

Sir Ricardo's Description of Combustion in Diesel Engines

Quote from a lecture on diesel combustion by Sir Harry Ricardo ¹(1885 – 1974), a great combustion pioneer, whose research establishment in Britain is still at the forefront of engine technology:

“I am going to take the rather unconventional course of asking you to accompany me, in imagination, inside the cylinder of a diesel engine. Let us imagine ourselves seated comfortably on the top of the piston, at or near the end of the compression stroke. We are in complete darkness, the atmosphere is a trifle oppressive, for the shade temperature is well over 500 celsius - almost a dull red heat - and the density of the air is such that the contents of an average sitting-room would weigh about a ton; also it is very draughty, in fact, the draught is such that, in reality, we should be blown off our perch and hurled about like autumn leaves in a gale. Suddenly, above our heads, a valve opens and a rainstorm of fuel begins to descend. I have called it a rainstorm, but the velocity of droplets approaches much more nearly that of rifle bullets than of raindrops.

For a while nothing startling happens, the rain continues to fall, the darkness remains intense. Then suddenly, away to our right perhaps, a brilliant gleam of light appears, moving swiftly and purposefully; in an instant this is followed by a myriad others all around us, some large and some small, until on all sides of us the space is filled with a merry blaze of moving lights; from time to time the smaller lights wink and go out, while the larger ones develop fiery tails like comets; occasionally these strike the walls, but, being surrounded by an envelope of burning vapour, they merely bounce off like drops of water spilt on a red hot plate. Right overhead all is darkness still, the rainstorm continues, and the heat is becoming intense; and now we shall notice that a change is taking place. Many of the smaller lights around us have gone out, but new ones are beginning to appear, more overhead, and to form themselves into definite streams shooting rapidly downwards or outwards from the direction of the injector nozzles.

Looking round again we see that the lights around are growing yellower; they no longer move in a definite direction, but appear to be drifting listlessly hither and thither; here and there they are crowding together in dense nebulae, and these are burning now with a sickly, smoky flame, half suffocated for want of

¹ Sir Harry Ricardo, Information on the prominent British Engineer:
<http://www.ricardo.com/index.htm?pages/history.htm>

oxygen. Now we are attracted by a dazzle, and looking up we see that what at first was cold rain falling through utter darkness, has given place to a cascade of fire as from a rocket. For a little while this continues, then ceases abruptly as the fuel valve closes. Above and all around us are still some lingering fire balls, now trailing long tails of sparks and smoke and wandering aimlessly in search of the last dregs of oxygen which will consume them finally and set their souls at rest. If so, well and good; if not, some unromantic engineer outside will merely grumble that the exhaust is dirty and will set the fuel valve to close a trifle earlier.

So ends the scene, or rather my conception of the scene, and I will ask you to realise that what has taken me nearly five minutes to describe may all be enacted in one five hundredth of a second or even less”.