

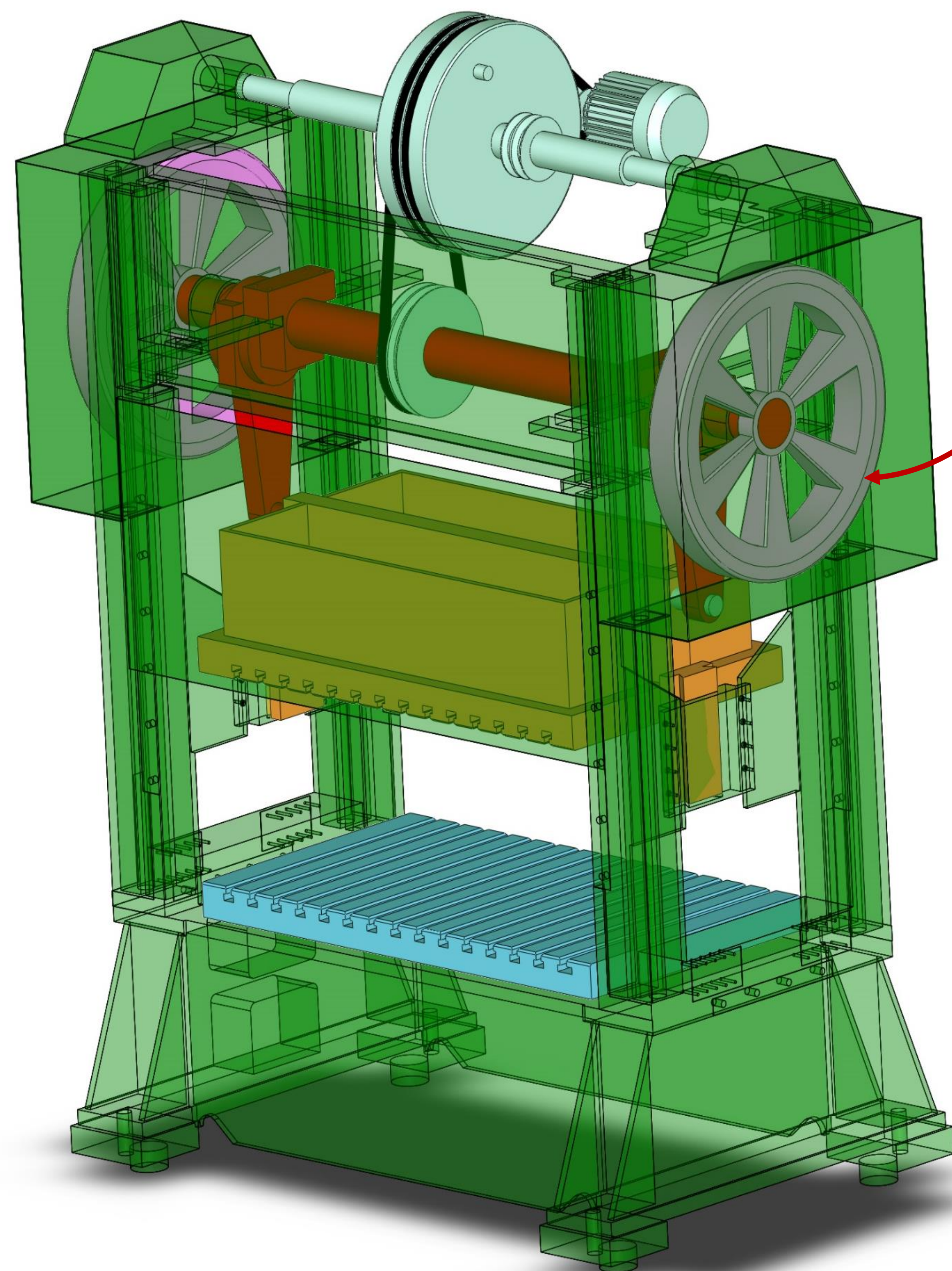
Hardik Hasmukhbhai Viradiya

Advisors: David Myszka, Ph.D & Andrew Murray, Ph.D  
Department of Mechanical & Aerospace Engineering

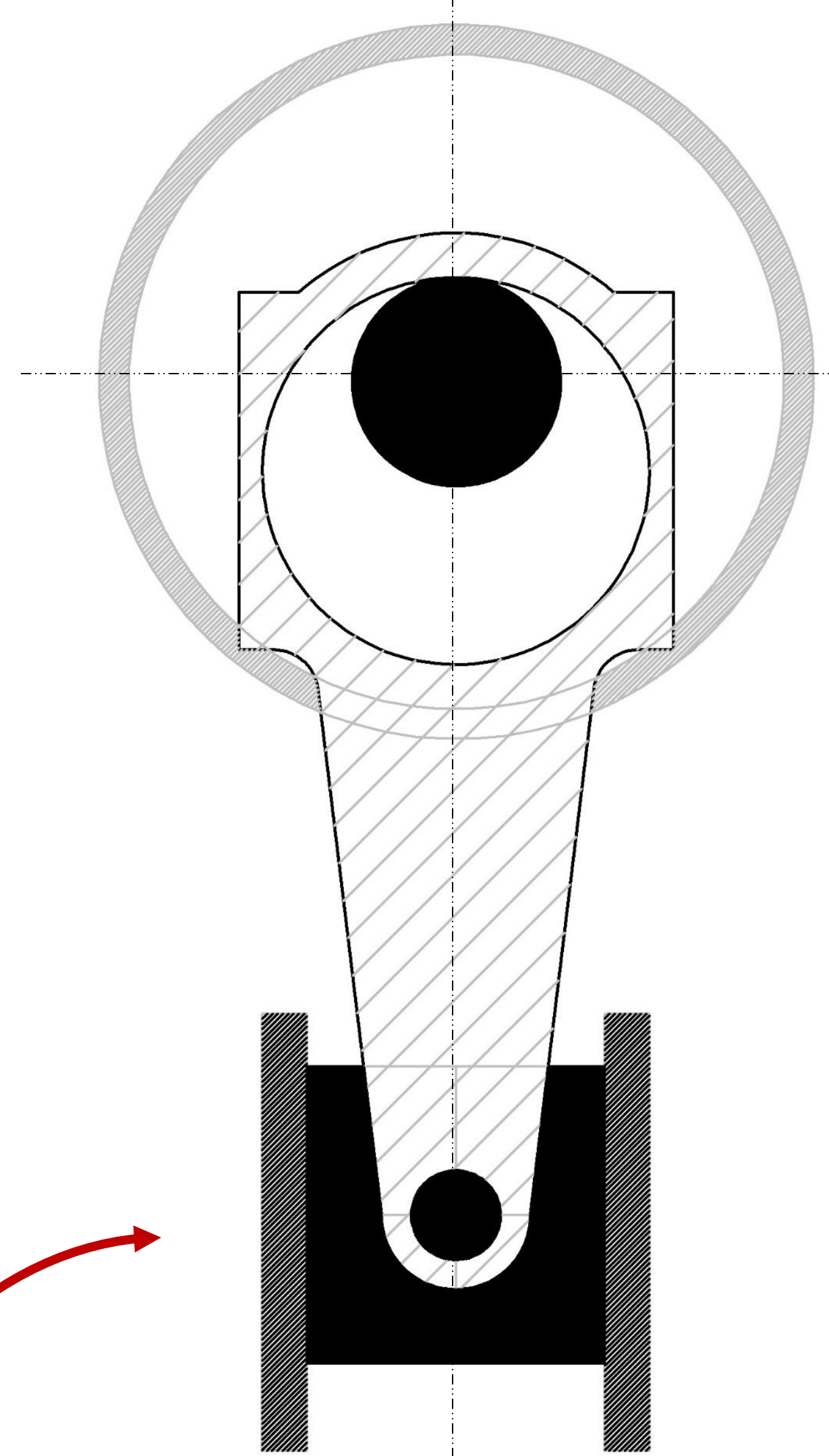
**Objective:** To compare the dynamic characteristics of alternative linkages to understand motor demands, joint loads and efficient design options for a mechanical press.

## Introduction

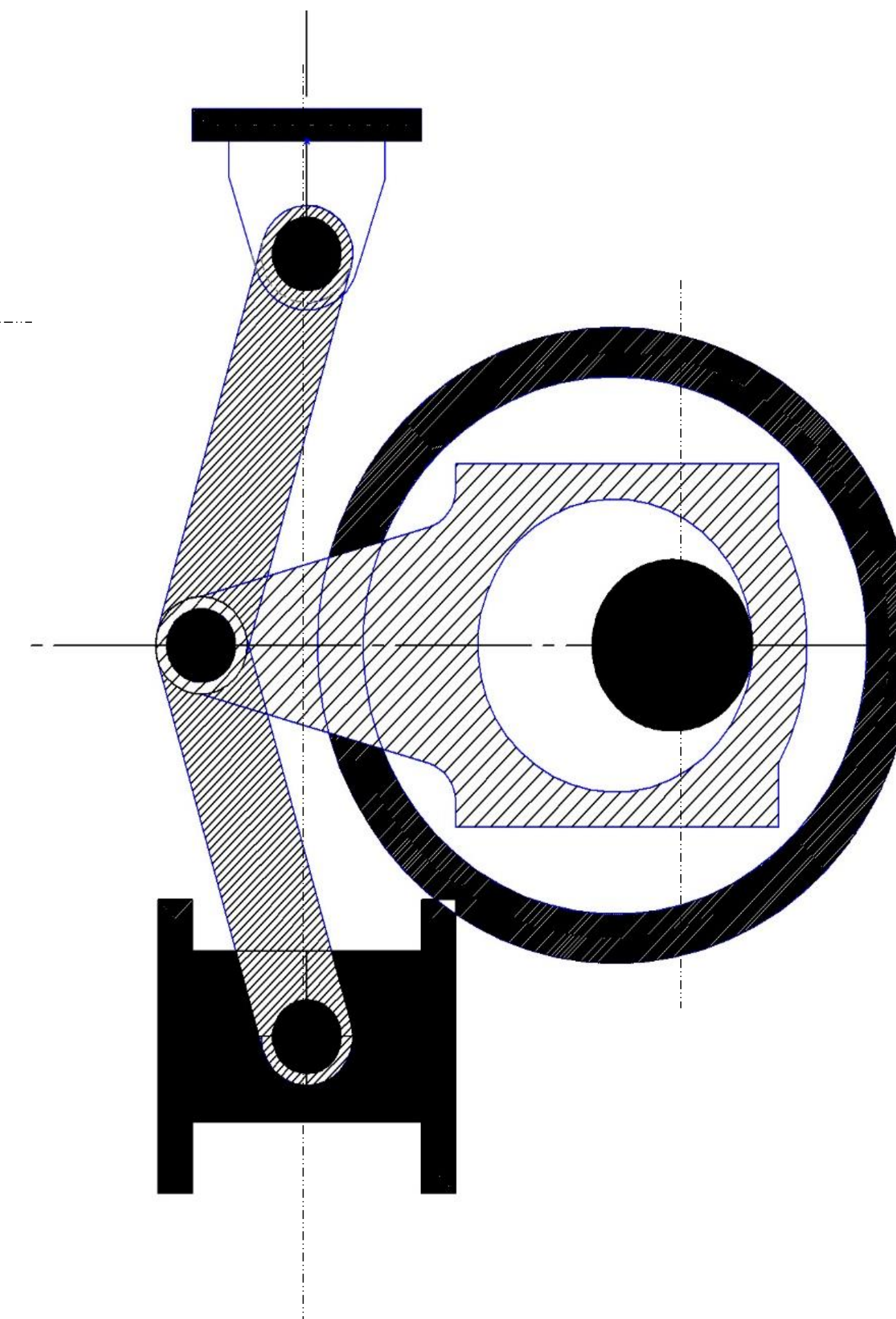
Mechanical presses are the most common machine used in the mass production of sheet metal parts such as a door, a tin can, washers. A conventional press uses a slider-crank linkage and flywheel to provide high energy strike for a short time period but certain operations require long dwell time which can be achieved by various alternative linkages.



### Crank Press

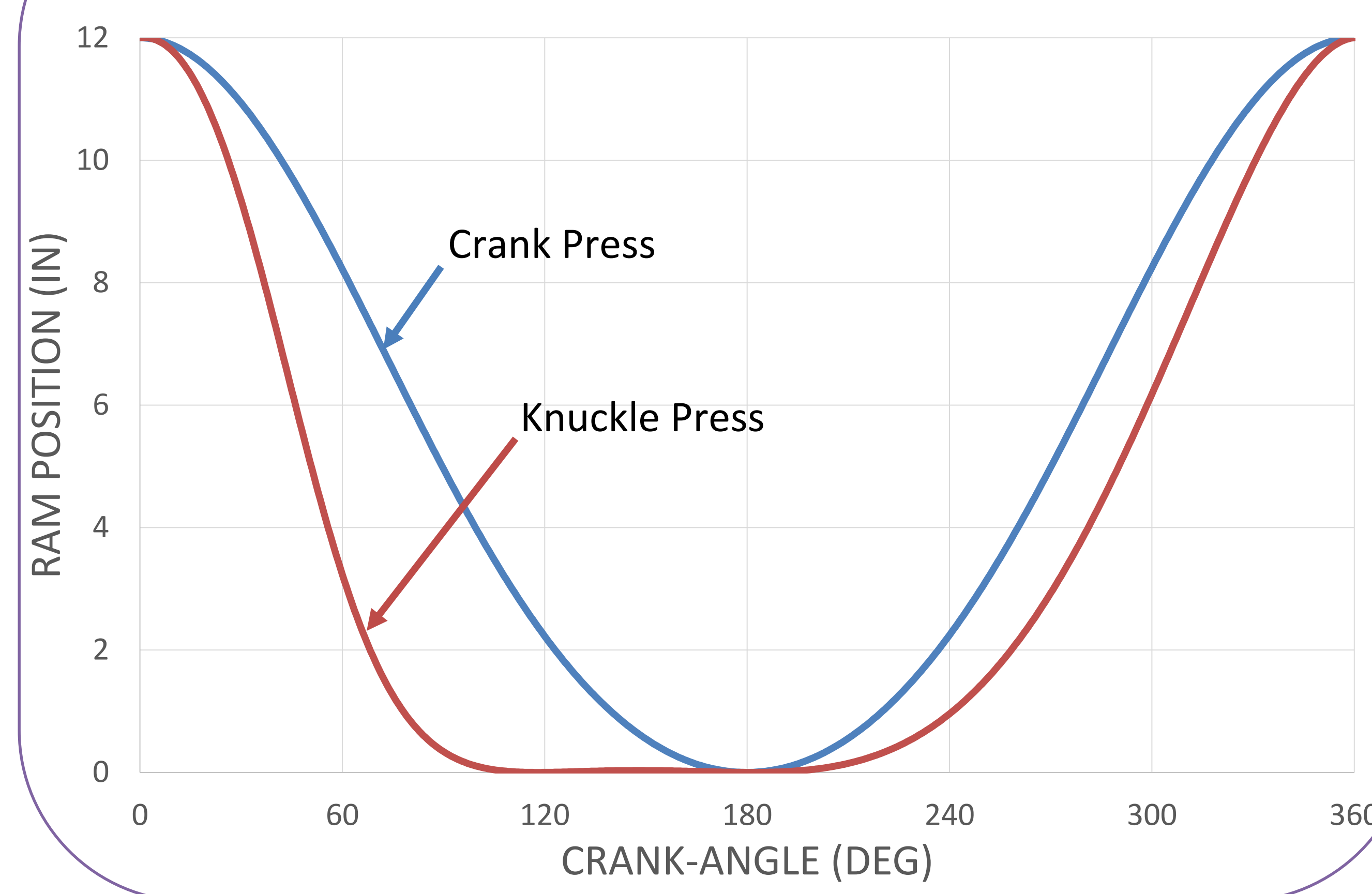


### Knuckle Press



Linkage dimensions for both press styles were designed for a stroke length of 12 in.

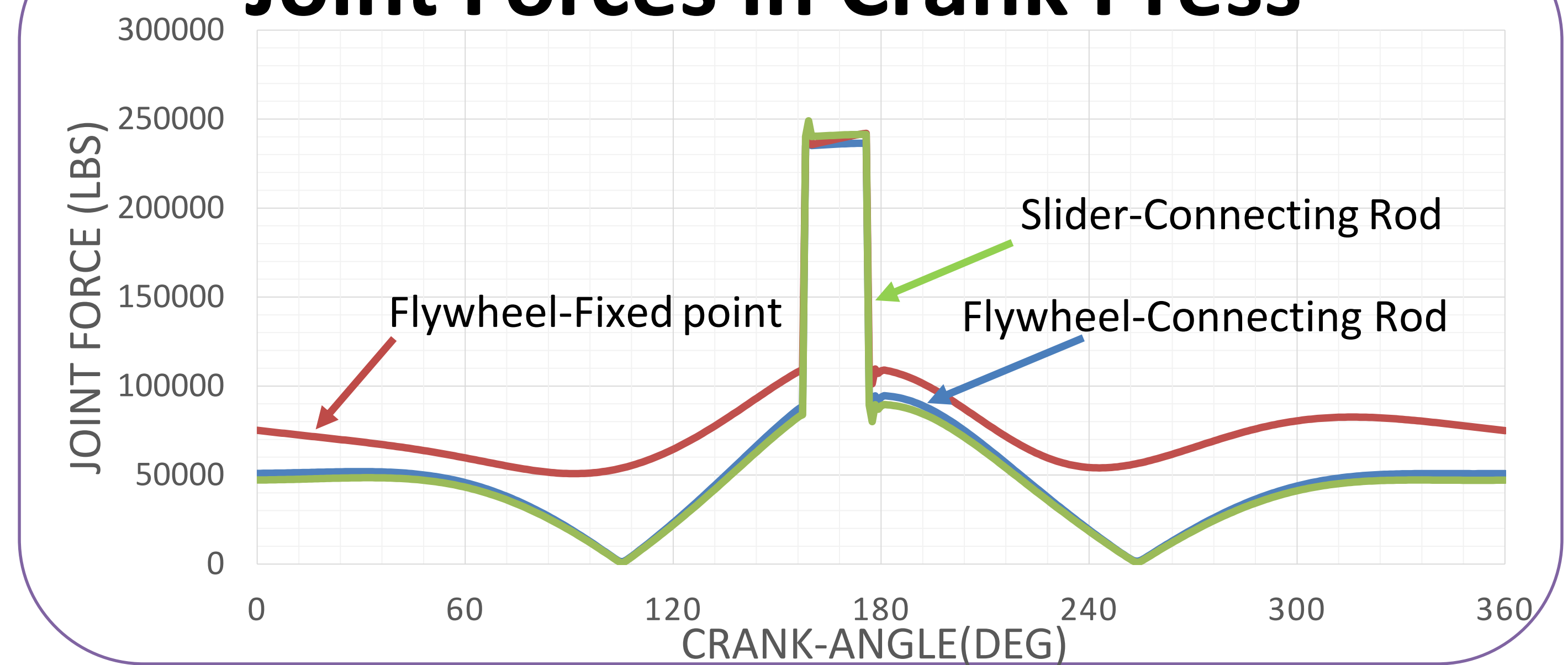
### Stroke curve comparison



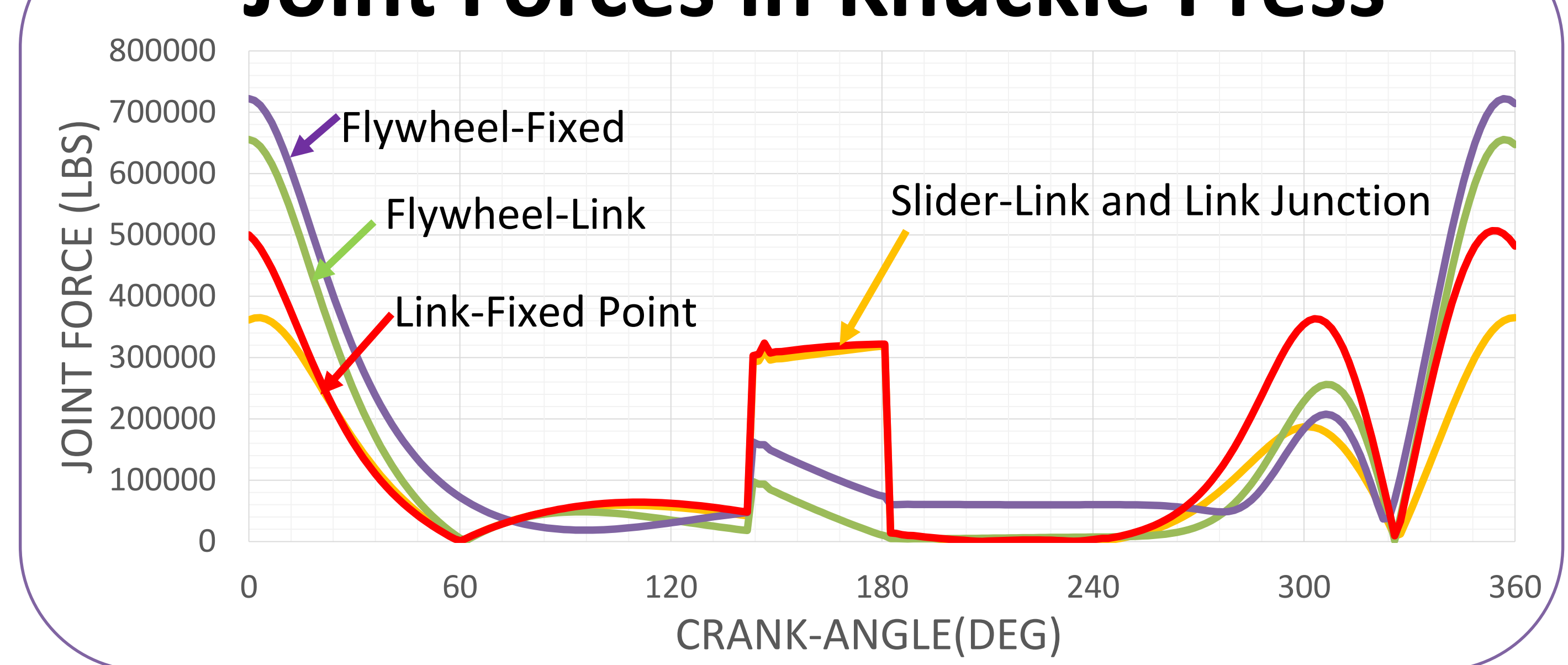
## Simulation

The presses were simulated at 250 punches per minute with a load of 150 tons near the bottom dead center and weight of Ram is 6196 lbs. Flywheels were used such that less than 10% speed fluctuation during the cycle.

### Joint Forces in Crank Press



### Joint Forces in Knuckle Press



**Preliminary Finding:** The knuckle press can produce a long dwell, but exhibits large joint forces due to high accelerations during the non-dwell portion of the cycle.