Thermostating equipment in quality control

Practical test benches for the car industry and its suppliers

Petrol or cold water pump, cooler or gears, shock absorbers or on-board electronics – all the components which make up a car are subject to extreme fluctuations in temperature. Price pressure, the use of new materials and light construction versions continue to give priority to the importance of component testing on special test benches. Varied test benches are offered, for example, by flexible, efficient thermostating equipment. The LAUDA DR. R. WOBSER GMBH & CO. KG company offers made-to-measure heating and cooling systems which involve the composition of long-since tested modules for the user. One example is the supplier to the car industry, Kolbenschmidt Pierburg AG in Neuss.

Illustration no. 1
Matthias Mohr, project engineer for heating and cooling systems at LAUDA (left), Chris Wibowo, graduate engineer at the test laboratory in Pierburg (centre), Erkan Keceli, engineer for vibration test benches in Pierburg (right).

The demands made on the suppliers to the car industry have increased. Not only are they expected to come up with the pure production of components and systems, but also to develop new technologies. It is thus that many innovations in the car industry come from the development departments of the over 500 system suppliers to the international vehicle industry. “With regard to the development and production functions, the suppliers are held increasingly responsible”, says Chris Wibowo, graduate engineer at the Kolbenschmidt-Pierburg AG. “The concentration on core competences results increasingly in the outsourcing of tasks”, according to the employee in the “test lab” department.

The Kolbenschmidt Pierburg AG develops and produces system solutions “to do with the engine” at its 22 production plants in Europe, North and South America, and China. The company employs 11,600 members of staff, and in 2002 made a turnover of € 1.9 billion. Kolbenschmidt Pierburg supplies the largest international car manufacturers with suction modules, pumps, pistons, rollers, exhaust gas recirculation systems and secondary air systems.

A part of the development of new car components is also the testing of such. The efficiency of new components, modules and systems has to be tested in as practical a situation as possible before they can be delivered to the customer. To this end, each and every test bench must be individually adapted to the test piece and the testing conditions. In order to be able to subject a certain test piece to a temperature change test, Pierburg contacted the LAUDA DR. R. WOBSER GMBH & CO. KG company at the end of last year. The LAUDA has been developing and producing heating and cooling systems for industrial applications for almost 50 years now. Using a LAUDA thermostating system, various types of test pieces can be tested for their efficiency in a practical situation.

“We always have to adapt the test benches to our customers’ requirements”, explains Chris Wibowo, “and to this end we gladly come to specific arrangements with them”. In this special case, simultaneously to the vibration resistance and a specified temperature curve in a climatic chamber, the stress caused by a certain temperature profile of the conveying means through the test piece had to be tested in accordance with an enquiry by a car manufacturer, states Wibowo. An efficient thermostating installation with which precise temperature ramps could be generated, was needed.

Depending on the test piece, the most various of requirements are frequently possible. Temperature profiles depending on the time must be repeated as often as wished: temperature gradients of 100 K/min are not infrequent in these cases. The following diagram shows a possible temperature ramp.

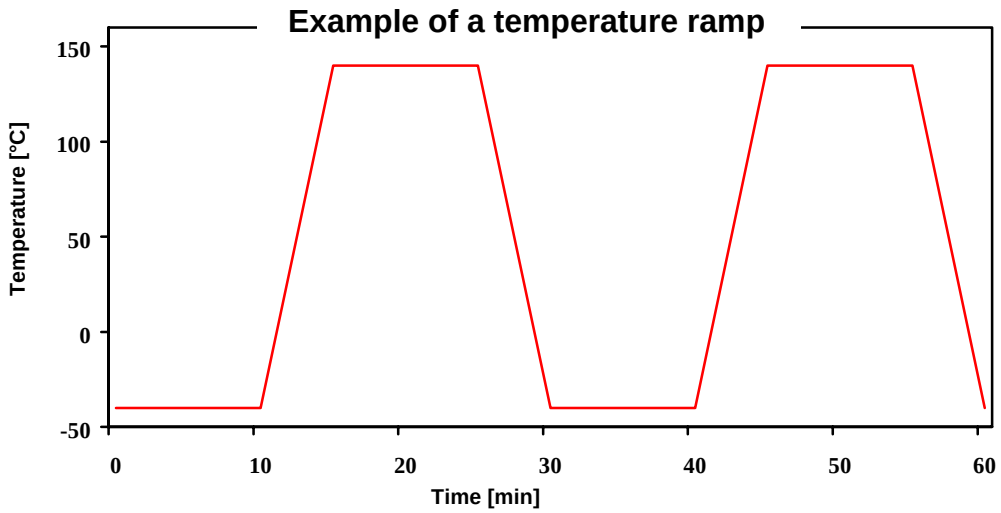

Illustration no. 2: Example of a possible temperature ramp.

In the car industry, the temperature range usually varies between -40 and 150 °C. As in practice, the requested heat transfer medium is frequently water/glycole. The corresponding ratio of a mixture is then coordinated according to the temperature range. When thermal oils are used as heat transfer mediums, in special cases the temperature range can be significantly extended. LAUDA considers itself a competent partner in this respect too, and helps you to find the right concept for the thermostating installation.

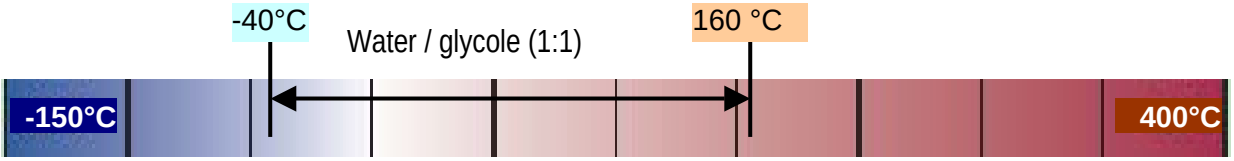

Illustration no. 3: Range of LAUDA thermostating systems.

LAUDA has succeeded in making decades of experience particularly in the development and the process control construction of thermostating systems. LAUDA uses modular engineering: the heating and cooling systems from LAUDA have a modular structure and can thus be individually adapted and, where necessary, extended. Each and every individual planning component has proven itself over and over, and is subject to continual further development. LAUDA was thus also able to compose for Pierburg the made-to-measure structure from the existing modules.

“Many customers aren’t familiar with the efficiency of such equipment”, explains Matthias Mohr, project engineer at LAUDA for industrial heating and cooling systems. It is therefore important to give the customers qualified advice. The customer must be actively involved in the development phase: this is the only way to optimally coordinate the test piece and the thermostating system with each other and to achieve a high-quality end result”, adds Mohr. “The corresponding of reference and actual values at such temperatures requires exact planning”, explains Mohr. The results are to be shown in the form of a temperature curve. As interfaces for such, LAUDA provides various signals on both an analogue and a digital basis. Compressed air and electric energy had to be provided in order to supply the LAUDA installation. The thermostating installation should contain a filling and a testing cycle. In test modus, the following measurements should be recorded: the temperature of the conveying medium in forward and reverse cycle, and the pressure difference between the

forward and reverse cycle of the thermostating installation. Moreover, Pierburg also requested a flow measuring device and a device for filling and emptying.

LAUDA engineers are also willing to listen to requested changes from the customer during the development phase. An intensive information and data exchange with the customer during the project phase is necessary for this. “The LAUDA thermostating system was individually adapted to the specific requirements”, says Mohr. “It was of great importance to our customer that as little pressure loss as possible arises within the thermostating installation, specifies Chris Wibowo. The heat transfer circuit had to be constructed in a very compact manner, due to the low pressure loss. Following a site visit, the maximum possible dimensions of the overall installation were recorded in order to enable use in several testing areas at Pierburg. LAUDA never uses series-produced installations in the development of such systems. Each installation is individually adapted to the customer’s requirements. The company’s proven Plug & Play technology is a great advantage: since the heating and cooling systems are made up of units ready for assembly, they only have to be “attached” on site. Transportation, mobility and setting up of the Pierburg construction were already considered during the planning stage. The issues of piping, insulation and safety engineering were also clarified right at the beginning of the project. “We realise precisely those interfaces which the customer requires”, according to Mohr. The connections were organised by LAUDA according to the conditions at Pierburg. The construction size was also adapted to meet the requirements of the site. The result: a mobile installation which is used in various places as a test bench in the Pierburg factory in Neuss.

Illustration no. 4
The SUK 350 W process cooling installation as a test bench for on-board electronics. Temperature range: -35 °C up to 140 °C. Temperature gradient: 100 K/min

The safety precautions were realised according to the wishes expressed by the Kolbenschmidt-Pierburg AG. All malfunctions are displayed and specified on a LED bar on the LAUDA unit. “At LAUDA, the safety issues are analysed in accordance with the project, and compared with the currently applicable regulations”, explains Matthias Mohr, test bench specialist at LAUDA. Thermostating devices from LAUDA can, upon the customer’s wish, come in an explosion-proof version, manufactured in accordance with the 94/9/EG (ATEX) European guideline.“ Before it was delivered to the customer, the test bench was tested under practical conditions at LAUDA”, says Matthias Mohr. In order to avoid unpleasant surprises as far as possible and to ensure that each individual construction module doesn’t have to prove itself once it arrives at the customer’s, LAUDA already thoroughly tests out the manufactured installations in its own test laboratory. The customer usually provides a test piece for this purpose.

The LAUDA installation has proved itself up to now at Pierburg. “What impresses me is the great refrigeration capacity and the automatic ventilation of our test piece”, Wibowo explains the special assets of this specific installation. “Following meetings with LAUDA employees, we were convinced mainly by the prospects of having our ideas realised quickly”, says Wibowo. Once the contract had been concluded, we also quickly agreed on minor changes”. Negotiations commenced in December 2002, the construction was delivered at the end of April and put into operation at the beginning of May. “Naturally, we expect that the LAUDA company remains flexible and supports Pierburg in any further demands made by the car industry”, emphasises Chris Wibowo.

“After sales service is very important at LAUDA”, Matthias Mohr ensures the customer. LAUDA engineers are always available in a consultative capacity”.