Space Propulsion – POLIMI

Flipped class on SRM internal ballistics

The Bayern Chemie method (BC)

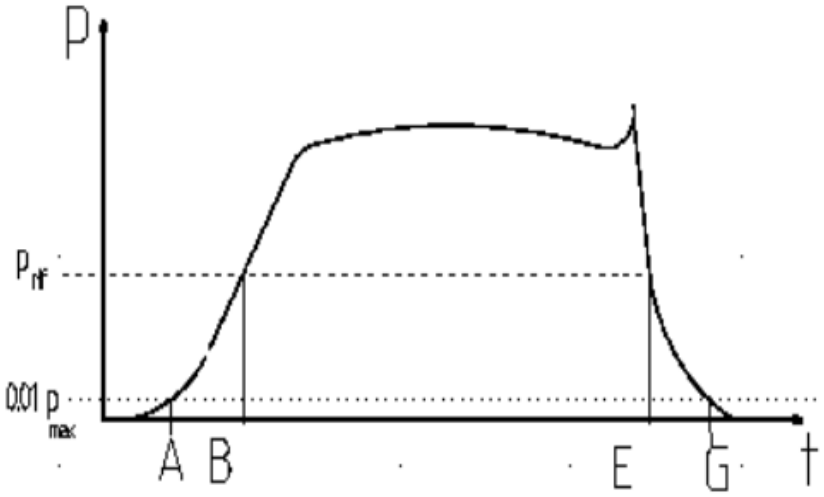

Figure 1: Pressure trace with BC pressure/time markers

The instants of time that identify SRM action are identified by the letters A and G. They represent the instant of time when the pressure trace crosses the 1% of the maximum pressure. During ignition transients and extinguishment. For ignition, in case of oscillatory behavior the instant of time is selected in the last upwards pressure change, just before to the steady state operations.

Once points A and G are identified, the integral in Eq. 1 should be computed.

$$I_1 = \frac{\int_{t_A}^{t_G} p\,dt}{2} \tag{1}$$

The reference pressure is identified by Eq. 2.

$$p_{ref} = \frac{I_1}{t_G - t_A} \tag{2}$$

The effective burning time is identified by the instants in which the pressure trace crosses the reference pressure. The respective letters are B and E. ($t_{burn} = t_E - t_B$).

Now, the effective pressure is computed in Eq. 3.

$$p_{eff} = \frac{\int_{t_B}^{t_E} p\,dt}{t_{burn}} \tag{3}$$

The burning rate is identified by $r_b = web/t_{burn}$.