The courses of the combustion pressure have been presented in Fig. 6. Due to a variable fuel atomization, the forced ignition (in the same moment) of the fuel results in different combustion courses. The courses were related to the time axis and not to the crankshaft angle because the RCM is not equipped with any crankshaft system typical for the conventional IC-engine.

The maximum cylinder pressures are similar (between the injection pressure 5 MPa and 10 MPa the maximum difference of Pcyl-max is 0.6 bar). As no significant differences were recorded in the pressure course the outstanding thermodynamic parameters of the cycles were determined: the time of the occurrence of the maximum combustion pressure (Pmax), the rate of pressure increment after the injection (dP/dt) and the times of its occurrence t-Pmax and t-dP-dt respectively (Fig. 7).

The time after which the maximum combustion pressure occurs (taken from the onset of the injection) is slightly reduced as the injection pressure grows. The maximum difference between the moments of occurrence of the maximum combustion pressure at the injection pressure of 5 MPa and 20 MPa amounts to 1.2 ms. This denotes an acceleration of the course of the combustion. This opinion is confirmed by the rate of pressure increment after the ignition (dP/dt). In the first case it is 7.55 bar/ms and at the injection pressure of 20 MPa it grows to the value of 11.67 bar/ms. This indicates the increase in the combustion rate, which is caused by the quality of the fuel atomization. The moment of occurrence of the maximum pressure $(dP/dt)_{max}$ is also reduced and amounts to 1.4 ms (between the extremes).

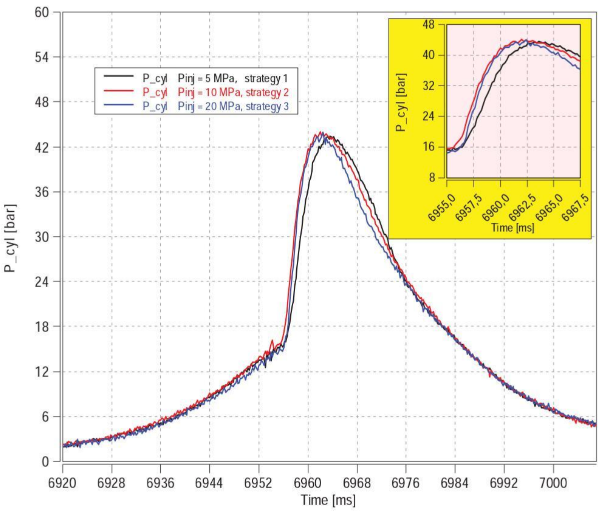

Fig. 6. The influence of the fuel injection pressure on the course of the combustion in a Rapid Compression Machine including the course of the heat release (corner)

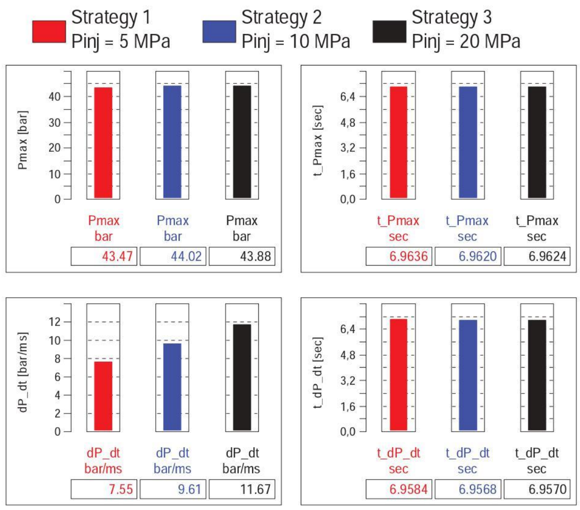

Fig. 7. The values of the indexes of the course of the combustion with no fuel dose division

A low pressure of the injected fuel results in certain thermodynamic consequences. The lack of fuel dose division results in that the maximum combustion temperature is obtained at the lowest fuel injection pressure (Fig. 8). Such a course of combustion is caused by poor fuel atomization and its high concentration around the spark plug. During the analysis it should be remembered that the values of the average temperature of the charge, not the local flame temperature are presented in Fig. 8. The determining of the flame temperature is possible with the use of optical methods.

The changes in the injection pressure (P_{inj} = 5, 10 and 20 MPa) result in small changes in the maximum temperatures of the charge (average in the cylinder). The analysis of the released heat (Fig. 9) indicates similar course of combustion (Fig. 6) for different fuel injection pressures. This is confirmed by both the course of pressure in the cylinder and the rate of heat release. Similar results were obtained for the used heat Q_i of the value of 190 kJ/ms (the maximum values were