

Transient Engine Test Bench

Steady state is the one condition an engine never runs in.

THE NUMBERS THAT MATTER LIVE IN THE TRANSIENTS

A steady-state bench holds speed and load until everything settles, then records - and settling is exactly what an engine in service never does. It accelerates, sheds load, starts cold. Fuel is wasted and emissions are produced in those moments, and the mechanisms behind them - turbocharger lag, fuel film on cold port walls, thermal inertia in the aftertreatment - have all vanished by the time a steady point has stabilised. So this bench does not measure points. It follows a duty cycle, and it must follow it closely enough that the tracking error is smaller than the effect being studied - otherwise the bench is the experiment.

THE DYNAMOMETER HAS TO MOTOR, NOT JUST ABSORB

A water brake or eddy-current unit can only take power out. A real cycle contains overrun - the engine driven rather than driving, torque negative, fuel cut - and reproducing it needs a four-quadrant alternating-current machine that drives the engine as readily as it loads it, torque response in milliseconds rather than seconds, and the missing driveline inertia simulated in software. That capability cannot be retrofitted into a brake never built to motor, which is why converting a steady-state cell usually means a new machine.

IF THE INPUTS DRIFT, THE RESULT IS NOT EVIDENCE

A transient is a path, not a place, and it carries its history with it. So intake air is held at set temperature, pressure and humidity; fuel at set temperature and pressure, metered by instruments that stay accurate while flow is changing; and coolant and oil are brought to a defined soak-and-start state before every run. In a fuels laboratory this is the entire point - the fuel is the variable under test, so the engine, the air, the coolant and the cell must be the constant.

THE MACHINE

- Dynamometer and coupling - four quadrant, guarded shaft, simulated inertia
- Conditioning - intake air, fuel, coolant and oil, all held
- Measurement and sampling - data rates fast enough to see the event
- Cell, safety and automation - ventilation, extraction, detection, interlocks

VARIANTS

Light-duty transient bench · 200-250 kW transient dyno bench · Fuels and lubricants evaluation cell · Retrofit of an existing steady-state cell

SCOPE

Ours: bench design and integration, dynamometer mounting, coupling and shaft guarding, conditioning systems, fuel handling, cell services, automation and cycle control, safety and interlocks, installation, commissioning, correlation, documentation, training, spares and AMC - including build to the customer's specification. Bought-in certified: the dynamometer and its drive, gas analysers, precision transducers. The customer's: the engine, the cycle and the test programme.

STATUS

Engineered to order. Equipment of this class has been quoted against successive transient engine test bench requirements for a national fuels and lubricants laboratory; no delivered transient engine test bench is claimed.