PLUG-AND-PLAY TESTING IN THE OIL AND GAS INDUSTRY

STRIVING FOR SAFE, RELIABLE AND COST-EFFICIENT TESTING

EHL GROUP
THE EXTRA EDGE

Resato

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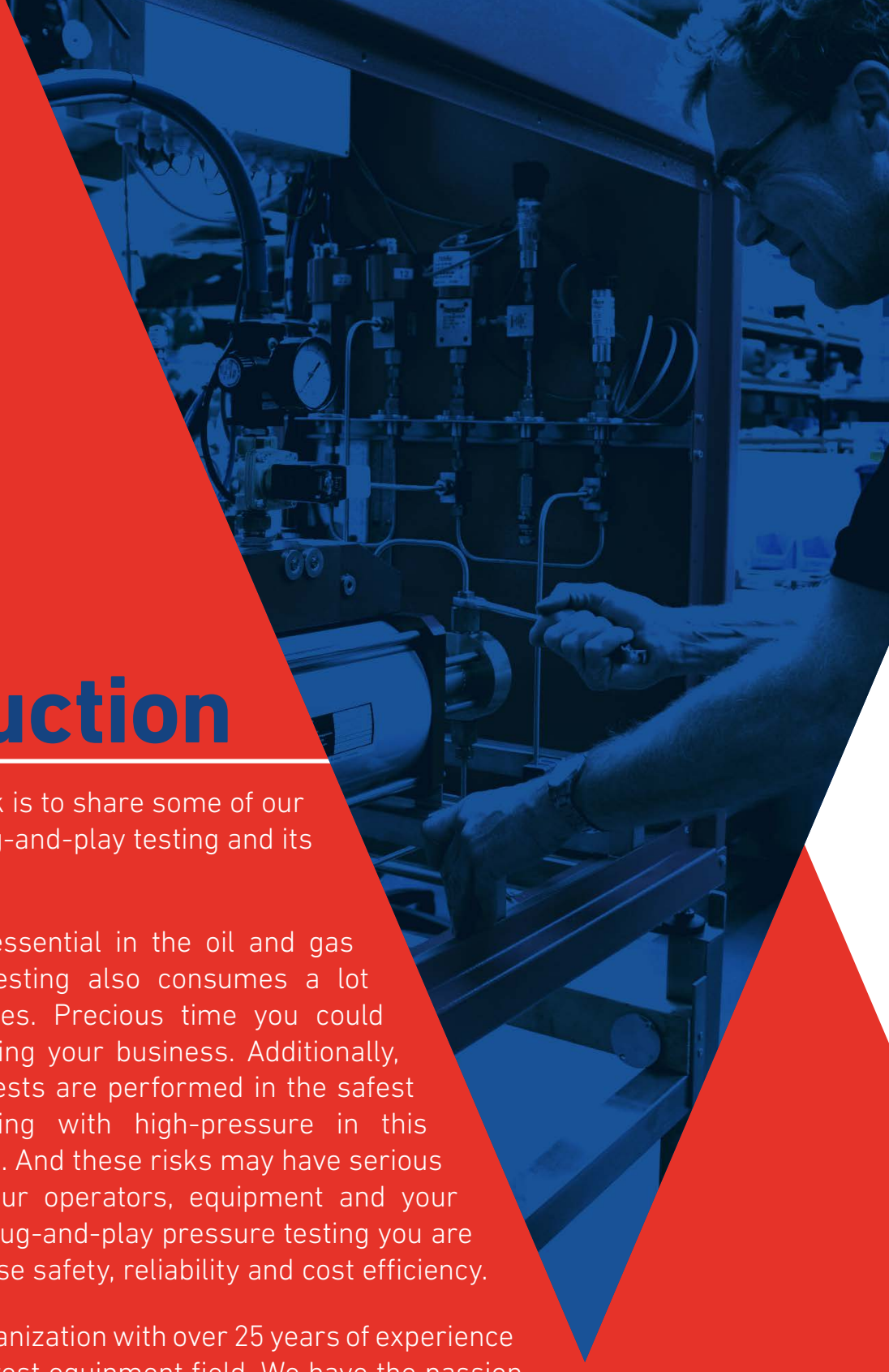


Introduction

The goal of this eBook is to share some of our knowledge about plug-and-play testing and its advantages.

Pressure testing is essential in the oil and gas industry. However, testing also consumes a lot of time and resources. Precious time you could be spending on running your business. Additionally, you want to ensure tests are performed in the safest way possible. Working with high-pressure in this industry creates risks. And these risks may have serious consequences for your operators, equipment and your facility. By applying plug-and-play pressure testing you are taking steps to increase safety, reliability and cost efficiency.

We are Resato, an organization with over 25 years of experience in the high-pressure test equipment field. We have the passion, people and knowledge to help you make quality business decisions.

TIP

IF ANY QUESTIONS COME UP WHEN READING, PLEASE DO NOT HESITATE TO CONTACT OUR EXPERTS. OUR HIGH-PRESSURE EXPERTS ARE MORE THAN HAPPY TO ANSWER ALL YOUR QUESTIONS.

Traditional testing vs plug-and-play testing

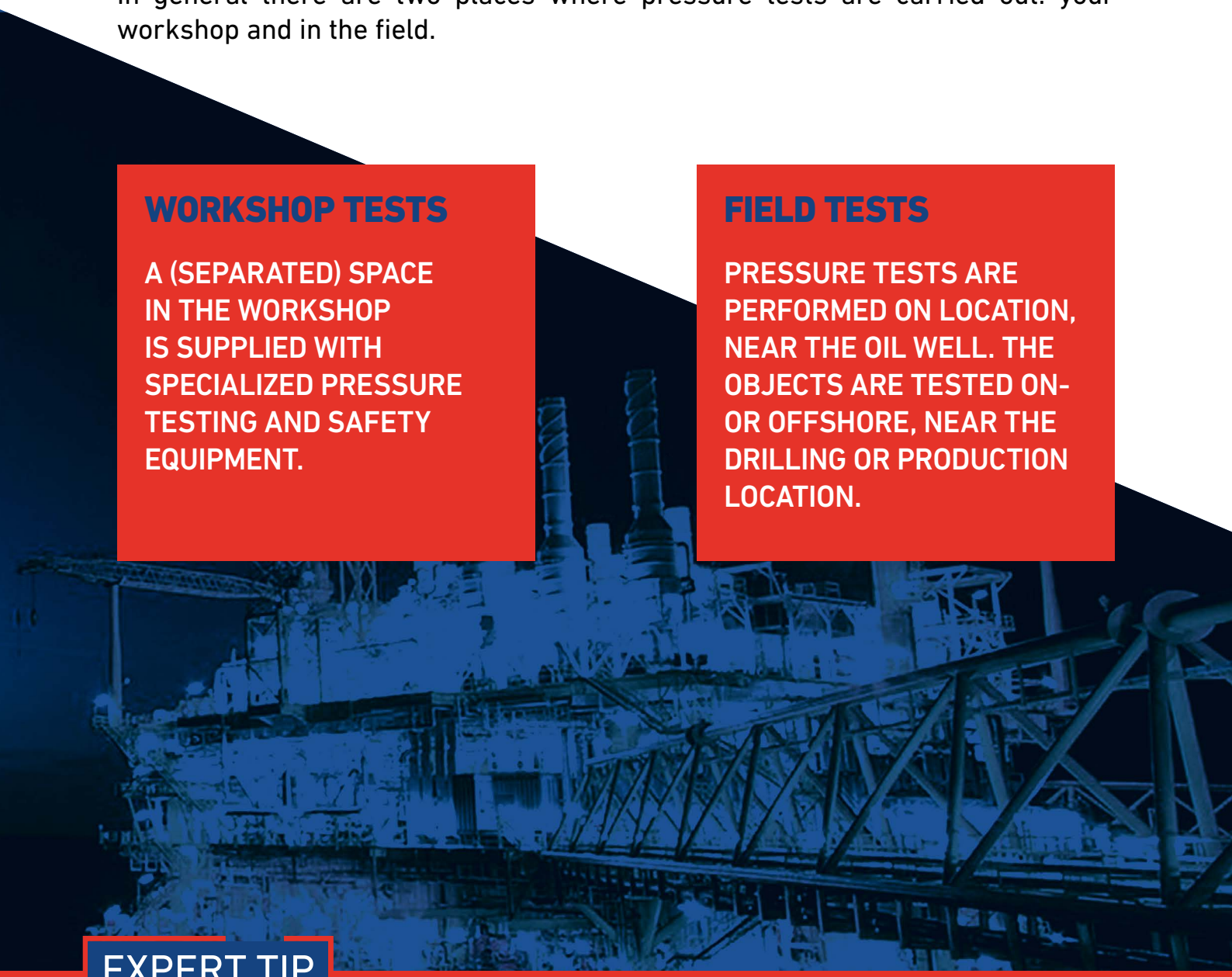
In general there are two places where pressure tests are carried out: your workshop and in the field.

WORKSHOP TESTS

A (SEPARATED) SPACE IN THE WORKSHOP IS SUPPLIED WITH SPECIALIZED PRESSURE TESTING AND SAFETY EQUIPMENT.

FIELD TESTS

PRESSURE TESTS ARE PERFORMED ON LOCATION, NEAR THE OIL WELL. THE OBJECTS ARE TESTED ON- OR OFFSHORE, NEAR THE DRILLING OR PRODUCTION LOCATION.



EXPERT TIP

ENCLOSED AND OPEN TESTING ENVIRONMENTS

Based on your safety standards, resources and your current test set-up you can either choose to test your objects in an enclosed or open test environment. If you need assistance in determining which equipment is required for your situation, we will be happy to assist you.

WORKSHOP TESTING

TRADITIONAL TESTING

- Traditionally in workshops, all objects connect seamlessly to the pressure test bench. Concrete test bays are built to execute tests at a desired location.
- If you wanted to test an object that did not meet the specifications of your pressure test system, it was **quite inconvenient to make this system suitable for the object**. Testing smaller objects than usual is a **waste of space** when using a large test cabinet.
- Additionally, **each single object needs to be transported back and forth to the test bay**. This is a time and rescource consuming undertaking.

PLUG-AND-PLAY TESTING

- Plug-and-play testing **optimises the surface area used for pressure testing in your workshop,** as the testing systems serve different purposes. The systems can conduct various tests for multiple objects.
- This type of testing comprises mobile testing systems, that can be moved around easily. **More objects can be tested in a shorter time frame, since you move the test bay towards the test objects.**
- To prevent human error, automated systems carry and document tests. **Pressure testing becomes more reliable and safer** as the exact same test is carried out repeatedly computerized. Documenting becomes easier, because of the automated process.

FIELD TESTING

TRADITIONAL TESTING

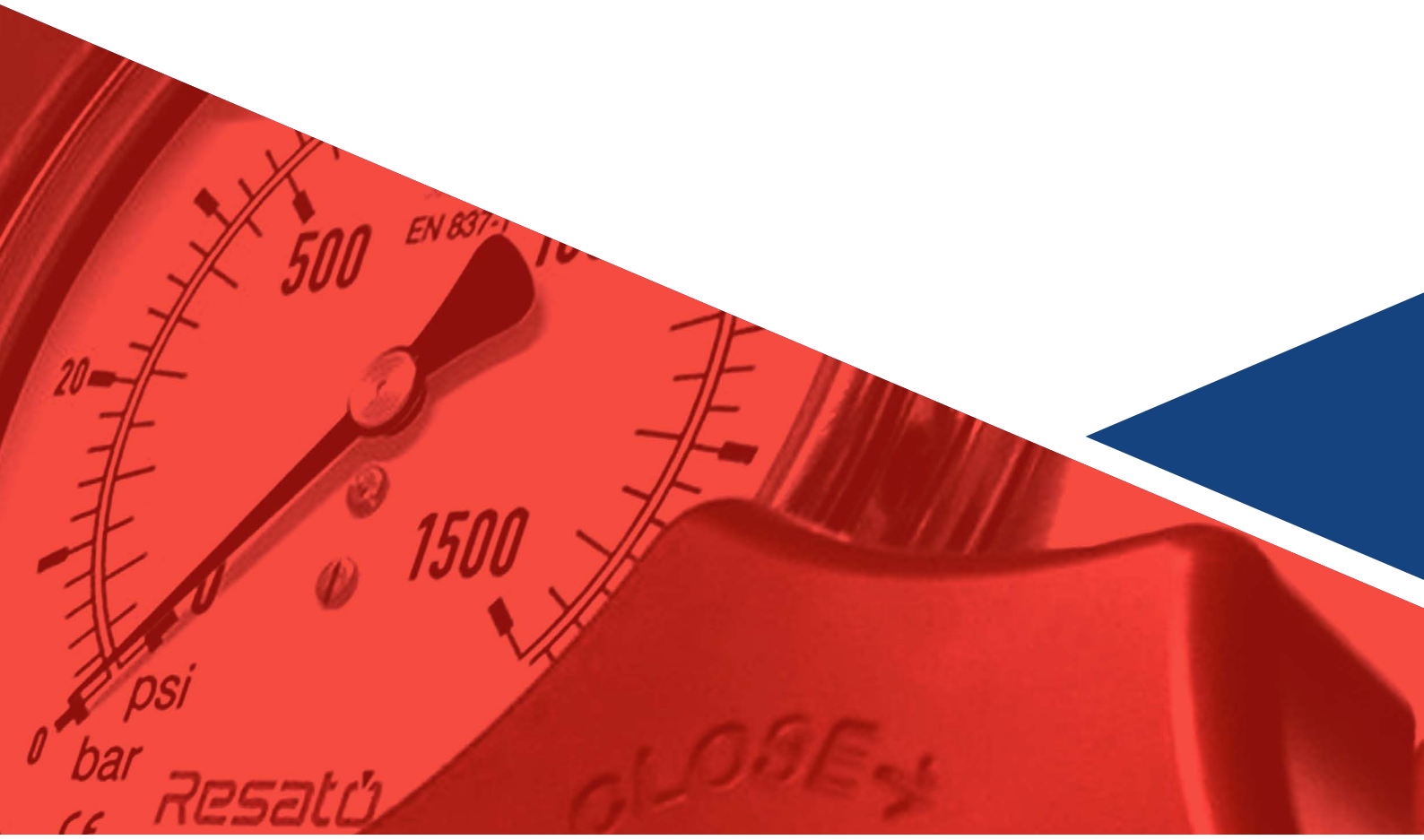
- In the field, traditionally it was logistically difficult to pressure test certain objects. Most of the time there is no safe space to test near the oil well and therefore **objects and tools needed to be transported to the nearest pressure test bay**. These aspects are time-consuming and increase downtime.

- Additionally, the concrete pressure test bay you may construct must comply with **certain requirements that may differ per location**.

PLUG-AND-PLAY TESTING

- As the equipment is mobile and serves for several high-pressure purposes, you can **bring along every tool you need** in the field.

- Pressure testing equipment can be brought to the production sight and the **tests can be carried out on location**.



Testing process

The object and your test protocol determine what kind of pressure test system is needed. In the oil and gas industry we distinguish between three kinds of tests. Of course there are a wide range of tests available, such as burst testing and body and functional testing. However, we think that each tests belongs to one of these three categories:

R&D / JUSTIFYING TESTING

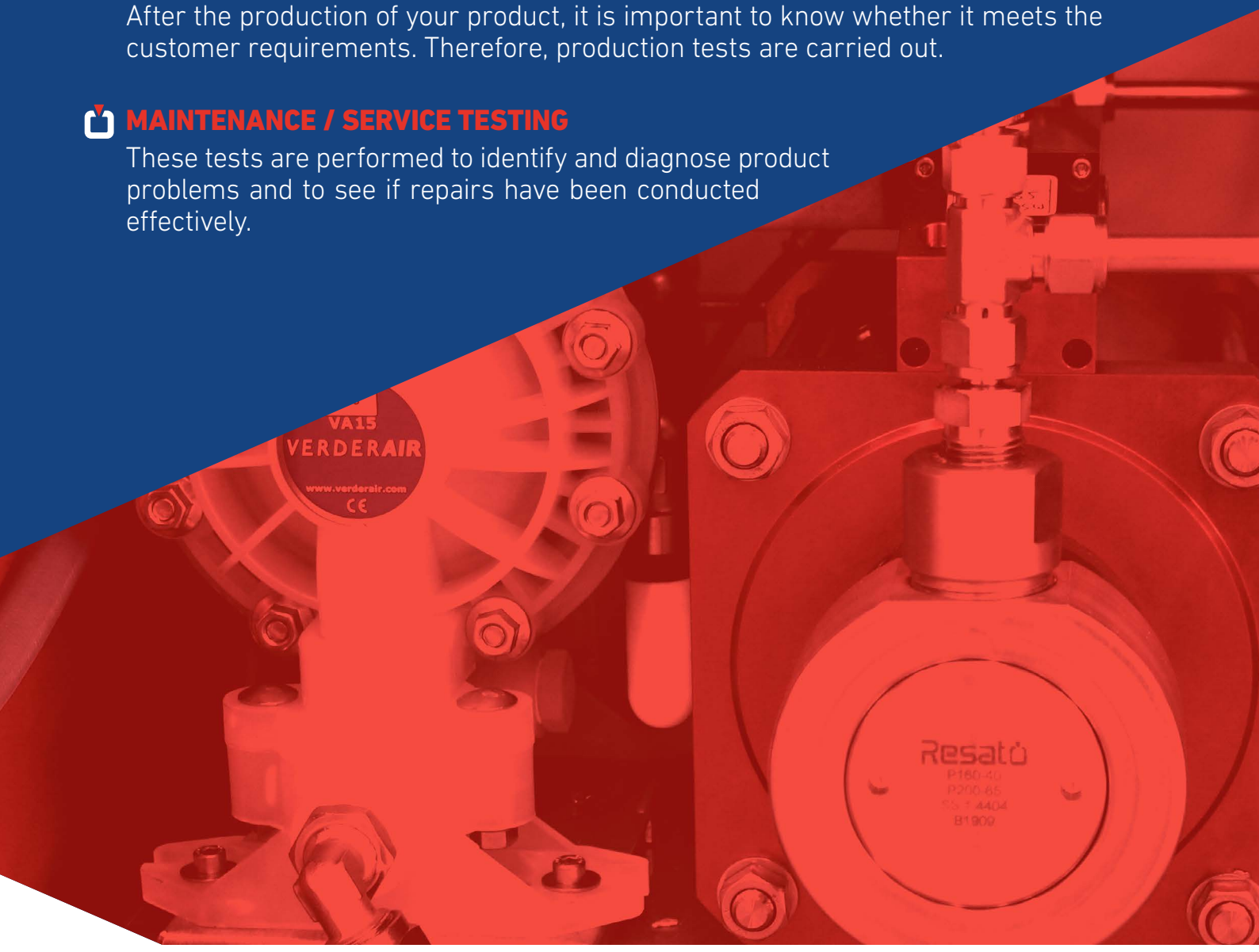
R&D / justifying tests are performed during the development of your product for product validation.

PRODUCTION TESTING

After the production of your product, it is important to know whether it meets the customer requirements. Therefore, production tests are carried out.

MAINTENANCE / SERVICE TESTING

These tests are performed to identify and diagnose product problems and to see if repairs have been conducted effectively.



Although there are a wide range of high-pressure tests that need to be performed in the oil and gas industry, they all include standard steps. These include the preparation of equipment and protocol, loading and pressurizing the test object and the generation of documentation, such as test certificates.

The actual execution of the test consists of four common steps or pressure stages. The steps cover a wide range of specifics, depending on the test protocol.

1 PRESSURIZING.

The pressure is increased until required test-levels have been reached.

2 STABILIZING.

When test object is subjected to high pressure, at first it will resist. This causes fluctuations in the pressure. The pressure needs to stabilize, to ensure your test results will be accurate and the actual test can be executed.

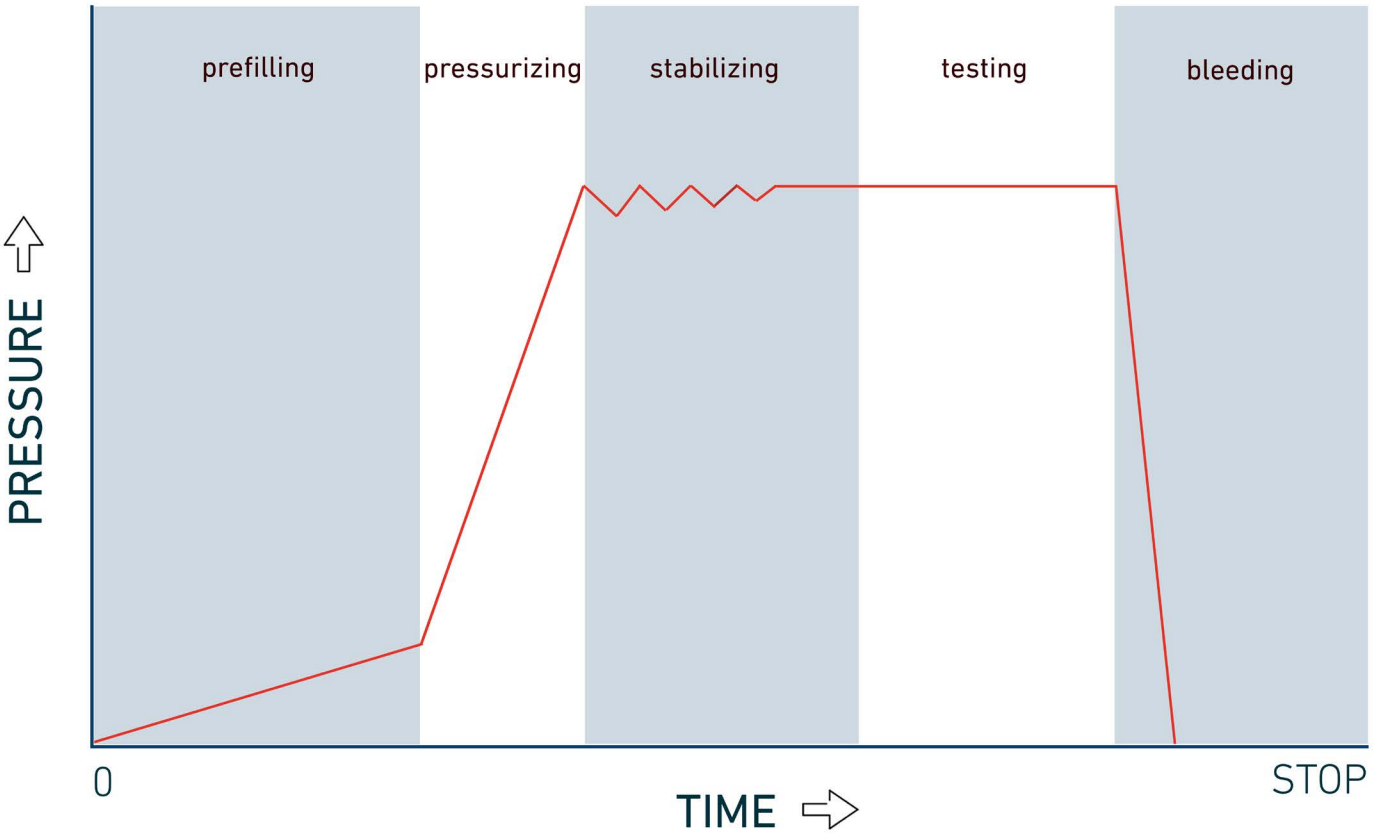
3 TESTING.

The actual test is performed.

4 BLEEDING.

There are two types of bleeding; fast and controlled. Fast bleeding means that the pressure is released at once, while in controlled bleeding continuous small volumes of pressure are released. In the oil and gas industry, fast bleeding is more common. This method saves testing time and additionally tests if certain components such as relieve valves are operating correctly. Also, fast bleeding simulates a pressure drop as it can occur in the field.

AN ILLUSTRATION OF THE VARIOUS PRESSURE STAGES OVER TIME:



EXPERT TIP

When the stabilizing stage takes quite long, this might indicate that the to be tested object is not closed properly or the pump-configuration is not right.

Our experts would like to discuss with you which pump-configuration and set-up ensures the optimal testing system.

What to take into account when testing

REQUIREMENTS, MAINTENANCE AND PERSONNEL

When considering the construction of a pressure test bay or buying pressure testing equipment it is important to **keep in mind what objects you are going to test and what your test protocol is**. With an underperforming system you will never meet your test qualifications. On the contrary, an overperforming system takes more time to test an object because the system operates with high pressure at a low flow rate, increasing downtime. With an optimized workshop or field pressure testing system, your operations will be most cost efficient in the long-run.

When working with high-pressure, it is not the question whether your system needs maintenance, but when. **Carrying out preventive maintenance keeps your equipment up and running, reducing downtime.** Resato provides preventive maintenance contracts, supporting you with regular check-ups and a stock of critical spare parts at your location. This makes linear cost calculation possible.

Besides having the right pressure testing equipment, having the right people also contributes to a safe testing environment. **Sufficiently trained and qualified personnel should carry out pressure tests to ensure a safe environment for your operators and equipment.** Regarding certification, you need to consider that a person's certification expires and needs to be renewed.

Take steps towards plug-and-play testing

There are only three steps towards plug-and-play testing, towards safety, reliability and cost efficiency. We like to refer to these steps as the 3 D's.

DIAGNOSE

You need to diagnose the situation. This consists of looking at the problems or chances that arise. What do you need to respond to these problems or chances? What does your test protocol look like? Each high-pressure situation is different, which means the optimal solution differs as well.

DESIGN

You want a design that solves problems or reacts to your input. We already discussed the properties of over-qualified or under-qualified systems. You need to avoid this and look at your unique diagnosis. This also involves considering how a new testing system is going to be incorporated in your current field or workshop set-up.

DELIVER

Your people are the driving force behind the equipment. When the right person uses the right equipment the system will be used as effectively as possible. Therefore, installing the equipment correctly and training your operators is key.

OUR EXPERTS ARE MORE THAN HAPPY TO HELP YOU DIAGNOSE YOUR SITUATION AND TO THINK ALONG WITH YOU ABOUT THE MOST OPTIMAL DESIGN.

ADDITIONALLY, RESATO PROVIDES PERSONAL OR GROUP TRAINING AND OFFERS AN EXTENSIVE KNOWLEDGE BASE ABOUT OUR SYSTEMS AND EQUIPMENT.

How to set up your pressure test facility

It is important to consider how to organize your pressure test facility for flexibility and safety. Our containerized test bay (type PPU) and our long test box (type LTB) are examples on how to achieve this. Both have their own specific design properties and have different advantages.

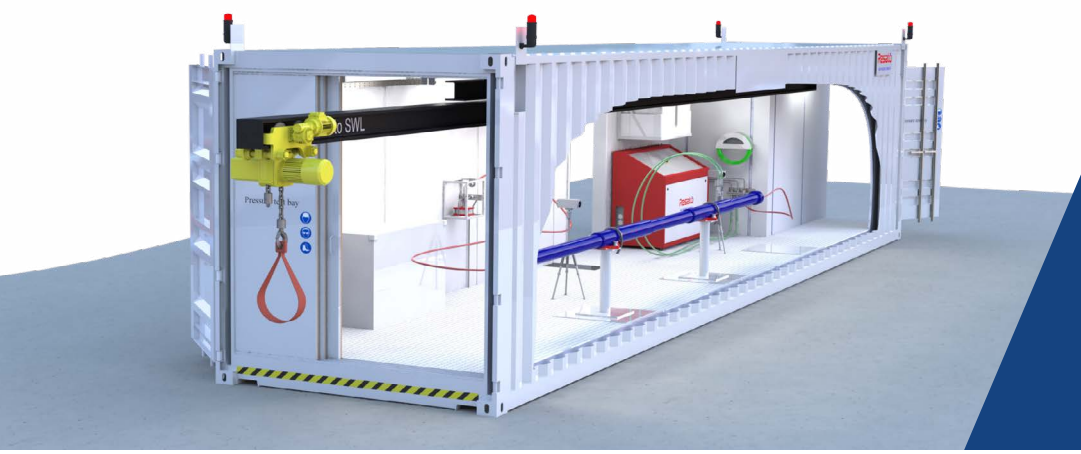
The PPU is suitable for pressure testing wide and large objects in an safe environment.

The LTB fits in an existing workshop, is especially designed for pressure testing long objects such as completions and assures a lean process.

Apart from our vision on safety and flexibility, we provide the possibility to design our enclosed pressure testing bays according to your general safety design criteria.

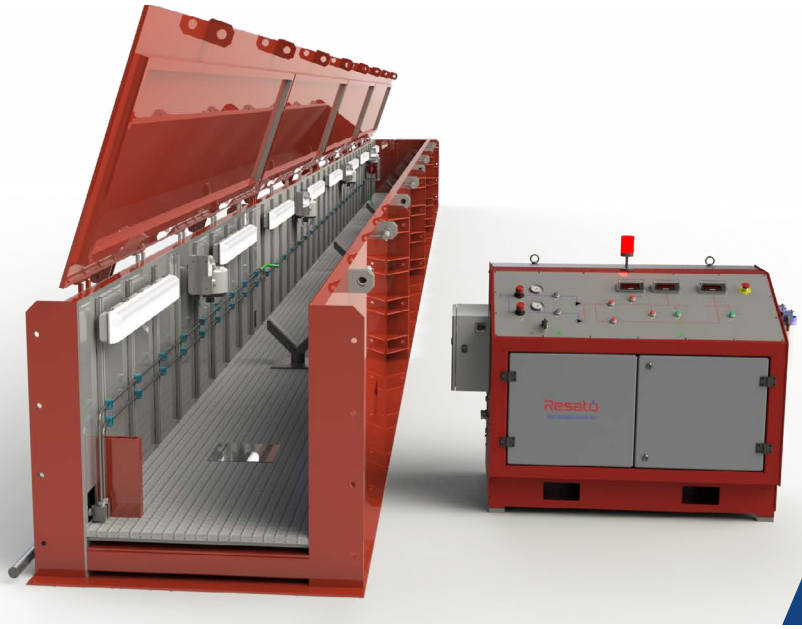
THE DESIGN PROPERTIES OF OUR CONTAINERIZED TEST BAY ARE:

- The container is CSC for top layer certified giving you the maximum flexibility in transporting the container to the preferred location. This is performed best by means of the workshop overhead crane.
- The test systems are located in the container, while the control panel is placed in a separate safe compartment to ensure safety for the operator.
- The container wall is designed according to customer need with waterproof plywood inlay for shock and impact absorption.
- An integrated data acquisition system allows you to generate test certificates onsite.
- Built-in air conditioning will enable workers to keep concentrated, even though they work in extreme conditions.
- Various pump setup possibilities: low pressure, high volume and high-pressure low volume.
- Spilled test fluids are captured and collected by an integrated grid floor in the test bay. The filtration system, in combination with reservoir, allows recycling of the test medium.



THE DESIGN PROPERTIES OF OUR LONG TEST BOX ARE:

- Build-in forklift pockets allow to move the test box around easily with an overhead crane.
- The test systems are located in the container, while the control panel is placed in a separate safe compartment to ensure safety for the operator.
- Hydraulic cylinders allow for easy opening and closing of the lid.
- An integrated data acquisition system allows you to generate test certificates onsite.
- From the sump pit on the box floor, the fluids are pumped back to the reservoir. This eneables re-use of test fluid.
- Because of the modular design, different lengths with 5 meter increments are possible. Because of the modular design, objects can be loaded, tested and monitored with minimal loss of valuable workshop space.



Why partner with EHL & Resato?

With high pressure comes high stakes, for your people, for your customers, and your business. EHL and Resato are the experts in ensuring that this area of your business operates smoothly. What makes us different?

- WE ARE AN ALL-IN-ONE SUPPLIER THAT DEVELOPS ALL COMPONENTS IN HOUSE TO ENSURE QUALITY AND MINIMIZE EXPENSIVE DOWNTIME
- WE HAVE A TEAM AVAILABLE THAT SUPPORTS YOU BY PHONE OR VPN CONNECTION TO GET YOU UP AND RUNNING AGAIN AS QUICKLY AS POSSIBLE
- WE OFFER A WIDE RANGE OF PRE-BUILT AND CUSTOMIZED HIGH-PRESSURE TEST SOLUTIONS
- WE OFFER SOLUTIONS AND SUPPORT GLOBALLY
- WE MEASURE OUR SUCCESS BY YOUR SUCCESS
- WE HAVE OVER 25 YEARS OF EXPERIENCE IN HIGH-PRESSURE TECHNOLOGIES

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