



Centralized Monitoring

Automating long-term test procedures

Parts and components located in a vehicle's engine compartment come under ever-increasing stress during their lifetime. They need to cope with extreme temperature differences and mechanical stresses and are exposed to corrosive substances such as fuels, oils and coolants. It is therefore vital to subject such components to long-term tests prior to production. Time and money are becoming increasingly scarce even in testing laboratories. Savings can be made here through automating testing procedures.

Rasmussen is a medium sized company located in Maintal, Germany. It employs 1600 people worldwide and has two major business operations: metals - hose clamps and metal pipe connectors mainly for the automotive industry (air, fuel and coolant systems); plastics - plastic hose and pipe connectors for cooling and fluid transfer systems also for the automotive industry. Development takes place at Maintal. Prior to an item going into production, extensive tests must ensure that it meets customer specifications. A testing department exists for this purpose with a range of test benches for the thorough testing of new products. Test samples undergo long-term testing procedures of up to 2000 hours and are subjected to the kind of stresses which can occur in the engine compartment of a motor vehicle.

Heat increases aging of plastics

Temperature is one of the main aging factors for fluid carrying lines made of plastic. Plastics age at high temperatures - low temperatures then reveal what condition the lines are really in. The lines are also under tension because of their metal pin fixings. This tension relaxes at high temperatures which then has an effect on how sealed the lines are. The fluids themselves represent a second aging factor in that fuels have a softening effect. Pressure and force are a third factor. All three factors can be partially combined in test rigs. Temperature is the standard parameter with pressure, vibration and fluid type as modules. The temperatures tested in the automotive industry range usually from -40 to 125°C, sometimes up to 135°C and even up to 150°C for short periods, depending on customer specifications. A supercharger test rig, for example, simulates temperature, movement and pressure occurring in the engine compartment of a heavy goods vehicle. A predetermined 16 hour cycle is repeatedly performed simulating a cold start, a long motorway journey, idling - thereby simulating the heating-up which occurs in a traffic jam - and finally, exposure to a temperature of -40°C. The data acquired is displayed online and automatically packed in 16-h-files, i.e. one cycle = one file. The complete test takes 240 hours. At the end, all files are merged and represented in an offline evaluation. The entire operation and data acquisition is performed using Delphin TopMessage devices.

To guarantee that the products achieve the required specifications, Rasmussen, as an accredited company, must ensure that the test programs in the test rig have actually been performed. For this reason it is necessary that the relevant parameters such as temperature and pressure are recorded without interruption so that at the end of testing it can be determined whether the requirements have been met. Measurement data is also acquired using TopMessage acquisition devices from Delphin.

It is also necessary that testing is regularly controlled so that testing personnel can act in the event of any problems occurring - locating the problem and restarting the testing procedure. A malfunctioning test procedure blocks valuable testing space and delays the release and manufacturing start up of a product. Monitoring the test procedures is made more difficult by the fact that test rigs are located in different buildings. To simplify working practices and save on scarce human resources, a centralized unit was set up in the testing laboratory from which access could be made to all test rigs and observation made of the state of testing procedures.

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Test rig monitoring from the office

One problem was that the test rigs were of different types and generations. Christoph Steinkamp, who works in Rasmussen's testing laboratory, explained, "Linking a 15 year old test rig to a modern system is not easy because so much has happened in IT over that time. It was not possible to get everything under one hat at a reasonable price so we firstly restricted ourselves to 25 long-term test rigs. We installed Delphin's data acquisition software ProfiSignal Klicks on one PC which accessed, via a network, the TopMessage devices connected to the test rigs. ProfiSignal shows the running times and temperatures of the test rigs. We can now see at a glance which rigs are currently operating, current temperatures and the number of hours in operation". Monitoring is also made easier because Rasmussen employees can access ProfiSignal on the main server from any PC on the network. Goran Lebo from Rasmussen: " With ProfiSignal we get a complete overview. The indicator lamps tell us which test rig is currently in operation and the number of hours in operation. I can observe each rig separately and can then tell immediately if testing has been successfully completed. If I'm interested in a particular point on the temperature curve I can zoom in and see it in more detail. The system was developed successively in cooperation with Delphin – we kept getting new requirements and wishes that had to be incorporated. The overview we get from the computer really saves us time because we don't have to run to each test rig, some of which are in different buildings like the fuel test rig which has to be located in a separate building for safety reasons".

If the computer is booted up with ProfiSignal, a background program is automatically activated which knows the devices on the network. This program then automatically retrieves the data from these devices, packs it and deposits it at a central computer or local server. In dynamic processes, such as in the supercharger test rig, large data quantities are involved. If all this data needs to be used, e.g. to be able to view potential malfunctions at a high resolution, then large quantities of data need to be processed on one computer. At a measuring period of 2000 hours this can amount to several gigabytes of data. To speed up processing times ProfiSignal supplies data at a resolution corresponding to the screen resolution because displaying data is restricted to the screen's number of pixels. Data is requested from a database at the respective resolution along with all min/max values so that no outlier can get through. If the user zooms in on an outlier the next resolution will be loaded so that the smallest resolution can be zoomed in to. And this at high speed. Data security is also ensured because ProfiSignal separates data archiving from visualization.

Test rig efficiency easy to determine

Alongside simple and efficient monitoring from a central control point, the test rig monitoring system offers further benefits. The operational hour counter enables the test rig's efficiency to be determined. This information will indicate whether new equipment needs to be acquired or, when efficiency is too low, whether the testing procedures need re-organizing. "It's a simple tool but it has made a real difference", explained Steinkamp. The efficiency of the test rigs had to be calculated by the Rasmussen personnel themselves. This can now be performed automatically by ProfiSignal Klicks. A further benefit is the calibration function. Monitoring and regular calibration is obligatory in accredited companies. ProfiSignal makes calibration simpler and more cost effective. A return on investment on the monitoring system was achieved within one year because calibration had been so expensive beforehand. Cabinets for calibration were set at a specific temperature and then tested with a probe with DKD traceability (the German calibration service). This procedure required the time it takes for the temperature cabinet to reach the stated temperature. Using an external temperature device in which the test rig's temperature probe is inserted, the required temperature is now achieved in just a few minutes. At the same time, the entire measuring section and display is calibrated so that all of the test cabinet's trend curves are 100% calibrated. To provide support to its customers worldwide, Delphin are able to create, modify and enhance ProfiSignal applications at a distance. This means fast responses to customer requirements with no traveling costs involved. Because applications with ProfiSignal are usually customer specific, this kind of support is important. Although Klicks is simple to use, the user does not usually have the time to deal with such issues. The set-up and configuration of Rasmussen's test rig monitoring system took place via remote data transfer by Delphin located in Overath, near Cologne in Germany. "When we phone with a problem we just have to give Delphin access to our computer and they sort it out. The problem is usually cleared up within 30 minutes. It would cost a lot if somebody from Delphin had to travel to us", explained Goran Lebo.

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More potential for automation

There is still potential for even greater automation of Rasmussen's test rigs. The system uses only a small part of ProfiSignal Klick's capabilities. For example, a set temperature curve could be generated as a reference against which the actual temperature curve could be compared. A planned new test rig could be set up with ProfiSignal. Automation could then take place up to the generation of finished protocols. This would eliminate the work involved in exporting the data to Excel. External data from an SQL database can be imported into ProfiSignal via an SQL port and used as header data for protocols. Graphics, tables, photos, logos etc. can all be incorporated into the protocols and the layout can be set up as required. Output is in pdf format. An intuitive report viewer is planned for the next version of ProfiSignal. If the user is not content with the pdf file, it can be altered using the viewer. The user does not require the entire ProfiSignal package to view and process the testing procedure. The user can scroll, pack and show or hide curves. In doing so the user is prevented from manipulating or overwriting the original data, but he can analyze the measurement data and, for example, zoom in on an outlier.

Praxis Plus

ProfiSignal Klicks is a universal tool to generate testing and process systems, to acquire and evaluate measurement data and to generate individual reports for specific applications. Parameter diagrams enable the input of charge and test information and visualization diagrams permit operation and observation. Using one program, the user can set up a complete system and avoid problems associated with interfaces and the merging of software from different suppliers. The object-oriented programming language requires no specialist training and is generated using the mouse. No more typing up of program instructions or searching for objects, attributes or variables.

Info-Tip

Rasmussen has its temperature cabinets calibrated with DKD traceability (Deutsche Kalibrierdienst). The DKD is an association of calibration laboratories from industry, research institutes, technical authorities and inspection and testing institutes. The accredited and inspected laboratories carry out calibration for measurement devices and measurands. The DKD calibration certificates issued by these laboratories prove traceability to national standards as required by DIN EN ISO 9000 and the DIN EN ISO/IEC 17025.