Our services –
tailored to your requirements

- Determination of testing goals, analytics before and after test
- Definition of fuels, additives and injectors to be tested, the abortion criteria and the testing times between 50 and 1,000 h
- If requested: Sourcing of (special) fuels, fuel blends and additives
- Specification of the variable operation conditions, such as fuel temperature, injector temperature, injection frequency, rail pressure
- Performing the test under the conditions agreed upon, fuel analytics during testing, either applying standard or special analytics, written report
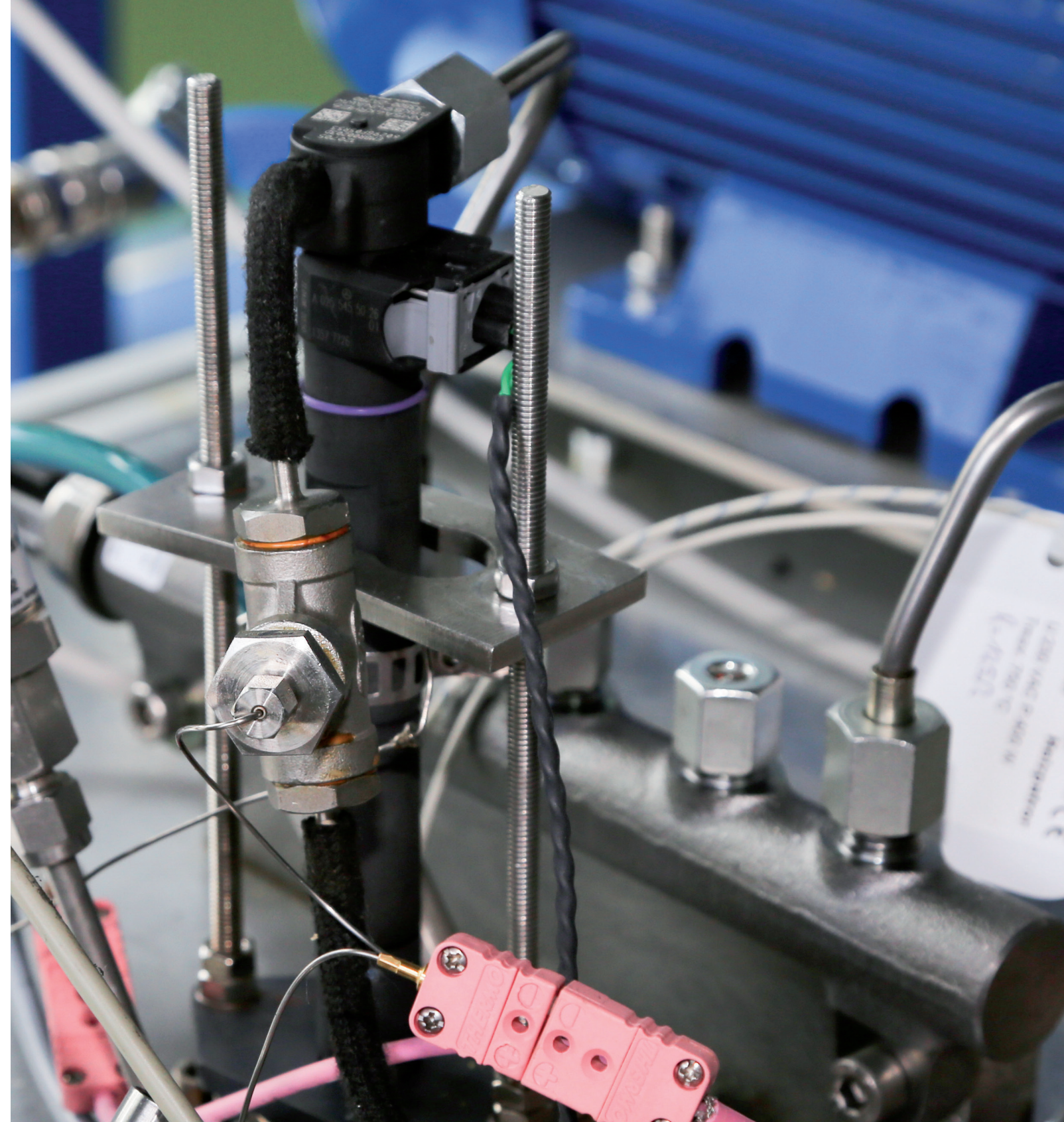
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ENIAK
Fouling test for diesel fuel injectors

Benchmark for injectors.
Testing of fuels and additives.

# New test method offers significantly lower costs and benefit in testing time

The injection systems of modern diesel engines are highly and increasingly sophisticated. The occurrence of deposits within the injectors (Internal Diesel Injector Deposits, IDID) can have a negative impact on the function of the injectors. The engine tests XUD9 and DW10 are commonly used to evaluate fuels and additives regarding their capability to prevent injector fouling. They are, however, either obsolete (XUD9) or expensive (DW10). TEC4FUELS GmbH offers a newly developed non-engine "Hardware-in-the-loop (HiL)" test, which features state-of-the-art technology while keeping the expenses low.

Flexible application

The test is capable of fouling injectors with IDID within 200 h, which would in everyday engine operation require several 10,000 km. These artificially fouled injectors can be used by manufacturers of engines, injectors, fuels and additives for the development of prevention strategies, for example change in the engine management or the additisation of fuels. The injector test is applicable as development tool, for instance as fit for purpose test with the following options:

- Testing of injectors of all common types, e.g. new against old, or specific injector series
- Testing of special fuels, fuel blends and additives, also as benchmark, e.g. new formulation against reference formulation of fuels in the market
- Testing of freely selectable operating points (e.g. individually defined temperatures and injection pressures) which are partly not feasible in engine tests

Comparative injector test with IDID:

Injection rate vs **time t in ms**

Drive Current

before
after
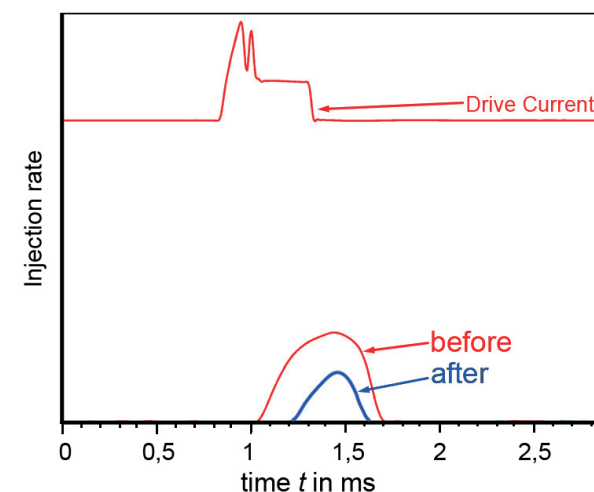
The opening time of an injector fouled by IDID is clearly reduced, so that after the test only approx. 60% of the usual opening time and injected fuel amount are achieved.

Comparative injector test with EDID:

Injection rate vs **time t in ms**

Drive Current

before
after
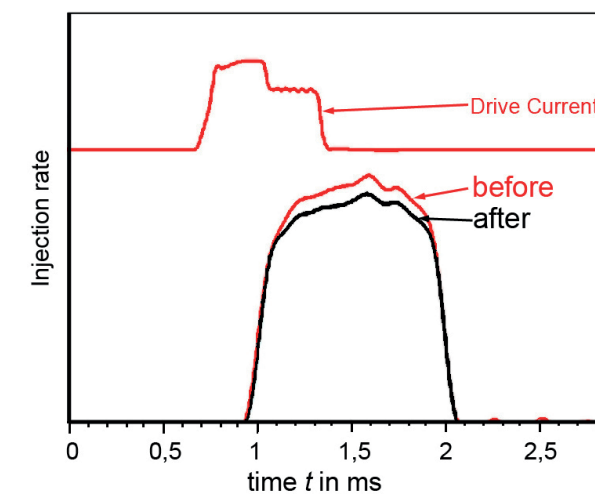
The injector's internal function after the test is spotless, but the nozzle holes are partially blocked from the outside.
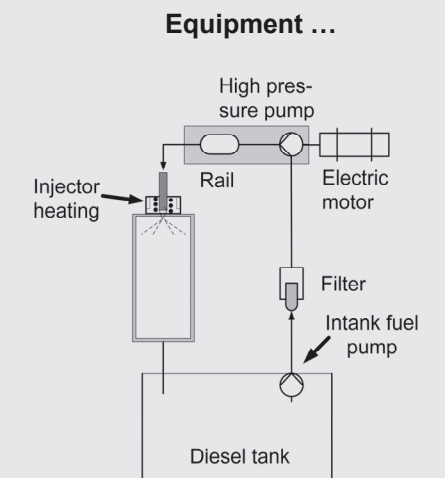
Benefits of the injector tests

- Cost efficient in comparison with the DW10 test due to simple test bench infrastructure and low fuel consumption thanks to the negligence of combustion
- Time-saving: HiL-test procedure enables simulations and significant results within 200 h due to forced testing conditions
- Flexible integration of different common-rail components
- Adaption of the test rig tailored to the customer's needs and variable testing injection conditions

Rapid and money-saving test method

Four complete, independent EURO V and VI common rail systems can be operated simultaneously. The test rig allows a flexible integration of different common-rail systems. The presence of four separate systems on the test rig allows multiple testing of the same fuel or simultaneous benchmarking of different fuels (screening).
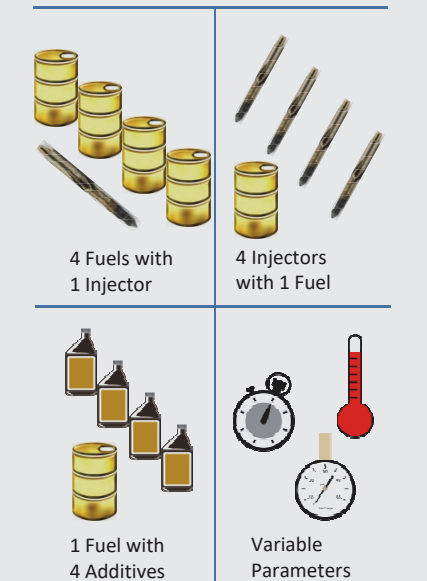
HiL-testing means conveying the fuel through the common-rail system, fuel injection and then recollecting and reusing it. It furthermore allows the use of almost all parts of the real application, thus reproducing real-life interactions between the fuel and the components. The fuel ages during testing. This intensifies the testing conditions, as the fuel bearing components come into contact with the aging products as well. Abandoning combustion allows for setting realistic injection conditions as well as ones impossible to realize in an engine. This enables a targeted investigation of single influences onto deposit formation inside the injectors.

Variable testing options:

Equipment …

High pressure pump
Injector heating
Rail
Electric motor
Filter
Intank fuel pump
Diesel tank

… 4 times available at test bench

Variable testing options, e.g.

4 Fuels with 1 Injector

4 Injectors with 1 Fuel

1 Fuel with 4 Additives

Variable Parameters

Injector needle after 200 operation hours in the non-motor rapid test: At the head the deposition of sodium soaps is recognizable as a whitish layer. As internal injector depositions (IDID) sodium soaps can release heavy malfunctions which limit the engine operation considerably.