In this project, the spark ignition timing is 26°BTDC. We made two clips to investigate flame propagation from 26° to 8°BTDC.

**clip between two valves:**

- **clip with spark ignition point (6.68cm above piston at BTDC):**

In our simulation above, we can clearly see the flame propagation and end-gas formation, so it’s an ideal model to investigate knock onset problems.

**clip with spark ignition point (6.68cm above piston at BTDC):**

In some conditions, HO2 is part of a chain propagating path. These two sequences of reactions above are very exothermic. Hence they can affect the temperature of a system and move the system into an explosive regime. That’s why the accumulation of HO2 can predict auto-ignition.

**Future work:**
1. validate numerical simulation with experimental data.
2. validate the method for predicting knock onset in real engine case.
3. develop test matrix for octane requirement studies and simulate the matrix conditions.