

Automation of a load cycling test bench

Propulsion & Control / Dr. Andrea Vezzini / Supervisors Bombardier Transportation: Martin Boháč, Schmid Roland / Expert: Urs Muntwyler, Solarcenter Muntwyler

In June 2009, Bombardier Transportation put into operation a new test centre for drive systems in Zurich-Oerlikon, the so-called Power Lab. Part of this project included the conceptual design and implementation of a modern test bench with automated control and data acquisition, which was based on an existing load cycling test bench for high-power semi-conductors (3.3kV – 6.5kV).



Yannik Moser

Initial Situation

The rectifier modules in modern traction vehicles now widely employ IGBT (Insulated Gate Bipolar Transistor) technology. This bachelor thesis should deal with the modernisation of an existing load cycling test bench for IGBTs, whilst also developing a new safety concept for a test bench that serves to record the static characteristic data and characteristic curves of IGBTs.



Alfred Rubin

Load cycling test bench

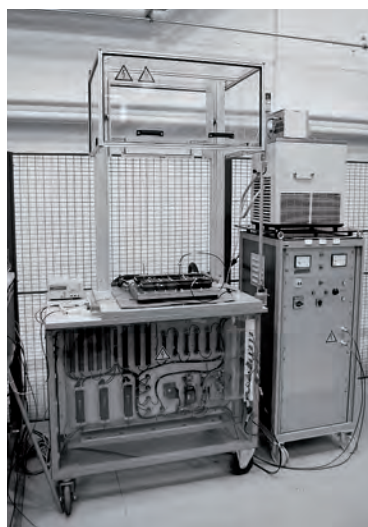
The load cycling test bench is used to determine the life expectancy of a batch of 10 IGBT modules. The modules in question are subjected to temperature cycles that represent the typical operational conditions on a traction vehicle. However, these cycles are accelerated to the point where a test duration of several months is sufficient to determine the expected life time of the IGBT modules. During the course of the thesis, the following modernisation work was undertaken on the load cycling test bench:

- Computerised control of the decentralised DC power source by means of a control box which was developed during the thesis and is galvanically isolated from the power source itself
- Generation of a clock signal by the computer and adaptation of the signal

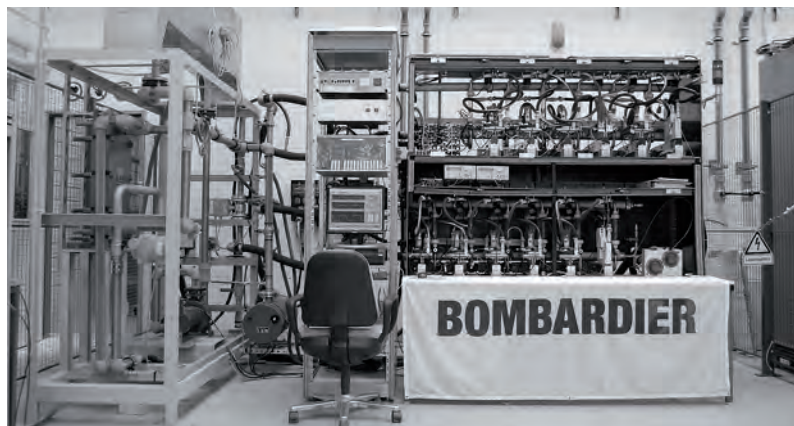
- Thermal measurements on 4 selected IGBT modules, each fitted with 6 thermocouples
- Re-programming of the entire control, measurement and processing software
- Re-wiring of the entire test bench

Test bench for determining static characteristics

A new safety hood was designed for the second test bench. This hood should always remain closed whenever high-voltage is applied to the modules, thereby providing a safe working environment for the test engineers. For this reason it was decided to implement a hood locking system based on magnetic latching solenoids, which are actuated by a specially developed control system. This system also prevents the high-voltage supply from being switched on as long as the hood is open.



Test bench incl. new hood for determining the static characteristics of IGBTs



Load cycling test bench for high-power semi-conductors