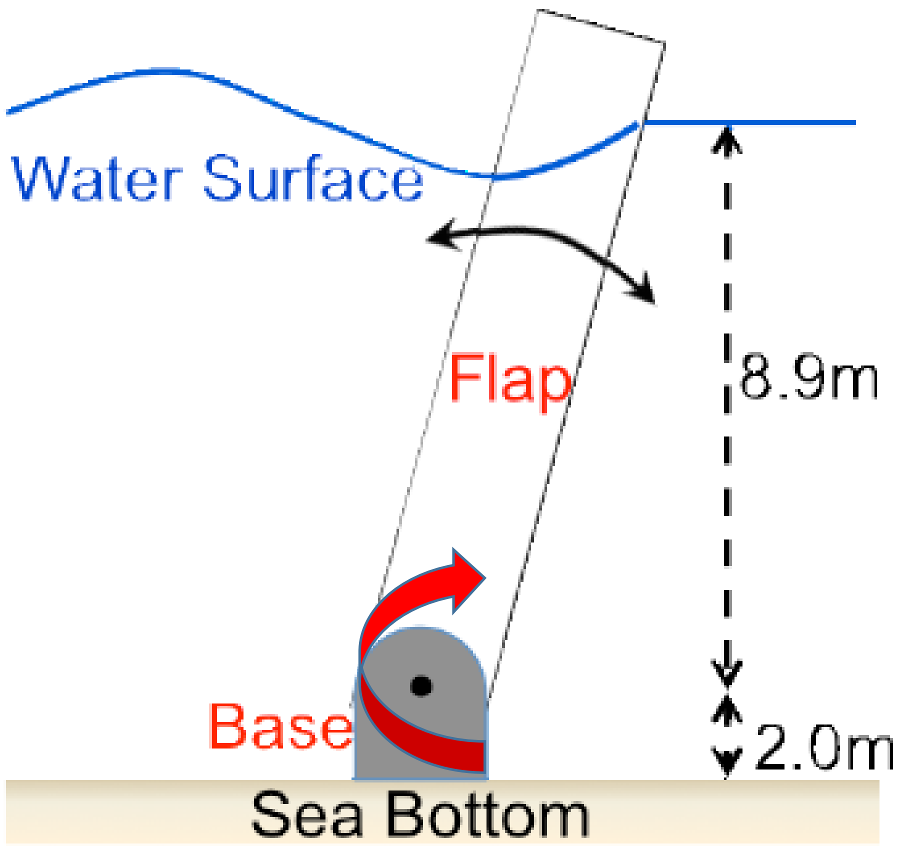


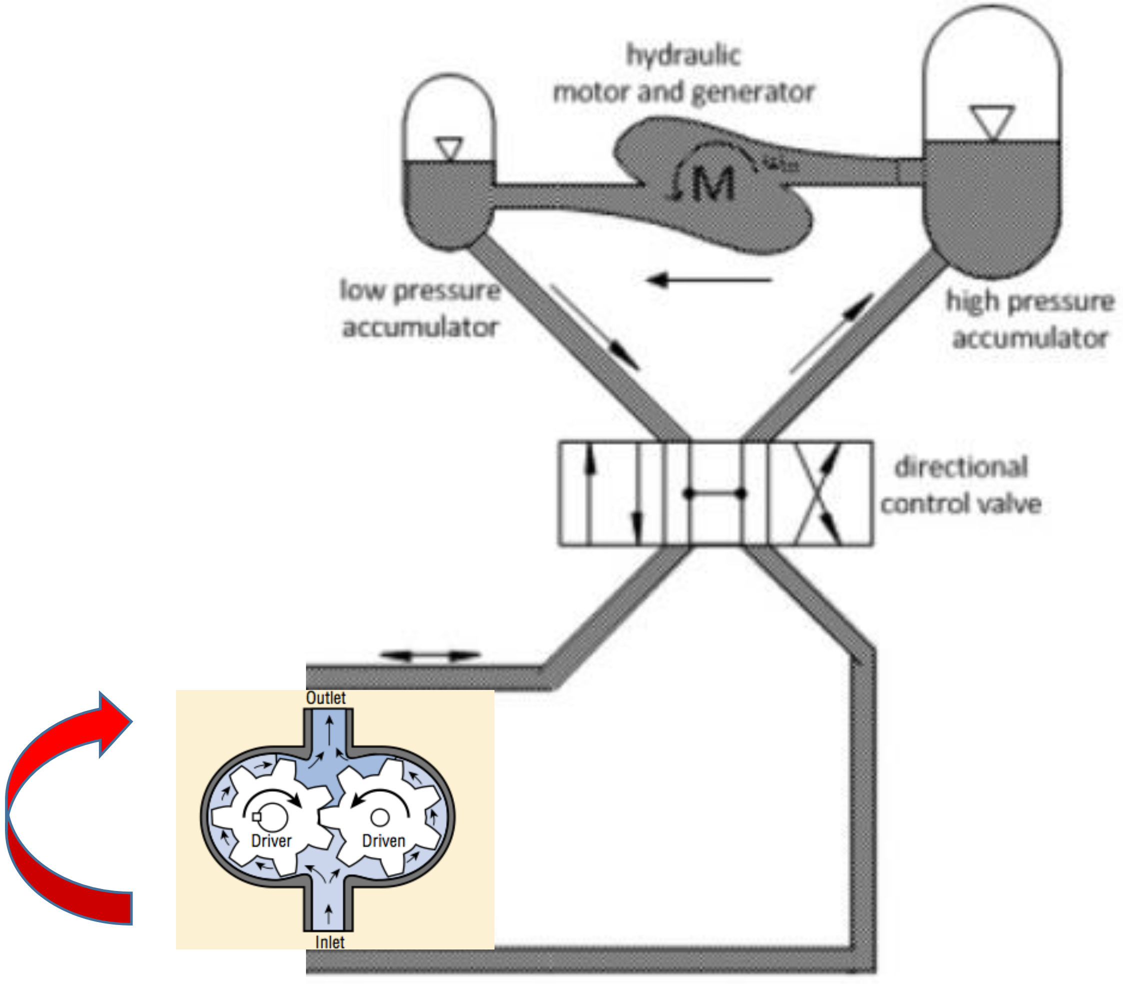
Sam’s Hydraulic PTO For OSWEC

- He used the following:
  - $\tau_{hm}(t) = \frac{V_g \Delta p(t) \eta}{2\pi}$
  - $\tau_{hm}(t) + \tau_{gen\ aft}(t) = \tau_{com}(t)$
  - $\alpha_m(t) = \frac{\tau_{com}(t)}{J_{tot}}$
  - $\omega_m(t) = \int_0^t \alpha_m(\tau) d\tau$
  - $\dot{V}_m(t) = \frac{V_g \omega_m(t)}{2\pi\eta}$

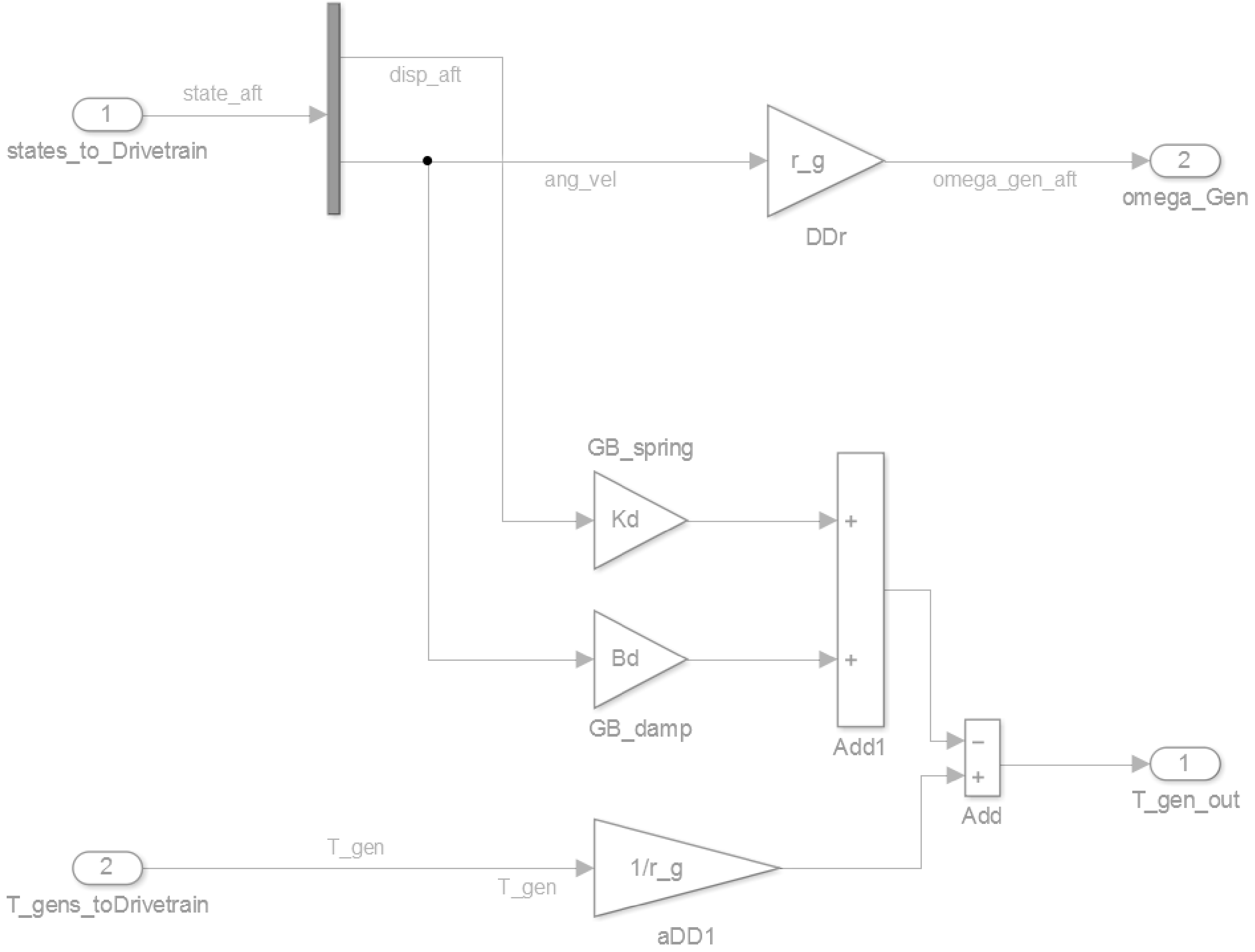


Relative Rotary Motion





Direct-Drive (Sam's Model)



$$\tau = r \times F$$

$$\tau = \|r\| \, \|F\| \, sin\theta$$

I think we should call 'F_toJoint' instead of 'T_gen_out'