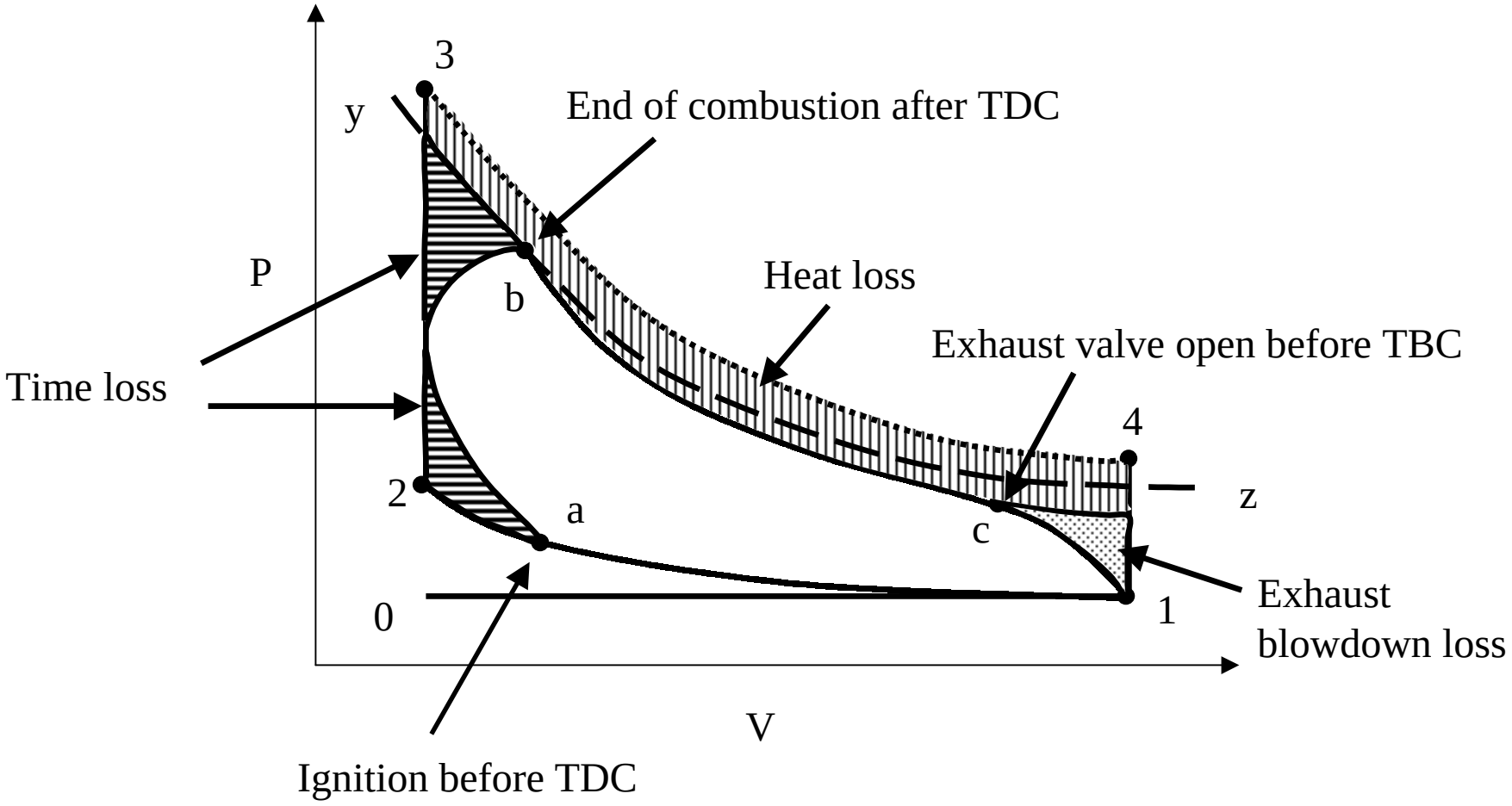
Real Cycle



Ideal Otto 1-2-3-4-1

Real Otto 1-a-b-c-1

Losses

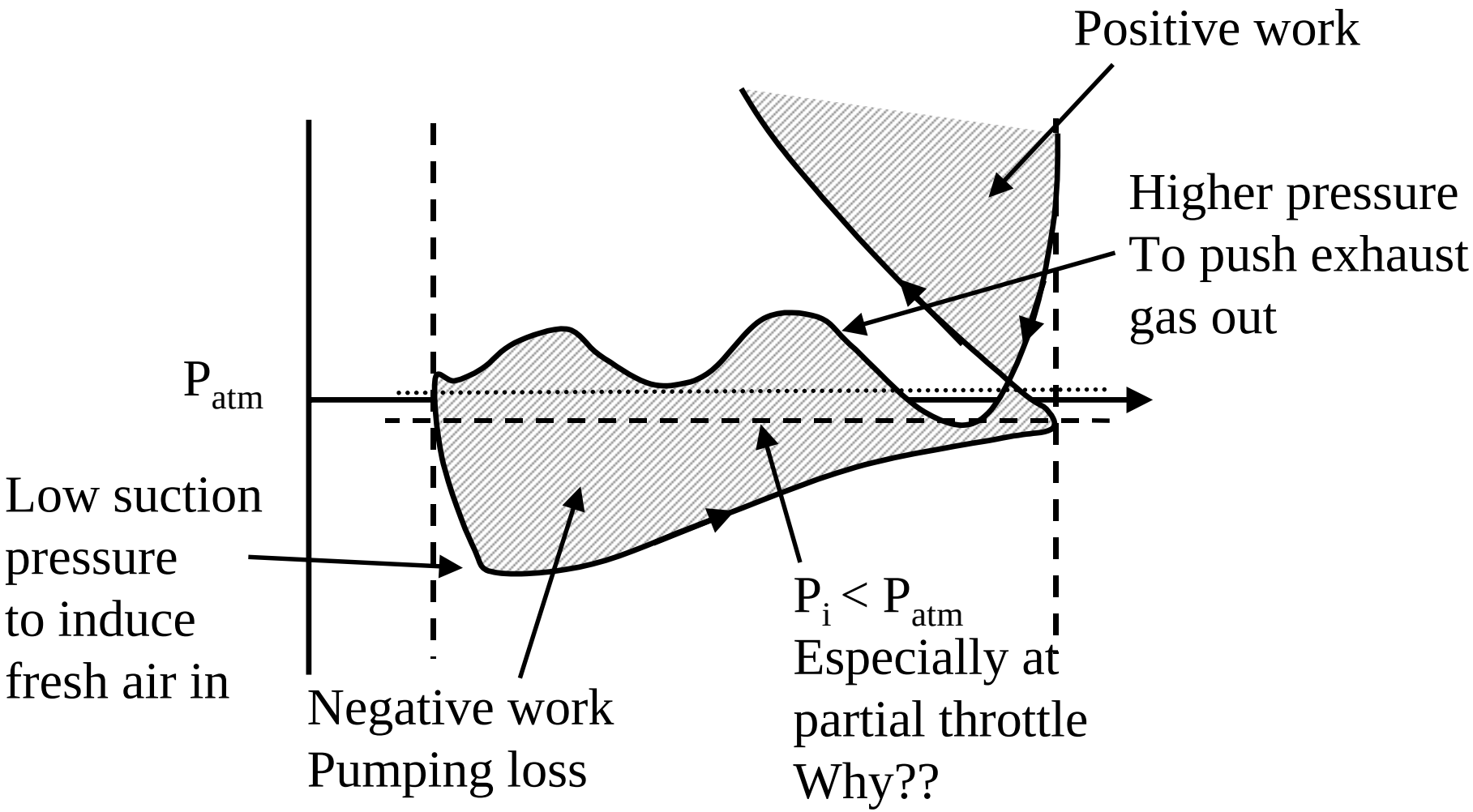
• Time loss: combustion is not an instantaneous process. It takes a finite time for the flame to propagate (time delay). It accounts for 30% of loss (as compared to an ideal cycle).

• Heat loss: heat is losing to walls and valve seats. 60% of loss.

• Exhaust blowdown loss: exhaust valve open (~47º) before TBC. This event associates with an immediate pressure drop and a loss of available work (10%)

• Other losses: pumping losses (important at partial throttle), poor mixing/unburned fuel loss, leakage losses (more severe for an older engine and at lower engine speed)

Pumping loss



Highlighted region during intake and exhaust periods