

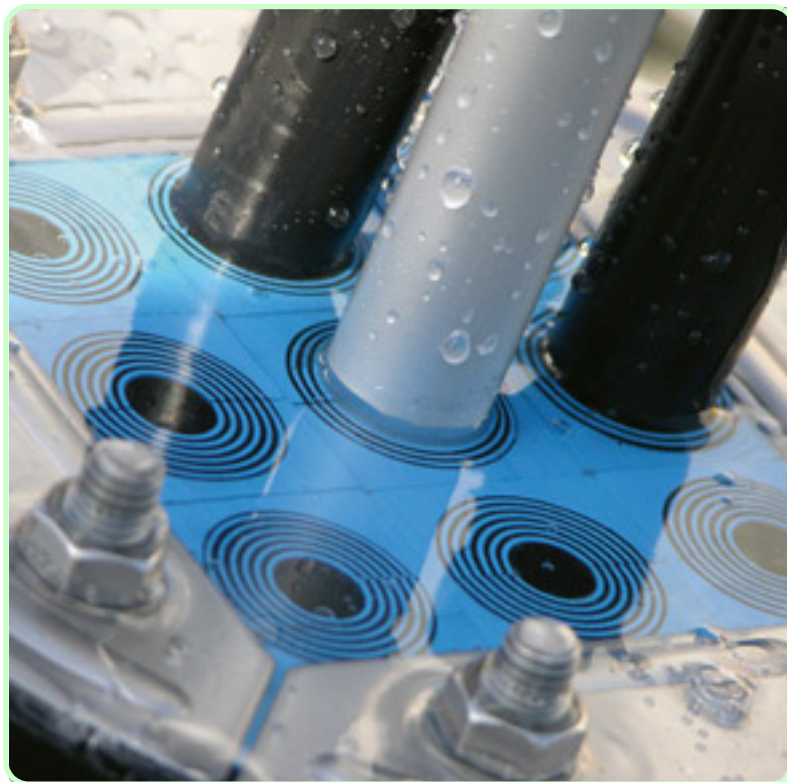
CASE STUDY

Roxtec International AB, Sweden
Flexible Cable and Pipe Sealing Solutions

Industrial including Marine, Telecom and Renewable Energy
PULSE LAN-XI, Transducers

Roxtec is a privately owned Swedish company that develops, manufactures and sells complete sealing solutions for cables and pipes. The Roxtec sealing system is based on Roxylon™ rubber modules with removable layers that enable a perfect fit for cables and pipes of different sizes. A PULSE LAN-XI system is used for internal R&D purposes, where Roxtec validates its existing seals and makes experimental tests on rubber. The portable LAN-XI and battery module also make the system perfect for on-site visits to customers where data from the customer's current cable and pipe installations can be gathered for troubleshooting or for making recommendations.

Photos courtesy of Roxtec



Roxtec is a privately owned Swedish company that develops, manufactures and sells complete sealing solutions for cables and pipes. Founded in 1990 with the invention of Multidiameter™, a special technology based on sealing modules with removable layers, Roxtec revolutionised the complicated process of cable routing and pipe installation – allowing designers and users to perform their tasks without knowing the size or number of cables or pipes in advance. The Roxtec sealing system has now become a worldwide industry standard.



Roxtec headquarters, Karlskrona, Sweden, 500 km south of Stockholm



Today, Roxtec is market leader in modular-based sealing systems and has 513 employees worldwide. It has customers in more than 70 countries, 18 subsidiaries and a wide network of distributors. Roxtec's headquarters in Karlskrona, Sweden covers 10 000 m² and houses around 160 employees who are distributed throughout research and development, fire and test labs, manufacturing, logistics and support services.

Roxtec is certified according to the quality standard ISO 9001, the environmental standard ISO 14001, EN 13980 and the MED Directive 2002/75/EC.

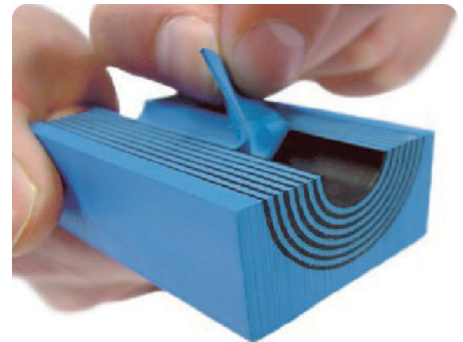
In 2010, Roxtec won the Swedish Trade Council's prestigious award "Stora Exportpriset" (Grand Export Prize). The award was handed out by His Majesty the King of Sweden at a ceremony in Stockholm.

A Revolutionary Seal for Demanding Industries

Where cables and metal or plastic pipes pass through openings, it is essential that no fire, gas, water, dust, dirt, insects, snakes or rats are allowed to penetrate. Some installations must also withstand corrosion, pressure differences, vibration and electromagnetic disturbance. Practicality and convenience also play their part. So the challenges are plentiful when it comes to the choice of seals.

Adaptable System

The Roxtec sealing system is based on Roxylon™ rubber modules with removable layers that enable a perfect fit for cables and pipes of different sizes. The seals consist of these modules, a compression unit and a housing frame, smartly developed to attach to the opening through which the cables or the metal or plastic pipes are routed. In this way, the common cable and pipe diameter range is handled with just six basic sizes of modules. And should there be design changes or other alterations, the flexible Roxtec seals can be reopened and closed again, for example, when exchanging cables and pipes or adding new ones. The raw material for making the sealing system is provided by a supplier according to Roxtec's specifications who then process it themselves.



Layers can be peeled off enabling a perfect fit

The sealing system on a wind turbine



Roxtec experiments a lot with different mixes and types of rubber and creates a lot of prototypes. The materials used are often tailor-made for customers.

Roxtec's sealing solutions are used by some of the most demanding industries including Marine, Oil & Gas, Telecom, OEM, Power and Construction. The products are used on land, at sea and underground and customers include Daewoo Heavy Industries, Samsung Heavy Industries, Hyundai Heavy Industries, the UK and US Navies, BP, Shell, AT&T/Cingular, Motorola, Alstom, Bombardier, Siemens, Vestas Wind Systems and Dow Chemical.

Extreme Testing

Roxtec's Test and Certification department with its six engineers and five test technicians ensures that the Roxtec sealing system undergoes a stringent series of tests. These include material testing in a climatic chamber (-40°C to 80°C), water and gas pressure testing up to 4 bar, splash water and water jet testing, and fire testing.

The sealing system is approved for use in A and H class rated sections and, therefore, protects from hazards induced by water, pressure, fire (can withstand temperatures up to 1000°C for one hour), jetfire and gas. In addition, a special EMC version can be used to prevent electromagnetic disturbances from interfering with equipment. The system is also approved for and complies with the marine equipment directive (MED).

*Pierre Berglund, Tests/
Certificates Engineer
at Roxtec*

Pierre Berglund is a Tests/Certificates Engineer who joined Roxtec 1½ years ago. Before that, he worked in the automotive industry. He has a Master of Science in Mechanical Engineering from the Blekinge Institute of Technology, Karlskrona.

Twenty percent of Pierre's time is used working on vibration and he foresees that will increase in the future – he is already considered to be the “exciting” ambassador at Roxtec.

A year ago, the Test and Certification Department at Roxtec invested in a Brüel & Kjær system that consists of:

- PULSE LAN-XI Front-end with Generator, Type 3160-B-042
- PULSE FFT Analysis Type 7770
- PULSE Data Manager Type 7767
- Battery Module for LAN-XI Type 2831-A
- Power Amplifier Type 2718
- Vibration Exciter Type 4809
- Force Transducer Type 8230
- Impact Hammer Type 8206
- 2 × Miniature DeltaTron® TEDS Accelerometer Type 4507-B-004

A deciding factor in why Roxtec chose the Brüel & Kjær system, beating off two competitors in the process, was the company name and reputation. Pierre explains, “By choosing Brüel & Kjær, we don't have to convince anyone of the quality and we implicitly trust the data”. However, before making a final decision, Roxtec was given the opportunity to loan the system for one month. “It took a mere two hours of training to learn how to use the system, and Brüel & Kjær's web courses provided good back up and support during the learning process”.



Searching for the Seal of Approval

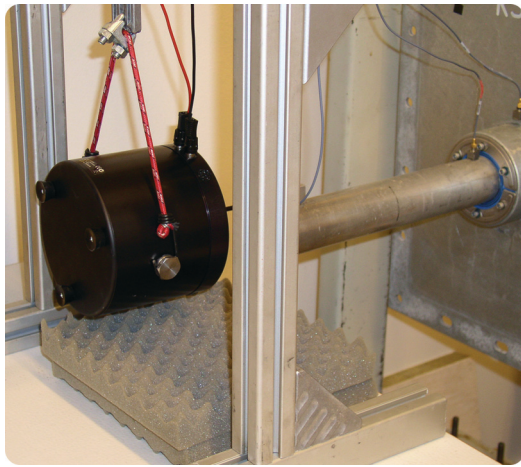
*The system in use at
the test facility*

The PULSE system is used for modal and structural analysis, vibration diagnostics and benchmarking. Pierre says. “The system is mainly for internal R&D, for example, we do a lot of experimenting and testing with rubbers with different properties. The more we learn, the better we know what kind of solutions work for our customers' needs. We also use the system to validate our existing sealing solutions and compare one type of seal with another”.

A PULSE template has been specially created so that all technicians can easily follow the procedure and perform the necessary testing. The same seal mounting test plate (representing a bulkhead) is also used for all the tests whether they are for benchmarking, research or development. This ensures that the modal behaviour of the plate is always known beforehand and provides test consistency.



The testing setup on the front side of the seal mounting test plate



A pipe or cable is mounted through the testing plate. A Force Transducer Type 8230 is placed on the pipe between the shaker and the plate and two Miniature DeltaTron® TEDS Accelerometers Type 4507 – one on the pipe or cable sealing system and one on the plate – measure the vibration levels. A Vibration Exciter Type 4809 driven with white noise is used to excite the pipe/cable setup. This is done first on the front of the plate and then repeated on the reverse side of the plate. Pierre adds, “The PULSE analyzer is set up for FFT and synthesized CPB analysis and we investigate or evaluate the products in a frequency range of 20 Hz to 1300 Hz (highest). It’s a real benefit to be able to look at spectra in real-time. After gathering time data we generate a report in PULSE and export the report into Excel®. The raw data and the report are stored in PULSE Data Manager”. He continues, “The resulting

vibration levels of both tests – front and back of the plate – are then compared and the damping effect of the seal validated”.

Pierre’s job also entails working as a sales consultant and provider of basic training. Armed with a LAN-XI, a battery module, impact hammer, laptop and a couple of transducers, Pierre has the possibility of visiting customers, making on-site surveys by gathering data from their current cable and pipe installations, troubleshooting, or making recommendations. He says, “The system is really easy to use in and out of house. It’s very intuitive for our applications and needs. One aspect I really like is the fact that the LAN-XI front-end and battery module are travel-friendly. I can just take them on customer visits and use them on-site for troubleshooting and verification”.

Pierre describes some typical scenarios where the Roxtec sealing system can make a big difference. “A ship’s hydraulic pipes connect to its engine and vibration from the engine, in an axial direction, excites the bulkhead causing it to vibrate. If the vibration energy coming from the axial direction can be reduced then so can the vibration and thus the noise radiated in the bulkhead. Another example could be the vibration imposed on a ship’s hull, which, over time can cause severe damage to installed pipes. In both cases, we can show our customers that, with the Roxtec sealing system, wear and tear is considerably reduced. By using our seals, welding and, therefore, structural fatigue, are also avoided. We are also proud of the fact that our sealing systems have a sound damping effect.” He continues, “In fact, this damping ability is a great selling point for us and differentiates us from our competitors – that and the flexible mounting”.

Pierre foresees that he will need to boost his Brüel & Kjær system in the future, “Plans for the future include the acquisition of order analysis software, additional front-end channel capability and more transducers. We would like to measure vibration spectra in different locations simultaneously, for example, on both sides of bulkheads so we would need these extra channels. In fact, being able to expand our system was definitely an important consideration when we initially chose Brüel & Kjær”.

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Brüel & Kjær 