



Put to the test

Easy acquisition and evaluation of heat exchanger performance parameters

A manufacturer of heat exchangers has invested in the development of completely new test stand technology. Find out in this case story how test-stand tasks underwent effective design and improvement.

The firm Funke Heat Exchangers located in Gronau (Leine, Germany) relies on measurement and testing technology from Delphin Technology AG for the testing of its products. Funke were able to set up a test stand system themselves using Delphin's ProfiMessage devices and ProfiSignal software thereby avoiding the need for costly specialist software or service providers such as system integrators.

Each heat exchanger system at Funke undergoes design in Funke's own engineering department. Thermodynamic and fluidic computations are performed not just with the company's own software but also with HTRI. This requires precision simulation to determine the optimal thermodynamic and most cost-effective system design, e.g. by identifying the best materials to be used. Such precision calculations are also beneficial for installation dimensions.

From theory to practice

The calculations and settings from testing need verifying in practice and adjusted if necessary. To achieve this, Funke invested in completely new test stand technology capable of calculating and evaluating heat exchanger performance parameters for exchanger surfaces ranging from 0.1 to 400 m². The test samples are large and dynamic in scope which require flexible measurement hardware.

Funke therefore opted for Delphin ProfiMessage devices because of their high-precision, 24-bit resolution measurement and recording capability and simple configuration. A further feature especially relevant to testing at Funke is the direct connection to the test stand PLC system via an integrated Profibus DP interface. An automated system was then easy to create which could guarantee continuous data exchange between the PLC and measurement acquisition systems while synchronising all testing procedures. Precision measurement and evaluation is also dependent on sensor calibration. Delphin's measurement technology is therefore equipped with sensor compensation. Sensor errors can then be eliminated and/or compensated for at just a few clicks. Also possible is the easy and efficient calibration of multiple pressure and temperature sensors.

Autonomously developed applications

Test stand engineering requires a high level of flexibility. Products which are non-standard and manufactured according to specific customer or project needs often require modifications to the test stand software, e.g. to procedures and to the evaluation. The ProfiSignal software provides the Funke test team with a practice-based tool. The software has a clear and tried and tested structure, uses pre-defined components, and is designed for intuitive operation. Users are then able to create and modify test stand applications without having to read masses of manuals or learn a new programming language. The software's visualisation interface is easy to configure. Users position objects for graphics, displays and operating elements directly onto the visualisation interface. Links are then established to the channels of the ProfiMessage devices.



Measurement data can be displayed while creating and configuring the test stand application which greatly simplifies system development. For example, setting limit values in an object can enable the colour of a digital display to change to indicate an alarm. In addition to the predefined visualisation components, ProfiSignal can also be used to create fully automated programmable and evaluation procedures by using the "Klicks" script language. By mouse clicking menu options and combining instructions, users are able to create complete automated test-stand procedures.

This process of "configuration" instead of "programming" has significantly simplified the work for Funke staff at the test stands. They have been able to configure the ProfiMessage devices by themselves and to create data archiving procedures as well as visualisation and operational interfaces.

Data exchange and Office compatibility

During testing, recording of sample-based data is made to a PC enabling users to simultaneously analyse the data. Temperatures, pressures and other signal measurements are portrayed in yt diagrams. Users are able to access statistics at any time for any period. ProfiSignal provides intuitive tools to instantly detect variations and anomalies. Integrated software channels enable online calculations to be performed on the data, e.g. to standardise temperatures or to calculate pressure differences and performance parameters.

The ProfiSignal software is Office compatible, an especially helpful feature at the Funke test stands. The range of measurement and evaluation data from a sample's testing report can then be exported at the click of a mouse to an Excel file. ProfiSignal users have an integrated CSV export function which can be triggered manually or automatically. Trend diagrams can also be exported in vector-based emf formats and then inserted as high-resolution graphics into Word or Excel reports along with captions, markings and comments if required.

Summary

By using Delphin products, test-stand tasks underwent significant improvement and design. Features in the ProfiMessage devices increased precision in the acquisition of data and in subsequent calculations and evaluation procedures. Funke already had certifications, but in 2013 the new test stands enabled approval for the US through AHRI certification (Air Conditioning, Heating and Refrigeration Institute).

This required that three devices designed using the Funke engineering software underwent testing by independent agencies. To receive approval, operational values calculated in testing needed to agree with the values provided by the actual equipment. For example, transfer efficiency statistics for the finished product were not permitted to be less than 95% of those calculated by the Funke engineering software.