

D2T SOLUTIONS & SKILLS

Complete range of very light inertia F1 dynos up to 750kW at 22000 rpm

Automation system, combustion analysis and Real Time knock detection

Test bed engineering, Study, and manufacturing of coupling shaft

For many years, D2T GROUP has put in place a research and development programme to increase its know-how and skills about F1 engine development and testing solutions.

F1 engine development team faces two major problems while improving their engines :

- Test facilities and loading devices are not able to follow continuous increasing of engine specifications.
- Engine testing at the test bed are not representative of engine behaviour within F1 car.

D2T GROUP is now able to offer not only products and systems but also partnership programme for F1 team to improve engine test beds features in advance or in parallel with continuous engine development. Furthermore we can study and provide systems and products which are able to best simulate the dynamic behaviour of the whole car's transmission.

D2T has "state of the art" solutions two years in advance from current F1 engine being developed.

Whole study of R&D single cylinder or twin R&D F1 engine

Owner of the "pendulum" patent to decrease camshaft acyclism

Study or consultancy on any F1 shaft assembly

D2T'F1 CUSTOMER

**FERRARI
RENAULT SPORT
ASIA TECH
PROST GRAND PRIX
PEUGEOT SPORT**



All D2T products are warranted against defects in materials and workmanship for one year from date of delivery to the original purchaser. Specifications are subject to change without notice.

F1 EC DYNAMOMETERS

The main target of D2T Group during that development was to provide EC dyno range for F1 engine with a very light inertia and extended life time.

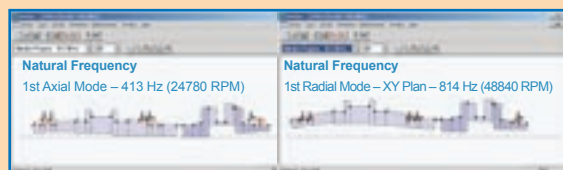
In partnership with major Universities, D2T Group has designed a unique mathematical model about magnetic flux within an EC dyno. This model is able, from target specifications, to specify rotor and cooling chamber dimensions as well as the best material to be used fulfilling both physical and magnetic properties.

Results of that model are put into our simulation software to check vibration levels. Torsional vibration, bending vibration and natural frequency are checked in detail to define the best mechanical assembly and dimension.

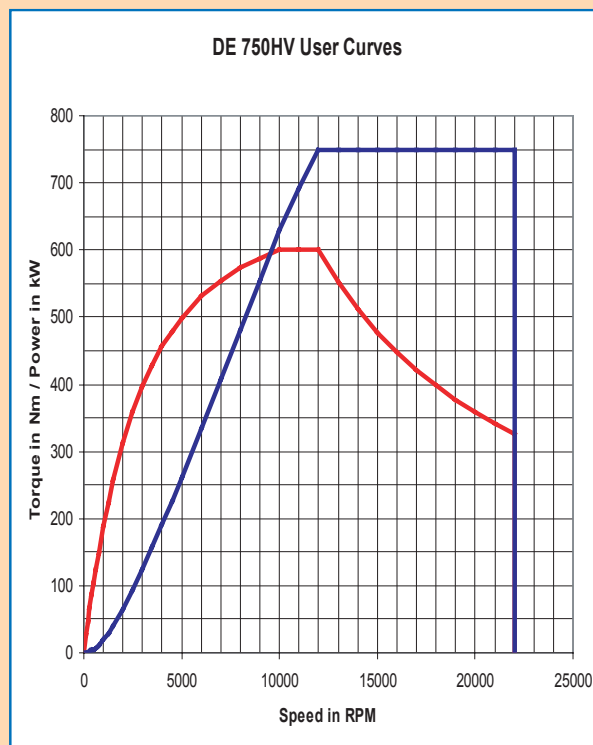
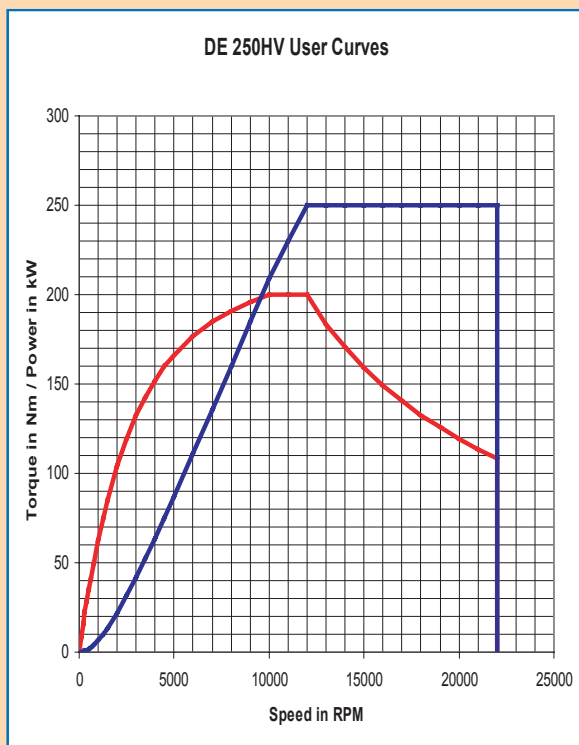
Rotor is designed to accept without any problem 24 000 rpm. All bearings has been simulated and studied to have a longer life time.

In standard our EC dyno are equipped with several temperature sensors and accelerometers. These sensors are connected to a remote monitoring system to predict before damage services to be done. Benefit is that maintenance cost has been drastically reduced.

At a reasonable cost compared to electrical motors, an EC dyno with a very light inertia and very good MTBF is the most appropriate solution for F1 engine testing.



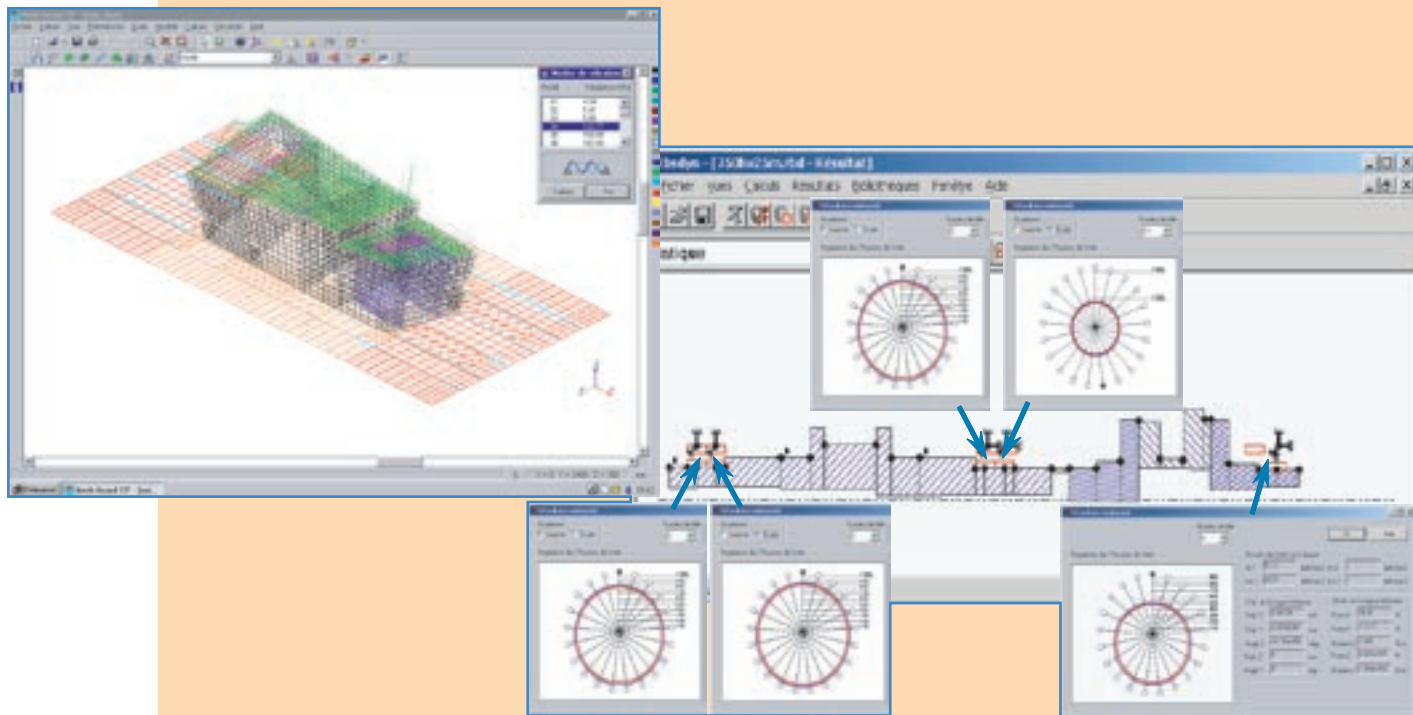
SPECIFICATIONS



TEST BED ENGINEERING

D2T Group can offer a complete engineering of F1 test bed. This study is done by using our vibration simulation tools and FEA analysis. Rejection of natural frequency is the major target achieved by our tools. Engine mounting frame, dyno frame and bed plate are completely modelised and studied under stress to defined the best mechanical choice.

In addition to test bed engineering D2T Group can realize systems able to reproduce F1 car environment, according to customer's specifications. In addition to the dyno we provide specific items to obtain same vibration mode and absorption of the final drive. By this way equivalent torque and vibration level, as inside the F1 car, are transferred to the F1 engine through the coupling shaft.



GEAR BOX ENGINEERING

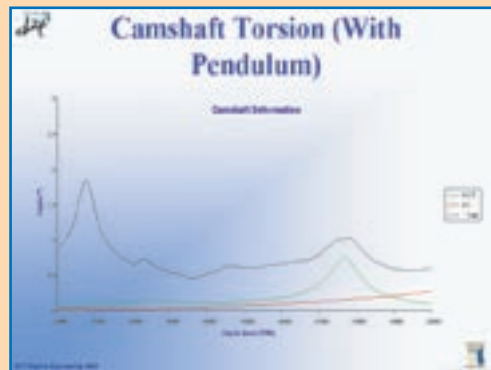
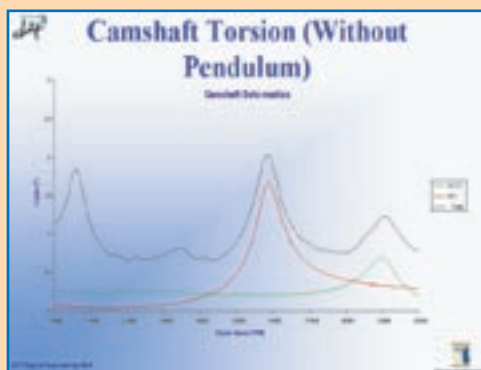
D2T Group, using same simulation and modelisation tools, is able to provide study or consultancy on complete or parts of the gear box. Target of these studies is always to decrease wasted power and to increase life time. D2T Group has already made such development and has proven a high expertise giving clear advantage and benefits to his customers.

Formula 1 Gear box	Original Data	After applying D2T know-how
Oil Flow (l/mn)	20	10
Oil Temp (°C)	150	100

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CAMSHAFT GEAR WHEEL DESIGN

D2T Group, using its original mechanical patented solution, is able to design complete camshaft gear wheel. Patented pendulum system is able to decrease camshaft acyclism.



FIRING ORDER OPTIMISATION

By combining unique modelisation, torsional vibration analysis tools and experience in very high speed engines, D2T Group is able to provide to his customers an innovative solution.

By optimising the firing order on V-Engine we can avoid problems due to torsional vibrations.

Torsional vibrations are inherent to internal combustion engine.

The excitation torque due to the connecting rod/crankshaft system creates large torque oscillations that may result in dangerous torsional vibrations whenever the operating speed is near a critical speed.

This torque, due to both gas and inertia, depends on engine load and internal engine dimensions.

A way to reduce crankshaft deformation on large multiple cylinders engine is to modify the firing order.

Some studies were done on V8 and V10 engine, using VIBMOT software, developed by D2T Group. This software allows to perform torsional vibrations calculations for a given internal combustion engine geometry and, therefore, to study the crankshaft deformation response versus a given firing order.

This allows us to study the best firing order in terms of deformation amplitude and/or to optimise the crankshaft design in order to get rid of critical rotational speed that can damage the engine.

COMPLETE ENGINE ENGINEERING

All necessary skills are available within D2T Group to study whole R&D engine for F1 team. D2T Group can also study single cylinder or twin engines. To complete that study, we can also realize rapid prototyping and of course prototype testing

within our research and development centre. All our personnel signed non-disclosure agreement and is used to respect secrecy about customer knowledge and specifications.