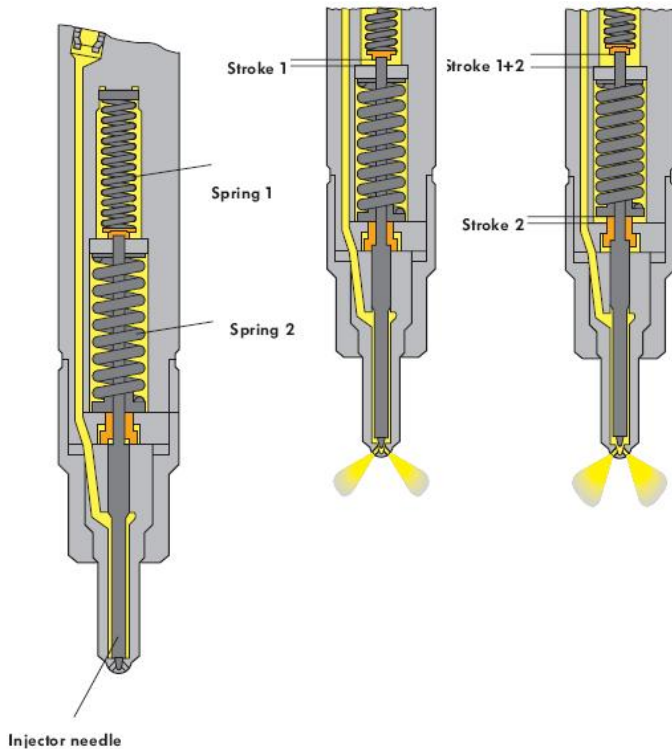


Mapping Injector Performance

Nozzle Opening Pressure (NOP2) cannot be detected by measuring only pressure or only flow. Similarly injected delivery alone does not give an indication of NOP2. The 2 Stagemaster measures flow over a range or pressures to establish a true Nozzle Opening Pressure (NOP2) value. We also are able to measure injected flow at the first stage and needle lift to confirm the actual change in nozzle flow rate.

Understanding The Results.

The results from the injector Map need to be plotted to provide a curve similar to the in the figure. From this the test plan parameters are derived.



Two Stage Injector Calibration

When I first started working with diesel engines fitted to cars, the breaking pressure (squirting pressure) of the injector was 115 Bar(1690PSI). Due to further development it was found that by increasing the injector pressure, and by altering various engine components and design, the engines would be more powerful and produce less emissions. The breaking pressure of the injector went up to 280 Bar(4116PSI). These 'conventional' injectors basically just squirted a measured amount of fuel into the cylinder and a further reduction of emissions became difficult so the 'Two Stage Injector' was developed.

The idea of the Two Stage Injector is to release a measured amount of fuel into the cylinder over a longer period and at a higher pressure, from 190 Bar (2 800 PSI) to about 400 Bar (5 880 PSI). The result of this greatly reduces the "Diesel Knock" formerly associated with earlier diesel engines. Two stage injectors require multiple steps to insure that both injection events occur within a very narrow window of pressure.