Field Load acquisition and variable amplitude fatigue testing on maxi-scooter motorcycles

Aim of the present work was the instrumentation of a maxi scooter for the field collection of service loads acting on the scooter main components such as frame, fork, handlebar, rear frame and suspension.
Service loads were collected on an instrumented Yamaha Tmax scooter equipped with 22 channels during a set of field tests that were representing a predefined road mix, covering a mileage of 270 km. Field load histories were used to develop an accelerated test procedure for the accelerated bench fatigue testing of a new model prototype whose mission was set to 50000 km. The acceleration procedure allowed a time reduction from 1600 hrs to 122 hrs bench equivalent testing. Both the benchmark scooter Tmax and a maxiscooter prototype under development underwent the bench ariable amplitude fatigue testing. The results of the fatigue tests on the prototype allowed to identify some critical bolted connections and to reduce some stress concentration features causing the appearance of small cracks that were found also after during 50000 km of driving tests.

Fig.1: examples of calibration tests on scooter Yamaha TmaxS. (a) Front fork and Frame channels calibration. (b) Handlebar Horizontal calibration. (c) Rear Damper tensile calibration.

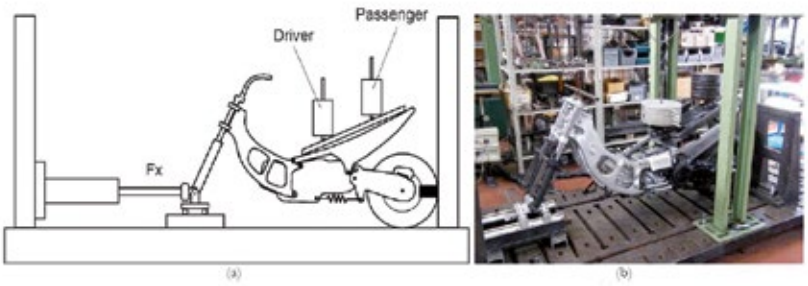

Fig. 2: Horizontal fatigue test bench (a) Sketch of the Horizontal Fatigue test bench. (b) Yamaha TmaxD undergoing the horizontal fatigue test.

Mobilità sicura e sostenibile
Safe mobility

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Machine Design

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Main research topics

- Development of numerical and experimental methods for the evaluation of the structural integrity of components and mechanical structures
- Mechanical characterization of metallic and polymeric materials
- Development of local approaches for structural analysis and fatigue design of components and structures weakened by the effects of geometric carving
- Development of methods for the analysis and design for sports equipment and rehabilitation